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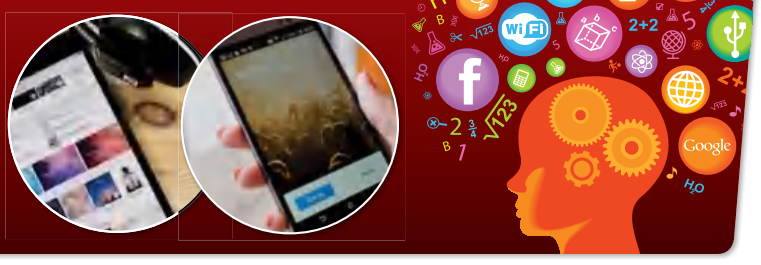

WINDOWS 10

Why the new Xbox app is a game changer

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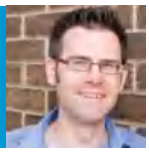

Happy birthday... to us

We celebrate 20 years of *PC Advisor*

It's exactly 20 years since the first issue of *PC Advisor* went on sale in August 1995. Reading back through the very first issue gives a stark reminder just how much technology has advanced in a mere two decades. It's easy to forget that this was a time before many people had even a dial-up modem to access the World Wide Web and send Electronic mail, let alone a dedicated broadband connection that didn't prevent anyone else in the house using the phone for – y'know – actual calls.

Windows 95 was about to launch and then-editor Jason Whittaker's hope was that it would make computer programs attractive and of real interest to the wider public. In his opinion they were simply too complicated, buggy and boring. Windows 95 certainly did make PCs more popular, and was followed by the massive success of Windows XP which – despite being unsupported now – is still being used by millions around the globe.

Counting Windows 10, there have been eight versions of Microsoft's ubiquitous operating system in the past two decades: 98, Me, Vista, 2000, XP, 7, 8 and now 10. Make that seven if you don't count Windows 2000 as a consumer operating system.

The real gem in Whittaker's opening column, however, was to state that: "The internet has been overhyped recently." With the benefit of hindsight it's laughable that this was the opinion of a tech expert. (You can read his column in full on page 146.) These days there isn't much you can do with a smartphone in Flight mode. Virtually every app relies on its connection to the "information superhighway" as we used to call it.

Getting online in 1995 was an expensive business. Your bargain basement PC cost over £1,000, and that didn't even include a modem, CD-ROM drive or sound card. If you had those you had a 'multimedia' PC, on which you could play Doom without having to put up with tinny bleeps and blurps from the internal speaker.

Even a basic smartphone today has a CPU that's at least 10x more powerful than a 1995 PC and costs roughly one-tenth as much. The recommendation back then was to buy a machine with a 200MB hard drive, 8MB of RAM and a 75- or 100MHz processor.

In the budget laptops group test on page 84, you'll find models with 8GB of RAM, 1TB hard drives and processors that run at over 3GHz. And you can have that for a lot less than £300. We'll look back in 20 years and smile at these paltry figures, no doubt, but right now these are veritable bargains.

Some things never change, of course. Our aim now is the same as it was 20 years ago: to provide the best buying advice and to explain how to use the kit once you've got it. In issue 1, we explained how to choose a modem and connect to the internet. Today we're explaining how to use the new features in Windows 10 and which smartphones and smart watches to buy.

We've scanned the best bits from issue 1 so you can reminisce about the good old days or, if you're a Millennial born in the 90s and therefore too young to remember beige midi-towers and CRT monitors, so you can better appreciate the lineage of the touchscreen tech you hold in your hand today.

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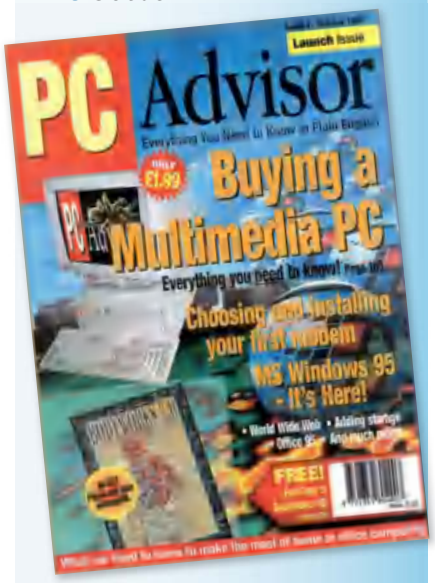

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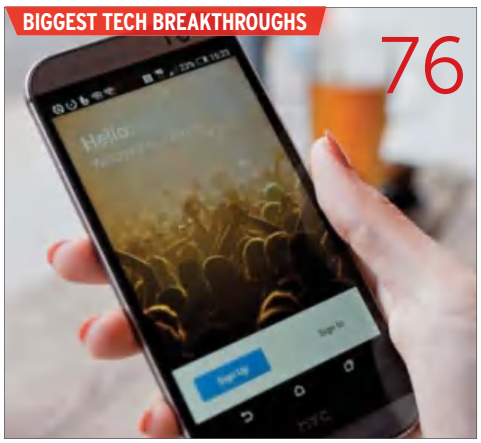

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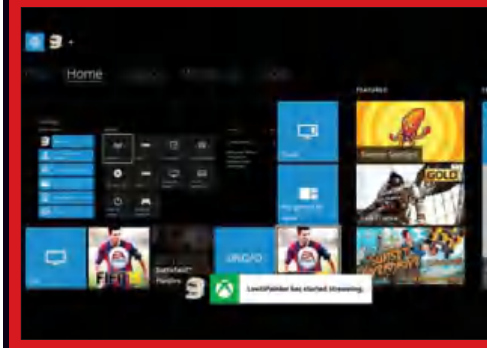

Windows Phone isn't going away

Satya Nadella says Microsoft isn't killing Windows Phone and will go it alone if it has to

You might think that Windows Phone was doomed, following Microsoft's recent reorganisation of its phone business, especially after Microsoft wrote down the value of the business. Microsoft CEO Satya Nadella put those fears to rest, however, in an interview with ZDNet's Mary Jo Foley.

He has emphasised, time and again, that his goal is for Microsoft to establish new product categories that partners can build upon. In the phone business, however, partners haven't followed Microsoft's lead.

The CEO seems to be fine with that. "If there are a lot of OEMs, we'll have one strategy. If there are no OEMs, we'll have one strategy," Nadella said of Windows Phone's future. Microsoft seems content to go it alone, or if a hardware partner such as HTC or Samsung commits to the platform, that's fine too.

Sticking up for Windows Phone shows how committed Microsoft is to supporting new categories of devices. This is something Nadella started talking about as early as the Surface Pro 3 launch, when Nadella said that Microsoft would set an example for the hardware industry to follow. As he told Foley, that strategy has carried over to app development like Sway or Gigjam, where Microsoft is breaking out of the traditional Office hierarchy to create cross-disciplinary apps. He also more plainly explained how Microsoft's vision will affect developers and consumers, especially in the mobile space.

Nadella has previously characterised Windows 10 as an operating system that straddles multiple hardware platforms: the desktop PC, the notebook, the tablet, the phone, the Surface Hub, HoloLens, and the Xbox. The market hasn't really bought this story so far, at least where Windows phones are concerned.

In the Foley interview, however, he made clear that he sees Windows 10 Mobile as part of the billions of Windows 10 devices, not as a standalone operating system, as it was with Windows Phone 8.1. "You start the journey there and take them to multiple places. Their app can go to the phone. They can go to HoloLens. They can go to Xbox," Nadella said.

That's the key to luring new developers, Nadella said: getting them on Windows, even if Windows is the PC or the Xbox or the HoloLens. "You talk to somebody like Airbnb. It might be more attractive, given our three percent share on phone, for them to actually build something for the desktop and for the Xbox. And by the way, when we hook them on that, we have a phone app."

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Restructuring

A key focus of those apps – phone or desktop – will be the business market. At the time of the restructuring, Nadella said Microsoft's phone business will focus on three things: low-end communications devices, flagship Windows phones, and business devices.

This restructuring has seen Microsoft announce that it will cut up to 7,800 jobs and take a $7.6bn impairment charge in a "restructuring" of its phone business, which it largely acquired through Nokia just over a year ago.

The write-down is in essence an admission that Nokia's phone business is worth practically nothing to Microsoft, despite a $7.2bn acquisition in April 2014. That deal was initiated by former Microsoft CEO Steve Ballmer, and became final after Nadella took over in February of 2014.

In addition to the impairment charge, Microsoft will pay $750m to $850m for the next round of layoffs. Microsoft already laid off roughly half of Nokia's 25,000 employees in July 2014.

In a memo to employees, Nadella said the company would stop trying to grow a standalone phone business and concentrate on expanding the Windows ecosystem. That means a smaller portfolio of Microsoft phones aimed at specific goals: "We'll bring business customers the best management, security and productivity experiences they need; value phone buyers the communications services they want; and Windows fans the flagship devices they'll love," he wrote.

This memo shows that the smartphone version of Windows isn't going away, as Nadella says he is "committed to our first-party devices including phones." But it sounds as though Microsoft is giving up its chase for market share – and by extension, a vast array of phones for every market – and instead focusing on a handful of cases where Windows might be useful.

Moore's Law slows and so does chipmaker Intel

CHRIS MARTIN

Intel announces it will add a third 14nm microprocessor, Kaby Lake, to its roadmap

Intel has announced that it will add a third 14nm microprocessor, Kaby Lake, to its roadmap, disrupting the steady tick-tock pace of the PC market as Moore's Law slows.

For Intel and the PC industry, adding Kaby Lake to the roadmap is a bombshell. Every two years like clockwork, Intel has released two products: a version of an older chip on a more advanced manufacturing process, followed by a brand-new processor design on the same manufacturing node.

That cadence, which Intel refers to as its "tick tock" manufacturing strategy, was upended recently when Intel said that it would add the Kaby Lake chip to follow the Skylake chip that Intel will launch this fall. Intel's shift to the next-generation 10nm process will now take place in the second half of 2017, roughly two-and-a-half years after Intel moved from the 14nm node.

To recap, then, Intel's roadmap looks as though this: Intel launched the 14nm 'Broadwell' fifth-generation Core chips earlier this year. Intel's sixth-generation Core chip, 'Skylake', also a 14nm product, has been qualified as a product and will roll out this fall. 'Kaby Lake', another redesigned chip on the 14nm node, will ship in the second half of 2016. And Intel expects the first 10nm chip, 'Cannon Lake', to ship in the second half of 2017.

As Moore's Law slows, so does the pace of PC demand: Intel reported lower revenue and profits as the market waits to buy Windows 10 PCs, including the Skylake processor, and the PC market continues to slow worldwide.

This matters because Intel is often viewed as the gold standard of manufacturing in the semiconductor industry, so any slowdown will send ripples through its competitors. Intel chief executive Brian Krzanich has enjoyed a manufacturing technology lead over his competitors. Intel may have handed back some of that lead. It remains to be seen whether Intel's competitors will adjust their manufacturing timetables, too.

AMD showing signs of life on the graphics side

AMD launches affordable A8-7670K APU for gaming PCs built on a budget

After a long period of status quo, AMD is showing signs of life on the graphics side with the Radeon R9 Fury and Fury X and the new Radeon R300-series. The company's still in comeback mode when it comes to computer processors, though, after a recently sluggish PC market resulted in lower APU sales.

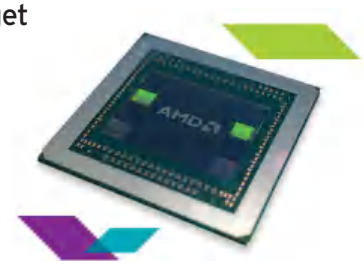
Hoping to deliver another punch against Intel's Core i3 line – and just in time for Windows 10 – AMD recently announced the quad-core A8-7670K desktop APU.

Similar to the A10-7870K that showed up in May, the A8 processor is aimed at budget PC builders looking to get their game on for a low price. The A8-7670K has a base clock of 3.6GHz compared to 3.9GHz on the 7870K; it's also a little slower on the GPU side, running at 757MHz compared to 866MHz on its A10 counterpart. The A8-7670K is also running with two fewer GPU cores – six, compared to eight on the A10-7870K.

Beyond the basic specs, the A8 features most of the goodies you'd like to see in a modern chip such as Virtual Super Resolution, and AMD's FreeSync feature that lets graphics processors and compatible displays sync their refresh rates.

That FreeSync support may wind up being important. AMD expects many current games to run around 30 frames per second at 1080p with the A8-7670K's integrated Radeon graphics processors, such as League of Legends, Heroes of the Storm, and Dota 2.

Now, 30fps is a far cry from the PC gaming gold standard of 60fps, and is considerably poorer than the 49fps AMD was claiming for the 7870K running Dota 2. Nevertheless, it's still at the bottom end of playable, and FreeSync may be able to squeeze a little more smoothness out of your typical 30fps experience if you pick up a display with a variable refresh rate that supports framerates that low.



If you have a setup and are thinking about trying to drop in the A8-7670K, it'll fit the FM2+ socket just like the A10-7870K.

Qualcomm plans cuts, may spin off assets

Plus, chipmaker under investigation by the European Union's antitrust authority

Qualcomm has announced that it is to cut costs by about $1.4 billion per year and study the possible sale of assets as part of a company realignment.

The mobile technology company is also shaking up its board of directors as part of an agreement with investment company Jana Partners. Jana, which owns a chunk of Qualcomm's stock, has pressured the company to spin off its chip division from its patent licensing business. The realignment was announced as Qualcomm reported its profit fell by nearly half in the April to June quarter on revenue that declined by 14 percent from a year earlier.

"The changes we are announcing today are designed to enable us to right-size our cost structure and reposition Qualcomm for improved financial and operating performance," CEO Steve Mollenkopf (pictured) said in a statement.

Qualcomm plans to cut $1.1bn from its annual costs of $7.3bn. It also intends to cut share-based compensation by $300 million per year. It will cut jobs, close offices and shift more operations to lower cost locations.

Palo Alto Networks Chairman and CEO Mark McLaughlin and Tony Vinciquerra, senior advisor to Texas Pacific Group and former CEO of Fox Networks Group, have joined Qualcomm's board as part of the deal with Jana. Together with Jana, Qualcomm will appoint another board member soon.

Antitrust probe

The chipmaker is also under investigation by the European Union's antitrust authority, which suspects the company of abusing its dominant position in the market for 3G and 4G chipsets used in smartphones and tablets.

The European Commission has initiated proceedings against Qualcomm in two investigations. The first concerns whether Qualcomm breached EU antitrust rules by offering financial incentives to phone manufacturers on the condition that they buy chipsets exclusively, or mostly, from the company; the second, whether Qualcomm engaged in predatory pricing, selling below cost to force competitors out of the market.

Mobile processors and baseband chipsets, which handle the communications protocols used in wireless networks, form a significant proportion of the cost of a mobile phone and, at least at the low end of the market, margins are getting thinner, leaving phonemakers more vulnerable to pricing pressures from their suppliers.

Qualcomm's business practices have come under antitrust authorities' scrutiny before. Earlier this year, Chinese regulators fined Qualcomm $975m for overcharging device makers there. While the Commission is investigating the issue of financial incentives on its own initiative, the predatory pricing probe was triggered by a complaint.

Commission officials declined to name the complainant, but UK semiconductor company Icera filed such a complaint against Qualcomm in 2010.

Staff at the Icera division of nVidia, which now owns the company, could not immediately be reached for comment. NVidia bought Icera in 2011 in order to add 3G and

4G baseband capabilities to the chipsets it was developing for mobile phones. However, nVidia has now abandoned development of baseband chips, and said in May this year that it will buy such components from other suppliers when Icera's current 4G LTE modem is no longer suitable.

The Commission has no deadline for completion of its antitrust investigations. While it has been investigating Qualcomm's business practices for some time, the recent announcement marks a new stage in the process.

Qualcomm said it had been notified that the Commission had initiated proceedings against it in the two ongoing investigations. It will continue to cooperate with the Commission, but believes the concerns are without merit, it said.

Sky launches free fibre-optic broadband

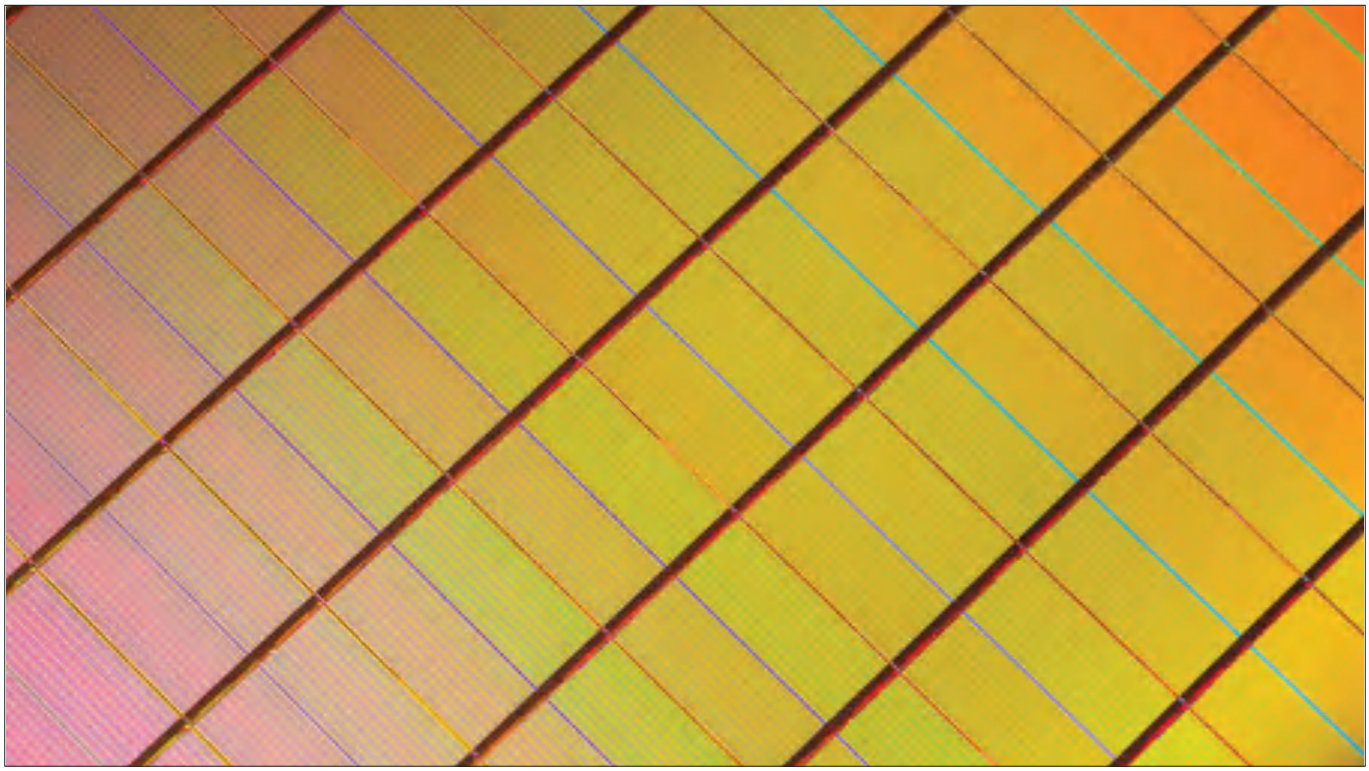
Sky has made a big move in the broadband market by making its Sky Fibre package free for a year

Sky has shaken up the broadband market with the launch of its free Sky Fibre Broadband offer. As the battle hots up between the broadcaster and BT on the sports side of things, Sky has made a new move to win over broadband customers which will potentially worry other rivals such as Virgin Media and TalkTalk.

The Sky Fibre package normally costs £10 per month, but the firm is waiving that fee. The contract is for 12 months and there's no obligation to continue after the year is up. Sky says this will mean that those who sign up will save £186.13 compared to BT.

Before you sign up, it's worth noting the following. First, Sky Fibre offers download speeds of up to 38Mb/s. You'll also need to pay £16.40 per month for line rental, £6.95 for router delivery and adhere to the 25GB monthly data limit. You'll also get free on-demand access to the large Sky Box Sets library. Customers who want unlimited broadband can get slower 17Mb/s broadband for free or get Fibre Unlimited for £10 per month which is normally £20 per month.

Lyssa McGowan, director of Sky Broadband, said: "We know there are lots of people who would like to try superfast speeds but are put off by the high prices charged by some providers. With this ground-breaking offer, we're making Sky Fibre even more accessible. Now superfast broadband is genuinely for everyone."



Intel and Micron invent a new class of memory

3D XPoint is 1,000 times faster than flash and 10 times more dense than DRAM, reports Stephen Lawson

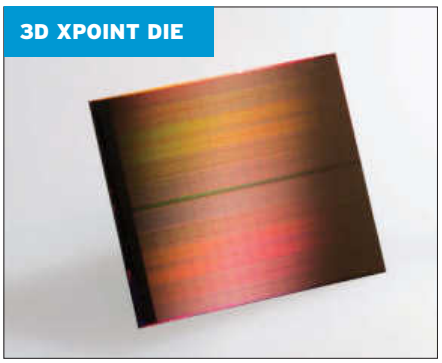
To fill computers' voracious appetite for data, Intel and Micron have announced that they've developed the first new kind of memory since NAND flash was introduced in 1989.

The new technology, 3D XPoint, is a form of non-volatile memory that's as much as 1,000 times faster than NAND flash, the companies claim. Processors will need access to memory that's fast enough to crunch the data sets for things such as 8K gaming and financial fraud detection, according to Intel and Micron. 3D XPoint is due to ship in sample quantities later this year and arrive in products next year.

The companies developed 3D XPoint to complement DRAM and NAND. Far faster than NAND, but still an order of magnitude slower than DRAM, it also has a cost per bit that falls in between the two established technologies, explained Scott DeBoer, vice president of research and development at Micron. The speed comes in part from the fact that 3D XPoint reads and writes data in very small sizes, similar to DRAM, but it's 10 times as dense as DRAM, he added.

3D XPoint could fit in anywhere that rapid access to large amounts of data is required, including as a high-speed cache. It could deliver benefits including high-fidelity pattern recognition, and more responsive games with larger worlds and more textures, they said.

"This is truly a breakthrough kind of technology the industry has been looking for a while," enthused analyst Patrick Moorhead of Moor Insights and Strategy. It will take the place of SSDs in some PCs and servers, especially for big data deployments, and in time could change the way developers architect applications and operating systems.



Intel and Micron have been working on 3D XPoint since 2012, though some of their scientists have been involved in the quest for much longer, DeBoer revealed. The two companies teamed up in order to make it a reality sooner. It's the faster flash that the industry has been looking for, the companies say. They also claim that it also has 1,000 times the endurance of NAND, meaning it's possible to read and write data with it many more times.

To achieve those goals, the companies developed a new architecture called a 'cross-point array', which they describe as a three-dimensional chessboard. Each cell is connected to metal lines at the top and bottom, which are perpendicular to each other and allow for quick connections. The cell itself consists of a switch and the memory element, with no need for a transistor. It stores data not by moving electrons, as NAND does, but by changing the resistance of the material itself, which the companies won't identify.

Intel's first Skylake chips incoming

The first Skylake chips due to be available later this year, reports Agam Shah

Fancy a Mac or Windows 10 PC with Intel's new Skylake processors? That will soon be possible: the company will launch its first chips based on the new architecture this summer. They will be branded 'sixth-generation core' processors and, according to Intel, offer "great performance and reduced power consumption".

The chipmaker's goal with Skylake is to make PC usage more convenient. With that in mind, it has talked about the "wire-free" technologies in Skylake, so PCs could charge and transfer data to peripherals wirelessly.

Dell, HP and Asus have announced that they will ship Windows 10 PCs with the new processor in the second half of this year. It's not clear when the chip will reach Macs, and Intel tends not to speak on Apple's behalf.

Some Skylake features are already known. In June, Asus showed off Skylake all-in-ones and mini-desktops, with support for the new DDR4 memory, USB 3.1 data transfer protocol. The architecture also offer support for Thunderbolt 3, a new technology that runs on USB Type-C cables and can transfer data at 40Gb/s (bits per second).

At the time of writing, Intel was due to shed more technical details about Skylake at its Intel Developer Forum. One interesting technical session was set to detail how to overclock Skylake gaming desktop chips. Another session was due to demonstrate Skylake PCs running Cortana and Windows Hello, a new Windows 10 biometric feature in which faces, fingerprints or eyes can replace passwords.

Intel has hurried to get Skylake to PCs, so it can close the curtains on the troubled predecessor Broadwell chips, which were delayed due to manufacturing issues on the 14nm process. The new processor will take on AMD's 'Carrizo' chips, which are now reaching PCs. AMD is also rushing to release its next-generation chips based on a CPU core codenamed Zen, which are due to appear in PCs next year. ☒

INTEL'S KIRK SKAUGEN DEMONSTRATES 'SKYLAKE'

Google Wing drones

Google wants order in uncontrolled airspace so its Wing drones can fly, says Martyn Williams

To bring order to low-altitude airspace so its Project Wing delivery drones can get off the ground, Google is proposing a set of rules for operating aircraft below 500 feet.

The proposal calls for all drones, including those flown by hobbyists, to constantly transmit identification and position information so airspace access and collision avoidance can be managed by computer.

The proposal, unveiled by Dave Vos (pictured), head of the Wing project, seeks to take moment-to-moment control of airspace under 500 feet away from air traffic control authorities and put it in the hands of private airspace service providers (ASP).

These companies would receive data from all craft in flight, including hobbyist drones, emergency helicopters and commercial craft such as those being developed by Google Wing. Before every flight, each craft would send a short flight plan. The flight might be approved as requested, approved with modifications to take into account other users, or denied.

"There's this fundamental enabler called the airspace management system. We have to build one, and we think everybody that wants to build one should be able to build one," said Vos, outlining his vision of competing ASPs.

They would exchange information about airspace users and communicate with current air traffic control systems only when there was something important going on. Run-of-the-mill flight and control would remain within the ASP-controlled system.

Right now, use of this low-altitude airspace is largely unregulated and hobbyists are able to fly without having to identify themselves, their vehicles or detailed flight plans. That's one reason that the US Federal Aviation Administration (FAA) allows drone flight only within visual line of sight.

But if Google, Amazon and other companies are to use drones for package delivery and other services, the line-of-sight restriction will need to be lifted.

"We definitely want to push the definition of this Class G airspace where we'd like to operate," said Vos, referring to the FAA's designation for most unregulated airspace. "There's a lot of business to be done there."

Vos is proposing that the system be based as much as possible around technology that already exists, to reduce development and standardisation time.

That means drones and aircraft would use ADS-B, an aviation industry standard used on many airliners that sends out position, heading, speed and identification data every few seconds. All large planes already have ADS-B transponders, but with entry-level equipment starting at around £1,500, many smaller aircraft do not.

Earlier this year, Google said it had started development of an "ultra low-cost" ADS-B transponder that will be cheap enough that every operator will be able to afford it. "If you can't afford it, you can't afford to fly, in my opinion," he said. "That means we need to make sure everyone can afford it."

He also wants to use existing cellular networks for the two-way data paths between drones and the ASPs, and he called on network operators to get involved.

"Join us. You guys can make a ton of money and so can we."

If the FAA takes up Google's proposal, Vos said, it will make flying "significantly safer and significantly more reliable and better performance", but Google clearly has a heavy commercial interest in changing the current regulatory regime.

It and Amazon have been two of the most vocal proponents for a new set of rules and regulations that would allow companies to use drones to make money. The FAA is also being lobbied by filmmakers, real-estate agents, engineers and others who see drones as a way to change or improve the way some work is currently done.

Five smartphones to look out for

The second half of 2015 looks as exciting as the first for smartphone buyers, says Mikael Ricknäs

If you're planning to buy a new smartphone this year but haven't bought one yet, it might be better to wait a bit longer: Apple, Samsung and OnePlus are all expected to launch new models in the next couple of months. Here are some of the models you should see during the second half of 2015.

OnePlus 2

While most of the products on this list (and their specs) are just rumours, Chinese smartphone maker OnePlus has been busy detailing its 2 model, which is available to buy now.

The phone has a fingerprint sensor and is powered by Qualcomm's Snapdragon 810. The company has used an upgraded version of the processor, v2.1, which, according to OnePlus, isn't susceptible to the overheating issues that the first version reportedly suffered from.

ONEPLUS 2

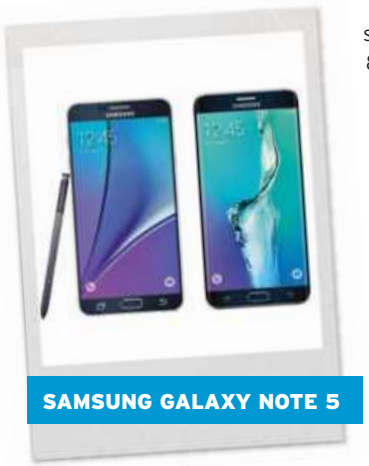
It's the first high-end smartphone to offer a USB-C port, which is meant to be an all-in-one solution for power, video, and data delivery using a single cable with a reversible connector. There are already laptops that use the technology.

Fairphone 2

Just like OnePlus, Dutch company Fairphone has started to build some hype for its second product. The goal is to build a smartphone that won't easily break and can be easily repaired.

Hardware specs include a Qualcomm Snapdragon 801 processor and a 5in, Full HD screen. The camera has an 8Mp resolution and there is 32GB of storage that can be expanded using a microSD card. The LTE smartphone also has 2GB of RAM and two SIM slots. The operating system will be Android 5.1.

The Fairphone 2 will be available for preorder before the end of August, and then ship during the following couple of months.

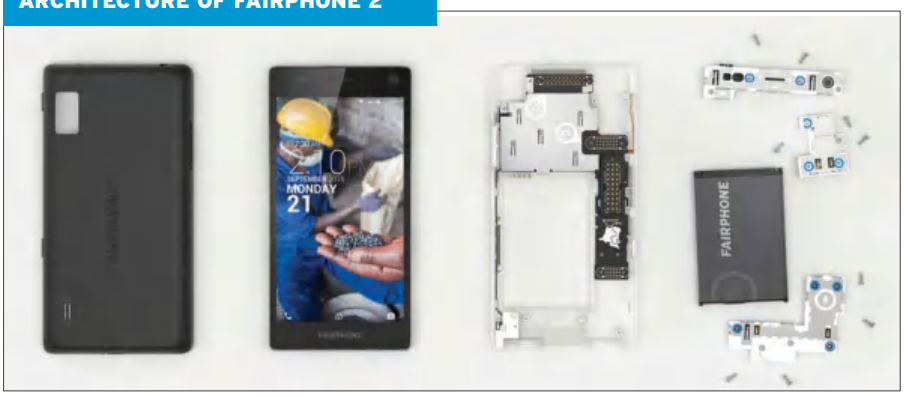


SAMSUNG GALAXY NOTE 5

Samsung Galaxy Note 5

A new Galaxy Note model arriving during the second half of the year has become a bit of a tradition. A launch at the IFA trade show in the beginning of September looks likely. With the fifth version Samsung needs to step up its game if it wants to compete more

ARCHITECTURE OF FAIRPHONE 2



successfully with Apple's iPhone 6 Plus, the upgrade of which before the end of the year is also a forgone conclusion.

Anticipated improvements include a new design that follows in the footsteps of the Galaxy S6. The Note 4, with its metal frame and plastic back, was a step in the right direction, but the metal frame and glass back on the S6 looks classier. Another reported upgrade is a screen that's slightly larger than the Note 4's 5.7in display, with a 2K or 4K resolution.

LG G4 Pro

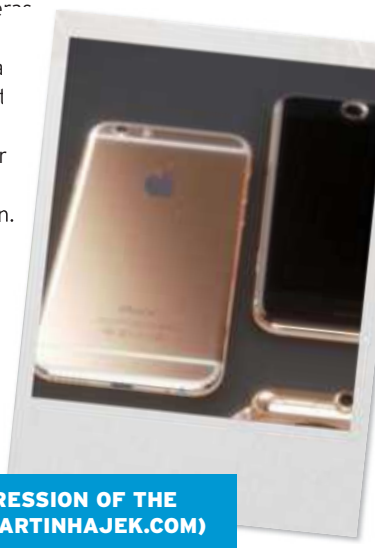
Launching a high-end smartphone during the second half of the year would be a departure for LG. That strategy has worked well for Samsung with the Galaxy Note family, so LG might want to emulate that to boost sales instead of just relying on dropping the price tag of the G4. The G4 Pro is rumoured to have some really impressive specs, including a 5.8in, 1440x2560-pixel screen, a 27Mp main camera, 4GB of RAM and Qualcomm's Snapdragon 820 processor.

Most of the parts to build a phone with those specs shouldn't cause LG much of a problem. The big question mark is whether the Snapdragon 820 will be ready for use in a smartphone before the end of the year. It was the first company to announce smartphones powered by the Snapdragon 808 and the 810, so it is a likely candidate to be among the first to get its hands on the new model.

Apple iPhone 6s and 6s Plus

The iPhone 6 and 6 Plus with their bigger screens have been unmitigated successes. The challenge for the company this year will be to come up with upgrades to continue to build on that success.

Cameras are one aspect that Apple is expected to focus on with the iPhone 6s and 6s Plus. Upgrading the current 1.2Mp front camera makes a lot of sense since competing products launched this year have at least 5Mp cameras. To what extent an upgrade of the main camera to a report 12Mp resolution will result in better image quality remains to be seen. The new models are anticipated to have faster processors, more RAM and speedier LTE connections.



ARTIST'S IMPRESSION OF THE IPHONE 6S (MARTINHAJEK.COM)

Car and pedestrian collision? There'll soon be an app for that

The new system will alert drivers and pedestrians of potential collisions, reports Martyn Williams

A safety system that ties together cars and smartphones to stop those heart-stopping near misses between cars and pedestrians could be standardised by the end of this year.

The technology involves smartphones broadcasting data over a short-range radio channel to nearby cars, so the cars can determine whether a collision is likely. Unlike today's radar-based systems, this can warn around blind corners and alert both the driver and pedestrian.

It's being developed by engineers at Honda and was demonstrated recently at the company's new research and development center in Mountain View, in the heart of Silicon Valley.

In the demonstration that took place in a car park, a car was slowly cruising a row looking for a space. Ahead, and unseen to the driver, a pedestrian was walking between a car and a four-by-four while listening to music, and about to step into the path of the oncoming vehicle.

Seconds before the pedestrian could emerge and the two came close to collision, an alert sounded in the car: "Distracted pedestrian" and a warning appeared on the car's LCD to brake. The pedestrian too received a similar alert, telling him to watch out. If the driver hadn't hit the brakes, the car would have automatically come to a halt.

Honda has been working on the technology for around three years and the first iteration is expected to be submitted for standardisation around the end of this year, said Sue Bai, a principal engineer at Honda research and development, who has been developing it.

She said it came about after a chance encounter with workers from Qualcomm, while at a conference in the UK. They got to talking about how the two companies could work together and came up with the idea of tying Honda cars with Qualcomm phone chips. The communication takes place over a channel in the 5.9GHz band that is dedicated for intelligent transportation systems. That's a frequency not used in current smartphones, but close enough that Qualcomm engineers were able to come up with a firmware modification so that it works on an off-the-shelf handset. No custom hardware is required in the phone.

In addition to the pedestrian's position and direction of movement, it also transmits whether the pedestrian might be distracted, for example if the person is listening to music or composing email while walking.

It's not intended to replace radar-based anti-collision systems, but to provide another layer of safety.

The proposed standard also includes attributes for others who may be in the roadway and at a higher level of risk, such as construction workers, police and emergency crews, cyclists or the disabled. The standard looks as though it will have backing from US and European carmakers, so it could work internationally, too.

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- 3 Year Premium Warranty

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The 3XS Gamer 20i is a super-fast gaming PC thanks to its combination of quad-core Intel Core i7 4790 CPU running at 3.6GHz with added Hyper-Threading plus a 4GB NVIDIA GeForce GTX 970 graphics card. These components are installed in an Asus Z97-K motherboard along with a 1TB hard disk.

Scan 3XS Z97 Vengeance Gaming PC

- Intel® Core™ i7 4790K processor overclocked up to 4.7GHz
- 8GB Corsair DDR3 2133MHz memory
- 4GB NVIDIA GeForce GTX 980 SC
- 250GB Samsung 850 SSD & 2TB HDD
- Windows 8.1
- 3 Year Premium Warranty

£1445 Inc VAT

This high-end gaming system includes a water-cooled Intel Core i7 4790K CPU overclocked up to 4.7GHz plus a 4GB NVIDIA GeForce GTX 980 graphics card, 8GB of 2133MHz Corsair Vengeance Pro DDR3, 250GB SSD for lightning quick gaming loading and a 2TB hard disk.

3XS Graphite LG157 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 2GB NVIDIA GeForce GTX 960M
- 15.6in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 8.1

£869 Inc VAT

The LG157 is a 15.6" mid-range gaming laptop that includes a NVIDIA GeForce GTX 960M graphics card plus an Intel Core i7 4720HQ CPU, up to 16GB of RAM and multiple hard disks and SSDs. The LG157 is ready for next-day delivery and is protected by a 2 Year Premium Warranty.

3XS Graphite LG1720 Gaming Laptop

- Intel® Core™ i7 4720HQ processor
- 8GB Corsair DDR3 1600MHz memory
- 3GB NVIDIA GeForce GTX 970M
- 17.3in 1,920 x 1,080 screen
- 1TB SATA 6Gb/sec hard drive
- Windows 8.1

£1075 Inc VAT

The LG1720 is a 17.3" high-end gaming laptop that includes a choice of powerful NVIDIA GeForce GTX 970M or 980M graphics card, ensuring silky smooth frame rates in all games. The LG1720 is ready for next-day delivery and has a 2 Year Warranty.

Scan Computers recommends Windows.

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Prices correct at time of print and are subject to change.

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tinyurl.com/gadgetspca

OnePlus 2

Smartphone

The firm that caused a storm with its first phone is back with a '2016 flagship killer'. Like its predecessor, the OnePlus 2 has 5.5in and Full HD display, but it also has a new Snapdragon 810 processor, a fingerprint scanner in the new home button, an Alert Slider and reversible Type-C USB. There are also new StyleSwap covers in Kevlar, rosewood and other materials.

£239 inc VAT
oneplus.net

Logitech G920

Steering wheel

There are some big name racing games out now – Project Cars and F1 2015 to name just two – so what better than a new wheel to shave some tenths off your lap time. The leather-clad G920 is stylish and features dual-motor force feedback, anti-backlash helical gearing and works with PC and Xbox One.

£299 inc VAT
logitech.com/en-gb

CHRIS MARTIN

Samsung Galaxy Tab S2

Tablet

Samsung has updated its best-ever tablets. These Tab S2 devices now measure 9.7- and 8in in size, in essence matching their iPad rivals. Each is just 5.6mm thick and are powered by Samsung's Exynos 5433 processor. Android 5.0 Lollipop is preloaded and you can opt for a 4G LTE model, too.

8in model: €399 (£280)
9.7in model: €499 (£350)
samsung.com/uk

Vector Watch

Smartwatch

New on the smartwatch scene are these stylish designs from Vector, available in round (Luna) or square (Meridian) options. They feature customisable watch faces, activity tracking, notifications, though the best thing is a touted 30-day battery life.

Price £219 inc VAT
vectorwatch.com

Motorola Moto G, Moto X Play, Moto X Style

Smartphones

A trio of new phones represents Motorola's biggest ever single launch of products. The affordable Moto G is now waterproof, has a 13Mp camera and is available to customise with the Moto Maker. The Moto X is now available in two models, which are cheaper than before. The Play edition has a 5.5in, Full HD screen, while the Style offers a 5.7in Quad HD display.

Moto G: £159 inc VAT
Moto X Play: £279 inc VAT
Moto X Style: £359 inc VAT
motorola.co.uk

Orbitsound A70 AirSound

Soundbar »

This slim soundbar comes with a wireless subwoofer which makes installation easy. Unlike older models, the A70 has a display for selecting the input and checking volume level. It sounds great and has built-in Bluetooth with aptX for streaming music from your phone or tablet.

£500 inc VAT
orbitsound.com

« Hive Active Heating 2

Smart thermostat

Much more stylish than the first model, Hive's new thermostat has a colour display and is easy to use. Existing Hive owners can upgrade for £99, but new customers have to pay £249 including installation (or £179 without). You don't have to be a British Gas customer to have Hive, and there's a range of connected home devices coming in the autumn which with work with the system.

From £99 inc VAT
hivehome.com

Marshall London »

Smartphone

The well-known amplifier manufacturer has introduced its own smartphone out of the blue. The Marshall London has mid-range core specs but various music focused features, such as dual-headphone ports, a volume scroll wheel and an 'M' button for accessing your tunes. All of which are made from brass.

£399 inc VAT
marshallheadphones.com

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Richard Cullen, Managing Director at bluebox
Fasthosts customer since 2002

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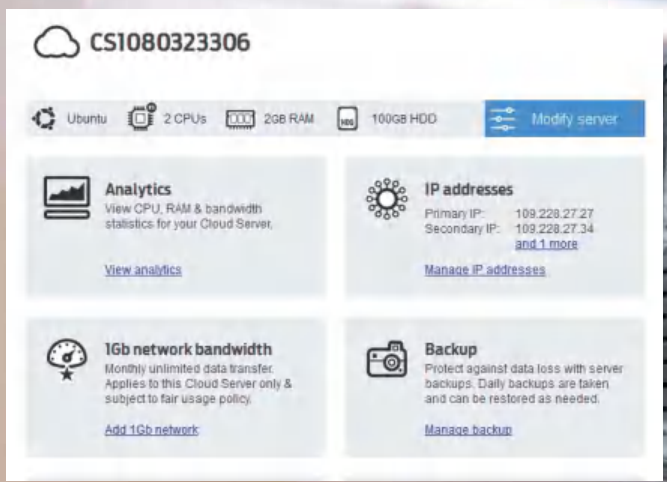

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DAN DANTIUM

You'd be amazed at the problems you can have with setting up PC's. Don't be alarmed in this case, however, because if you order from a reputable company like Dan then you should have a computer up and running in no time at all. To prove this point, the Dantium was an absolute dream to setup and run - as long as you know how to put a plug in a wall socket! Setup really was that convenient, which is great news for first time owners (all the software was pre-installed and worked perfectly, meaning that we didn't have to do a thing).

The hard disk drive is 850MB, which is a lot of closet space, but with the ever increasing disk-eating multimedia products that are arriving just lately, this amount of hard disk space will probably soon become the standard. 8MB of RAM is also pretty much the minimum, as software requirements are increasing all the time - making greater demands upon desktop PCs. Although setting the pace for the majority of multimedia PC's, 8MB could ideally be upgraded to 16MB, which would enable even faster accessing times for office and leisure programs and would take full advantage of the Pentium processor. However, this 8MB is EDO RAM, supported by a fast static RAM cache, and is a fair offering bearing in mind the large amount of hard disk space and the awesome P90 processor chip provided.

Accompanying the hardware inside the Dantium is a 0.28mm dot pitch SVGA monitor that really promotes the fast 64-bit Stealth graphics card. This sort of card and monitor works very well in a variety of settings up to 1024 x 728 and, although not the best looking monitor externally, a wide range of facilities are available for altering the display size and length, whilst the picture remains detailed and clear.

To get you on the road with multimedia, the DAN comes with Microsoft Works (spreadsheet, database, wordprocessor and communications application) and Encarta '95 (an excellent multimedia encyclopedia showing the full capabilities of your PC). A mouse is also provided to help you on your explorations and also a pair of relatively good Juster stereo speakers, which are eminently suitable for use in conjunction with the provided - and trouble free - soundblaster16 sound card. The DAN is bundled with DOS 6.22 and Windows 3.11. (Windows 95 after August). A Toshiba quad speed CD-ROM drive comes with your machine, and will satisfy the needs of the vast majority of users with a 600Kb/s data transfer mode and fairly fast 150 millisecond access time (tested with WinCheckIt - not supplied with the machine).

The DAN is a wonderful machine for its price, offering first time buyers and experienced users alike the foundations for an excellent setup. The monitor produces beautifully crisp graphics and the P90 processor chip makes running software an absolute dream. All the components and applications run smoothly and hopefully, like us, you shouldn't encounter any problems. Even if you do, however, we found that DAN offers a friendly and very helpful customer services line. Documentation is more than adequate, but not exceptional.

The only minor point, which isn't really a problem, is the rather dated looking and clumsy feeling keyboard. This may seem rather petty here, but it wasn't the friendliest and the most comfortable to use amongst the PCs reviewed here, and a mouse mat would also have been nice. These are far from major problems as I've said before, and perhaps a more important criticism is that not much software is supplied with the system; this is a little disappointing for first time buyers - but for the same sort of money you're getting a P90 instead of a P75. This is an excellent machine for an upgrade from a 486 and will handle multimedia software more than adequately.

The DAN is a wonderful machine for its price, offering first time buyers and experienced users alike the foundations for an excellent setup.

Dantium at a glance

Performance	●●●●●○
Ease of Use	●●●●●○
Features	●●●●○○
Value	●●●●○○
Overall	●●●●●○

System Specifications

8Mb RAM
850Mb Hard disk
15" SVGA monitor
MS Bundle
Windows 3.1 & DOS 6.22
(Windows 95 after August)

Supplier: Dan 0181 830 1100

Price: £1535 + VAT

PC Advisor Reviews

RED BOX

As you can see by the specifications, this system is heading towards the top end of ultimate PC's. The presence of Intel's P90 is evident, and the overall running performance when partnered with the more than capable 16Mb RAM, is nothing less than impressive.

The desktop's stylishly designed casing supports the computer's 'guts' and also the 15" iiyma Vision Master SVGA monitor.

There is 16 MB of EDO RAM included, which gives plenty of room to manoeuvre in and, running in unison the Pentium P90 processor makes this virtually one of the fastest machine we reviewed - helped along by a cache of 256K static RAM. The resulting efficiency from access time reductions showed throughout virtually every performance test we ran, and is fully proven when playing software titles - the whole machine runs smooth and fluently. The 850MB hard disk was not the largest included with the machines, but again it will hold just about everything you will need for years to come.

The quad-speed Toshiba CD-ROM also ran smoothly, transferring 600Kb/s of data, though its random access time of about 190ms could be faster. This should run just about any CD you place in it and will scroll through video and animations effortlessly.

There had to be some crunch, however. This PC is more expensive than the average, and what you gain in hardware is lost in software: accompanying applications are virtually non-existent, apart from Windows 3.11, DOS 6.22, (Windows 95 after August) and sound card software. This isn't so bad, considering the high specified machine on offer. Multimedia has not been forgotten, however, as the Red Box comes with two excellent speakers and an awesome sub-woofer. If your not too sure what a Sub is, don't worry - I'm sure your neighbours will. BASS! BASS! BASS! - that's what. The partnering sub and speakers should amaze you and, when turned up a little, are simply stunning. Bearing in mind that multimedia is the thing at the moment, speakers and any other audio peripherals should not be overlooked - Red Box certainly haven't. Most of the speakers provided were substantial - none were the substandard frequently found with Sound cards, but the Red Box sub-woofer was superb. Treble and bass controls can be found along side the power button, which gives you even more independence from the manufactured settings.

Graphical displays are very well provided for, courtesy of the Diamond Stealth 64 Video card which is proving to be the card generally found in similar specified machines. Unlike others, however, the Red Box has a less familiar sound card installed. Ensoniq's 'Soundscape' is a 16-Bit Wavetable sound board and includes General MIDI and Roland MT-32 sound sets as well as AdLib/Soundblaster FM synthesizer emulation. There seemed to be no problem with incompatibility as the card is supported by pre-installed software and, provides excellent audio output quality when used with the Sub woofer and speakers. A problem with emulation a few years ago was that it frequently required extra memory and processor power to succeed - though this may still prove a problem if you have an old 386, it never occurred with the Red Box.

Documentation with the system is of reasonable standard, and if you are bilingual in English, Spanish and German then you should have a good read - the sound card software is accompanied by three manuals of different native tongues. There is not really enough here for the beginner, however, and the Red Box is more of an excellent machine for an upgrade from a lower specification PC. If you have a bundle of software to run, this is the computer to run it on.

> Multimedia has not been forgotten, however, as the Red Box comes with two excellent speakers and an awesome sub-woofer.

Red Box at a glance

Performance	●●●●●○
Ease of Use	●●●●○○
Features	●●●●○○
Value	●●●●●○
Overall	●●●●●○

System Specifications

Pentium 90
16 Mb RAM
850 Hard disk
Stealth 64 Video accelerator
Ensoniq 16-bit sound card
Quad speed CD-ROM
15" SVGA monitor
Windows 3.11 and MS-DOS 6.22
(Windows 95 after August)

Supplier: Red Box
01480 405541

Price: £1760 + VAT

features

PC Advisor features

The Window of Opportunity

Man born free is everywhere in chains. PCs born of open architecture are everywhere in the grip of DOS. Not quite Rousseau, but the principle remains the same.

Ever since Bill Gates announced that development of Windows would continue almost as soon as Windows 3.0 was released, the computing world has waited eagerly for a faster, better, more stable version of the world's favourite operating environment which would be free from the limitations of DOS. Windows 3.x and its forebears were not true operating systems, but rather more elaborate shells for DOS which happily (or not so happily) trundled on in the background.

DOS, whilst fast at some tasks (notably databases and word-processing) was difficult to use and far from the easiest system to understand. Furthermore, although backwards compatibility meant that applications wouldn't be redundant as soon as they were released and could be marketed on a much wider scale than previously, it also seriously tied up system resources such as hard disk drive and memory access. Depending on your point of view, it is either comforting or disturbing to know that some applications from your megabucks 586 machine could run on one of the original 8086 processors!

A new stage of computing promises to open up with Windows 95, however. Although Microsoft's new graphical user interface will not abandon its base of current Windows 3.x users, Windows 95 is meant to be not just another environment but a whole new operating system which is intended, in the long term at least, to make DOS a thing of the past.

Windows 95 is meant to be not just another environment but a whole new operating system.

It's been a long time coming, however: codenamed Chicago, Windows 95 was due in 1994, but programming refinements pushed the release date further and further back. We've evaluated late beta releases and the final product to give you a preview of how this program works.

New blood from old stock

Windows 95 will be (largely) a 32-bit operating system - the end result for the user should be a faster, more stable and easier interface. An immediate feature of the new OS is that you can wave goodbye to all those obscure eight character filenames, a hangover from the days of DOS. More than this, though, Windows 95 will be able to open up more applications than before, performing multi-tasking in a safer environment than ever was possible with Windows 3.x. This should mean less crashes all round.

Microsoft are also addressing the problem of hardware recognition: in the past it has often proved very difficult to install new cards and peripherals, but the new Windows will support plug-and-play making installation much easier. Again, how many times have you seen the message 'Out of memory', even when you know you have megabytes to spare? Windows 95, as a 32-bit system, will allocate memory to applications much more efficiently. (See our feature on 32-bit architecture.)

Microsoft have looked at all those households and businesses which don't have computers, and who don't know their C:\> prompt from their elbow, and designed Windows 95 to be as easy as the original Windows should have been. As hardware and software developments have leapt forward over

PC Advisor features

the past few years, this operating system promises to make sound, video and animation perform much better on the most up-to-date multimedia PCs.

Setup of Windows 95 couldn't be easier - either type setup at the DOS prompt or using the Run command in Windows 3.x. Setup first checks your system and offers to make a Startup disk should you encounter any problems. You will be informed of any problems, but the new OS should still load if you press Enter and, once Windows 95 is loaded, you will be greeted by a very tidy screen. You may be used to Windows 3.x, but once you begin using Windows 95 you'll experience all the benefits of one of the simplest to use interfaces ever.

Instead of directories, Windows 95 uses files and folders.

A New Face in Town

When you first boot up Windows 95, you are greeted by a bright blue sky and Windows logo, followed by a screen with three icons and a bold 'Start' button. After all the vices and vicissitudes of Windows 3.x, the first reaction for many an experienced user may be - 'It's a trap!' But Microsoft really have aimed at the complete novice and 95 is as easy to begin as pressing the start button: if all goes well, it's like turning the ignition on a finely tuned car.

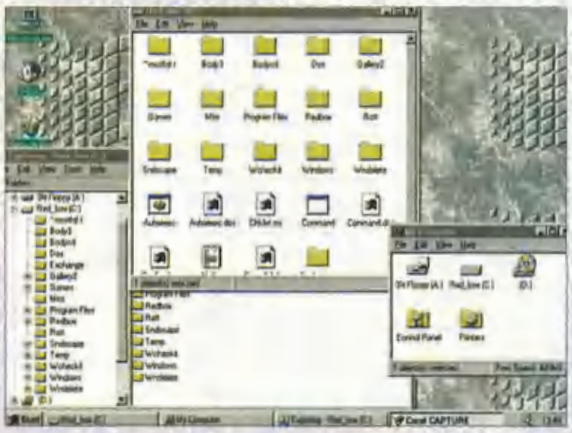
Windows 3.x used hierarchical directories to organize programs. In Windows 95, the Program and File managers have gone (rather, they have been combined and well hidden in the Explorer) to be replaced by icons such as My Computer, Recycle Bin and a Taskbar with the ubiquitous Start button. Although you may waste sad minutes looking for familiar friends (enemies?), these changes do make the system easier and more intuitive.

An important difference is that anything you do to the icon affects the program involved - so dragging a program icon to the Recycle Bin and emptying it at the end of the day actually deletes your program. Though this may be a little worrying, Recycle Bin, as its name suggests, is not an automatic trasher of all your valuable work and applications, allowing you to rescue its contents before they disappear into the dark recesses of your cyber-sewer.

> With Windows 95 you'll experience all the benefits of possibly the simplest to use interface ever.

Microsoft have made extensive use of the drop down menus and toolbars seen on Encarta 95, so that clicking on the start button will bring up a list of programs, documents and other features. The documents button is especially useful: this keeps track of most recently opened files, so if you know you were working on a spreadsheet or letter, but you don't know which application it was associated with, clicking the document file will open it for you. What is more, if you minimise the program it remains resident on the Taskbar waiting for the next time you need it.

Windows 95 also uses the right mouse button for general options such as opening files, copying, moving and such forth, making File Manager unnecessary for these tasks, whilst My Computer shows the organization of your directory as files and folders which can be opened immediately. Windows Help has been made much easier, allowing text searches which go straight to the contents or index and then allow you to jump straight to the application involved. And, if you need it, File Manager is still there in a very much improved form as Explorer - but using this regularly will hinder rather than help your productivity and enjoyment.



There are a variety of ways to access programs.

features

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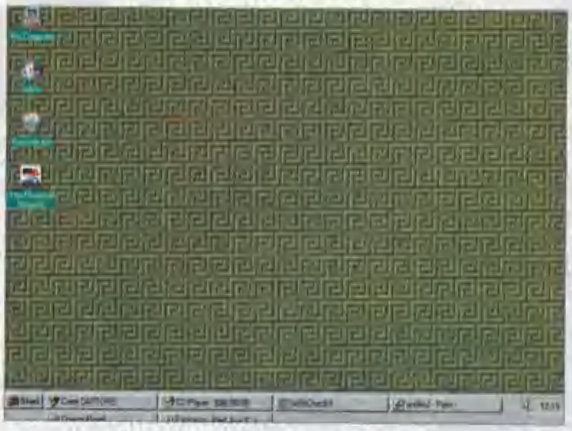

You can customize the taskbar from which applications open with a single click of the mouse.

Programs in 95

So, you have your new operating system - it's simple, elegant, easy-to-use but (and for many of us, this is a big but) will it run that large collection of software you've amassed over the years? Windows 95 will run virtually every program that currently works on Windows 3.x. The exceptions are primarily low-level utilities that deal directly with your computer's hardware and so use different code to that employed by your new OS, as well as some third party desktops which rely on a close relation to the present File and Program Managers.

Microsoft have been criticized in some quarters for not producing a true 32-bit system, but backwards compatibility is very important for the majority of users. Even IBM, the maker of OS/2, realizes that to succeed in the market its operating system must be able to use applications that are widely available for Windows and DOS, especially as users often spend more on software for their machines than hardware. Full 32-bit operating systems will be more common than 16-bit ones in future years, but it is important for Microsoft to take the majority of their customers with them. Backwards compatibility has been responsible for hindering the computer world technically, yet it has also meant that software does not immediately become redundant and thus gives greater incentive for large-scale development. (See our feature on 32-bit applications.)

One of the reasons for the development of Windows in the first place was to allow greater access to multiple programs. DOS had allowed some very basic multitasking but it often proved more difficult than it was worth. Whilst running a multitude of programs was much easier with Windows 3.x, it was very unstable as each application would encroach upon the memory space of another, causing dreaded General Protection Faults. This would mean, at the very least, that the current running program would hang and, more often, that the whole system could crash - losing any unsaved data that had been entered that session.

Microsoft promises that Windows 95 will be much safer than its predecessor.

Another limit of DOS, only partially addressed by the old generation of Windows, was its maximum memory address of 640KB. Various methods of paging files in and out of extra memory have evolved over the years, with differing rates of success, but in Windows 3.x applications have still been confined to a 64KB 'heap' which has severely limited their effectiveness. One side effect of Windows 95's improved memory and file address, as well as being able to open more programs with greater security, is that finally games (which have required the speed of DOS) will be able to run in Windows without the necessity of rebooting your computer after every installation. (See the page on games and Windows 95)

Microsoft promises that Windows 95 will be much safer than its predecessor, although the necessity of running old 16-bit programs means that the memory space allocated these applications will not be entirely secure. What should happen, however, is that if one program should crash it will be much less likely to bring down the rest of your applications. Crashes will still happen (and it is almost impossible that any operating system will ever be crash-free due to a whole variety of reasons) but they will be less dangerous.

Multitasking consists of more than simply opening different programs - multithreading different applications means that you can print, work on documents and even receive incoming e-mail. Though this may never be as fast as you need it (and the law of diminishing

Windows 95 makes it easy to cross from menu to menu.

returns means that it will never be), it should be a lot more effective than in Windows 3.x.

Window on the World

As well as more effective program management, Windows 95 will include better communications support. Networking should be easier with Setup Wizards to set up the link between two or more local computers, but more than this Microsoft are improving the connection with the larger world of communications.

Now you will be able to access the Internet, Compuserve, MS Mail and others via MS Exchange, a great improvement on the very basic Terminal program included with Windows 3.x, as well as the scattered files that exist on many PCs which have to communicate with a local network, E-mail service or use other fax software. As it supports OLE, this means that you can simply drag-and-drop your file onto the program to send your message to another machine, and at the same time makes receiving e-mail much easier via its Inbox.

As Microsoft also have plans to open up a direct communications service with the Microsoft Network (MSN), which will link up to the Internet, so they may very well achieve their aim of bringing information to every user's fingertips.

Windows 95 should also make another form of communication easier - that between your hardware and software. If you have ever spent hours fiddling with DIP switches and settings, you'll appreciate the new plug-and-play which will allow the operating system to recognize new devices much more easily. This will also be more effective when hardware manufacturers bring out peripherals that are specially compatible with 95.

On opening Windows 95, you are greeted with a clean screen.

Microsoft have intended Windows 95 to run on a 386DX computer with 40 megabytes hard disk space and 4MB RAM. Obviously, to work effectively, their new OS will require much more than this, but this is understandable - it's over five years since Windows 386 came out which was able to take advantage of some of the new features of the 386 family, and now the 386 is hardly a state-of-the-art machine. Certainly Windows 95 will make less hardware demands than Windows NT and, by being able to use Windows 3.x software, will prepare users for a full 32-bit operating system as well as making computers easier to use by taking control of many functions which previously had to be performed manually.

MSN - Microsoft Network

As part of their plan to make information exchange easier, Microsoft have poured a considerable amount of time and money into integrating communications in Windows 95.

This has taken several forms, including simpler networking and OLE for the Internet. Wizards are available to help you setup networks and, by clicking on the Computing icon under My Computer and selecting Modem, you can enjoy the benefits of a local area network without specialist software. Communications is also effected via the MS Exchange which, by using OLE for the Internet and e-mail, allows you to drag-and-drop messages using Compuserve, MS Mail, and others.

A more important development, however, is MSN - the Microsoft Network. This is intended (eventually) to provide full Internet access for those computer users who have a modem. As it will be fully integrated with Windows 95 it will use the same very visual framework, employing icons to explore the information highway. By clicking on one of these icons, you will be able to explore sites by categories such as business, the arts, sport and so on. It is intended as a friendlier gopher to help you seek out data as much as possible. MS Plus! will also provide additional communications support in the form of an Internet explorer, which is the built-up version of MS Exchange with more complex features.

Obviously Microsoft are hoping that by giving users the opportunity to use Windows 95 to access their service, MSN will become the logical port of call for new explorers of the Infobahn. This may well be the case, but the overriding factor is almost certain to be cost. As most Internet providers charge between £10 and £20 a month, Microsoft will have to be very competitive to succeed. Certainly Internet software is not an entirely attractive feature in itself - it may have helped IBM shift some copies of OS/2, but a free communications package hasn't yet made it an overwhelming choice for the majority of users.

The future of communications is still uncertain, with potential growth either in the direction of mediated or unmediated access to the 'Net. This has become easier with the World Wide Web (see our feature) but the 'Net still remains a tricky place for many consumers to wander in unguided. For this reason alone - if the price is right - MSN may prove to be the major provider of information access for those computer users who are familiar with the Windows 95 operating system.

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Applying 95

Why buy?

Now that Windows 95 has hit the streets you can be sure there will be applications ready to employ the extra goodies that a 32-bit operating system offers. To use the features such as long file names and effective multitasking, though, you'll have to upgrade to the 95 version.

Microsoft has to convince its customers that Windows 95 is good old Windows 3.x that can run all your old features - better; but it is also promoting its new OS as a completely different system designed from the ground up. Do you need to upgrade, or will your old applications suffice? Over the next two of pages, we'll be looking at what you can expect from the new generation of software and what will be available in the near future.

Immediate changes

Windows 95 will run nearly all your old Windows 3.x software, so there's no need to worry about an upgrade, is there? Will it just be a case of extra bells and whistles, as well as features that I'll never use.

Before you shell out your hard-earned money for a new product, you'll need to ask yourself a few questions. Do I use my current application thoroughly? Can I make efficiency gains from the simplicity and extra features that will come from Windows 95? (Windows 95 won't just add more, it'll also simplify what you use at the moment.) Are the extra features worthwhile?

One thing to bear in mind with operating systems is that there is, generally, a progression towards ease-of-use with each generation. It's no longer necessary to be a master of electrical engineering just to understand the instructions manual, and one of the advantages of the Windows 3 family was that it began to systematize software; unlike DOS, where every application could be very different from the next, Windows programs began to share certain features, making them easier to learn.

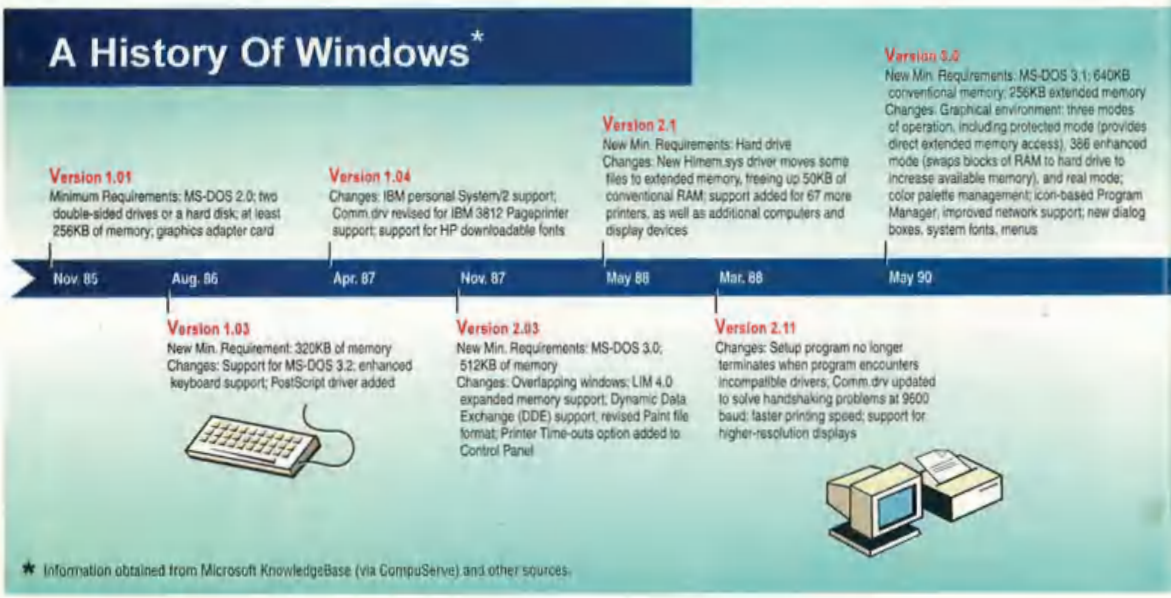
Windows 95 continues this simplification. It's long file names mean that the arcane magic of eight and three letter filenames is a black art that you will no longer need to practise - if you have a 32-bit application which can utilize long file names. Windows 95 file names can be up to 256 characters long, so that WED89INV.DOC can finally be renamed 1989 Wedding Invitation - immediately it makes more sense.

You'll also be able to create a new directory in the same dialogue box where you save and load files, rather than having to locate and open File Manager. And some of the surface features are more intuitive too - the close box is on the right hand side (this could be a bit tricky for experienced Windows users) and closes the application with one click instead of two. The roll-down menus are an added bonus.

Some superficial details, such as the interface, apply to all programs, 16-bit as well as 32-bit, but to take advantage of the superior file management you'll need to upgrade.

Deeper down

But Windows 95 is about more than surface detail: although it is much better at accessing the hard disk and memory, you won't especially notice these



improvements on your old software. 16-bit software has to run in 16-bit emulation mode, addressing your processor as if it were an 8086 (in the case of DOS programs run in Windows) or 2086 (with Windows 3.x programs) machine. This means that these programs are slower because they have to run an emulated environment as well as the program, and also because 8086s and 286s are slower at their sums.

By contrast, 95 applications are intended to run in the 386 family (including 486s and 586s) native 32-bit mode. As well as making them faster, this improves file management and makes them more stable: as they will have their own protected memory area to run in, they are less likely to infringe upon other applications and, even if one application should crash it is unlikely to bring down any others. For the first time, Windows should be a proper multitasking environment, but you will need a 32-bit application to use multi-threading properly.

What's out?

As would be expected, Microsoft is developing software which will fully take advantage of Windows 95. It has been working on its Works 4 whilst Office 95 has been released with Windows 95 itself, both being followed by Publisher 3 and Money 4. Lotus and Novell have also developed office suites to compete with Microsoft, so many of the basic PC applications are available in 32-bit format.

Canadian suppliers Corel have developed the new version of their famous graphics package, CorelDraw! 6, released in August - also due are Micrografx Designer and Picture Publisher, meaning that graphics should be well catered for. Norton have also worked on an upgrade of their popular utilities package - something of a necessity, as it is precisely such low-level programs which will not transport easily from Windows 3.x to 95.

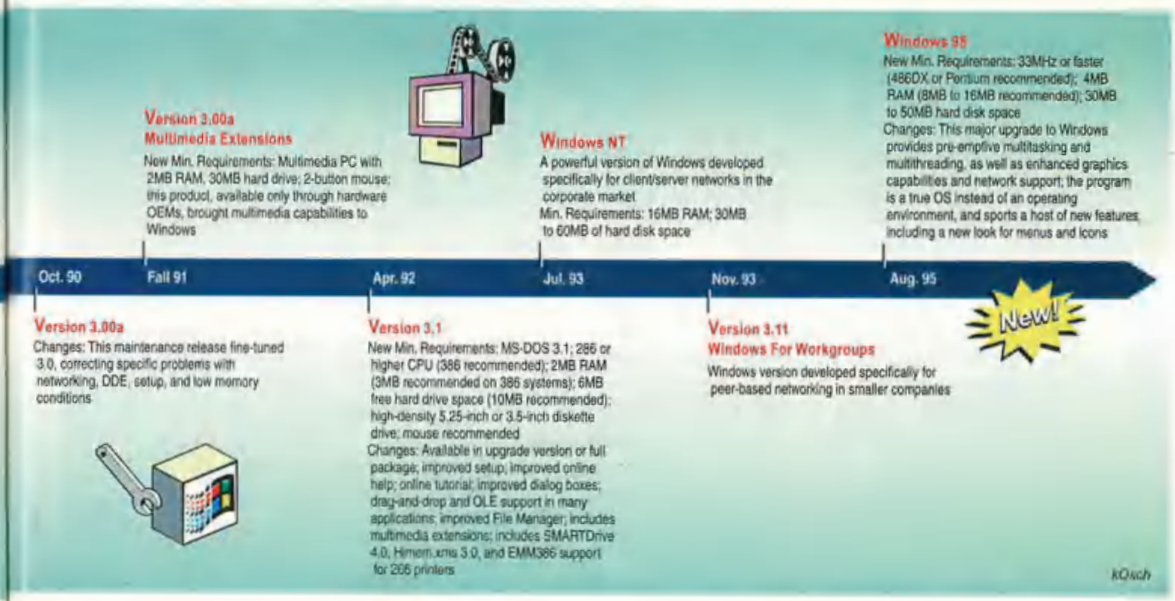
If these and other developments are well-designed, new applications should soon look and feel more consistent with their new environment. Windows 3.x? Yes, there was such an operating system once...

Long term

For many users, upgrading to Windows 95 and a few choice packages - such as an Office suite - will initially provide enough new features (and expense) to satisfy their requirements. Backwards compatibility means that old versions of Windows software will run adequately in their new home.

Eventually, however, to make use of all the benefits of 95, especially a more secure and stable working environment, users will have to upgrade to new versions of applications, not merely because they offer more bits and pieces but because of fundamental changes in file and memory management.

What is more, backwards compatibility will also come into play when Windows 95 is itself superseded by a complete 32-bit OS. When that day comes, it is likely that 16-bit programs will not work, certainly will not work efficiently, and then your 95 programs will come into their own. For the future, 32-bit applications are necessary for the industry to move forward, but only if development and design is implemented thoroughly.



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Looking at the Future

As the name Windows 95 suggests, this operating system is part of a process rather than an end in itself. In an industry which is developing so rapidly, we cannot expect to be accessing information in precisely the same way in 2010, or even 2001. So what is the future of Windows?

As 95 is not a full 32-bit system (see the article on 32-bit architecture) the next stage must be development and integration of Windows 95 with a version of Windows NT, which has seen much of Microsoft's real innovation. The main hindrance at the moment is the amount of memory required to run any 32-bit OS effectively, yet this is less a problem of technology than of economics. If SIMM prices fall over the next few years - and nearly all the industry must be hoping that they will (apart from RAM manufacturers that is) - this will cease to be a problem.

The project code-named Cairo is Microsoft's next aim, a full 32-bit operating system which will incorporate OLE (Object Linking and Embedding) in the OS itself. OLE is Microsoft's technique for moving information easily between programs. If it is integrated in the OS itself, then it should make data transfer effective between any application running on Windows, regardless not only of the program which generated it, but also the machine on which it originated. This is vitally important for communication if Microsoft are to fulfil their aim of information at your fingertips from any source.

Yet beyond Cairo lies Memphis (does Bill Gates fancy himself as a new Rameses?) which Microsoft are keeping under wraps at the moment. As hardware looks set to leap into 64-bit data transfer as standard, especially when Hewlet-Packard and Intel release 64-bit processors sometime in 1997 or thereabouts, it will need an OS which can take full advantage of its speed and complexity. To succeed, Microsoft will have to navigate further towards the source of the Nile.

95 Gameplay

HELP! He's got a gun! Armed and dangerous, DOOM the cult game is a dream to play.

Games? And Windows? Are you serious? Yeah, it's probably fun to play solitaire once in a while - or perhaps some form of virtual chess. But no fast scrolling graphics, no rapid blasting and movement, no adrenaline - no speed!

Everybody knows that Windows is a business affair or, at best, something more cerebral. It's great for handling spreadsheets, DTP packages, interactive encyclopedias and suchlike, but when you want a game to tear down the walls of your motherboard and rip out the lungs of your soundcard - then DOS rules. Hell, the way I found out most about the actual way my hardware works is by slapping shareware games on my hard disk: five seconds of staring at some dumb message about not enough expanded memory, or listening with despair to the PC speaker, meant I was soon raring to discover the joys of EMS and soundcard configurations.

DIP switches depart! XMS begone! Windows 95 promises to break the nefarious barrier of 640K (nearly). Realising that the joys of memory configuration are about as appealing to the everyday gameplayer as a Spectrum ZX81 with a broken keyboard, Microsoft have aimed at making Windows 95 a truly egalitarian OS, with rough-shod games rubbing shoulders alongside their capital-making masters. Vive la Liberté!

In Windows 95, if you want to run a game you can customize its settings via the Explorer dialog box. If you click on the appropriate icon, you'll find a section governing memory allowing you to set the necessary amount of EMS and XMS your game requires. 95 isn't that clever, however, and cannot free up any more conventional memory if your Autoexec.bat and Config.sys files are loading unnecessary drivers. Nor can

You can run but you can't hide - games such as Heretic run brilliantly in Windows 95, though don't bother running them in a window.

most games run in a window, so you'll need to check the Full Screen box.

Once the required changes have been made, whenever a game icon is clicked on it should run without you first having to exit to DOS. Now you'll be able to make your CD-ROM drive howl and your speakers thunder from inside the safer haven of Windows. Until now, the Windows 3.x environment has been too slow for games because the overhead of 16-bit emulation has meant that refresh rates have simply been too slow. But Microsoft has been developing improved speed and 32-bit data transfer with its WinG code, which lies behind such recent efforts as The Last Dynasty.

Most games should work this way - most. There's bound to be some glitches, especially at first, but then there are a few titles (not expensive ones, I admit) sitting on my shelf at home which have rarely been played, merely because I couldn't work out that particular combination of TSRs which would allow me to use my CD-ROM drive, soundcard and leave me enough conventional memory to run in.

So here's to a brighter, faster, louder and simpler future.

Plus! for Windows 95

If you want to get the most from Windows 95, you may wish to consider Microsoft Plus! MS Plus! is available on CD or 3.5" disk, and includes the following features.

- Intelligent System Agent - this enables your PC to be largely self-maintaining, tidying up your disk as it goes along.
- Enhanced Drive Space - with this feature, you'll be able to utilize up to 50% more disk compression than with Windows 95.
- Themes - these are eleven colourful themes, each including fonts, icons, backgrounds, sounds and screen savers.
- Internet Browser - includes a more enhanced version of the Windows '95 Internet Browser.
- Pinball - this is a 3D game with gorgeous graphics designed specially for Windows 95.
- Dial-up Networking - another useful utility which you can use to send and receive mail remotely or share data over a workgroup.

With these various extra features, you'll be able to improve your efficiency with Windows 95 and at the same time have a bit of fun.

SMARTPHONE

Lenovo ThinkPad X250

£1,200 inc VAT

Contact
■ lenovo.com/uk

Specifications
12.5in (1366x768, 125ppi) AH-IPS matt anti-glare (LG LP125WH2-SPT1) display; 2.3GHz Intel Core i5-5300U (2.9GHz Turbo) 2C,4T; Intel HD Graphics 5500; 8GB 1600MHz DDR3 RAM; 256GB SATA Revision 3.0 SSD; gigabit ethernet; 802.11ac 2x2; Bluetooth 4.0; Sierra Wireless EM7345 4G LTE; 2x USB 3.0; Mini DisplayPort, VGA D-Sub; fingerprint reader; SD card, smart card reader; 0.9Mp webcam; dual array mics; UK tiled, backlight keyboard with TrackPoint; buttonless multi-touch trackpad, 87x54mm; 24Wh lithium-ion battery, removable; 45W mains charger with USB-style connector; 305x208x21mm; 1.4kg

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

The Lenovo ThinkPad X250 is a lightweight laptop weighing just over 1.4kg, and measuring 21mm thick, making it a good travel companion. It's a traditional design in a matt charcoal finish across its plastic chassis, with square edges and corners rather any attempt at curves and streamlining.

Our sample came with Windows 7 Professional preinstalled, though it's eligible for a free upgrade to Windows 10 Pro, should you want it.

Opening the lid reveals the much-lauded Lenovo keyboard comprising chunky shaped keys with deep travel. Another trademark feature is the rubbery red trackpoint in the centre of the keyboard, and accompanying three-button array just below the space bar to enable you to type, steer and click while keeping your fingers on the keyboard at all times. These buttons are true mechanical clickers, while the more familiar trackpad below these is one of the new buttonless designs, hinged at the back and able to receive left and right clicks from the respective front corners.

Our review sample was fitted a 1366x768 IPS panel, and while we may rail against this resolution on 15in laptops, here the smaller 12.5in screen size means a decent pixel density of 125ppi, so screen graphics look smooth.

Our test unit came with a 2.3GHz Intel Core i5-5300U processor, including Turbo to 2.9GHz and Hyper Threading Technology. Storage technology is limited to SATA Revision 3.0 only, and you can choose between a basic 500GB hard disk, up to 512GB SSD. For memory, the X250 has either 4- or 8GB and this is removable, though the limit seems to be 8GB even if you find your own 16GB SO-DIMM module.

The X250 has two USB 3.0, Mini DisplayPort and VGA for external displays, SD card slot and a gigabit ethernet port.

There's also a tray to accept a Micro-SIM card, enabling cellular data access over 4G LTE. And for professional applications that require a smart card for authorised access, there's a slot on the left side.

On the underside lies a miniaturised docking port, for use with Lenovo's proprietary desktop docking stations. The battery is removable after sliding two catches, a tiny 24Wh lithium-ion pack that's less than half the capacity of a 13in MacBook Air, for example.

The line up of dual-core Broadwell processor, 8GB of memory and 256GB SSD makes a sprightly notebook quick enough for many business applications.

The PCMark 8 rated the X250 with 2511 points in the Home Conventional test, rising to 2973 with the benefit of OpenCL acceleration in the graphics processor. In the Work test, it scored 3142 points, which rose to 4336 points with graphics acceleration.

Geekbench 3 returned good scores in line with the chipset, 2771 points single-core and 5632 points multi-core. Cinebench 15 awarded the ThinkPad 269 points, or 115 points for a single processor core. The OpenGL graphics test here averaged 25fps with the benefit of the relatively capable Intel HD Graphics 5500.

We also ran a few gaming benchmarks to get an idea of its graphics prowess. It averaged 26fps playing Batman: Arkham City at native screen resolution and Medium detail, and then around 29fps when we dropped the resolution to 1280x720 pixels with Low detail.

We found the display to be of high quality, easily viewable from any angle thanks to the IPS technology, and since the screen lid can be folded right back this could prove even more beneficial when several people are clustered around to view the screen.

In our test, the panel had a good contrast ratio, if a little lower than usual for IPS, at around 550:1. Colour accuracy was satisfactory for this 6-bit panel, with an average Delta E of 1.94. Colour gamut was rather limited though at 70 percent coverage of sRGB and 52 percent Adobe RGB. The matt anti-glare finish makes viewing a relaxed experience, with little evidence of grain or sparkle that the coating can sometimes introduce.

Our sample had a Toshiba SATA SSD, which performed right on spec, showing sequential reads at around 505MB/s and reads at 456MB/s. The input/output operations per second result for 4kB random reads was in the premium range at 97,000 IOPS.

Despite the tiny battery the X250 with its new Broadwell processor proved reasonably long-lived, lasting for six hours 50 minutes in our standard video rundown test.

We did notice some glitches and long pauses in video playback though, which might be a symptom of the restrictive energy-saving cutbacks introduced by Lenovo's custom Energy Saver power plan.

Verdict

For business users that demand a trackpoint interface, smart card slot or TPM module, the ThinkPad X250 has all the right business credentials. ☒ **Andrew Harrison**

SMARTPHONE

EE Rook

£39 inc VAT

Contact
■ ee.co.uk

Specifications
Android 5.1 Lollipop; 4in (480x800) TFT screen; MediaTek MT6735M 1GHz quad-core; 1GB RAM; 8GB storage; microSD cards slot (up to 32GB); Wi-Fi 11b/g/n; Bluetooth 4.0; GPS; 1500mAh removable battery; 64x126x10.3mm; 130g

Build:
Features:
Performance:
Value:

If you're looking for the cheapest 4G phone on the market, then you've come to the right place. The Rook is available for the paltry sum of £39 for EE customers. Otherwise you'll have to pay £49, plus another £10 to top up the phone, though since this is credit you can use to make calls it's hardly a catch.

Even at the higher price, it's still a very cheap device, with most budget phones with 4G LTE support costing £80 to £100. Even EE's own Harrier Mini is £99, so the closest rival on price is the impressive Vodafone Smart Prime 6 at £79.

As with most budget phones, there's little to say about the EE Rook in terms of looks and build. The device is small, too, so fits in the hand much easier than most modern phones. The 130g weight helps the Rook to feel solid, and like its bigger brothers there's a yellow ring around the camera.

The rear cover is removable, giving access to the card slots and battery. Our main gripe is that the rear cover attracts fingerprints and grease, so it constantly looks grubby. Plus, the recessed ear piece will be a magnet for dust and dirt.

At 4in, the display is tiny compared to almost every other smartphone on the market at the moment. Anything under 5in can arguably be described as small, so going back to the same size as the iPhone 4s is strange if you've got used to today's average.

Unsurprisngly, the resolution is just 480x800, so images are far from crisp. There is, however, a bigger problem – poor viewing angles mean you need to look at the Rook straight on to see what you're doing. Move the device, or your head, even a small amount and image quality diminishes severely. From the bottom of the phone, it's almost completely white, while the opposite is true when looking from the top.

The Rook is powered by a MediaTek MT6735M 1GHz processor, which is quad-core and 64-bit, with a built-in 4G modem. There's also 1GB of RAM, and apart from the initial setup of the phone, we found performance to be unexpectedly smooth. Don't try and play any graphically advanced games, but titles such as Temple Run 2 will be okay.

It's far from flawless and the Rook does lag when you push it, but on the whole it can keep up with most regular tasks. We were also impressed with the benchmark results, which you can see in the table below. Note that it outpaced the Smart Prime 6 and EE Harrier Mini in graphics tests.

Of the 8GB of storage just 2.5GB is available out of the box, however, a microSD card slot alleviates this problem and can accept up to 32GB memory cards.

Don't expect much in the way of other specs, though. It has basic Wi-Fi, GPS and Bluetooth 4.0, but no fancy features such as NFC for use with EE's Cash on Tap.

As mentioned earlier, the battery is removable and isn't particularly large in capacity at 1500mAh. However, the Rook faired pretty well in our benchmark test lasting five hours, 22 minutes. That's better than the mid-range Sony Xperia M4 Aqua, which managed four hours, 49 minutes.

We wouldn't have been too shocked to find one or even no cameras on the EE Rook in order to achieve the price, but it has both front and rear shooters. The back offering is 5Mp, while the front is a very basic VGA resolution camera. Although there are features such as HDR and panorama available, the results won't be anything special.

It's impressive to find the EE Rook preloaded with the latest version of Google's Android operating system, 5.1 Lollipop. Like

the EE Harrier and Harrier Mini, the experience is largely stock Android, or 'vanilla', so the firm has left the OS alone on the whole.

The Rook comes with a number of preinstalled apps, including Lookout, Deezer, Games and Apps, plus various apps from Amazon. While widgets can be removed from the homescreen panels, the apps themselves can only be disabled, not uninstalled completely.

Navigation buttons sit below the screen, which in this case is pretty handy as the 4in display is small enough without having to host a nav bar. It's good to see that one of the buttons is for recent apps and not the out-of-date menu option, which we've seen on other phones.

Verdict

If you don't mind the basic design, the EE Rook is a good little phone. We can't argue with the price of £39 for existing customers and the performance is better than we expect for a sub-£50 phone. It's mainly the miserable viewing angles of the screen that put us off, so you are better off spending a little more if you can afford it. ☒ **Chris Martin**

	GEEKBENCH 3	GFXBENCH T-REX	GFXBENCH MANHATTAN	SUNSPIDER*
EE Rook	1359	12fps	6fps	2092ms
Vodafone Smart Prime 6	1401	9fps	4fps	1301ms
EE Harrier Mini	1549	10fps	4fps	1880ms

* lower is better

TABLET

Sony Xperia Z4 Tablet

£499 inc VAT

Contact
■ sony.co.uk

Specifications
Android 5.0 Lollipop; 10.1in (2560x1600, 300ppi) IPS Triluminos screen, 500cd/m²; Qualcomm Snapdragon 810 processor, 64-bit; 3GB RAM; 32GB internal storage, microSD card slot (up to 128GB); 8.1Mp rear camera with Exmor RS; 5.1Mp wide-angle front camera; MHL 3.0; Wi-Fi 802.11b/g/n/ac; NFC; Bluetooth 4.1; Nano-SIM (LTE model); 6000mAh battery; 254x167x6.1mm; 392g (Wi-Fi), 396g (LTE)

Build:
Features:
Performance:
Value:

The Xperia Z4 Tablet is Sony's latest 10in Android tablet and is the successor to the Japanese tech giant's Z2 Tablet.

In comparison with Apple's market-leading iPad Air 2, the Z4 is the same thickness, though a decent 45g lighter, so tops marks to Sony. The Xperia feels great in the hand too, with the weight making it easy to handle.

Sony continues to offer dust- and waterproofing, this time to an IP68 rating, which is the highest available. We've got used to the headphone port not needing a cover or flap to keep the moisture out, but now the Micro-USB port doesn't either, which is a great addition. Only having one flap for cards is ideal as you rarely need to open it.

Aside from the above changes, the design remains the same as the Z2. The bezel that runs around the display doesn't look great, but means you can hold any side without needing to touch the screen, leaving your fingers in the way.

What we thought was an optional Bluetooth keyboard dock (BKB50) is now bundled with the tablet. This supports tilt and a trackpad for what Sony calls a "premium laptop experience". The Z4 Tablet slots in easily and you can then adjust the angle or close it just as you would a regular laptop.

It all works smoothly, though there's a limit to how far back you can tilt the tablet, so it doesn't topple over. The keyboard is a little flimsy and the keys are small, so it's not the optimum experience, but you can get a reasonable amount of typing done without pulling your hair out. The trackpad is good and using Android with a mouse cursor makes a lot of sense.

Sony has improved the resolution of its latest 10in tablet to 2560x1600 and boosted the brightness to 500cd/m². The pixel density of 299ppi is also impressive and outpaces the iPad Air 2's 264ppi. We were impressed by the 'Triluminos' screen and the IPS panel means viewing angles are good, too.

Other hardware upgrades include a Qualcomm Snapdragon 810 processor, which is both octa-core and 64-bit. There's 3GB of RAM to accompany it, 32GB of internal storage, while there's a microSD card slot that's capable of accepting up to 128GB more.

Performance is also impressive and the Z4 Tablet breezed through our benchmarks (see below) and felt slick in operation.

Additional hardware consists of 11ac Wi-Fi, NFC, Bluetooth 4.1 and MHL 3.0. Our review unit was a Wi-Fi only model, but you can also opt for a Z4 that offers 3G/4G LTE connectivity if you want data on the go and the ability to make phone calls. It's not cheap though, and will set you back £579.

The Z4 supports High-Res audio, and like the Z3 range has front-facing stereo speakers, supports digital noise cancelling, offers automatic headphone compensation and comes with a new LDAC codec that according to Sony transmits data three times more efficiently than Bluetooth.

For photo and video there are 8.1- and 5.1Mp cameras back and front. The main shooter uses Sony's Exmor RS sensor, while the front camera has a wide-angle lens to get more people in the frame.

In our Geekbench 3 battery test, Sony's tablet lasted an impressive nine hours 53 minutes, with a score of 5933.

The Xperia Z4 runs Android 5.0 Lollipop and Sony has kept things vanilla, so the experience is close to that of a Nexus device running stock Android. There's the Lollipop two-stage notification bar and card-style recent apps menu. During testing, we found the software to be slick and responsive.

Sony has preloaded its own apps, including Walkman, Album, PlayStation and Lifelog. The Z4 also comes with Microsoft Word, Excel and PowerPoint. Other third-party apps include AVG Protection, Garmin Navigation, Vine and Kobo Books. Thankfully, you can uninstall them all if you don't want them.

Xperia Lounge, which has been around for a while now, offers silver and gold tiers with the top level reserved for Z devices. Sony promises content including music, video, cloud storage and software upgrades for the life of the tablet.

As well as the High-Res audio support mentioned earlier, the Xperia Z4 includes PS4 Remote Play enabling you to play PS4 games on the device from the console over the same Wi-Fi network.

Verdict

The Z4 Tablet is an impressive device and one of the best tablets we've tested. ☒ **Chris Martin**

	GEEKBENCH 3	GFXBENCH T-REX	GFXBENCH MANHATTAN	SUNSPIDER*
Sony Xperia Z4 Tablet	4573	37fps	16fps	580ms
Apple iPad Air 2	4523	52fps	25fps	287ms
Samsung Galaxy Tab S 10.5	2769	14fps	3fps	1079ms

* lower is better

TABLET

Dell Venue 8 7000

£369 inc VAT

Contact
■ dell.co.uk

Specifications
Android 5.0 Lollipop; 8.4in (2560x1600) OLED; Intel Atom Z3580, up to 2.3GHz; PowerVR G6430; 2GB RAM; 16GB storage; microSD card slot (up to 512GB); 8Mp rear camera with Intel RealSense; 2Mp front camera; up to 11ac Wi-Fi; Bluetooth 4.0; 124x216x6mm; 305g

Build:
Features:
Performance:
Value:

Dell is the slightly unlikely claimant to the title of world's thinnest tablet with the Venue 8 7000. It's also the first device we've seen with Intel RealSense technology.

As we've touched on, the headline design feature of this tablet is how thin it is. At just 6mm, it's slimmer than the Samsung Galaxy Tab S 8.4, Sony Xperia Z3 Tablet Compact and iPad Air 2, which are 6.6-, 6.4- and 6.1mm respectively. It's also lightweight in the hand, although 310g makes it a little heavier than its Samsung and Sony rivals. We like the feel of the unibody metal casing that covers most of the tablet.

Dell has created a stylish design, although it looks a little odd with the large bezel at one end of the screen, which houses a sizable camera lens and speaker grill. It would look very HTC-like if there was a second speaker at the other end and we're not sure why Dell didn't go down this route in order to offer stereo speakers (they are stereo but at one end, which defeats the point).

The tablet is designed to be held in portrait orientation, with the speaker at the bottom. That's fine and while you can easily hold the Venue 8 7000 one-handed, grasping it this way does mean that the cameras are also at the bottom and get blocked by your hand.

On the hardware front, the Dell uses a quad-core Z3500 Moorefield chip that has PowerVR G6430 graphics, while there's 2GB of RAM. Performance is decent across the board and we've only noticed a little bit of lag with things such as auto-rotation and launching the camera.

In terms of benchmark results, the Dell Venue 8 7000 keeps up with its Sony and Samsung rivals which all provide similar results. See the table below for all the results.

The 8.4in OLED screen is stunning. With a resolution of 2560x1600 and a pixel density of 359ppi, it matches the Samsung Galaxy Tab S 8.4. The glossy display is highly reflective, and although it's very crisp, the Lollipop drop-down menu is a little small.

One of the features that Dell is highlighting as a reason to buy this tablet is that it comes with Intel's RealSense technology.

There are three cameras on the rear of the tablet – one is 8Mp, and the other two are 1Mp and shoot 720p video. The main camera sits on its own in the bezel, while the other two sit in a more central location. The idea is that the additional two act like your eyes and capture depth information (up to 10m). This can be used to not only refocus the image after you've take in but also measure items within it.

Unfortunately, after all the hype we found RealSense to be a letdown. The tablet does warn that you need good bright conditions for it to work, but we've simply found it unreliable at measuring things and the refocus can only be described as atrocious.

The Venue 8 7000 comes with 16GB of internal storage, which sounds good, but only 6GB is available to the user. There is a microSD card slot though, which adds up to 512GB of extra storage.

Dell also touts a battery life of up to nine-and-a-half hours and fast charging. Our battery benchmark test yielded a result of nine hours, 11 minutes with a score of 5493, which isn't far off the impressive Sony Xperia Z4 Tablet which managed nine hours, 53 minutes and a score of 5933.

Out of the box, the Venue 8 7000 runs Android 4.4 KitKat, though we we're able to update it to Android 5.0.2 Lollipop straightaway. It's getting more common for Android to be left well alone making for a 'vanilla' experience. This is a plus point as it gives you a blank canvas with which to customise the interface how you like. Dell does add a few apps though and you must use its Gallery app to take advantage of the RealSense features.

An advantage of the Gallery app is the option to store and organise photos and video by GPS position, making it easier to show someone only photos taken on a holiday abroad or a particular day trip, for example. Another app, MyDell, lets you check on things such as storage, charge, CPU and memory usage, as well as getting online support.

As well as the Dell apps, you'll find things such as Evernote, Dropbox, Polaris Office 5, Skitch, McAfee Security and MaxxAudio preinstalled. The list isn't too big but the bad news is that you can't uninstall them – disabling is the best you can do here.

Verdict

The Dell Venue 8 7000 is an attractive Android tablet with a super slim design, a great screen and offers smooth performance combined with good battery life. However, it's more expensive than its rivals and the RealSense camera technology isn't worth the time of day. ☒ **Chris Martin**

	GEEKBENCH 3	GFXBENCH T-REX	GFXBENCH MANHATTAN	SUNSPIDER*
Dell Venue 8 7000	2896	21fps	8fps	747ms
Sony Xperia Z3 Compact	2708	28fps	11fps	1017ms
Samsung Galaxy Tab S 8.4	2765	14fps	3fps	1089ms

* lower is better

TABLET

Vodafone Tab Prime 6

£150 inc VAT

Contact
■ vodafone.co.uk

Specifications
Android 5.0 Lollipop; 9.6in (1280x800, 157ppi) screen; Qualcomm Snapdragon 410 processor 1.2GHz quad-core; 1GB RAM; 16GB storage; microSD card slot (up to 32GB); 5Mp rear camera; 2Mp front camera; Wi-Fi 11a/b/g/n; Bluetooth 4.1; IR blaster; GPS; 4G LTE; 4600mAh battery; 146x244x7.9mm; 406g

Build:
Features:
Performance:
Value:

It's becoming increasingly common for mobile networks to offer their own products and EE now has its own range, including an action camera. Vodafone isn't far behind, but is sticking to core devices such as smartphones and tablets. We were impressed by its Smart Prime 6 budget phone, so our hopes were high for the Tab Prime 6.

This is a simple tablet in terms of design, looking a little like the Google Nexus 9 but without the premium materials. Despite the lack of any metal, it looks and feels good, with the anthracite rear cover, which is smooth and slippery.

The camera sticks out a little way, but that's not a big problem and the back also has a flap hiding the microSD- and SIM card slots. As you might expect, there's a Vodafone logo and '4G' printed above four round metal contacts, which are for connecting to a keyboard.

The Tab Prime 6 is just 7.9mm thick and weighs 406g. We found it easy to hold in both portrait- and landscape mode, but be aware it's tall because of the 16:9 ratio screen.

Most budget tablets offer a small 7in screen, but the Vodafone Tab Prime 6 has a 9.6in display. That's a decent amount of space, though the resolution is just 1280x800.

There's a reasonable amount of brightness on offer here – at least for indoor use – and colour reproduction isn't bad either, but that resolution on a screen this size simply means things aren't crisp and some text can even appear blurry, which is far from ideal. The display is just 157ppi.

Inside is a 1.2GHz quad-core Qualcomm Snapdragon 410 processor and 1GB of RAM. Benchmark results aren't great, and although the Tab Prime 6 is sticky in performance occasionally, we found it was smooth during testing. Take note of the GFXBench results though, which show that this really isn't a tablet for gaming. Although Vodafone's website lists only an 8GB model, we were sent a 16GB version. There's a microSD card slot for adding more storage (up to 32GB) which is handy.

One of the main features and reasons to buy the Vodafone Tab Prime 6 is the built-in 4G LTE support. Whether you buy the tablet on PAYG or contract, it will come with a SIM card and you can get data on the go easily.

With 11a/b/g/n Wi-Fi and Bluetooth 4.1 we were surprised to find an IR blaster on the Tab Prime 6, which means you can use it as a universal remote control around your home via the preinstalled Peel app.

The cameras are basic and you won't get anything special from the 5Mp rear camera, which doesn't have a flash. The front snapper is equally poor and won't provide a crisp image for video calling, plus it's positioned off-centre, which doesn't help matters.

In terms of battery life, the Vodafone offers decent performance from the non-removable 4600mAh battery. In our Geekbench 3 test, it managed seven hours 49 minutes, with a score of 3129. We've not tested many tablets with this benchmark, but for comparison the Sony Xperia Z4 Tablet provided nine hours 53 minutes, with a score of 5933 with its 6000mAh battery.

The Tab Prime 6 comes with a vanilla version of Android 5.0 Lollipop. It does come with some branded items though, but not many. There's a Vodafone SIM app, plus Discover and Update apps, though you can uninstall these if you like.

As with many Android devices, swiping right from the homescreen takes you to a separate section. In this case it's Flipboard, though Vodafone offers the option to change it which we really like. Within the display settings, you can switch it off completely or choose what swiping right launches, including regular apps. Google is included in the options giving you a Nexus style UI where Google Now is a swipe away – just remember it launches the app so you can't swipe back to the homescreen.

With Vodafone offering stock Android Lollipop, holding back on bloatware and adding customisation where it's not normally available, the software of the Tab Prime 6 is a real plus point.

Verdict

The Tab Prime 6 isn't a bad attempt at a budget tablet, with decent build and almost stock Android. It's the screen that is the biggest letdown here. ☒ **Chris Martin**

	GEEKBENCH 3	GFXBENCH T-REX	GFXBENCH MANHATTAN	SUNSPIDER*
Vodafone Tab Prime 6	1323	9fps	4fps	1327ms
Tesco Hudl 2	2165	17fps	N/A	768ms
Amazon Fire HDX	2067	N/A	N/A	697ms

* lower is better

TABLET

LeapFrog LeapPad Platinum

£99 inc VAT

Contact
■ leapfrog.com

Specifications
7in (1024x600) capacitive touchscreen; 8GB storage, 1GHz processor; 2Mp front and rear cameras (640x480 max video resolution); 3.5mm headphone jack; mini-USB sync/charge port; 356x292x25mm; 500g; 1-year warranty

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★½☆
Value: ★★★½☆

★★★½☆

LeapFrog is one of the best-known brands when it comes to kids tablets. The Platinum is – as the name suggests – the top-of-the-range model. In looks and how it works, it's similar to the older models.

It has a built-in stylus, front and rear cameras, a speaker, headphone socket and Wi-Fi (with a kid-safe web browser). The LeapFrog also comes with several preloaded apps and some demos, and you can buy more apps from the LeapFrog app store.

It's possible to create multiple user profiles so it can be shared between siblings, and games offer age-appropriate material.

The Platinum costs £99.99 and comes in either pink or green. You get the PetPadParty game included (very similar to PetPlayWorld on the LeapTV), along with a clock app (which reads out the time to help kids learn to read an analogue clock), a calculator, a calendar, voice memo and a camera app which can add fun effects to photos.

Through the app store you'll find an extra 800 or so apps ranging from £2 to £20. There are also the new Imagicards games. These are £19.99 each and come with a tin of cards which are used in the game.

As it's designed for children aged from three to nine (we think a two year old would get enough out of it, but beyond seven kids will probably find it too childish), the LeapPad Platinum has a tough case and a 'shatter-safe' screen.

The 7in screen has a resolution of 1024x600, which is higher than other LeapPad tablets, but by no means high resolution by today's standards. It's bright enough and colourful, with good viewing angles.

There's a volume rocker on the bottom edge and a card slot for game cartridges on the right.

You can charge the tablet using the bundled charger or use the included USB cable to charge it from your computer or any USB charger (which means it can also be charged in a car).

The battery lasts around five hours, which isn't amazing, but as the tablet turns off completely when you press the power button or if you leave it idle for too long, power isn't wasted. It also means the Platinum keeps its charge even if you don't use it for a few days. We found it was enough for a good few sessions before it needed a recharge.

To the left of the screen is a direction pad which can be used to navigate around in some apps, and pressing left or right moves between home screens.

There's enough preinstalled for hours of fun. Our three-year-old tester loved PetPadParty, as well as the included music in the Music app.

In PetPadParty, a pre-schooler will have to select numbers and letters when directed to unlock mini-games which themselves help with dexterity and are generally just good fun. You can create and name pets, give them toys, feed them, wash them and exercise them.

Six demos come with the tablet, although some require extra files downloading before you can play them. The Imagicard demo is one of them. This gives you a flavour of what you'll get for £19.99 if you buy one of the full sets. It's not the augmented reality experience we were expecting, though. When you focus the camera on a card, the tablet recognises it and takes a photo, and the letter or character springs into life on top of the photo. Because it's a photo, you can't move the tablet around and see the character run around on your knees or on the floor as you can with certain iOS and Android apps.

The first time you go to the app store, you will be prompted to download a free app (and create a LeapFrog account if you skipped that step during setup). There's a choice of three for each age group, and you're allowed one. For the four to five Nursery age group we were offered spelling, maths or a colouring game. It's a shame that no colouring or sketching app is included by default. There's a Notes app, but it only lets you type using the keyboard – not much use if your child is three.

You can filter by age group as well as by price, character, app category or skillset. Sadly there are no free apps. It's even more of a walled garden than an iPad: there are no other app stores to browse, and although there are Disney and Nickelodeon licences, you're not going to find Toca Boca and many other popular kids games here.

For the most part, the Platinum is speedy enough, but there can be delays when returning to the home screen and launching apps. Kids can often be confused when there's a tutorial section of an app as it stops being interactive until the tutorial is over, so it's worth supervising them until they've played it for a bit.

Almost every instruction is spoken so kids don't need to be able to read to use most aspects of apps.

It almost goes without saying that the 2Mp cameras aren't up to much. Although children will have fun using them to take photos and videos, their quality is dismal by modern standards. It's a sad fact that every kid's tablet we've tested has poor cameras, and the VGA video clips from the Platinum aren't really good enough for sharing.

Verdict

If you're after a tablet for your kids, then the LeapPad Platinum is a decent choice. ☒ **Jim Martin**

E-READER

Amazon Kindle Paperwhite (2015)

£179 inc VAT

Contact
■ amazon.co.uk

Specifications
6in Paperwhite display with Carta e-paper technology and built-in light, 300ppi, optimised font technology, 16-level grey scale; free cloud storage for all Amazon content; 802.11b/g/n Wi-Fi standard with support for WEP, WPA and WPA2 security using password authentication or Wi-Fi Protected Setup (WPS); Kindle Format 8 (AZW3), Kindle (AZW), TXT, PDF, unprotected MOBI, PRC natively; HTML, DOC, DOCX, JPEG, GIF, PNG, BMP through conversion; 169x117x9.1mm; Wi-Fi: 205g; Wi-Fi+3G: 217g

Build: ★★★★½
Features: ★★★★½
Performance: ★★★☆☆
Value: ★★★★☆

★★★★☆

The Kindle Paperwhite is Amazon's newest eReader, which makes it just about the most important member of the entire eReading fleet. It sits between the bog-standard Kindle and the high-priced Kindle Voyage.

The Kindle Paperwhite we reviewed costs a mighty £179 from Amazon. This is the top-of-the-range spec. If you go without 3G connectivity, and allow Amazon to place 'special offers' on your Kindle's homescreen, you can get the cost down to a more reasonable £109 inc VAT. Honestly, this seems a better deal to us - even if you don't like the adverts it costs only £119 inc VAT without 3G. 3G is useful for downloading books wherever you are in the world, but you can usually get on to Wi-Fi.

At this price, then, we expect the best. And by and large we get it. The 2015 vintage Kindle Paperwhite is a thin and light black slab, with roughly the footprint of a paperback book, but much thinner and lighter. To be exact it measures 169x117x9.1mm, and the Wi-Fi and 3G model we tried we weighed at around 217g. The Wi-Fi-only Kindle Paperwhite is a few grammes lighter.

That 9mm thickness is enough to make the Kindle Paperwhite comfortable to grip. This is helped by the slightly rubbery feeling of the back, offering additional grip. And, of course, it's light.

And we also put the Kindle Paperwhite through the mill, somewhat. It lived in the bottom of a work bag, among the detritus, keys, smelly gym kit and discarded tech that we consider critical work-related kit. Two weeks on and there is the odd faint smudge on the back cover, but nothing that doesn't quickly rub away with a finger. The Kindle Paperwhite is built to last.

It's not a thing of beauty, but that's okay. The Kindle Paperwhite is good at what it does. Its ugliness stems from the thick black bezels that surround the display. If this was a smartphone you would be annoyed by the wasted space, but in use we found the Paperwhite to be the right size to hold and use. And the pixels didn't bother us when we were using it to read.

This, ultimately, is the critical aspect of any eReader. What is the screen like, and how does it feel to read, read, read?

Technically, this Kindle has a 16-level grey scale 6in Paperwhite display with Carta e-paper technology and built-in light. It has a very detailed eReader resolution of 300ppi, as well as what Amazon calls 'optimised font technology'.

In laymen's terms that means it's an e-ink display that is backlit and super sharp. It's a beautiful reading experience, and when we were reading in bed), the backlit screen was great too. Clear, comfortable, but adjustable so that we could find a light that was not too bright. Indeed, our one complaint was that by default the backlit screen was too bright. You could use that thing as a torch.

Reading outside in direct sunlight is also great. A real advantage of this kind of eReader over a general tablet. And the Kindle's fonts are truly excellent, in the sense that the reading experience is so comfortable.

So far so good. But you are paying a premium for the Paperwhite's 300ppi display. Given that you can pick up a more bog-standard Kindle for £59 – albeit one without a backlit display – is the premium model worth the premium fee? Certainly we would pay extra for the backlit display, and at £109 the Paperwhite is a good deal. But it has to compete with the Nook Glowlight, a backlit eReader that is lighter than the Paperwhite – and cheaper. We are not sure that the 300ppi resolution makes it worth the upgrade. Although Amazon's unsurpassed library, and the feature set, may be.

As well as that unsurpassed high-resolution 300 ppi display and the built-in adjustable light, the main features are Amazon's millions of books in its store, and the fact that you can hold thousands of books on the Kindle itself. Amazon has built-in some additional software features.

Without leaving the page, you can query words you don't understand in order to build your vocabulary and learn about characters within books. To be honest, although these features work well in our experience, we don't have much use for them.

A key advantage of a dedicated eReader is the long battery life. Amazon claims that a single charge will last up to six weeks, and charges via USB in around four hours. That battery life claim is based on half an hour of reading per day with wireless off and the light setting at 10. Battery life will vary based on light and wireless usage and – reader – it does.

We found that we had to charge it around once every 10 days. In once case, after a week. This reviewer commutes for two hours every day and reads for most of that, and tends to read for another half an hour or so in the evening. The backlight is on at least once a day, and I never got around to switching off the wireless. All of these things will have legitimately hurt the battery life, but they are also part and parcel of using a well-loved device.

Clearly 10 days is not six weeks, and we will admit to being mildly disappointed with the battery life. Irrationally so, because a week is a long battery charge, the Kindle warns you in good time, and there are myriad USB chargers at home. We can happily read in bed attached to a charging plug. We suspect slightly less than stellar battery life is a direct result of that amazing display resolution. Honestly, we would rather better battery life.

Verdict

The Kindle Paperwhite is an excellent eReader. Brilliant display, superb design and build, and access to an unsurpassed library of eBooks. Our only minor quibble is about battery life. ☒ **Matt Egan**

ACTIVITY TRACKER

Jawbone UP3

£129 inc VAT

Contact
■ jawbone.com

Specifications
Bluetooth; splash-proof; LED display; accelerometer, bio-impedence electrodes for heart rate; respiration and galvanic skin response; measures skin temperature and ambient temperature; up to 7 days battery life (USB charger provided), compatible with iPhone 4s or newer and Android 4.3 and newer; 220x12.2x3-9.3mm; 29g

Build: ★★★☆☆
Features: ★★★★☆
Performance: ★★★½☆
Value: ★★★½☆
★★★½☆

This is the one. The UP3. This reviewer has been for almost eight months for this thing to turn up. It was originally meant to go on sale last winter but problems with waterproofing led to big delays.

The plan was to make the UP3 waterproof, as opposed to water-resistant. Early production models didn't make the mark, though. So, the UP3 has been reclassified as water-resistant and means you can wear it in the rain, but you can't go swimming or submerge it in the sink while you wash up.

Anyone with a previous UP tracker will notice the new bracelet design. Instead of a rigid twist-on, twist-off mechanism, the new bands (all three) have more traditional straps with a new buckle.

Gone is the removable cap and 3.5mm minijack connector: the only way to sync is via Bluetooth. That's not a problem for most people, who would want that anyway. The proprietary magnetic charging cable is a pain, though. As with other activity trackers, it's frustrating to have to take care of a small cable and ensure you've always got it to hand when the battery is low.

As ever, there's no real display on the UP3. Some people like this. We don't. We'd much rather have only one device on our wrist – a tracker and clock in one – than wear a separate watch. There are also no buttons: you have to tap and touch the band to check its status and change modes.

There's a choice of black or silver versions, with the quilted effect on the silver one. One size fits most: the buckle is adjustable to fit most people's wrists, from 140- to 190mm. As with the UP2, it fitted everyone who tried it in the office.

Like any activity tracker, the UP3 isn't a standalone device. You'll need an Android phone or iPhone to use it and the app is free.

Thanks to a collection of sensors, the band can detect what you're up to and along with information you enter into the app about yourself, it will pretty accurately estimate how many steps you've walked, the distance you've travelled and how many calories you've burned.

Those golden pyramids on the inside of the band are electrodes which measure heart rate. This is different from the optical sensors used on Fitbit bands and the Apple Watch. There are pros and cons to each method.

Jawbone says it uses a lot less power, so the UP3 lasts longer with a smaller battery than it would with optical sensors. The disadvantage is that it doesn't offer continuous heart-rate monitoring, which is why Jawbone talks only about 'resting heart rate'.

When you wake in the morning, you sync the band and you'll get a detailed graph of your sleep split into light, deep and REM sleep. Plus, you'll see a graph of your heart rate through the night along with a lowest figure for that night.

You can tell none of this from the band itself because it relies on three LEDs for a display. The orange man is the 'awake' state. The blue moon is 'asleep'. A third white 'message' LED is for alerts.

You'll know about these alerts because of the vibrating motor inside the band. There's the usual get-off-your-bottom alert if you're idle for longer than the time you set in the app. It can also buzz when it's time to get ready for bed, and there's the same smart alarm that wakes you at the optimal time within the range you set.

The new buckle is a bit fiddly to use. We don't really like it much. For one thing, we had to adjust it regularly as it relies on friction to keep it in the position you've set so it's the right size. Secondly, it came undone more than a few times - when gardening and washing the car - and almost fell off.

What we do like is the size. It's slim and so light you soon forget you're wearing it. It will fit under shirt cuffs, and it's one of the more stylish fitness monitors.

The original Jawbone UP suffered from worrying build quality issues and these don't appear to have entirely gone away with the UP3. On the one hand Jawbone couldn't make it as waterproof as it wanted to, but during testing one band stopped working and a second lost its pairing with my iPhone three times. That wouldn't be so bad if you didn't need the charging cable for the pairing process.

The battery lasted a little over a week between charges which is what Jawbone claims. However, while that's a couple of days more than the Fitbit Charge HR, it's hardly impressive given than the Charge HR has a display showing the time and stats, plus continuous heart-rate monitoring using an optical sensor. It's a little bigger, yes, but not uncomfortably.

We're not the biggest fan of the hardware, then, but the app is still one the best out there. It looks great and presents information in a way that's easy to understand. The Smart Coach is also far better than you might think.

Far from just being generic advice, your stats are interpreted so you know how you're doing. It's motivational, and also educational. Unless you're already a health and fitness expert, you'll benefit from the tips it serves up each day, ranging from how to eat more healthily to nudges to go to bed earlier to get more sleep.

You can compete with friends who own Jawbones and, again, the app will prompt you to add some team members, presenting you a note explaining that people who compete tend to do 30 percent more steps than those who don't.

Remember that there's no built-in GPS, so it's not going to be as accurate as a device that has this feature for tracking your exercise.

Verdict

The UP3 adds a few extra features over and above the UP2, namely the ability to track resting heart rate and REM sleep. What it's good at is monitoring your health and fitness, as well as motivating you to become better on both counts. ☒ **Jim Martin**

ACTIVITY TRACKER

Jawbone UP2

£89 inc VAT

Contact
■ jawbone.com

Specifications
Bluetooth; splash-proof; LED display; accelerometer; up to 7-day battery life (USB charger provided); compatible with iPhone 4s or newer and Android 4.3 and newer; 220x11.5x3-8.5mm; 25g

Build: ★★★★☆
Features: ★★★½☆
Performance: ★★★★☆
Value: ★★★★☆

In terms of wearables Jawbone is the (not so) little company that did. Its Jawbone Up24 activity tracker has been a smash hit in wearable terms, managing to find its way on to the wrists of tech- and fitness-savvy beautiful people in London and San Francisco (and therefore the entire world).

The UP2 replaces the almost ubiquitous UP24, and is the middle child of Jawbone's current fitness family. It sits between the bargain basement Jawbone Up Move pendant and the UP3 (see page 38), Jawbone's new flagship wristband.

There are two colour schemes for the UP2: grey and black. Both come with a textured metal plate appended to the top, but in the case of the UP2 that metal is black. The device itself comprises a thin rubber strap and that metal midsection. It's a one-size-fits-all gadget, with an all-new metallic watch clasp. In our experience the clasp was initially incredibly fiddly, but then a welcome addition in that it allowed us to set the UP2 to be sufficiently tight as to live on the same wrist as my watch without the two clashing.

Like that activity tracker the UP2 is robust and splashproof. The metal plate does pick up scratches, but it is impossible to tell on the top side because of the textured finish. I wouldn't take it swimming, but it survived the odd shower with no problems. And that is a good thing, because like the UP24 that rubbery strap will get sweaty and grubby when you workout.

The UP2 weighs in at a measly 25g and measures just 220x11.5x3-8.5mm. Jawbone accepts that some wrist sizes will be too big or too small, but claims that it will fit all wrists ranging from 140- to 190mm in diameter. We couldn't find anyone in our office for whom it didn't fit.

In terms of the user experience, the lack of physical buttons or a screen is both a boon and a pain. A pain because although you can switch between modes by tapping on top of the unit, we found this fiddly and counter intuitive. But a boon because it is really simple to refer to the all-new Jawbone UP on your smartphone. When you do that, you see more detail on a comfortable display. And it is much easier to control your activity tracker via the app than through a variety of taps on your wrist.

Overall though, the on-device user interface of the UP2 is poor. It is worse than the more simple single-button, two-LED UI of the UP24. But the price you pay for having a slim and stylish activity tracker is the absence of a screen.

Generally speaking we don't like the kind of proprietary charging cables sported by the UP2, as it requires you to carry it around with you when you are in need of a charge. But given that it charges via USB, and quickly, we are prepared to give it a pass. The UP2 clips into the charger using a magnet, so you can do it in the dark.

Battery life is nothing out of the ordinary for this type of device. During testing, we achieved seven- or eight days (and nights) out of the UP2 and its Li-Po 38mAh battery.

The UP2 does not have a GPS capability. Instead, it uses an accelerometer to act as a pedometer, measuring your activity based on weight and height data you give it. Reader, this will never be as accurate a method as that of a device with onboard GPS. If you are training for a marathon, the UP2 is not the device for you. Rather, it is a gadget in the spirit of the original generation of activity trackers. It quantifies activity, so you can set a benchmark and challenge yourself to beat that benchmark. You set a target of steps and sleep time each day, and try to hit those targets. The 'Coach' in the app nags and prompts you, praising you for a job well done. Tell the app what you eat, nudge it when you sleep, and you have yourself a good way of measuring and improving your lifestyle.

The UP2 is – in our experience – good at noticing when you exercise. If we went for a run or a walk it noticed. The bands lights came on, and the app asked us to confirm the duration of the exercise, and make a judgment on how strenuous it was. You can also tell it that you are exercising by going into the app and enabling the 'Stopwatch' feature. This is all well and good, but not entirely intuitive. With a device that is designed to quantify activity as it fits into your daily life, having to enable a feature before you head out is annoying.

Other good points include the ability to tell the app what your exercise was. Not restricted to the usual walk, run, cycle, the UP app will allow you to be as specific as selecting a 'hike' or even something called 'Zumba'. The app is brightly coloured and easy to use. It looks like the existing Jawbone app, but is a new piece of software for use with the UP3 and the UP2. Your stats are laid out clearly, and targets are easy to set. We could live without the hints and tips, but it may be that a prompt from a virtual coach is what it takes to get you moving.

Verdict

The UP2 is comfortable to wear, robust and well priced. Most importantly, the UP app builds on the success of its predecessor, and is a great way of quantifying and improving your health. ☒ **Matt Egan**

MEDIA STREAMING DEVICE

Roku 2

£69 inc VAT

Contact
■ roku.com

Specifications
HDMI; dual-band Wi-Fi; ethernet; microSD; USB; remote control; 61x178x178mm; 558g

Build: ★★★½☆
Features: ★★★★☆
Performance: ★★★½☆
Value: ★★★☆☆
★★★½☆

Roku is one of the leading names in media streaming. Whereas most of its competitors want you to use their services – Amazon, Apple and Google are three prime examples – Roku is a third-party brand that simply wants to give you the best experience possible.

The company's current line-up consists of just three products. Roku's entry-level product is its Streaming Stick (priced £39), while at the top end of the range is the £99 Roku 3. At £69, the Roku 2 sits in the middle of the three products. However, while it's cheaper than the company's premium model, it's still more expensive than rivals such as the £59 Apple TV.

Design

The Roku 2 now has the same design as the Roku 3. The remote, however, is very different, with rubbery buttons, and there are now dedicated keys for launching Netflix, YouTube, Rdio and Google Play. Those shortcuts are handy, but it's worth noting that the remote uses traditional line-of-sight to work, so you can't tuck the box away or have anything between the two. Unlike its more expensive brother, it doesn't have a headphone port for private listening or motion sensors for playing games. It might be worth paying the extra if you want these features.

While the remote is different, the box itself is the same as the Roku 3. This means it has an HDMI port, ethernet, dual-band Wi-Fi, USB and microSD. It uses the same processor too, so performance is snappy.

If you're not bothered about the above features, then the simple but effecting Streaming Stick is probably the Roku for you.

Regardless of which device you pick, the amount of content on offer and features remains the same. Roku continues to lead the way in terms of the best range of streaming services, or apps, you can access. Top names include Netflix BBC iPlayer, ITV Player, Demand 5, All 4, Now TV, Sky Store, BBC Sport, Spotify, Facebook, Google Play, and more. You can also browse the 1,400+ strong channel store where there are all kinds of things from barbecue channels to Yoga.

It does, of course, depend what you want to watch so if you subscribe to Amazon Prime Instant Video and not Netflix, then you're not going to want to buy a Roku, although the firm has told us it's working on adding support.

We've always been fans of the Roku user interface, which is intuitive and customisable with different themes. It's good to see new features, then with the ability to search the channel store a welcome and necessary addition.

You can also look for content by name, actor or even director. Start typing and suggestions will appear making things quicker. Don't, however, be fooled into thinking it will go through every channel. Our search warned at the bottom of the screen it would search only Netflix and Snagfilms. Roku says that "over time more channels are expected to complement this list," and we hope this happens soon.

> MyFeed is a new feature that allows you to 'follow' new releases and receive updates when they become available to stream on your Roku

MyFeed is another handy new feature, which allows you to 'follow' new releases and receive updates when they become available to stream on your Roku – either for free or to rent. The only real downside is that you can only opt to get updates on suggested films rather than anything out there.

The Android and iOS apps have been updated with these features too, but voice search is currently restricted to the US and Canada.

Verdict

The Roku 2 is yet another decent media streaming box from the market leader, and we like the new Roku Search and MyFeed features. However, these are available on the company's other devices and the slightly high price means you'll want to pay the extra for the better remote that comes with the Roku 3 or save money by getting the similar Streaming Stick. ☒ **Chris Martin**

PORTABLE HARD DRIVE

LaCie Rugged Thunderbolt and USB 3.0

£695 inc VAT

Contact
■ www.lacie.com/uk

Specifications
1TB portable solid-state flash drive; Samsung 850 PRO Serial ATA Revision 3.0 SSD; Thunderbolt connection with built-in 350 mm cable; USB 3.0 connection with separate 440mm cable; 142x90x26.4mm; 292g

Build:
Features:
Performance:
Value:

LaCie is famous for its eye-catching computer peripherals, taking ordinary products such as portable and desktop hard drives, and adding a style element you won't find elsewhere. In the case of its Rugged Thunderbolt portable drive (product code 9000602), LaCie and the product's designer Neil Poulton poured in a little lifeboat chic, to make a tough portable storage drive in emergency-services orange. The result is a drive that is not only harder to lose thanks to its beacon-like visuals, it should also shrug off more than a casual battering.

LaCie has now gently updated the original popular product, increasing the storage capacity available to the SSD version up to 1TB, and additionally hard-wiring in one of the connection cables.

The revised LaCie Rugged Thunderbolt is still based on the same basic form, comprising a 2.5in SATA drive in an aluminium case, that is then held within a thick rubber orange bumper case. This life jacket, combined with the shock-resistant solid-state storage technology inside, really deserves to be a very tough combination.

You can still choose between either of two high-speed data connections, either USB 3.0 or Thunderbolt, with a Thunderbolt cable now fixed to the drive, and with just enough cable length to wrap around the outside. The plug end rests neatly in a cut-out in the bumper case, and a concealed magnet gently holds the plug fast.

When unfurled, the cable is 35cm long, sufficient to easily reach the ports on even stand-mounted laptops. Also in the box is a 44cm detachable cable for USB 3.0.

In addition, LaCie now includes a removable rubber seal which fits over the docked Thunderbolt plug, and fills in the remaining aperture reserved for the USB 3.0 port. With the drive locked down with its rubber stopper in place, LaCie specifies the drive with ingress protection (IP) up to IP54, meaning simply it has limited protection against dust, and is protected against splash water from any direction.

Shock and pressure should also be mitigated, the specifications listing resistance to a drop up to 2m, and surviving being run over by a 1000kg car (you're extremely lucky if one of these rare beasts drives over your LaCie - modern cars are significantly heavier than this). Included software enables AES-256 encryption and data backup.

Performance

Inside the LaCie Rugged Thunderbolt is a very accomplished solid-state drive, the Samsung 850 PRO, currently one of the finest SATA Revision 3.0 SSDs available. This was the world's first SSD to promote a form of 3D NAND flash technology that Samsung calls V-NAND, which unusually builds flash memory up in layers. It is still using MLC flash memory, with better performance and reliability than the emerging TLC technology, and the increased process size of 40nm also bodes well for long-term longevity.

The Rugged drive is always bus-powered whether used in USB or Thunderbolt mode of operation. This does mean that perhaps contrary to expectation for the technology, it performs a little slower with the nominally faster Thunderbolt connection, since Thunderbolt is currently more easily compromised by under-power mobile operating conditions.

In our tests using the Thunderbolt connection, we saw sequential reads speeds peak at 390MB/s, with sequential writes reach up to 367MB/s. For small random I/O – a good way to gauge real-world speed when working with typical documents and system backup files – the average across data from 4- to 1024kB was 182MB/s for reads, and 215MB/s for random averaged writes.

Turning to USB 3.0, sequential reads reached 439MB/s and writes up to 390MB/s. Small file transfers were more closely aligned to Thunderbolt performance here, averaging 197MB/s random reads and 210MB/s random writes.

The raw SSD inside is capable of much higher speed again (exceeding 560MB/s sequential) but despite being somewhat reined in by both the USB 3.0 and Thunderbolt connections, this is still one very quick drive to carry as portable storage.

Of course, if you don't need this level of performance but do want a rugged portable drive, the same enclosure is also available in 1- and 2TB versions for around £130 and £175 respectively, with 5400rpm hard disks. We haven't tested them, so can't give specific performance figures but if you're not willing to shell out the thick end of £700, one of the pair could be a viable alternative.

Verdict

The LaCie Rugged has been updated so is now available with up to 1TB capacity of award-winning Samsung SSD technology inside. The built-in Thunderbolt cable means one less cable to lose or forget, while an additional rubber end cap will keep out some dust and light water splashes. It's a good, tough solution with plenty of capacity and speed but LaCie's own price of £719 will be too rich for most tastes. Especially when the drive inside itself can be found for half that price at time of review – making the remaining £360 an ambitious price for just the outer LaCie Rugged casework and cables. ☒ **Andrew Harrison**

NAS DRIVE

WD My Cloud DL2100 8TB

£580 inc VAT

Contact
■ wdc.com/en

Specifications
8TB NAS drive; 2-bay NAS enclosure; My Cloud OS 1.06.133; 2x WD Red 3.5in SATA HDD; 1.7GHz Intel Atom C2350 dual-core x86 processor; 1GB DDR3 RAM; 2x gigabit ethernet; 2x USB 3.0; 48W external power supply; 216x109x148mm; 3.5kg

Build: ★★★★☆
Features: ★★★★☆
Performance: ★★★★☆
Value: ★★★★☆

★★★★☆

Western Digital is best known as a manufacturer of hard disks, but is becoming recognised for its complete storage solutions and in particular network attached storage (NAS).

Two new series of NAS drives were launched this year, both bearing the established My Cloud name, adding two models to the Expert Series for home users; and a new Business Series for small enterprises. Following the two-bay EX2100 from the EX Series we now focus on its Business counterpart, the My Cloud DL2100.

The DL2100 shares an almost identical chassis with the EX2100, and viewed from most angles you can't tell them apart without reading the printed name.

They do differ in the type of processor. The EX series uses ARM Marvell chips, while the DL units have budget Atom processors from Intel. In the case of the DL2100, we have a 1.7GHz Intel Atom C2350, a dual-core based on a 22nm die. It includes 1GB memory, and unlike the EX2100 is upgradeable to 5GB.

Again we see the inclusion of two USB 3.0 ports – one front, one back and two ethernet ports that can be configured for bonding or failover. To help add confidence for businesses needing assured uptime, the DL2100 adds a second DC power input. There is one external 48W supply in the box, and you can buy another to plug into the second port. If one PSU should fail the other will keep the NAS up and running.

We tested an 8TB model with two WD Red 4TB disks preloaded. You can set the two disks as JBOD, linear volume, RAID 0 or 1. By default the unit is configured in RAID 1 with the disks mirrored to provide protection against a single disk failure. Using CrystalDiskMark in Windows, we saw sequential read speeds at 115MB/s and writes at 99MB/s, suggesting it's slightly faster in reads than the EX2100's 103MB/s, but slower at large sequential writes compared to the latter's 109MB/s.

With single threaded 4kB random reads, its 20MB/s doubled the 10MB/s we recorded from the EX2100, and its 6.4MB/s random writes also beat the 4.3MB/s of the cheaper ARM-powered NAS. At greater queue depths there was a reversal of fortunes, with 4kB random reads at least (QD=32), as the EX2100 hit an impressive 51MB/s against the DL2100's 17MB/s.

Tested in OS X over AFP, the Mac system default, we again saw derisory performance with small 4kB random writes, at just 0.07MB/s. Sequential reads hit 112MB/s but sequential writes averaged only 34MB/s using data 10MB its size.

Power consumption was comparable to its ARM brother at around 19W disks active, falling to 12W idle.

Verdict

The DL2100 is around £80 more than its EX2100 twin, but offers improved performance juggling multiple data transactions, and has a power failover option. Either unit is capable and can be recommended as among the best in two-bay NAS at the price. ☒ **Andrew Harrison**

COLOUR INKJET PRINTER

HP OfficeJet 3830

£60 inc VAT

Contact
■ hp.com/uk

Specifications
4-colour (CMYK) inkjet printer; print resolution, 1200x1200dpi (enhanced); scanner resolution, 1200dpi; fax resolution, 200dpi; Wi-Fi; USB 2.0, Apple AirPrint; 60-sheet input tray; 25-sheet output tray; 222x454x362mm; 5.76kg

Build:
Features:
Performance:
Value:

At first glance, HP's new OfficeJet 3830 looks like an absolute bargain of a printer. Costing £60, this compact multifunction device offers home users and small businesses a really affordable printer, scanner, copier and fax machine. It also includes a 35-page document feeder, built-in Wi-Fi, and even support for Apple's AirPrint so that you print from your iPad and iPhone.

The 60-sheet input tray and 25-sheet output tray are small, but should be adequate for a home office. There's no ethernet for wired networks, but that's only a minor omission, and the only potential deal-breaker is the reliance on manual duplex (two-sided) printing, which requires you to turn the pages over and reinsert them into the paper tray in order to print on both sides.

For those wanting to print from their phone, just download the HP All-in-One Printer Remote App (available for Android, iOS, Windows) or the HP ePrint app (also available for Amazon devices), and you can check the printer's status as well as scan and print remotely and wirelessly.

Performance is pretty good, too. HP doesn't quote speeds, but we got 11 pages per minute when printing text documents, which is pretty good going for a printer in this price range. Colour printing was slower, at just 4ppm for mixed text and graphics, while a 4x6in photo print took a full 60 seconds, but that's still fine for occasional colour work.

Text quality was good, but didn't have the crisp, smooth outlines provided by the best inkjet printers. HP only specifies a print resolution of "up to 1200x1200dpi rendered," which basically means that it's a low-res printer that uses some clever algorithms to try and enhance print quality. We'd say that the OfficeJet 3830 will be fine for printing routine letters and reports, but if you require top quality text output then it might be worth paying a little extra for an inkjet or laser printer that provides higher native resolution.

We couldn't fault the colour and photo output, though, which was excellent for a printer that only uses three coloured inks (cyan, magenta and yellow). But it's those ink cartridges that give the OfficeJet a sting in the tail. We took one look at the two tiny ink cartridges – one for black and a tri-colour cartridge containing the three colour inks – and immediately started to worry about the running costs.

The good news is that colour printing isn't too bad at all. Shop around online and you can buy a two-pack containing both standard-size cartridges for £22.98, while a two-pack with the high-yield XL cartridges cost £39.98. The standard-size colour cartridge will last for about 165 pages, which works out at a quite reasonable 7p per page, while the XL cartridges provides 330 pages and brings that down to a competitive 6p per page.

Unfortunately, the black ink cartridges don't provide such good value for money. The standard black ink cartridge lasts only for a modest 190 pages, which comes to a whopping 6p per page. The XL cartridge increases the yield to 480 pages, but that still works out at just over 4p per page, which is well above average for an inkjet printer.

There is another option, though. The OfficeJet 3830 is on HP's Instant Ink scheme, which charges a flat monthly fee for a fixed number of pages. There are a number of different options available for Instant Ink – starting at only £1.99 per month – but they still tend to favour colour printing, and leave mono printing looking relatively expensive.

That shouldn't be an issue for most people, and the flip side is that it's no more expensive to print a photo than a single page of black text. You can enrol in the scheme when you buy the printer, but you don't start paying until you receive your first Instant Ink cartridge. There's no contract, either, so you're not tied into any kind of subscription – you can stop paying whenever you like.

Cartridges are identical to those you'd buy off the shelf - not a lower-quality version. You'll also get a pre-paid envelope to return your empty cartridges. For many people this fixed cost is a nice way to budget for your printing: you can print 600 'pages' per year for £24.

Verdict

The initial purchase price of the OfficeJet 3830 is obviously very attractive, and will appeal to many home users and smaller offices. Its running costs are also good when printing in colour, so it will be a good option for printing photos, or reports and presentations that contain colour graphics. However, simple mono printing is more expensive, and the OfficeJet 3830 could prove expensive to run if you print a lot of simple text documents. If you don't need to print all that much, though, this is a great-value all-in-one printer ☒ **Cliff Joseph**

COLOUR INKJET PRINTER

HP OfficeJet 7510

£129 inc VAT

Contact
■ hp.com/uk

Specifications
4-colour (CMYK) inkjet printer; print resolution, 600x1200dpi; scanner resolution, 1200dpi; fax resolution, 200dpi; Wi-Fi; USB, ethernet; Apple AirPrint; 250-sheet input tray; 75-sheet output tray; 613x725x287mm; 13kg

Build: ★★★☆☆
Features: ★★★★☆
Performance: ★★★☆☆
Value: ★★★★★

★★★★☆

Most A3 printers are expensive devices aimed at designers and photographers who need to produce colour proofs of their work. However, HP describes its OfficeJet 7510 as a 'personal print shop' that is affordable enough even for home users and small businesses who need to produce A3 posters, brochures and other marketing materials.

It's certainly good value for money, costing just £129, for a multi-function device that includes 600x1200dpi printer, scanner and copier, and fax machine. There's a 35-sheet document feeder, ethernet, USB and Wi-Fi connectivity, and support for Apple's AirPrint for iOS devices. The only real omission is lack of full duplex (two-sided) printing – although there is a manual duplex option if you don't mind standing by the printer and turning the pages over by hand.

The 250-sheet input tray should be large enough for most small businesses, and can be adjusted for sizes from 4x6in postcards up to full A3. However, there's only one input tray, which means that you'll probably use the OfficeJet 7510 as a conventional A4 printer most of the time and just switch to A3 paper every now and then.

Inevitably, an A3 printer such as this is going to be bulky. HP has reduced the size of the OfficeJet 7510 as much as possible by having the paper input tray project out from the front of the printer by several inches – rather than being housed entirely inside the main body of the printer – but you'll still need a pretty big and sturdy desk to support it.

Our only other concern about the design of the OfficeJet 7510 was that the print-head mechanism where you insert the ink cartridges felt rather flimsy, and the large metal springs in the print-head look like an accident waiting to happen.

Performance when printing A4 documents is respectable for a printer in this price range, at 12.5 pages per minute for mono text and 7.5ppm for text and colour graphics. Text quality was very good – not quite up to laser-printer standards, but more than adequate for most routine printing tasks.

The OfficeJet 7510 did slow down a bit when stepping up to A3 format, taking 30 seconds to print a poster containing text and colour graphics, but that's still fine if you're just using A3 printing every now and then. Photo output was also a little sluggish, at 50 seconds for a single 4x6in print on glossy paper, but the quality was extremely good, and the use of separate cartridges for the cyan, magenta, yellow and black inks ensures that you only need to replace individual inks as they run out.

We were also pleasantly surprised by the cost of the replacement ink cartridges. HP only sells a single size of cartridge for the OfficeJet 7510, but the black cartridge costs £17 and lasts for about 1000 A4 pages, which works out at a very competitive 1.7p per page. The colour cartridges cost £9 each – or £27 for all three – and last for 825 pages. That comes to just 3.3p per page for A4 colour printing, and gives the OfficeJet 7510 some of the most competitive running costs we've seen for quite a while.

Verdict

Many low-cost printers end up saddling you with high running costs because of the high price of replacement ink cartridges, but that isn't the case with the OfficeJet 7510. It's not the fastest printer around – and designers who need to meet tight deadlines may prefer a faster, more specialized A3 printer – but its high quality, low running costs and versatile A3 printing option make it a great choice for any small business that needs to produce occasional A3 posters and brochures. ☒ **Cliff Joseph**

COLOUR INKJET PRINTER

Canon Pixma MG7550

£130 inc VAT

Contact
■ canon.co.uk

Specifications
Print resolution, up to 9600x2400dpi; print technology, 6 individual ink tanks (PGBK, BK, C, M, Y, GY); borderless printing, A4, letter, 20x25cm, 13x18cm, 10x15cm; two-sided printing, auto duplex print (A4, A5, B5, letter); scanner resolution, 2400x4800dpi; colour, 48- to 24-bit; greyscale, 16- to 8-bit; maximum document size, 216x297mm; device size, 435x370x148mm; 7.9kg

Build:
Features:
Performance:
Value:

The Canon Pixma MG7550 is a great all-in-one photo printer/scanner/copier that can also print direct to disc (CD, DVD, Blu-ray). It's available in white, what Canon calls Burnt Orange (see below), as well as the usual printer black.

While being available in white as well as black might not mean much when choosing the best multifunction inkjet printer, the option is a welcome one. Plus, it's a good-looking device that isn't as bulky as many of its rivals.

The added disc-printing functionality is a bonus for printers, if you regularly make CDs or DVDs for work or pleasure. Printers that print on DVDs, CDs and Blu-ray discs are hard to come by, and Canon leads the field from a consumer printer point of view.

Performance

Let's get right to the point. The MG7550 produces great photo prints, although its six inks can make it a little more expensive than some other inkjets. We think you'll be happy with the results, though.

The colours are rich, and with a lack of graininess you can really see the sharp details. Tones and shading are well rendered, too. Some have found (or rather not found) a lack of detail in darker shadows, but this is not uncommon.

Print speeds don't match Canon's claimed 15 pages per minute (ppm) for mono and 10ppm for colour, though the reality is still respectable. It takes 20 seconds to turn on and print the first page, 16 seconds from standby, and just nine seconds when already up and running. Black text prints at 14.3ppm and an A4 photo takes less than two minutes to print.

Print costs aren't the cheapest, but if you buy the high-yield XL-sized ink cartridges you'll save money. The MG7550 comes with standard-sized ink cartridges as standard. Note that turning on and off the printer for multiple jobs will cost you money as the printer (like many) cleans its print heads when you do so.

The MG7550 uses six inks to achieve such results: C, M, Y, BK, PGBK (pigment black) and GY (grey). The black and grey inks allow clear contrasts, with deep and detailed blacks. You need change only the ink cartridge colour that runs out rather than them all, which should save money, though the printer won't print any pages if one of the cartridges is empty – even if that colour is not required for the job.

When it came to scanning, we were impressed by the speed and quality for both text and photos. The same was true when it came to photocopying documents.

Design

With its sloped, rounded edges and glossy case the Pixma MG7550 is a great-looking printer – and we love the white and orange options. Online we found the orange model to be more expensive, but it looks wonderful. Our home environment favoured the white edition, and it's excellent to have a choice of colour for a multifunction printer. On the front of the Canon is a large touch control, so you can quickly navigate the menus and preview images.

There are two paper trays (so can simultaneously handle photo- and plain paper): one holds 125 sheets of plain paper, while the other 20 photo blanks up to 13x18cm. A slot above takes a CD/DVD carrier, which is stored in a clip under the photo tray. Double-sided (duplex) printing is supported as standard.

The MG7550 has USB and ethernet (10/100) for wired connectivity to a home network, plus Wi-Fi (802.11 b/g/n). It's compatible with Apple AirPrint and Google CloudPrint, and has its own Pixma Cloud Link that allows you to print photos from Facebook, Twitter and online photo albums, and print/scan documents to cloud services such as Google Drive, OneDrive and Dropbox.

On the front panel, inside the front cover, are twin SD and Memory Stick slots.

The MG7550 also has Near Field Communications (NFC), so you can print from compatible phones by holding the handset up to the printer. It can also be used to print from wireless cameras.

By using Canon's Pixma Printing Solutions app for your smartphone or tablet, you can access cloud services, and check printer status, the manual or real-time ink levels over Wi-Fi.

Verdict

We're big fans of the Canon Pixma MG7550 and recommend it for photo enthusiasts and people who sometimes need to print direct to disc. In fact, it's a great general-purpose multifunction printer that produces great photo prints, can print direct to CD/DVD and other printable discs, and also offers duplex (double-sided) printing, and a raft of wireless and cloud-based services. It is good looking, not overly bulky, and is available in both black and white, and a curious Burnt Orange. ☒ **Simon Jary**

Indulge us. It's a milestone for a computer magazine to reach 20 years and still be going strong. The years are littered with one-time *PC Advisor* rivals who are no longer around.

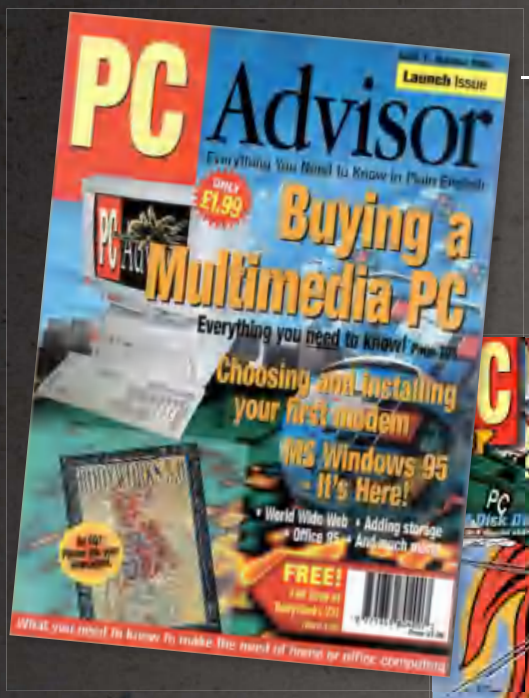
Taking stock of what *PC Advisor* has become, and where it has come from, we've had great fun looking over all 20 years, laughing at some of the predictions we made, designs we used and headlines utilised to entice readers.

Check out the different styles of covers, the way the subjects covered changes and expands, and the way in which some messages remain constant. What we want from personal computing doesn't really change, even as the medium of delivery grows ever more sophisticated.

Technology has come a long way in the 20 years we've been on the newsstand, and *PC Advisor* has come a long way with it. Far from the Windows-only book it once was, the magazine now reflects the increasingly divergent way we all interact with personal-computing devices, from smartphones and tablets to desktops and laptops.

In that time we've morphed from being a magazine only in print, to a publication with the UK's most popular technology magazine website (pcadvisor.co.uk), Europe's most popular online technology forums (pcadvisor.co.uk/forums), our own digital magazines (tinyurl.com/6su6sdy), Facebook (facebook.com/pcadvisor) and Twitter (twitter.com/pcadvisor) publications, and mobile sites on Android and iOS.

There have never been more ways of enjoying *PC Advisor,* so join us as we flick through some of our favourite issues.



Issue 1: October 1995

Not that it's dated, but 'MS Windows 95 – It's here!' is a lead headline, and we explain how to choose your first modem. Another headline is simply: 'World Wide Web'. That's right, we explained the internet. All of it.

1995 1996 1997 1998

Issue 100: December 2003

There's 100 reviews, £100 gadgets and 100 questions answered. As if these days we'd be so unsophisticated. We love the bonus of two software CDs. Or, as we call it now, just over a third of a DVD.

1999 2000 2001 2002 2003

Issue 101: January 2004

Over the next 100 issues *PC Advisor* became less a Windows PC magazine, and more a personal-computing tome. Look for brands such as Google, eBay, YouTube and the iPad, reflecting the divergent world of tech.

2004 2005 2006 2007 2008

Issue 200: March 2012

We celebrated our 200th issue by producing our biggest ever guide to Windows, with 200 tips. We also revealed what we'd buy if we had £200 to blow. Back then spending a couple of hundred quid on a set-top box didn't seem excessive – remember this was before the digital switchover and many people had just five channels to watch. How did we survive?

2009 2010 2011 2012

Issue 210: January 2013

Grabbing the headlines in this issue was Windows 8, the first operating system designed to be used on both desktop and mobile devices. It'll never take off.

2013 2014

Issue 243: October 2015

A completely different beast to the magazine launched all that time ago, but covering more subjects, across print, online, mobile, social media and digital magazines. It's been a blast making 20 years of *PC Advisor*, and here's to the next 20. ☒

2015

features

PC Advisor features

The World Wide Web: *a license to cruise*

Sure, the Internet is great. At least, it sounds cool in all those newspaper stories. But unless you know your Telnets from your FTPs, it's been as friendly an environment to normal humans as Pluto.

Until now, that is. The World Wide Web brings the SuperHypeway back to Earth. Rather than typing in alien computer lingo, the Web allows you to connect to machines around the world with a point and click, download reams of information, or just waste time taking part in the fastest-growing and farthest-reaching (as well as the biggest hyped) computer phenomenon since Windows itself.

The Web is like giving that little space-rodent on your desk a pilot's license. By clicking on the links of each Web page (or site), you can navigate the Internet with the same hypertext system familiar to many as the way Windows helps files work but, instead of merely calling up data from your hard drive, you're cruising the 'Net. The possible destinations on your first time out number in the tens of thousands worldwide.

The Web allows you to connect to machines around the world with a point and click and download reams of information.

Many home computer users don't have full access to the Web yet, but it's coming. The major commercial online services all have or plan to have some type of Web connection in the near future, and local and national Internet access providers are making it easier and cheaper than it once was to wire yourself.

PC Advisor *features*

Web Weaving

The first graphical Web **browser**, a program that lets users page through the Web, was Mosaic, released in early 1993 by a group at the University of Illinois. Mosaic turned the then text-only Web into an exciting missing link that promised to finally connect the Internet to point-and-click environments like Windows.

With browsers like Mosaic, users could jump from point to point in cyberspace by clicking on words or icons (called hyperlinks) in Web pages. These pages, set up at sites around the world, multiplied rapidly as computer users and businesses realized the potential of the emerging medium. Since then, popular new browsers such as Netscape have been developed to make the Web interface more attractive.

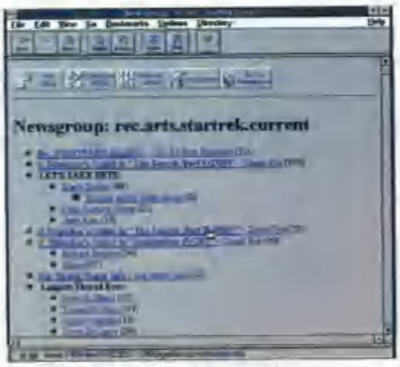
Larry Jackson, technical manager for NCSA Mosaic, says the total amount of data transported through the Web increased by a factor of 10,000 within six months after the introduction of Mosaic. Today, some estimates put the number of Web servers as doubling every 54 days.

The Web attracts users like bees to honey (or mice to cheese) because it is even easier to use than it looks. Each Web page usually focuses on a certain subject. Some words and pictures on the page are just what they seem to be, while others are displayed in a different colour from the rest of the page, telling us that more lies under the surface.

By clicking on a hyperlink, you tell your browser to move to a different Web page or download a file. A television show page might have a list of character names: by clicking on a name, you move to a page or download a document just about that character, perhaps a picture of that character or some sound bites from the latest episode.

You'll need a modem to connect you up to the Internet. Get one that is as fast as possible.

In this way, the Web works like a huge encyclopedia filled with thousands of topics and authored by computer users around the world. Each page has cross-reference links to other pages. In one Web session, you might try to track down all you can about a certain topic, or you may hop from subject to subject at whim.



Web browser newsreaders aren't sophisticated, but they get the job done.

Web Wandering

Like an encyclopedia, there is no Page 1 where everyone is supposed to start reading - where you open the Web is up to you. Unlike an encyclopedia, the Web is not lined up in a neat row with all its offerings alphabetized. However, there are a few indices for guidance: while no Web index could be complete, they are good places to start.

For example, one of the most widely used indices is called the Yahoo list. Yahoo divides known Web links into a list of categories such as Art, Entertainment, and Science. At the time this article was written the list contained pathways to more than 31,000 pages on subjects as diverse as UFOs and flowers.

Like an encyclopedia, there is no Page 1 where everyone is supposed to start reading - where you open the Web is up to you.

As with any Web location, getting to Yahoo is easy if you know the address. Web browser programs all work a little differently, but look for a button or menu item that will open a new **URL**, or **uniform resource locator**; in plain English, a URL is an address. Both Netscape and Mosaic, the two most popular browsers, have Open buttons near the top of the application window.

To visit Yahoo, type the address http://akebono.staford.edu/Yahoo.html Web addresses look something like E-mail addresses, except they usually start with 'http' (for **hypertext transfer protocol**) and a double slash. The browser takes up this address and looks up the website's host computer. After connection, the web page information is downloaded to your browser and, in the case of Yahoo, you see a list of categories that lead to other lists.

With tens of thousands of sites linked together in seemingly random ways, it is easy to get lost on the Web. Many Web wanderers consider this part of the fun but, if you get hopelessly stuck in a huge tangle of bad links, you can always go home. Instead of clicking your ruby red heels, click on the Home button found on most Web browsers. You will be transported to a predefined home page, which by default is usually set up by whoever produced your browser. Like the tallest tree in the forest, Home allows the weary webber to take a breather and regroup.

One of the best things about Web browsers is that they can be used for different Internet tools. The same Web page might have standard hyperlinks to other websites, **File Transfer Protocol (FTP)** links to download files, E-mail links to send off messages to a particular address, links to gophers, Telnet links, and Usenet links to Internet discussion groups. In addition, Web browsers can tell you what sort of files you're downloading and launch the proper application for viewing, reading, or hearing them. (File-transfer protocol is a standardized, text-based method of transferring files between computers over telephone lines. **Gophers** are menu-driven, search-and-retrieval tools providing access to databases, text-files, and other Internet resources. **Telnet** is a

features

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method of obtaining information by logging into another computer remotely and controlling it as if it were your own.)

As more people use the Web and the software market becomes more lucrative, browsers will become more sophisticated. Today's browsers can't receive E-mail, for instance, and the built-in newsgroup readers are passable but lack the advanced functions found in older Unix versions. The Web's many graphics crawl into older, slower modems, although you can turn off most of the images for high-speed performance. All these areas will probably attract more attention from programmers as Web browsers move closer to being true, all-in-one Internet packages.

With tens of thousands of sites linked together in seemingly random ways, it is easy to get lost on the Web.

The possibilities offered by the Web are as endless as the numbers of people signing on. Libraries of information aren't the only links out there: a few Webbers with soldering irons and maybe a little too much time on their hands have dreamed up ways to connect machines to their websites. At personal homepages, sites set up by ordinary people experimenting with the web, you can read resumés, check out someone's favourite links, or just see what everybody is up to.

Getting the Web

Web pages are independent of the system they're browsed on and the World Wide Web is an example of the **client-server** system, where the storage or information is separated from how it is displayed. Most Web servers are Unix machines, but you can use DOS, Windows or OS/2 to access the same information.

The Web has been *the* marketing idea to open up the Internet, and UK companies such as Demon and Cityscape have been quick to promote its services to users. Compuserve has also announced plans to enable its members to connect directly through an optional **Point-to-Point Protocol (PPP)** connection, which lets users dial into the Web through a modem and use browsers like Mosaic and Netscape.

Besides commercial online services, a few national companies offer direct access to the Internet through local numbers in larger cities. Because they usually feature PPP connections, the software for direct-access providers can be a little tricky for the novice user to set up, but help is available from the company or the piles of Internet books on bookstore shelves.

Another option for urban dwellers are small, local Internet access providers. The prices such companies charge to connect you to the Internet vary widely, but for those who use online services frequently, it can often work out to be cheaper, especially if they charge a flat rate for unlimited connect time. Web wandering through endless menus and documents can quickly eat up the limited amount of 'free' time larger companies offer.

The possibilities offered by the Web are as endless as the numbers of people signing on.

World Shopping

As full of variety as today's Web is, some of the more exciting aspects of the Web are the burgeoning commercial uses businesses are finding for it. In the near future - within about two years - the Web will be used for two main types of transactions at least.

The first transaction will work a lot like mail-order catalogues: anything you can order with a credit card you will soon be able to order off the Web. Encryption programs now being tested will let you safely send your credit card numbers through Web forms, secure in the knowledge that your account won't be used by thieves at Internet sites along the way. A few more of these secure sites already exist, and the more recent browsers work with them to encrypt information automatically.

The second type of transaction will use smaller amounts of money from a kind of computerized 'wallet' to buy intellectual property, such as documents or excerpts from articles or books. A wallet would be a debit account set up through your bank by calling and asking its computer to transfer a specified amount to your computer wallet.

Credit cards won't work for the small amounts involved in browsing each page because of the overhead involved in credit card purchases. Publishers will be able to offer paperless documents and still make their profit through these type of wallet systems, which are currently in the testing stage.

The ability to buy and sell over the Web will lead to a new kind of global market where any small company can afford to have a world-wide presence. As long as a business is located in an area covered by some type of mail or package-delivery system, it will be able to accept orders from computers in any corner of consumerdom and send out products.

Besides the wide distribution, Web catalogues also have other advantages over paper catalogues. They can be

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much larger than their dead-tree counterparts without a comparable increase in cost. Without printing and mailing delays, Web catalogues would be instantly updateable and include multimedia presentations.

The only problem in this scheme is the difficulty in making a new Web page known to potential customers. Comprehensive Web 'yellow pages' don't exist, although there are ways to search the Web at places like Yahoo. If you wanted to buy a toaster, for example, you could type 'toaster' into one of these search engines and find some toaster stores. Perhaps you'd find someone out there who collected toasters and set up a list of their own pointing to every toaster seller in the Western hemisphere.

With these kind of practical uses, the Web offers much potential for the future. Novice computer users are more curious than ever about the Internet, and the Web is a painless way to roam the catacombs of cyberspace. If you never learned what a Telnet or FTP was, it doesn't matter much anymore - Web users and developers are rewriting the book, and this time it has plenty of pictures and sound to open up a world of information.

Popular Web Sites

Popular magazines and newspapers love to mention hip and happening Websites. With so many destinations being dreamed up all the time, the Web is full of both gems and timewasters. Everyone has their own hotlist of great sites, but this sample should provide a peek at what types of information are out there in the tangled computerized yonder.

• The WWW changes each day. One place to keep up with interesting sites is Yahoo's What's Cool list (http://www.yahoo.com/Entertainment/COOL_Links). Updated periodically, this page is a useful cool link in itself and includes a What's Popular page.

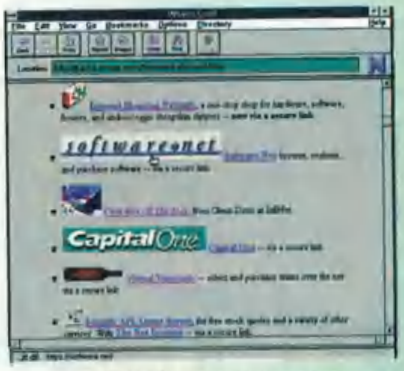
• *Time* magazine (http://www.timeinc.com) and a few other publications have set up Websites on an experimental basis. Eventually you will probably have to pay to receive information like this.

• Nearer home, Cyberia (http://www.easynet.co.uk/pages/cafe/cafe.htm) is the UK's first Cybercafé and provides links to fun sites all over the world - galleries, databases, games, museums and all sorts of weird science. Set in the West End of London, this is an easy way to access the Web if you live or work in London and, if you don't, soon a Cybercafé could open near you.

• The Library of Congress (http://lcweb.loc.gov./homepage/lchp.html) offers links to loads of interesting information, though our own British Library (Gopher: gopher.bl.uk) is less exciting than it could be. If officialdom is your thing, try CCTA Government Information (http://www.open.gov.uk/) or Her Majesty's Treasury (http://www.hm-treasury.gov.uk). Further afield, you could connect to the US Federal Government Servers (http://www.fie.com/www/us_gov.htm) or say hello to the Japanese Prime Minister (http://ww.kantei.go.jp).

• The Space Telescope Science Institute offers a look through the Hubble Space Telescope archives (http://www.stsci.edu/).

• To look toward the Earth rather than away from it, try up-to-date weathermaps (http://www.cs.ucl.ac.uk/misc/weather/weather.html), or spy in on declassified satellite photos (http://edcwww.cr.usgs.gov/dclass/dclass.html).



From each page you can access hundreds of other sites.

•If you want to shop or conduct business via the Net, there are a range of services from finding your nearest Sainsbury store (http://www.j-sainsbury.co.uk/) to locating the goods you need on the Internet Business directory (http://ibd.ar.com/).

• You can find out almost any movie-related fact by using Cardiff's Movie Database Browser (http://www.msstate.edu/Movies/). This is a large database that Internet users add to themselves - an example of how users can compile useful information.

• On the other hand, an index of what is billed as the 'Worst of the Web' (http://turnpike.net/metro/mirsky/Worst.html) shows you how users can compile data that is less-than-useful. PCAdvisor

PC ADVISOR 20 YEARS 1995 – 2015

FROM ISSUE 1

It's in the E-mail

Checking your mail no longer means just running out to the mailbox to see if you got a letter from Grandmother or a bill from the record club. Mail has been electrified by the advent of computers.

It's a phenomenon that's catching on around the world. People are communicating via their computers anytime, anywhere, and they're doing it now more than ever.

Why is e-mail all the rage? It brings us a step closer to a paperless office where we store memos, documents, and letters electronically. It lets us send our boss an update on a report or keep in touch with far away family and friends for the cost of a local telephone call. It puts at our fingertips the ability to communicate with people and obtain information on the other side of the world.

Let's explore the attraction of electronic mail and how you can get onboard.

What is e-mail?

Simply put, e-mail is a kind of correspondence you can directly send and receive on your computer.

E-mail can be a quick little note. You might use it to say, 'We received your message; thanks for your timely response.' Or, it can be a lengthy letter to your significant other, pledging your undying love.

Think of it as a computerized version of the mail you send and receive through the post, otherwise known as snail mail to Internet fans. When you send e-mail, however, there's no need for envelopes, stamps, or the Postal Service altogether. With the click of the Send button, you can dispatch a message to one or more recipients in an instant. The message reaches its destination in a matter of minutes, rather than days, and remains safely in the recipient's mailbox until the message is read.

Just as you tuck little extras in an envelope, you can affix all sorts of extras to your e-mail. Perhaps you want to send an important spreadsheet to a co-

worker, or your child wants to send a picture he or she drew on the computer to Grandmother. Just attach the spreadsheet or image file to the e-mail message and send it.

That little extra doesn't have to be a text or image file. You can scan photographs into the computer and attach the electronic versions to your letter, allowing you to send the great snapshot you took on your last fishing trip to an old friend. You can even attach a sound file to a note, so that you can wish your mom or dad a happy birthday, singing with a voice only your parents can love.

Sending e-mail has become simpler and more efficient over the years. The above example is from Datastorm's ProComm Plus.

Your Online Service

Electronic messaging can be used by just about anyone, anywhere, but first you need the right hardware and software combination.

If you want to send messages to other computer users around the world, you need access to some kind of online service, such as Compuserve, Tel-Me, Demon or the Internet. An online service is a dial-up service that lets users access informational databases and communications features so they can research topics and communicate with others. The Internet is the mother of all online services, loosely connecting government, business, education, and ordinary people who have access to the system. Or, you can 'post' messages on an electronic bulletin board system (BBS) where other BBS users can read your messages and respond. In addition, there are specialty services, specifically set up to manage electronic mail.

To use these telecommunications services, all you need is a modem, which lets your computer communicate with other PCs over telephone lines, and the appropriate software. Online services and some specialty e-mail services supply their own software interfaces you install on your computer. To access the Internet, you can obtain a shell account from an Internet access provider, or you can pay a premium for a direct Internet connection. If you work for the government or are a student at a university, you might get this access for free. Otherwise, most online services now allow access to Internet sites and e-mail via the Internet.

'Online' e-mail isn't the only form of electronic mail. If you are computing at work, you may also be able to send e-mail through an interoffice electronic mail system. Microsoft Mail and Lotus's cc:Mail are some of the most popular office e-mail systems. Here you can send messages, memos, documents, and files to co-workers, managers, etc., without ever leaving your desk. And if the office system has a 'gateway' to the Internet, you can even send messages from your workstation to someone halfway around the world.

'Online' e-mail isn't the only form of electronic mail. If you are computing at work, you may also be able to send e-mail through an interoffice electronic mail system.

Pieces and Ports

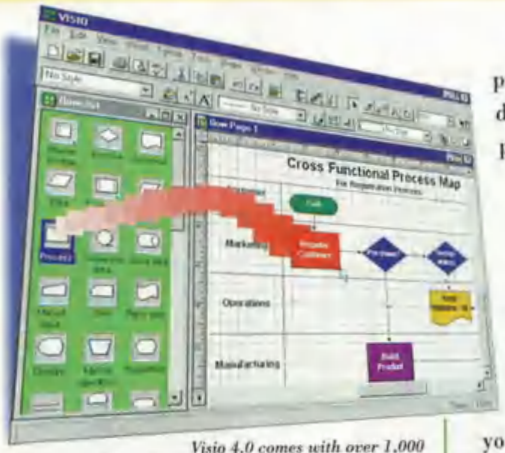
Although e-mail seems to be in a world of its own, it retains much of the lingo we all have come to know and love.

Take, for example, when you receive an e-mail message. Just like at your home or office, e-mail arrives in an inbox, or mailbox. Almost all e-mail services signal you when you receive mail. Some put a little envelope in a mail slot, some raise the flag on an on-screen mailbox, and some produce an audible message when you start the program. When you open your inbox, the sender's name or identification number appears, along with a subject line to let you know what the message is about.

There will be numerous occasions on which you'll need to keep e-mail on hand for future reference, but you don't want to print and store it. The majority of online services and office e-mail systems let you create folders in which you can save e-mail. These folders are reminiscent of the manila folders you probably use at home or in the office to hold documents. Instead of paper reports and letters, you could use the electronic folders to store corporate e-mail, e-mail about a specific project, or e-mail from a family member.

When you're through reading your messages, some services include wastebaskets or deleted mailbox folders that 'trash' your mail when you've finished with it. If you accidentally delete a message that you later need, you may be able to retrieve it.

You'll find familiar terminology when you send messages, as well. After you compose messages, they either are sent immediately or copied and stored in an



Visio 4.0 comes with over 1,000 pre-drawn SmartShapes on 29 task-specific stencils. To create diagrams, just drag SmartShapes onto the drawing page, connect, add text and voilà. You're done.

When it comes to clarifying and managing your organisation's processes and information, nothing does the job like clear, concise diagrams. Problem is, creating them can take more time and patience than you have to spare. Until now.

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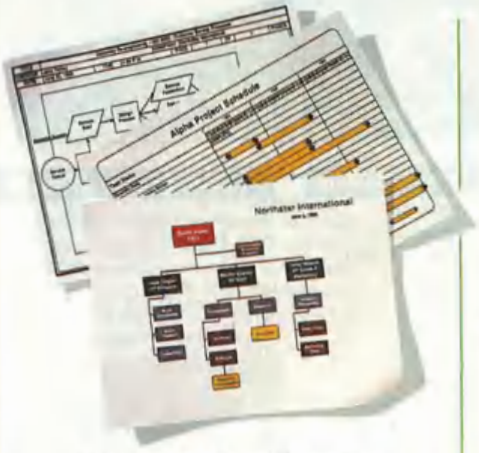

Visio wizards do the work for you. Your organisational charts and timelines are automatically generated from the data you provide. And the Page Layout Wizard gives you a head start on all your diagrams.

Visio supports the new Microsoft Office Binder, offers a user interface option for the three most popular suites, and supports Lotus Notes/FX. It's no wonder large organisations are standardising on it.

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Reader Response 11

outbox until you are ready to send them. Some online services let you compose messages while you are not connected to the service and then store them in your outbox until you can go online and send them. This is a handy feature that saves you online time and charges.

Another handy feature is the address book. Most e-mail systems let you keep a running tally of all your contacts and their e-mail and snail mail addresses, as well as other applicable information about who they are or how to contact them. It's the little black book of the computer age.

If you are dying to know whether the recipient has read your message and when they read it, you can add a receipt to your message. Select this option, and when the recipient gets his or her message, you will be sent a receipt e-mail address containing the time the message was read. If your service doesn't offer the Receipt option, perhaps it offers an alternative, which may allow you to do such things as read your message again and check when it was opened by the addressee.

If your message is extremely important, many services and office e-mail systems let you assign e-mail a priority signal. Some may use an exclamation mark, a flaming envelope or a numbering scheme. It's a good way to get vital messages noticed immediately.

Getting It Going

Although sending an electronic message seems relatively simple from the user's end - click a button and it's whisked off to a destination - it goes through a fairly complicated process of routing standards to get where it's going. Acronyms like X.400 and TCP/IP help transport your digital message from one site to the next, keeping all your data intact.

Fortunately, you don't need to worry about all that. Your biggest concern is to make sure your message is properly addressed, especially on the Internet. If you incorrectly address an Internet message, it simply floats out to Never Neverland.

Every type of service has its own way of formulating addresses. Office e-mail systems may use the employee's name, or first initial and last name. The Internet has its own complicated address system made up of specially coded domains, periods, and the @ (at) signs that indicate who the message is addressed to and where the addressee is located. For instance, an Internet address might read:

williams@physics.ucla.edu.

Whenever you send a message from one on-line service to another, or (if your office has an online gateway) from your office network to an online service ser, you are using the Internet mail system. You only need to know the user's identification or screen name and their 'zip code,' so to speak. If you aren't sure of someone's exact ID, most online services and office networks have a sort of member directory through which you can search. Some even let you search for aspects other than a person's name, including their hometown, hobbies or age. While you are searching, you may run across a long-lost relative or an old school friend. On the Internet, however, you're on your own, so make sure you get the proper address the first time - there are no receipts with this service.

The Sky's the Limit

What are you going to do with an e-mail account once you have it? You'd be surprised at the things you can send via e-mail.

Businesses thrive on e-mail. Consider the options of communicating with co-workers or managers through a short electronic message, without ever leaving your desk. If you want to send them a report or file you've been working on, just attach it to the message. Send a message to a business contact or customer in another time zone. The message won't get lost in a pile of memos but will remain safely in an inbox until the recipient has time to read it.

Office e-mail, however, doesn't have to be all work. You could send paperless birthday cards, adding clip art and sound files to the message. This is then forwarded around the office so it can be signed and noted by each employee before it reaches the recipient.

E-mail can bolster the home business person. e-mail can be used to take customer's orders, or help find a job. Some users are finding that it that it's an easy way to send copies of their CV to firms throughout the country. E-mail also can be a useful tool to help with all kinds of odd jobs.

Some users employ e-mail as a means to advertise their products, services, or opinions. However, the idea of inboxes or bulletin boards littered with junk mail is getting a negative reception. Businesses who dump advertisments in random mailboxes will most likely find themselves 'flamed' to a crisp with negative e-mail.

You don't have to be a real socialite to reap the benefits of e-mail. It doesn't require the pleasantries of phone conversation, asking about the wife, kids, and weather before you get to the crux of a discussion. However, if you

E-mail messages pass through a series of routers that continually directs them to their intended destinations. Routers simply direct the course of the electronic signals so that they can travel most efficiently from one location to the other. An e-mail message may run through any number of routers on its journey.

thrive on the pleasantries, you also can get your fill.

Average consumers are finding that e-mail can help them keep in touch with family and friends. In addition, a quick e-mail sometimes can create a life-long friend. E-mail has also turned out to be an electronic matchmaker, whereby a number of couples have gotten married after corresponding through e-mail - without previously meeting face to face.

Communicating Down the Line

It's doubtful that advertising and match making were what researchers had in mind when working on a 1969 defence project that started the whole project in America. They were simply testing a computer network, which we know today as the Internet, that could continue to function and let people communicate in the event of a nuclear war. They discovered that an online network had great potential as a communication tool.

When you're right, you're right. Today, just one online company can send 1.5 million messages a day, compared to less than half that number a year ago. The numbers continue to grow rapidly.

The world of communications is heading towards e-mail. If you're in tune with what's going on with technology and government, you've probably heard about plans for a National Information Infrastructure in America and similar (but more low key affairs) in this country: we're still several years behind the states, and our own infrastructure is being built up piecemeal. The hope is that eventually we'll be able to send e-mail to doctors, researchers, professors, businesses, government officials, and other citizens around the world. In fact, with the high-capacity wiring being laid in pavements around the country at the moment, we will be able to do more than just send text messages. We may be able to communicate online through audio, graphics, and video.

Does this mean the postal system will go the way of earlier means of delivery by horse and mail carriage? Not likely.

> If your message is extremely important, many services an office e-mail systems let you assign e-mail a priority signal.

For the foreseeable future, people will still want to send hard copies of anything that is important, anything that has legal ramifications. For instance, people still want physically to sign a piece of pater or receive official papers through snail mail. People aren't as trusting unless they have something tangible in their hands.

E-mail has replaced much of the casual writing that people are doing, including communicating with family and friends. In fact, it probably generates more communication than snail mail and telephone calls. Maybe you will run across a friend online you haven't talked to for years, or perhaps you'd be more willing to contact someone you wouldn't have previously because you can get right to the point in e-mail without all the small talk.

But it's inaccurate to say that e-mail is the end of snail mail. There are things you simply can't send in digital form. Sure, you can scan images and record sounds, but you can't digitize a birthday present or Christmas plum pudding.

The changes we've seen

A lot has changed in the world of technology during the 20 years that *PC Advisor* has been in existence. Matt Egan takes a look at some of the more significant developments, and what they mean

The world in 1995 was a very different place, in ways both significant and banal. Most people didn't have a robust internet connection, and no-one had heard of Mark Zuckerberg or Facebook (not so surprising, given that he was 11 at the time *PC Advisor* made its bow). Google, eBay, YouTube and Twitter were all well in the future, Microsoft was on a roll and Apple looked to be on its way down the plug hole.

How things have changed. The connected world of digital music, movies and photos that we enjoy now would have been inconceivable. Mobile computing was so far in the future that even laptops were the exception rather than the norm.

All these developments have changed not only our technological horizons, but also the way we live our lives and view the world at large. Some make our existences better but, in other areas, such progress has come at a cost. We've selected what we think are 10 of the most significant changes we've seen, and analysed their impact.

THEN: TELEVISION

Look around the majority of households in 1995 and you'd find that the TV was the undisputed king of the home-entertainment world. A big fat CRT that dominated the front room. And in 1995, in most cases that meant only analogue TV – in those days a four-channel affair, as the world was as yet mercifully unaware of the hilarious ironic in-joke that would grow up to be Channel 5.

The birth of the Premier League in 1992 massively ramped up the number of subscribers that Sky had, but it wasn't until 1998 and the launch of the Astra satellite that modern digital TV became available. Cable TV, initially from NTL and Telewest and later from the unified Virgin Media, was a localised niche product until 1996, and free-to-air digital TV was a pipe dream (or a non-pipe dream, depending on your method of receiving it). As for streaming TV from the web – what web?

In those houses that had a PC, the old beige box was unlikely to be found anywhere more prominent than the spare bedroom. A word processing, printing and occasional gaming device, functional, hidden and unloved by all but geeks.

Fast-forward to today and Sky TV alone has more than 10 million subscribers, each of whom is able to watch literally hundreds of channels 24 hours a day. They can view programmes on demand, remotely record to a hard-disk-based recorder, and pause live programmes, returning to watch the remainder later. Netflix, Amazon Prime and other online streaming services deliver whatever you want, whenever you want.

The PC now sits at the centre of entertainment. And even if the device you're using to consume media isn't recognisably a Windows PC, I bet that beneath its branded, set-top box clothing, it's nothing but a computer, processor, RAM and all.

In my own front room I can see an old Mac hooked up to a speaker set used principally to play music. I watch Blu-ray Disc, DVDs and TV on-demand from BBC iPlayer and others via apps built into the TV. Also a PC. The PlayStation is somewhat neglected as a gaming device since I got a Wii. Finally, the Sky+ box sits under the telly, which is now little more than a flat-screen display, as the Sky-branded PVR – itself nothing more than a locked-down PC – streams all the TV I want to watch, when I want to watch it.

If I want to listen to radio I stream it from my laptop, a device that nominally lives in the office upstairs, but rarely makes it back there unless it needs to be charged.

And that's before we address the way that devices more traditionally recognised as PCs now take up space in the lounge. Rare is the TV programme so gripping that I can't be found pootling about on the web using a laptop or tablet. And if all else fails I'll be fiddling with my smartphone (much to Mrs Matt's annoyance). Indeed, there are plenty of households that no longer have a dedicated TV, choosing instead to watch programmes on-demand from a laptop or PC.

The TV had a good run. But the PC is now the king of the home.

NOW: PC

CHANGE FACTOR ★★★★☆

THEN: LETTERS, PHONE CALLS

When was the last time you wrote a letter? Not a piece of formal communication, an annual round robin or a birthday card, but an honest to goodness, common-or-garden 'how are you doing' letter? For me it's been at least 10 years. In fact, I can directly trace the demise of my letters correspondence to the birth of what I laughingly call my 'career', and my introduction to ubiquitous email.

During my student days, which commenced after the birth of *PC Advisor*, the only way to keep up with former schoolmates was the occasionally scrawled note. Infrequent, but personal and direct to the correspondent, friendships might lose their immediacy, but longer-lasting intimacy was faithfully preserved. At the same time I was honour-bound to phone my parents at least once a week, which required a freezing trip to the phonebox (it was always cold), and a brief chat down the line, usually curtailed by the pips before my shoulder gave into the effects of trying to hold up a phone the weight of a dumbbell. I am a man, reader, and a man of Yorkshire at that. Talking on the phone does not come naturally to me.

Interestingly, my sister attended the same university five years after me, by which time three significant things had changed. Most importantly, the scuzzy old university bar had become a 'fun pub'. More pertinently to this feature, SMS via mobile phones and email had both become popular. This meant that, even before social media, IM and mobile email came on the scene, my younger sibling had a different social experience of higher education.

While I only vaguely kept in touch with friends from my younger days, Egan minor was able to communicate daily, if not hourly, with her childhood pals. As a consequence, the not-massive distance between our childhood home in Leeds and alma mater in Hull felt a lot bigger to me than it did her.

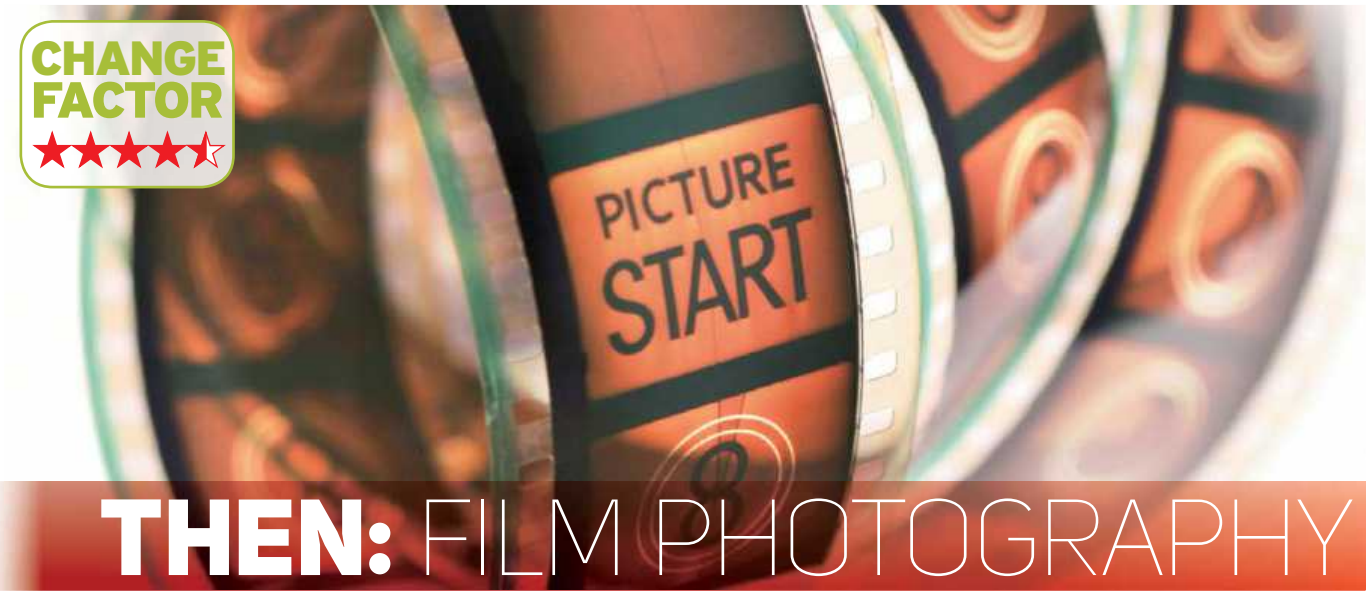
Fast-forward a few *PC Advisor* issues to today, and the world is a very different place. It's possible to keep up a constant conversation with friends and family regardless of geographical distance, using email, texts and instant messages. This gives the impression of a greater level of intimacy, but does it work like that? It's a lot easier to keep up the semblance of a correspondence when it's a simple question of typing and hitting send. It's also less private: whether or not you make it clear to your recipients, it's simple to send digital mail from one to many.

It's also the case that before everyone habitually texted each other you had to make a firm time and place to meet up, rather than heading to the same area and relying on technology to hook you up. Thus even face-to-face meetings become more casual affairs.

On the other hand, I know I'm able to maintain relationships with people I care about that I wouldn't be able to in a world without email, SMS and IM. And I'm more likely to send someone a text asking if they want to meet up than I ever would phone them.

The shift from more formal, paper and phone-based communications to digital messaging has changed the way we live.

NOW: EMAIL, SMS, IM



THEN: FILM PHOTOGRAPHY

Film photography still has a healthy existence, with some expert photographers refusing to use anything else. And those throwaway cardboard analogue cameras are still around, proving an especially resilient hit on the wedding circuit. Plus, of course, there are plenty of film makers who would never use anything other than 35mm film camera, believing it simply looks better.

But the move from analogue to digital in the world of still and video photography has been quick and almost total. And when you consider that the first modern digital camera widely available was the Casio QV-10 in 1995, and the first camera to use CompactFlash was the Kodak DC-25 in 1996, the speed of change becomes apparent. The concept of Jpeg didn't even exist until the late 1980s.

For the vast majority of people at the time *PC Advisor* first appeared, photography was strictly an analogue pursuit, and movie making the preserve of the one friend or relative who had everything. Going to the chemist to pick up your holiday snaps was as much a part of the trip as wondering what would arrive home first: you or the postcard.

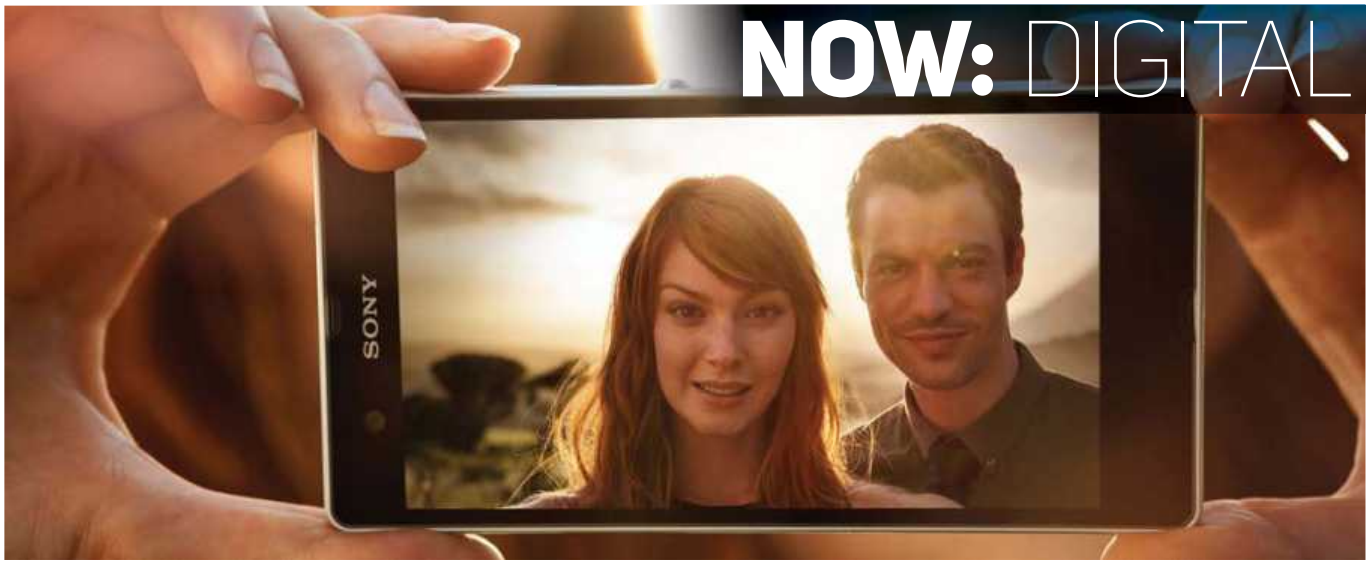
You had no preview, so the chances that all 24 or 32 snaps would be good or even usable were very low. (Unlike the chance that the assistant in your local Boots was likely to take his or her own copy of your most embarrassing snap for under the counter posterity.) Changing the film on many cameras was strictly mum- or dad's preserve, as clumsy hands could easily expose a whole roll of film to natural light and ruin a week or two's hard photographic work. And even though film limited the amount of photos you could take, shooting a few shots of the wardrobe in order to finish the roll was an honourable tradition.

I remember being stupendously impressed by one of my uncles when he showed up to a family gathering with a handheld VHS camcorder. It was about as big as a small family car, took awful footage and had next to no battery life. But still. Me, on the telly. It was like magic.

Today this seems impossibly quaint. To take photos and video you don't even need a standalone camera, as every Tom, Dick and Harryhausen carries a veritable digital studio everywhere they go in the shape of their phone. As is often the case with digital media, the sanctity of the individual shot has disappeared as it's possible to take and retake an infinite number of photos until you have that perfect shot of everyone gurning around a pint pot.

Home movies are posted online in seconds, for all the world to see (often before their subjects know the footage has been captured). And editing both photo and video is within the grasp of everyone who has access to a PC and some basic software.

There's still no substitute for photographic skill. There never will be. But the world of digital puts the ability to take decent photos in the hands of everyone, all the time. And that has to be a good thing. Try to remember that the next time an embarrassing picture of you appears on Facebook.



NOW: DIGITAL

THEN: DESKTOP COMPUTING

Take a look at the cover of our launch issue (it's on page 144) and you'll see: PCs have changed. A lot. Back in 1995, the term 'PC' referred almost exclusively to a beige Windows box, hooked up to a CRT monitor and a keyboard. You might have a connected printer – probably a dot-matrix type – and super-early adopters may even have a dialup modem, perfect for spending hours tying up the home phoneline in order to attempt to hack the Kremlin.

Up until the early 2000s, desktop PCs were more powerful, much easier to upgrade and, partly in consequence, much cheaper than laptops. But over the past decade or so that's changed. Laptops are close to becoming as powerful as desktop PCs, they start as cheap as the same spec in a desktop, and most peripherals are available in laptop-compatible USB versions, which minimise the need for internal add-on cards.

Given a straight choice, what benefits do desktops offer, apart from a marginally easier upgrade process? And if I can change the hard drive in a laptop (and I can) it can't be that difficult. Laptops on the other hand – even hulking great desktop-replacements – are more convenient. Even if you don't want to take one on the train, the biggest laptop is still simple to shift from one room to another. And if it's that keyboard-and-screen desktop experience for which you hanker? You can have it using your laptop and peripherals, and still have the benefit of portability.

All of which means that it was no surprise when, in the second half of 2008, laptops outsold desktops for the first time. The desktop isn't going to disappear any time soon, but the trend toward portability is headed in only one direction. Not least because it suits manufacturers: laptops are easier to ship, they can be built and stored in vast numbers, and they are sold as a consumer commodity rather than a confusing amalgamation of parts.

But that's not the end of the story. Far from it – we've done nearly 40 issues since laptops overtook desktop computers. And in that time the trend has been for an ever increasing array of personal computers in ever decreasing sizes. Consider the things for which you use your home computer: email, word processing, web surfing, gaming, photo and video editing, social networking. Each of those tasks can be accomplished on a smartphone or tablet, with a greater or lesser degree of comfort.

As computing platforms and form-factors continue to evolve and diverge, the choice of personal-computing device increasingly becomes a case of horses for courses: smartphone, laptop, netbook or tablet – and which is best for the task in hand, in your current circumstances.

There are still plenty of occasions where a desktop system best fulfils that criteria, but they tend to be workstation-based, editing large media files, crunching numbers and the like, often in an office situation. The days of a household having only one computing device, and it being a desktop PC, are numbered if not gone.

NOW: MOBILE COMPUTING

One result of all the extra digital photos and videos we are now capturing is that we all need more storage space. Music, movies, books, files... all were once analogue 'things' for which we had to find shelf space – a self-limiting process. We've investigated the changing price of storage on page 108, but it's fair to say that the exponential rate of increase in the amount of digital media we all generate, own and share means we are increasingly unable to store everything on physical storage media in our homes.

Enter the cloud.

Let's get one thing straight. True cloud computing is the delivery of computing functionality as a service rather than a physical product. It is a means of sharing resources, software and information between multiple devices, as a utility, over a network, which almost always means the internet. So if you use an online word processor or video editor from a web-based interface, you are cloud computing. But, these days, 'the cloud' tends to refer to any service that utilises web connectivity to share and stream information and media. It's a term appended to products and services good, bad, complex and simple in an attempt to add an element of mystique to what is a very simple process: if you have neither the storage space or the computational power to do something from your desktop, you can throw it up into the cloud.

It's an idea that was unheard of in 1995, but something we are all doing today – to a greater or lesser extent. Even if you don't know it as cloud computing.

Use webmail? That's storage in the cloud. Share your images over Facebook, Instagram or Flickr? Cloud. Perhaps in your working life you share and edit documents using a service such as Google Docs or OneDrive? That, my friend, is cloud computing. And all of that information is being stored remotely, whereas once you'd have had a physical copy.

More prosaically, increasing numbers of businesses choose to back up their data to offsite cloud storage services. It's a sensible idea. Even if you slavishly back up every file and folder you have in your business, if the tape drive is in the same building as the office and it burns down then you've lost the originals and backup in one fell swoop.

The same principle applies to individuals in the home. All reputable online storage services use servers across multiple sites, mirroring content so you're covered in the case of natural disaster. One of the weirder hangovers from the rapid switch from analogue to digital is that we all consider hard copies of photos, music and so on to be more robust than ephemeral digital files. It's a completely wrong-headed principal: digital files are simply a set of digits. Saved across multiple servers they will last unharmed as long as those servers remain live. An optical disc or paper copy will eventually degrade, no matter how carefully it is stored.

Sixteen years ago if you owned a record or a photo, you had to store a physical device. Now we all have multiple copies stored on servers all over the world.

Meeting people in the flesh is so hard. All that eye contact, hugging and shaking hands. Do you bump cheeks, actually kiss or maintain an awkward distance? Who starts up the conversation? When do you leave? Much better to sit in a darkened room and communicate with the outside world via a social-media website...

Or not. In *10 technology breakthroughs* (page 76) we've talked about the fantastic speed of growth that social media has enjoyed, but not so much about the way it's changed how we communicate. It's easy to sneer at the banality of much of the content shared on social sites such as Twitter and Facebook, but consider the benefits.

Back in 1995, the only way you could talk with others about a shared interest was to join a group that allowed you to subscribe to a newsletter, or – if you were really lucky – attend events set up by like-minded people. To communicate with a group you had to be geographically close. It almost certainly cost money. Today, that's very far from the case.

An interesting case study is *PC Advisor*'s own social media network: the PCA Forum (head to pcadvisor.co.uk/forums). Where else could you get together with 315,000 people interested in technology, in order to shoot the breeze about the latest hardware and software, solve problems and support PC projects? The answer is nowhere. And nowhere else could you ask a technical support question, and have your PC problems solved within hours, for free, by another user somewhere else in the country.

This kind of thing simply didn't happen in 1995, and it's all over the internet now. On Facebook alone there are special interest groups representing subjects as diverse as knitting and support for sports teams, there are virtual book groups and fan clubs, and discussions on everything from the Leveson inquiry to Justin Bieber.

When world events happen, eye witnesses can share news and opinion, in real time, with the rest of the globe. If you want to find out what's happening on the ground of a country with no external international media, just search Twitter. Of course, this isn't without problems. Personal opinion is often reported as fact, flame wars can quickly descend to unpleasantness, and hate mobs can brew up frighteningly quickly. Famous people are regularly incorrectly reported as dead, too.

Perhaps more importantly, social-media websites can produce a genuine sense of community. There has been at least one marriage born from 'meeting' on our Forum, and many more occasions where people who have felt desperate and lonely have been able to reach out and receive support from virtual friends. And that's without even considering the very successful results of dating websites: most people under a certain age know someone who met a significant partner via such a means.

Despite my facetious comments at the beginning of this chapter, it's clear that there's no substitute for human contact. But social-media websites offer us a lot now that we didn't have then.

THEN: DIALUP NOW: BROADBAND

CHANGE FACTOR ★★★★★

Originally 'broadband' had an actual, proper technical meaning. But it has long been used as a marketing term for any high-speed, always-on internet access. Let's define it for these purposes as an always-on connection that can at least nominally reach download speeds of 2 megabits per second (Mb/s). You almost certainly have it now – but if you were lucky enough to have an internet connection in 1995, it was dialup.

Ah, dialup. It really is impossible to get misty eyed about dialup internet. In retrospect, and at the time, it was a dog. For most households with a single phoneline, dialup meant precious time wasted hooking up a modem and waiting for it to 'dial' the relevant number several times before it finally caught on. Then you had to wait for even the most simple sites to load, knowing all the time that (a) your phoneline was tied up (and this at a time when most people didn't have a mobile) and (b) every second you were online you were pouring money into your ISP's pocket. And that's before we talk about the vast volume of Tiscali and AOL CDs that clogged up shop counters.

Dialup internet was slow and expensive, and decidedly unreliable. Not surprisingly this affected how we used the internet, which in turn shaped the kind of content posted up on to the web. There wouldn't have been much point in BBC iPlayer existing in 1995, because no-one would have been able to see it. In fact web video felt ludicrously futuristic. There were no MMORPGs or photo-sharing sites. Web 1.0 consisted almost entirely of static text content. And it was aimed at a much more tech-savvy audience than is today's more equalitarian net.

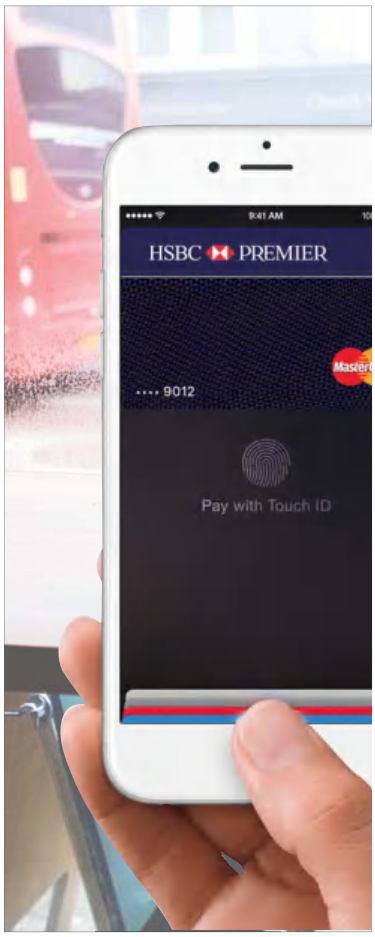
People rationed the amount of time they spent online. Sending an email was more like writing a letter, infrequent and long form, as you wrote things offline and popped online to hit send.

Nowadays it's unusual to find a household without at least a nominal 2Mb/s connection. This means that people can habitually browse the web, communicating, enjoying music and video, messaging friends. It also means that people rely on the web as a medium of entertainment and business much more than they did.

Dialup and broadband are related but, in terms of user experience, they are different beasts; life would be far less enjoyable if we were still using dialup internet.

THEN: CHEQUES, CASH NOW: CONTACTLESS

CHANGE FACTOR ★★★☆☆



It used to be that the only person who didn't carry cash was Her Majesty Queen Elizabeth II. But now in the UK debit- and credit cards are accepted everywhere for any amount. Cheques, not so much. Pull out a wad of cash in certain upmarket stores and you're certain to get odd glances. PayPal and other payment services hold cash for you to make purchases online. The latest development is using your phone instead of a card to make payments up to £20, a figure that's set to be increased soon. Passengers on public transport systems pay for their journeys via a contactless card, and mobile users and gamers habitually make purchases using micro-payment services for which they need only a password or fingerprint.

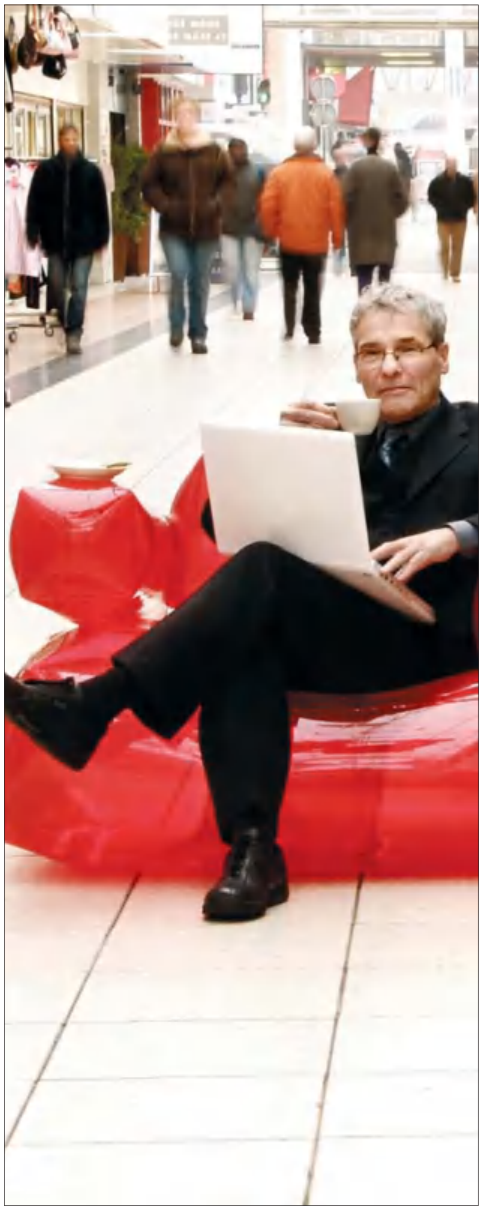
Don't think this describes you? Then we can only assume that you've never purchased an app on the iPhone or an Android device. Or your children don't buy games via Xbox Live.

These are all fantastically simple, time-saving ways of making purchases. But the very convenience creates an enormous risk. If you get someone's details, you are able to convert them quickly to cash. But in the past 16 years we've chosen convenience over security, in much the same way that credit won out over prudence.

Which is not to say that the banks and credit-card companies accept the risk. We always advise making large purchases using a credit card, as the bank is buying the product on your behalf – if the purchase goes wrong, they have to recover the cash. That's not the case with smart cards and payment services.

Banks in the UK have now converted all debit cards in circulation to chip and PIN to increase transaction security; but PINs aren't required for internet transactions, and they exist principally to pass on the transactional risk to customers. If a shop fails to spot a spoofed signature, you can't be blamed. If you give away your PIN code, you can. It's the logic behind the PIN-generating machines most banks hand out to online banking customers, too. Your account is more secure, but you are responsible for that security.

The move toward a digital payment economy isn't going to slip into reverse. Contactless payments are the norm, phone apps are replacing paper tickets for travel, and smartphone payment systems are arriving now.



THEN: HIGH STREET
NOW: THE WEB

CHANGE FACTOR ★★★½☆

Staying with the theme of splashing your cash, take a close look at your local high street. Ask yourself how you did your Christmas shopping this year, and how you did it in 1995. I'm pretty certain I did mine in a single branch of Halfords back then, but I'm a bad son with a lazy streak. The point is that in the mid-90s, we none of us went shopping on the web. That's very far from the case now.

A recent *PC Advisor* poll makes for interesting reading. When asked where they'd do their Christmas shopping, 23 percent said they would do all their shopping online, and only 3 percent said they'd shop on the high street only, as online shopping 'isn't yet reliable enough'. A more understandable 31 percent said they'll probably do a bit of both, while 25 percent said they'd shop wherever they could find the best deals. So only a fraction of those people who are doing Christmas shopping wouldn't be doing at least a part of it online. (Incidentally, the outstanding 18 percent have somewhat damaged our previous point about the *PC Advisor* Forum making people warm and fuzzy inside, saying 'Christmas? Bah, humbug. I don't do presents'.)

That categorically wouldn't have been the case in 1995, when online shopping barely existed. Amazon, Play, Dabs, eBuyer, More Computers, CCL... we could fill up this chapter with a list only of online stores, without even talking about auction sites such as eBay, itself a marketplace bigger than any city in the world.

Meanwhile, our high streets are looking ever more moribund. Currys, PC World, Argos and their independent brethren battle manfully to keep the bricks-and-mortar technology store alive in a world where almost anyone can set up an online tech store, without holding stock. Simply by backing into the networks set up by distributors, and cutting the profits earned to a bare minimum, anyone with a web connection can undercut the high-street stores.

Voucher schemes from services such as Groupon further erode the ability to compete on price of stores with hefty rent to pay. And innovative social selling schemes such as MoreFrom.me allow the customer to set the price and make a little cash as they sell.

But there is hope, despite the rapid rise and fall of Best Buy's UK operation. The phenomenal success of Apple's high-street stores shows that there's a market for shops that offer expertise and advice (and know how to take your cash before you have time to think twice). And supermarkets are increasingly turning a healthy profit from technology as the personal computer becomes a commodity and people want to do all of their shopping in one place for convenience.

THEN: PRIVATE, SECURE
NOW: PUBLIC, INSECURE

CHANGE FACTOR ★★★★★

Almost all the changes we've outlined above represent a move from a world where our security and privacy was established by physical locks and barriers, to a more fluid, infinitely more convenient, but lots more dangerous world.

The way our personal-computing devices have increased in power and scope, the increased connectivity, the casual way with which we communicate with a wider world... all these things made life easier and more interesting, but leave us more open to loss of data and privacy. The very portability of laptops, smartphones and tablets makes them easier to steal, and the data they access gives up our identities. Shopping and banking online requires trust. Our always-on web connections offer great connectivity in, but a portal for thieves to take data out. The social networks we so love to use are fertile data-mining territory for criminal gangs. Without digital messaging there'd be no phishing, placing our data in the cloud allows third-party access to our information, and even the humble digital photo contains information about where we go and what we do.

Is it worth it? In my view it most certainly is. We live infinitely richer and more varied lives than we did just 16 short years ago, able to communicate with a greater number of like-minded people, and stay closer to loved ones despite greater geographical distance. ☒

10 BIGGEST TECH BREAKTHROUGHS OF THE PAST 20 YEARS

Reaching back through the *PC Advisor* archives, Matt Egan picks out the 10 technological leaps forward that have most affected our computing lives

To a time traveller from 1995, the pace of change in technology over the past 20 years is such that the current world is bewilderingly futuristic. When *PC Advisor* launched, the idea of handheld devices offering instant access to an exponentially bigger world of entertainment would have been the stuff of science fiction.

Gizmos the size of books now contain detailed maps of the world, your entire record collection and hundreds of, well, books. We can access everything, everywhere, all the time. And we expect to be able to contact all the people in our lives, whenever, wherever. Each day for the past 20 years and more, *PC Advisor* has reported on new technologies and products. Some stay with us and some disappear. Most are mediocre updates of existing technologies. But some, like the 10 listed here, changed our computing world for ever. This list includes fantastically clever technologies, user-led trends and simple upgrades. But in each case they paved the way for further changes that made our world unrecognisable from the way things were when *PC Advisor* started out.


3G
Blu-ray Disc
Wi Fi
Google
2+2
H2O

3G BROADBAND

TECH BREAKTHROUGH RATING: ★★★★☆

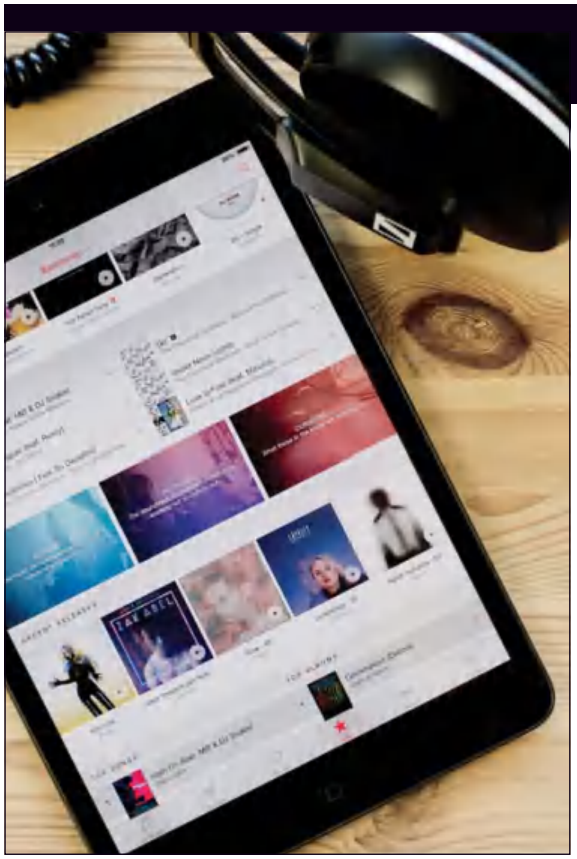
It had a painful birth in the UK, and no-one who's had to rely on it for work or play will be entirely enamoured of its flaky ways, but 3G represents a breakthrough. If you don't believe us, simply cast your mind back to WAP.

Before 3G came along, the mobile web was, frankly, nothing of the sort. It was a strange, Ceefax-like hybrid with which you could just about glean stock prices and football scores, but only with patient coaxing and an underdeveloped sense of the ridiculous. I remember attending conferences where people talked about the commercial opportunities offered by mobile web use, and thinking 'yeah, right. Pull the other one'.

The first pre-commercial 3G network was launched by NTT DoCoMo in Japan in 2001. Although global rollout took longer than expected, by June 2007 more than 200 million 3G subscribers had been connected around the world. Some used smartphones, others mobile web dongles. Indeed, it's worth remembering that this figure was achieved without the first-generation iPhone – launched in early 2007 and a touchstone product for so many emerging technologies, but a 2G phone and no more.

In the UK, telcos who had written off billions of pounds on 3G licences they bought in a feverish auction found that mobile dongles represented a lucrative new business. Over time, the smartphone and tablet markets have grown to such an extent that UK consumers are grumpy about how long it's taking us to get 4G connectivity in their area.

It's imperfect, expensive and growing increasingly tired. But because it freed us from home and business broadband connections, 3G led the way to much faster developments in mobile computing. And it lets me watch Sky Sports under the table at boring meetings.



DIGITAL DOWNLOADS

TECH BREAKTHROUGH RATING: ★★★★☆

To understand how much the digital world has changed the way we consume music, movies and games, talk to someone under the age of 20. Unless you happen to be under the age of 20. Then talk to me.

When I were a lad, we bought records on vinyl, and we watched films on the TV. And we were lucky to get either. Then, for some unfathomable reason, we migrated to tape cassettes for audio and games, and VHS video cassettes for movies. Well, I did. Those with taste and foresight stayed true to vinyl.

When audio CDs and, later, movie DVDs came along, it felt like a staggering step forward. The ability to leap direct to the song or movie chapter of your choice? Wow. Whole albums without turning over? Kerching.

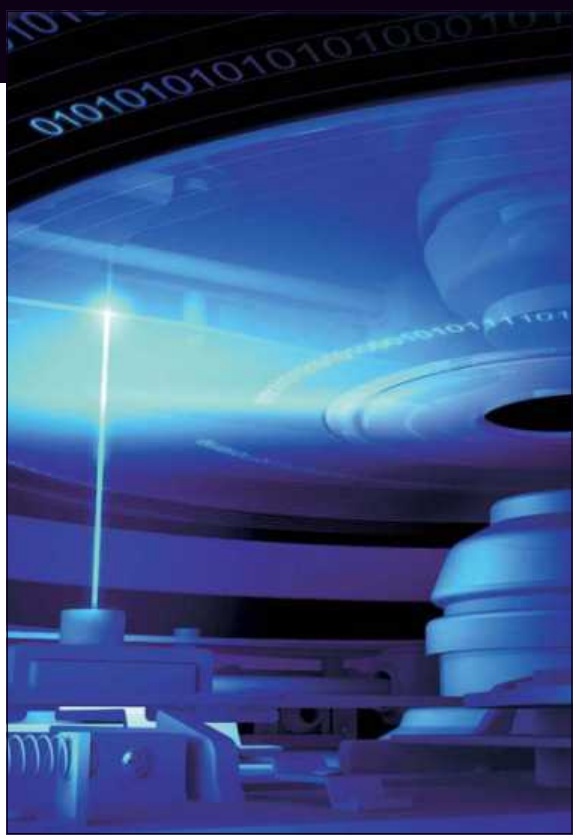
Yet now it all seems archaic. Tonight, if you're sitting on the bus and you want to hear a particular song, for a small fee you can immediately buy and listen to it on your smartphone. With an app such as Shazam, you don't even need to know what it's called. You can hold your entire music collection in a device a little bigger than a cigarette packet, watch movies on your phone until you get home (and then catch the rest on the big screen), and download and play the latest game without even having to stretch your legs with a stroll down to the shop.

We'll gloss over the way that media downloads were initially driven by criminal sharing, and put that down to media owners being slow on the uptake. The technology is the thing and, for better or worse, it's totally changed the world of entertainment. It's even changed the way it's produced: few people buy albums, so live performances are key to musicians making a crust.

It's not just music, though. Podcasting has allowed comedians and radio presenters to create their own markets, while TV series debut simultaneously around the globe and are immediately available to download.

BLU-RAY DISC

TECH BREAKTHROUGH RATING:



It's more of an upgrade than a radical new technology, but Blu-ray Disc is worthy of inclusion because it succeeded when the odds were heavily stacked against it.

Blue-laser technology emerged in 2000. A putative successor to the DVD format backed by industry heavyweights including Sony, Blu-ray uses a blue laser to read information off the disc at a greater density. This allows more information to be stored than is possible with the longer-wavelength red laser used for DVDs. (Note to DVD-player makers: call them 'Red-ray Disc', and watch sales fly.)

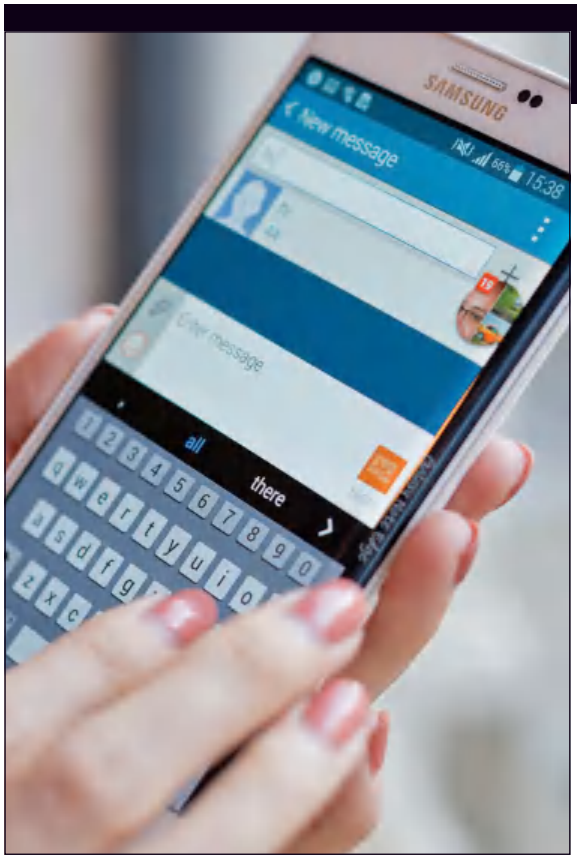
After a series of false starts and stumbles, Blu-ray finally came to commercial players in June 2006 – with plenty of doubts over its long-term success.

A single-layer Blu-ray Disc can store up to 25GB of data; two-layer discs that offer up to 50GB of space are also available. In principle you can add third and fourth layers, each adding a further 25GB, but commercially 50GB is your lot. It's enough, though. Enough to allow for HD and 3D movies and games to be sold to fans, enough to keep people upgrading their home-entertainment equipment, and more than enough to keep the makers of optical drives in business.

Which is all very well, but why would a mere storage-capacity upgrade make it into our list? Well, because unlike its principle rival, Blu-ray is still with us, just.

In August 2002 Toshiba and NEC decided to challenge the in-development Blu-ray with their own large-storage blue-laser optical-disc format, which eventually came into being as HD DVD. This technology made it on to shop shelves before Blu-ray, and initially had greater success, but then Sony launched the PlayStation 3 with a Blu-ray drive and the rest is history.

Simply for winning this battle, as much as for its part in the drive toward HD entertainment, which we now enjoy via Netflix, Blu-ray Disc deserves its place as a technology breakthrough. It's a born survivor.



MOBILE EMAIL

TECH BREAKTHROUGH RATING:

I remember sending my first email. I was a student and my alma mater had gifted me use of an email account. The address was an impossible-to-remember string of digits, and to access it I had to book a timeslot at the university's computer centre. On balance, I decided that even a task so suited to email as keeping up with friends at other universities was much simpler when scrawling on a scrap of paper and heading down to the post office. And the post office sold sweets.

Of course, even then email was more portable than I'd realised. But it remained only a slightly easier way of sending letters, using a static PC or laptop, until push email for mobile devices became prevalent. Although push email was standard on Japanese smartphones from around the turn of the last century, it wasn't until RIM started flogging its BlackBerry phones that it became a big deal in the UK.

The first full-featured BlackBerry phone launched in 2003. Its impact in that short time has been nothing short of staggering. Now almost everyone has a push-email-enabled portable device and, in plenty of cases, more than one. The age of being out of contact when out of the office is well-and-truly over, as executives email from the beach, and weekend warriors check their email in nanosecond moments of down time.

Being able to email from a mobile has – along with SMS – in turn spawned other, more immediate forms of mobile communication, from instant messaging, through Twitter and Facebook to video-calling. But mobile email remains the daddy of them all, meaning that working 9 to 5 is a distant memory, while enabling flexible working practices.

Whether this makes us more efficient and flexible, or simply more stressed, is a moot point. The way we communicate has changed to a staggering extent, and this in no small part down to mobile email.

MULTITOUCH

TECH BREAKTHROUGH RATING: ★★★★½

At any point in the first 10 years of *PC Advisor*, you'd have been within your rights to offer only a casual shrug at the idea of multitouch technology representing a major breakthrough. The use of touchscreens to control devices has been around since the dawn of computing, but for a long time it remained unpopular. Indeed, like many of our technology breakthroughs, touch input was something that Microsoft correctly recognised as important, without immediately cashing in.

Microsoft's table-top touch platform – Microsoft Surface – was dreamed up in 2001, but a final spec was announced with typically poor timing barely a month before the iPhone. Surface interacts with both the users' touch and objects placed on the display, and the technology forms a huge part of Microsoft's plans for a future wherein every surface is an input device, and every device can interact.

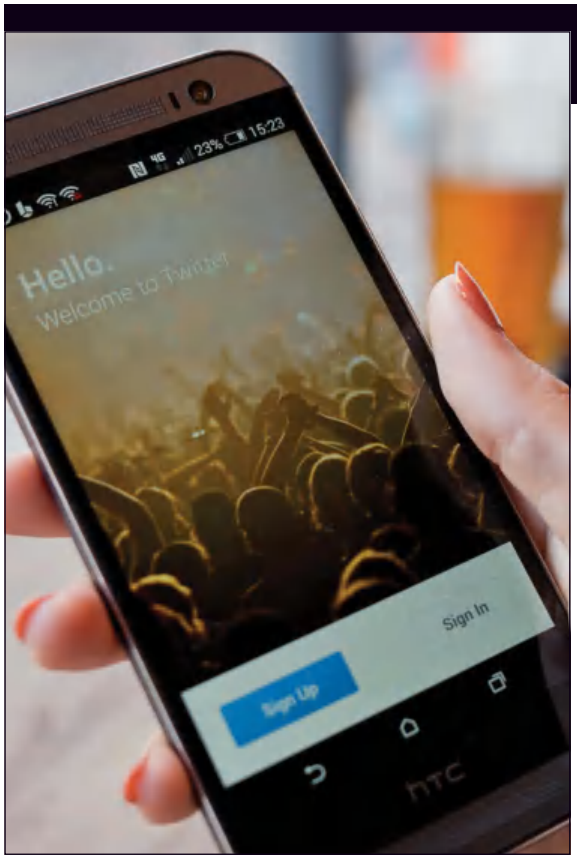
But it was Apple that made multitouch popular with the iPhone, launched in 2007. The iPhone's screen tech was ultimately the product of a company called Fingerworks. Fingerworks spent the early years of this century developing various multitouch technologies. It produced several products, including a touchscreen keyboard that Apple liked so much it bought the company.

Of course, no-one is claiming that Apple invented multitouch – except Apple itself – but the iPhone was the first mobile device with a multitouch screen.

From being a niche feature, touch is now intrinsic to all manner of devices. Not all touchscreens are made equal, but the success of the iPhone and the products that followed it have firmly entrenched a 'touch first, ask questions later' policy into the minds of most computer users. It may not be the ideal input mode for every type of product, but it's not going away: place a child in front any tech device, and they will instinctively attempt to control it by touch. That, my friends, is intuitive.

SOCIAL NETWORKING

TECH BREAKTHROUGH RATING: ★★★★½



For almost as long as there's been a *PC Advisor*, there's been a *PC Advisor* forum – our own social network, and the largest of its kind in Europe. But it took the rest of the world a while to catch up.

According to Wikipedia, the first social-networking websites went live around the same time as *PC Advisor* thrust itself on to an unsuspecting world. But the key dates in social networking happen much later.

Consider this, as you browse the web: the term 'weblog' didn't exist before 1997 and, although people published online diaries, the first dedicated blogging sites appeared even later than that. Friendster, MySpace, FriendsReunited... they've all risen and fallen since 2002. And even then, success and failure are relative terms, given the thousands of people who still use networks considered moribund by the watching world. Facebook debuted in 2004, Twitter in July 2006, and yet the amount of web traffic that now goes to such sites is staggering.

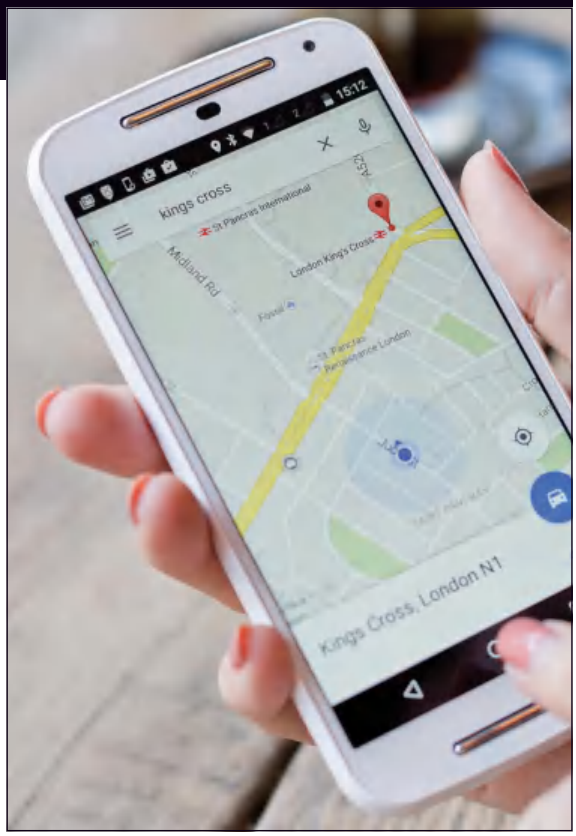
Facebook, the biggest of all, tells us it has more than 1.49 billion active users – more than half of whom visit the site at least once a day and a staggering 1.31 billion of whom access the site through mobile devices. More than 350 million photos are uploaded each day, the site is available in more than 70 languages, and there are more than one billion pages, group events and community pages.

Facebook, Twitter and the rest have changed the way we communicate, while other sites and services have altered the way we access and consume media. There's more content on YouTube today than has ever been broadcast on all the TV stations in the world. Want to share an event with a loved one far away? If photos on Instagram and live Twitter updates aren't enough, just Skype it.

Love it or loathe it, social media has changed the lives of millions of people to the extent that it's not the 'social web'; for lots of people, it's just 'the web'.

SATELLITE NAVIGATION

TECH BREAKTHROUGH RATING: ★★★★½



Who remembers maps, hey? These clumsy paper contraptions were the 'route' of 37 percent of all divorces between 1973 and 1988. Okay, we made up that stat, but I can't be the only child of the 70s for whom the advent of turn-by-turn navigation banished forever nightmares based around French road systems and the M25.

Navigation by satellite has been available in some form since the 1960s, but for most of that time it was principally a military tool. It became a realistic civilian product only when the then US president Bill Clinton opened up the military's Global Positioning System in the late 1990s. That's right, we have the good old US of A to thank for satnavs. Before long, a device that literally told you where to go became a crucial part of every serious driver's armoury.

Of course, despite the way we rely on them, satnavs are no panacea. Like all digital devices, when they are good, they are very, very good, and when they are bad they send you down a single-track country lane in a double-decker bus. As maps get older and road systems change, your satnav can be every bit as geographically challenged as a harassed spouse with an A-Z. There's a patch of the A1 which throws my own device into paroxysms of rage as it screams at me to stop driving through a field.

But the modern satnav is often internet-enabled, allowing it to update on the fly. And such is the power of modern smartphones, and the utility of satnav software, that many people now use their mobile devices as constantly updating GPS navigators. Indeed, Android users may never need to look beyond the Google Navigation app for getting from A to B.

Something that seems almost banal now would have seemed like science fiction back in 1995, and for that reason satellite navigation on smartphones and dedicated devices is a serious technology breakthrough.

USB

TECH BREAKTHROUGH RATING: ★★★★½

PC Advisor is older than Universal Serial Bus (USB), version one of which was released in January 1996. Offering specified data rates of 1.5 megabits per second (Mb/s) and 12Mb/s for low- and full-bandwidth respectively, the first version of USB couldn't support extension cables or pass-through monitors. Had we not seen the birth of USB 1.1 in 1998, the technology would be little more than a footnote in the history of computing.

That iteration of the connectivity technology achieved popularity, while USB 2.0 was launched in 2000 and blasted its way to ubiquity. Promising a higher maximum bandwidth of 480Mb/s, USB 2.0 was also known as 'Hi-Speed'. It also offered the flexibility of MiniUSB, but it's the technology's plug-and-play simplicity that makes it such a winner.

Look around your home or work computing setup, and count the number of USB connections. You may or may not run your mouse and keyboard by USB, but we bet you have external storage devices and USB thumb drives to extend your PC's storage and move files around. And while smartphone and MP3-player makers may infuriate all but themselves by making the device end of their charge and synch cables proprietary, the bit you plug in to the PC? That's USB.

Desktop printers and scanners, laptop stands with cooling fans, lights, cup holders, hubs for more USB connectivity... all are powered by the one hardware port to rule them all. 'What about wireless connectivity?' I hear you say. A fair point. But don't forget that USB is used in dongles that connect everything from Bluetooth peripherals to wireless networks.

USB has a battle on its hands to stay ahead of such rivals as Thunderbolt. But with USB 3.0 already on stream and the new reversible Type-C connector gaining popularity, who's to say it won't remain the king of all connectors?

WEB SEARCH

TECH BREAKTHROUGH RATING: ★★★★½

Search has been around since the early days of the web, but finding useful content was for a long time a complex and unsatisfying business. Domain names and URLs were hugely important, and you never really knew what you were getting until you landed on a page, with often negative results.

Although Google's ground-breaking PageRank algorithm was the internet's great leap forward, search really kicked into gear in 1996. Netscape held a competition to find a search engine for its then market-dominant web browser. The competition was so stiff it ended up choosing five search partners, each paying $5m for the pleasure of appearing one fifth of the times that Netscape's search page was called up. Yet the successes of Yahoo, Magellan, Lycos, Infoseek and Excite fell with the dotcom boom and the inexorable rise of Google.

Google Search rose to dominance around the turn of the century, with its use of inbound links to ascertain popularity and uncluttered user interface blowing away the competition. In time, Microsoft's Bing and Yahoo have come together to provide a viable alternative to Google, and other search engines provide more specialist services, meaning that most web-browsing sessions start with a search.

Search engines are the most important newsstands for website owners. They dominate the web-advertising industry, and in some ways rival the sites and services they promote. Optimising sites so that they rank higher in search-engine results has become a full-time profession. At the same time, search engines have become much savvier at understanding what web users actually rate on the internet, and grown increasingly sophisticated at picking out the best of the net.

Count on search to play a crucial part in the way the web develops, as the distinction between on- and offline continues to blur. Good, bad or indifferent, the internet as we know it exists the way it is now only because of search.

WIRELESS INTERNET

TECH BREAKTHROUGH RATING: ★★★★½

Although the origins of Wi-Fi are much older than *PC Advisor*, a quick glance through our launch issue confirms that wireless connectivity was nothing more than a pipe dream in 1995. The first commercial products to be marketed under the term 'Wi-Fi' appeared in 1999, and we were still banging on about the advantages of wireless well into the noughties, as takeup proved stubbornly slow.

There are plenty of reasons for this. A robust broadband infrastructure helps to make wireless in the home useful and desirable, and there are plenty of places in the UK where that remains out of reach to this day. And until Microsoft and the mainstream ISPs worked out that consumers need serious hand-holding, configuring a wireless network in Windows was fiendishly difficult.

But once setting up a network became a relatively simple task, Wi-Fi became ubiquitous. The PC is liberated from the study, and sofa surfing with a laptop is possible. Smartphones, tablets, printers, games consoles, set-top boxes and audio systems... all can access your home network, pulling down media and pushing out information. And each is more useful for its wireless connection to the web.

Step out on to the streets and it's staggering how often you'll now find yourself in range of a wireless network. As time goes by this will only increase, with city-wide Wi-Fi planned for many major conurbations.

Of course, Wi-Fi has its down sides. It's a major security risk, for a start, and its very usefulness means that if your router fails you lose a lot. If you're lucky enough to live in a house with sturdy walls or multiple floors, you'll find that even the best connection struggles to reach every corner, and it's easy to use a lot of power, and even more of your data allowance, with an always-on connection.

But walk around your house, go on a journey, and try to imagine life without 802.11 connectivity. Things would be a lot more constrained, and a lot less fun. ☒

TIME TO GO DIGITAL

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PC ADVISOR

iTUNES DOWNLOAD

ZINIO DOWNLOAD

Andrew Harrison reviews five of the cheapest Windows laptops you can buy right now

Everyone likes cheap when it comes to spending their own money. After all, who pays more than they need to, to get what they want?

Fewer people like cheap in the sense of low quality, but if you can't spend more than £450 on a portable computer and you don't want to play 3D games, read on for a guide to buying a cheap laptop for not much money.

When you see laptops and PCs advertised on the telly, there are usually a few specifications called out to help define what's on offer. These typically include the main processor type, the screen size, and how much memory it has installed. And don't forget, memory means random access memory (RAM) and should never be confused with the storage capacity of a hard disk or solid-state drive.

Screen size is a good starting point for finding the laptop you need. Most today are sized at either around 13- or 15 inches, the viewable screen area measured diagonally; there are also some 17in models made as gaming machines, professional workstations or all-round family entertainment centres. At the smaller end, you may also find some laptops with 11.6in displays.

The screen also gives a guide to the overall weight, helping you make a decision if portability is key to your needs. Most 13in laptops weigh between 1.3- and 1.6kg, while 15in models are usually between around 2- and 3kg.

The screen is frequently the poorest-performing component in a low-cost laptop. Alongside its physical size and resolution listed in advertisements, there's rarely any quantitative indication of quality, helping manufacturers to fit the cheapest and lowest-grade screen they can find to pare down costs. Such displays will have very low contrast ratios, and limited colour gamut, while colours will look crude and garish. These crude twisted-nematic (TN) displays also have severely limited viewing angles. Compare these to the better-grade IPS displays now common on your phone or tablet, and you'll notice that it's difficult to view the laptop screen from the side, forcing you to keep your head in certain positions.

Look out for the screen finish, too. Shiny screens became popular about five years ago, as they seem to have better colours and contrast, but in use these untreated gloss panels reflect daylight, bulb light and your own image straight back at you. Matt anti-glare screens are more versatile, but also beware of cheap coatings that give a sparkly, fuzzy effect to images.

Processor

The processor is the heart of the computer, although today it's not so much performance we need – laptop chips reached a fast-enough level years ago – as good battery economy. Apart from the slowest chips such as the Intel Atom, almost any processor from Intel or AMD is fast enough to smoothly handle the Windows operating system and programs such as Microsoft Office.

However, the cheapest chips fitted to low-cost laptops, such as AMD's or Intel's entry-level Celeron, also tend to be less power efficient than Core i3/5/7. This means they burn energy needlessly to do the same work, so they require a larger battery to run the

Photography by Dominik Tomaszewski

same time; or more often they feature the same size batteries but have shorter usable life before running flat.

For better quality laptops fitted with the latest Intel chips and other power-saving measures, you can expect seven- to 12 hours of actual battery life. Budget laptops meanwhile may run for only around two- to five hours.

The most efficient and powerful chips are currently Intel Core series, such as the i3, i5 and i7. Recent generations, codenamed Haswell (2013) and Broadwell (2015) can be found even in budget laptops. The mobile chips are mostly dual-core designs, some with Hyper Threading Technology, which makes them perform like even faster quad-core chips with the right programs.

Clock speed should not be used as a guide to speed any more. But clock speed of a processor does give you an idea how quickly it will drain the battery – the higher the number, the faster it's gone. Modern laptops usually have chips running at around 2GHz or lower, and which perform as fast as the 2.5GHz and over chips of a few years ago. Watch out for laptop manufacturers who only list an inflated overclock ('Turbo') speed, since most consumers still believe that higher numbers are always better.

And so to memory. Historically, RAM was expensive and represented a significant part of the investment in a computer. Today, however, it's so cheap that whether your laptop has 4-, 8-, 12- or 16GB is less important, providing you can still upgrade yourself if required. Windows 7, 8 and 10 will run fine on 4GB, although even sub-£450 laptops often come with 8GB, now that it's such a cheap commodity.

To make a computer feel fast and responsive it's as important that it have fast storage. The cheapest laptops do not yet feature the best option of a solid-state drive (SSD) unless you're prepared to accept a pitifully small capacity, so you must make do with a slower hard disk instead.

Disks are now so cheap that laptop makers can afford to put in 500GB or 1TB disks; great for hoarding weeks of music and video, but don't forget your backup plan to safeguard your personal files when the disk breaks or your laptop is stolen.

As a halfway measure, a small amount of flash and a larger disk are sometimes combined into what's being called an SSHD ('solid-state hard drive'). This is a cost-effective way to get some of the benefits of both technologies.

Over the following pages we test and rate five laptops on sale in summer 2015. Don't expect these to be available exactly as tested when you read this, though – the budget laptop market is extremely volatile, and retailers tend to secure limited stock of any model. Laptop makers will make many slight variations of the same laptop, with subtly different product codes. They typically use the same chassis, complete with the same ports, screen, keyboard and touchpad, so you can use our reviews as a basis for some of these models from the same range.

Remember that any laptop with Windows 8.1 – including 8.1 with Bing – can be upgraded to Windows 10 free of charge if done before 28 July 2016.

ACER EXTENSA EX2508-C3QZ

£280 inc VAT • acer.co.uk

Build	★★★☆☆
Features	★★★½☆
Performance	★★½☆☆
Value	★★★½☆
Overall	★★★☆☆

Acer's Extensa EX2508-C3QZ is a basic budget business laptop, although its no-nonsense values may appeal to anyone looking for a cheap Windows laptop. It has an equally basic Intel Celeron processor and low-grade 15in display, although a 1TB hard disk, DVD drive and 8GB of memory may help distract from other shortcomings.

Build and design

The all-plastic case is matt plastic from top to bottom, with a light texturing to help with purchase when handling. Weighing 2.2kg and just over 26mm thick, it's a chunkier mass than today's popular ultraportables, but about average for the traditional class of 15in-screen general-purpose laptops.

Most of the ports are ranged along the back below the screen hinge – power inlet, audio headset, HDMI and ethernet, plus one each USB 2.0 and 3.0 ports.

On the left side is an SD card slot and another USB 2.0, while the right side is host to the increasingly rare tray-load DVD drive. Like most such mechanisms today, it can write to dual-layer DVD±RW discs. For Wi-Fi, the Acer has a rudimentary single-stream 11n adaptor.

The Extensa is simply built, which is evident from the solid underside that offers no easy way in to upgrade memory or even change battery. Any upgrade work would require removing 18 screws to strip down. The keyboard and numberpad stretch across the top deck of the Extensa, with deeply-sprung tiled keys that proved excellent for easy typing. The trackpad was, however, nearly unusable due to a broken right-click button that clunked on each press. It's a large component at 106x78mm, and buttonless to follow the current fashion even if real buttons work better on low-grade trackpads fitted to cheaper laptops. If this unit had been a personal purchase, it would have been hastily returned as defective.

Performance

Screen quality was average for the category, which is to say rather poor. The resolution is coarse at just 100ppi, the colour quality lousy with only 57 percent coverage of sRGB, and the contrast ratio is low at just 80:1. Viewing angles are also limited by the budget TN technology, if not as bad as the worst we've seen.

In the Geekbench 3 test, it scored 1053- and 1850 points for single- and multi-core modes, low scores roundly bested by even a two-year old iPhone 5s (1415- and 2550 points). Looking at the complete system rather than just CPU and RAM, PCMark 8 Home scored the Acer with just 1239 points in its Accelerated test.

Neither bored business types nor home users should get ideas about any gaming from the Extensa 15's integrated Intel graphics. In our starter test with Batman: Arkham City at native screen resolution of 1366x768 and Low detail, it managed only 12fps. Dropping down to 1280x720 brought the average up to a still unplayable 14fps.

The battery life was more satisfactory though, at over seven hours in our standard streaming-video test.

VERDICT: Beware of quality-control issues on an otherwise just about serviceable Windows laptop. The Extensa keeps the price and performance low with its cheap components and free Windows operating system, but at just £280 it should prove popular.

ASUS X555LA-XX290H

£300 inc VAT • asus.com/uk

Build	★★★½☆
Features	★★★½☆
Performance	★★★½☆
Value	★★★★☆
Overall	★★★★☆

PC ADVISOR BEST BUY

The perfect all-round value laptop for work and play. That's how Asus bills its X555LA-XX290H, and for once we're almost inclined to agree. This 15in budget laptop can be found for under £300, and while suffering the common failings such as low-resolution display and slow Wi-Fi, it presents a better balance in overall performance.

Build and design

The X555LA has a two-tone finish, featuring a dark lid back with fine circular patterning, a black plastic base and silver-painted plastic top deck. At a little over 2.1kg in weight and 26mm thick, it follows a similar template to the Acer Extensa, and similarly also offers a dual-layer DVD±RW writer with pop-out tray on the right-hand side.

Two USB 3.0 ports, gigabit ethernet, VGA analogue and HDMI digital video output on the left, are joined by one USB 2.0 socket on the right and a card slot able to accept SDXC cards. You can also use headphones and microphone from the 3.5mm combo headset jack.

A standard-issue tiled keyboard includes a numberpad, and its key action is firm and easy to type on. There is a little flex under the keyboard under typing pressure, but not enough for concern.

The trackpad follows the same silver-coloured finish as the wrist-rest area, a large buttonless multi-touch type 103x73mm for easy cursor control. Asus includes its branded Smart Gesture software to optionally allow two- and three-finger gestures. The pointer precision could be better but it works well enough to get around.

Like most budget Windows laptops, the display is a weak point, offering a relatively low resolution at 1366x768 pixels across the 15.6in panel. Its colour is limited to just 61 percent sRGB and the low contrast ratio of 80:1 means images and text lack the definition we now expect from consumer technology such as smartphones and tablets. A gloss finish gives a better impression of clarity but suffers from annoying reflections in daylight conditions.

For wireless connectivity Asus fits the most basic single-stream 11n adaptor, along with the usual Bluetooth 4.0.

Performance

Asus offers the X555LA with AMD or Intel processors – our sample had a 1.9GHz Core i3 from Intel's fourth generation, lacking any Turbo boost but usefully including Hyper Threading Technology to provide pseudo-quad core capability. Only 4GB of memory is included, but a spare SO-DIMM slot is available through an easy-access trapdoor on the underside. The 1TB hard disk and 37Wh battery are not easily accessible, and in our tests the lithium-polymer battery meant the Asus ran for five hours 17 minutes in our video rundown test.

Overall speed was good for the category, scoring 2028 points in PCMark 8 Home, while raw processor and memory performance reached 1906 points in Geekbench 3 single-core, and 3981 points with four threads active.

Some light gaming may just be possible – we averaged 26fps in Batman with Low detail and native resolution, rising to 30fps at 720p.

VERDICT: Asus has restricted build and component quality to fit the attractive £300 price point, but all the essentials work well together. The Haswell Intel chip means overall performance is better than any Celeron-based competition.

DELL VOSTRO 15

£442 inc VAT • dell.co.uk

Build	★★★½☆
Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆
Overall	★★★★☆

PC ADVISOR RECOMMENDED

Dell is known as the cut-price Windows brand, and within its business line-up sits the Vostro series of budget laptops. The Vostro 15 was updated early this year and can now be found with the latest fifth-generation Intel Core processors, an unusual feature in entry models.

Build and design

The Vostro is another no-nonsense design, all black plastic with matt textured finish. It's a large laptop by modern standards, with a large footprint spreading 378x259mm, but weighing 2.4kg and its 25mm thickness means it's not a complete brick either. Like many 15in models, Dell has found space to include a DVD±RW drive.

Pick up the laptop and you can feel the whole chassis flex a little, but otherwise it feels tough enough to survive the battering meted out to commodity Windows appliances. The 40Wh battery is removable, and access for service and upgrades is very good. A third-width plastic bottom cover lifts to reveal hard disk, wireless card, CMOS battery and SO-DIMM slots. Our sample had 4GB memory in one slot, with another empty slot available.

It may run with the latest Intel chip but costs have been cut elsewhere. The 500GB WD disk is a noisy example of the breed, there is no HDMI output, and quality of the matt low-resolution display is poor. It has restricted viewing angles and about the worst colour accuracy, contrast ratio and gamut on test.

Elsewhere ports are limited to three USB ports (including one USB 3.0), ethernet and SD card slot. The keyboard and trackpad are not so bad, the regular Scrabble-style keyboard working well with a clean responsive action, while the buttonless trackpad followed our fingertip directions with little extraneous jumps despite the buttonless design that hides left/right switches under the panel.

Various processor options are listed – our sample had a 2.2GHz Intel Core i5 that includes Turbo Boost and Hyper Threading Technology, yet still keeps the overall price below £500 at time of press. And that's with the dearer Windows 8.1 Pro OS, too.

Wi-Fi should be more versatile than most budget models, a recent 11ac single-stream adaptor from Intel.

Performance

Synthetic benchmark results for the Dell Vostro were the best in this group, peaking with 5177 multi-core points in Geekbench 3 (and 2624 single-core, beating the multi-core results of Celeron chips).

PCMark 8 Home unit returned an accelerated score of 2732 points, and business credentials were underlined by a decent 3734 points in the Business test from the same suite.

Usable graphics performance from the Intel HD Graphics 5500 meant some light gaming is feasible: we averaged 25 fps in Batman at 1366x768 Low detail, rising to 29fps at 720p.

Despite the 14nm processor that's designed to cut power consumption, and a reasonable 40Wh battery, we saw less than four hours unplugged runtime in our wireless video test.

VERDICT: Battery life was disappointing and screen quality is poor. Application performance measure well but it often felt slow to respond in actual use. Corners have been cut, but overall the Dell Vostro is a workable machine that leads with the latest Intel silicon.

Build	★★★½☆
Features	★★★½☆
Performance	★★★½☆
Value	★★★½☆
Overall	★★★½☆

HP PROBOOK 455 G2

£300 inc VAT • hp.com/uk

If you're not a Windows fan but can't afford the extra expense of an Apple MacBook and its OS X operating system, you'll be glad to hear that there is a third way – a laptop with Linux preinstalled. The ProBook 455 G2 is one of three HP laptops sold by eBuyer running Ubuntu Linux instead of Windows. Here we review the highest spec model, which comes with a 1.9GHz quad-core AMD processor, 1TB hard disk and 8GB of memory.

Build and design

From the budget end of HP's business range, the ProBook is a simple 15in laptop, which comes with the kind of components you would find on a sub-£500 machine, including a low-grade TN display, plastic casework buffed up with gunmetal paint and simple connectivity.

A slot-load DVD±RW drive pops out the right side beyond two USB 2.0 ports. The left side trumps these with a pair of high-speed USB 3.0, alongside HDMI, VGA and gigabit ethernet ports.

Like most business laptops there's decent access from the underside to essential upgrade areas: two doors, one to access hard disk and memory, the other for Wi-Fi card. A small 31Wh battery can also be detached easily.

Screen quality is the usual weak spot on budget laptops, and you won't be surprised to hear that we had an issue with the 15.6in (100ppi) TN panel. The screen's contrast and colours leave images looking simultaneously dull and washed out.

Real buttons below the multi-touch trackpad have smooth operation, while pointer precision is average for the price. Typists may feel at home with its serviceable keyboard and numberpad.

The real story here is that HP has opted for Ubuntu – a certified option that should be free of incompatibilities between hard and software. Ubuntu is often seen as an alternative to OS X and Windows, an OS that in interface terms should be easy enough to get around. Finding the applications you need can be challenging, though. Office programs such as Word and Excel can be substituted by Libre or OpenOffice, and web browsing and email are easy with familiar cross-platform utilities. Games and entertainment come up short; look around and you will find titles such as Half Life for Linux.

Ubuntu has some issues here – switchable graphics and TPM security module are not supported. The installed version is dated too, an odd choice from 2012, despite this laptop's build after the release of up-to-date 14.04 LTS. You can, of course, upgrade yourself.

We couldn't benchmark with the usual Windows programs, but the 28nm AMD chip is roughly comparable to a four-year-old Intel Core i5. Our usual battery benchmark also proved problematic as the Wi-Fi performance was so terrible, causing constant crashes. One driver update later, the laptop could run with wireless but slowly, less than 10Mb/s, stuttering the video playback.

AMD-powered laptops don't fare well in power efficiency, but this Ubuntu laptop proved even shorter lived than usual. Streaming over Wi-Fi our usual test video played for just one hour 24 minutes. Repeated without wireless, it lasted three hours 13 minutes.

VERDICT: It may be cheap but out of the box, the ProBook won't suit many users. A newer Ubuntu or Windows operating system may help, but it's not one for the typical untutored budget PC buyer.

TOSHIBA SATELLITE CL10-B-100

£199 inc VAT • toshiba.co.uk

Build	★★★★☆
Features	★★★½☆
Performance	★★½☆☆
Value	★★★★☆
Overall	★★★★☆

Small and extremely lightweight, the Satellite CL10-B-100 is an 11.6in budget laptop aimed at buyers who may be tempted by the lure of a Google Chromebook. Compared to even other cheap systems it is limited in performance by the low-power Intel Celeron processor and frugal 2GB memory, the latter unable to be upgraded. But with the help of Microsoft's free Windows 8.1 with Bing, the £199 price is keen.

Its flash storage is a welcome choice, even if that's a paltry 32GB eMMC card, with less than half that size actually remaining after the OS, recovery partition and sponsored bloatware – including Microsoft Office, CyberLink Media Player, Evernote, WinZip and McAfee – that together take up precious gigabytes of the tiny drive space.

You can supplement storage either with the time-limited offer of Microsoft OneDrive online space, or by taking advantage of the SDXC card slot to easily add, say, 64GB local storage for under £30.

Build and design

At just under 1.1kg in weight and measuring 20mm thick, the CL10 is a particularly totable slice of laptop, and despite the price build quality is very good. The top deck is smooth plastic with champagne gold finish, the underside a matching but textured moulding, while the lid back has a gloss finish over the same colour.

As you open the lid, the Toshiba's back is lifted a few millimetres – disconcerting but affording a little more rake that makes typing easier. The keyboard has undersized rectangular keys that we found trickier to type on than full-size keyboards. The action is good though, with positive clicks and a firm unyielding deck for support. The trackpad is a mixed bag – accurate enough but small in size. Its real buttons are a merciful relief from low-grade buttonless trackpads that are becoming ubiquitous.

Connectivity is somewhat reduced at two USB, one each 3.0 and 2.0, an HDMI port and SD card slot. Wi-Fi connections will be slowed by the single-stream 11n adaptor.

Performance

Like the Celeron-fulled Acer Extensa, we found raw performance trails that of older smartphones, with Geekbench 3 reporting 1043 and 1824 for single/multi-core modes. The PCMark 8 Home score was around the same too at 2732 points – there may be flash storage inside, but eMMC cards as used in phones and tablets are little better than slow hard disks. Small files move faster though, improving system responsiveness.

Graphics measured better than the Acer despite the same Intel HD Graphics and less memory, averaging 26fps in Batman at its native screen resolution, and 30fps at 720p.

Screen quality appeared better than others in this group, in part because the low 1366x768-pixel count was squeezed into a smaller panel, giving tighter 135ppi. And while colour and contrast ratio were poor (61 percent sRGB and 80:1) we found this glossy screen less irritating than competitors.

VERDICT: The little Toshiba has the best build and weighs less than half that of most budget laptops. It may not measure well in benchmarks but the flash drive means the machine feels more responsive in normal use. Add your own SD card and the CL10 becomes viable.

Conclusion

Budget laptops under £500 can appeal to the truly impecunious, such as students and those on low income. Don't jump to buy one if you're just trying to scrimp on a commodity portable though, unless your personal time is unlimited or not valued, as you'll have to invest extra precious hours in using and maintaining them. Take the Dell Vostro for example, with up-to-date Intel processor yet still wasting our time in slow Windows patching and long reboots.

You can dodge Windows altogether of course – take the eBuyer ProBook with its Ubuntu Linux. Yet despite its Linux preinstallation by HP, we found the Wi-Fi performance woefully inadequate, while the dated OS version means you're advised to upgrade to newer Ubuntu 14.04 LTS or resort to Windows, even if that will cost you another £80 and a day of your life installing it and all the essential drivers.

Two of these laptops bare cost to the bone by exploiting Microsoft's free Windows 8.1 with Bing, itself no worse that regular paid-for Windows, and using humble Celeron chips and cheapest possible parts. The Toshiba is the better deal of the two, super light and with useful runtime, even if the 2GB fixed memory may severely cramp your working style. The Acer has plenty of memory in comparison but build and quality control disappoint.

Whichever you choose, be prepared for fuzzy, washed-out screens from almost all cheap laptops, with screen quality easily sidestepped in advertised specs lists.

The Asus and Dell laptops are better all-round bets. Dell has managed to fit the latest Intel chips, delivering slightly better number-crunching speed although we found routine tasks still betrayed budget performance, and battery life was bizarrely shortest after the wayward HP ProBook.

The Asus X555LA meanwhile had around five hours battery and enough pace from its last-generation Haswell processor to keep things moving, and includes modest gaming skills in a reasonably built package.

How we test

Application performance

We test with Futuremark's PCMark 8 v2.0 benchmarking suite. The, results are divided into Home and Work tests.

The Home benchmark reflects command tasks for typical home use with lower computing requirements such as web browsing and low-end gaming. The Work test is geared towards office work tasks like creating documents, web browsing, spreadsheets and video conferencing. This test does not stress the gaming and multimedia capabilities of the laptops in this group test.

Minimal gaming

Budget laptops are capable of some basic gaming. We've tested the systems in this group test by running two games – Batman: Arkham City and Tomb Raider 2013. This is enough to reveal differences in gaming performance.

Power consumption

We measure the power consumption of each PC while it's idling at the desktop and after it has settled down following bootup. We then measure each system's consumption while pushing it to the limit by running Prime95 with the maximum number of available threads, and at the same time running the storage test from PCMark 7. Real-world power consumption will fall somewhere between these two measurements, depending on use.

Display quality

We use a Datacolor Spyder4 calibrator to measure colour gamut and accuracy, contrast and uniformity across the surface of the screen. We also take into account the viewing angles afforded by the display technology used by each panel.

Subjective assessment

It's not all about speed. We also pay close attention to the physical characteristics of each all-in-one PC, its noise output and build quality, and take note of important features such as the quality of components.

Warranty and support

Differences in warranty terms can affect our verdict. Obviously, longer warranties are better, but we also look at the terms and conditions – specifically, whether faulty systems must be returned to the vendor at your own cost, and if both parts and labour are included. In-home support is particularly welcome. ☒

	ACER £280 inc VAT (£233 ex VAT) ★★★☆☆	ASUS £300 inc VAT (£250 ex VAT) ★★★★☆ PC ADVISOR BEST BUY	
Model	Extensa EX2508-C3QZ	X555LA-XX290H	
OS	Windows 8.1 with Bing	Windows 8.1	
Display size	15.6in (1366x768, 100dpi)	15.6in (1366x768, 100dpi)	
Display type	TN matt anti-glare	TN gloss	
Processor	2.16GHz Intel Celeron N2840 (2.58GHz Burst) 2C, 2T	1.9GHz Intel Core i3-4030U (no Turbo) 2C,4T	
Graphics	Intel HD Graphics	Intel HD Graphics 4400	
Memory	8GB (1x 8GB) 1600MHz DDR3	4GB (1x 4GB) 1600MHz DDR3	
Storage	1TB 5400rpm HDD (WD Blue, WD10JPVX-22JC3T0)	1TB 5400rpm SATA HDD (Seagate ST1000LM024)	
Ethernet	Gigabit ethernet	Gigabit ethernet	
Wi-Fi	802.11b/g/n	802.11b/g/n (Qualcomm Atheros AR9485)	
Bluetooth	Bluetooth	Bluetooth 4.0	
Optical drive	DVD±RW DL (Matshita UJ8HC DVD-RAM)	DVD±RW DL (LG HL-DT-ST DVD-RAM GUCON)	
USB	1x USB 3.0, 2x USB 2.0	2x USB 3.0, 1x USB 2.0	
Video ports	HDMI	HDMI, VGA D-Sub	
Other	Kensington lock slot	Kensington lock slot	
Card slot	SD	SDXC	
Speakers	Stereo	Stereo	
Webcam	0.3Mp	0.3Mp	
Microphone	Single mic	Single mic	
Audio IO	3.5mm headset jack	3.5mm headset jack	
Keyboard	UK tiled with numberpad	UK tiled with numberpad	
Trackpad	Buttonless multitouch 106x78 mm	Buttonless multitouch, 104x73mm	
Battery	36Wh lithium-ion, non-removable	37Wh lithium-ion polymer, non removable	
Power charger	45W mains charger with IEC C5 inlet	45W wall charger	
Dimensions	382x257x26.2mm	381x257x26.3mm	
Weight	2247g	2122g	
PERFORMANCE			
Geekbench 3	1053/1849	1906/3981	
PCMark 8			
Home (conventional/accelerated)	1237/1239	1985/2028	
Work (conventional/accelerated)	1673/1319	2362/2957	
Batman: Arkham City			
1280x720, Low	14fps	30fps	
1280x720, Medium	N/A	28fps	
1366x768, Low	12fps	26fps	
1366x768, Medium	12fps	25fps	
Tomb Raider 2013			
1280x720, Low	12.4fps	31.3fps	
Battery life	7 hours 8 minutes	5 hours 17 minutes	
Display			
sRGB/Adobe RGB (percent)	57/43	61/46	
Contrast ratio	80:1	80:1	
Delta E	3.43	5.43	

	DELL £442 inc VAT (£368 ex VAT) ★★★★☆ PC ADVISOR RECOMMENDED	HP £300 inc VAT (£250 ex VAT) ★★★½☆	TOSHIBA £199 inc VAT (£165 ex VAT) ★★★★☆
	Vostro 15	ProBook 455 G2	Satellite CL10-B-100
	Windows 8.1 Pro	Ubuntu Linux 12.04.5 LTS	Windows 8.1 with Bing
	15.6in (1366x768, 100dpi)	15.6in (1366x768, 100dpi)	11.6in (1366x768, 135ppi)
	TN matt anti-glare	TN matt anti-glare	TN gloss
	2.2GHz Intel Core i5-5200U (2.7GHz Turbo) 2C, 4T	1.9GHz AMD A10 7300 (3.2GHz Turbo) 4C, 4T	2.16GHz Intel Celeron N2840 (2.58GHz Burst) 2C, 2T
	Intel HD Graphics 5000	AMD Radeon R6	Intel HD Graphics
	4GB (1x 4GB) 1600MHz DDR3	8GB (1x 8GB) 1600MHz DDR3L	2GB 1600MHz DDR3L
	500GB 5400rpm HDD (WD WD5000LPVX-75V0TT0)	1TB 5400rpm HDD	32GB eMMC
	Gigabit ethernet	Gigabit ethernet	None
	802.11ac (Intel Wireless-AC 3160)	802.11b/g/n 1x1 MIMO (Realtek RTL8723BE)	802.11b/g/n 1x1 MIMO (Realtek RTL8723BE)
	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
	DVD±RW DL (PLDS DU-8A5LH)	DVD±RW DL	None
	1x USB 3.0, 2x USB 2.0	2x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0
	VGA D-Sub	HDMI, VGA D-Sub	HDMI
	Kensington lock slot	Kensington lock slot	Kensington lock slot
	SD	SDXC	SDXC
	Stereo	Stereo	Stereo
	0.9Mp	0.9Mp	0.9Mp
	Single mic	Single mic	Single mic
	3.5mm headset jack	3.5mm headset jack	3.5mm headset jack
	UK tiled with numberpad	UK tiled with numberpad, spill-resistant	UK tiled
	Buttonless multitouch, 105x80mm	Two-button multitouch, 103x54mm	Two-button multi-touch, 85x44mm
	40Wh lithium-ion, removable	31Wh lithium-ion, removable	26Wh lithium-ion, non-removable
	45W mains charger with IEC C5 inlet	45W mains charger with IEC C5 inlet	45W mains adaptor with IEC C7 inlet
	378x259x24.5mm	375x263x26.7mm	315x216x20.3mm
	2359g	2250g	1064g
	2623/5177	N/A	1042/1824
	2296/2732	N/A	1273/1273
	2702/3734	N/A	1786/1408
	29fps	N/A	13fps
	27fps	N/A	13fps
	25fps	N/A	12fps
	24fps	N/A	12fps
	34.5fps	N/A	10fps
	3 hours 51 minutes	1 hour 24 minutes	6 hours 16 minutes
	59/43	N/A	61/46
	60:1	N/A	80:1
	3.78	N/A	3.14

Apple Pay security

Nik Rawlinson looks at whether there are any risks using Apple Pay

As you will no doubt have gathered, Apple Pay is now available in the UK. You can use it to buy a coffee at Starbucks, pay for journeys on the London Underground, or settle your bill for a cheeky Nando's with nothing more than a tap of your iPhone or Apple Watch on a regular contactless reader. You can also use it in apps – but not on websites – to pay for downloads, tickets, and physical products scheduled for delivery.

But is it Apple Pay safe? The short answer is yes. Apple wants us to think of its payment gateway the same way we think about PayPal or Visa. After all, it's only through gaining our trust that it will win our custom, and without our custom it won't earn commission from retailers.

To that end, it's spent a lot of time and money on making things secure. It's edging us all towards using six-digit passcodes rather than four, and the only iOS devices through which you can authorise a payment are those with NFC (Near Field Communication) and the device-unique Secure Element chip built in. So, if you don't have an iPhone 6, 6 Plus, iPad Air 2, mini 3 or Apple Watch, you'll have to upgrade – or stick to alternative payment options.

Card details

If you already have a credit- or debit card registered with your Apple ID, you can add it to Apple Pay directly, so you don't need to send it again over the air. If not, or you want to add a new card, Apple encrypts the whole process from end to end, wrapping up the card details in a unique identifier before handing it over to your card operator.

Assuming you are credit-worthy, the operator sends back an authorisation key that's stored in the Secure Element in the iOS device or Watch. Secure Element is an industry standard chip, so you're not relying on just Apple to maintain the technology, and because each one is unique to the device in which it resides, it ties your device to your account. That way, the card processor knows exactly whose account to debit without

We can't vouch for the security of every NFC-enabled device, but the checks and controls built into Apple Pay make this kind of attack all but impossible

passing your details over the network again or handing them to the retailer itself.

Safety

So, the transaction is secure in transit as it's effectively useless data, but that's only half of the equation. Apple has also come up with a way to keep the physical interaction between your device and the reader safe, too.

Using Apple Pay in a real-world setup requires you to hold your iPhone or Apple Watch against the shop's contactless card device (you can't use an iPad in store). If you're using the Watch, you then press the side button twice to authorise the transaction or, if you're using the iPhone, you enter your passcode or use Touch ID to scan your finger.

As passcodes can now comprise more than just four digits, they're more secure than using a regular PIN, which has only 10,000 possible combinations if you include 0000.

Fingerprints offer even more protection. The likelihood of finding two people with the same pattern of loops and whorls stands at around one in 64,000,000, which means that you're about four times as likely to win the National Lottery as you are to have a fingerprint that matches anyone else – and the chance of ever meeting that person... Well, it's unlikely and it's even more unlikely that they will get hold of your iPhone.

Fingerprinting isn't a precise science, though. Speaking to the Daily Telegraph in 2014, Mike Silverman, who rolled out the Metropolitan Police's first automated fingerprint detection system, explained that the process of identifying a print is more complicated that we might imagine. "No two fingerprints are ever exactly alike in every detail, even two impressions recorded immediately after each other from the same finger," he said. "It requires an expert examiner to determine whether a print taken from crime scene and one taken from a subject are likely to have originated from the same finger."

This has led to some miscarriages of justice when experts have declared two different prints to match, so it's perhaps fortunate that the detection performed by your iOS device is entirely driven by algorithms and doesn't rely on the skill of a trained eye.

Hack protection for Apple Pay

The fact that you need to authorise the transaction before it can complete – and that your card details are never involved in the process – protects you from drive-by NFC hacks.

The Near Field Communication system is designed to connect quickly and easily to nearby devices, such as contactless card readers, with which it can share data. This has led some to posit that it would be possible to wave a card reader against your pocket and process a transaction automatically. This is exactly how NFC-based transport tickets work, allowing you to open a platform gate by tapping your card on a reader without entering your PIN.

We can't vouch for the security of every NFC-enabled device, but the checks and controls built into Apple Pay make this kind of attack all but impossible, as you'd have to physically authorise the transaction, and therefore be aware of it taking place.

How the transaction is authorised

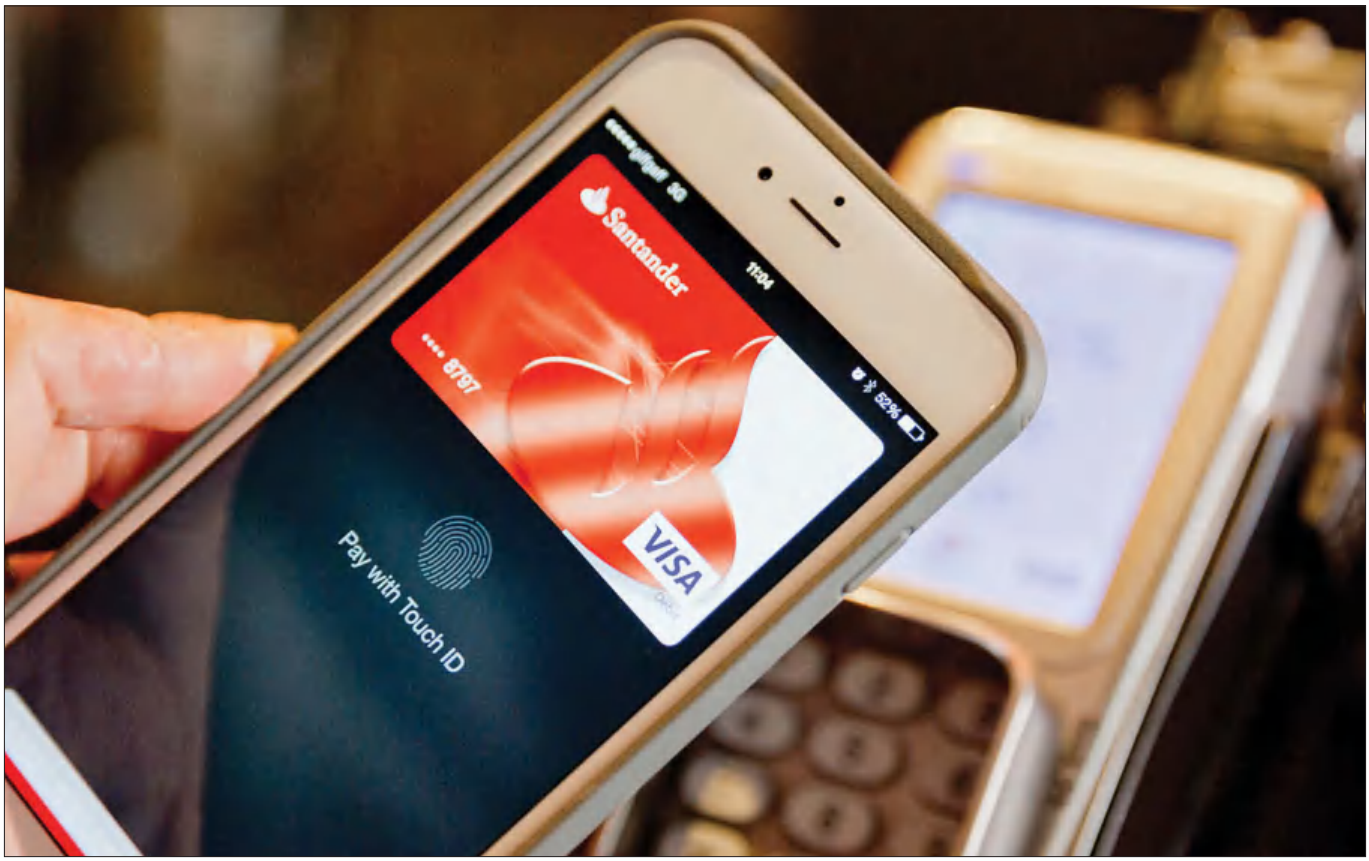
Once your code or finger are recognised, Apple Pay sends your card provider the key from your Secure Element, plus the amount you're spending and the merchant identifier, which is a double check, unique to that outlet, that ensures only they can receive the payment.

The retailer doesn't need to see your card details, and neither Apple nor your bank gets to find out what you're buying, so either half of the transaction is kept secret.

Lost device

If you lose your Watch or iOS device, putting it into Lost Mode through Find my iPhone suspends the key stored in your Secure Element, so nobody can make purchases on your account.

And despite all this, if you still fall foul of a scam – which will almost certainly be a case of human error – the most you can lose in the early days is a paltry £20. That will rise to £30 in the autumn when contactless payment limits not just for Apple Pay, but for all cards, will be boosted by 50 percent.



PC ADVISOR 20 YEARS 1995 – 2015

Hands On

PC Advisor Hands On

Connect Now!

Installing a modem

To communicate with other computers you're going to need a modem. We'll show you how to connect using an internal card.

Installation of an internal modem can cause even an experienced computer user to run for cover. Internal modems have ranked among the most difficult pieces of hardware to install, fraught with IRQ and COM port conflicts.

While the installation procedure has become far easier in recent years, it still can be a daunting experience, depending on your computer's

A modem-equipped computer opens a world of new possibilities.

composition. Some users will install an internal modem with plug-and-play ease; others will spend hours sweating over minuscule DIP switches.

People who use a modem to go online, though, will testify that the toils are worthwhile. A modem-equipped computer opens a world of new possibilities. We'll provide step-by-step instructions for installing an internal modem and give advice on dealing with installation headaches.

(NOTE: While most internal modems connect to the computer in the same manner, usually the locations and setting of COM ports and IRQs is different. We'll explain a common installation scenario, but you may encounter some different situations. Refer to the glossary at the back for an explanation of technical terms.)

PC Advisor tips

• Modem Technology

A **modem** or modulator/demodulator, lets your computer exchange information across telephone lines with another modem. When transmitting information, the modulator changes the computer's digital signal to an analog signal which allows it to be transferred over telephone lines. When receiving information, the demodulator translates the analog signal back into a digital signal the computer can use.

Some modems can exchange data only; others, called fax/modems, can send and sometimes receive fax messages. Other modems add voice capabilities, letting you record messages on your computer.

Modems are available in internal and external versions. An external modem connects to a port on the back of your computer and sits on your desk. If you'd rather save the port (and desk space), you can install an internal modem which is contained on an expansion card.

• IRQ Nightmares

The physical installation of an internal modem isn't too difficult, but making your computer communicate with it can be a nightmare because of conflicts with **IRQ** settings. An IRQ, or interrupt

PC Advisor Hands On

request line, is the hardware line over which devices (such as keyboard, disk drive, or modem) send interrupts, or requests, for service to the microprocessor. IRQs are assigned different levels of priority, allowing the microprocessor to determine the importance of each request. Unless hardware devices each have a different IRQ priority setting, conflicts may occur (such as a malfunctioning modem).

PC Advisor tips

Devices that won't be in operation at the same time can have the same IRQ setting, but, in the interest of avoiding catastrophe, it's best to give each device a unique IRQ setting. A COM port is a serial communications port. Different hardware devices connect to the serial ports, and the operating system uses different COM port designations to identify the connections. Two hardware devices cannot use the same COM port.

External modems, used in tandem with software, take care of the settings for you, making them simple to install. While internal modems have become easier to install, you may still encounter some IRQ or COM port conflicts. Many times, the modem's factory settings will prevent these conflicts, but if they don't, you'll have to correct the settings manually. Obtaining the ease-of-use associated with an external modem isn't free, however: they usually cost £15 to £50 more.

• Preparing for Installation

Before attempting any hardware installation, it's important to read through the user manual and installation guide provided with the product to familiarize yourself with the different components and any odd configurations. Many user guides will describe exactly what types of tools you need. A Phillips screwdriver is a necessity when installing an internal modem. Don't use a magnetic screwdriver, though; a magnet is a deadly enemy to computer components and data.

To obtain communications capabilities, you'll need to install a software package. As the software installation procedure probably will make changes to your Autoexec.bat, Config.sys, and Win.ini files, you should make a backup copy of these files prior to beginning any installation. Make certain you have enough hard disk space available for the software.

(NOTE: Keep your expansion card inside its static-resistant packaging until you are ready to install it. A build-up of static electricity as well as dirt, salt, and oil from your hands can damage the card.)

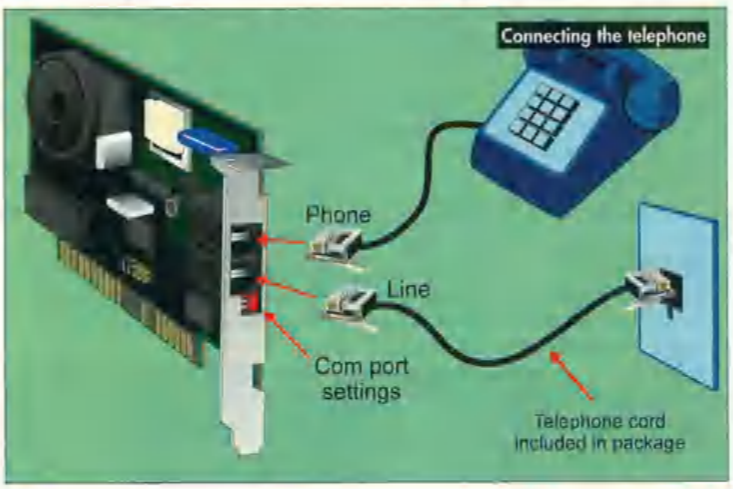
1 Unplug the computer and monitor at their power sources. Move the monitor out of the way and ensure you have plenty of desk space. Some cases have clips, but most are held on by screws. After removing the case, make sure you ground yourself by touching the metal part of the case near the power supply before touching any of the computer's internal components.

2 Most internal modems can use either an 8-bit or 16-bit expansion slot, though some have to use the longer 16-bit slots which have room for two connectors. If possible, you'll want to install the modem in a slot that has empty slots on either side, which will help reduce electrical noise and interference that sometimes, although rarely, inhibits modem communications.

3 After you've selected a suitable expansion slot, you'll need to remove the corresponding metal plate blocking the slot at the back of the computer. Save the screw, which you'll need to fasten your modem in place. It's useful to keep a small jar or box handy so that the relevant screw won't be misplaced when you most need it.

4 Remove the expansion card from its packaging, handling it by the edges as much as possible. Avoid touching the components on the card or the pins on the connector. Line up the connector on the expansion slot. The connector should slide almost entirely into the slot, leaving only the top of the gold pins visible. It's a tight fit, so you might find it easier to roll the card into the expansion by placing a corner in the expansion slot first and then fitting the remainder of the connector into the slot. Don't jam the expansion card into its slot; you could damage the components. *(See Diagram, "Installing the card")*

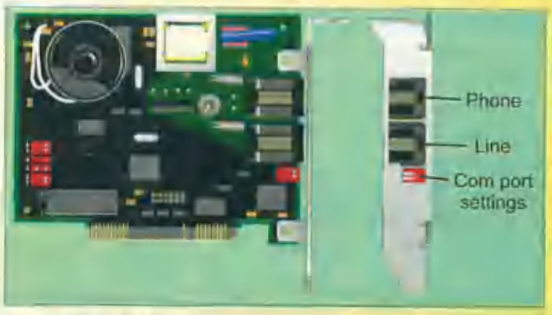
5 If you've properly installed the modem expansion card, the metal plate on the edge of the card should align with the empty slot in the back of the computer's case. You should be able to connect the metal plate of the modem expansion card easily to the computer's case with



Hands On

PC Advisor Hands On

Changing Modem Settings



You may run into COM port conflicts if you have a printer or network connection, especially if that connection occupies COM2, which is the default for most modems. COM1 usually isn't available for a modem because it hosts the mouse connection. If your modem won't work on COM2, you'll have to change the modem's settings.

Most newer modems and those from manufacturers use **DIP (dual inline package)** switches to configure the COM port and IRQ settings. Some need to be flipped on or off (like an electric light switch), while others slide into position. Some modems contain pins with a plastic jumper switch. You must move the jumper switch to cover various pins to change the COM port settings. Mainstream modems usually do not use the latter sort of pins.

The configuration of the DIP switches - which you'll find in groups of two, four, or six, depending on your type of modem - determines the COM port and IRQ settings. In the future, such hardware installations may be truly plug-and-play, with any changes being made via software. Until then, hardware settings often still need to be altered manually.

The DIP switches can be located in various places on the expansion card (see illustration). Many times, the factory settings will suffice for installation of your modem. For example, we installed a Hayes Accura modem, and the various DIP switches for each COM poet were printed on the modem's metal dust cover. On others, the potential DIP switch settings may be printed in the installation guide. If your modem doesn't contain any such documentation, you have two choices: trial-and-error or call technical support.

the screw from the original backing plate. Don't use the screw to force the modem to line up properly; it should fit properly in the expansion slot without the screw in place. If the expansion card isn't aligned properly, remove it and try again. Look at the other expansion cards in the computer for guidance.

6 To check the card's alignment, connect the telephone line to the modem. The jacks at the back should be visible - if they are partially or completely hidden, the board is incorrectly installed.

On most modems, the incoming phone connects to the jack labelled "line", and the phone to the second jack labelled "phone". If it is connected properly, you should hear a dial tone when you pick up the receiver *(See Diagram, "Connecting the phone").*

7 After connecting your modem to the phone, make certain the other expansion cards haven't been jostled out of place accidentally and replace the case cover. You could, however, delay replacing the cover until after Step 9 (once you've tested the modem to ensure it is working properly).

8 Reconnect the cables and turn on your computer. You should notice no changes as it boots.

The easiest and quickest way we found for checking the status of your modem involves using the Terminal application in Microsoft Windows. (If you're a DOS user, skip ahead to step 9.)

After entering the Windows environment, double-click on the Accessories program group in the Program Manager. Double-click on the Terminal icon.

You'll probably see a dialog box giving you a chance to select a COM port for your modem. Most modems will use COM2, so you should choose that option. If you don't see the dialog box and end up at the Terminal screen, your modem is probably ready to work. Try typing a command followed by ENTER. If the Terminal screen responds with an OK, your modem is probably ready.

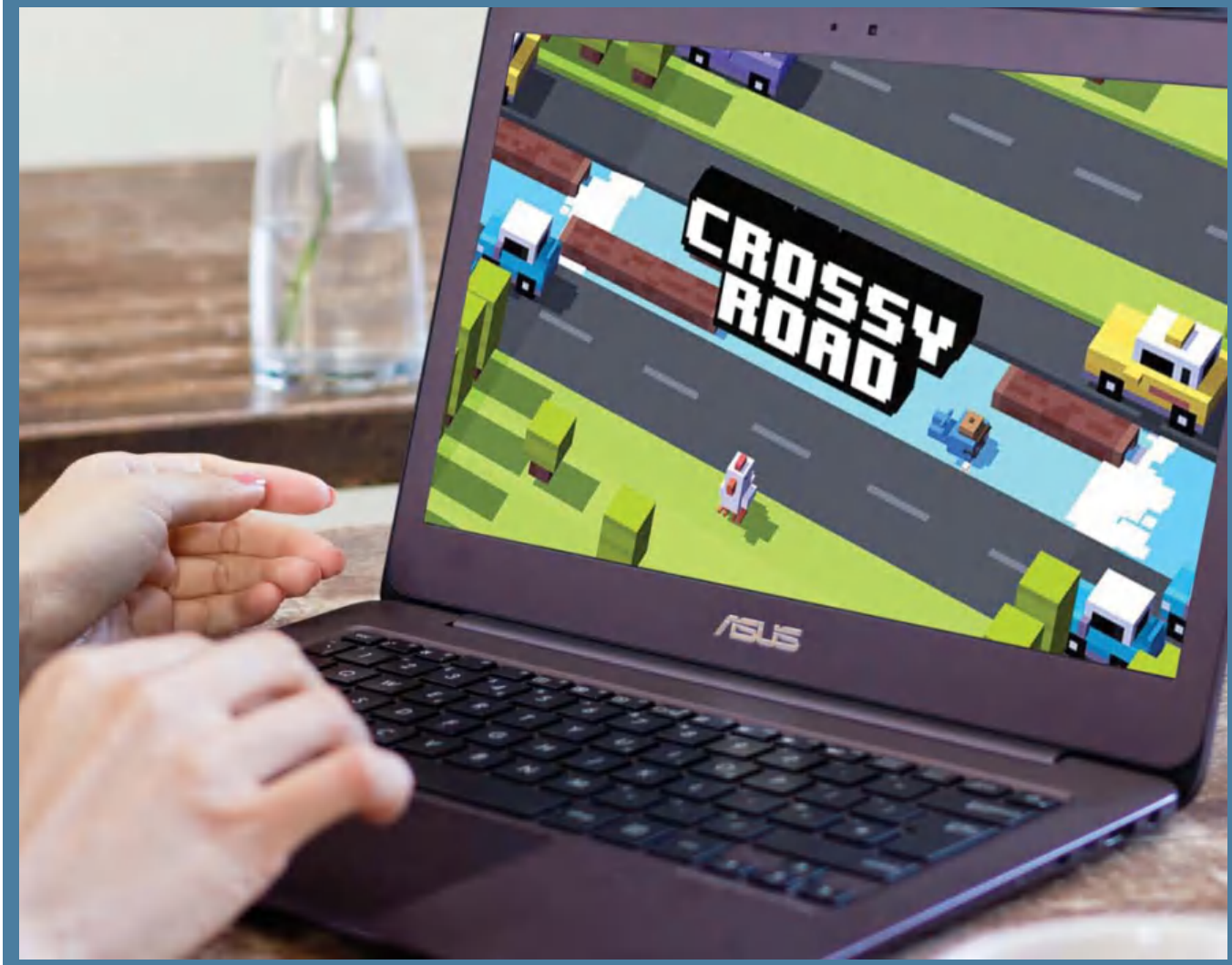
If you can't type on the screen or if you receive an error message when you try to select COM2, your modem may be on a different COM port. Click on the Settings menu and select Communications. In the Communications dialogue box, try selecting your other COM ports, one at a time. If none of them work, the factory settings on your modem won't work with your system, and you'll have to tackle the dreaded DIP switches. Depending on your modem brand, this may not be as daunting as it sounds. *(See "Changing Modem Settings" for advice on fixing this problem.)*

9 If it appears your modem is working properly, you can now install your communications software. (Many modems include such software as part of the package. You can buy separate packages as well.) Most major software packages will find your modem for you; you'll only need to specify the brand and speed of your modem. Others will require you to give the modem's location, which you know if you use the Terminal program.

With most communications software and online services packages, you can register the software through your modem. This procedure will give you a final chance to test drive your modem and ensure it's working properly. PC Advisor

FROM ISSUE 1

HAYES
ACCURA MODEMS MAKE
COMMUNICATION
BETTER FOR ALL YOUR INFORMATION
NEEDS
A Hayes modem for under £180 RRP*
The new Hayes™ ACCURA™ fax modems allow any small business or home user to keep in touch with the outside world.
● Send and receive faxes using your PC
● Broadcast a standard fax to your customer base at off-peak times
● Keep up-to-date with what's happening in the world by using the Internet or other on-line information services
● Access banking and credit checking facilities from your PC
● Exchange files with colleagues based away from the office
● Hayes unique AutoFAX facility allows for automatic switching between incoming fax and data calls
● All ACCURA fax modems are supplied with everything that you will need to get started including: serial cable, telephone adaptor, fax software, data software
Choose from the ACCURA 144 + FAX144 or ACCURA 288 V.34/V.FC + FAX. The 144 model is intended for general communications needs while the much faster 288 model is the ideal choice if you need to transfer large amounts of data or if you need to communicate internationally.
Cut Your Costs and Lower Transmission Time with Hayes ACCURA Modems
Time | Cost | RRP
ACCURA 288 V.34/V.FC + FAX | 120 sec. | 16.8p | £249
ACCURA 144 + FAX144 | 240 sec. | 33.6p | £179
One Megabyte data file (400 pages) at BT's National Day Time (B1) call rate
You may also be surprised to learn that access to data and fax communications comes at a very down to earth price. So, for better communications, get talking to one of the suppliers below or your local dealer.
Byte Computer Superstores, Currys, Dixons, Icon Computer Superstores, The Link, PC World, Action (0800 333 333), Inmac (01344 301 144), MicroWarehouse (0800 181 000) or MISCO (01933 400 400).
Hayes
Reader Response 16
HIGH PERFORMANCE LOW COST MODEMS FROM HAYES
* Excluding VAT



Record games with Game DVR in Windows 10

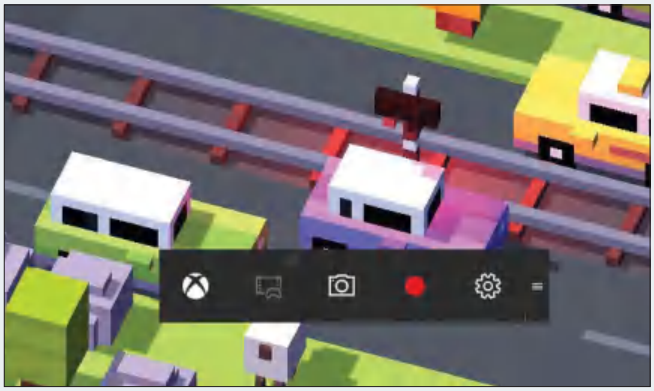
Jim Martin reveals how to use Game DVR and the Game Bar – both part of the Xbox app

We're big fans of Windows 10. The interface tweaks and new features – plus the free upgrade for most users – make upgrading to the operating system a no-brainer. One of the new features lets you record any game you play in Windows and take screenshots.

There's currently no way to upload it directly to YouTube or any other video-hosting site, nor to stream your games live to the internet. To do that you'll need a third-party app such as Twitch.

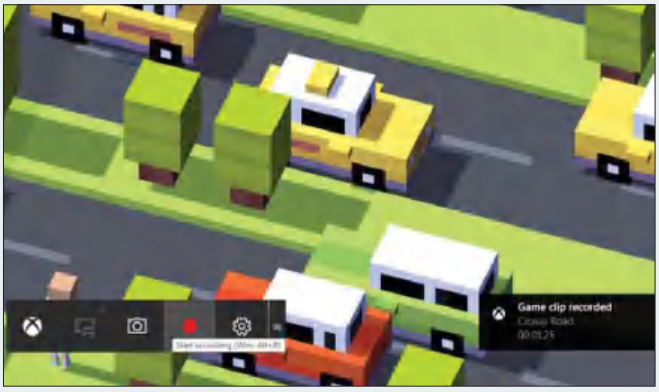
Game DVR works in a similar way to the same feature on the Xbox One. On the console, you double-tap the Xbox button to bring up an overlay, which also lets you press the 'X' button to record the past 30 seconds of gameplay, since the Xbox One is always recording what you're playing. It's ideal for capturing something interesting that just happened.

With Windows 10, you get a new app called Xbox. This lets you check on your achievements when you're logged in with the same ID you use on your Xbox, as well as message friends. It also houses Game DVR where you can find screenshots and video clips from both your Xbox One and games you've played on your Windows 10 machine, be that a tablet, laptop or PC.



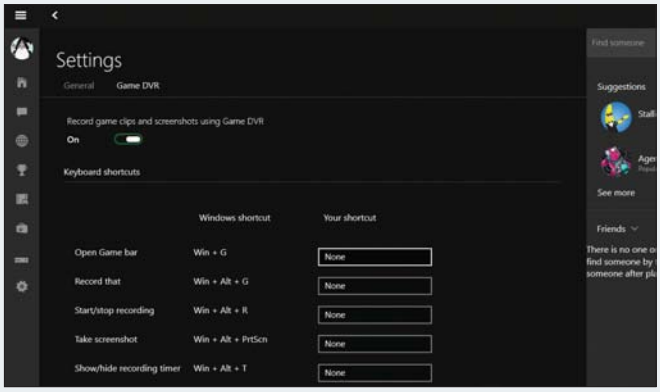
START In any game, press the Windows key along with G to bring up the Game Bar. This is a little like the Snipping tool overlay (see page 102) and offers a few controls for recording games. It doesn't matter if it's a Steam game, a classic Windows game or something from the new Windows Store.

2 The game will continue to play in the background, so you may want to pause it. Then, press the red record button (shown above) to begin the recording. A timer will start and after a few seconds the Game Bar will hide and you'll see only a small red timer at the top-right of the screen. In this early build of Windows 10 (10130), the timer display was corrupted.

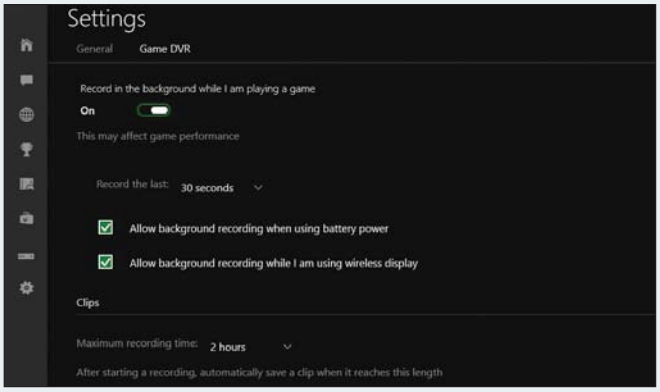


3 To stop the recording, press Win+G and tap or click on the red square. A message confirms the clip has been recorded and it's automatically saved in your user account's Videos folder.

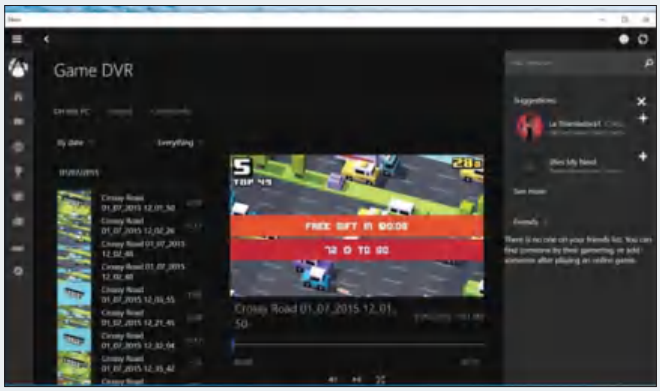
You can use the shortcut Win+Alt+R to start and stop recordings without having to bring up the Game Bar and click on it. This way it's easier to record clips while you're in the middle of a game.



4 You'll notice that one of the icons on the Game Bar is greyed out – the Game DVR icon. Tapping it when it's live automatically saves the past 30 seconds of gameplay. To enable it, launch the Xbox app and click on the settings icon at the bottom of the left-hand menu. Just type Xbox in Windows 10's search box in the taskbar to launch the app.



5 Scroll down the list of options until you find 'Record in the background while I am playing a game'. It's advisable only to enable this when necessary as it does have an impact on game performance and could make gameplay choppy if your machine doesn't have enough spare processing power. Below the switch is a drop-down menu to change the amount of time to save.



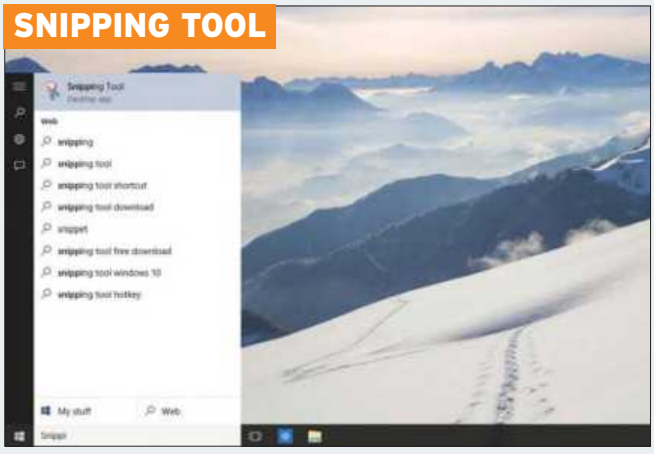
6 If you want to review screenshots and video recordings in the Xbox app, click on the Game DVR icon in the left-hand menu. There are three sections: On this PC, shared and community. Shared includes clips you've recorded on your Xbox One when logged in with the same Xbox gamertag or Microsoft ID. Click on a clip it will appear on the right. Use the playback controls to watch it.

7 Below the playback controls is a Trim link. Click this to make the blue markers appear. Just drag these to the positions where you want the video to start and end. Then click Trim original or Save copy depending on what you want to do. ☒

Take a screenshot in Windows 10

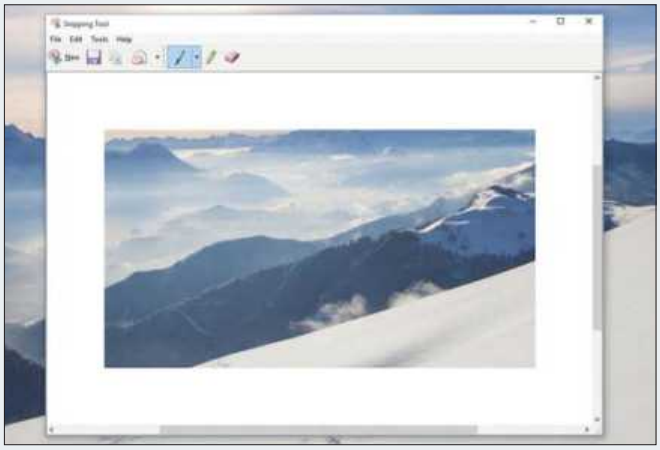
Roberta Alidori shows how to take a screenshot using Windows' Snipping Tool or the Paint program

SNIPPING TOOL

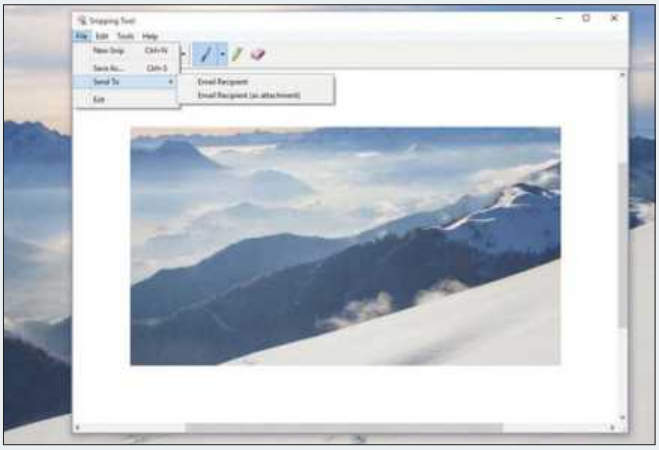


START Go to the Start Menu and type 'Snipping Tool' in the Search box. Click on the Snipping Tool icon that appears.

2 To take a screenshot, you will need to click on New. To customise the shape of the snapshot, click on the arrow beside the New button.



3 Next, drag the cursor around the area you want to snapshot. A new window will be opened with the image you wanted to retain, now click on File.

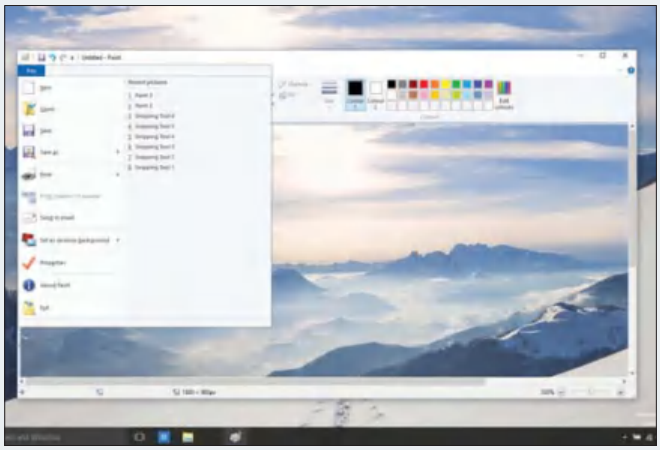


4 A new window will be opened with the image you wanted to retain, now click on File. Finally, scroll down and click on 'Save As' if you want to save the image or on 'Send To' if you want to email the screenshot.

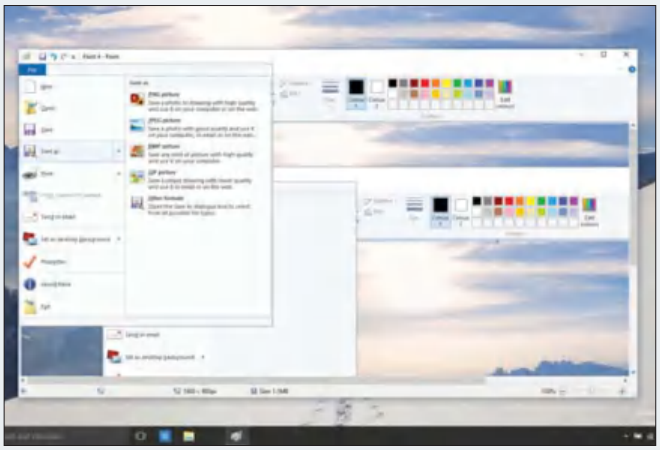
PAINT

START Press the button 'Prt Sc' on the right of your keyboard to take a full snapshot of your screen. You may need to hold Shift at the same time, depending on your keyboard. On a Microsoft Surface, press Fn+Win+Spacebar. Next, open Paint.

2 Click on the Paste button. You will then see the image you wanted to capture on Paint Clipboard.



3 You can select a portion of the screen and crop it if necessary. To save the screenshot or send it to someone, click on File.



4 Now scroll down and click on 'Save As' to save the screenshot or on 'Send in email' to email it. ☒

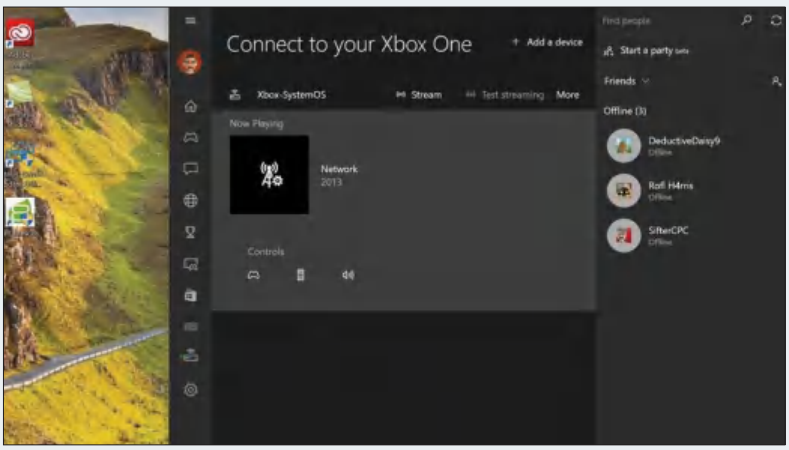
Play your Xbox One on a Windows 10 PC

Lewis Painter explains how you can use the Xbox app to play your Xbox One games on a PC

The Xbox app

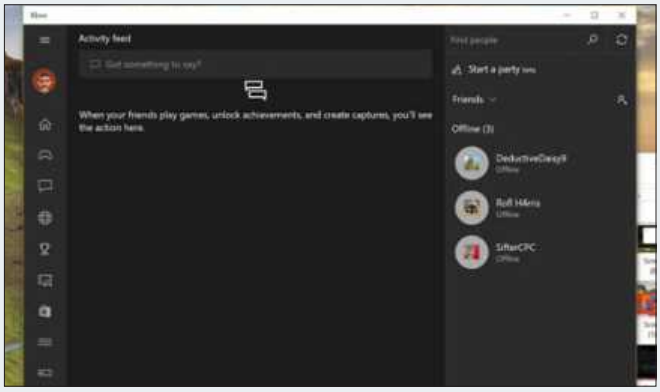
The Xbox app is an integral part of the Windows 10 experience for gamers as it allows you to do a number of activities that, until now, were only able to be completed directly on an Xbox One. The Xbox app allows you to control the admin side of your Xbox Live account, as well as join parties via your PC to talk to your Xbox One comrades. Windows is even boasting cross-platform multiplayer for certain games, including the upcoming RPG Fable Legends and third-person shooter Gigantic.

You can also use the Xbox app as a remote control for your Xbox One, with a swipe gesture interface for touch enabled devices and a standard button layout for those of us who don't have a touch-based input.



The Xbox app's best feature is its ability to connect to and stream games directly from your Xbox One to your PC from anywhere in your world, as long as you have an active Wi-Fi connection. Simply plug your Xbox One controller into your PC/laptop, connect to your Xbox and click 'Stream' to get going.

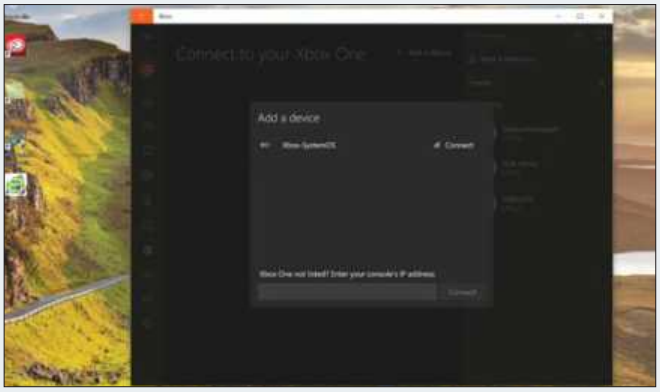
With Xbox gaming now available on PC, it only makes sense to include a DVR – and that's exactly what Microsoft has done. Now, you can quickly and easily record both gameplay videos and take screenshots while playing both Xbox and PC games.



START If you haven't already, download the Xbox app. It's free from the Microsoft Store.

2 Open the app and sign in, if it doesn't automatically. On your Xbox One, enable game streaming by going to Settings > Preferences and making sure that 'Allow game streaming to other devices' is checked.

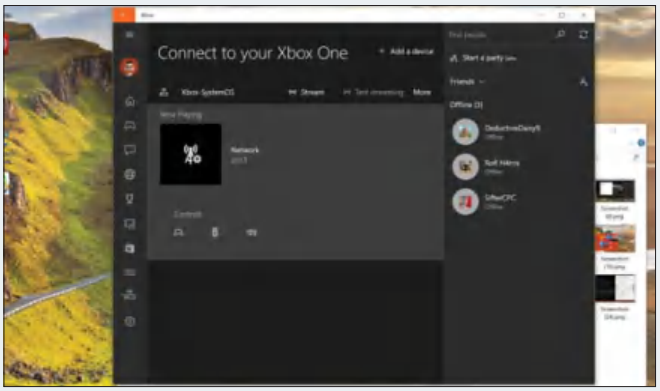
3 On the tabs on the left-hand side, you should see the 'Connect' tab (circled here) – click it.



4 Make sure your PC/laptop and Xbox One are both connected to the same Wi-Fi network, and your Xbox One is turned on. Your Xbox should appear automatically, but if not, you can still manually enter its IP address. Click 'Connect' to link to your Xbox One. Plug your Xbox One controller into your PC/laptop.

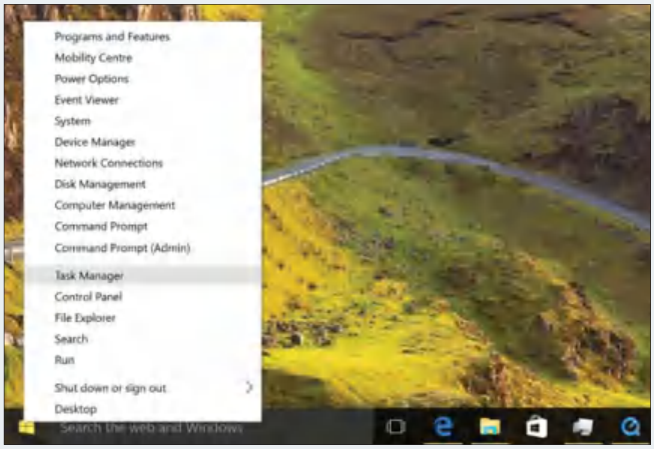
5 Click 'Stream' and you'll be gaming in no time. While you're streaming, you should see a toolbar at the top of the screen with a number of options, including a quick Home button, a microphone toggle and a button to stop the stream. The hamburger button displays an overlay with network bandwidth stats, which could be very useful when trying to troubleshoot your stream.

However, it's the last button that seems to be the most interesting (and most useful), especially for those of you with slower internet. This lets you adjust the bandwidth speed of the stream, which means if your stream is laggy, you can just turn it down to try and combat the issue. ☒

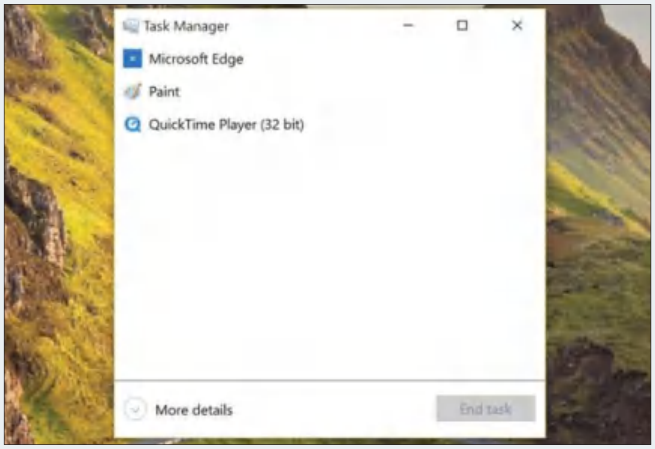


Change Windows 10's startup programs

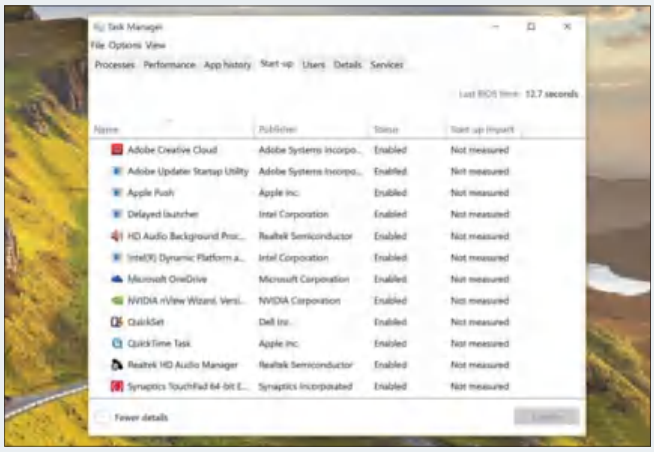
Martyn Casserly explains how to change Windows 10 startup programs using the Task Manager



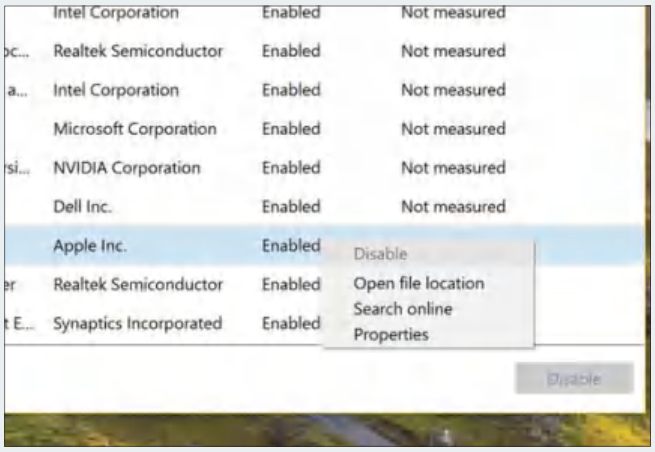
START To open the Task Manager, right-click on the Start button (the Windows icon) and choose Task Manager from the menu.



2 When the utility is first launched it will default to the programs that are currently running on your system. Click on 'More details' to see a wealth of information displayed. To find the startup items click on the tab along the top that is marked Startup.



3 This displays a list of everything that can load when you turn on your machine. Note the Status column, as not everything on the list is actually enabled. If an item it marked as Disabled then you can ignore it as it will not load in the startup sequence.



4 To remove apps from the startup sequence, right click on the relevant app, then select the Disable option from the pop up menu. The app will remain in the list, but will no longer launch automatically when you turn on your machine. ☒

Increase a smartphone's in-call volume

There's no setting for it in the menu, but Chris Martin reveals how to increase in-call volume

So you're having a phone call with someone and they're particularly quiet. It's not a bad connection though, it's your phone. You've probably searched through your smartphone's settings menu to find some kind of in-call control or volume slider, but you won't have found one because there isn't one. Instead, you will have found all kinds of other sound settings for things such as alarm volume, notification volume and more.

It might seem odd but the real answer to your question is that you can't adjust in-call volume until you're connected on a phone call. When you are, no matter whether you're using iOS, Android or Windows Phone, you simply need to use the volume buttons/rocker on the side of your device to increase or decrease the volume. If you're already aware of this and you're call volume is at maximum, then you've got a different problem. Reviewing so many phones, as we do, we've notices that some earpieces dramatically change in volume with only a small movement while holding it to your ear – so you might just need to take some time to find that 'sweet spot'.

Once you've tried the above and the problem is still ongoing, you might need to try an app. Search your respective app store for a volume booster and see which one works for you. Volume Booster is popular on Android, for example. ☒

Use Periscope on an Android phone

Twitter has now released its new live-broadcast app on Android. Martyn Casserly shows how to use it

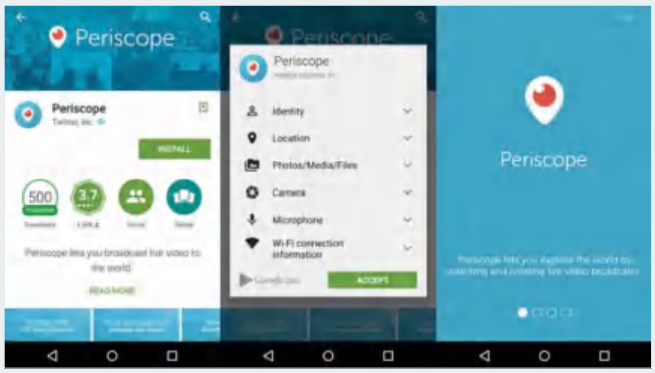
Following its release on iOS back in March, Periscope – the live video broadcast app – is now available for Android users. Owned by Twitter, this new form of social media looks set to take on the likes of Meerkat and bring live streaming into the mainstream. Here, we explain what Periscope is, how to use it, and why you'd want to.

What is Periscope?

Periscope is Twitter's new live broadcasting app, which allows users to either watch or create videos on their phones, which can be watched in real-time by others. While YouTube provides a way for video creators to build up a catalogue of well-made episodic content, Periscope is very different, in that everything is instantaneous and you can interact with your audience while the broadcast is going on. Streams are only stored on the servers for 24 hours before being deleted, although you can save them to your device's camera roll if you want to keep them longer and share with friends and family.

Installing the app

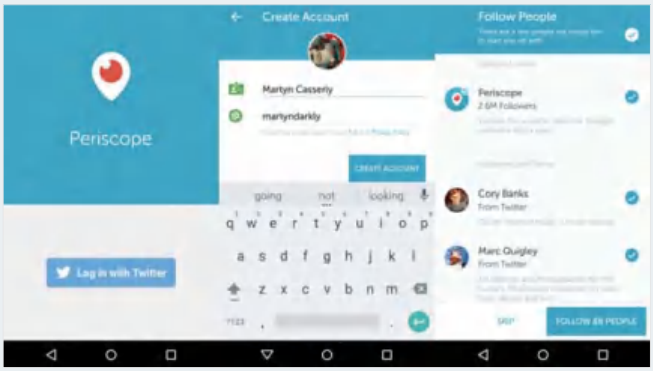
Installation is very easy, as the app can be found in the Google Play store. Open the Store app, search for Periscope, then tap on Install. You'll be presented with a lengthy list of app permissions, but this is often due to the social nature of the app and the fact it needs



access to your camera, microphone and location for the service. Accept these and the app should install

Setting up your account

As Periscope is a Twitter app, you'll need to have a Twitter account to use it. Tap the Log in with Twitter button to get started, then enter your existing account details or create a free account. One of the advantages that the Android app has over its iOS alternative is that you can actually use more than one account if you have them. To set up multiples, tap on the one displayed at the top of the



screen and then tap the Add Account button. Now you can switch between them whenever you want – great if you want to keep your personal and business Twitter IDs separate.

After authorising your Twitter ID, by tapping Allow, you'll need to also create a username for your Periscope account. Next, tap Create Account. Now you'll be shown a list of people you can follow – these will be drawn from who you already follow on Twitter. As Periscope is still a recent release, it would be wise to accept the people the app suggests, this way you'll be guaranteed content or an audience. You can, of course, thin these out later on.

Using the interface

The main screen of Periscope looks a little like a Tumblr feed, with a scrollable selection of videos you can tap on to watch. Select one and you'll be taken to whichever video is currently being filmed/broadcast live. These can range from someone out in the park, to a newsroom showing behind the scenes footage. The first one we found was of a man conducting a video tour of the British Museum.

In the bottom left-hand corner you'll see a scrolling list of comments. To add one yourself, tap the 'Say something' area of the screen and your message will be relayed in real time to the video creator. You could ask them to do something – maybe back up a bit so you can see what they are filming a little better – or pose a question, which they might then respond to. In the bottom right hand corner of the screen you'll see a stream of hearts scrolling upwards. These are generated by users tapping the screen. Unlike Facebook, where you can only like something once, on Periscope you generate hearts each time you tap the screen. This allows real-time (there's that term again) feedback for the creator, akin to cheers or applause from the audience. With this feedback they can judge with things people are enjoying and which they are not – making the interactive experience hopefully better for everyone. You can also see the number of people currently watching the stream displayed in the bottom right corner.

Tapping the cross in the top-right corner takes you back to the main screen. You'll notice that there are three main icons across the top – a TV, globe, and people. The TV option shows you a list of any of your friends that are currently broadcasting, the globe is the default that appeared when you first loaded the app, showing all the latest streams from around the world, and the People icon is a list of popular users that you can follow by pressing the plus icon of the right hand side.

One other icon remains on the right-hand side - the person in a circle. Tap this to see your own profile, how many followers you have, who follows you, and down at the bottom there is the Settings option. Here, you'll find controls for notifications that let you know if any of your friends begin broadcasting or shares a saved broadcast. One important option to take note of is the Autosave Broadcast control – this ensures that anything you create will also be stored in your camera roll, so you won't lose it when the Periscope servers delete them after 24 hours.

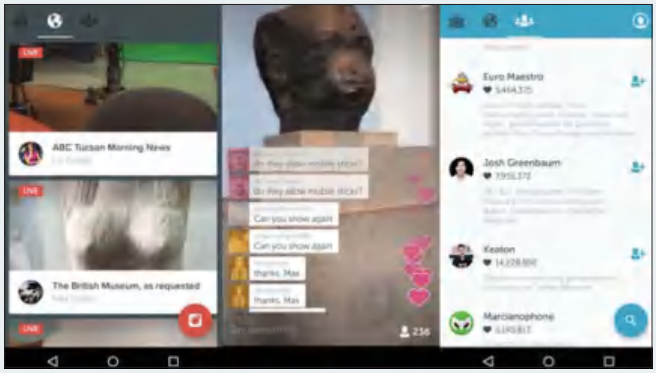
Creating your own live broadcast

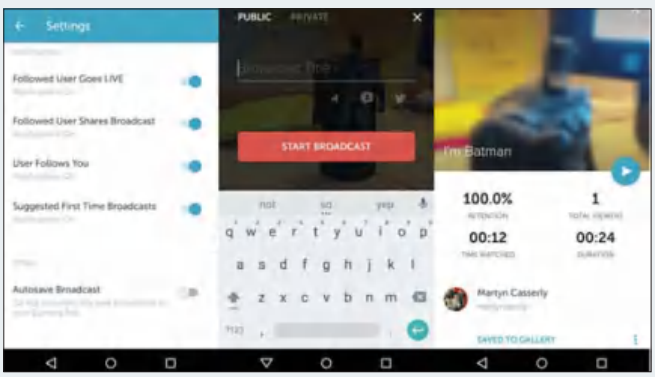
Return to either the global or TV feed, and you'll notice a red camera icon in the bottom-right corner of the screen. This is your record button, which let you start your own live broadcast. Before you begin, remember that video content uses up a lot of data. So if you have a small allowance in your monthly tariff, then it would be best to wait until you find a Wi-Fi hotspot or keep your broadcast short. When you're ready to go tap the camera icon.

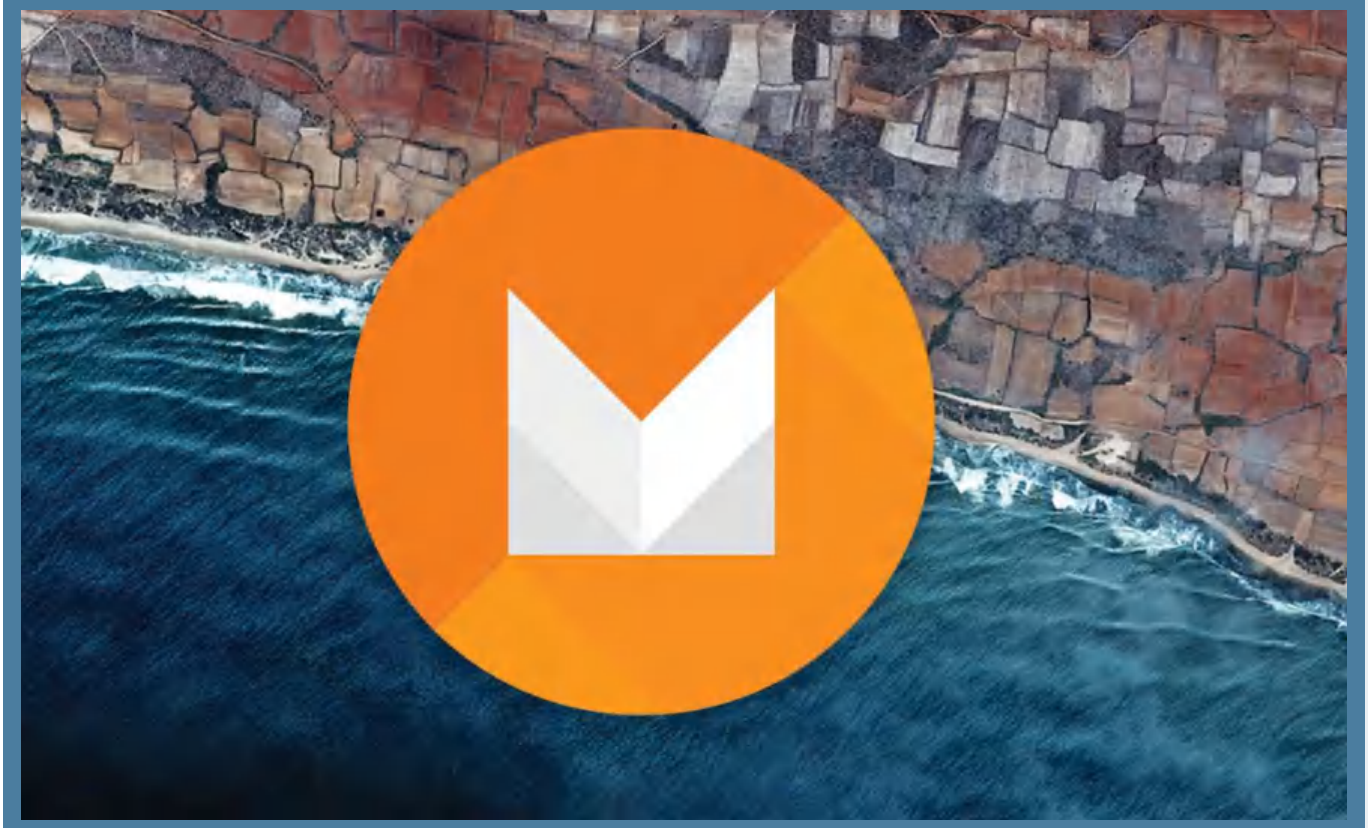
First of all, you'll need to give your broadcast a title, so that people will know what it's about. Then you can choose whether to make it Public or Private by tapping on the options in the top-left corner. Public is exactly as it sounds, while Private means the feed will only be available to a list of people from your contacts that you select. Under the title line, you'll see three other icons that can be toggled on or off by tapping them. The first is location (so people will see where you are), tapping the next one means only users who follow you can comment on the stream, and the last one selects whether the broadcast details are posted on Twitter. When you're happy with these settings tap Start Broadcast to begin.

Now you'll be live across the globe, and if anyone taps on your broadcast they'll be able to watch what you're doing and comment accordingly. Obviously the longer you broadcast, the more chance an audience will find you. The default view is the rear camera on your phone, but to switch to the back camera double tap the screen. Swiping up from the bottom reveals the chat window, so you can type in responses, and swiping down from the top reveals the Stop Broadcast button which you tap to end the stream.

Once you've completed your broadcast you'll see the information about it – length, viewers, retention rate – and, if you have the option selected, that it's been saved to your camera roll. The three dots that follow this last stat opens up a menu where you can select to Remove Replay (meaning that the stream will no longer be available to view for the 24 hours), Delete Broadcast (which removes it completely) and Hide Chat (which stops any comments being displayed). That's it. Periscope in a nutshell. If you return to the TV icon you'll see your video listed, but come tomorrow it will be gone. So, enjoy the experience while it lasts. ☒







Get Android M on your Nexus smartphone

Marie Brewis explains how download the Android M Developer Preview on to your handset today

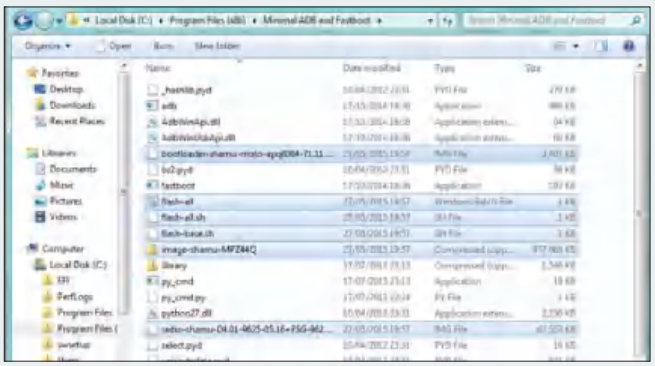
It's unlikely that the final version of Android M will be available to consumers until November at the earliest, when it will first appear on the new Nexus 5. However, if you have a Nexus 5, 6, 9 or Nexus Player and you're desperate to get your hands on Android M, you can download the Developer Preview today.

It's important to note that this is very early software and the Android M Developer Preview is intended for developers only. It is going to be buggy and you are going to encounter some problems with it. If you just want to take a peek, you can, of course, reinstall Android Lollipop – we'll tell you how at the end of this article.

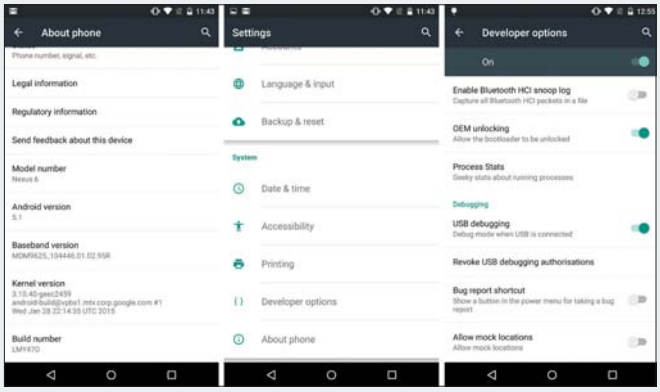
Be warned that manually installing Android M is not for novice users, and it's possible to brick your device if you don't know what you're doing. It's important to back up any data installed on your device before you begin since this will be lost in the process.

GET ANDROID M

START On a Windows PC, install Minimal ADB and Fastboot. You can download it from here – tinyurl.com/Lmstqa4. Download the appropriate Android M installer for your device, which you'll find on the Android Developer's site (tinyurl.com/q63q2eh). The Android M Developer Preview is compatible with the Nexus 5, 6, 9 and Nexus Player only. Do not install it on a different device.

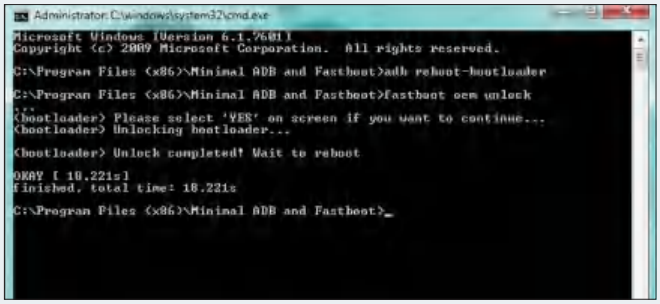


2 You'll need to extract the contents of the downloaded Android M file to a new folder on your desktop. We used the free 7-Zip (7-zip.org) utility to achieve this. From the folder on your desktop, copy the extracted files into C:\Program Files (x86)\ Minimal ADB and Fastboot. (Some users have needed to rename the .tgz file extension as .tar in order to complete this step.)

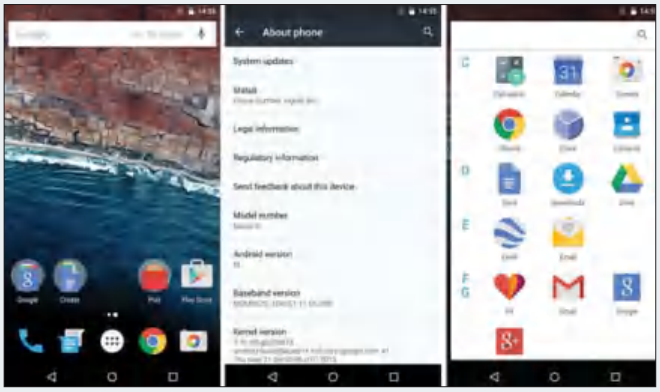


3 On your Nexus phone or tablet, open Settings, About phone/tablet and tap on Build Number seven times. This will unlock a hidden Developer Options menu within Settings. Open Developer Options and enable USB debugging and OEM Unlock.

4 Plug your Nexus device into your Windows PC via USB and download the Google USB Driver from tinyurl.com/3y32nw9. Extract the contents of the Zip file to a safe place, then click on Start, Devices and Printers, right-click on your phone or tablet and choose Properties. Open the Hardware tab, then choose the top entry under Device Functions and click on Properties. Update the driver, pointing Windows to the Google USB driver you've just downloaded. A prompt will appear on your device's screen to 'Allow USB debugging'; tick the box to 'Always allow from this computer', then press OK.



5 Now you're ready to flash Android M on to your device. If you're sure it's been backed up properly (you will lose everything otherwise), launch Minimal ADB and Fastboot. Type **adb reboot-bootloader** and hit Enter. This will boot your device into Fastboot mode. Scan the information on the device screen for LOCK STATE. If this reports that the phone or tablet is unlocked move on to Step 7; if it is locked, in ADB type **fastboot oem unlock** and hit Enter. Use the volume button on your phone or tablet to select Yes, then use the Power button to confirm your choice.



6 Technically, flashing Android M should now be a case of typing flash-all and hitting Enter. When you then reboot the phone, you'll be greeted with Android M. Unfortunately, this didn't work on our Nexus 6, and we received an error message that the update package was missing system.img before it aborted the process. If you get the same error message, move on to Step 7.

7 In order to make Minimal ADB and Fastboot see those files, we had to go back to the files we extracted from our Android M installer in Step 2. Within those files is another Zip file, and it's in here that you'll find the missing system.img file. Extract this Zip file, then copy its contents into C:\Program Files (x86)\Minimal ADB and Fastboot. You'll need to manually install each file. In Minimal ADB and Fastboot we entered the following commands to successfully get our Nexus 6 running Android M:

fastboot flash bootloader bootloader-shamu-moto-apq8084-71.11.img [this is for the Nexus 6 - the filename here will differ for the Nexus 5, 9 and Player]
[Enter]
fastboot flash radio radio-shamu-D4.01-9625-05.16+FSG-9625-02.94.img [again this is for the Nexus 6 - the filename here will differ for the Nexus 5, 9 and Player]
[Enter]
fastboot reboot-bootloader
[Enter]
fastboot flash recovery recovery.img
[Enter]
fastboot flash boot boot.img
[Enter]
fastboot flash system system.img
[Enter]
fastboot flash cache cache.img
[Enter]
fastboot erase userdata
[Enter]
fastboot flash userdata userdata.img
[Enter]
fastboot reboot
[Enter]

The device should then restart running Android M.

If after all this, you decide that the preview isn't for you, you can revert to your old operating system. Simply download the appropriate system image from tinyurl.com/c2efby3 and repeat the instructions above. Note that you'll first need to clear out the files from Minimal ADB and Fastboot that you added earlier. ☒

LETITIA AUSTIN

ONLINE REGISTRATION REQUIRED

iolo System Mechanic 14

FULL PROGRAM (SIX MONTHS OF UPDATES) AVAILABLE ONLY ON THE DISC+

Installation details

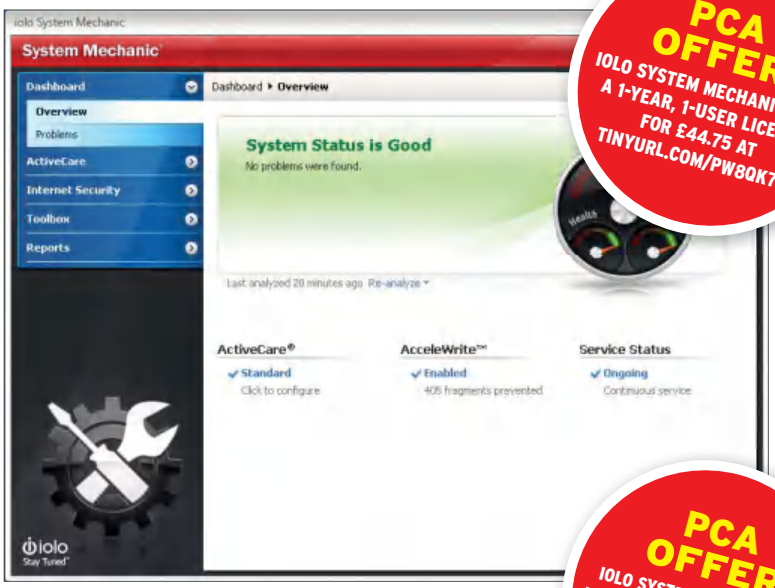
Go to My Computer, right-click the DVD icon and open the disc. Select Files 243/iolo System Mechanic 14 and open the install file.

Online registration required: Follow the instructions within the program before 14 October 2015.

System requirements

Windows 8/8.1/7/Vista (32- and 64-bit), XP (32-bit SP2 or later); 256MB RAM; 300MHz processor; 240MB drive space

System Mechanic uses patented technology to restore speed, power and stability to your PC. It fixes errors, boosts performance, defends against infections, and proactively prevents problems from reoccurring. This all-in-one solution for complete PC optimization also provides online backup, recovers deleted files, securely wipes data, and includes high-performance triple-certified antivirus protection that won't slow you down. Version 14 contains new technologies that can protect your PC from stability threats more precisely and intelligently than ever before. These include:



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IOLO SYSTEM MECHANIC PRO LICENCE. GET A 1-YEAR, 1-USER LICENCE FOR £34.45 AT TINYURL.COM/OU9GGP9

New LiveBoost Technology

The ability of a PC to respond quickly to the operating system and the programs it runs is based on a critical triangle of components: the Central Processing Unit (CPU), RAM and the storage drive. If any of these are compromised, the entire performance chain is affected.

New OptiCore

This maximizes CPU power for important tasks and intensive operations such as video, graphics and hardcore multitasking. Most programs aren't designed to share resources, even if they're running in the background. Some apps tend to consume so much CPU power that you can't use your PC for anything else while they're running. OptiCore prevents low-priority programs from creating lags and freezes when more important tasks need to get done. It's optimized for single-, dual-, quad-, 6- and 8-core PC,s and reduces lag on Windows 8, 7, Vista and XP.

New RAMJet

Automatically maximizes available memory when you need it most. Many programs forget to release memory they've reserved but are no longer using, artificially lowering your available RAM and starving foreground apps from the resources they need to run responsively. This can impact the operating system's ability to serve your needs and prevent slowdowns, and the more you multitask the worse it can get. RAMJet automatically recovers trapped memory in real time to help your PC stay at the top of its game.

Enhanced AcceleWrite

Optimizes file organization on both solid-state drives and hard disk drives. Working deep inside the Windows operating system, AcceleWrite increases the efficiency of how files are written to the drive.

Ashampoo Media Sync

ONLINE REGISTRATION REQUIRED

FULL PROGRAM AVAILABLE ONLY ON THE DISC+

Installation details

Go to My Computer. Right-click the disc icon and open the disc. Select Files 243\Ashampoo Media Sync and then open the install file.

Online registration required: Follow the instructions within the program before 14 October 2015.

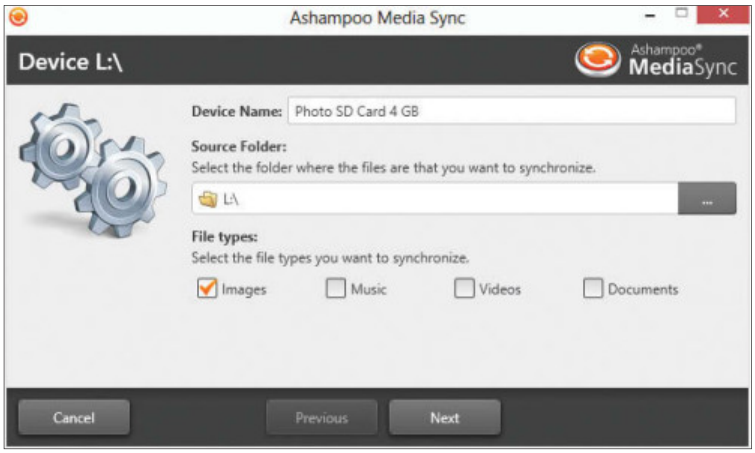
System requirements
Windows 8/7/Vista/XP ; 512MB RAM; 35MB free hard disk space

Get organised automatically
Don't spend time hunting down and organising your files manually. Ashampoo Media Sync scans, identifies and automatically organises your media for you into categories – Documents, Music, Pictures, Video.

Files instantly organised
No more file chaos – just plug in your device and Media Sync will do all the hard work for you.

Setting up takes seconds
Select input location, then output location and file types, and that's it.

Compatible with all autoplay-enabled devices
CDs, DVDs, flash drives, smartphones, digital cameras, and more. You name it, Ashampoo Media Sync supports it.



Apowersoft Screen Capture Pro

ONLINE REGISTRATION REQUIRED

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APOWERSOFT SCREEN CAPTURE PRO. GET A 1-YEAR, 1-USER LICENCE FOR £25.62 AT TINYURL.COM/OSJW6UM

FULL PROGRAM (90 DAYS) AVAILABLE ONLY ON THE DISC+

Installation details

Go to My Computer, right-click the disc icon and open the disc. Next, select Files 243\ Apowersoft Screen Capture Pro and then open the install file.

Online registration required: Follow the instructions within the program before 14 October 2015.

System requirements

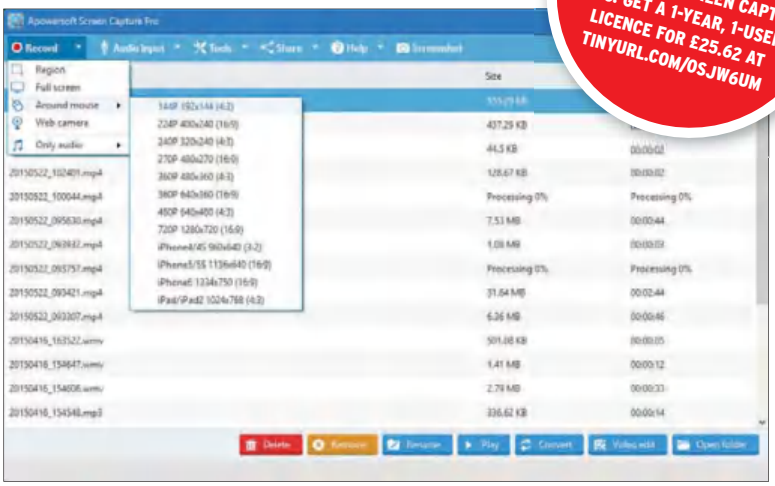
Windows 8/7/XP; 1GB RAM; 45MB free hard disk space

Apowersoft Screen Capture Pro lets users tae a screenshot and record anything on their PC screen. With the software's multiple screenshot/recording modes, rich image editing and sharing options, various output formats and hot keys, users are able to create quick communication via intuitive screenshots and dynamic video guides.

You can capture screen as images or videos, then edit, upload and share them. It has an intuitive interface that has 10 screenshot modes and a screen recorder for you to capture the screen in different situations.

Once a screenshot has been created, you can edit it with the software's quick and advanced editor, copy it to the clipboard, save it to your local file, upload it to the free cloud space provided by the publisher or share it directly to your social accounts. Furthermore, there is a task scheduler function for you to take screenshots automatically. This will save you a lot of clicks when you need to capture screens at regular intervals.

On the other hand, if you prefer to record things happening on your screen as a video, you can use its screen recorder function. Apowersoft Screen Capture Pro has four screen recording modes, various video resolutions and popular video formats. Audio inputs are also taken into consideration. You can record system sound, microphone sound or both without configuration. If you want to highlight the cursor during a video recording, go to its options to set the cursor's colour and its hot spot size. What makes this recorder stand out is that it supports real-time editing, while recording. With this feature, you can add arrows and texts to make the recorded video more instructive.



To conclude, Apowersoft Screen Capture Pro improves the efficiency of taking screenshots and recording screen. It also offers free cloud space, image sharing and other useful features.

DISC INSTRUCTIONS

Place disc in drive. Open the file 'Click here to begin.pdf' for extra information.

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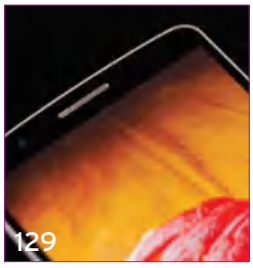
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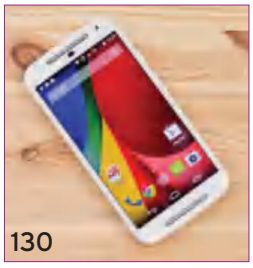
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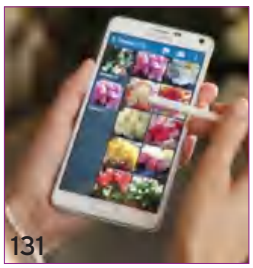
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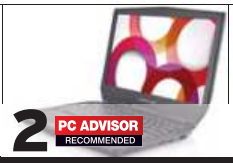

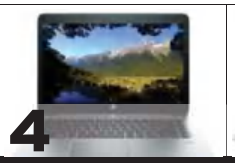

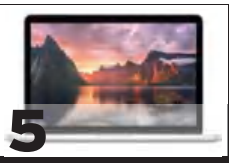

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Price	**£1,720 inc VAT**	**£1,100 inc VAT**	**£1,599 inc VAT**	**£2,116 inc VAT**	**£999 inc VAT**
Website	Aorus.com	Alienware.co.uk	Apple.com/uk	Hp.com/uk	Apple.com/uk
Launch date	Sep 14	May 15	June 15	Jan 15	June 15
Build rating	★★★★☆	★★★★½	★★★★½	★★★★½	★★★★½
Features rating	★★★★½	★★★★☆	★★★★½	★★★★½	★★★½☆
Performance rating	★★★★½	★★★★☆	★★★★☆	★★★★½	★★★★☆
Value rating	★★★½☆	★★★★☆	★★★★☆	★★★☆☆	★★★★☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
Processor	2.4GHz Intel Core i7-4860HQ	2.4GHz Intel Core i7-5500U	2.2GHz Intel Core i7	2.1GHz Intel Core i5-4600U	2.7GHz dual-core Intel Core i5
RAM	16GB DDR3	8GB (2x 4GB) DDR3	16GB DDR3L	8GB DDR3L	8GB LPDDR3
Storage	1TB HDD, 3x 128GB SSD	256GB SSD	256GB SSD	256GB SSD	128GB SSD
Screen size	17.3in matt	13.3in matt	15.4in matt	14in matt	13.3in matt
Screen resolution	1920x1080	1920x1080	2880x1800	1920x1080	2560x1600
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	Intel Iris Pro Graphics	Intel HD Graphics 4400	Intel Iris Graphics 6100
Video memory	8GB	2GB	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11ac	802.11a/b/g/n/ac	802.11a/b/g/ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	3x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0
FireWire	×	×	×	×	×
Thunderbolt	×	×	✓	×	×
DisplayPort	✓	✓	×	✓	×
HDMI	✓	✓	✓	×	✓
DVI	×	×	×	×	×
VGA	✓	×	×	×	×
eSATA	×	×	×	×	×
Media card slot	✓	×	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam	2Mp webcam	720p FaceTime	0.9Mp webcam	720p FaceTime
Operating system	Windows 8.1 64-bit	Windows 8.1	OS X Yosemite	Windows 7 Professional	OS X Yosemite
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	89/64fps in Tomb Raider	Not tested	49/33fps in Tomb Raider	Not tested
Battery	74.7Wh lithium-polymer	52Wh lithium-polymer	74.9Wh lithium-ion	42Wh lithium-polymer	74.9Wh lithium-ion
Battery life	1 hr 48 mins	10 hrs 20 mins	8 hrs 58 mins	5 hrs 41 mins	17 hrs 5 mins
PCMark7 score	6304	5429	Not tested	4783	Not tested
Dimensions	425x303x24.5mm	328x235x26.7mm	358.9x247.1x18mm	338x232x17.3mm	314x219x18mm
Weight	3.24kg	1.97kg	2.04kg	1.556kg	1.58kg
Warranty	2-year return-to-base	1-year collect-and-return	1-year return-to-base	2-year return-to-base	1-year return-to-base
FULL REVIEW	TINYURL.COM/KLUXLGE	TINYURL.COM/O8VXAGL	TINYURL.COM/O6U4NCR	TINYURL.COM/OWV2FRR	TINYURL.COM/NG98LD4

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	1 PC ADVISOR RECOMMENDED	2	3	4 PC ADVISOR RECOMMENDED	5
					
	Lenovo IdeaPad Z50-70	**Toshiba Chromebook 2**	**Acer Chromebook 13**	**Dell Chromebook 11**	**Acer Aspire V13**
Price	**£399 inc VAT**	**£269 inc VAT**	**£219 inc VAT**	**£239 inc VAT**	**£410 inc VAT**
Website	Lenovo.com/uk	Toshiba.co.uk	Acer.co.uk	Dell.co.uk	Acer.co.uk
Launch date	Jan 15	Jan 15	Sep 14	Dec 14	Jan 15
Build rating	★★★½☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Processor	1.7GHz Intel Core i3-4010U	Intel Celeron	2.1GHz nVidia Tegra K1	1.4GHz Intel Celeron 2955U	2GHz Intel Core i3-4158U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3
Storage	1TB HDD	16GB SSD	32GB SSD	16GB SSD	500GB HDD with 8GB flash
Screen size	15.6in gloss	13.3in IPS	13.3in	11.6in glossy	13.3in matt
Screen resolution	1920x1080	1920x1080	1920x1080	1366x768	1366x768
Graphics	nVidia GeForce 820M	Intel HD graphics	nVidia Kepler	Intel HD Graphics	Intel Iris Graphics 5100
Video memory	2GB	N/A	N/A	N/A	N/A
Wireless	802.11b/g/n	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 2x USB 2.0	1x USB 3.0, 1x USB 2.0	2x USB 3.0	2x USB 3.0	1x USB 3.0, 1x USB 2.0
FireWire	×	×	×	×	×
Thunderbolt	×	×	×	×	×
DisplayPort	×	×	×	×	×
HDMI	✓	✓	✓	✓	✓
DVI	×	×	×	×	×
VGA	✓	×	×	×	×
eSATA	×	×	×	×	×
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	DVD Writer	None	None	None	None
Extras	None	Webcam	Webcam	Webcam	None
Operating system	Windows 8.1	Google Chrome OS	Google Chrome OS	Google Chrome OS	Windows 8.1
Bundled software	None	None	None	None	None
Battery	41Wh Lithium-ion	9 hrs	9 hrs 20 mins	Lithium	48Wh Lithium-ion
Battery life	4 hrs 58 mins	Not tested	660ms	7 hrs 17 mins	6 hrs 35 mins
PCMark 8 Home score	1959	Not tested	Not tested	N/A	2358 (3396 Work)
Batman (Low/High)	33/29fps	Not tested	Not tested	N/A	29/24fps
Dimensions	382x265x27.5mm	320x214x19.3mm	18x327x227.5mm	295x201x24mm	327x227x20.6mm
Weight	2.4kg	1.35kg	1.5kg	1.3kg	1.5kg
Warranty	1-year return-to-base	1 year	1 year	1-year depot	1-year return-to-base
FULL REVIEW	TINYURL.COM/NJNNKWQ	TINYURL.COM/OP9NQAY	TINYURL.COM/Q2YT5AD	TINYURL.COM/NBUL2NO	TINYURL.COM/OQ94SKB

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Best ultraportable laptops

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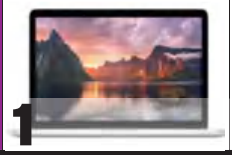
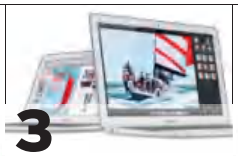
	 Apple MacBook Pro Retina 13in	 HP EliteBook Folio 1040 G1	 Apple MacBook Air 13in	 Dell XPS 13 9343	 Microsoft Surface Pro 3
Price	**£999 inc VAT**	**£2,116 inc VAT**	**£849 inc VAT**	**£1,099 inc VAT**	**£639 inc VAT**
Website	Apple.com/uk	Hp.com/uk	Apple.com/uk	Dell.co.uk	Microsoft.com/en-gb
Launch date	June 15	Jan 15	April 14	Mar 15	Oct 14
Build rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★½
Features rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★★½
Performance rating	★★★★☆	★★★★½	★★★★☆	★★★★½	★★★★☆
Value rating	★★★★☆	★★★☆☆	★★★★☆	★★★★½	★★★½☆
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	2.7GHz Intel Core i5	2.1GHz Intel Core i5-4600U	1.6GHz Intel Core i5	2.4GHz Intel Core i7-5500U	Intel Haswell Core i3
RAM	8GB LPDDR3	8GB DDR3L	4GB LPDDR3	8GB DDR3	4GB DDR3
Storage	128GB SSD	256GB SSD	128GB SSD	256GB SSD	64GB SSD
Screen size	13.3in matt	14in matt	13.3in glossy	13.3in IPS	12in ClearType
Screen resolution	2560x1600	1920x1080	1440x900	3200x2000	2160x1440
Graphics	Intel Iris Graphics 6100	Intel HD Graphics 4400	Intel HD Graphics 6000	Intel HD Graphics 5500	Intel HD Graphics 4400
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/ac	802.11a/b/g/n/ac	802.11ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	None	Gigabit	None
Bluetooth	✓	✓	✓	✓	✓
USB	2x USB 3.0	2x USB 3.0	2x USB 3.0	2x USB 3.0	1x USB 3.0
FireWire	×	×	✓	×	×
Thunderbolt	×	×	✓	×	×
DisplayPort	×	✓	×	×	✓
HDMI	✓	×	×	×	×
DVI	×	×	×	×	×
VGA	×	×	×	×	×
eSATA	×	×	×	×	×
Media card slot	✓	✓	✓	✓	×
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	720p FaceTime	0.9Mp webcam	720p FaceTime	720p webcam	5Mp webcam
Operating system	OS X Yosemite	Windows 7 Professional	OS X Yosemite	Windows 8.1 64-bit	Windows 8.1 Pro
Bundled software	None	None	None	Microsoft Office 2013 Trial	None
Gaming scores	Not tested	49/33fps in Tomb Raider	Not tested	40fps Batman: Arkham City	Not tested
Battery	74.9Wh lithium-ion	42Wh lithium-polymer	38Wh lithium-ion	52Wh lithium-polymer	8000mAh lithium-ion
Battery life	17 hrs 5 mins	5 hrs 41 mins	12 hrs 49 mins	6 hrs 12 mins	9 hrs
PCMark 7 score	Not tested	4783	Not tested	Not tested	Not tested
Dimensions	314x219x18mm	338x232x17.3mm	300x192x17mm	304x200x15mm	292x201.3x9.1mm
Weight	1.58kg	1.556kg	1.35kg	1.3kg	800g
Warranty	1-year return-to-base	2-year return-to-base	1-year return-to-base	1-year next business day	1-year return-to-base
FULL REVIEW	TINYURL.COM/NG98LD4	TINYURL.COM/OWV2FRR	TINYURL.COM/PH3YN5K	TINYURL.COM/PPD3BYW	TINYURL.COM/OLDJ9KK

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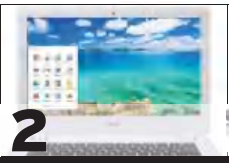
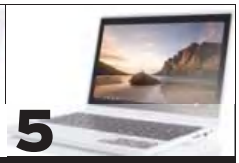
Best Chromebooks





	Toshiba Chromebook 2	Acer Chromebook 13	Dell Chromebook 11	HP Chromebook 14	Acer C720p Chromebook
Price	**£269 inc VAT**	**£219 inc VAT**	**£239 inc VAT**	**£259 inc VAT**	**£249 inc VAT**
Website	Toshiba.co.uk	Acer.co.uk	Dell.co.uk	Hp.com/uk	Uk.asus.com
Launch date	Jan 15	Sep 14	Dec 14	Sep 14	Jan 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Features rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Value rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	Intel Celeron	2.1GHz nVidia Tegra K1	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U	1.4GHz Intel Celeron 2955U
RAM	4GB DDR3	4GB DDR3	4GB DDR3	4GB DDR3	2GB DDR3
Storage	16GB SSD	32GB SSD	16GB SSD	16GB SSD	16GB SSD
Screen size	13.3in IPS	13.3in	11.6in glossy	14in glossy	11.6in glossy
Screen resolution	1920x1080	1920x1080	1366x768	1366x768	1366x768
Graphics	Intel HD graphics	nVidia Kepler	Intel HD Graphics	Intel HD graphics	Intel HD graphics
Video memory	N/A	N/A	N/A	N/A	N/A
Wireless	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n	802.11a/b/g/n	802.11a/b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	1x USB 3.0, 1x USB 2.0	2x USB 3.0	2x USB 3.0	2x USB 3.0, 1x USB 2.0	1x USB 3.0, 1x USB 2.0
FireWire	×	×	×	×	×
Thunderbolt	×	×	×	×	×
DisplayPort	×	×	×	×	×
HDMI	✓	✓	✓	✓	✓
DVI	×	×	×	×	×
VGA	×	×	×	×	×
eSATA	×	×	×	×	×
Media card slot	✓	✓	✓	✓	✓
Audio	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack	Headphone minijack
Optical drive	None	None	None	None	None
Extras	Webcam	Webcam	Webcam	Webcam	Webcam
Operating system	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS	Google Chrome OS
Bundled software	None	None	None	None	None
Battery life	9 hrs	9 hrs 20 mins	7 hrs 17 mins	7 hrs 50 mins	6 hrs 7 mins
SunSpider score	Not tested	660ms	465ms	470ms	502ms
Peacekeeper score	Not tested	Not tested	2468	2478	2453
Browsermark score	Not tested	Not tested	3732	3643	3698
Dimensions	320x214x19.3mm	18x327x227.5mm	295x201x24mm	20.5x345x239mm	19.1x288x204mm
Weight	1.35kg	1.5kg	1.3kg	1.7kg	1.35kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OP9NQAY	TINYURL.COM/Q2YT5AD	TINYURL.COM/M3D3QJ4	TINYURL.COM/OCU7FTY	TINYURL.COM/O9KFZMA

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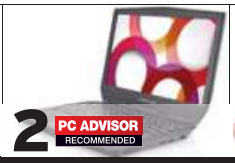

	Aorus X7 v2	Alienware 13	MSI GS60 2QD-470UK	Gigabyte P37X	Aorus X7 Pro
Price	**£1,720 inc VAT**	**£1,100 inc VAT**	**£1,299 inc VAT**	**£1,750 inc VAT**	**£2,100 inc VAT**
Website	Aorus.com	Alienware.co.uk	UK.msi.com	Uk.gigabyte.com	Aorus.com
Launch date	Sep 14	May 15	May 15	May 15	Jan 15
Build rating	★★★★☆	★★★★½	★★★★☆	★★★½☆	★★★★☆
Features rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★½
Performance rating	★★★★½	★★★★☆	★★★★☆	★★★½☆	★★★★½
Value rating	★★★½☆	★★★★☆	★★★★☆	★★★★½	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Processor	2.4GHz Intel Core i7-4860HQ	2.4GHz Intel Core i7-5500U	2.6GHz Intel Core i7-4720HQ	2.6GHz Intel Core i7-4720HQ	2.4GHz Intel Core i7-4860HQ
RAM	16GB DDR3	8GB (2x 4GB) DDR3	16GB (2x 8BG) DDR3	16GB DDR3	16GB DDR3
Storage	1TB HDD, 3x 128GB SSD	256GB SSD	1TB HDD, 128GB SSD	2x 128GB SSD, 1TB HDD	2x 256GB SSD
Screen size	17.3in matt	13.3in matt	15.6in matt	17.3in matt	17.3in matt
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	2x nVidia GeForce GTX 860M	nVidia GeForce GTX 860M	nVidia GeForce GTX 965M	nVidia GeForce GTX 980M	2x nVidia GTX 870M
Video memory	8GB	2GB	3GB	8GB	6GB
Wireless	802.11a/b/g/n/ac	802.11ac	802.11ac	802.11ac	802.11a/b/g/n/ac
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	✓	✓	✓	✓	✓
USB	3x USB 3.0, 2x USB 2.0	3x USB 3.0	3x USB 3.0	2x USB 3.0, 2x USB 2.0	3x USB 3.0, 2x USB 2.0
FireWire	×	×	×	×	×
Thunderbolt	×	×	×	×	×
DisplayPort	✓	✓	×	✓	✓
HDMI	✓	✓	×	✓	✓
DVI	×	×	×	×	×
VGA	✓	×	×	✓	✓
eSATA	×	×	×	×	×
Media card slot	✓	×	✓	✓	✓
Audio	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic	Headphone jack, mic
Optical drive	N/A	N/A	N/A	N/A	N/A
Extras	HD webcam	2Mp webcam	2.1Mp webcam	0.9Mp webcam	HD webcam
Operating system	Windows 8.1 64-bit	Windows 8.1	Windows 8.1	Windows 8.1	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Gaming scores	189/157fps in Tomb Raider	89/64fps in Tomb Raider	123/82fps in Tomb Raider	221/153fps in Tomb Raider	221/170fps in Tomb Raider
Battery	74.7Wh lithium-polymer	52Wh lithium-polymer	48Wh lithium-ion	78Wh lithium-polymer	74.7Wh lithium-polymer
Battery life	1 hr 48 mins	10 hrs 20 mins	2 hrs 49 mins	4 hrs 2 mins	1 hr 48 mins
PCMark 7 score	6304	5429	6241	6305	6474
Dimensions	425x303x24.5mm	328x235x26.7mm	389x265x20.3mm	415x286x23.2mm	425x303x24.5mm
Weight	3.24kg	1.97kg	2.04kg	2.89kg	3.24kg
Warranty	2-year return-to-base	1-year collect-and-return	2-year return-to-base	2-year	2-year return-to-base
FULL REVIEW	TINYURL.COM/KLUXLGE	TINYURL.COM/O8VXAGL	TINYURL.COM/O6Q3JJD	TINYURL.COM/NDPC6P6	TINYURL.COM/OZVQ6JQ

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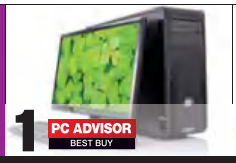

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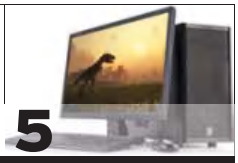

5

	1 Chillblast Fusion Commando	2 Wired2Fire Diablo Reactor	3 Chillblast Fusion Pharoah	4 Mesh Elite 4670-PCA	5 Dino PC Raging Lizard V2
Price	**£799 inc VAT**	**£668 inc VAT**	**£799 inc VAT**	**£799 inc VAT**	**£780 inc VAT**
Website	Chillblast.com	Wired2fire.co.uk	Chillblast.com	Meshcomputers.com	Dinopc.com
Launch date	Jul 13	May 14	May 14	May 14	May 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★½☆
Features rating	★★★★☆	★★★½☆	★★★★★	★★★★½	★★★½☆
Performance rating	★★★★½	★★★★½	★★★★★	★★★★½	★★★★☆
Value rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★☆
Processor	3.2GHz Intel Core i5-4570	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690	3.4GHz Intel Core i5-4670	3.5GHz Intel Core i5-4690
RAM	16GB DDR3	8GB DDR3 1600MHz	16GB DDR3 1600MHz	16GB DDR3 1600MHz	8GB DDR3 1600MHz
Storage	1TB HDD + 120GB SSD	1TB HDD	1TB HDD + 120GB SSD	2TB HDD + 120GB SSD	1TB HDD + 128GB SSD
Motherboard	Asus B85M-G	Asus B85M-G	Asus B85M-G	MSI B85M-E45	Gigabyte H97M-D3H
CPU cooler	Arctic Cooling Freezer 7 Pro	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler	Standard Intel Cooler
Power supply	600W CiT	500W FSP	500W FSP	500W FSP	500W CIT
Screen	23in Iiyama X2377	24in AOC E2495Sh	23in Asus VS239HV	24in Iiyama E2483HS-B1	24in Iiyama E2483HS-B1
Screen resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Graphics	Zotac nVidia GeForce GTX 650 Ti	AMD Radeon R7 265	AMD Radeon R7 265	nVidia GeForce GTX 750 Ti	nVidia GeForce GTX 750 Ti
Video memory	N/A	2GB	2GB	2GB	2GB
Connectivity	802.11b/g/n, gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet, 802.11b/g/n
USB	3x USB 3.0, 6x USB 2.0	3x USB 3.0, 6x USB 2.0, 2x HDMI, VGA	3x USB 3.0, 6x USB 2.0, 2x DVI, 2x HDMI, DP, VGA	4x USB 3.0, 8x USB 2.0, HDMI, VGA, DVI-D, DVI, DP	5x USB 3.0, 3x USB 2.0, 2x HDMI (1x e-Mini), VGA, 2x DVI
Media card slot	None	None	None	None	None
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Speakers	2x Logitech LS220	None	None	None	None
Case	Cooler Master Force 500	Zalman Z3 Plus	Zalman Z3 Plus	Zalman Z3 Plus	Fractal Design Core 1000 USB3
Keyboard	Logitech MK260	Octigen wireless combo	Logitech MK270 (wireless combo)	Logitech MK270 (wireless combo)	Gigabyte KM6150 (wired combo)
Optical drive	LG BD-ROM/DVD±RW	LiteOn DVD±RW	LiteOn BD-ROM/DVD±RW	24x DVD RW	None
Operating system	Windows 8 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Bundled software	None	None	None	None	None
Sniper V2 Elite score (Low/High/Ultra)	147/59/14fps	240/76/18fps	240/76/18fps	195/68/16fps	196/83/20fps
Alien vs Predator score (720p/1080p)	52/27fps	83/44fps	83/44fps	71/37fps	102/53fps
PCMark 7 score	6177	3938	5953	7304	6431
Warranty	2-year collect-and-return	2-year return-to-base	5-year labour, 2-year collect-and-return	3-years labour (2-year parts, 3-months free C&R)	3-year labour (2-year parts)
FULL REVIEW	TINYURL.COM/KF6G3T7	TINYURL.COM/OA8UKDP	TINYURL.COM/K2KF83U	TINYURL.COM/OZCSHYU	TINYURL.COM/PFA55F7

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120GB Samsung M.2 PCIe SSD
1000GB Seagate SSHD Hybrid Drive
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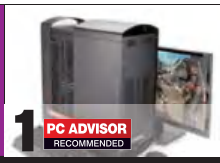
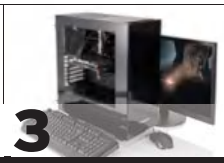
Best gaming PCs

	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3	4	5 PC ADVISOR RECOMMENDED
					
	Eclipse SuperNova i5r285oc	**Dino PC Dark Spark GTX 960**	**Cyberpower Infinity Achilles**	**Chillblast Fusion Mantis**	**Yoyotech Warbird Gam3r**
Price	**£999 inc VAT**	**£999 inc VAT**	**£999 inc VAT**	**£749 inc VAT**	**£999 inc VAT**
Website	Eclipsecomputers.com	Dinopc.com	Cyberpowersystem.co.uk	Chillblast.com	Yoyotech.co.uk
Launch date	Mar 15	Mar 15	Mar 15	Mar 15	April 15
Build rating	★★★★★	★★★★½	★★★★½	★★★★½	★★★★★
Features rating	★★★★★	★★★★★	★★★★½	★★★☆☆	★★★★½
Performance rating	★★★★☆	★★★★☆	★★★★½	★★★½☆	★★★★½
Value rating	★★★★☆	★★★★☆	★★★½☆	★★★★★	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Processor	3.5GHz Intel Core i5-4690K (OC 4.4GHz)	3.5GHz Intel i5-4670K (OC 4.6GHz)	3.5GHz Intel Core i5-4690K	3.5GHz Intel Core i5-4690K (OC 4.2GHz)	3.5GHz Intel Core i5 4690K (4.2GHz OC)
CPU cooler	Zalman CNPS11X Extreme	Be Quiet Pure Rock BK009	Cooler Master Seidon 120mm RL-S12M-FLNN-S1	Corsair H55 Water Cooler	SilentiumPC Fera 2 Heatpipe Cooler
Memory	16GB HyperX Savage	8GB DDR3	8GB DDR3	8GB DDR3	8GB DDR3
Storage	2TB HDD + 250GB SSD	1TB HDD + 120GB SSD	1TG HDD + 120GB SSD	1TB SSHD	2TB HDD + 240GB SSD
Power supply	550W XFX Core Edition	450W Corsair	600W Cooler Master	600W Corsair	600W Aerocool Integrator
Motherboard	Asus Z97-K	Gigabyte Z97X-Gaming 3	Gigabyte H81M-S2H	Gigabyte Z97-HD3	MSI Z97M-G43
Operating system	Windows 8.1	Windows 8.1	Windows 8.1	Windows 8.1 64-bit	Windows 8.1
Screen	26in HKC 2615	24in Iiyama GE2488HS-B1	24in AOC E2470SWDA	None supplied	23.6in AOC I2476VWM
Graphics	XFX AMD Radeon R9 285 DD Edition	Palit nVidia GeForce GTX 690	MSI nVidia GeForce GTX 970	MSI GeForce GTX 960	MSI nVidia GTX970 4GB
Sound	Onboard	Onboard	Onboard	Onboard	Onboard
Connectivity	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet	Gigabit ethernet
Ports	6x USB 3.0, 4x USB 2.0	6x USB 3.0, 4x USB 2.0, 2x PS/2, D-Sub, DVI-D, 6x SATA	6x USB 3.0, 3x USB 2.0, 2x DVI, HDMI, DP	6x USB 3.0, 2x USB 2.0, 2x DVI, HDMI, DP, PS/2	6x USB 3.0, 2x USB 2.0
Optical drive	Samsung DVD±RW	None	None	None	DVD±RW
Case	XFX Type 1 Bravo	NZXT Source 340	NZXT Source 340 Black	NZXT Source 340	CIT Kube Case
Keyboard & mouse	Cooler Master Storm Devastator Set	Corsair	Cooler Master Devastator Keyboard and Mouse	None	Gamdias Ares Keyboard and Mouse
Other	None	Corsair Raptor Bundle	None	Chillblast Family Software pack (optional)	None
PCMark 7 score	7931	7090	5945	5823	6244
Alien vs Predator score (720p/1080p)	111.4/59.8fps	103.4/54.7	167.8/89fps	104.2/55.2fps	1169.2/89.6fps
Final Fantasy XIV (Maximum)	91fps	86fps	120fps	86fps	137fps
Sniper Elite V2 (Low/Medium/Ultra)	292.1/106.8/26.5fps	285.6/123.6/28.9fps	281.1/192.9/48.1fpsfps	289.3/123.8/29fps	429.4/204.3/49.1fps
Power Consumption	76/432W	77/310W	48/261W	50/277W	72/369W
Warranty	3-year return-to-base	3-year PromoCare	2-year parts, 3-year return-to-base, 30-day C&R	5-year labour (2-year collect-and-return)	1-year RTB (3-year labour only), 90-day C&R
FULL REVIEW	TINYURL.COM/K5AJLBO	TINYURL.COM/MVBK6KX	TINYURL.COM/KKKRXAD	TINYURL.COM/L5H9ZDR	TINYURL.COM/NWZZZBM

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All-in-one PCs	1 PC ADVISOR RECOMMENDED	2	3	4	5
	Apple iMac with 5K display	Acer Aspire AZ3-615	Chillblast Volante AIO	Asus Eee Top	HP Envy Beats 23-n001na
Price	**£1,999 inc VAT**	**£799 inc VAT**	**£1,299 inc VAT**	**£799 inc VAT**	**£900 inc VAT**
Website	Apple.com/uk	Acer.co.uk	Chillblast.com	Asus.com/uk	Hp.com/uk
Launch date	Dec 14	Dec 14	Dec 14	Dec 14	Dec 14
Build rating	★★★★★	★★★½☆	★★★☆☆	★★★½☆	★★★★☆
Features rating	★★★★★	★★½☆☆	★★★★☆	★★★★☆	★★★☆☆
Performance rating	★★★★☆	★★★½☆	★★★★★	★★½☆☆	★★½☆☆
Value rating	★★★★½	★★★★☆	★★★★☆	★★★☆☆	★★★½☆
Overall rating	★★★★★	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Processor	3.9GHz Intel Core i5-4690	2.7GHz Intel Core i5-4460T	4GHz Intel Core i7-4790S	2.6GHz Intel Core i5-4200U	3.2GHz Intel Core i7-4785T
RAM	8GB DDR3	8GB DDR3	16GB DDR3	6GB DDR3	8GB DDR3
Storage	1TB Fusion Drive	1TB HDD	1TB SSD	1TB HDD	1TB HDD
Screen	27in	23in touchscreen	24in	23in touchscreen	23in touchscreen
Screen resolution	5120x2880	1920x1080	1920x1080	1920x1080	1920x1080
Graphics card	AMD Radeon M9 M290X	nVidia GeForce GT 840M	nVidia GeForce GT 750M	Intel HD Graphics 4400	Intel HD Graphics 4600
Video memory	2GB	2GB	2GB	N/A	N/A
Wireless	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Ethernet	Gigabit	Gigabit	Gigabit	Gigabit	Gigabit
Bluetooth	×	×	×	×	×
USB	4x USB 3.0	2x USB 3.0, 3x USB 2.0	4x USB 3.0, 2x USB 2.0	3x USB 3.0, 3x USB 2.0	2x USB 3.0, 4x USB 2.0
FireWire	×	×	×	×	×
Thunderbolt	✓	×	×	×	×
HDMI	×	×	✓	✓	✓
Media card slot	✓	✓	✓	✓	✓
Optical drive	None	DVD Writer	Blu-Ray Combo	DVD Writer	DVD Writer
Other	Final Cut Pro X, Logic Pro X, Aperture	1Mp webcam, wireless keyboard and mouse	Logitech MK520 wireless keyboard and mouse	2Mp webcam, Freeview TV, wireless keyboard and mouse	Wireless keyboard and mouse, Beats Audio stereo speaker system (8x 12W)
Operating system	OS X Yosemite	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit	Windows 8.1 64-bit
Power consumption (idle/max)	46/215W	46/91W	35/177W	33/69W	43/81W
Sniper V2 Elite (Low/High/Ultra)	Not tested	47.7/18.7/5.1fps	91.5/41.2/10.5fps	31.4/7.8/5fps	27.7/7.4/5fps
PCMark 8 Home score	Not tested	2906	3776	2828	2702
Dimensions	650x203x516mm	540x489x579mm	585x200x450mm	571x359x50-214mm	563x143x413mm
Weight	9.54kg	8.8kg	14.6kg	9kg	8.4kg
Warranty	1-year return-to-base	Not stated	5-year labour (2-year collect-and-return)	1-year return-to-base	1-year limited parts, labour, and pickup-and-return service
FULL REVIEW	TINYURL.COM/NWJUJSF	TINYURL.COM/QEY8FOE	TINYURL.COM/LO8A5MC	TINYURL.COM/PRPHC7L	TINYURL.COM/O6M4BCN

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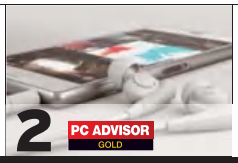

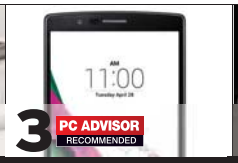

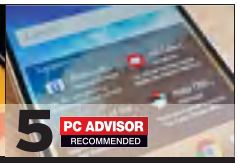

	Samsung Galaxy S6	Sony Xperia Z3 Compact	LG G4	LG G3	HTC One M9
Price	**£349 inc VAT**	**£349 inc VAT**	**£500 inc VAT**	**£479 inc VAT**	**£579 inc VAT**
Website	Samsung.com/uk	Sony.co.uk	Lg.com/uk	Lg.com/uk	HTC.com/uk
Launch date	Apr 15	Sep 14	May 15	May 14	Mar 15
Build rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★½
Features rating	★★★★½	★★★★☆	★★★★☆	★★★★½	★★★★☆
Performance rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★☆
Value rating	★★★★☆	★★★★★	★★★★½	★★★★½	★★★½☆
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★☆
OS (out of box)	Android 5.0 Lollipop	Android 4.4 KitKat	Android 5.1 Lollipop	Android 4.4 KitKat	Android 5.0 Lollipop
Processor	2.1GHz Exynos 7420	2.5GHz Snapdragon 801	Snapdragon 808 six-core	2.5GHz Snapdragon 801	Snapdragon 810 octa-core
RAM	3GB	2GB	3GB	2GB/3GB	3GB
Storage	32/64GB	16GB	32GB	16GB/32GB	32GB
MicroSD support	No	Up to 128GB	Up to 128GB	No	Up to 128GB
Graphics	Mali-T760 GPU	Adreno 330	Adreno 418	Adreno 330	Adreno 430
Screen size	5.1in	4.6in	4.5in	5.5in	5in
Screen resolution	1440x2560	720x1280	1440x2560	1440x2560	1080x1920
Pixel density	577ppi	319ppi	538ppi	534ppi	441ppi
Screen technology	Super AMOLED	IPS	IPS	IPS	IPS
Front camera	5Mp	2.2Mp	8Mp	2Mp	4Mp (UltraPixel)
Rear camera	16Mp, LED flash	20.7Mp, LED flash	16Mp	13Mp, LED flash	20Mp
Video recording	4K	4K	4K	4K	4K
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Nano-SIM	Nano-SIM	Micro-SIM	Micro-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.1	Bluetooth 4.0	Bluetooth 4.1	Bluetooth 4.0 (aptX)	Bluetooth 4.1 (aptX)
GPS	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes
USB OTG	Yes	Yes	Yes	Yes	Yes
Extra features	Heart-rate sensor, fingerprint scanner	Waterproof, PS4 Remote Play	24-bit/192kHz audio, rear key	24-bit/192kHz audio, rear key	BoomSound speakers
Geekbench 3.0 (single)	1347	Not tested	Not tested	Not tested	1160
Geekbench 3.0 (multi)	4438	2800	3513	2465	3378
SunSpider	1048ms	944ms	715ms	959ms	867ms
GFXBench: T-Rex	30fps	41fps	25fps	20fps	50fps
GFXBench: Manhattan	14fps	26fps	9fps	Not tested	24fps
Battery	2550mAh, non-removable	2600mAh, non-removable	3000mAh removable	3000mAh, removable, Qi	2840mAh, non-removable
Dimensions	143.4x70.5x6.8mm	64.9x127x8.6mm	64.9x127x8.6mm	75x146x8.9mm	70x145x9.7mm
Weight	138g	129g	155g	149g	157g
Warranty	1 year	2 years	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PC2KOYQ	TINYURL.COM/NBBUY82	TINYURL.COM/NBBUY82	TINYURL.COM/OA76T73	TINYURL.COM/PUS2XEJ

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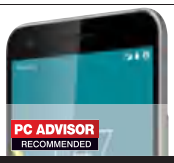
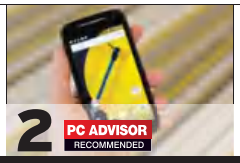
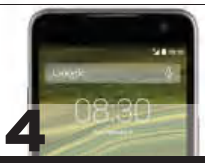
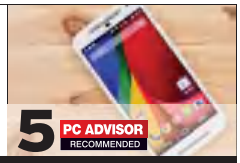
	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3	4	5 PC ADVISOR RECOMMENDED
					
	Vodafone Smart Ultra 6	**Motorola Moto E 4G 2015**	**Vodafone Smart Prime 6**	**EE Harrier Mini**	**Motorola Moto G 3G 2014**
Price	**£125 inc VAT**	**£109 inc VAT**	**£79 inc VAT**	**£99 inc VAT**	**£140 inc VAT**
Website	Vodafone.co.uk	Motorola.co.uk	Vodafone.co.uk	EE.co.uk	Motorola.co.uk
Launch date	Jul 15	Feb 15	June 15	June 15	Sep 14
Build rating	★★★★½	★★★★☆	★★★★½	★★★★☆	★★★★☆
Features rating	★★★★½	★★★★☆	★★★★☆	★★★½☆	★★★★☆
Performance rating	★★★★½	★★★★☆	★★★★★	★★★½☆	★★★★☆
Value rating	★★★★★	★★★★★	★★★★☆	★★★★½	★★★★☆
Overall rating	★★★★½	★★★★☆	★★★★½	★★★★☆	★★★★☆
OS (out of box)	Android 5.0.2 Lollipop	Android 5.0 Lollipop	Android 5.0.2 Lollipop	Android 5.0 Lollipop	Android 4.4 KitKat
Processor	2.5GHz Snapdragon 615	1.2GHz Snapdragon 410	1.2GHz Snapdragon 410	1.2GHz	1.2GHz Snapdragon 400
RAM	2GB	1GB	1GB	1GB	1GB
Storage	16GB	8GB	8GB	8GB	8GB
MicroSD support	Up to 128GB	Up to 32GB	Up to 64GB	Not stated	Up to 32GB
Graphics	Adreno 405	Adreno 306	Adreno 306	Not stated	Adreno 305
Screen size	5.5in	4.5in	5in	4.7in	5in
Screen resolution	1920x1080	540x960	720x1280	720x1280	720x1280
Pixel density	401ppi	245ppi	294ppi	312ppi	294ppi
Screen technology	IPS	IPS	IPS	IPS	IPS
Front camera	5Mp	0.3Mp	2Mp	2Mp	2Mp
Rear camera	13Mp	5Mp	8Mp	8Mp, LED flash	8Mp, LED flash
Video recording	1080p	720p	1080p	720p	720p
Cellular connectivity	4G	4G	4G	4G	3G
SIM type	Nano-SIM	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM
Dual-SIM as standard	No	No	No	No	Yes
Wi-Fi	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n	802.11b/g/n
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	GPS, A-GPS	GPS, A-GPS, Glonass	A-GPS	A-GPS, Glonass	A-GPS, Glonass
NFC	Yes	No	No	No	No
USB OTG	No	No	Yes	Yes	Yes
Extra features	FM radio	Double-twist launches camera, lockscreen alerts	FM radio	Wi-Fi calling	Stereo speakers
Geekbench 3.0 (single)	649	464	464	Not tested	340
Geekbench 3.0 (multi)	2469	1463	1401	1549	1144
SunSpider	1545ms	1301ms	1301ms	1880ms	1526ms
GFXBench: T-Rex	14fps	13fps	9.4fps	10fps	11fps
GFXBench: Manhattan	5.7fps	6fps	3.8fps	4fps	4fps
Battery	3000mAh, non-removable	2390mAh, non-removable	N/S, non-removable	2000mAh, non-removable	2390mAh, non-removable
Dimensions	154x77x9mm	66.8x5.2-12.3x129.9mm	141.65x71.89x9mm	138x67.9x9.5mm	71x142x11mm
Weight	159g	145g	155g	124g	155g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q7Q9NXR	TINYURL.COM/Q5DSNHE	TINYURL.COM/PXTROH4	TINYURL.COM/OAE6AH5

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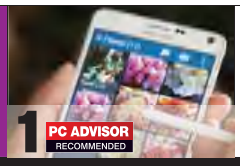
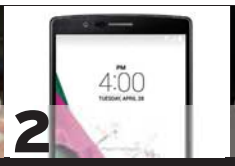
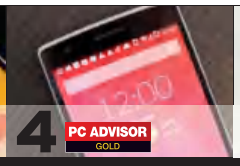
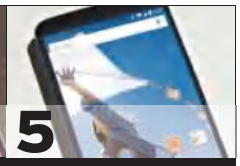
Best phablets	 1 PC ADVISOR RECOMMENDED	 2	 3 PC ADVISOR GOLD	 4 PC ADVISOR GOLD	 5
	Samsung Galaxy Note 4	LG G4	LG G3	OnePlus One	Google Nexus 6
Price	£599 inc VAT	£500 inc VAT	£479 inc VAT	£229 inc VAT	£499 inc VAT
Website	Samsung.com/uk	Lg.com/uk	Lg.com/uk	Oneplus.net	Play.google.com
Launch date	Sep 14	May 15	May 14	Jul 14	Oct 14
Build rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★☆
Features rating	★★★★½	★★★★☆	★★★★½	★★★½☆	★★★★☆
Performance rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★☆
Value rating	★★★★☆	★★★★½	★★★★½	★★★★★	★★★½☆
Overall rating	★★★★☆	★★★★☆	★★★★½	★★★★½	★★★★☆
OS (out of box)	Android 4.4 KitKat	Android 5.1 Lollipop	Android 4.4 KitKat	Cyanogen 11S (Android 4.4)	Android 5.0 Lollipop
Processor	2.7GHz Snapdragon 805	1.82GHz Snapdragon 808	2.5GHz Snapdragon 801	2.5GHz Snapdragon 801	2.7GHz Snapdragon 805
RAM	3GB	3GB	2GB/3GB	3GB	3GB
Storage	32GB	32GB	16GB/32GB	16GB/64GB	32GB/64GB
MicroSD support	Up to 128GB	Up to 128GB	No	No	No
Graphics	Adreno 420	Adreno 418	Adreno 330	Adreno 330	Adreno 420
Screen size	5.7in	5.5in	5.5in	5.5in	5.96in
Screen resolution	1440x2560	1440x2560	1440x2560	1920x1080	1440x2560
Pixel density	515ppi	538ppi	534ppi	401ppi	493ppi
Screen technology	Super AMOLED	IPS	IPS	IPS	IPS
Front camera	3.7Mp	8Mp	2Mp	5Mp	2Mp
Rear camera	16Mp, LED flash	16Mp, LED flash	13Mp, LED flash	13Mp, LED flash	13Mp, LED flash
Video recording	4K	4K	4K	4K	4K
Cellular connectivity	4G	4G	4G	4G	4G
SIM type	Micro-SIM	Micro-SIM	Micro-SIM	Micro-SIM	Nano-SIM
Dual-SIM as standard	No	No	No	No	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.1	Bluetooth 4.0	Bluetooth 4.0 (aptX)	Bluetooth 4.0	Bluetooth 4.1
GPS	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass	GPS, Glonass
NFC	Yes	Yes	Yes	Yes	Yes
USB OTG	Yes	Yes	Yes	Yes	Yes
Extra features	Fingerprint, UV, heart-rate sensors, S Pen stylus	24bit/192kHz audio, rear key, IR blaster	24bit/192kHz audio, rear key	None	None
Geekbench 3.0 (single)	Not tested	Not tested	Not tested	969	Not tested
Geekbench 3.0 (multi)	3272	3513	2465	2570	3304
SunSpider	1367ms	715ms	959ms	877ms	791ms
GFXBench: T-Rex	27fps	25fps	20fps	29fps	27fps
GFXBench: Manhattan	11fps	9fps	Not tested	Not tested	12fps
Battery	3220mAh, removable	3000mAh, removable, Qi	3000mAh, removable, Qi	3100mAh, non-removable	3220mAh, non-removable, Qi
Dimensions	78.6x153.5x8.5mm	76x149x6.3-9.8mm	75x146x8.9mm	75.9x152.9x8.9mm	82x159x10.4mm
Weight	176g	155g	149g	162g	183g
Warranty	2 years	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PNHJCZ4	TINYURL.COM/QDGU48T	TINYURL.COM/OA76T73	TINYURL.COM/PK3S5CP	TINYURL.COM/NLZ4UD9

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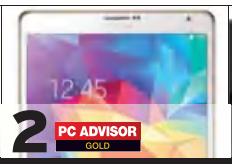
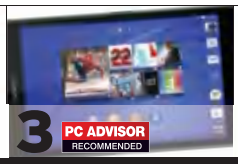
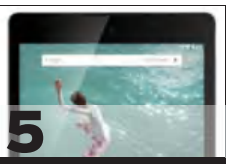
Best 7- & 8in tablets







	Google Nexus 7	Samsung Galaxy Tab S 8.4	Sony Xperia Z3 Tablet Compact	Apple iPad mini 2	Google Nexus 9
Price	**£199 inc VAT**	**£319 inc VAT**	**£299 inc VAT**	**£239 inc VAT**	**£319 inc VAT**
Website	Play.google.com	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Aug 13	Aug 14	Sep 14	Oct 13	Oct 14
Build rating	★★★★☆	★★★★☆	★★★★☆	★★★★½	★★★½☆
Features rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★☆
Performance rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Value rating	★★★★½	★★★★½	★★★★☆	★★★★☆	★★★★☆
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★☆
OS (out of box)	Android 4.3 Jelly Bean	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 5.0 Lollipop
Processor	1.5GHz Snapdragon S4 Pro	Exynos 5420, octa-core	2.5GHz Snapdragon 801	Apple A7, Apple M7	2.3GHz nVidia Tegra K1
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 128GB	No	No
Graphics	Adreno 320	ARM Mali-T628 MP6	Adreno 330	Apple A7	192-core Kepler
Screen size	7in	8.4in	8in	7.9in	8.9in
Screen resolution	1920x1200	2560x1440	1920x1200	2048x1536	2048x1536
Pixel density	323ppi	359ppi	283ppi	326ppi	287ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.6Mp
Rear camera	5Mp	8Mp, LED flash	8.1Mp	5Mp	8Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	4G version available
Wi-Fi	802.11b/g/n, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11a/b/g/n/ac, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.1
GPS	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes	No	Yes	No	Yes
USB OTG	Yes	Yes	Yes	No	Yes
Fingerprint scanner	No	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PS4 Remote Play, stereo speakers	None	BoomSound speakers
Geekbench 3.0 (single)	Not tested	Not tested	Not tested	Not tested	1904
Geekbench 3.0 (multi)	Not tested	2765	2708	Not tested	3352
SunSpider	1136ms	1089ms	1017ms	397ms	955ms
GFXBench: T-Rex	Not tested	14fps	28fps	Not tested	48fps
GFXBench: Manhattan	Not tested	3fps	11fps	Not tested	22fps
Battery	3950mAh, non-removable, Qi	4900mAh, non-removable	4500mAh, non-removable	6470mAh, non-removable	6700mAh, non-removable
Dimensions	200x114x8.65mm	126x213x6.6mm	213x124x6.4mm	134.7x7.5x200mm	153.7x228.3x8mm
Weight	299g	294g	270g	331g	425g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PUJDJBY	TINYURL.COM/OUEM64Z	TINYURL.COM/NJ6VHEO	TINYURL.COM/PCJPB5L	TINYURL.COM/NQ6K77Y

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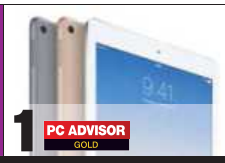

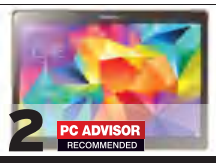

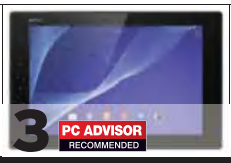

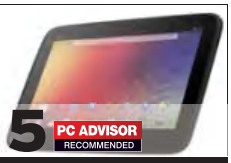

	Apple iPad Air 2	Samsung Galaxy Tab S 10.5	Sony Xperia Z2 Tablet	Apple iPad Air	Google Nexus 10
Price	**£399 inc VAT**	**£399 inc VAT**	**£369 inc VAT**	**£319 inc VAT**	**£389 inc VAT**
Website	Apple.com/uk	Samsung.com/uk	Sony.co.uk	Apple.com/uk	Play.google.com
Launch date	Oct 14	Aug 14	Mar 14	Oct 13	Oct 12
Build rating	★★★★★	★★★★☆	★★★★½	★★★★☆	★★★★½
Features rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Performance rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Value rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★½
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★★½
OS (out of box)	iOS 8.2	Android 4.4 KitKat	Android 4.4 KitKat	iOS 8.2	Android 4.2 Jelly Bean
Processor	Apple A8X, Apple M8	Exynos 5420, octa-core	2.3GHz Snapdragon 801	Apple A7, Apple M7	1.7GHz Exynos 5250
RAM	2GB	3GB	3GB	1GB	2GB
Storage	16GB/64GB/128GB	16GB/32GB	16GB	16GB/32GB	16GB/32GB
MicroSD support	No	Up to 128GB	Up to 64GB	No	No
Graphics	Apple A8X	ARM Mali-T628 MP6	Adreno 330	Apple A7	ARM Mali T604
Screen size	9.7in	10.5in	10.1in	9.7in	10.1in
Screen resolution	2048x1536	2560x1600	1920x1200	2048x1536	2560x1600
Pixel density	264ppi	288ppi	224ppi	264ppi	300ppi
Screen technology	IPS	Super AMOLED	IPS	IPS	IPS
Front camera	1.2Mp	2.1Mp	2.2Mp	1.2Mp	1.9Mp
Rear camera	8Mp	8Mp, LED flash	8.1Mp	5Mp	5Mp, LED flash
Video recording	1080p	1080p	1080p	1080p	1080p
Cellular connectivity	4G version available	4G version available	4G version available	4G version available	No
Wi-Fi	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n/ac, dual-band	802.11a/b/g/n, dual-band	802.11b/g/n, dual-band
Bluetooth	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0	Bluetooth 4.0
GPS	A-GPS, Glonass	GPS, Glonass	GPS, Glonass	A-GPS, Glonass	GPS, Glonass
NFC	Yes (for Apple Pay)	No	Yes	No	Yes
USB OTG	No	Yes	Yes	No	Yes
Fingerprint scanner	Yes	Yes	No	No	No
Waterproof	No	No	Yes	No	No
Extra features	None	Stereo speakers	PlayStation certified	None	None
Geekbench 3.0 (single)	1816	Not tested	967	1487	Not tested
Geekbench 3.0 (multi)	4523	2769	2719	2703	Not tested
SunSpider	Not tested	1079ms	1099ms	400ms	1329ms
GFXBench: T-Rex	48fps	14fps	27fps	23fps	Not tested
GFXBench: Manhattan	Not tested	3fps	Not tested	Not tested	Not tested
Battery	7340mAh, non-removable	7900mAh, non-removable	6000mAh, non-removable	8600mAh, non-removable	9000mAh, non-removable
Dimensions	240x169.5x6.1mm	247x177x6.6mm	266x172x6.4mm	240x169x7.5mm	264x178x8.9mm
Weight	437g	465g	439g	469g	603g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PLQXWSZ	TINYURL.COM/OESDFZQ	TINYURL.COM/M8BZZUN	TINYURL.COM/NVOOF6H	TINYURL.COM/PUAG9RN

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Best smartwatches	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3	4	5
	LG G Watch R	Motorola Moto 360	Sony Smartwatch 3	LG Watch Urbane	Asus ZenWatch
Price	**£195 inc VAT**	**£199 inc VAT**	**£189 inc VAT**	**£259 inc VAT**	**£199 inc VAT**
Website	Lg.com/uk	Motorola.co.uk	Sony.co.uk	Lg.com/uk	Uk.asus.com
Launch date	Nov 14	Oct 14	Sep 14	Jul 15	Jan 15
Overall rating	★★★★½	★★★★½	★★★½☆	★★★★☆	★★★½☆
Operating system	Android Wear	Android Wear	Android Wear	Android Wear	Android Wear
Compatibility	Android	Android	Android	Android	Android
Display	1.3in 320x320 P-OLED	1.56in 290x320 LCD	1.6in 320x320 LCD	1.3in 320x320 P-OLED	1.6in 320x320 AMOLED
Processor	1.2GHz Snapdrgon 400	TI OMAP 3	1.2GHz ARM V7	1.2GHz Snapdragon 400	1.2GHz Snapdragon 400
RAM	512MB	512MB	512MB	512MB	512MB
Storage	4GB	4GB	4GB	4GB	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	410mAh	320mAh	420mAh	410mAh	1.4Wh
Dimensions	46.4x53.6x9.7mm	46x11.5mm	36x51x10mm	46x52x10.9mm	51x39.9x7.9-9.4mm
Weight	62g	49g (leather band model)	45g	67g	75g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/QATY8FT	TINYURL.COM/O9C69K6	TINYURL.COM/OQVZ3PN	TINYURL.COM/Q3VK7ES	TINYURL.COM/NN7GA7W

Best smartwatches	6	7 PC ADVISOR RECOMMENDED	8 PC ADVISOR RECOMMENDED	9 PC ADVISOR RECOMMENDED	10
	Apple Watch	Pebble Steel	LG G Watch	Sony Smartwatch 2	Samsung Gear 2 Neo
Price	**£299 inc VAT**	**£179 inc VAT**	**£159 inc VAT**	**£125 inc VAT**	**£169 inc VAT**
Website	Apple.com/uk	Getpebble.com	Lg.com/uk	Sony.co.uk	Samsung.com/uk
Launch date	Apr 15	Sep 14	Jul 14	Jun 13	Apr 14
Overall rating	★★★☆☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Operating system	watchOS	Proprietary	Android Wear	Proprietary	Tizen
Compatibility	iOS	iOS, Android	Android	Android	Samsung phones
Display	1.32in 340x312 Ion-X Glass	1.26in 144x168 E-Paper	1.65in 280x280 IPS	1.6in 220x176 LCD	1.6in 320x320 Super AMOLED
Processor	Apple S1	Not specified	1.2GHz Snapdragon 400	Not specified	Dual-core
RAM	512MB	512MB	512MB	Not specified	512MB
Storage	8GB	Not specified	4GB	Not specified	4GB
Waterproof	Yes	Yes	Yes	Yes	Yes
Battery	Not specified	130mAh	400mAh	Not specified	300mAh
Dimensions	38.6x33.3x10.5mm	46x34x10.5mm	37.9x46.5x9.95mm	42x41x9mm	58.8x37.9x10mm
Weight	72g	156g	63g	123g	55g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OUTH9XK	TINYURL.COM/PPBXV7J	TINYURL.COM/Q84WL6L	TINYURL.COM/P4X7AZM	TINYURL.COM/Q68FS5U

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Best activity trackers

	1 PC ADVISOR RECOMMENDED	2	3	4 PC ADVISOR RECOMMENDED	5 PC ADVISOR RECOMMENDED
					
	Fitbit Charge HR	**Fitbit Surge**	**Fitbit One**	**Microsoft Band**	**Fitbit Charge**
Price	**£119 inc VAT**	**£199 inc VAT**	**£79 inc VAT**	**£169 inc VAT**	**£99 inc VAT**
Website	Fitbit.com/uk	Fitbit.com/uk	Fitbit.com/uk	Microsoft.com/en-gb	Fitbit.com/uk
Launch date	Jan 15	Jan 15	Jan 14	May 15	Nov 14
Overall rating	★★★★½	★★★★½	★★★★½	★★★½☆	★★★★☆
Compatibility	iOS, Android, Windows	iOS, Android, Windows	iOS, Android	iOS, Android, Windows	iOS, Android, Windows
Display	OLED	Touchscreen	OLED	TFT	OLED
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	Yes	Yes	No	Yes	No
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	Yes	Yes	Yes	Yes	Yes
Third-party app synching	Yes	Yes	Yes	Yes	Yes
Call notifications	Yes	Yes	No	Yes	Yes
Waterproof	Yes	Yes	No	Yes	Yes
Battery life	5+ days	5 days	10-14 days	2 days	7-10 days
Dimensions, weight	21.1mm, 26g	34mm, 51g	35.5x28x9.65mm, 8g	11x33mm, 60g	21.1mm, 24g
FULL REVIEW	TINYURL.COM/PCKV4SU	TINYURL.COM/O83DR47	TINYURL.COM/PT2TC6F	TINYURL.COM/LHMQ2AC	TINYURL.COM/PFMQ9KH

Best activity trackers

	6	7 PC ADVISOR RECOMMENDED	8	9 PC ADVISOR RECOMMENDED	10
					
	Basis Peak	**Xiaomi Mi Band**	**Jawbone Up 2**	**Jawbone Up Move**	**Jawbone Up24**
Price	**£169 inc VAT**	**£29 inc VAT**	**£89 inc VAT**	**£39 inc VAT**	**£99 inc VAT**
Website	En-gb.mybasis.com	Mobilefun.co.uk	Jawbone.com	Jawbone.com	Jawbone.com
Launch date	Apr 15	Feb 15	June 15	Nov 14	Mar 14
Overall rating	★★★½☆	★★★★½	★★★★☆	★★★★☆	★★★½☆
Compatibility	iOS, Android	iOS, Android	iOS, Android	iOS, Android	iOS, Android
Display	E-Ink	No	No	No	No
Pedometer	Yes	Yes	Yes	Yes	Yes
Heart-rate monitor	Yes	No	No	No	No
Sleep tracking	Yes	Yes	Yes	Yes	Yes
Alarm	No	Yes	Yes	No	Yes
Third-party app synching	No	No	Yes	Yes	Yes
Call notifications	Yes	Yes	No	No	No
Waterproof	Yes	Yes	Splashproof	Splashproof	Splashproof
Battery life	4 days	30 days	7 days	Six months, non-rechargable	7 days
Dimensions, weight	33x43x10mm, 51g	157-205mm, 13g	220x11.5x3-8.5mm, 25g	27.6x27.6x9.8mm, 6.8g	S: 19g, M: 22g, L: 23g
FULL REVIEW	TINYURL.COM/LHMQ2AC	TINYURL.COM/QZ3YVCR	TINYURL.COM/PHT98ZK	TINYURL.COM/PFXQFNE	TINYURL.COM/ND8YMB8

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Best budget printers





	1 HP OfficeJet 3830	2 Samsung Xpress M2070W	3 Brother HL-1110	4 Canon Pixma MX535	5 Canon i-Sensys LBP6230dw
Price	**£60 inc VAT**	**£100 inc VAT**	**£59 inc VAT**	**£70 inc VAT**	**£91 inc VAT**
Website	Hp.com/uk	Samsung.com/uk	Brother.co.uk	Canon.co.uk	Canon.co.uk
Launch date	Jun 15	Mar 14	Feb 14	Jul 14	Mar 15
Overall rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★½
Technology	Colour inkjet	Mono laser	Mono laser	Colour inkjet	Mono laser
Max print resolution	1200x1200dpi	1200x1200dpi	600x600dpi	4800x1200dpi	1200x1200dpi
Actual print speed	B=11ppm C=4ppm	B=17.1ppm	B=16.4ppm	B=9.7ppm C=3.8ppm	B=22.2ppm
Scan/fax facilities	None	1200x1200 scans	None	1200x2400 scans/fax	None
Supported interfaces	USB 2.0, 802.11b/g/n, AirPrint	USB 2.0, 802.11b/g/n, NFC	USB 2.0	USB 2.0, 802.11b/g/n, AirPrint	USB 2.0, 802.11b/g/n
Cost per page	B=6p C=7p	B=3.8p	B=2.7p	B=2.7p C=4.8p	B=2p
Media card/auto duplex	×✓	××	××	×✓	×✓
Input capacity	60 sheets	150 sheets	150 sheets	100 sheets + 30-sheet ADF	250 sheets
Dimensions	222x454x362mm	406x360x253mm	340x238x189mm	458x385x200mm	379x293x243mm
Weight	5.76kg	7.4kg	4.5kg	8.5kg	7kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PJ4K9D7	TINYURL.COM/OYZKJKE	TINYURL.COM/OQE9LGJ	TINYURL.COM/N9LXVN7	TINYURL.COM/KZW8VU3

Best printers





	1 Canon Pixma MG7550	2 Samsung Xpress M2835DW	3 Canon i-Sensys MF6180dw	4 Epson WorkForce Pro	5 Brother HL-L9200CDWT
Price	**£130 inc VAT**	**£143 inc VAT**	**£320 inc VAT**	**£200 inc VAT**	**£548 inc VAT**
Website	Canon.co.uk	Samsung.com/uk	Canon.co.uk	Epson.co.uk	Brother.co.uk
Launch date	Jul 15	Oct 14	May 14	May 15	Aug 14
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Technology	Colour inkjet	Mono laser	Mono laser	Colour inkjet	Colour laser
Max print resolution	9600x2400dpi	4800x600dpi	1200x600dpi	4800x1200dpi	2400x600dpi
Actual print speed	B=14.3ppm	B=22.7ppm	B=24ppm	B=18.9ppm	B=30ppm C=30ppm
Scan/fax facilities	2400x4800dpi scanner	None	600dpi scanner, 33.6Kb/s fax	None	None
Supported interfaces	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n	USB 2.0, ethernet, 802.11b/g/n
Cost per page	B=2.4p C=8.1p	B=1.5p	B=1.5p	B=1.1p	B=1p C=5.9p
Media card/auto duplex	×✓	×✓	×✓	×✓	×✓
Input capacity	125 sheets	250 sheets	250 + 50 sheet + 50 ADF	250 + 80 sheet	750 sheets + 50 sheet
Dimensions	435x370x148mm	368x335x202mm	390x473x431mm	3461x442x284mm	410x495x445mm
Weight	7.9kg	7.4kg	19.1kg	11.4kg	28.3kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/PZ3SVH7	TINYURL.COM/QECOF7V	TINYURL.COM/LE9WA5N	TINYURL.COM/OC7FUJ3	TINYURL.COM/PT52MH6

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Best wireless routers

	Apple AirPort Extreme	Netgear Nighthawk R7000	D-Link DIR 880L	TP-Link Archer C7	Asus RT-AC68U AC1900
Price	**£169 inc VAT**	**£150 inc VAT**	**£108 inc VAT**	**£90 inc VAT**	**£160 inc VAT**
Website	Apple.com/uk	Netgear.co.uk	Dlink.com	Tp-link.com	Uk.asus.com
Launch date	Jan 14	Sep 14	Sep 14	Jan 14	Jan 14
Overall rating	★★★★☆	★★★★½	★★★★☆	★★★★☆	★★★★☆
Standards supported	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Frequency modes	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)	2.4GHz/5GHz (concurrent)
Antennas	6x internal	3x external	3x external	3x external, 3x internal	3x external, 3x internal
Built-in modem	×	×	×	×	×
Manufacturer's rating	1300/450Mb/s	1300/600Mb/s	1300/600Mb/s	1300/450Mb/s	1300/600Mb/s
WPS	×	✓	✓	✓	✓
Ports	Gigabit WAN, 3x gigabit LAN, USB	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 1x USB 3.0, 1x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0	Gigabit WAN, 4x gigabit LAN, 2x USB 2.0
Average power use	8W	9W	10W	N/A	N/A
Max speed (11n/11ac)	171/572Mb/s	171/592Mb/s	171/625Mb/s	110/505Mb/s	98/610Mb/s
Dimensions, weight	98x168x98mm, 945g	285x186x45mm, 750g	247x190x47mm, 745g	32.5x243x160mm, 508g	160x83x220mm, 640g
Warranty	1 year	N/S	N/S	3 years	2 years
FULL REVIEW	TINYURL.COM/MFDLLSC	TINYURL.COM/Q2NRQ8Q	TINYURL.COM/OZ5G7KG	TINYURL.COM/KKJMPCE	TINYURL.COM/K4ZATKV

Best powerline adaptors

	Solwise SmartLink 1200AV2	TrendNet Powerline 500 AV2	TP-Link AV1200	Devolo dLan 1200+	Devolo dLAN 500AV
Price	**£43 inc VAT**	**£41 inc VAT**	**£88 inc VAT**	**£119 inc VAT**	**£129 inc VAT**
Website	Solwise.com	Trendnet.com	Uk.tp-link.com	Devolo.com/uk	Devolo.com/uk
Launch date	Nov 14	Mar 14	May 15	Sep 14	Nov 13
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★☆
No of adaptors in kit	1 (2 required)	2	2	2	2
Max throughput	1200Mb/s	600Mb/s	1200Mb/s	1200Mb/s	500Mb/s
Near test result	410Mb/s	146Mb/s	500Mb/s	357Mb/s	96Mb/s
Far test result	107Mb/s	71Mb/s	200Mb/s	126Mb/s	47Mb/s
Ethernet ports	2x gigabit	1x gigabit	1x gigabit	1x gigabit	3x gigabit
Passthrough socket	Yes	No	Yes	Yes	Yes
Wireless hotspot	No	No	No	No	Yes
Encryption	128-bit	128-bit	128-bit	128-bit	128-bit
Dimensions	62x122x41mm	55x87x58mm	230x190x100mm	130x66x42mm	152x76x40mm
Weight	Not specified	90g	898g	Not specified	Not specified
Warranty	2 years	3 years	1 year	3 years	3 years
FULL REVIEW	TINYURL.COM/NZ4EJW8	TINYURL.COM/QYEPJQ7	TINYURL.COM/NVONCWT	TINYURL.COM/Q4EOO4M	TINYURL.COM/OVNPPQ7

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Best NAS drives

	Qnap TS-421	Synology DS115j	Qnap HS-210	WD My Cloud EX2100	Synology DS414j
Price	**£320 inc VAT (diskless)**	**£83 inc VAT (diskless)**	**£190 inc VAT (diskless)**	**£205 inc VAT (diskless)**	**£270 inc VAT (diskless)**
Website	Qnap.com	Synology.com	Qnap.com	Wd.com	Synology.com
Launch date	Mar 14	Feb 15	Dec 14	May 15	Jan 15
Overall rating	★★★★☆	★★★★☆	★★★★½	★★★★☆	★★★★☆
Drive bays	4	1	2	2	4
Processor	2GHz Marvell single-core	800MHz Marvell Armada 370	1.6GHz Marvell single-core	1.3 GHz Marvel Armada 385	1.2GHz Mindspeed Concerto
Memory	1GB DDR3	256MB DDR3	512MB DDR3	1GB DDR3	512MB DDR3
Remote access	✓	✓	✓	✓	✓
eSATA	2x	×	×	×	1x
USB port	2x USB 3.0, 2x USB 2.0	2x USB 2.0	2x USB 3.0, 2x USB 2.0	2x USB 3.0	1x USB 3.0, 1x USB 2.0
Raid options	0/1/5/6/10/JBOD	None	0/1/JBOD	00/1/JBOD	0/1/5/6/10/JBOD
Software	Backup Station	DSM 5.1	HD Station	My Cloud	DSM 5.0
Dimensions	177x180x235mm	71x161x224mm	302x220x41mm	216x109x148mm	184x168x230mm
Weight	3kg	700g	1.5kg	3.5kg	2.2kg
Warranty	2 years	1 year	2 years	3 years	3 years
FULL REVIEW	TINYURL.COM/MCYWUB8	TINYURL.COM/MNEYVNK	TINYURL.COM/OEXRYNY	TINYURL.COM/M643BSG	TINYURL.COM/M643BSG

Best external hard drives

	Transcend StoreJet 25M3	WD My Passport Ultra Metal	Toshiba Canvio Basics	Seagate Seven mm	iStorage diskAshur Pro
Price	**£70 inc VAT**	**£90 inc VAT**	**£76 inc VAT**	**£99 inc VAT**	**£269 inc VAT**
Website	Uk.transcend-info.com	Wdc.com/en	Toshiba.co.uk	Seagate.com/gb/en	Istorage-uk.com
Launch date	Feb 15	Feb 15	Feb 15	Feb 15	Feb 15
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★½☆
Capacity tested	2TB	2TB	2TB	500GB	1TB
Capacity range	500GB, 1TB, 2TB	1TB, 2TB	500GB, 1TB, 2TB	500GB	500GB, 1TB, 1.5TB, 2TB
Disk size	2.5in	2.5in	2.5in	2.5in	2.5in
Spin speed	5400rpm	N/A	5400rpm	5400rpm	5400rpm
Transfer speed	135MB/s	114MB/s	117MB/s	49MB/s	115MB/s
Encryption	256-bit AES	256-bit AES	256-bit AES	N/A	256bit AES-XTS
Other interfaces	USB 3.0	USB 3.0	USB 3.0	USB 3.0	USB 3.0
Software	Transcend Elite	WD Drive Utilities	None	Seagate Dashboard	Security utilities
Dimensions	130x82x19mm	110x80x19mm	111x79x21mm	123x82x7mm	120x85x20mm
Weight	234g	241g	207g	178g	200g
Warranty	3 years	3 years	2 years	2 years	2 years
FULL REVIEW	TINYURL.COM/M72D3EP	TINYURL.COM/L2B7V3B	TINYURL.COM/JWHHACB	TINYURL.COM/O6KZFDM	TINYURL.COM/MZOBZ6J

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Best SSDs

	OCZ Arc 100	Samsung 850 Pro	SanDisk Extreme Pro	Crucial MX200	Kingston HyperX Savage
Price	**£69 inc VAT**	**£365 inc VAT**	**£172 inc VAT**	**£301 inc VAT**	**£185 inc VAT**
Website	Ocz.com	Samsung.com/uk	Sandisk.co.uk	Uk.crucial.com	Kingston.com/en
Launch date	Jul 15	Jul 15	Jul 15	Jul 15	Jul 15
Overall rating	★★★★½	★★★★½	★★★★½	★★★½☆	★★★½☆
Capacity tested	240GB	1TB	480GB	1TB	480GB
Price per GB	28.8p	36.5p	35.8p	30.1p	38.5p
Memory cache	512MB DDR3	1GB LPDDR2	1GB	1GB DDR3	256MB
Controller	Indilinx Barefoot 3 M10	Samsung MCX	Marvell 88SS9187	Marvell 88SS9189	Phison PS3110 S10
Encryption	AES 256-bit	AES 256-bit	AES 256-bit	AES 256-bit	Unknown
Flash	Toshiba 19nm MLC	Samsung 40nm V-AND MLC	SanDisk 19nm MLC	Micron 16nm MLC	Toshiba 19nm A19 MLC
Firmware updated via	OCZ SSD Guru	Samsung SSD Magician	SandDisk SSD Dashboard	Crucial Storage Executive	None
ATTO peak sequential	489-/447MB/s	564-/534MB/s	556-/525MB/s	533-/514MB/s	564-/543MB/s
CDM peak IOPS	79.2-/90.3MB/s	103.2-/93.7MB/s	102.7/91.4MB/s	26.1/90.1MB/s	91.6-/94.8MB/s
CDM 4kB rnd	27-/127MB/s	36-/89MB/s	32-/88MB/s	29-/131MB/s	26-59MB/s
Warranty	3 years	10 years	10 years	3 years	3 years
FULL REVIEW	TINYURL.COM/QZQLYY4	TINYURL.COM/OVHDALD	TINYURL.COM/NMSJU25	TINYURL.COM/P3YX2KE	TINYURL.COM/ON54VUC

Best projectors

	ViewSonic PLED-W800	BenQ W1300	Optoma W316	InFocus IN126STa	NEC M352WS
Price	**£512 inc VAT**	**£730 inc VAT**	**£458 inc VAT**	**£525 inc VAT**	**£778 inc VAT**
Website	Viewsoniceurope.com/uk	Benq.co.uk	Optoma.co.uk	Infocus.com	Nec-display-solutions.com
Launch date	Feb 15	Jun 14	Jul 14	Sep 14	Jul 14
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Projection technology	DLP	DLP	DLP	DLP	DLP
Resolution (pixels)	1280x800	1920x1080	1280x800	1280x800	1280x800
Brightness, Contrast	800, 120,000:1	2000, 10,000:1	3400, 15,000:1	3300, 15,000:1	3500, 10,000:1
Image size	100in	300in	300in	300in	150in
Supported aspect ratios	16:10 native	16:9 native	16:10, 16:9, 4:3	16:10, 16:9, 4:3	16:10
Noise levels (dB)	34 (32 eco)	33 (30 eco)	29db	32db (30 eco)	33 (39 bright mode)
Connections	VGA, HDMI, USB	VGA, 2x HDMI, USB, 3D	VGA, HDMI, Mini-USB, 3D	2x VGA, HDMI, USB, ethernet	2x VGA, 2x HDMI, USB
Lamp/lamp life	90W/30000 hrs	240W/6000 hrs	190W/10000 hrs	278W/3500 hrs	278W/8000 hrs
Dimensions	175x52x138mm	330x257x128mm	315x223x102mm	292x220x108mm	368x268x97mm
Weight	0.83kg	3.4kg	2.5kg	3.7kg	3.6kg
Warranty	3 years	3 years	2 years	1 year	3 years
FULL REVIEW	TINYURL.COM/K83X8LA	TINYURL.COM/K4FA89Q	TINYURL.COM/OCWTHGW	TINYURL.COM/NHH3QPB	TINYURL.COM/Q6J2N6W

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Best budget graphics cards

	1	2	3	4	5
					
	Sapphire Radeon R7 250X	**MSI R7 260X OC**	**EVGA GeForce GTX 750**	**Asus GeForce GT 740 OC**	**MSI GeForce GT 730**
Price	**£65 inc VAT**	**£91 inc VAT**	**£90 inc VAT**	**£65 inc VAT**	**£48 inc VAT**
Website	Sapphiretech.com	Uk.msi.com	Eu.evga.com	Asus.com/uk	Uk.msi.com
Launch date	Feb 15	May 14	Mar 14	Feb 15	Aug 14
Overall rating	★★★★½	★★★½☆	★★★½☆	★★★½☆	★★★½☆
Graphics processor	AMD Radeon R7 250X	AMD Radeon R7 260X	nVidia GeForce GTX 750	nVidia GeForce GT 740	nVidia GeForce GT730
Installed RAM	1GB GDDR5	2GB GDDR5	1GB GDDR5	1GB GDDR5	2GB GDDR3
Memory interface	128-bit	128-bit	128-bit	128-bit	128-bit
Core clock	950MHz	1175MHz	1294MHz	1033MHz	780MHz
Memory clock/Effective	1125/4500MHz	1625MHz/6.5GHz	1253/5012MHz	1.25/5GHz	900/1800MHzHz
Stream processors	640	896	512	384	320
Texture units	40	56	32	32	20
Power connectors	1x 6-pin	1x 6-pin	None	1x 6-pin	1x 6-pin
DirectX	12	11.1	Unknown	Unknown	Unknown
Digital interface	1x DVI, HDMI, DisplayPort	2x DVI, HDMI, Mini-DP	1x DVI, HDMI, DisplayPort	1x DVI, HDMI, VGA	1x DVI, HDMI, VGA
Warranty	2 years	3 years	3 years	3 years	2 years
FULL REVIEW	TINYURL.COM/OLJ83SQ	TINYURL.COM/OZ6WUYT	TINYURL.COM/PB3F6EN	TINYURL.COM/PAH5VMJ	TINYURL.COM/P8J4C2R

Best graphics cards

	1	2	3	4	5
					
	Gigabyte GeForce GTX 770 2GB	**HIS Radeon R9 280X**	**Zotac Geforce GTX 960**	**XFX Radeon R9 290X**	**MSI Radeon R9 295 X2**
Price	**£200 inc VAT**	**£246 inc VAT**	**£285 inc VAT**	**£280 inc VAT**	**£680 inc VAT**
Website	Uk.gigabyte.com	Hisdigital.com	Zotac.com	Xfxforce.com	Uk.msi.com
Launch date	Aug 13	Nov 13	Mar 15	Apr 14	May 14
Overall rating	★★★★½	★★★★½	★★★★☆	★★★★½	★★★★☆
Graphics processor	nVidia GeForce GTX 770	AMD Radeon R9 280X	nVidia GeForce GTX 960	AMD Radeon R9 290X	AMD Radeon R9 295 X2
Installed RAM	2GB GDDR5	3GB GDDR5	2GB GDDR5	4GB GDDR5	8GB GDDR5
Memory interface	256-bit	384-bit	128-bit	512-bit	2x 512-bit
Core clock/boost	950/1020MHz	850MHz/1GHz	1266/1329MHz	1/1GHz	1018MHz/N/A
Memory clock/Effective	1.5GHz/6GHz	1.5GHz/6GHz	1752MHz/7.1GHz	1.25GHz/5GHz	1.25GHz/5GHz
Stream processors	1536	2048	1024	2816	2x 2816
Texture units	128	128	64	176	2x 176
Power connectors	1x 6-pin, 1x 8-pin	2x 8-pin	1x 6-pin	8-pin, 6-pin	2x 8-pin
DirectX	11	11	12	11	11
Digital interface	2x DVI, HDMI, DisplayPort	DVI, HDMI, 2x Mini-DisplayPort	DVI, HDMI, 3x DisplayPort	2x DVI, HDMI, DisplayPort	DVI, 4x Mini-DP
Warranty	3 years	2 years	5 years	3 years	3 years
FULL REVIEW	TINYURL.COM/OAG6277	TINYURL.COM/PR5O3GT	TINYURL.COM/MWBCO36	TINYURL.COM/NPET8ER	TINYURL.COM/POTAOGZ

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Best budget flat-panel displays

	1 PC ADVISOR BEST BUY	2 PC ADVISOR RECOMMENDED	3	4	5
	AOC i2369Vm	**Philips 234E5QHAW**	**NEC MultiSync E243WMi**	**BenQ EW2740L**	**BenQ GL2450**
Price	**£130 inc VAT**	**£130 inc VAT**	**£194 inc VAT**	**£175 inc VAT**	**£108 inc VAT**
Website	Aoc-europe.com/en	Philips.co.uk	Nec-display-solutions.com	Benq.co.uk	Benq.co.uk
Launch date	Jul 14	Jul 14	Jun 14	Aug 14	Jul 14
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Screen size	23in	23in	23.8in	27in	24in
Panel type	IPS matt	IPS matt	IPS matt	VA semi-matt	TN matt
Native resolution	1920x1080	1920x1080	1920x1080	1920x1080	1920x1080
Pixel density	96ppi	96ppi	93ppi	82ppi	92ppi
Brightness	220cd/m²	187cd/m²	250cd/m²	300cd/m²	261cd/m²
Static contrast ratio	630:1	210:1	650:1	280:1	610:1
Response time	6ms	5ms	6ms	4ms	5ms
Ports	HDMI, HDMI/MHL, DP, VGA	2x HDMI (QHAB) or 1x HDMI (QDAB), VGA	DP, DVI-D, VGA	2x HDMI, VGA	DVI-D, VGA
Dimensions	531x204x398mm	532x213x414mm	558x214x380-490mm	623x191x451mm	579x179x436mm
Weight	3.75kg	3.5kg	6.3kg	4.2kg	4.1kg
Warranty	3 years	2 years	3 years	2 years	2 years
FULL REVIEW	TINYURL.COM/OOEFYPR	TINYURL.COM/KLYLW4V	TINYURL.COM/KNCGVOU	TINYURL.COM/OO6EC5L	TINYURL.COM/OOUPFUE

Best flat-panel displays

	1	2	3	4	5
	LG 34UM95	**HP DreamColor Z27x**	**ViewSonic VP2772**	**BenQ BL2411PT**	**BenQ PG2401PT**
Price	**£760 inc VAT**	**£750 inc VAT**	**£540 inc VAT**	**£235 inc VAT**	**£855 inc VAT**
Website	Lg.com/uk	hp.com/uk	Viewsoniceurope.com/uk	Benq.co.uk	Benq.co.uk
Launch date	Dec 14	Jan 15	Jun 14	Jan 14	Oct 14
Overall rating	★★★★☆	★★★★☆	★★★½☆	★★★★☆	★★★★☆
Screen size	34in 21:9	27in	27in	24in	24.1in
Panel type	IPS matt	AH-IPS	AH-IPS	iPS	IPS
Native resolution	3440x1440	2560x1440	2560x1440	1920x1200	1920x1200
Pixel density	110ppi	109ppi	109ppi	94ppi	94ppi
Brightness	320cd/m²	250cd/m²	350cd/m²	300cd/m²	317cd/m²
Static contrast ratio	1000:1	800:1	560:1	100:1	540:1
Response time	5ms	7ms	6ms	5ms	5ms
Ports	HDMI, DP, Thunderbolt, USB 3.0	HDMI, DP, USB 3.0, USB 2.0	HDMI, DVI, Mini-DP, 4x USB 3.0	DVI, DisplayPort	DVI, DP, HDMI, VGA, 3x USB 3.0
Dimensions	830x83x380mm	641x655x379mm	643x348x470mm	574x555x236mm	543x254x555mm
Weight	6.7kg	8.8kg	8.5kg	6.7kg	7kg
Warranty	2 years	3 years	3 years	3 years	1 year
FULL REVIEW	TINYURL.COM/QYKH6UM	TINYURL.COM/NKUF9EN	TINYURL.COM/LLQRWTX	TINYURL.COM/O8VZZYT	TINYURL.COM/PMV5L5V

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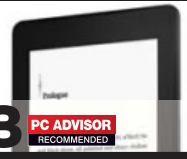
Best e-book readers

	1	2	3	4	5
					
	Amazon Kindle Voyage	**Amazon Kindle (7th gen)**	**Amazon Kindle Paperwhite**	**Nook GlowLight**	**Kobo Aura H20**
Price	**£169 inc VAT**	**£59 inc VAT**	**£109 inc VAT**	**£89 inc VAT**	**£139 inc VAT**
Website	Amazon.co.uk	Amazon.co.uk	Amazon.co.uk	Nook.com/gb	Kobo.com
Launch date	Oct 14	Sep 14	Sep 13	Oct 13	Sep 14
Overall rating	★★★★☆	★★★½☆	★★★★☆	★★★★☆	★★★☆☆
Screen size	6in touchscreen	6in touchscreen	6in touchscreen	6in touchscreen	6.8in touchscreen
Screen technology	E Ink	E Ink	E Ink	E Ink	E Ink
Screen resolution	1440x1080	600x800	768x1024	758x1024	1430x1080
Built-in light	Yes	No	Yes	Yes	Yes
Storage	4GB	4GB	2GB	4GB	4GB, microSD up to 32GB
Book store	Amazon Kindle	Amazon Kindle	Amazon Kindle	Nook	Kobo
Cellular connectivity	Optional extra	No	Optional extra	No	No
Battery life	Six weeks	Four weeks	Eight weeks	Eight weeks	Two months
Dimensions	162x115x7.6mm	169x119x10.2mm	117x169x9.1mm	127x166x10.7mm	179x129x9.7mm
Weight	180g	191g	206g	175g	233g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NXAAU3Q	TINYURL.COM/NSFORJE	TINYURL.COM/PREZPRK	TINYURL.COM/OZ5WMPO	TINYURL.COM/MJVR4M9

Best media streamers

	1	2	3	4	5
					
	Roku Streaming Stick	**Roku 3**	**Google Chromecast**	**Apple TV**	**Amazon Fire TV**
Price	**£49 inc VAT**	**£99 inc VAT**	**£30 inc VAT**	**£59 inc VAT**	**£79 inc VAT**
Website	Roku.com	Roku.com	Play.google.com	Apple.com/uk	Amazon.co.uk
Launch date	Mar 14	Mar 13	Mar 14	Mar 12	Oct 14
Overall rating	★★★★½	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Type	Dongle	Set-top box	Dongle	Set-top box	Set-top box
Ports	HDMI, Micro-USB	HDMI, USB, ethernet	HDMI, Micro-USB	HDMI, ethernet, Micro-USB	HDMI, USB, ethernet
Processor	600MHz single-core	900MHzsingle-core	Single-core	Apple A5 single-core	1.7GHz Qualcomm quad-core
RAM	512MB	512MB	512MB	512MB	2GB
Graphics	Not specified	Not specified	Not specified	Not specified	Adreno 320
Storage	None	512MB plus microSD slot	None	8GB (not user-accessible)	8GB
Voice search	No	Yes	No	No	Yes
Remote control	Yes	Yes	No	Yes	Yes
Dimensions	78.7x27.9x12.7mm	89x89x25mm	72x35x12mm	98x98x23mm	115x115x17.5mm
Weight	18g	170g	34g	270g	281g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/OAP9QF9	TINYURL.COM/PT7MGUL	TINYURL.COM/QBGTCS2	TINYURL.COM/OLCJRC3	TINYURL.COM/P4RE7WP

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Best games consoles

	Sony PlayStation 4	Microsoft Xbox One	Nintendo Wii U Premium	Sony PlayStation 3 Super Slim	Microsoft Xbox 360
Price	**£349 inc VAT**	**£349 inc VAT**	**£249 inc VAT**	**£249 inc VAT**	**£199 inc VAT**
Website	Playstation.com	Xbox.com	Nintendo.co.uk	Playstation .com	Xbox.com
Launch date	Nov 13	Nov 13	Nov 12	Sep 12	Dec 05
Overall rating	★★★★☆	★★★★☆	★★★★☆	★★★★½	★★★★★
Processor	Octa-core AMD x86	1.75GHz octa-core AMD x86	IBM Power multicore CPU	IBM CPU	IBM Xenon CPU
Graphics	1.84TFlops AMD Radeon GPU	1.31TFlops AMD Radeon GPU	AMD Radeon GPU	256MB nVidia RSX	512MB ATI Xenos
RAM	8GB GDDR5	8GB DDR3	Not specified	Not specified	512MB GDDR3
Storage	500GB	500GB	32GB, plus SD card support	500GB	500GB
Optical drive	Blu-ray, DVD, game discs	Blu-ray, DVD, game discs	Wii U, Wii discs only	Blu-ray, DVD, game discs	DVD, game discs
Ports	2x USB 3.0, AUX, HDMI	USB 3.0, HDMI	4x USB 2.0, HDMI	2x USB 2.0, HDMI	5x USB, HDMI
Connectivity	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n	802.11b/g/n	Ethernet, 802.11b/g/n, Bluetooth	Ethernet, 802.11b/g/n
Other	1 controller	1 controller, 4K, Kinect option	1 controller	1 controller	1 controller
Dimensions	275x53x305mm	333x274x79mm	46x269x171mm	290x230x60mm	269x75x264mm
Weight	2.8kg	3.2kg	1.6kg	2.1kg	2.9kg
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NBFLQK2	TINYURL.COM/M6J4KHS	TINYURL.COM/6J49LHL	TINYURL.COM/QDJP56O	TINYURL.COM/PFP9CCK

Best budget portable speakers

	Denon Envaya Mini	Lumsing B9	i-box Twist	Lava BrightSounds	iClever IC-BTS02
Price	**£99 inc VAT**	**£23 inc VAT**	**£41 inc VAT**	**£39 inc VAT**	**£23 inc VAT**
Website	Denon.com	Lumsing.com	Iboxstyle.com	Lavaaccessories.co.uk	Hisgadget.com
Launch date	Jan 15	Aug 14	Nov 12	Dec 14	Nov 14
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★☆
Speaker(s)	Not specified	2x 3W	2x 3W	1x 5W	1x 5W
Bluetooth	Bluetooth 4.0	Bluetooth 3.0 + EDR	Bluetooth 2.1	Not specified	Bluetooth 4.0
Handsfree calls	Yes	Yes	Yes	Yes	Yes
NFC	Yes	Yes	No	No	No
Frequency response	Not specified	20Hz to 20kHz	Not specified	Not specified	90Hz to 18kHz
Impedence	Not specified	4 ohms	Not specified	Not specified	Not specified
Extra features	IPX4 splashproof	MicroSD slot, lanyard	None	IPX4 splashproof, LED lamp	None
Claimed battery life	10 hours	25 hours	5 hours	8 hours	8-12 hours
Dimensions	209x54x51mmmm	177x50x70mm	246x59x56mm	190x95x103mm	64.5x64.5x70.1mm
Weight	558g	300g	380g	821g	261g
Warranty	1 year	1 year	5 years	1 year	1 year
FULL REVIEW	TINYURL.COM/QDRNP3P	TINYURL.COM/P623MK8	TINYURL.COM/LET9RDF	TINYURL.COM/KOM2ZT3	TINYURL.COM/Q2YT6NV

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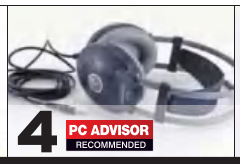
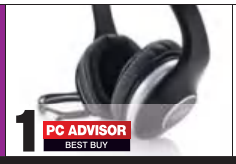
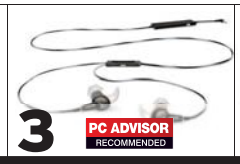
Best budget headphones

	1 PC ADVISOR RECOMMENDED	2 PC ADVISOR RECOMMENDED	3 PC ADVISOR RECOMMENDED	4 PC ADVISOR RECOMMENDED	5
					
	RHA MA450i	**Sennheiser HD 429**	**Rock Jaw Alpha Genus**	**AKG K77**	**Vibe Slick Zip V3**
Price	**£39 inc VAT**	**£45 inc VAT**	**£41 inc VAT**	**£25 inc VAT**	**£12 inc VAT**
Website	Rha-audio.com/uk	En-uk.sennheiser.com	Rockjawaudio.com	Uk.akg.com	Vibeaudio.co.uk
Launch date	Nov 14	Jan 11	Jun 14	May 08	Sep 13
Overall rating	★★★★½	★★★★½	★★★★½	★★★★☆	★★★½☆
Type	In-ear	Circumaural over-ear	In-ear	Circumaural over-ear	In-ear
Frequency response	16Hz to 22kHz	18Hz to 22kHz	20Hz to 20kHz	18Hz to 20.5kHz	20Hz to 20kHz
Nominal impedence	16 ohms	32 ohms	16 ohms	32 ohms	16 ohms
Sensitivity	103dB	110dB	108dB	112dB	93dB
In-line remote	Yes (3 button)	No	No	No	Yes (1 button)
Mic	Yes	No	No	No	Yes
Extra grommets	Yes	N/A	Yes, and filters	N/A	Yes
Carry case	Yes	No	Yes	No	No
Cable length	1.5m (braided)	3m	1.2m (twisted)	2.5m	1.2m
Weight	14g	218g	11g	190g	21g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/P7W7RVL	TINYURL.COM/ND8TD8O	TINYURL.COM/NNYUFBF	TINYURL.COM/PA8FOX4	TINYURL.COM/QJULK9P

Best headphones

	1 PC ADVISOR BEST BUY	2	3 PC ADVISOR RECOMMENDED	4	5 PC ADVISOR RECOMMENDED
					
	Denon AH-D600	**Audio-Technica ATH-WS99**	**Bose QC20**	**Denon AH-W150**	**Bowers & Wilkins P3**
Price	**£229 inc VAT**	**£79 inc VAT**	**£259 inc VAT**	**£59 inc VAT**	**£169 inc VAT**
Website	Denon.co.uk	Eu.audio-technica.com/en	Bose.co.uk	Denon.co.uk	Bowers-wilkins.co.uk
Launch date	Aug 2012	Jun 15	Jun 13	Aug 12	Jun 12
Overall rating	★★★★½	★★★★☆	★★★★½	★★★★½	★★★★½
Type	Circumaural over-ear	Over-ear	In-ear	Over-ear wireless buds	On-ear, foldable
Frequency response	8Hz to 25kHz	8Hz to 25kHz	20-21kHz	5Hz to 25kHz	10Hz to 20kHz
Nominal impedence	37 ohms	37 ohms	32 ohms	16 ohms	34 ohms
Sensitivity	120dB	120dB	105dB	102dB	111dB
In-line remote	Yes	Yes	Yes	Yes	Yes
Mic	No	Yes	Yes	Yes	Yes
Extra grommets	N/A	N/A	Yes	Yes	N/A
Carry case	Yes	No	Yes	Yes	Yes
Cable length	3m	0.8m	1.3m	N/A	1.2m
Weight	250g	250g	44g	23g	132g
Warranty	1 year	1 year	1 year	1 year	1 year
FULL REVIEW	TINYURL.COM/NBCFJW6	TINYURL.COM/QDRCCAT	TINYURL.COM/OEAGFOF	TINYURL.COM/O2CJV3R	TINYURL.COM/PZO7PON

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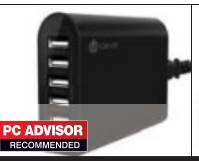
Best power banks

	Xiaomi 10,000mAh	Zendure A2	iHarbot Power Bank MS024	Anker Astro Mini	Intocircuit Power Castle
Price	**£11 inc VAT**	**£33 inc VAT**	**£7.50 inc VAT**	**£13 inc VAT**	**£22 inc VAT**
Website	mi.com/en	Zendure.com	Amazon.co.uk	Ianker.com	Hisgadget.com
Launch date	May 15	May 14	Jun 15	Apr 13	Mar 13
Overall rating	★★★★½	★★★★½	★★★★½	★★★★½	★★★★½
Capacity	10,000mAh	6000mAh	5000mAh	3200mAh	11200mAh
Input	1x 10W Micro-USB	1x 7.5W Micro-USB	1x 10.5W Micro-USB	1x 4W Micro-USB	1x 5W Micro-USB
Outputs	1x 10.5W USB	1x 10.5W USB	1x 10W USB	1x 5W USB	1x 10.5W USB, 1x 5W USB
Auto-on/-off	Yes	Yes	Auto-on	No	Auto-on
Passthrough charging	Yes	Yes	Yes	No	Yes
Status indicator	4 LEDs	4 LEDs	4 LEDs	No	LCD screen
LED flashlight	No	No	No	No	Yes
Carry case	No	Yes	No	Yes	Yes
Dimensions	91x60.4x22mm	93x48x23mm	118x11.6x63mm	92x23x23mm	110x71x22mm
Weight	207g	137g	150g	80g	280g
Warranty	1 year	1 year	18 months	18 months	1 year
FULL REVIEW	TINYURL.COM/NFQZOCB	TINYURL.COM/NGCNO5F	TINYURL.COM/PVO2LEC	TINYURL.COM/PZHUHJO	TINYURL.COM/P5M9NKE

Best desktop chargers



		iClever USB Travel Charger	Zendure Turbo Charger	Olixar Smart IC Charger	Inateck USB Charger	Lumsing 5-Port Charger
Price		**£20 inc VAT**	**£25 inc VAT**	**£34 inc VAT**	**£15 inc VAT**	**£8 inc VAT**
Website		Hisgadget.com	Zendure.com	Mobilefun.co.uk	Inateck.com	Lumsing.com
Launch date		Oct 14	May 14	Feb 15	Feb 14	Apr 14
Overall rating		★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Max output		50W	40W	50W	35W	30W
Outputs:	USB 1	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
	USB 2	12W USB	12W USB	12.5W USB	10.5W USB	10W USB
	USB 3	12W USB	12W USB	12.5W USB	5W USB	10W USB
	USB 4	12W USB	12W USB	12.5W USB	5W USB	5W USB
	USB 5	12W USB	12W USB	12.5W USB	5W USB	5W USB
	USB 6	12W USB	N/A	12.5W USB	N/A	N/A
Colours available		Black	Black, white	White	Black	Black
Dimensions		100x69x27mm	97x60x27mm	100x69x26mm	100x55x20mm	136x68x30mm
Weight		180g	166g	189g	340g	422g
Warranty		1 year	1 year	2 years	1 year	1 year
FULL REVIEW		TINYURL.COM/MPA4DWC	TINYURL.COM/NKYNJ7P	TINYURL.COM/OCZXK93	TINYURL.COM/KBXUHDF	TINYURL.COM/LK22OGY

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FROM ISSUE 1

PC ADVISOR 20 YEARS 1995 - 2015

PC Advisor

Editors Spot

Out of the Heatwave and into the Limelight

Come to sunny Brum! No? As we sit in our office, here at PC Advisor, savouring the delights of the Bull Ring and the Rotunda - under threat from architects and bureaucrats alike - the appeal of the sun may be less attractive when, instead of being combined with golden sands and the cool ocean, you have to struggle through choking traffic and dust.

But enough of this very British activity of talking about the weather. August 1995 won't be famous simply for being one of the hottest months on record, for it was in this month that the climate of the PC world was disturbed in a very significant way. As I sit here, Windows 95 is about to be released onto the no longer unsuspecting world with the sort of media interest that is usually reserved for major films or albums.

There is a theory of chaos that suggests a butterfly fluttering its wings in the Amazon rain forest can start a hurricane the other side of the world. If that's the case, Windows 95 is probably an elephant moth with duvet sized wings and share options in wind power.

The long term plan of Microsoft - and of anyone else interested in wide-range growth in the computer industry - is to make computing as simple and intuitive as possible; computers are transforming our lives, but there is a feeling that too often this is done behind the scenes, with people rarely understanding their relation to the machines they are using. Put simply, too many PC programs have been complicated, buggy and boring to attract the real interest of the wider public.

If Microsoft can change this sense of PC alienation - and in one sense they owe it to us to improve the most popular operating system in the world - then all power to their elbow. To succeed, Windows 95 must be good, really good, and a great deal of attention is going to be directed towards Microsoft over the coming months, deservedly so.

There are concerns that Microsoft are aiming for monopoly overload, especially since Bill Gates recently became the richest man in the world (although admittedly not with the sort of money you can spend easily). The past few months have seen a series of hot summer takeovers, including IBM's record buyout of Lotus. Competition is certainly aggressive, but simply being one of the largest corporations in the world does not guarantee success - witness Microsoft's own abortive attempt at Intuit, whose Quicken applications were scattering dust over MS Money. Admittedly Microsoft were stopped by the courts, but their strenuous efforts indicate how successful smaller concerns can still be in this industry.

In this first issue of PC Advisor, we'll be taking a long look at Windows 95 and reviewing some of the latest products which take full advantage of Microsoft's new system. More than this, however, we'll also be giving you some practical advice on communications, how to choose and install a modem and get connected to the World Wide Web. The Internet has been overhyped recently, but electronic communication remains one of the most important areas of progress - one which will continue to influence our lives when the long summer of 1995 has been followed by more summers, more releases.

By then, you'll probably be downloading your monthly copy of PC Advisor to discover the latest news and products from your living room or office. We'll be writing copy from oriental shores or pacific isles, beaming our features and reviews from across the world. And the Rotunda? Oh, that'll still be there, don't you worry. After all - you can't change everything.

Jason Whittaker

Jason Whittaker

PC Advisor Issue 1

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