PC & TECH AUTHORITY

LOOKING BACK:
13 COMPUTERS THAT CHANGED THE WORLD

LOOKING AHEAD:
COMPUTEX 2014
THE PC'S NEXT EVOLUTION
FULL REPORT

Triple your
Wi-Fi
SPEED

10 ROUTERS TESTED

802.11AC ROUTERS TESTED
THE BEST AND CHEAPEST UPGRADE
YOU WILL MAKE THIS YEAR

NETGEAR

REVIEWS

INTEL GALILEO, DELL CHROMEBOOK 11, FUJIFILM X-T1, ACER ICONIA A1-380, RAPOO E9090P, LG G3, PANASONIC TOUGHPAD FZ-M198 AND MORE!

HOW TO:

BEAT GEO-BLOCKING AND GET NETFLIX

ENCRYPT YOUR PHONE, TABLET AND PC

NEXT-GEN 3D:
UNDER THE HOOD OF DIRECTX12 PHOTO-REALISTIC GRAPHICS?

TECHDESK
INVESTIGATOR:
WHAT TO DO WHEN TECH SUPPORT FAILS

TP-LINK®

The Reliable Choice

AC 1900 *Archer* D9

Wireless Dual Band Gigabit ADSL2+ Modem Router

▶ 802.11ac - The Next Generation of WiFi

▶ 1900Mbps Simultaneous Dual Band

▶ Beamforming Technology
Locate your connected devices and boost
wireless signal strength

▶ 1GHz dual-core processor

Dual Core
1GHz

▶ USB 3.0 & 2.0 Ports - Easy Storage
and Sharing

▶ Full Shielded Gigabit Ethernet Ports

Ready for
NBN

Chipset Supplier: BROADCOM.

Please contact sales.anz@tp-link.com for more details

3 year warranty

A week in PC Mecca

At Computex, every PC dream comes true.

It's been a few years since I was last at a Computex show, but there I was, right in the heart of Taipei this year and eating it all up. It's an immense show, vast in size and equally huge in importance. There is simply nothing else that comes even remotely close as Computex.

Asia is indisputably the centre of the PC hardware universe. Almost every component in your case comes from a company based in Taiwan, and those that don't are from Chinese companies. Fun fact: 90% of the world's laptops are made in Taiwan. But Taiwan isn't important as a manufacturing centre – most of that has shifted to China. No, Taiwan is to PCs what Hollywood is to movies. It's a boiling hub of ideas and innovation, and is as fiercely competitive as any industrial hub on Earth.

I'm always amazed at how quickly these companies can move. They adapt to new technology seemingly overnight, with a product following soon after. Case in point; the new motherboards based around Intel's new series-9 chipset. The big four – Asus, Gigabyte, MSI and Asrock all have an average of 25 new motherboards. All being manufactured right now. I've had the pleasure of enjoying factory tours in the past and the fascinating thing is how automated technology is complimented by good old human skill. Typically, a motherboard will have almost all of its components attached by machine, but there are always bits that need delicate fingers. It's quite amazing how they can rig up the factories for production of so many different products simultaneously, and adapt with upgrades or revisions incredibly quickly.

So, hats off to the engineers, designers, workers and everyone up and down the chain at these remarkable companies.

The biggest benefit that comes from having your PC&TA team on the ground in Taipei is that we now have a crystal clear map of where things are heading in the year ahead, and that translates to more relevant and rewarding editorial here in the magazine's pages.

Ben Mansill
Editor
bmansill@nextmedia.com.au

Have a need for speed?

Looking for a wireless router that delivers super-fast speed? How does wireless speeds as fast as 1.3 gigabits per second sound? Well, hold onto your seats because Billion's new BiPAC 8800AXL wireless AC broadband router offers just that! Based on a Broadcom chipset, the BiPAC 8800AXL supports ADSL2+ and is fibre-ready, using an Ethernet Wide Area Network port to hook into the NBN as soon as it comes to your house. It also has four additional Gigabit Ethernet ports plus two USB 2.0 ports, allowing for 3G/4G modem connectivity, print serving or Network-Attached Storage. Aside from being blazingly fast, NBN-ready and backwards compatible, this amazing device is jam-packed with loads of other exciting features, including:

- 4-port gigabit switch
- 1-port gigabit Ethernet WAN (EWAN)
- 2 USB ports for print server, NAS, DLNA and 3G/4G LTE USB modem
- ultimate wireless speed 300+1300Mbps
- SNR adjustments to achieve highest sync speeds
- monitoring of individual LAN traffic
- QoS for traffic prioritisation and bandwidth management.

3 x faster than the current Wireless N protocol

Speeds up to 1.3 gigabits per second

For more information on the BiPAC 8800AXL or for a list of Billion stockists Australia-wide, visit billion.com.au.

BILCOM2-14

Inbox

if you have a story or point to make, send it in!
tell us your anecdotes, opinions & tales of woe

LETTER OF THE MONTH

Whenever my computer performance becomes erratic or grinds to a halt, I race over to my ADSL 2+ Wi-Fi router and observe the lights. Sure enough, I find them going flat out suggesting updates are in progress. But the problem is these 'updates' can go on for hours if not days.

This raises the question; is the computer being 'hacked' by the CIA, FBI or ASIO? And are 'uploading' my precious emails etc?

Now when a file transfers, say to an external back-up drive, the files are flashed momentarily on the screen, one after the other in quick succession, just long enough to see the activity. So, here's my beef! WHY, when downloads or uploads are taking place, we can't be shown, on screen, each packet of code? (I suspect Bill Gates and his mob wanted it this way so YOU can't tell).
P. Gannon

We invited security expert **Tim Falinski** from **Trend Micro** to provide a respnse, Tim says: Even when the PC is "doing nothing" it is very likely that there will be some network activity happening. To observe these, and the question of "who's doing what to whom and why", there are Process Monitor software programs available on the internet to help you out.

Daily we see various articles regarding personal information being hacked and how dangerous the internet has become over the last few years. Although there is no straight forward answer of what information is being captured by individuals or organisations, there are a few ways we can ensure protection for both our PCs, as well as our personal information from getting into the wrong hands:
1. Have a strong firewall setup on the PC – Detect and block unwanted incoming and outgoing access to your PC to ensure only programs you have approved are downloading/uploading
2. Install Internet Security Software – Protects your PC and your personal information from phishing attacks and malware that can take over your PC.

3. Ensure Windows Updates are always up to date – Keep Windows optimized to the latest settings available.
Over time technology will evolve and we will start to see programs or devices that will help you ensure that whatever you do in your daily lives, you will be protected.

GOOD JOB

I recently just purchased my first issue of *PC & Tech Authority* and I absolutely loved it! I found a lot of helpful tips and some really interesting features and news updates. I'll definitely be purchasing this magazine every month. Keep up the good work!
P Jedani

BIASED?

I think that this issue was a sales ploy and missed the mark on the reality of what VR really is, as there was no comparison to any other of the same type of gadget, I can see that this is a biased article for the use of Oculus over any other that are in existance, even though other companies have been in manufacture of the same type of gadget for some time now, I wont give examples as to show names as that would be giving bias as to what this magazine has done with Oculus.

Ben Mansill replies: The only consumer VR product that is anywhere near Oculus in development progress is Sony's Project Morpheus. The Oculus story was commissioned prior to Sony's announcement.

RAZER WINNERS

This month's letter of the month as well as best site comment will receive Razer Adaro stereo headphones valued at $149.95.
www.razerzone.com/au

Want to get in touch?

MAIL : Inbox, Level 6, Building A, 207 Pacific Highway, St Leonards NSW 2065
WEB: pcandtechauthority.com.au
EMAIL : inbox@pcand techauthority.com.au
Please limit letters to 200 words, where possible. Letters may be edited for style and to a more suitable length.

Contents

Issue 201, August 2014

54 802.11ac ROUTER LABS

The new 802.11ac standard was finally ratified at the start of this year and now, ac routers are widely available. We test the best to help you enjoy a faster Wi-Fi home network.

18 Computex 2014

Editor Ben Mansill returns from a week in PC Mecca with many tales of a bright future for the PC.

REGULARS

Subscribe & SAVE!

Get PC & Tech Authority delivered! For details on the latest subscription off see page 80.

REVIEW FUJI X-T1 **52**

REVIEW
ACER ICONIA
A1-830 **42**

REVIEW INTEL GALILEO **48**

REVIEW
WATCH
DOGS **74**

RWC LOCATION TRACKING **105**
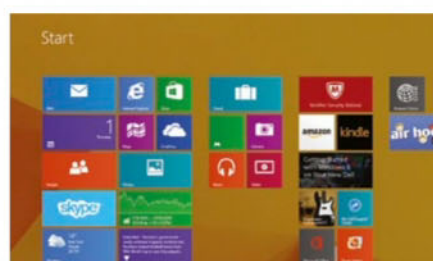
RWC
FIX THE WIN 8 UI **102**

HOW TO
ENCRYPT YOUR
PERSONAL DATA **90**

HOW TO GET NETFLIX **86**

REVIEWS

Tech News

The latest trends and products in the world of technology

GOOGLE BUYS SATELLITE
COMPANY SKYBOX FOR $500MIL
LATEST ACQUISITION WILL IMPROVE MAPS, INCREASE INTERNET COVERAGE.

Google's spending spree shows no sign of slowing down, following the acquisition of high-resolution satellite firm Skybox Imaging.

In a note to investors, Google said it has entered into an agreement to buy the company for $500 million, subject to regulatory approval.

Explaining the rationale behind the purchase, Google focused mainly on Skybox's satellites, which Skybox claims are smaller and lighter than traditional satellites of similar type.

In the immediate term, Skybox's satellites, only one of which has been launched so far, will "help keep Google Maps accurate with up-to-date imagery".

"Over time, we also hope that Skybox's team and technology will be able to help improve internet access and disaster relief," the company added.

Google has been steadily investing in technology to help bring the internet to areas of the world that have less coverage via traditional terrestrial methods.

Last year, it unveiled Project Loon, a scheme to deliver broadband via internet-connected balloons deployed in the southern hemisphere.

The company followed this up with the acquisition of Titan Aerospace, a solar-powered drone maker whose technology could also further the internet-by-air project goals.

It's unclear how the acquisition of Skybox will affect Google's relationship with GeoEye, the satellite firm that currently provides Google with its online mapping data on an exclusive basis.

In a statement posted to its blog, Skybox said it had made "great strides" in its mission to alter the way changes on the earth's surface are recorded in images.

"The time is right to join a company who can challenge us to think even bigger and bolder, and who can support us in accelerating our ambitious vision," it added to the statement.

IOS 8 PROTECTS USERS
FROM ADVERTISERS - AT LAST!
RANDOMISED MAC ADDRESSES STOP TRACKING THROUGH WI-FI PINGS.

Anew function discovered in iOS 8 could deal a major victory for privacy – and a major blow to marketers.

The update, found on slide 18 of this slide deck (http://t.co/RYTthDvvaQ), apparently uses "random, locally administered MAC addresses" when scanning for Wi-Fi, the meaning being that they "may not always be the device's real (universal) address".

Marketers use a device's MAC address, which is broadcast when the phone sends out a "ping" to find nearby Wi-Fi networks, to identify individual devices.

They can then analyse the data to discover what devices, and therefore customers, regularly visit certain shops and serve them targeted advertising.

By obfuscating the device's MAC address in iOS 8, Apple effectively renders this method of collecting consumer data useless.

Frederic Jacob, a security developer who publicised the feature's existence via Twitter, said he hopes "this becomes an industry standard", and many who responded to his original tweet welcomed it as a privacy improvement.

Apple did not say in its presentation what direct benefit, if any, it intends to derive from the system. However, it could be an attempt to drive marketers onto its own Bluetooth-based iBeacon technology, which also serves up location-based advertising via push notifications and is a technology Apple has been keen to push.

WINDOWS 8 START MENU WON'T RETURN THIS YEAR
COMING BACK, BUT NOT UNTIL 2015.

Microsoft has confirmed the Start Menu is making a comeback, but reports suggest it won't be returning to Windows this year.

There was no Start Menu in the desktop side of Windows 8, but after complaints from users, Microsoft has slowly been reintroducing it, starting with a Start Button last year.

An early version of the new Start Menu was shown off by Microsoft at its Build conference in April, with vice president Terry Myerson saying it would arrive with the next version of Windows.

However, it wasn't clear whether he meant the Windows 8.1 Update 2 arriving later this summer or the so-called Threshold update due next year, with leaks suggesting it was the former.

Now, it's looking like the latter: Windows watcher Mary Jo Foley has said her sources have revealed that the Start Menu won't arrive until next year as part of Threshold. That major update is due to arrive in spring 2015, and may or may not be released as Windows 9. In the meantime, anyone wanting to get a Start Menu sooner can install third-party versions such as StarDock's Start8.

Foley also suggested that plans to allow Metro apps to run on the desktop will likely also not arrive until next year.

POLYMER DISPLAY COULD
MAKE SMARTPHONES
SHATTER-PROOF

ROBUST, COST-EFFECTIVE MATERIAL OFFERS FLEXIBLE ALTERNATIVE FOR SMARTPHONE SCREENS.

Shattered smartphone screens could be a thing of the past, thanks to a new technology developed by researchers at the University of Akron.

The team, led by assistant professor of polymer science Yu Zhu, has developed a new type of touchscreen made out of a transparent layer of electrodes on a polymer surface.

According to the researchers, whose work was published in the American Chemical Society's journal ACS Nano, the new material is "extraordinarily tough and flexible".

Despite being bent 1,000 times during testing, it remained functional and its shape didn't distort.

Coatings for touchscreens are currently made of indium tin oxide (ITO), which is more brittle and likely to shatter than the polymer. The new material is also more cost effective and easily mass produced than ITO, and offers the same transparency with greater conductivity, the group claimed.

"We expect this film to emerge on the market as a true ITO competitor," Zhu said. "The annoying problem of cracked smartphone screens may be solved once and for all with this flexible touchscreen."

However, as the University of Akron's polymer is not yet in commercial production, it will be some time before it arrives in devices.

Mobile manufacturers are already looking to more flexible displays. The LG Flex sports a concave screen, and the iPhone 6 may also feature a curved glass display, although this will likely be more like a slight bulge. Apple's iWatch is also going to have a flexible screen, according to some rumours.

▼ It's the bane of every iPhone owner, but shattered screens may soon be a thing of the past.
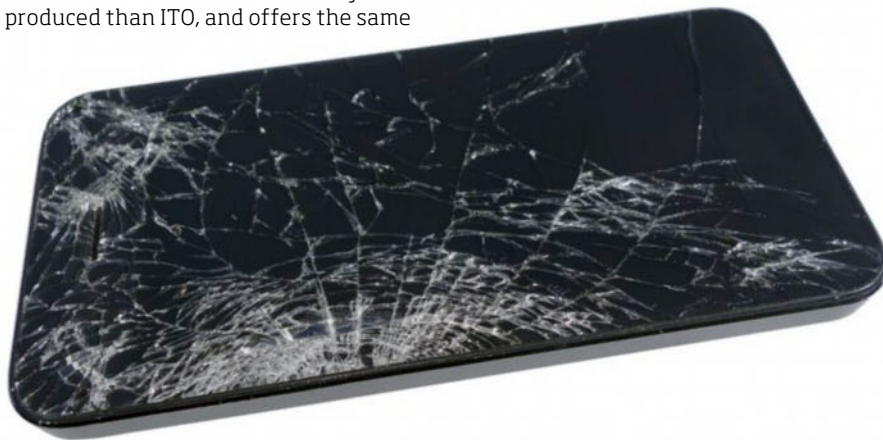
HOT...
OR NOT

HOT

MOTHERBOARD ONBOARD AUDIO

It just keeps getting better. Poor souls who have never tried anything but Realtek don't know what they're missing. More and more quality audio chips, like the Core 3D from Creative, are making their way onto motherboards. We applaud. Great sound makes all the difference to games and media.
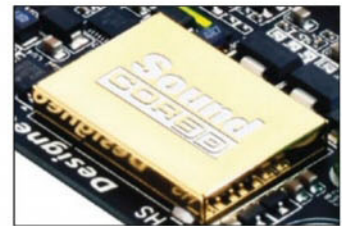
NOT

GLOSSY SCREENS

They will tell you that a gloss screen on your laptop or tablet helps improve colour richness. These are lies. The only unexpected thing you will see on a gloss laptop is the reflection of your own face. Gloss screens have been shown to sell more units in a bright display area than far more useful matte screens. This must stop!

AMD ANNOUNCES NEW MOBILE APUS FOR CONSUMER AND GAMING NOTEBOOKS

AMD'S KAVERI APU GOES MOBILE.

AMD's putting all its chips on its A-series Kaveri range of APUs, announcing a range of new chips for the ultra-thin and gaming laptop market segments.

"AMD takes a major step forward today on our journey to transform and enhance the computing experience with the launch of the 2014 Performance Mobile APU family," said Bernd Lienhard, corporate vice president and general manager, Client Business Unit, AMD, in a release yesterday.
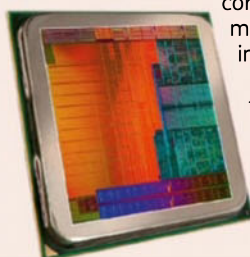
The mobile APUs feature up to 12 compute cores (that's four CPU cores, and eight GPU cores) on a single chip, Heterogeneous System Architecture that can push the right data to the right core for the job, Graphics Core Next architecture for improved graphics. This is alongside gaming-focused technologies that AMD has also been heavily invested in and that we have seen recently emerge, like Mantle, AMD Dual Graphics so the APU can work alongside dedicated GPU solutions, and a range of video features.

We hope to see machines with the new APU soon, as AMD's partner line-up at Computex has included ASUS, Dell, Lenovo and more.

Gaming News

All the news that's fit to print from the gaming world

OCULUS FOUNDER: WE'RE GOING TO SELL RIFT AT COST

ALSO, HE DOESN'T CARE HOW IMPATIENT YOU ARE TO USE ONE: YOU'LL HAVE IT WHEN IT'S FINISHED, AND NOT BEFORE.

Still shaking from the pants-ruining terror of playing Alien Isolationon the Oculus Rift, we sat down with Oculus founder, Palmer Luckey, to discuss what's next for the field-leading VR company. And while Luckey remained tight-lipped on a release date for Oculus as a finished consumer gadget, he did reveal that Oculus doesn't plan to make any money from selling it.

"Whatever it costs to make, that is what we're going to sell it for."

"The next six months is going to be crazy," says Oculus's 21-year-old founder. "We've got a lot of stuff going on." Read what you like into that, speculation fans, but Luckey and his team are definitely working flat-out to create the consumer version of their already revolutionary virtual reality headset. "The first consumer version will be a lot better than DK2 [the current developer kit] – a lot better. There's a lot of unannounced things we can't talk about, but it's going to be a lot smaller, a lot lighter, cheaper, wider field of view, higher resolution and higher framerate. DK2 wasn't designed to be the thinnest or lightest thing we could make, or the cheapest for that matter: it was meant to be something we could get out quickly, that did all the functions we needed it to, very reliably. But it is a developer tool. We reused a lot of the same parts for DK2 that we used for DK2, because that allowed us to move a lot faster. But for the consumer version we're making every piece from the ground up. There isn't a single piece from DK1 or DK2 that will go into it, so we're able to design it from the beginning to be a perfectly integrated, minimal piece of hardware."

This sounds expensive - we must be looking at a rather low margin on this thing. "We're going to be selling it at cost," Luckey tells reveals in a bobmshell announcement. "Whatever it costs us to make, that is what we're going to sell it for. That's one of the things the Facebook deal has allowed us to do: because we already have these resources behind us, we don't have to worry about making money from our customers right away. If we were running purely on our own and trying to make money just from hardware, we would need to make enough profit from each unit to pay for running the company for several years, until we launched the next one."

"With Facebook, now we have that financial backing, we have the confidence that we're going to be around for a long time and we can afford to make the right decisions to make VR happen in a big way."

BATMAN: ARKHAM KNIGHT DELAYED UNTIL 2015

LOOKING FORWARD TO GETTING YOUR BATMOBILE AND CAPE ON IN ROCKSTEADY'S NEXT BAT-GAME? YOU'RE GONNA HAVE TO WAIT A LITTLE LONGER...

Looks like another game is slipping from being oh-so-close to completion to now a year away. Rocksteady's Dax Ginn (love that name - sounds like a Star Trek character!) has told Kotaku that the game is slipping to 2015 because "awesome takes time".

To be fair this is Rocksteady's farewell to the franchise, so if this means a delay, we get it. This is something you only get right once.

Hopefully this means that the new game won't be quite so... samey as previous Bat-titles.

VOLKSWAGEN REVEALS GRAN TURISMO-INSPIRED GOLF GTI ROADSTER

GAMERS REJOICE! VW MAKES VIDEOGAME SPEED MACHINE A REALITY, BUT DON'T START SAVING FOR THAT DEPOSIT JUST YET...

Don't tell us, another manufacturer has designed a vehicle that will be available to download in Gran Turismo 6...

You're right; but Volkswagen clearly swallowed some crazy pills and actually built the manic GTI Roadster concept you see below. And do you know what's more insane? It packs around 370kW underneath that elongated snout.

We very much doubt it as boring factors such as feasibility and price will likely put the brakes on a production model. Which is a shame, because it looks a lot more fun than a Passat.

Actually, no. The Golf GTI Roadster concept packs a very real 3.0-litre V6 biturbo TSI engine. Everything is driven through a seven-speed DSG gearbox and eventually piped to all four wheels for maximum traction.

You may leave your face behind, though; the Roadster is decidedly lacking in the roof department, practicality not being a major consideration when your car's designed for a video game.

Designers Malte Hammerbeck, Domen Rucigaj and Guillermo Mignot came up with the angular concept, while Klaus Bischoff, head of design for Volkswagen, and Kazunori Yamauchi of Sony Computer Entertainment plucked it from a batch of submissions. VW liked it so much, they made one.

You could book a flight to Austria and ask the Volkswagen representatives if they'll let you have a drive while it's on display at the Lake Worthersee meeting, or you can download it and 'pretend' to drive it in GT6 from mid-June. The latter is probably easier.

Chip News

After 10 years Intel finally cracks the 4GHz barrier then decides to Rockchip. Meanwhile Nvidia's Watch Dogs causes AMD to ask how GameWorks as it plans HBM. **Mark Williams** helps decipher what it all means.

CPU

INTEL'S ENTHUSIAST CPUS INCOMING

At the Computex 2014 show, Intel confirmed the specs of three of its upcoming enthusiast-focused processors.

The i7-4790K is essentially a 4770K but with a new polymer TIM, +4W TDP to 88W, better voltage regulation via additional capacitors and a 4GHz base clock with turbo of 4.4GHz. The TIM is a compromise on Intel's part, it's not the fluxless solder of previous generation parts, but to keep its production lines running non-stop they opted instead to improve what TIM they could apply with current manufacturing. So there will be a temperature benefit, just not as much as soldered on heat spreaders. This product also marks Intel's first official product to launch in the 4GHz range, some ten years after it killed off its NetBurst based Pentium line that was desperately close to launching a 4GHz beast of a part back in 2004 to keep AMD at bay. How times have changed.

The second, called the i5-4690K, is based on the 4670K and also includes the new enhancements made on the 4790K but has a base clock of 3.5GHz and turbo of 3.9GHz.

The third is the G3258 (aka Pentium Anniversary Edition), which is a G3420 but with turbo boost and unlocked multipliers.

These fun products should be available by the time you read this.

INTEL GETS INTO BED WITH ROCKCHIP

It's always been tough for Intel to crack into the ARM dominated mobile segment where price and power is king.

To help achieve this Intel has entered into a strategic partnership with Rockchip (a fabless Chinese company that specialises in ARM based mobile SoCs) in an effort to both expand Rockchip's product offerings and to grow Intel's brand into the segment.

The deal will allow Rockchip to design and create an Intel-branded quad core SoC for Intel's SoFIA family of products (aimed at entry level smart phones) using Intel's

CPU and modem (3G/LTE) technologies. The deal even allows for the use of third party IP such as other GPU solutions to make the design competitive.

To further cut costs these new designs will also be fabricated at TSMC. Both companies will sell the product to their respective customers towards the end of 2014. beating Intel's current Bay Trail offerings.

GPU

R9 295X AND HBM

There's whispers about that AMD is cooking up a new single GPU monster possibly called the R9 295X to topple the likes of the GTX 780 Ti. AMD used similar tactics with their 7970 GHz Edition in the previous generation. The juicy part is the possibility of a new memory technology to be included with it.

Called High-Bandwidth-Memory (HBM) it's a new technology that stacks memory chips on top of each other. Benefits allegedly include 65% better performance, 40% power savings and higher densities.

Not much else is known other than this should arrive in the second half of this year.

AMD BERATES NVIDIA OVER GAMEWORKS

Triple A game title releases are typically followed by the inevitable slew of benchmarks to see who runs it best. The recently released Watch Dogs game has caused quite an outburst from AMD regarding Nvidia's practices.

Upon release of Watch Dogs (an Nvidia supported title created using its GameWorks middleware tools), benchmarks showed that AMDs high end R9 290X was merely equalling the performance of Nvidia's mid-range offering the GTX 770.

AMD stated that "Gameworks represents a clear and present threat to gamers by deliberately crippling performance on AMD products to widen the margin in favor of NVIDIA products".

"Participation in the Gameworks program often precludes the developer from accepting AMD suggestions that would improve performance directly in the game code–the most desirable form of optimization".

"The code obfuscation makes it difficult to perform our own after-the-fact driver optimizations, as the characteristics of the game are hidden behind many layers of circuitous and non-obvious routines"

Nvidia hit back saying "We don't preclude them [developers] from changing anything and making it run better on AMD".

Nvidia seem to be playing innocent on this. It appears they indeed don't hamper developers optimizing for AMD, but its methodologies doesn't exactly help AMDs cause either. A Valve developer said "I don't think NV is purposely tilting the table here. But if you look at the big picture, I wouldn't preclude a sort of emergent behaviour that could effectively tilt the competitive advantage".

AMD might indeed have a valid reason for concern, we will be following this one.

Most Wanted

The good stuff that's just around the corner

▼ ZERO LATENCY BY INVERSION VR

A couple of talented chaps in Melbourne have pulled off quite the technical achievement in the field of excellence in kickarse VR. The Zero Latency project uses the prototype Oculus Rift headset at its heart, but the team at Zero Latency has taken that already awesome experience several very cool steps further into the realms of complete virtual immersion.

They have created physical spaces in a warehouse that exactly match a game's environment – so as you wander around you won't have any fear of nosing into a wall, or indeed, another player, as this is a single player experience for now. These game environments were built entirely by the team at Inversion VR (using the Unity Engine). For the Pause Festival it was a relatively simple Zombie level.

Next, weapons were built (pretend, of course) with the ball from a PlayStation Move used to house a custom sensor (Tim Ruse from Inversion VR told us that "it turns out that the Move offers the most affordable silicon ball you can buy"), so in-game what you hold in your hands appears in the game world roughly where it should be.

And, the icing on the cake is that the unit works with a PC in a backpack they have created, which communicates by Wi-Fi to the game server. So, no cables to slow you down or worry about tangling with, and no fear of running into a wall that's not there in VR view.

The net end result is a game world that's even more real than using Oculus on its alone.

Zero Latency was demonstrated at Melbourne's Pause festival, which has just concluded. They're now aiming for another event in November this year, but to get there they need crowd funded support. Given that they are clever and driven innovators with a truly unique idea, we have no hesitation recommending this for your support. What they've done is a world first and is the most exciting implementation we've seen in a space where all the gaming excitement is heavily focussed.

While the first iteration was a simply zombie level, the guys are working on a more ambitious demonstration for the November showing. It will be a 30 minute narrative-driven experience and feature multiple rooms.

Tim explained that with the technology in its current state, areas of up to 200 square metres can be accommodated without lag. Prototype 2 of the Oculus will be used for the November version, and the team plan to keep updating to the newest Oculus technology as it improvesover time.

Eventually players from multiple locations will be able to exist in the same virtual environment, and that includes international friends. An issue which the team did encounter was one of health and safety – when more than one person is active in the physical space there is a good chance someone will run into someone else "people tend to go a bit crazy in there" said Tim. Having just recently played laser tag with a birthday group of 10 year olds we completely understand.

Visit the team at http://zerolatencymedia.com/. There are videos of it in action and it's plain to see that what they have built is an intensively immersive experience not unlike the Star Trek Holodeck.
Ben Mansill

CORSAIR®

Designed for Enthusiasts.
Engineered for Performance.

Corsair makes high-performance PC components and gaming peripherals with innovative designs that offer both leading edge performance and dependable operation. We build products that PC enthusiasts and experts will recommend to their friends...not just for their performance, but for their high value and reliability.

1 GAMING HEADSETS
Accurate audio reproduction for compelling gaming and the situational awareness you need for a competitive edge.

2 FLASH DRIVES
High-speed data storage in rugged designs lets you safely take your data with you.

3 MOBILE WIRELESS STORAGE
Voyager Air™ is the first all-in-one portable wireless drive, home network drive, USB drive, and wireless hub.

4 GAMING KEYBOARDS
Flexible and ergonomic designs, highly customizable and built with quality components for superior key feel.

5 POWER SUPPLIES
Stable, reliable power with a focus on high output, energy efficiency, and ease of installation.

6 FANS
Physics meets design in a line of case fans that work better, and look better, too.

7 CPU COOLING
Efficient, quiet cooling with zero maintenance and simple setup makes it easy to protect your CPU.

8 DRAM
Stability under pressure that's the result of superior engineering and fanatical screening for performance and reliability.

9 SOLID-STATE DRIVES
Amazing storage performance that will improve the speed of virtually everything you do with your PC.

10 CASES
Give your PC a new look for the new year. Corsair has the industry's widest selection of bulder-focused, builder-friendly cases.

11 GAMING MICE
Precision gaming tools that help you play your best...whether it's professionally, or you're just playing to win.

12 GAMING MOUSE MATS
Corsair gaming mouse mats are tuned to deliver outstanding glide characteristics without sacrificing control. And, they're available in multiple sizes to fit your playing style.

The help loop of no hope

Why doesn't Microsoft recognise its own email address?

The 'help loop' is one that many readers will be sadly familiar with when trying to sort out a tech problem. It usually goes something like this: fill out the help form to log your issue, after which you wait for a reply with instructions to sort the problem or the good news that it's already resolved.

In theory it works like this, but it often goes awry if the problem can't be easily solved. The most galling outcome of all is when you log your problem, eagerly await a response that's not satisfactory only to be eventually told the problem is closed by the support team because they have decided it's been resolved. The help system at most tech companies is designed to deal with standard problems and tricky ones often fall through the net.

PC & Tech Authority reader Michael wrote to Investigator at his wit's end when trying to sort out a problem with Windows 8.1 verification. It's a two-step process that requires a password and an extra verification code. The code is sent to an email address, alternatively it can be sent as an SMS to a mobile phone.

WHEN HELP ISN'T

Sounds simple enough and it should be in practice. But what if you can't get the security code because there's a problem with the email address? It quickly becomes an exercise in extreme frustration.

"My niece bought a Windows 8.1 laptop and when you go to verify your sign in account, Microsoft is supposed to send a code to her email account. The trouble is that the code never arrives. I have been told by Microsoft Live ID in a support request that they have no record of her email account existing in their database yet she accesses it daily. We cannot set up secondary verification on her email account for the same reason," Michael wrote.

Michael had been in touch with Microsoft to try and find out why the verification email was a no show. Microsoft for some reason couldn't find the email address that had been given for the verification code. It

ROSALYN PAGE
has been a journalist for over 10 years specialising in the areas of consumer issues, technology and lifestyle. Rosalyn is the 2008 winner of the Best Consumer Technology Journalist at the IT Journalism awards. Her work is published in a range of newspapers and magazines

didn't make sense to Michael why Microsoft wouldn't be able to find one of its own email addresses. He was told that it couldn't be located.

"Our investigation shows that your account does not exist in our database. Kindly verify if this is the correct account so we can investigate further. Let us know the last time this was accessed on any Microsoft account services online. Note that free accounts expires due to inactivity if not accessed within 365 days."

Michael replied, repeating that the email address was correct and used regularly, but was told to put his problem on the forums to get some help. At this point, he was extremely unhappy because the laptop software couldn't be verified and he faced having to abandon the email address.

He tried once again to get someone to look further into the mystery of the missing email address but to no avail.

"I have been told that the email address doesn't exist on your database and that this is the

problem. The email address is being used on a daily basis."

The email account contained about 1500 messages so abandoning the address wasn't a suitable option. Michael questioned how the problem could be solved by using the help forums. Microsoft replied, but it was

> **"Our investigation shows that your account does not exist in our database. Kindly verify if this is the correct account ."**

to say that it was 'case closed' from its side.

"As previously stated, the Microsoft account public moderators can best address your concern. Due to this reason I am closing your case and any future requests for this issue will not be responded to."

Michael didn't know how to get out of this dead end. He contacted Investigator in the hope of getting someone to take another look at the issue. Investigator contacted a Microsoft representative and asked for some help.

Michael, to his and his niece's relief, discovered that three months of frustration had been resolved. He was able to verify the account when he tried again on the laptop without needing the secondary verification code itself.

Investigator approached Microsoft for a comment. A representative said the problem was resolved by customer support, but no explanation on why they couldn't find the email address was available at the time of going to print.

> **HAD AN ISSUE AS A CONSUMER? INVESTIGATOR CAN HELP.**
>
> Email: investigator@ pcandtechauthority.com.au

The ultimate wireless

ᒥᗩPOO

BLADE Series

5.6mm ultra slim
design keyboard

E6300\E6500\9060

❋
3.0
Version

2.4G
WIRELESS
CONNECTION

Fn
MULTIMEDIA
CONTROL

NANO
RECEIVER

5.6mm
Metal Making
THINNEST

f https://www.facebook.com/Rapooau

COMPUTEX
2014 SHOW REPORT

THE MAJOR EVENT IN THE PC CALENDAR OFFERS A REVEALING LOOK INTO THE NEW GEAR WE'LL BE ENJOYING IN THE MONTHS AHEAD. **BEN MANSILL** SPENT A WEEK IN TAIPEI REVELLING IN IT ALL.

As our posse of five, covering both *PC & Tech Authority* and our sister magazine *PC PowerPlay* departed the vast halls of Computex after a big week of taking in a veritable mountain of tech, and with a goodly number of hour-long briefings ticked off, too, the overriding impression was of a show of evolution. For there wasn't a lot of revolution to be seen.

The giant PC show held each year in Taipei has every company in or revolving around the PC industry laying bare the latest products. It's the place to be for everyone in the PC business, from buyers to technology partners to journalists. Everyone closely examines everyone else's gear and it should be clear which are floating and sinking.

If any one technology were to be tapped as the best of the show it would be the swath of new motherboards based upon Intel's H & Z 97 chipset. There were some clever innovations to be seen, mostly around storage. As we have been reporting in *PC & Tech Authority*, the 9-series chipset itself doesn't bring much, but it's been so long since the last Intel chipset that motherboard manufacturers appear to have saved up new features (many of which didn't actually require any of the 9-series features) for this rollout to dazzle with the most.

MOTHERBOARDS

As we reported in this issue's Chip News (page 12), Intel has two new enthusiast CPUs just out (the i7 4790 and i5 4690), and they both run in a 1150-socket design, so an upgrade to a Z97 board won't be necessary if your existing board is an 1150 for these new CPUs. But there are still a few good reasons to upgrade, which we saw at Computex.

At the enthusiast end, Gigabyte put on a show of its new Z97X-SOC Force2 LN2, a limited edition board that was used at the show to hit a new world record memory speed of 4.5GHz – and it used seemingly mundane Kingston memory to do it, which raised a few eyebrows. For the rest of us, Gigabyte had a healthy selection of Z97 boards, thirteen of them, in fact. Here we get a glimpse of what features motherboard makers are focussing in the near future.

Audio is one key area, and while Realtek codecs powered all but three new Z97 boards, the full Sound Blaster Core 3D audio processor was included on the Z97X-Gaming G1 WIFI-BK (yes, this one includes Wi-Fi, another lesser but still growing trend), the Z97X-Gaming G1 and G1.Sniper Z97. Boards from other companies also featured a decent audio processor in high end game boards, but few sported the top-line Core 3D chip from Creative.

Showing what happens when a company makes an add-in card that no one buys, yet still has functional potential, Killer's E2200 is now the chip to be seen integrated on any self-respecting motherboard at this year's Computex. Almost every vendor had a board with Killer LAN, including every one of Gigabyte's gaming range. If it didn't have a Killer chip alone, it was paired with Intel LAN as a dual

▲ MSI put on an overclocking display and invited attendees to participate.

▼ The Computex show floor. Exhibitors, showbags and great excitement!

solution. Gigabyte's sZ97X-Gaming G1 WIFI-BK and ZX97-Gaming G1, for example. These two top boards also include upgradeable OP-AMPs and a switch to select headphone impedance (Asus are still a step ahead here, with motherboards in its range that included the SonicSense feature able to auto-detect impedance).

We also learned, while visiting the Gigabyte area, that the company is now the only one left in the motherboard business that still manufactures in Taiwan. Its high-end boards are made in a local factory, including the over-engineered Ultra Durable Black range, which undergoes an intensive seven day testing process (most motherboards are only tested for a few minutes).

Over at Asus and its Z97 range was expanded at Computex, adding several new boards to those we revealed last month. They included the Gryphon Z97, a micro ATX board built to the same reliability standards as its Sabretooth range. That means superior components selected for durability. Perhaps this too is an emerging trend? Now that CPU performance has peaked – at least in terms of current app and game demands – could it be that we're upgrading motherboards less often with reliability more important?

1 Corsair's stunning new Graphite microATX 380T case
2 The mighty BitFenix Atlas case could house several small animals
3 Asrock has two Pentium Anniversary boards ready to go
4 Corsair's splendidly colourful RGB keyboard
5 Gigabyte's custom power board for video card overclocking
6 All of the Gigabyte Brix mini-PCs can be attached to the rear of any monitor with standard VESA mounting holes. Nifty!

Another interesting one from Asus is the Maximus VII Formula Z97, with a cooling block for the CPU caps that is able to run in either air or water mode. With the success of easy to install all-in-one CPU water cooling kits, and closed loop systems starting to appear as stock in graphics cards, we wonder how long it will be before the custom rigs required to add plumbing to areas like CPU chokes remain relevant.

MSI had a particularly huge display area showcasing products across many categories, with laptops particularly well represented. Its motherboards were divided into either Gaming, OC, Eco and Classic lines. The Eco board we saw was especially impressive. The H97M Eco can shut down unused components on the motherboard, including unused PCI/e slots or SATA ports, which on their own draw very little power, but, MSI claimed, savings of up to 38W across the system can be achieved with an aggressive approach.

Over at the Asrock area were another dozen or so Z97 boards. While the Z boards were standard fare, Asrock's edge is having a tweak in place very soon that will enable overclocking on the cheaper H 9-Series boards. That should offer some very well priced boards for budget-minded folks who are up for a bit of overclocking. Given that the price of Asrock's new top-line Z97 Extreme9 board is just $220, the company could well become a favourite among budget enthusiasts.

And budget enthusiasts are salivating over the prospect of having a play with the imminent Intel Anniversary Edition CPU. Asrock has a board ready for it, and a company rep told us to expect "one-click overclocking to 4.5GHz".

On the AMD front there was startlingly little. Most motherboard vendors were 90% Intel in the display areas, with just a tiny shelf or cabinet

> **"What is the point of making fancy cooling if you can't overclock them?"**

dedicated to AMD. Not one actually showed us an AMD board, despite us being on the receiving end of hour-long tours by company reps.

STORAGE
Incredibly, storage technology was quite interesting this year. We're serious! Z97 brings M.2 SSD storage, which is itself a potential doubling (or better) of SSD speed, and was a hot topic in the last issue of *PC & Tech Authority.* Speaking to a few vendors, they don't expect M.2 to take off quickly, as SATA SSDs offer decent performance for now. Exactly what constitutes 'decent' is a matter of perspective. At around 450MB/s on a SATA 3 port today's SSDs are plenty fast, but M.2 is able to double or even triple that.

But that comes at a cost, so we were very excited when Western Digital showed off a prototype hard drive array running on a SATA Express interface. The drives were a new hybrid design, so we expect the included SSD area to boost performance yet still deliver storage that's much more cost-efficient than solid state.

Speaking on high-performance solid state, OCZ dazzled us with a pair of RevoDrive 350 PCIe SSDs running in RAID 0, and achieving almost 4GB/s. Quite amazing. It should be noted that an extra external cooling fan (an Asus device) needed to be attached to each drive to keep it functioning in this intensive mode.

Crucial's new M100 SSD is positioned as a transitional product for a first SSD in a system, and is priced to appeal at just $199 for the 128GB drive, 512GB and 256GB are also available. It replaces the M500 as an entry level device. Crucial has an important strength in that the company manufactures its own NAND so is able to price aggressively, it also has a mature in-house firmware and software team.

OCZ also launched its entry-level SSD, the Vector 180. If you're shopping for a new SSD this budget area of the market is seeing promising activity.

GRAPHICS
With no new desktop chipset from AMD or Nvidia recently, the graphics cards on show were nothing remarkable, or we'd seen them before. We did enjoy one enlightening conversation, though, that made the trip worthwhile. While

these companies like to innovate with graphics cards, at least one manufacturer just isn't bothering to innovate with Nvidia-based cards anymore, because they are voltage-locked so, one vendor wondered "what is the point of making fancy cooling if you can't overclock them?".

PERIPHERALS

Corsair are determined to own the fast-evolving keyboard scene, by securing the exclusive rights to Cherry MX RGB multi-coloured keys. The result is the Vengeance K95 RGB keyboard, and it is spectacular, with the potential for customised arrays virtually endless.

Red Cherry keys will come first in mid Q3, then blue and brown. This gives and interesting insight, too, into the popularity of the Cherry switch colours in general. Corsair's first multicoloured keyboard will be the standard-format K70 in RBG, followed by the larger K95 (more keys for MMOs) in RGB colours.

Cherry is a German owned and based company, and while its patent has expired, Cherry's competitors are still unable to match the feel, and more importantly the durability.

We also asked about Corsair's plans in audio – with its SP2500 stereo plus sub speakers now running into several years of a well deserved reputation. Sadly no new models are planned, we were told.

TP-Link showed off the cute Archer D7 AC 1900 modem router. We included the TP-Link Archer D7 in this month's router group test. The new D9 has a well thought out set of features, including a 1GHz dual-core

CPU and 802.11AC compatibility. What really caught our eye at TP-Link was a seemingly mundane power line extender, but featuring a new Wi-Fi Clone button that simply mirrors your network configuration as you extend your coverage.

CASES

Corsair's other big debut are its two microATX cases – the Air 540 and 380T, both of which look lovely in the flesh. The plastic used in the case is particularly solid looking, we also discovered that Corsair invested in a special pigment for the white case that won't fade anywhere near as quickly as other white cases.

BitFenix had a particularly strong line up. The company has a well deserved reputation for quality at a nice price, and its Ronin and Shadow cases were classy, well built and will likely hit our shores priced at well under $200.

At the other end of the scale, BitFenix wowed all who saw the huge new Atlas case, being just about the biggest PC chassis we've ever seen, with its 18 drive cages and cavernous internal space all ready for someone who likes to fit more in.

▲ The Asus stand was huge and packed with new gear.

PORTABLE

If there was a single product that impressed us so much we wanted to get our hands on it there and then, it was the Asus Transformer Book T300 Chi. Not since we first held the MacBook Air have emotions run so high. This really is a beauty. With Asus claiming it is the world's thinnest detachable 12.5in laptop (hey, there's a category for everything in the Guinness book), it's stunningly thin and light. With a 2560 x 1440 screen and 4G, it will run Windows 8.1 as well as other OSs to be announced.

OVERALL

Computex 2014 showed that these are buoyant times for the PC industry. What we saw was an evolution of products, the sort that a confident industry is able to bank on, while continuing to innovate and move forward with quality gear.

▼ CLOCKWISE FROM TOP LEFT: TP-Link's stand; OCZ's RAID 0 RevoDrive performance; Thermaltake's mouse range was impressive; MSI's new Eco board

SHOW CURIOS

Quote of the show: "Chromebooks are for entertainment, not productivity." Leading maker of Chromebooks. Oh really?

A product demonstration hostess was apparently assigned to stand next to the new Asus six-channel router, because every single person that walked by it would touch one of the six antennas, causing it to topple over. This poor girl would straighten the antenna back up again so it was neatly aligned with its five friends. She did this four times in the minute I watched.

Speaking of show girls, there weren't any. Or hardly any. It seems Computex may have finally cast off its old school shackles and realised that pretty girls holding a product all day doesn't make us love it more.

Loser of the show: a monitor company, touting new 4K screens, decided to demonstrate their clarity by mounting several of them into a wall-sized array, and playing non-stop 4K HD footage of surgery. Horrible bloody images that you just couldn't miss, the size of the side of a house, and with the unenthusiastic staff dressed up in doctors and nurses outfits to round off the disastrous theme. Not a single person stopped to visit the stand as we watched, while every stand around them was packed. I hope they think that one through a little more carefully next year.

13

COMPUTERS
that changed
the world

CREATED MORE THAN 70 YEARS AGO,
COLOSSUS WAS A GIANT STEP TOWARDS
COMPUTING AS WE KNOW IT TODAY.
DAVEY WINDER REVEALS THE
LANDMARK MODELS THAT FOLLOWED

This year marks the 70th birthday of Colossus, one of the most important machines in the history of IT. As well as being the world's first "electronic" computer, it also played a pivotal role in helping to end World War II by deciphering coded German military messages. Colossus has achieved something of a cult status among computer nerds and historians alike, but could you name the world's first laptop, tablet or games console? Or even the world's first web server or the first computer with a mouse-driven graphical user interface? Davey Winder, tech enthusiast, *PC & Tech Authority* contributing editor and collector of vintage computers, uncovers the 13 most important pieces of computing hardware in history.

1944
Colossus

Although Charles Babbage had envisaged a programmable computer 100 years earlier, it was in 1944 that the first fully programmable and electronic digital computer was realised in the shape of the aptly named Colossus.

Using vacuum tubes to perform Boolean operations, and requiring the physical manipulation of telephone jack plugs, cords and switches to change wiring in order to program it for new tasks, Colossus was designed by Tommy Flowers and influenced by Alan Turing's crypto-analysis probability theories.

In all, there were ten Colossus computers built, each occupying a large room and consisting of eight racks more than 2.3m in height, arranged in two bays that were 5.5m in length. A fully functional replica was completed in 2007 and can now be seen at The National Museum of Computing at Bletchley Park.
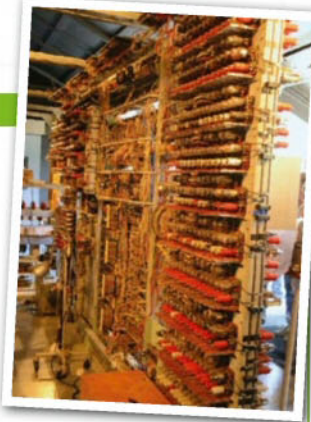
1973
Xerox Alto

Most computer historians agree that the Xerox Alto was the first to combine a desktop graphical user interface (GUI) and Douglas Engelbart's mouse input device in a meaningful way. Developed at Xerox PARC, the Alto was never commercially released, although thousands were built for use within Xerox facilities and by universities. It included a monochrome bit-mapped VDU, and came with a three-button mouse, a visual UI and 2.5MB of removable data storage.

The Alto pushed the GUI input concept into the output too, being the first to enable true wysiwyg printing, and was designed to work with the laser printers Xerox was developing at the time. The Alto changed the way users interacted with the computer and influenced the design of personal computing hardware, such as the Apple Macintosh, that followed.

1972
Magnavox Odyssey

Think video-gaming consoles and the names that spring to mind include Atari, Nintendo, Sega, Sony and Microsoft. However, none of these were responsible for kick-starting the home video-gaming revolution; that milestone belongs to the Magnavox Odyssey. Developed by Ralph Baer – who later designed the Simon game – and released in 1972 (pre-dating Atari consoles by a few years), the Odyssey sold over 300,000 units before it was discontinued in 1975.

Designed for use with a TV, the games took the form of cartridges and required a plastic overlay to be taped to the screen. Tennis, football, hockey and roulette were all played by manipulating light using rudimentary controllers. A shooting gallery game introduced the world's first gun controller in the form of a full-sized, pump-action shotgun, which detected light as a target.

It may sound basic when compared with today's consoles, but Atari was found guilty of patent infringement when it released its Pong game because it so closely resembled the Odyssey tennis game. Without the Odyssey gaming may have taken longer to take hold.

1975
MITS Altair 8800

The Altair 8800 makes it onto our list on two counts: it was one of the first affordable home computer kits to hit the market; and it inspired future computing engineers and designers who went on to change the face of computing as we know it.

Costing less than US$400 at the time, the Altair was offered as a kit based on an eight-bit Intel 8080 CPU and a 256-byte memory. The display was nothing more than front-panel LEDs, and there was no keyboard either; input was via a collection of toggle switches. However, the open 100-line computer bus **went on** to become the de facto standard S-100 bus, and the first programming language written for the device, Altair BASIC, was created by none other than Paul Allen and Bill Gates, who shortly went on to form Microsoft.

SAMSUNG
SSD 840 EVO

OUTSTANDING EVERYDAY COMPUTING

Transform your PC with a Samsung SSD. They're fast, light and cool. This is evident in Samsung's SSD 840 EVO range.

OUTSTANDING SPEED FUNCTIONALITY

Armed with an 840 EVO drive, users have the potential to unlock exceptional speeds and great flexibility for everyday computing. The SATA 6Gb/s interface (also backwards compatible with SATA 3Gb/s and 1.5Gb/s) can afford incredible speed, with Samsung's TurboWrite technology which boasts Sequential Read and Sequential Write speeds that are up to three times faster than the previous

> ### "The combination of high-quality Samsung hardware and user-friendly software makes the SSD 840 EVO an all-in-one hard-drive solution."

generation of Samsung SSD 830 models.

Better yet, users can shift the 840 EVO into high gear thanks to the Samsung Real-Time Accelerated Processing of I/O Data (RAPID) Mode. With the included Magician software, witness the speed afforded by this clever technology that utilises the PC's free DRAM memory as a cache boost. RAPID Mode also intuitively monitors data usage and can adjust the I/O accordingly.

In practical terms this provides support to key computing operations. Whether running a virus scan, listening to music, streaming HD video content, gaming or involved in video editing, the 840 EVO can help to keep up across multiple simultaneous processes.

SPEEDY UPGRADE

Thanks to the one-stop Install Navigator

software toolkit included with the Samsung Data Migration software, it can be easy to follow steps to migrate compatible data from old, slow internal storage to a fast 840 EVO drive.

The included Auto Install software guides users through every step of the installation process, while recommending options that can help to optimise the transferred data. The three-step migration process helps to ensure users are up and running as soon as possible, with all essential compatible data from their old hard drive. The Samsung Magician software doesn't stop there in terms of intuitiveness, either. Monitor and manage an SSD 840 EVO with access to meaningful tools that help performance such as operating-system support, benchmarking

and disk health status tracking.

MOBILITY

The combination of high-quality Samsung hardware and user-friendly software makes the SSD 840 EVO an all-in-one hard-drive solution. Self-Encrypting Drive (SED) security technology boasts an AES 256-bit hardware-based encryption engine designed to help keep files safe and secure.

Enjoy the Self-Monitoring Analysis & Reporting Technology (SMART) that helps track the 840 EVO's health status through Samsung's Magician Software.

Available in 120GB, 250GB, 500GB, 750GB and 1TB models, there's a speedy storage solution for almost every PC owner in the Samsung SSD 840 range.

▼ Samsung is leading the SSD charge with its high-performance and well-priced drives. high=performance and well-priced

1976
Apple I

The first Apple computer was designed and hand-built by company co-founder Steve Wozniak, with Steve Jobs creating a business through which to sell them. Now known as the Apple I, only 200 units were made, and sold at a cost of US$667 each – but they were the start of the Apple revolution.

Apple enthusiasts remain adamant the Apple I wasn't sold in kit form similar to other hobby computers of the time; however, the fully assembled circuit board still had to be connected to a power supply and display, and take residence in a case of some description in order to work. However, unlike the Altair 8800, it connected to a television and didn't rely on toggle switches and LEDs. The relative success of the Apple I led to the Apple II, which went on to sell more than five million units.

1977
Commodore PET

The Commodore Personal Electronic Transactor (PET) was the first fully integrated, plug-and-play home computer.

In the 1970s, Commodore's business was calculators, but when the price of the Texas Instruments chips at the heart of those calculators rose – resulting in the chip costing more than the entire calculator – the company went looking for a new chipset. It found one being used to power a computer kit called the KIM-1. Commodore head Jack Tramiel, having turned down the opportunity to buy the "too expensive" Apple II prototype, set about building a cheaper alternative, and the resulting PET came with a 6502 processor controlling a built-in screen, keyboard and cassette tape inputs. More importantly, the single-board computer was housed in a metal case with a built-in "datasette" for data tape storage, expansion ports for more memory, tape drives, parallel port and a modem.

Initially, the small keyboard gave away the company's roots, often being likened to using a calculator. Later models saw this initial design replaced with a full-sized keyboard, making the Commodore PET look less like a cash register and more like a PC.

1980
Sinclair ZX80

Although the earlier Altair 8800 had been sold as an "affordable" kit in 1975, you had to wait until 1980 to get real value for money in the form of the Sinclair ZX80, which brought hobby computing to the masses for around $160. It wasn't for the faint-hearted, though: built to that price point by Science of Cambridge – later Sinclair Research – the ZX80 kit required not only assembly but soldering, too. A ready-made version was available for around $200. Both proved popular, featuring a 3.25MHz Z80 CPU, 1KB of RAM, 4KB of ROM, and the Sinclair BASIC programming language and editor alongside the operating system.

The distinctive white case with the blue membrane keyboard made the ZX80 stand out, which is more than can be said for its reliability. However, plugged into a TV and with data stored on an ordinary portable cassette recorder, the ZX80 achieved sales of roughly 50,000 units.

1981
IBM PC

No roundup of the history of computing would be complete without mention of IBM, and the IBM PC in 1981 started the personal computer revolution as we know it. That revolution got off the ground and running pretty quickly, with an IBM PC reportedly being sold every minute of the working day within the first year of its launch.

Model 5150 entered a microcomputer market already dominated by the likes of Commodore PET and the Apple II. The mainframe business giant, in the top ten of the Fortune 500 companies at the time, managed to bridge the gap between hobbyist and business user, with a single, small and reasonably priced computer.

The introduction of the IBM PC XT two years later cemented the company as the driver of the PC revolution. It was the first computer to be supplied with an internal hard drive (albeit only 10MB) and set the standard for all that followed thereafter.
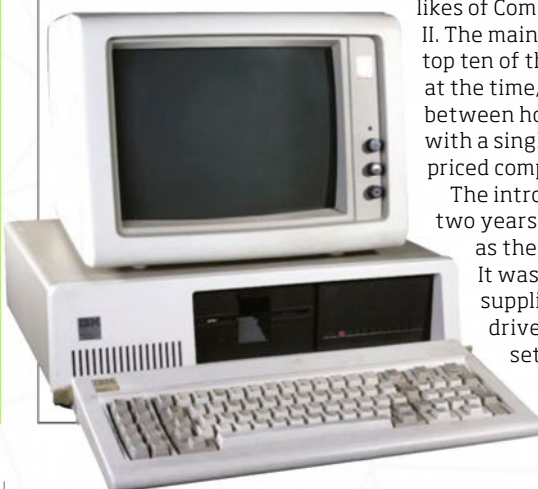
1981
Osborne 1

Visually, it may not fit the laptop mould with which we're familiar, but the Osborne 1 deserves a place in our list as the grandfather of the mobile computer. Referred to as a portable microcomputer at the time of its release, the Osborne 1 was known as a "luggable" by those who had to move it around.

Weighing in at 10.7kg and the size of a sewing machine, this was no ultraportable. Nor was it cheap, at around $2000. It was, however, a fully featured computer with a suite of business applications. Running the CP/M operating system, the Osborne 1 came with software advertised as being of the same value as the hardware itself. Unfortunately, the display wasn't so impressive at only 5in, and the single-sided floppy disk drives made data storage a problem.

It wasn't fast, it wasn't expandable and it wasn't the most practical computer, but it sold 10,000 units a month, and proved there was an appetite for portable computing.

1982
The C64

The biggest-selling computer model of all time, the C64 sold more than 22 million units during its lifetime, earning over $1 billion in sales, according to Guinness World Records. This 8-bit home-computing machine sold for $499, making it cheaper than the IBM, and it was expandable, featuring ports integrated into the motherboard for interfacing with peripherals and an external ROM cartridge port for bus expansion. Oh, and let's not forget the 64KB of RAM from which it took its name.

Games developers quickly took to the C64 since Commodore made detailed documentation available, unlike its competitors. As a result, the C64 quickly became one of the most popular games computers of its time.
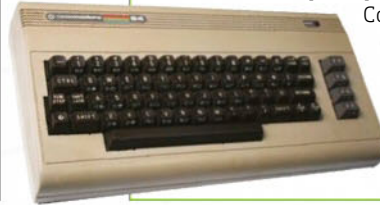
1990
NeXT Cube

Not all entries in this list are here because they represent a big step in the evolution of computing hardware. Some, such as the NeXT Cube, are here because the way in which people used them actually enabled that evolution.

In the case of the NeXT Cube, which was developed by the company Steve Jobs created in 1985 after he resigned as Apple CEO, it's all about one user in particular. The NeXT Cube, like the NeXT Computer before it, wasn't the greatest commercial success. A high-end workstation, running a proprietary NeXTSTEP operating system and costing upwards of $10,000, it sold for only a three-year period between 1990 and 1993.

However, one fan of the NeXT was Sir Tim Berners-Lee, who used a Cube as the first web server to host the fledgling World Wide Web, and created the first web browser client using its object-oriented development tools.

1993
Compaq Concerto

Convertible laptops that have a folding form factor to enable use as a laptop or tablet are surely a very recent innovation. However, we have to travel some way back to see where it all began; the Compaq Concerto was introduced in 1993, and was unlike anything we'd seen before.

It shipped with Microsoft Windows for Pen Computing (effectively Windows 3.1 with added stylus input functionality), and allowed handwriting recognition direct to the screen via a stylus. But that's not all: the keyboard was detachable, and therefore you could use the touchscreen in tablet mode with the stylus. This was possible since the motherboard, hard drive, floppy and expansion slots were all housed behind the screen; the keyboard was in effect just a case.

Unfortunately, at 2kg it wasn't particularly arm-friendly, and Pen Windows wasn't a runaway success either. But it was an early vision of today's mode of computing.

1837 Babbage's Analytical Engine

Mathematician and engineer Charles Babbage is perhaps best known for the Difference Engine, a working copy of which was built by the Science Museum in London to celebrate his 200th birthday – but it's the Analytical Engine that features in our list.

The Difference Engine, often referred to as the world's first computer, was just a calculator. However, it led to Babbage drawing up plans for the Analytical Engine – a machine with expandable memory, a central processing unit (called a 'mill'), punch-card programming (copying techniques used by the Jacquard loom) and a rudimentary printer. Although a complete and working Analytical Engine has never been built – modern builders would likely be hampered by its size, and the fact that it's made of brass and powered by steam – individual parts, such as the mill, have been. There's no doubt that it deserves a place in our list as the first "computer" capable of being programmed to carry out different tasks, and incorporating functions we know as conditional branching, iteration, parallel processing and microprogramming.
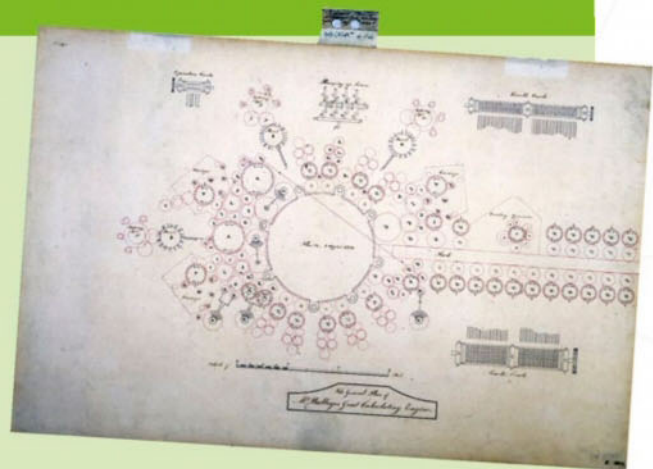
POWERED BY TUF PC
POWERFUL, DURABLE AND LOW MAINTENANCE

Selecting the right desktop system is not an easy task, especially when it comes to the professional application. Professionals such as designers, mathematicians and scientist, require stable and long lasting systems that remain on 24/7, with solid future-proof performance and low maintenance over time. The Powered by TUF system is designed solely for this purpose, featuring the state of the art Sabertooth Z97 Mark 1 motherboard, a high performance GTX780-DC2OC-3GD5 graphics card, the Powered by TUF system will be your best workmate in house.

GUARANTEED DURABILITY: TUF DESIGN AND VALIDATION

• The top side of the motherboard is guarded by the TUF Thermal Armor and dual Turbo fans, which remains on for a customized period of time after shutdown to provide additional cooling.

• An easily removable dust filter can be fitted at the back I/O port where the turbo fan intakes cool airflow from outside the chassis, while the same fan also spins in both directions to prevent dust accumulation.

• All unused I/O ports can be covered up by the bundled TUF Dust Defender kit, when working with the TUF Thermal Armor, will prevent dust from affecting the system operation over time.

• The lower side is protected by the TUF Fortifier to guard the motherboard from the bottom to prevent short circuit and bending board.

• The I/O ports are guarded by the TUF ESD Guards at all I/O ports for 2X the electrostatics protection over industry standard.

• All TUF motherboard passes server grade validation criteria, and has been validated with over 1000+ compatible devices for over 7000+ hours validation hours to minimize maintenance needs.

GUARANTEED STABILITY: TUF ENGINE POWER DESIGN

Featuring the American Military Grade Certified ultra long life TUF 10K Ti-CAP, TUF New Alloy Choke, and TUF MOSFET, managed by the fully digitalized DIGI+ voltage regulator. This unique power design enables the most precise power delivery towards both the CPU and the memory for ultimate stability for even the toughest applications and environmental conditions.

FAST PROCESSOR PERFORMANCE: NEW 4TH GEN INTEL® I7/I5 PROCESSOR

The powerful four core processor supports up to eight processor threads, and up to 4.4GHz default Turbo Boost clock at a low power consumption of only 88W default.

▲ TUF Fortifier prevents short circuit and board bending.

This powerful processor has enough power for the most complicate applications.

ULTRA FLEXIBLE OUTPUTS: UP TO 2 X UHD OUTPUTS @ 60HZ

The powerful Nvidia™ GTX780 GPU with 2304 CUDA cores that is great for 3D modeling and scientific calculations. By combining with the integrated Intel® HD 4600 graphics via iGPU Mult Monitor function, the Powered By TUF system can output up to dual UHD 3840x2160@60Hz, or quad QHD 2560x1440@60Hz resolution effortlessly, perfect for professional applications involving multiple high resolution displays.

▶ Military grade certified TUF components guarantees ultra long lifetime under the toughest usage environment.

▼ TUF ICe features incredible fan management and immediate response.

IMMEDIATE SYSTEM RESPONSE & NOISE TAKER: TUF ICE & THERMAL RADAR 2

The TUF ICe processor monitors and manages up to 12 temperature critical locations and 9 fan headers without utilizing CPU resource, assures an immediate system response, while maintaining the perfect balance between temperature and fan acoustics. Moreover, it also with in conjunction with the Thermal Radar 2 to tune up not only the CPU and system fan, they also calibrates and fine-tunes the dual cooling fans on the DirectCU II cooler off the GTX780-DC2OC-3GD5 graphics card, keeping the system dead silent while idle, keep the system cool, quiet, and also free from dust.

FUTURE-PROOF EXPANSION: SATA EXPRESS

Featuring the nextgen SATA Express interface, the Sabertooth Z97 Mark 1 is ready to support the nexgen ultra fast storage of up to 10Mbits/s when devices become widely available, or used as standard dual SATA6G ports when wish to stay with the existing technology.

▲ TUF Thermal Armor and reversible fans keeps your motherboard cool and clean

▼ Simple interface to keep all fans under control.

POWERED BY

STAY COOL BE TUF | THE 1ST ARMORED MOTHERBOARDS SERIES

THE ULTIMATE FORCE

LOOKS TUF. PERFORMS TOUGHER.

SABERTOOTH Z97 MARK1 MOTHERBOARDS

GTX780-DC2OG3GD5
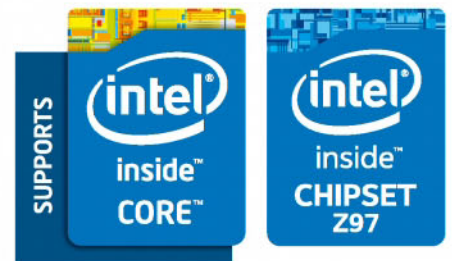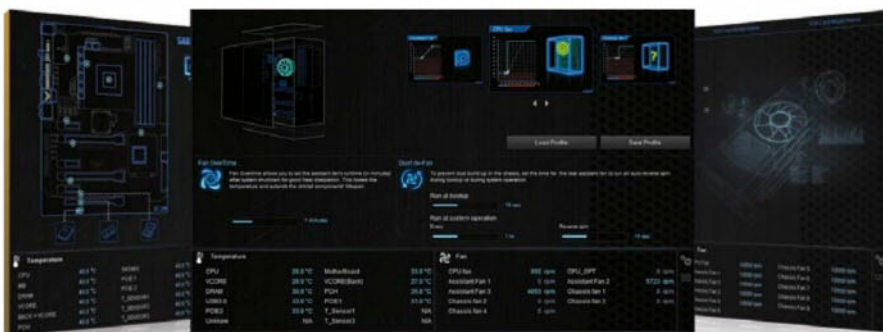
▲ ASUS 9 series motherboards support the latest 4th and upcoming 5th Generation Intel® Core™ processors

▲ Utilize both DP ports at the same time to support up to dual UHD resolution, or quad QHD outputs.

DirectX 12

THE REDEMPTION OF MICROSOFT?

DOES THE RECENTLY ANNOUNCED DIRECTX 12 HAVE THE POTENTIAL TO RESCUE MICROSOFT'S STATUS IN PC GAMING? **RICK LANE** INVESTIGATES

It's fair to say that Microsoft has had a difficult time over the past few years. Windows 8 proved extremely unpopular with many PC users, the Surface platform failed to live up to the company's expectations in the tablet market, and the company's relationship with PC gaming was severely damaged by the disastrous Games for Windows label and the accompanying nightmare service LIVE.

Even one of its most enduring successes – the DirectX API – has begun to flounder in the face of growing competition. Developers have been slow to adopt DirectX 11, and the vast majority of games that support it do so as an option, with only a handful of games supporting it exclusively. Meanwhile, Valve has demonstrated a clear preference towards OpenGL as the ideal API, and AMD has further stirred the pot with the introduction of its own graphics API effort, Mantle.

Now with a new boss, Satya Nadella, at the helm, Microsoft desperately needed a response, and the result was the announcement of the latest iteration of the DirectX API, DirectX 12. Announced at GDC in March, DirectX 12 marks a significant departure for the API, and although it's very early days yet, with a commercial release not due until the end of 2015, it's already clear that Microsoft isn't going to go down without a fight.

DirectX12 is the first update Microsoft has made to the API since 2009, marking the longest period between iterations since the initial version debuted in 1995. There are many potential reasons for this delay, but the most likely cause is the extended lifespan of the Xbox 360.

The aging console has left little room for Microsoft to pursue any graphical or performance advancements in the past half-decade or so, and since the Xbox has been the company's primary focus over the PC for some time, there's also been little incentive for the company to innovate further.

However, the GDC announcement of DirectX 12 placed considerable focus on the benefits of the new API to the Xbox One, but also the PC. In fact, the one visual demonstration Microsoft made of DirectX 12 in action was using a PC version of Forza V, running on an Nvidia Titan Black. What's more, Nvidia now claims it has been discussing the plans for DirectX 12 with Microsoft for the past four years.

So while Microsoft is still looking after its own console-child, it appears the PC is thankfully not being sidelined as a result.

HARDWARE SUPPORT

So far, Microsoft has only unveiled Direct3D 12, the graphics component of DirectX 12, with a wider range of features yet to be announced . For the moment, we know that DX12 will follow a very different track from previous versions though. Whereas all iterations of DirectX up to this point have concentrated on bringing new features to the table to improve visual fidelity, such as DirectX 11's

> *"VALVE HAS DEMONSTRATED A CLEAR PREFERENCE TOWARDS OPENGL AS THE IDEAL API"*

introduction of tessellation and displacement mapping, DirectX 12's focus is on boosting the performance of both current and upcoming hardware. DirectX 12 will be supported by all Nvidia GPUs that support DX11 (most of its GeForce 400-series cards and above), and all AMD cards that feature its Graphics Core Next architecture (the Radeon HD 7000 series) or above.

The significance of this tactic can't be underestimated. Arguably the greatest problem with DirectX 11 was the slow pace of developers

to adopt it. Even potential flagship games such as Crysis 2 didn't support it on release, and while nowadays the majority of mainstream titles are compatible with the API, for most it's still an optional feature rather than a necessary one. By comparison, with almost two years still to go before it's released, upon DirectX 12's arrival almost every PC gamer should have a card that's compatible with it, if they don't already.

This means both developers and players will be able to take advantage of it from the off.

However, AMD revealed an interesting fact in our interview (see p36), which is that although older hardware will support the standard DX12 spec, there will apparently be extra optional features that do indeed require specific new GPU hardware, although those new features haven't been defined yet.

A NEW PROGRAMMING MODEL

But what exactly are those advantages? In summary, DirectX 12 (or more specifically, Direct3D 12), introduces a new programming model that's less abstract than that of DirectX 11, which essentially lends developers greater control over the hardware; in other words, to get 'closer to the metal' – getting more direct access to the hardware with a smaller software overhead than was achievable previous Direct3D versions.

This new model also helps to remove the bottleneck between the GPU and the CPU, where the ever-growing power of GPUs is being held back either by single-core processors that have evolved little in recent years, or multi-core CPUs that inefficiently thread commands to the GPU. When combined, these new

features give developers a chunk of leftover performance that can be used to either improve gaming frame rates or increase visual fidelity.

To break the changes down a little, the Direct3D programming model has been altered in four specific areas. The first is with the introduction of pipeline-state objects (PSOs), which basically arrange many of aspects of the graphics pipeline into predefined groups. These PSOs can then be immediately converted

With a new boss, Satya Nadella, at the helm, Microsoft desperately needed a response, and the result was the announcement of DirectX 12

▲ The one visual demonstration Microsoft made of DirectX 12 in action was using a PC version of Forza V, running on an Nvidia Titan Black

by the hardware into the relevant instructions for the GPU. To use an analogy, it's the difference between typing out a set of instructions off the Internet by hand in DirectX 11, and copying and pasting them instantly into a Word document in DirectX 12. It gets the information to the GPU faster, and allows it to work much quicker.

Complementing these PSOs are command lists, which act as a replacement for DirectX 11's context-based execution model. Command lists instruct the GPU regarding which PSOs to use, alongside other specifics such as what textures it needs to render. Again, it's about telling the GPU precisely what to do, rather than asking it to figure it out for itself.

This is further aided by a secondary level of compartmentalised computation in the form of Bundles, which help to speed up rendering through repetitions of certain commands. If a game needs to render two objects with different textures, for example, a Bundle could be used as a recorded version of one command that's played back a second time using different resources, so the GPU only has to perform the calculation once.

Last but not least is a feature called descriptor heaps and tables. Descriptor heaps enable the GPU to view its various available resources

The developer perspective: CRYTEK

CRYTEK IS NEARLY ALWAYS AT THE FOREFRONT OF GRAPHICS TECHNOLOGY DEVELOPMENT, SO WE SPOKE TO ITS RESEARCH AND DEVELOPMENT PRINCIPAL GRAPHICS ENGINEER, TIAGO SOUSA, ABOUT HOW CRYTEK VIEWS THE DIRECTX 12 ANNOUNCEMENT, AND WHAT IT WOULD LIKE TO SEE FROM THE API WHEN IT DEBUTS AT THE END OF 2015

CPC: What was your initial reaction to the DirectX 12 announcement?

Crytek: It was great finally seeing a new iteration of DirectX. We've been asking about it for quite some time since; from a developer perspective, it had been stagnating for a few too many years. The expected updates from DX12 are in sync with our ongoing work.

CPC: What will the performance improvements enable you to do?

Crytek says it's currently limited to 2–4K draw calls in DirectX 11, but that it will be able to make a lot more with DirectX 12ms

Crytek: The main concern is improving throughput on the CPU side, and adding good multi-threading support alongside fancy new rendering features. Improvements on the graphics side, together with the release of the new consoles (which means less in the way of developer constraints), will make it easier to tackle the long-term problems that real-time rendering has been struggling with in recent years.

CPC: How will your development process benefit from multiple CPU threads?

Crytek: As a basic example, if a developer has an 8-core machine, but only uses one core, and also doesn't use instruction-level parallelism, that developer is using less than 10 per cent of the power the CPU provides him.

The way to move forward is – and has been for a number of years – to go massively parallel, but also to optimise for throughput, and APIs such as DX12 will see this coming to the PC market on the rendering side. This isn't a silver bullet though; rendering will become cheaper on the CPU side, but then there's the other systems that also need to be on a par with it, such as game code, physics, animation, GPU rasterisation itself and so on, otherwise performance will still remain limited on those particular systems.

CPC: Microsoft stated Direct 3D 12 would enable more complex scenes. How would you approach adding complexity to scenes?

Crytek: The extra CPU performance

at once, and commit the description of those resources directly to memory. Meanwhile, on the software side, games group the resources required by the graphics pipeline into descriptor tables, which are smaller groupings of the same resources described by the descriptor heap.

Because these tables can access the heap's data directly from the memory, the resources can be switched in and out easily for a very low performance cost. In short, descriptor heaps and tables give the developer much greater control over memory management.

LOWER OVERHEADS

Refocusing the control from driver to developer, and the workload from software to hardware, specifically towards the GPU, significantly lessens the overall workload on the CPU. Microsoft demonstrated

▶ DirectX 12 will be compatible with any of Nvidia's DirectX 11 GPUs, including most of its 400-series chips, as well as any of AMD's GCN GPUs, from the Radeon HD 7000 series onwards

this in action at GDC. A 3DMark benchmarking demo ported to DirectX 12 showed up to a 50 per cent improvement in CPU performance, with the workload spread evenly across the quad-core processor in the demo machine.

This gives developers more

flexibility over how they create their games. They could bank that performance improvement for a much better frame rate. This was emphasised by John Carmack at his final QuakeCon keynote speech, before his departure from id to Oculus in August last year.

---

means developers will be able to add more detail into scenes for a fraction of the performance cost – before, most DX developers were restricted to between 2-4K draw calls, but that number will now be able to go up quite a bit. This will have one great, really positive side effect: allowing for an easier and faster art workflow. Before, artists had to batch together geometry and do their best to minimise draw calls, but now they'll be able to become more creative and less restricted in the way they set up levels and create assets.

CPC: How will getting 'closer to the metal' affect Crytek's approach to development?

Crytek: In our case, we've relied on having a DirectX 11-style front end in recent years, and each platform having its own backend implementation (GCM, DX9 and so on). However, retrofitting new [close to metal] APIs to match such an approach wouldn't make sense for various reasons. In the end, it means more effort for initial iterations, in terms of refactoring, to ensure we can extract the best performance.

CPC: Microsoft described the Direct 3D API as 'console-like,' and much of the focus of DX12 seems to be on the Xbox One. As a developer whose primary focus has been the PC, how do you feel about this?

▶ Crytek is pushing its Render Doc to become a standard across multiple platforms

Crytek: It's great that DX12 will be on different platforms, since we try to share as much work as possible across many platforms, to minimise QA effort and the time spent across different implementations. In the end everyone wins; it's less of a burden and less time wasted for developers.

CPC: With much of DX12 still under wraps, is there anything you would particularly like to see it support?

Crytek: Feature-wise, we've been in touch with Microsoft since DX12's inception, and Microsoft has been really keen on listening to developers, which is great. I don't think I can disclose information currently, but a lot of features that we've been requesting for many years will finally be in there. One feature we would really like to see is DX12 on Windows 7, which would offer a much bigger market share for

developers to aim at.

We would also like better debugging and profiling tools. I've been preaching for quite some time that PC gaming tools are lagging behind in comparison to tools available on the previous console generation, specifically the Xbox 360 and PS3.

Most of the PC tools aren't usable on big, real-world projects, or they're IHV-specific (independent hardware vendor), so developers have to use one tool for one IHV, and a different one for another – it's a big waste of time.

From my point of view, effort developing such tools could be put into developing a single one that actually works and makes everyone happy. I would like to encourage developers, Microsoft and other IHVs to join in and make Crytek's soon-to-be open source Render Doc (**http://cryengine.com/renderdoc**) an industry standard across multiple platforms.

An advocate of low-overhead APIs, Carmack was keen to see games performing faster as a priority over providing better visuals. In hindsight, these comments are especially interesting given his recent job move to the Oculus Rift team. Low-overhead APIs will be a significant boon to stereoscopic 3D displays and virtual reality technology such as the Oculus Rift. Basically, lower overheads will make it easier for developers to render the same image twice (once for each eye to produce the stereoscopic 3D effect) at higher resolutions without impacting overall performance.

Alternatively, developers could use DirectX 12 to keep the same level of performance seen in games now, but with considerably greater environmental detail. This could be achieved by increasing the number of objects in a landscape – putting more gravel on a gravel path, for example, or adding detail to character models and so on.

With DirectX 11, Crytek increased the environmental detail between Crysis 2 and Crysis 3 significantly, introducing visual features such as much denser vegetation, for example. DirectX 12 could see a similar leap in terms of the pinpoint nature of

game visuals, only across the board and without requiring an overly powerful rig – Crysis 3 was one of the few DirectX 11-exclusive games, and required powerful hardware to see it at its best.

NEW RENDERING FEATURES

Precisely how games exploit the alleged advantages of DirectX 12 will depend on the new rendering features brought by D3D12. At this stage, very little is known about how DirectX 12 will take advantage of future hardware and vice versa. What Microsoft did reveal, however, was that DirectX 12 will enable

> ## "LOW-OVERHEAD APIS WILL BE A SIGNIFICANT BOON TO STEREOSCOPIC 3D DISPLAYS"

programmable blend with pixel-shader-ordering, and conservative rasterisation.

The latter is intended to enable better collision detection and culling. Improving hit detection will presumably help to lessen glitches of objects moving through surfaces,

In a 3DMark benchmarking demo, the Direct3D 12 renderer makes much more use of a quad-core CPU's four cores, while the Direct3D 11 renderer mainly just stresses a single core

and may have benefits for certain game types, such as shooters, but it's difficult to be more specific without knowing more about how this feature plays into the rest of DX12. Better object culling will improve the way in which objects that aren't currently being viewed are removed from the rendering process, which ties into the 'improving performance' theme of DX12.

Meanwhile, the programmable blend feature simply feeds into the theme of giving developers greater flexibility within the graphics pipeline. Blend functions can be used to make objects appear transparent, for example, and are currently fixed-function (non-programmable). Making them programmable enables developers to theoretically create a more efficient blend function. It's a small feature, but again it potentially gives developers a little extra performance to use elsewhere.

Microsoft has promised that many more new rendering features will be unveiled in the coming months, and it will be interesting to see how they help to define DirectX 12, because currently Microsoft's outline for the API very closely resembles the design philosophy behind AMD's Mantle. This isn't surprising, since AMD is on the board that advises Microsoft on the trajectory DirectX should take. What might seem surprising, though, is that AMD would advise Microsoft on building an API that appears to effectively make its own development efforts redundant.

THE API RACE

Of course, AMD benefits from a better API, regardless of who ultimately owns it, because AMD can build and sell hardw are that takes advantage of it. As such, refusing such cooperation would be senseless. Furthermore, as you can

Crysis 3 was one of the few DirectX 11-exclusive games, and required powerful hardware to see it at its best

see from the interview on the right, AMD is confident that Mantle has enough grunt to hold its own.

So far, in our own testing, Mantle has proved to have an advantage over Direct3D in Battlefield 4, for example, but often the biggest differences were seen when pairing high-end GPUs with low-end CPUs – an unlikely combination that makes it difficult to endorse form a real-world perspective. However, the results in Star Swarm revealed the potential to show a lot more on the screen rendered in real time.

Mantle also has a further two years before DirectX 12 is released, which is sufficient time to carve a niche for itself, and AMD claims that Mantle gets even closer to the metal in some instances than DX12, making it even faster. What's more, more developers are gradually supporting Mantle, the latest of which is – intriguingly – Crytek.

Nvidia, by comparison, isn't competing in the API race, instead focusing on providing better graphics drivers for additional performance boosts, which is a perfectly reasonable strategy. After all, we've got this far without low-overhead APIs. In the meantime, Nvidia is also committed to supporting DX12, and seemingly determined to be the lead technology supporter of DX 12. In a bold blog post explaining its intentions following the DX12 announcement, Nvidia has brazenly stated that 'with more than 50 per cent market share (and a slightly more significant 65 per cent for discrete graphics) among DX11-based gaming systems, Nvidia alone will provide game developers the majority of the potential installed base'.

Yet Microsoft's biggest competitor in the API space is, as it has been in the past decade or so, OpenGL. With Valve currently developing its own Linux-based operating system SteamOS, and controlling a vast portion of the gaming market through Steam, it isn't impossible that Valve could potentially topple Microsoft as the industry standard

▶ Co-founder of id Software (now at Oculus Rift), John Carmack, is keen to see fast performance prioritised over better visuals

for PC software, sending DirectX down with it. As such, Nvidia and AMD will have just as much interest in supporting OpenGL as DirectX 12.

Moreover, SteamOS is due out this summer, giving it 18 months to gain traction with PC users before DirectX 12 is released. Of course, SteamOS is targeted at the lounge PC gaming market, rather than the traditional desktop, but if it works properly and takes off, it could end up being the first proper competitor Microsoft has seen in the PC gaming business, possibly resulting in OpenGL seriously challenging Direct3D.

Much of this is highly speculative, of course. Most developers haven't even had a chance to touch DirectX 12 yet, and there's still an awful lot we don't know about it. Perhaps most importantly, we don't yet know how Microsoft will package DirectX 12 to consumers. Will it be compatible with Windows 7 and/or 8? Or will it be exclusive to Windows 9?

The latter initially seems like the most obvious choice for Microsoft, but when you consider DirectX 12's modus operandi of wide-ranging compatibility, it's also the most counter-intuitive. Moreover, it's the most likely to further alienate PC users who have either stuck with Windows 7, or who have just got Windows 8 working for them in a satisfactory way.

What we can say for certain is that DirectX 12, and the shape Microsoft plans for it to take, is one of the first genuinely interesting moves we've witnessed from the company in quite some time. Even at this very early stage, it looks capable of providing benefits to hardware manufacturers, game developers and players alike. The question now is, will it be sufficient to steady Microsoft's increasingly insecure position in the PC gaming sphere?
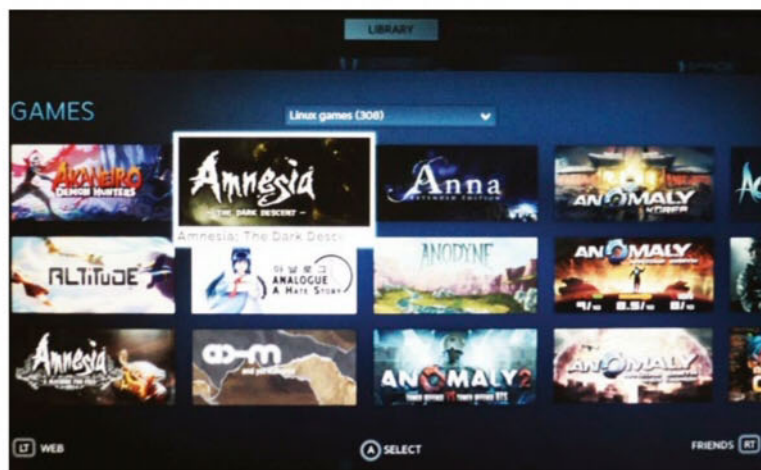
◀ DirectX 12's biggest competitor could end up being OpenGL, via SteamOS' Linux games catalogue
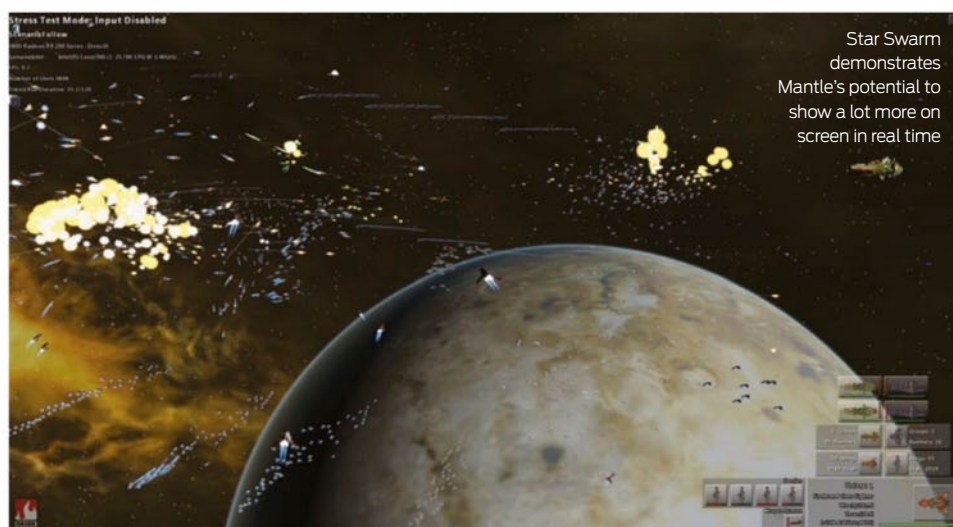
Star Swarm demonstrates Mantle's potential to show a lot more on screen in real time

The hardware perspective: AMD

ROBERT HALLOCK IS IN CHARGE OF TECHNICAL COMMUNICATIONS AT AMD. WE ASKED HIM ABOUT THE COMPANY'S INVOLVEMENT WITH DIRECTX 12'S DEVELOPMENT, HOW IT AFFECTS ITS OWN API MANTLE, AND ITS PLANS FOR CURRENT AND UPCOMING HARDWARE

CPC: Much of the focus on DX12 has been on the benefits for Xbox One, but where does PC hardware stand with regard to the API?

AMD: Well, I think it's important to emphasise that DirectX 12 is still some way off, so there's a lot to do and learn about the API. That said, we're pretty excited that Microsoft, a really influential member of the tech industry, has seen the value of console-like, or low-overhead, APIs and is going in that direction.

We feel as if we started that chain last year – at the end of 2013, nobody was talking about low-overhead APIs, until we announced Mantle, and then at GDC 2014, everyone seemed to be talking about it. What excites us most is that low-overhead APIs have been able to make some pretty significant performance gains on modern graphics cards, by reducing or eliminating software bottlenecks. You have to wonder how much performance has been wasted by inefficient software over the years. How much performance have hardware buyers been unable to claim for themselves, just because the software wasn't ready to do the job?

CPC: If everyone will get these low-overhead benefits from DX12 in the future, where will that leave Mantle?

AMD: I think Mantle is complementary to DirectX and OpenGL. Every API has unique features that set it apart from the others, and it's difficult to say what those features will be in DX12 in 2015. However, we're confident that the broad support Mantle offers on Windows 7 or higher, and that the time developers have invested into familiarising themselves with it, has given it some staying power.

CPC: John Carmack recently said that current consoles are twice as fast as PCs, because of the Windows overhead. Will this change with DX12, or are PC overheads still going to be significant?

AMD: That's the beauty of the low-overhead API. One factor that hasn't been widely understood is that these low-overhead APIs are coming to the PC. For example, we brought Mantle onto the PC because game developers asked us for a programming environment that was similar to consoles. A console already has many low-level APIs available to it, and in many respects always has - game developers have been programming close to the metal since the NES. Being able to extract more performance per FLOP, or per watt, is always valuable, and that kind of programming didn't exist on the PC. However, with these low-overhead APIs that we've

▲ Any GPUs based on AMD's Graphics Core Next architecture, such as the R9 270X, will be compatible with the DX12 spec, but there could still be optional features that require new hardware

started, people are going to get more performance per watt, and at the same time I think developers are going to have an easier time navigating the challenges, because they'll spend less time tricking the system into overcoming software problems, and more time just programming their own games.

CPC: How are DirectX 12's new rendering features going to affect the trajectory of your GPU development?

AMD: You might not know this, but AMD sits on the board that Microsoft has assembled to define the features for DirectX, and we've been serving in that detachment since the mid to
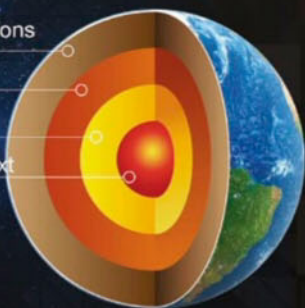

AMD's 'close to metal' Mantle API was announced last year

MANTLE IS GAME CHANGING

THE FUTURE OF GAMING

Graphics Applications
Mantle API
Mantle Driver
Graphics Core Next

▶ Game developers have been programming close to the metal since the Nintendo NES days

> "*USERS HAVE BEEN TRAINED TO THROW MORE POWERFUL CPUS AT THEIR SYSTEM*"

late 1990s. So DirectX won't affect the trajectory of our graphics cards in that way; rather, we come to the table with the hardware features we'd like to put in our GPUs in two or three years, and we help to shape the spec with other hardware vendors to make sure the API can harness those features when the time comes.

CPC: Can you give an example?
AMD: There was a feature in the Graphics Core Next architecture called tiled resources, which is similar to id Software's mega-texturing – you have absolutely enormous texturing, and you can split chunks out of that and only load one chunk in the memory. It's great, because the texturing in the game world is then really diverse – players always see something different because the texture is enormous. We've had that feature in our hardware for a very long time now, and it was exposed in DirectX for the first time in DirectX 11.2.

CPC: DirectX 12 is the first DirectX version for a long while that hasn't required specific new GPU hardware

to access all its features. Is that going to make it harder for you to sell new GPUs?

AMD: Well, firstly, all of our Graphics Core Next products, including APUs, support DirectX 12. However, one fact that I think some people don't know is that there will be certain optional features of DirectX 12 that will necessitate new hardware from the graphics industry. We don't know what those features will be yet, as the full spec hasn't been defined, but we know that's the case. So while most GPUs will be broadly compatible with the spec, there could be a feature that does need new hardware.

CPC: Will an AMD GPU have any advantages over an Nvidia one when running DX12?

AMD: It's hard to say; it's the end of 2015, so it's a long way to project. However, I will say that game developers are already looking at Mantle, and they've been working on it for six months, so at the end of 2015 they'll have been working on it
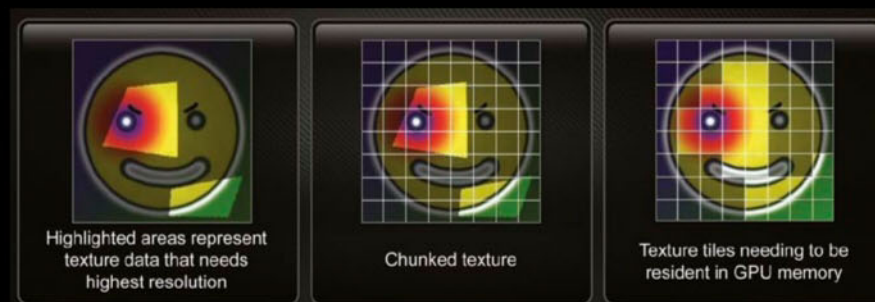
for 20-24 months. By this time, game developers will have a tremendously large time advantage in the low-overhead API space on Radeon hardware, so they'll be most familiar with the best practices of the low-overhead API development on our hardware. I think that's potentially an extremely powerful advantage that is in our favour.

CPC: DirectX 12 is supposed to improve multi-threading performance in CPUs. How will this benefit games?
AMD: A common bottleneck in graphics is poor parallelisation across multi-core CPUs, and it's tough to break up a rendering scene into multiple CPU threads with the APIs we have today. At the moment, some cores could go completely unutilised, and that's an opportunity to reclaim lost performance by doing graphics work in a new way so that these cores become used.

In Mantle, for example, better CPU parallelisation is one of the techniques we're using to make strides in graphics performance as well. We have some specific tools that allow multiple threads to be launched in flight and generally improve the performance of the scene. It's very easy for a game developer to harness that advantage – users have been trained to throw more powerful CPUs with more cores at their system, when really the actual problem was that the software wasn't taking full advantage of what they already had. We're very excited about helping to address that problem now with Mantle, and helping Microsoft to address it as we head towards 2015.

▼ AMD's tiled resources feature was exposed for the first time in DirectX 11.2

Highlighted areas represent texture data that needs highest resolution

Chunked texture

Texture tiles needing to be resident in GPU memory

IN THE LABS

A long route to perfection

BEN MANSILL IS THANKFUL 802.11AC ROUTERS ARE HITTING EN-MASSE, AND EQUALLY GRATEFUL THAT DEVICES WEREN'T RUSHED OUT PREMATURELY.

I remember when 802.11ac was at its imminent arrival stage. It was towards the end of 2012, and the thinking at the time, amongst my tech journo friends, was that products would be available very soon. The fact that the standard was still being ratified by the IEEE working group meant absolutely nothing – because as we'd seen with 802.11n, devices starting spilling onto shelves at least a year before that standard had been nailed down.

It worked for 802.11n, but it shouldn't have. Companies that made 802.11n devices – and there were very few companies in the business that didn't – were banking on the standard specifications remaining mostly unchanged through the final ratification process, and any deviations from that could be handily dealt with via a relatively simple firmware update.

Of course, consumers who weren't actively following the ratification process (that's a job for people like me...), snapped up the new faster longer range n routers and quickly put them to work. The benefits were immediate and highly relevant to a world where streaming media was itching to be set free across domestic airwaves, but the Neolithic 802.11 b/g standard fell far short for this new and demanding task.

We were lucky with n. Shoving product onto shelves using an incomplete technology standard was risky, but ironically that act in itself more than likely added to the impetus to finish off the ratification process.

The ac standard was finally given the tick in January this year, and, just as with n, devices were available long before then. But, interestingly, nowhere near as far back as was the case with n, or as many. There are a few reasons for this, and conversations with high-ups at a couple of the leading router manufacturers made clear to me that risk was the least important factor – or at least, technical risk wasn't. Financial risk was, as it always will be, where the buck stops.

The simple fact is that n was delivering sufficient performance. Filling up our Wi-Fi bandwidth with media, or whatever you do with yours, sat perfectly well within n's capacity. What's changed, now, is that instead of (most likely) a single stream of Wi-Fi data being occupied, we're asking our home networks to deliver fat content to more people and their devices simultaneously. A perfectly reasonable scenario has someone gaming online, some internet video being sent to a smartphone or tablet, or two, and some bandwidth-intensive surfing all happening simultaneously. 802.11ac can handle that with ease, send its signal further, and with more power to get past walls or other signal-degrading obstacles.

So, the time is truly right for a big look at 802.11ac routers. The products themselves may not be sexy (well, nobody told Netgear that...), but what they can do for your home network most certainly is. If you've been neglecting your router, and that's probably most of us, now is the time to upgrade.

DELL CHROMEBOOK 11 41

PANASONIC TOUGHPAD FZ-M1 44

ACER ICONIA A1-830 42

WHAT OUR A-LIST MEANS

Our A-List award is reserved for the best products in each category we review. With a winner and an alternative pick in each, that's 92 products you know are first class.

WHAT OUR AWARDS MEAN

PC & Tech Authority's comprehensive Real World testing sorts out the best products from the pack. Any product recommended by *PC & Tech Authority* is well above average for features, value for money and performance.

WHAT OUR RATINGS MEAN

OUTSTANDING
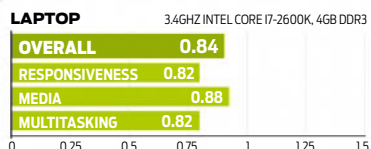VERY GOOD
GOOD
ORDINARY
POOR
VERY POOR

HOW WE TEST

OUR BENCHMARKING TESTS ARE THE BEST IN THE BUSINESS. READ ON TO FIND HOW THEY WORK...

2D TESTS

We test desktop PCs, netbooks and laptops with our own, custom-built, 2011 Real World Benchmarks.

We split the results into three categories: Responsiveness, Media and Multitasking, with the Overall score an average of the three sub-scores.

For instance, responsiveness replicates light browser and productivity workloads. The Media test involves running iTunes for audio conversion, Photoshop CS5 to crunch large images and Sony Vegas 10 to edit home video. This then gets run simultaneously alongside Cinebench 11 in order to get a handle on the multitasking ability of the system.

LAPTOP	3.4GHZ INTEL CORE I7-2600K, 4GB DDR3
OVERALL	0.84
RESPONSIVENESS	0.82
MEDIA	0.88
MULTITASKING	0.82

0   0.25   0.5   0.75   1   1.25   1.5

3D TESTS

We use pre-recorded demos in Crysis and DIRT 3 to test gaming performance where relevant. We have three standard test settings, depending on the power of the graphics card: Low, Medium and High.

To test gaming performance, we use our own recorded Crysis benchmark. We use the Low, Medium and High quality settings in 1366 x 768, 1600 x 900 and 1920 x 1080 screen modes respectively. Very high-end systems can also be tested using the ultra-intensive Very High settings, with all detail switched on, and varying levels of anti-aliasing enabled.

3D SPEED	GOOD PLAYABLE UNPLAYABLE
HIGH SETTINGS	10FPS
MEDIUM SETTINGS	27FPS
LOW SETTINGS	86FPS

LAPTOP BATTERY LIFE

We subject laptops to two battery tests. In the light-use test, we optimise the system settings for the greatest power efficiency. We then disconnect the mains and run a script scrolling a selection of web pages until the system shuts down, giving you a realistic idea of the surfing time each laptop offers.

For the heavy-use test, we engage Windows' High Performance power profile, set the display brightness to maximum, and allow the taxing Cinebench 3D renderer to push the processor load to the limit. This gives a worst-case figure, revealing how long you can expect the battery to last under the most demanding conditions.

BATTERY LIFE	HOURS:MINUTES
1.35 HEAVY USE	
LIGHT USE	6:02

0   1   2   3   4   5   6

GROUP TEST
ROUTERS
54

REVIEWED THIS ISSUE...

DELL CHROMEBOOK 11

WELL MADE AND QUICK IN OPERATION, THE CHROMEBOOK 11 IS LET DOWN ONLY BY A POOR DISPLAY

PRICE $399
SUPPLIER www.dell.com.au

Dell unveiled its first Chromebook at the BETT educational technology show back in January, raising considerable interest with a promised price of $379 for the 2GB model. That specification finally goes on sale on 26 June, but ahead of it comes a more expensive ($399) model with 4GB of installed RAM.

Aside from the memory provision, the two models are identical. For your money you get an 11.6in screen with a resolution of 1,366 x 768; a Haswell-class, dual-core 1.4GHz Intel Celeron 2955U CPU; and 16GB of flash storage. Connectivity is impressive for a laptop this cheap, and comprises a pair of USB 3 sockets, a full-sized HDMI output so you can hook it up to a monitor or HDTV, a 3.5mm headset jack and an SD card slot. Dual-band 802.11n Wi-Fi and Bluetooth 4 take care of networking; the only major missing item is the lack of a wired Ethernet port.

This specification enables the Dell Chromebook 11 to run Chrome OS seamlessly. The machine wakes up instantly from sleep, and boots in seven seconds from a completely powered-down state. In use, we never had to wait for tabs to appear and disappear, performance never flagged – even with a screen full of websites – and streaming HD video played perfectly smoothly. Our only reservation in this area concerns the slightly noisy fan, which kicks in as soon as the load on the CPU ramps up.

The Chromebook 11 also excels in benchmarks, completing the SunSpider JavaScript test in 323ms and scoring 2,767 in the demanding Peacekeeper browser test. We'd expect the 2GB model to perform similarly, since there's little difference between these scores and those of the 2GB Acer Aspire C720.

Battery life was also on a par with the C720. With the screen set to a brightness of 120cd/m2, wireless turned off, and a low-resolution YouTube video set to loop indefinitely, the Dell lasted 5hrs 54mins on a single charge. It's a touch better than the Acer, but the gap is small at 18 minutes.

Where the Dell Chromebook 11 disappoints is the screen. Its glossy finish is highly reflective, yet looks dull and flat, vertical viewing angles aren't great, and there's a touch of grain. Measuring performance with our colorimeter revealed the panel's maximum brightness to be a disappointing 208cd/m2, and the contrast only 360:1. Such figures aren't uncommon on budget laptops, but they're a long way short of the screens we're seeing on sub-$400 tablets these days.

Perhaps more significantly, screen quality also falls well short of the HP Chromebook 11 – a machine previously withdrawn from sale temporarily due to problems with faulty power supplies, but now back at various shops for around $389.

Still, the Dell's panel is similar to its closest rival, the Acer Aspire C720 – which is slightly brighter, but has worse contrast – and the rest of the package is superior to Acer's offering. The Scrabble-tile keyboard has a crisper, more solid feel and the broad touchpad is responsive; although we've never liked integrated buttons, its heavy, positive click is just about acceptable to use.

As you'd hope from a product designed for the classroom, build quality is excellent. The lid is stiff, its glossy front protecting the LCD beneath from heavy-handed prodding. A rubberised coating surrounds the keyboard and completely covers the wristrest, which makes for a comfortable touch-typing platform. Beneath the laptop are two long strips of rubber, which do a fine job of preventing the laptop from slipping around on a desk or your lap. Despite the solid feel, this isn't a heavy machine, weighing a mere 1.3kg and measuring 23mm thick.

With its strong performance, creditable ergonomics and low price, the Dell Chromebook 11 is a great option for any student looking for a budget workhorse – especially

▲ The Chromebook 11 runs Chrome OS seamlessly, and boots up in seven seconds

KEY SPECS
1.4GHz Intel Celeron 2955U · 4GB DDR3 RAM · 6GB flash storage · Intel HD graphics · 11.6in 1,366 x 768 display · dual-band 802.11n Wi-Fi · Bluetooth · Chrome OS · 1yr C&R warranty · 296 x 201 x 23mm (WDH) · 1.3kg (1.6kg with charger)

since, with the integration of the Quickoffice beta into the Chrome OS Files app, offline editing capabilities are now much stronger than they were before. At this cheaper end of the Chromebook market, we prefer it to the Acer Aspire C720.

Now that the HP Chromebook 11 is back on sale, however, it's that model that remains our favourite Chromebook. Although it can't compete with this Dell on performance or battery life, its display is vastly superior, and that makes a real difference.

Despite being a product for students, this, and other Chromebooks, remain excellent productivity machines and are well worth a close look.
Jonathan Bray

PERFORMANCE	★★★★☆
FEATURES&DESIGN	★★★☆☆
VALUE FOR MONEY	★★★★☆

OVERALL ★★★★☆

ACER ICONIA A1-830

NOT AS GOOD AS THE NEXUS 7 OR KINDLE FIRE HDX 7IN, BUT ACER'S BUDGET 7.9IN TABLET PERFORMS WELL FOR THE MONEY

PRICE $197
SUPPLIER www.acer.com/au

Last year's Acer Iconia A1 7.9in Android tablet failed to impress us: its low price wasn't enough to excuse a grainy screen and lacklustre performance. This time around, Acer has fitted the Iconia A1-830 with a higher-frequency, dual-core Intel Atom CPU and reduced the price to under $200.

The Iconia's IPS panel is a big step up from its predecessor, yielding adequate, if uninspiring, image quality. With a resolution of 768 x 1,024, it has a low pixel density of 162ppi, but this isn't too much of a problem. You can see stair-stepping on text if you look closely, but for the most part it's barely noticeable at all.

More importantly, quality is fine. In our tests, the panel's LED backlight topped out at a respectable 337cd/m², meaning that using the Iconia outdoors isn't out of the question. Images stand out thanks to a contrast ratio of 843:1, but as with many budget tablet displays, lower-end greys have a tendency to blend into black, resulting in a loss of shadow detail. The panel's colour fidelity is good for the most part, although skin tones, reds and oranges look slightly washed out.

Unusually for an Android tablet, the Iconia A1 is driven by an Intel Atom – in this case a Hyper-Threaded, dual-core 1.6GHz Z2560. It completed the SunSpider JavaScript test in 457ms, not too far behind the Apple iPad mini 2's time of 418ms. Its Geekbench 3 score was somewhat less impressive, however, delivering single- and multi-core results of 460 and 1,064 respectively.

While this doesn't approach the performance of our current favourites, the Nexus 7 and Amazon Kindle Fire HDX 7in, it's better than we expected. We had to open a large number of apps before the Iconia exhibited any noticeable lag; navigating around Android 4.4 felt smooth; and zooming, panning and scrolling around web pages was fluid.

The Iconia is surprisingly games-capable for a budget tablet, too, and managed a respectable score of 14.4fps in the GFXBench T-Rex HD test at native resolution. You won't be playing high-end games at top detail levels, but the majority of titles should be playable, if only thanks to the low screen resolution.

The Iconia's build and design is also superior to its predecessor. The white rear panel has been replaced with a sturdier, less flexible, matte-plastic panel with a metallic finish. The bezels are now white, giving the tablet the tastefully cohesive look of an Apple product. The chassis adds very little extra bulk, and the back panel curves at the edges just enough to prevent it digging into your flesh when held in one hand.

While build, processing and graphical performance are more than adequate considering the price, it's clear that battery life is one of the main areas where costs have been cut. With the screen set to 120cd/m² and a low-resolution video left looping continuously, the Iconia persevered for a mere 8hrs 33mins, more than three hours short of the Nexus 7.

The Iconia isn't exactly bristling with expansion options, possessing only a micro-USB port that doubles as the charging point, a 3.5mm audio jack and a microSD card slot. There's no HDMI output, but this isn't unusual. The 5-megapixel rear camera is disappointing, though. It takes grainy photographs that are horribly lacking in detail. The 2-megapixel front camera is even worse, bathing images in a murky gloom, and the speakers on the rear are quiet and tinny.

Perhaps most disappointing is that the Iconia is equipped with only Android 4.2, which is now two years out of date. Acer has preinstalled a couple of applications of its own to sweeten the deal, but these aren't particularly exciting: they include an inconsequential scrapbook app called Life Image and AcerCloud, Acer's own data-backup and basic file-synchronisation service.

Like the Iconia A1 before it, the Acer Iconia A1-830's price is good. However, unlike its predecessor, the A1-830 delivers passable performance and screen quality, plus a more solid build. In the overall scheme of things, the Nexus 7 and Kindle Fire HDX 7in are better-quality devices, with superior displays, quicker performance and longer battery life.

Bobby Macpherson

KEY SPECS
1.6GHz Intel Atom Z2560 · 1GB DDR3 RAM · 16GB eMMC storage · 7.9in 768 x 1,024 IPS display · single-band 802.11n Wi-Fi · Bluetooth 3 · 3.5mm audio jack · microSD slot · 5MP rear/2MP front cameras · Android 4.2 · 1yr RTB warranty · 136 x 6.3 x 203mm (WDH) · 388g

◄ Build quality has improved since the original Iconia A1

BATTERY: VIDEO PLAYBACK 8HRS 33MINS

PERFORMANCE ★★★★☆☆
FEATURES&DESIGN ★★★★☆☆
VALUE FOR MONEY ★★★★☆☆

OVERALL ★★★★☆☆

THE GREAT GEFORCE GTX 750 TI STORMX DUAL

## StormX DUAL — GEFORCE® GTX™ 750 Ti

Utilizing NVIDIA's Maxwell architecture, the GeForce GTX 750 Ti is capable of providing better performance without the need for more power. It doesn't require any extra power connectors, so you can upgrade your desktop PC without buying a new power supply. The Maxwell-based card is cooled by the StormX Dual cooler. This reliable cooler features two 80 fans that have the TurboFan Blade design for increased airflow while maintaining low operation noise.

The StormX Dual comes equipped with solid capacitors, ferrite core chokes, and an improved PWM design. Utilizing these, the card is able to run more efficiently and get an increase in its overclocking potential. As with all GeForce cards, this card also features NVIDIA technologies such as PhysX, GPU Boost 2.0, Adaptive Vsync, and ShadowPlay to name a few.

Without a doubt, this card makes for a perfect partner for gamers on a budget.

Key Specifications:
- CUDA Cores: 640
- Base Clock: 1202MHz
- Boost Clock: 1281MHz
- Memory Config: 2GB/128-bit GDDR5
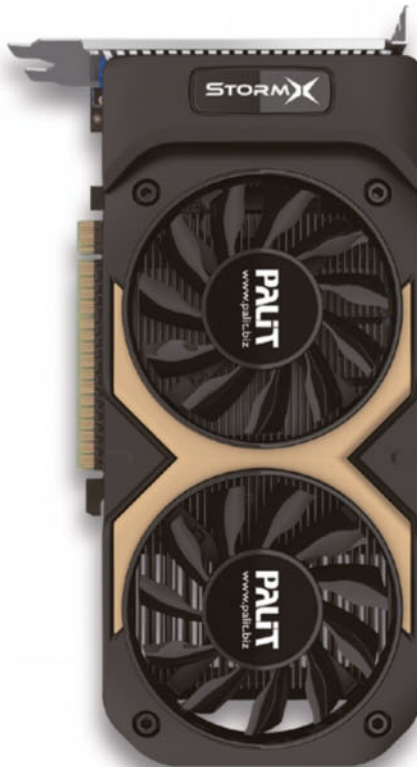
- StormX Dual
- Solid Capacitors
- **TURBOFAN BLADE** TurboFan Design
- High efficiency PWM design with super low RDS(on) MOSFET
- High quality Ferrite Core Chokes

PREMIUM PC power by Palit GEFORCE® GT 740

Enjoy a rich multimedia experience and affordable PC gaming.

FASTER MULTIMEDIA
WITH WEB, PHOTOS, & VIDEO

Chart (vertical axis: 0X, 5X, 10X, 15X):
- MS Fishbowl (Web)
- Impact HTML5 (Web)
- Adobe Photoshop CC (Photo)
- BasemarkCL (Photo)
- BasemarkCL (Video)
- Adobe Premiere Pro CC (Video)

Legend: 🟩 NVIDIA GT 740   ⬛ Intel HD Graphics
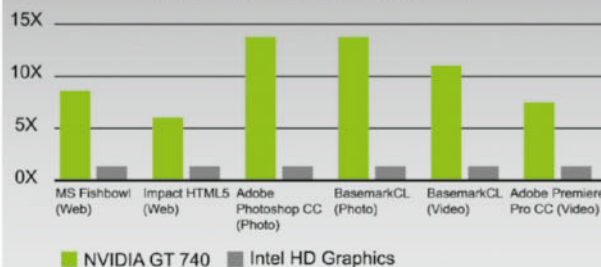
GeForce GT 740 outperforms Integrated graphics in Web, Photo, and Video benchmarks

BETTER GAMING

4X PERFORMANCE UPGRADE

- 400% — INTEGRATED NVIDIA GT 740
- 100%

Premium PC powered by GeForce GT 740, it allows you play games that you just can't play on integrated graphics.

Product List : GeForce GT 740
- 2048MB GDDR5 | 2048MB DDR3
- 1024MB GDDR5 | 1024MB DDR3

PANASONIC TOUGHPAD FZ-M1

AN UNYIELDING CHASSIS AND A LONG LIST OF FEATURES MAKE THIS THE ULTIMATE ROUGH-AND-TUMBLE WINDOWS 8 TABLET

PRICE $2700
SUPPLIER www.panasonic.com/au

At 18.8mm thick and weighing 540g, the FZ-M1 is hefty by compact-tablet standards. It would be churlish to hold its heft against it, though, since it's purpose-built to flourish in environments that would spell doom for most devices. The hardened exterior is cast from metal and hardened plastics, and a strip of black rubber encircles the edges, flaring out to protect the corners from accidental drops. The rubber edges offer decent grip, and their rounded profile makes the FZ-M1 comfortable to hold.

It has the credentials to match its tough-nut physique. Panasonic has tested the FZ-M1 to MIL-STD-810G standards, which means it's able to survive drops of up to 5ft, as well as exposure to shock, vibration, humidity and extremes of temperature. It also boasts an IP65 rating for water- and dust-resistance thanks to its sealed design: its single USB 3 port, 3.5mm headphone jack and 19V PSU input are safely hidden away behind thick rubber flaps, and the microSD and SIM slots are sealed behind the battery at the rear.

The 1,200 x 800 touchscreen is designed to take outdoor use in its stride. The matte IPS panel is lit by an LED backlight that tops out at a gleaming 492cd/m², and as a result the display remains legible on even the sunniest of days. Image quality

isn't exemplary, but while colours are lacking in vibrancy, the panel's contrast ratio of 705:1 is wide enough to dredge up lots of detail in shadows and highlights.

The touchscreen is more flexible than most. It supports ten-point touch input as standard, with Panasonic's Dashboard app giving access to touch, stylus and gloved-touch modes, plus a "water" mode. Our review unit was supplied with the optional capacitive stylus, which worked well in our tests, providing enough accuracy for scribbling notes and writing onscreen. The stylus is also handy for navigating the OS with gloves on, and provides pinpoint control even in fiddly desktop applications.

Panasonic has squeezed a highly capable roster of hardware into the FZ-M1's compact chassis. Underneath all that metal and rubber is a passively cooled 1.6GHz Intel Core i5-4302Y CPU, 8GB of RAM and a 128GB mSATA Samsung SSD. In our Real World Benchmarks, the low-voltage CPU acquitted itself fairly well, delivering a serviceable Overall score of 0.47. The 128GB SSD does its bit to keep Windows 8 feeling snappy, and helped the Toughpad cold-boot in a whisker less than eight seconds.

Battery life is competitive. With the screen dimmed to 75cd/m², the FZ-M1's 22Wh, 3,220mAh battery lasted for 9hrs 14mins in our usual light-use battery test. Panasonic also offers a long-life 7,100mAh battery option, as well as an optional "bridge" battery that lasts for around 30

seconds – long enough to swap battery packs without powering down.

And aside from performance, the FZ-M1 is packed with features. Even the bare-bones model comes with dual-band 802.11ac Wi-Fi and Bluetooth 4, and IT departments will appreciate additions such as the TPM 1.2 security and Intel vPro support. The front-facing 0.9-megapixel camera pairs up with a serviceable 8-megapixel sensor at the rear, and the rear camera is also equipped with an LED flash.

There's a wide variety of optional extras, adding anything from integrated GPS, 4G mobile broadband and pass-through connections for an external high-gain Wi-Fi antenna, to a selection of plug-in modules that provide barcode, magnetic stripe and RFID readers.

As ever, the Panasonic Toughpad FZ-M1's talents come at a considerable price but it easily lives up to its name. It's supremely well designed, and for those who need a tablet that can withstand the kind of abuse that would ruin any other device, the FZ-M1 stomps all over the opposition.
Bobby MacPherson

KEY SPECS
1.6GHz Intel Core i5-4302Y · 8GB SDRAM · 128GB mSATA Samsung SSD · 7in 1,280 x 800 touchscreen · single-band 802.11ac Wi-Fi · Bluetooth 4 · USB 3 · 1 x 3.5mm audio jack · 5MP rear/0.3MP front cameras · Windows 8.1 · 3yr RTB warranty · 202 x 18.8 x 130mm (WDH) · 540g

◀ A strip of black rubber protects the edges from accidental drops

PC &TECH AUTHORITY RECOMMENDED

BENCHMARKS 3.4GHZ INTEL CORE I7-2600K, 4GB DDR3 = 1

OVERALL	0.47
RESPONSIVENESS	0.68
MEDIA	0.50
MULTITASKING	0.24

0   0.25   0.5   0.75   1   1.25   1.5

BATTERY LIFE HOURS:MINUTES

HEAVY USE	3:07
LIGHT USE	9:14

0   1   2   3   4   5   6   7   8   9
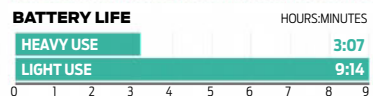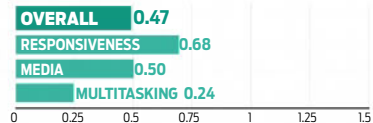
PERFORMANCE	★★★★☆☆
FEATURES&DESIGN	★★★★★★
VALUE FOR MONEY	★★★★☆☆
OVERALL	★★★★★☆

Vigor2860Vn-Plus

**NBN Ready Triple-WAN
VDSL2 / ADSL2+ Router with
Concurrent Dual Band WLAN & VoIP**

DrayTek
Aust & NZ
www.draytek.com.au

NBN READY

UFB READY

TAIWAN EXCELLENCE 2013

2.4 GHz

Vigor2860Vn-plus
VDSL2 Security Firewall

5 GHz

High Performance Networking Solutions
Ideal for small to medium sized businesses

- NBN (Aust) and UFB (NZ) Ready
- ADSL2+ for current and VDSL2 for future networks
- 6-port Gigabit LAN switch
- Concurrent dual band Wi-Fi with Central AP Management
- SIP VoIP (2 x FXS and 1 x Line port)
- Comprehensive Firewall capabilities
- 32 x VPN tunnels with Central VPN Management
- Support Smart Monitor Traffic Analyzer (up to 30-nodes)
- Support TR-069 for VigorACS SI Central Management

	Vigor 2860	Vigor 2860n	Vigor 2860n-Plus	Vigor 2860Vn-Plus
VDSL2/ADSL2+ (WAN1)	✔	✔	✔	✔
Gigabit WAN (WAN2)	✔	✔	✔	✔
6 port Gigabit (LAN)	✔	✔	✔	✔
USB	✔	✔	✔	✔
Wireless LAN		2.4 GHz	2.4 GHz & 5 GHz	2.4 GHz & 5 GHz
VoIP				✔

i-LAN
TECHNOLOGY

i-LAN Technology Pty Ltd trading as DrayTek Aust & NZ

🌐 www.i-lan.com.au   📞 (02) 9838 8899   ✉ sales@i-lan.com.au

UBUNTU 14.04 LTS

A STABLE, UP-TO-DATE PLATFORM, BUT THOSE SEEKING NEW FEATURES WILL BE DISAPPOINTED

PRICE Free
SUPPLIER www.ubuntu.com

Canonical is pushing hard to expand Ubuntu into new consumer markets. In the past year, we've seen shiny prototypes of Ubuntu-based mobile phones and tablets, and the company hasn't given up on its 2012 vision of getting Ubuntu onto TVs either. What's more, serious work is underway on converging all of these roles into a single chameleonic OS, something even Microsoft hasn't tried to tackle.

Against that backdrop, Ubuntu 14.04 LTS (codenamed Trusty Tahr) seems curiously unambitious. Perhaps that shouldn't be a surprise: Canonical's biannual release schedule typically brings only small incremental changes over the previous release. And since this is a long-term support (LTS) release, supplied with the promise of five years of support, Canonical has an incentive to avoid taking a punt on any experimental new technologies.

As a result, 14.04 looks and feels all but identical to 13.10. If you squint at the screen, you might notice that the embossing effect around the edges of windows has gone, and if you're using a very high-DPI screen (such as on a MacBook Pro with Retina display) you'll see that problems with tiny or blocky interface elements have now been fixed. There's also a new tray icon at the top right of the screen showing your keyboard language

– useful in specific scenarios, but eminently switch-offable for most.

Perhaps the most welcome change to the Ubuntu desktop is hidden away in the System Settings. Since Ubuntu 11.04, application menus have appeared in the bar along the top of the screen, in OS X style. The ergonomics of this are very much up for debate, and we've always thought it rather cussed of Canonical not to provide the option of incorporating menus into their respective application windows. In 14.04, such an option has quietly appeared, but the implementation takes a little getting used to: rather than each window having its own menu bar, menus appear directly in the title bar when the mouse is placed over it.

Another quiet change is the removal of the Ubuntu One front-end, since Canonical has thrown in the towel on its own-brand cloud storage and music-download service. That must be a blow to the company's pride, but we're hopeful it will inspire the developers to focus more actively on working with established cloud storage and media services.

For now, it's on the enterprise side of things that 14.04 is strongest. The OS itself may not have evolved much, but since the previous LTS release the supporting components have taken some big steps forward. That includes Canonical's "Metal as a Service" (MAAS) server provisioning system, which was barely out of beta in the last LTS
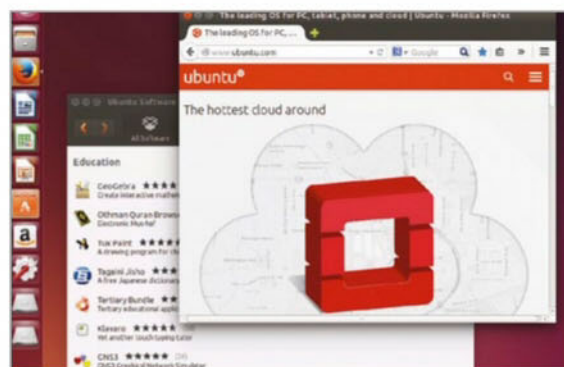
▲ Visually, Ubuntu 14.04 looks extremely similar to its predecessors

release, and the latest version of the Juju software-deployment system.

The best news is that, for the first time, Canonical has pledged five years' support not only for the Ubuntu 14.04 LTS Server OS, but also for the OpenStack cloud computing framework bundled with it. Factor in upgrades in the 3.13 Linux kernel that improve support for networking, virtualisation and security, and we suspect many businesses will already be preparing a switch, even though LTS 12.02 still has three years of support on the clock.

It's easy to feel a little disappointed in 14.04; it's a conservative release that feels at odds with the future-focused talk coming out of Canonical. In the end, however, that's the point. Ubuntu takes its enterprise role seriously, and this stable, supported wrap-up of the conventional desktop and server distributions is just what many businesses will have been waiting for. Smaller organisations and individuals seeking a switch from XP are well covered, too: it's notable that for the first time the "community flavours" – Kubuntu, Xubuntu, Edubuntu, Ubuntu GNOME and so forth – are all promised long-term support as well.

With a stable platform thus established, Canonical now has some breathing space to focus on more ambitious works, such as the forthcoming Mir display server and Unity 8 front-end that will underpin the next-generation, multiplatform, consumer edition of Ubuntu. In other words, Ubuntu 14.04 LTS may not be exciting in itself, but it sets the scene for bigger things to come.
Darien Graham-Smith

◀ A new option moves application menus into the title bar of the application's window
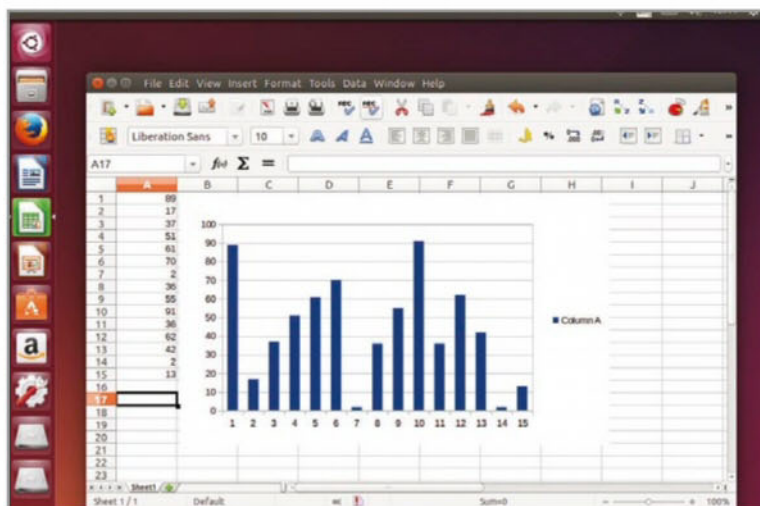
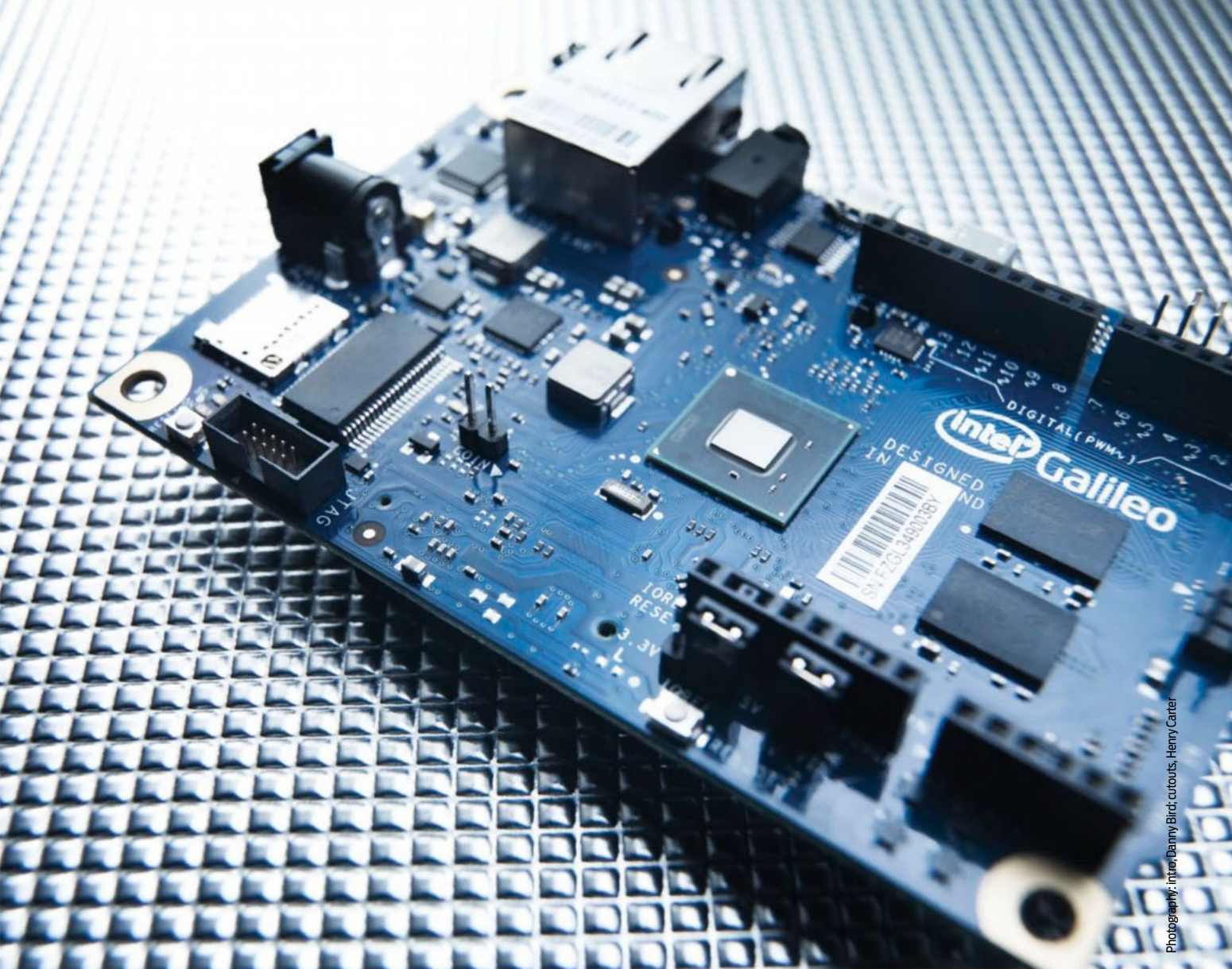| PERFORMANCE | ★★★★★☆ |
| FEATURES&DESIGN | ★★★☆☆☆ |
| VALUE FOR MONEY | ★★★★★★ |

OVERALL ★★★★★☆

INTEL GALILEO

IN A BID TO CAPTURE A SHARE OF THE HOBBYIST COMPUTING SECTOR FROM THE RASPBERRY PI, INTEL MAKES ITS FIRST STAB AT A MASS-MARKET DEVELOPMENT BOARD, BASED ON ITS CLEVER QUARK PROCESSOR

PRICE $200
SUPPLIER www.intel.com.au

A handful of years ago, few people had heard of single-board computers or development boards. Those who had were involved in product development, and had to order them at great expense, ge nerally from specialist distributors.

Then came the Arduino, an open-hardware microcontroller that can be had for around $100 and introduced a generation of enthusiasts to the joys of modern electronic development. This was followed by the Raspberry Pi, and overnight development boards were big news. The low-cost Pi is now a common sight in classrooms worldwide, and can be found on the shelves of high-street retailers, something that would have been unimaginable a few years ago.

For Intel, this is a clear threat to its near-monopoly of the mainstream computing market. Rather than the x86 instruction set Intel has spent decades promoting, the Pi uses a rival architecture developed by ARM. If tomorrow's programmers grow up learning ARM, it could spell disaster for the x86-exclusive Intel.

KEY SPECS
400MHz Intel Quark X1000 SoC · 256MB DDR RAM · 10/100 Ethernet · mini PCI Express slot · micro-USB 2 host and client ports · 14 x digital I/O pins including 6 x PWM · 6 x analogue input pins · Yocto Project Linux · 1yr RTB warranty · 107 x 74 x 23mm (WDH)

It's this very issue that the Galileo is designed to address. Built to appeal to the maker and hacker communities, the Galileo is a partnership between Intel and microcontroller specialist Arduino, and the first outing for the company's low-power Quark processor.

ARDUINO COMPATIBILITY
Launched in 2005 as a low-cost development board for college use, Arduino is the darling of the maker community. Its devices can be found powering creations ranging from motion-tracking turrets to secret-

NVIDIA JETSON TK1

While Intel is working to take its high-performance processor know-how and shrink it down for the low-power embedded market, starting with the Quark processor that powers the Galileo, its ARM-architecture rivals are beginning to do the opposite.

Nvidia, which designs and builds the Tegra range of ARM system-on-a-chip (SoC) processors, has recently launched the Jetson TK1. Designed as a high-end single-board computer, the Jetson adopts the opposite approach to Intel's Galileo: take a chip originally built for low power and boost its performance as much as possible.

The Jetson TK1 boasts a Tegra K1 SoC with 192 Kepler-class graphics processing cores, four ARM Cortex-A15 general-purpose processing cores and a fifth low-power Cortex-A9 "companion core" alongside 2GB of RAM. The board includes 16GB of flash storage, HDMI video output, and expansion options, including an extensive and well-equipped GPIO header for electronics projects, USB, SATA as well as mini-PCI Express.

With these specifications in mind, it's no surprise that the Jetson is comparatively expensive: current Nvidia pricing for the board starts at US$192, a far cry from the sub-$50 Raspberry Pi that no doubt inspired Nvidia to produce its board.

The Quark isn't exactly a powerhouse. Its single core runs at a mere 400MHz: a compression test of a 10MB file completed in 25.9 seconds, compared with 8.3 seconds on a Raspberry Pi. Its performance when running time-critical Sketches is also poor – anything that relies on rapid changes to the GPIO pins is unlikely to run as expected. Unlike the Pi, however, the Galileo isn't designed as a general-purpose computer; it lacks video output, and any port to directly connect a keyboard or mouse.

Instead, Intel is targeting the microcontroller market. The Quark may not be the fastest processor around, but it's capable of running far more complex code than a pure microcontroller, including its bundled operating system, Yocto Project Linux. This allows the Galileo to run host software, such as a web server or database, that would ordinarily require a separate PC, served via the onboard Ethernet port or via an optional mini-PCI Express wireless adapter.

It also helps explain Intel's pricing for the board: an Arduino Uno microcontroller costs around $50, and an Ethernet shield to provide network connectivity another $55. At $200, the Galileo offers more flexibility than that combination, but costs twice the price. Bear in mind, though, that prices for these can vary in a short space of time.

knock door sensors. Millions of Arduinos have been sold, and there's a large market of add-on boards, known as Shields, to extend the board's capabilities.

For Intel, this has provided an opportunity for a partnership. Thus, the Galileo doesn't enter the market as a completely green product with no support network, but rather one that boasts full certification from Arduino. From a set of general-purpose input-output (GPIO) pins that mimic the esoteric layout of the Arduino (ensuring compatibility with Shields) to the use of a modified version of the Arduino integrated development environment (IDE), the Galileo is designed to be familiar to those already versed in Arduino development.

The secret to Arduino's success is Wiring, a programming library designed to make it as simple as possible to develop software to drive your own electronics projects. The pins of an Arduino board – and, therefore, those of the Galileo – can be used as analogue inputs, sensing different voltages from components such as moisture and gas sensors; as potentiometers connected to knobs; or as digital outputs to turn components such as buzzers, LEDs and motors on and off. Some support pulse-width modulation, which

or alter the brightness of an LED.

All of this is accessible by writing Sketches, the name given to Arduino programs, and a Sketch for the Galileo is no different. A special version of the Arduino IDE software

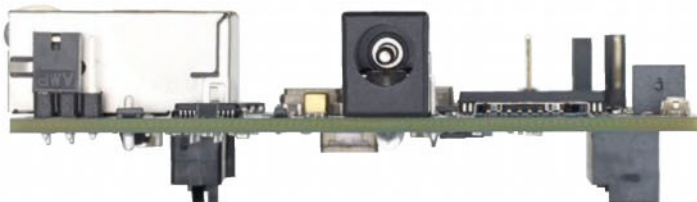## "Galileo isn't designed as a general-purpose computer, it lacks video output."

must be used, but it's visually identical to the original, to which Galileo support will likely be added in the future.

THE QUARK SOC

If the Galileo was simply another Arduino clone, it would be extremely overpriced. While it's true that you can run almost any Arduino Sketch without modification, Intel's secret sauce comes in the form of the Galileo's Quark processor.

Quark is Intel's first ARM-like ultra-low-power system on a chip (SoC). Using the classic 32-bit x86 Pentium architecture, shrinking the manufacturing process and boosting the clock speed, Intel has created a chip that draws as little power as possible while still being capable of running standard and widely-available x86 code.

VERDICT

While the Galileo is undoubtedly a clever design, it falls short of its rivals in key areas, although it offers more flexibility than a traditional Arduino. The performance of the Quark processor is much lower than that of ARM-based rivals, but it runs hotter – in excess of 60°C – and the board can't be used as a general-purpose PC.

For those who don't mind these limitations, however, it offers considerable potential. If nothing else, the Galileo provides a glimpse at Intel's plans to attack the low-power market with its Quark processor.
Gareth Halfacree

▼ The Galileo is the first Intel development board, designed to rival the Raspberry Pi

PERFORMANCE	★★☆☆☆
FEATURES&DESIGN	★★★★☆
VALUE FOR MONEY	★★★☆☆
OVERALL	★★★☆☆

APPS ROUND-UP

JENNETH ORANTIA WITH THE WISE WORD ON THE ESSENTIAL APPS, TOOLS AND UTILITIES WE THINK YOU NEED.

WECHAT

PRICE FREE **DEVELOPER** TENCENT
PLATFORM IOS, ANDROID, WINDOWS PHONE, BLACKBERRY, MAC, WEB
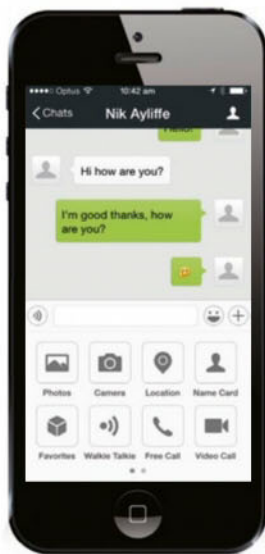
Between Facebook Messenger, iMessage, Snapchat and WhatsApp Messenger, you may not have come across WeChat just yet. According to the developer, it's the world's fastest growing social app, with more than 300 million registered users internationally – most of who are located in South-East Asia.

Like its popular compadres, WeChat is a multi-platform service with clients available for iOS, Android, Windows Phone, BlackBerry, Mac and Web. WhatsApp fans should note the availability of Mac and Web clients for WeChat – to date, WhatsApp hasn't offered any options for chatting on non-mobile devices.

As well as the usual instant messaging, voice and video calls, group chat and file transfer options, WeChat offers several unique features. You can share specific photos with all of your friends by putting them into the 'Moments' photo album – complete with Facebook-style shares, likes and comments. There is also a walkie-talkie mode that lets you talk with up to 40 friends, animated emoticons, a social gaming option, and password-protected group chats.

WeChat uses your mobile phone number to register you on the network, and like WhatsApp, it can automatically find fellow WeChat users in your address book. WeChat's user interface is easy to navigate, with four tabs along the bottom for moving between different sections.

From the Chats tab, it's easy to initiate a new group chat or voice call, as well as move between your various chat sessions. You can specify that certain chat sessions stay at the top of the list for easy access, and accessing the emoticons, file transfers, walkie-talkie mode and other features is straightforward.

Naturally, a social platform is only any good if you know other people that are using it. If, like us, you don't actually know anyone else using WeChat, you can go old school and chat with strangers using the 'People Nearby' feature. This lists all the people that are within 3km, and you can filter the results based on gender. If you want to tap into the millions of users in South East Asia, where this app appears to be particularly successful, the latest 5.3 update has also added a translation feature.

EASE OF USE	★★★★★★
FEATURES	★★★★★☆
VALUE FOR MONEY	★★★★★★
OVERALL	★★★★★☆

SECRET

PRICE FREE **DEVELOPER** SECRET
PLATFORM IOS, ANDROID
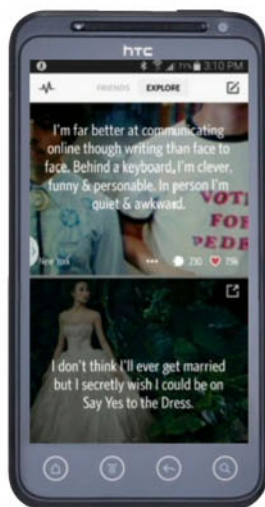
There's something delightfully voyeuristic about Secret, a new social platform that lets you anonymously post secrets and read and comment on everyone else's. Once you sign up, you can browse through the secrets of friends (which are found by going through your contacts) or the broader Secrets community.

Given the platform has only just launched internationally, you probably won't find many people you know using it, but there are plenty of delicious secrets on offer from the wider community, with people confessing to secret shames like eating an entire box of Krispy Kremes, worrying that their dog doesn't really like them, and sleeping with three loads of laundry on their bed for the last week. It makes for surprisingly compelling reading, given a lot of the secrets on offer are things most people don't talk about even with their closest friends.

The privacy of Secrets means many people are also using it as a de facto support group, with personal issues spanning depression, panic attacks and eating disorders. You can like or comment on any secret, as well as share especially juicy secrets you find on social services like Twitter and Facebook. Each secret displays the country of origin and the number of likes and comments it has. Once you like a secret, all of the people in your own network will be able to see it as well, which means the most interesting secrets will travel far. Thus far, the community appears to be delightfully troll-free, with people posting positive comments and feedback for each secret.

If you're posting a secret yourself, you can customise it with a photo or colour backdrop, and add effects like blurs, textures and moods. Photos need to be in your library already to use them as a Secret background – it would have been nice to have access to a few stock or creative commons images to ensure the Secrets feed maintains its visual appeal.

EASE OF USE	★★★★★★
FEATURES	★★★★★☆
VALUE FOR MONEY	★★★★★★
OVERALL	★★★★★☆

▶ AUDIBLY

PRICE : FREE
DEVELOPER NICK FREY, CHRIS GALZERANO, VEERAL PATEL
PLATFORM IPHONE

Developed by three student scholarship winners at Apple's WWDC annual developer conference, Audibly lets you 'broadcast' your music playlist in real-time to other iPhone users in your immediate vicinity, either over a Wi-Fi network or a peer-to-peer Wi-Fi connection. Using this app, you could share the music you're listening to with nearby friends in real-time, either with headphones connected or through the iPhone's speaker. Using the latter option lets you create your own surround sound system of iPhone speakers, with the ability to control the volume of each iPhone's playback. Oddly, you have to turn Bluetooth off for the app to work, which rules out creating a surround sound system with multiple Bluetooth speakers.

OVERALL ★★★★☆☆

▶ KINDLE

PRICE : FREE
DEVELOPER AMAZON
PLATFORM IPHONE & ANDROID

Never tried audio books before? Or, as they were known in the days of cassette tapes, 'books on tape'? The latest update to Amazon's popular Kindle e-reader on iOS and Android, which integrates support for the Audible audio books platform, may convince you to try one. You can now 'upgrade' any of the books in your Kindle library to add an audio version for as little as 99c, although the price differs with each book. For some books, upgrading to the audio version may cost more than you paid for the original book, and the pricing model seems quite arbitrary. Popular book 'The Hunger Games', for instance, is available as an audio upgrade for $3.95, while you have to pay $12.99 for the old Orson Scott Card book, 'The Shadow of the Hegemon', which presumably caters to a far smaller audience.

OVERALL ★★★☆☆☆

▶ DAYBOARD

PRICE FREE **DEVELOPER** DAYBOARD
PLATFORM CHROME

Dayboard replaces the usual text that's displayed when creating a new tab in Chrome with your five most important tasks for the day. Once you complete a task and mark it as done in Dayboard, it stays in the list with a strike through it to remind you of what you've already accomplished that day.

But you don't have to stick to only five tasks per day, and the app can run in the way that best suits your own lifestyle. For example, once you've marked a task as complete, you can delete it off the list and create a new one. You can also flick back in time to see what you've accomplished on previous days, which could be handy if you are just rolling out a new routine in your daily schedule and want to fine tune it, but there's no search option to look for specific tasks, nor is there an option to set time reminders.

OVERALL ★★★☆☆☆

▶ PINTEREST

PRICE FREE
DEVELOPER COLD BREW LABS
PLATFORM WINDOWS PHONE

Little by little, the major apps and platforms are making their way over to Windows Phone, making an upgrade to one of the new Windows Phone 8.1 devices that much more compelling. Pinterest is the latest to join the Microsoft march, and while it's still labeled as a beta, it offers many of the features available in its iOS and Android counterparts, such as the ability to follow friends and pin new posts. However, it doesn't have the Guided Search discovery feature that recently debuted on other platforms, a feature that narrows down popular search terms to more specific searches.

Ironically, the stylised layout of Pinterest and use of 'pins' for posts looks more at home on Windows Phone than any other mobile platform.

OVERALL ★★★★☆☆

LABS BRIEFS

▶ FUJIFILM XT1

PRICE $1600 (body)
WEBSITE www.fujifilm.com.au

The Fuji X-T1 is a mirrorless powerhouse that combines retro styling with professional features. Control dials across top of its body provide direct access to all the key photographic settings, such ISO shutter speed and exposure compensation. The tough magnesium-alloy weatherproof body feels solid and the rubber accents provide excellent grip and control.

The system comprises a 16 megapixel X-Trans CMOS II sensor (with on-chip phase detection), EXR Processor II, built-in Wi-Fi, and full HD video recording. The camera starts up and is ready to shoot in less than a second. Pair this with an incredibly fast autofocus system and the X-T1 is one extremely fast camera. The images are top notch no matter what situation is thrown at it, and with the in-camera RAW editing capabilities you can produce high quality edited photos straight from the camera

The X-T1 truly is an incredible camera, and is going to give the DSLR market a good run for its money.
Tim Frawley

OVERALL	★★★★★★

▶ BOSE QUIETCOMFORT 20

PRICE $279
WEBSITE www.bose.com

These were released a year or so ago, but we're including a review because they haven't had a look in *PC&TA* previously, and, I've just spent 20 hours with them easing the trip to Computex in Taiwan.

The noise cancelling performance is outstanding. It's easily the best I've experienced, and that includes Bose's on- and over-ear models. Droning white noise is cut almost entirely, and they do a decent job of muting peaking sounds like voices. The remaining audio is a clean, crisp sound that was a pleasure to enjoy with classical music and vocals, while proving adequate for rock.

The large microphones mounted on each bud, as well as larger than usual earpieces make you think they weren't designed for human ears, but fit they do. They're not intended to be shoved deep into the ear canal, but somehow they just sit there barely touching the edge of your ears comfortably.

The USB/microUSB-charged battery is a small block in-line with the cable, near the plug. This keeps it out of the way nicely, and is a better solution than competing products that need regular AA or AAA batteries to power it.
Ben Mansill

OVERALL	★★★★★☆

▶ LG G3 PREVIEW

PRICE $799
WEBSITE www.lg.com

We recently got a chance for an early look at LG's new flagship smartphone at its launch in Singapore. In between dodging random showers and some stunning humidity, we indluged in some hands-on fondling of the LG G3, and came away with a largely positive feeling.

It certainly boasts a premium look and feel, with a metallic-seeming plastic shell and minimalist but easy to use controls. The real winner, though would have to be the awesomely beautiful display, a 5.5in 538ppi screen that boasts incredible resolution and great colours. Under the hood is a quad-core Qualcomm Snapdragon processor, that provides horsepower and more to LG's tweaked version of Android Kit Kat. It's far less flashy version of the OS than some third party phone makers, but still has a lot of reasonably useful LG features, such as learning Smart Keyboards and lots of security tweaks, and Smart notices to remind you of missed calls and other forgotten tasks.
David Hollingworth

▶ NZXT SENTRY 3

PRICE $45
WEBSITE www.nzxt.com

Despite ever-better BIOS fan control, as well as a wide choice of desktop software that does the job too, having a dedicated hardware controller is still a valid consideration for a performance PC build.

NZXT's new Sentry 3 handles fan-speed control elegantly, and is simple to install. Five channels are available – and each can manage three fans (each of which is synced with the others on the same channel), for a total of 15 fans controlled. Power is via Molex, which is a plus if you're running short of SATA cables.

There's nothing wrong with a bit of bling, and the Sentry 3 has bling to spare – and, I don't mind saying, is a valid reason for installing this alone. You see, it has a lovely colour touch screen. Be cool, and cool your case by swiping to change fan speeds. While not as accurate as using buttons, or the available pre-sets you can configure, it's a pretty sweet design. The unit is a single 5.25in-bay in size, yet almost all of that is taken up by the 5.4in screen.
Ben Mansill

OVERALL	★★★★★☆

RAPOO E9090P

PRICE TBC
WEBSITE www.rapoo-images.com

Computing has been steadily spreading through the house for decades now. Sometimes it works, like with a good home theatre PC, sometimes it's kind of naff - like internet-connected fridges. Yeah...

One thing this ubiquity brings with it, though, is the need for different ways to interact with our PCs, and in a loungeroom environment a good wireless keyboard is a must. Rapoo's answer to the problem is the E9090P, a wonderfully slim keyboard that's built around two pieces of strong but light aluminium. With full-size keys it's great for typing, and a roomy touchpad makes mouse or even gesture control equally convenient. The keys are backlit, making it perfect for lights-down movie watching, and though shallow are quite responsive.

Speaking of convenience, the wireless hub that controls the keybaord also doubles as wireless charging base - you just sit the keyboard on the hub and let it charge. It's an elegant solution that should ensure you never lose control of your HTPC - or any PC, really - when the keyboard runs out of charge.

David Hollingworth

OVERALL ★★★★☆

LIAN LI PC-A51

PRICE $189
WEBSITE www.lian-li.com

All-aluminium and in a choice of black or silver, the new Lian-Li PC-A51 is a slick and refined design, sporting none of the stylistic adornments popular with other makers. Five drive cages are mounted at the front of the case, right behind an included 140mm fan (another 120mm unit is mounted at the rear, and the vented top panel has room for 2x 120mm or 140mm fans). There's no unnecessary framework or partitions to interrupt airflow. Graphics cards up to 29cm can be installed before bumping into the drive cages, but they're removable should you have a very large card. A single empty 5.25in bay at the top sits under the front panel connectors for mic and audio out, plus four USB 3.0 headers. Unusually, the PSU is mounted at the bottom front, with a pass-through power cable that feeds out at the rear of the case.

This is truly a minimalist design and it's all the more classy for it. At the price, though, it's in a crowded space with many cheap and decent cases offering similar capabilities for fewer dollars.

Ben Mansill

OVERALL ★★★☆☆

EPSON WORKFORCE WF-3620

PRICE $249
WEBSITE www.epson.com.au

There hasn't been a lot of action in the inkjet printer scene for quite a while. Performance has remained steady, while prices are still astoundingly low. Epson has shaken things up, now, with its new range based around the company's new PrecisionCore inkjet technology.

It's a genuinely interesting evolution and one with tangible practical benefits. PrecisionCore is a new print head technology using a thin film piezo print chip, which is just one micron thick. Epson has been using it in its large-format commercial printers, and now it's appeared in a range of new inkjets for the rest of us. The WorkForce WF-3620 is the baby in the range, most suitable for home/SOHO use.

The benefits are twofold – PrecisionCore delivers quality that's on par with laser, so great for documents, with the other plus being warm-up time, which is just a couple of seconds. Compared to a laser, which can take anywhere from several seconds to almost a minute to warm up once a print is sent to it, that's time and money saved.

Ben Mansill

OVERALL ★★★★☆

NETGEAR PR2000

PRICE $60
WEBSITE www.netgear.com.au

It has been a long time since we last encountered a networking product that drips with as much innovation as Netgear's PR2000 Travel Router. It is one of those products that doesn't look fantastic from a simple spec sheet, with only 2.4GHz b/g/n wireless support, and two network ports, but it is now firmly entrenched as part of our toolkit when on the road.

The premise is simple, bypass the often overloaded and underwhelming hotel Wi-Fi connection and create your own, ideally plugged straight into the Ethernet cable found in most decent hotels around the world. It packs the software trickery to reroute any sign-in pages to the device you are using at the time, and is quick and easy to set up.

Once connected, you can share the connection with all your devices, often saving on charges as well as adding security in the form of a network separate to the one everyone else in a hotel is using. Add this to the fact that in a small hotel room every device will get a great connection and you have a product that will revolutionise the way you travel, just plug it in and go.

John Gillooly

OVERALL ★★★★★

Triple your Wi-Fi speed

WITH 802.11AC, THE NEW GENERATION OF ROUTERS IS READY TO TAKE YOUR WIRELESS TO THE NEXT LEVEL. WE TEST 10 OF THE LATEST, FASTEST ROUTERS AROUND TO FIND OUT WHICH IS BEST

CONTENTS

Buyer's guide

802.11AC PROMISES FASTER SPEEDS, BUT THAT SHOULDN'T BE
YOUR ONLY CONSIDERATION WHEN CHOOSING A WIRELESS ROUTER

The world of wireless is changing for the better. After years of being stuck with the 802.11n standard, the faster 802.11ac is beginning to take hold in the wireless router market and, crucially, among manufacturers of tablets, laptops and smartphones. It's a technology that brings a dramatic step up in the top speed of Wi-Fi connections, and since it's gradually appearing in more products, buying an 802.11ac router is no longer for the early adopter.

That's why this month's Labs focuses solely on routers supporting the new technology. We have 10 routers on test, ranging from the ultra-cheap ZyXEL NBG6503 (at $125) to the premium-priced Fritz!Box 7490 ($369).

WHAT'S THE ADVANTAGE?

So what precisely does 802.11ac bring to the party? The principal benefits can be summed up in one word: speed. A top-of-the-range 802.11ac router, of which we have plenty of representatives in this group, can connect at a nominal rate of 1,300Mbits/sec or 163MB/sec; compare that with the top speed of 802.11n – 450Mbits/sec or 56MB/sec – and you'll have an idea of the performance advantage to expect.

As usual, even in ideal circumstances, you won't see file-transfer rates of exactly those speeds due to network protocol, overheads and other bottlenecks, but in our testing this month we've seen file transfers peak at speeds of almost 80MB/sec over 802.11ac at close range.

That's approaching the maximum speed of a wired Gigabit Ethernet connection, and more than triple the speed of the fastest 802.11n router we tested in the last *PC & Tech Authority* wireless routers Labs. That means it's now possible to quickly back up your data over your home network, or transfer large video files back and forth – and all without an Ethernet cable in sight.

There are two key technologies within the 802.11 specification that enable this vast leap forward. The first is an improvement in modulation techniques that enable router and adapter to pack more data per given waveform in the radio frequency channel. The second is the ability to join two 40MHz channels in the 5GHz radio frequency band to create one super-fat 80MHz channel; that's twice as wide as 802.11n 5GHz channels can be (we explain both of these in more detail on p69).

THE NUMBERS EXPLAINED

One thing that hasn't changed with 802.11ac is the proliferation of confusing and misleading numbers that manufacturers use to sell their routers. In this group, most will be labelled "AC1200", "AC1750" or sometimes "AC1900".

In reality, this is a bit of a sham: the numbers don't refer to the router's maximum rated speed, but rather to the sum of the maximum rated speeds over 802.11n and 802.11ac. Thus, an AC1750 router, such as the D-Link DIR-868L, delivers a maximum link rate of 1,300Mbits/sec over
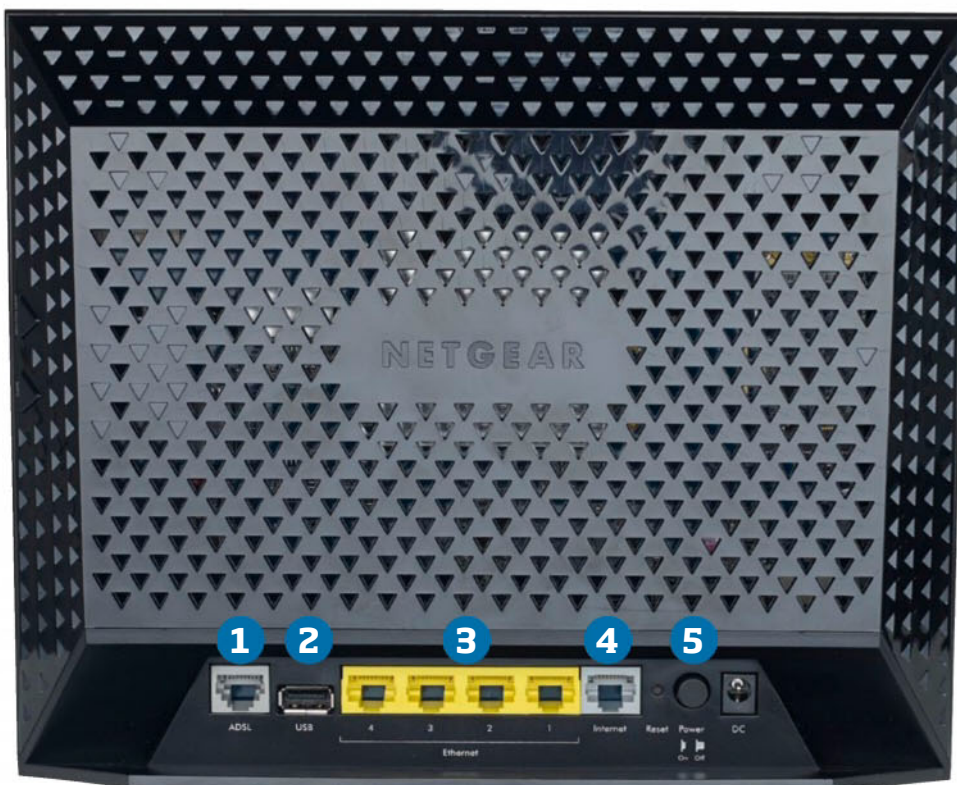
1 You can tell a lot about a router just by looking at its ports. You can see here, for instance, that this Netgear has connections for both ADSL and an Ethernet-based cable (see **4**) connections, which means you can use the router with both types of internet services

2 Most routers come with a USB port these days, allowing you to share the contents of a thumbdrive across the network. They're definitely not all made equal, however, with performance varying wildly between models

3 Make sure when buying a router that the four LAN ports at the rear are all Gigabit Ethernet. 10/100 Ethernet ports can cause a performance bottleneck with devices connected by cable

5 A simple power switch is a surprisingly useful tool on a wireless router. In the event that the device's web front-end becomes unresponsive, and you have to turn it off and on again, it means you don't have to fumble around unplugging and plugging in cables

802.11ac and 450Mbits/sec over 802.11n. An AC1200 router, such as the Asus RT-AC56U, delivers 867Mbits/sec over 802.11ac and 300Mbits/sec over 802.11n (yes, manufacturers also round up 1,167Mbits/sec to 1,200Mbits/sec). Finally, an AC1900 router delivers up to 1,300Mbits/sec over 802.11ac and 600Mbits/sec on 802.11n.

Remember, too, that these numbers are in turn related to the number of spatial streams and the channel width your client devices are capable of transmitting and receiving. For example, to hit 1,300Mbits/sec you need a 3×3 stream device – a 2×2 stream laptop will only ever be able to connect at 867Mbits/sec.

DO YOU REALLY NEED 802.11AC?

It goes without saying that you need an 802.11ac-enabled adapter or device in order to reap the maximum benefits from an 802.11ac router, preferably one that supports 3×3 streams. If you don't own one, the benefits would appear to be minimal. However, even if you don't own such a device, 802.11ac routers can improve the reliability of your 802.11n network if the signal is currently weak, using implicit (or universal) beamforming.

We'll delve further into the specifics of beamforming in our technical boxout on p69, but for now all you need to know about implicit beamforming is that it can work with any client on any network type to strengthen the given wireless signal. And a stronger signal means faster, more reliable wireless networking.

Take note, though: not every 802.11ac router offers this feature, and even standard beamforming – which requires compatibility on the client side – is optional within 802.11ac.

PHYSICAL CONNECTIONS AND ANTENNAS

Aside from rated speeds, the principal difference between models, when it comes to the hardware side of things, concerns the antennas, ports and internet connectivity.

If it comes down to a choice between a router with detachable external antennas and one with internal antennas, go for the external option. It may not look neat, but external antennas give the option of tweaking their position to change the spread of your wireless network. This isn't only a simple way of getting your Wi-Fi network to reach every corner of your home, but it also opens the possibility of swapping them for higher-gain models if you find your network just
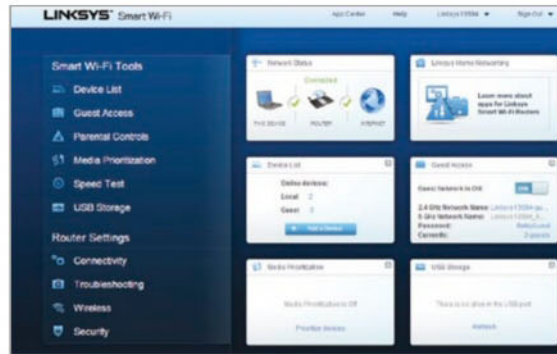
doesn't reach far enough.

Look out for routers with only USB 2 ports, especially if you like the idea of hooking up an external hard disk to turn your router into a basic NAS drive. This month, we've found there's a huge difference between the performance of different models, with the fastest reaching top speeds of around 60MB/sec and the slowest lagging well behind on 8MB/sec.

Finally, if you have an ADSL or fibre connection, don't get too hung up on buying a router with a built-in modem. Most 802.11ac routers on the market don't have ADSL or VDSL modems built in, and restricting your search to these models severely limits your options. Instead, we'd recommend buying a separate modem (available for less than $30). With a separate modem, you'll have a much wider range of routers to choose from, and the cost of adding a stand-alone modem is often much cheaper and less of a headache than putting a value on specifications between modem/routers.

SOFTWARE, FEATURES AND APPS

The final point of difference is the quality of the user interface and the features it exposes. It may be 2014, but some router manufacturers still employ daunting, text-heavy HTML pages.

Linksys is way out in front here. Its Smart Wi-Fi UI is the best we've come across, with a clean, modern look that's easy to understand and navigate. It's also accompanied by free mobile apps for iOS and Android, which allow you to extend the router's capabilities via in-app extensions, monitor who's connected to your wireless network and change the basic settings.

Not every router offers the same breadth of features. Although most routers these days have USB ports, allowing you to share files on connected USB sticks and hard drives, not every router sports a media server, which you'll need if you want to easily stream music and movies to your smart TV or tablet, for example.

▲ The Linksys Smart Wi-Fi user interface is the best around

Finally, for anyone with children, it's well worth finding out about the type of parental controls on offer. Most routers deliver the bare bones here, allowing you to block URLs and keywords manually. Some will also let you set access rules for specific devices based on the day of the week and time of day. The better routers, however, link up with a third party to supply category-based website filtering, where you can choose to block pornographic and gambling sites, but not social networking; Netgear teams up with OpenDNS for its Live Parental Controls, for example.

Results

T his month's test results show 802.11ac can offer fantastic levels of performance. The only model that failed to deliver top speeds of more than 40MB/sec this month – the ZyXEL NBG6503 – wasn't restricted by its wireless capabilities but its slow 10/100 Ethernet switch. Remember, though, that you'll only approach such speeds with a 3×3 stream 802.11ac adapter installed in your laptop, PC or tablet. For this reason, we also tested with the 802.11n 2×2 stream iPad Air, and it's the reason behind giving awards to the best all-rounders – the Netgear R7000 Nighthawk AC1900 and the Asus RT-AC68U – and not just the fastest over 802.11ac at close range.

	Close range (2.5m)				Long range (30m with one wood wall in the way)				
	802.11ac 3×3 stream, 5GHz (PC with Asus PCE-AC68)	802.11n, 3×3 stream, 2.4GHz (PC with Asus PCE-AC68)	802.11n, 2×2 stream, 5GHz (iPad Air)	802.11n 2×2 stream, 2.4GHz (iPad Air)	802.11ac, 3×3 stream, 5GHz (PC with Asus PCE-AC68)	802.11n, 3×3 stream, 2.4GHz (PC with Asus PCE-AC68)	802.11n, 2×2 stream, 5GHz (iPad Air)	802.11n, 2×2, 2.4GHz (iPad Air)	USB transfer read speed (over Gigabit Ethernet)
Netgear R7000 Nighthawk AC1900 ®	68	15.4	17.2	9.9	45	13.4	10.8	5.6	60.8
Asus RT-AC68U ®	64.8	33.3	18.2	12.3	31.9	12.8	8.2	4.8	63.6
Asus RT-AC56U	71.2	23.3	17.6	8.8	36	9.2	6.4	2.9	60.7
Linksys WRT1900AC	71.9	19	16.8	9.5	29.3	6.7	4.8	4.6	60.7
Linksys EA6900	70.1	18.3	17.6	12.2	35.4	7.1	5.8	3.8	48.1
D-Link DIR-868L ®	79.7	20.4	18.4	11.6	23.2	8.7	6.2	3.6	39.4
TP-Link Archer D7	59.5	28.1	17.1	11.1	27.6	13.4	6.3	4	15.4
AVM Fritz!Box 7490	48.3	14.9	15.9	9.3	21.1	5.4	3.8	2.7	24.3
Netgear D6200	29.2	12.2	16.7	10.3	25.1	3	3.8	1.9	14.1
ZyXEL NBG6503	11.6	11.5	11.3	9.7	11.6	7.2	3.6	2.3	N/A

® Recomended

All speeds are in MB/sec

	AVM FRITZ!BOX 7490	ASUS RT-AC56U	**RECOMMENDED** ASUS RT-AC68U	**RECOMMENDED** D-LINK DIR-868L	LINKSYS EA6900
OVERALL	★★★☆☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Performance	★★★☆☆	★★★★★	★★★★★	★★★★☆	★★★★☆
Features & design	★★★★★	★★★☆☆	★★★★☆	★★★☆☆	★★★★☆
Value for money	★★★☆☆	★★★★☆	★★★★☆	★★★★★	★★★☆☆
OPERATION					
Dimensions (WDH inc antennas)	243 x 177 x 55mm	205 x 68 x 147mm	220 x 83 x 320mm	98 x 117 x 215mm	255 x 206 x 105mm
Warranty	5yr RTB	1yr RTB	3yr RTB	1yr RTB	3yr RTB
Tested firmware version	Fritz!OS 6.4	3.0.0.4.374_5656	3.0.0.4.374_5517	1.07	1.1.42.158863
CORE SPECIFICATIONS					
Main internet connection type	ADSL2+, VDSL and Ethernet WAN (via external modem)	Ethernet WAN (via external modem)	Ethernet WAN (via external modem)	Ethernet WAN (via external modem)	Ethernet WAN (via external modem)
Encapsulation methods	DHCP; static IP; PPPoE; PPPoA; L2TP; bridged	DHCP; static IP; PPPoE (MPPE supported); PPTP; L2TP	DHCP, static IP, PPPoE (MPPE supported), PPTP, L2TP	DHCP; static IP; PPPoE; PPTP; L2TP; bridged	DHCP; static IP; PPPoE; PPTP; L2TP; DS-Lite; bridged
Concurrent dual-band	✓	✓	✓	✓	✓
Maximum rated link speed, 802.11ac	1,300Mbits/sec	867Mbits/sec	1,300Mbits/sec	1,300Mbits/sec	1,300Mbits/sec
Maximum rated link speed 802.11n	450Mbits/sec	300Mbits/sec	600MBits/sec	450Mbits/sec	600Mbits/sec
MIMO stream configuration, 802.11ac	3x3	2x2	3x3	3x3	3x3
MIMO stream configuration, 802.11n	3x3	2x2	3x3	3x3	3x3
WAN port speed	Gigabit Ethernet (shared with one of the LAN ports)	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet (shared with one of the LAN ports)	Gigabit Ethernet
LAN ports	4 x Gigabit Ethernet	4 x Gigabit Ethernet	4 x Gigabit Ethernet	4 x Gigabit Ethernet	4 x Gigabit Ethernet
USB/eSATA ports	USB 3; USB 2	USB 3; USB 2	USB 3; USB 2	USB 3	USB 3; USB 2
Beamforming	✘	Universal and explicit	Universal and explicit	Universal and explicit	Explicit
256-QAM on 2.4GHz	✘	✘	✓	✘	✓
ON-ROUTER SECURITY AND PARENTAL CONTROLS					
Security types	WPA; WPA2	WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2, WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2; WPA Enterprise; WPA2 Enterprise
Web content filtering	✘	✘	✘	✘	✓ (smartphone app)
URL whitelisting	✓	✘	✘	✓	✘
URL blacklisting	✓	✓	✓	✓	✓
Schedule-restricted internet access	✓	✓	✓	✓	✓
WPS button/router PIN/device PIN	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓
OTHER					
IPv6 support	✓	✓	✓	✓	✓
Wireless repeater functions	✓	✓	✓	✘	✓
Wireless on/off switch	✓	✓	✓	✘	✘
Power switch	✘	✓	✓	✓	✓
User-configurable QoS	✓	✓	✓	✓	✓
Media server	✓	✓	✓	✓	✓
Torrent server	✓	✓	✓	✘	✘
Guest network	✘	✓	✓	✓	✓
Android/iOS app	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
Extendability via apps	✘	✘	✘	✘	✓
Automatic firmware updates	✘	✘	✘	✘	✓
Manual online firmware updates	✓	✓	✓	✓	✓

	LINKSYS WRT1900AC	NETGEAR D6200	LABS WINNER NETGEAR R7000 NIGHTHAWK AC1900	TP-LINK ARCHER D7	ZYXEL NBG6503
	★★★★☆☆	★★★☆☆☆	★★★★★☆	★★★★☆☆	★★☆☆☆☆
	★★★★☆	★★☆☆☆	★★★★★★	★★★★☆	★★☆☆☆☆
	★★★★☆	★★★★☆☆	★★★★★★	★★★★☆☆	★★☆☆☆☆
	★★☆☆☆☆	★☆☆☆☆☆	★★★☆☆	★★★★☆☆	★★★☆☆☆
	245 x 205 x 125mm	255 x 68 x 205mm	285 x 68 x 205mm	230 x 48 x 180mm	157 x 140 x 103mm
	1yr RTB	3yr RTB	2yr RTB	3yr RTB	2yr RTB
	1.1.7.160177	v1.1.00.09_1.00.09	v1.0.3.24_1.1.20	0.9.1 0.5 v002d.0 Build 140225 Rel.37189	V1.00(AAJN.1)C0
	Ethernet WAN (via external modem)	ADSL2+ and Ethernet WAN (via external modem)	Ethernet WAN (via external modem)	ADSL2+ and Ethernet WAN (via external modem)	Ethernet WAN (via external modem)
	DHCP; static IP; PPPoE; PPTP; L2TP; bridged	DHCP; static IP; PPPoE; PPPoA; IPoA	DHCP; static IP; PPPoE	PPPoA; PPPoE; IPoA; MER/PoE (RFC routed); RFC 1483 bridged	DHCP; static IP; PPPoE; PPTP
	✓	✓	✓	✓	✓
	1,300Mbits/sec	867Mbits/sec	1,300Mbits/sec	1,300Mbits/sec	433Mbits/sec
	600Mbits/sec	300Mbits/sec	600Mbits/sec	450Mbits/sec	300Mbits/sec
	3x3	2x2	3x3	3x3	2x2
	3x3	2x2	3x3	3x3	2x2
	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	10/100 Ethernet
	4 x Gigabit Ethernet	4 x Gigabit Ethernet	4 x Gigabit Ethernet	3 x Gigabit Ethernet	4 x 10/100 Ethernet
	USB 3; USB 2/eSATA	USB 2	USB 3; USB 2	2 x USB 2	✗
	Explicit	Explicit	Universal and explicit	✗	✗
	✓	✗	✓	✗	✗
	WEP; WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2; WPA Enterprise; WPA2 Enterprise	WEP; WPA; WPA2
	✓ (smartphone app)	✓ (OpenDNS-based Live Parental Controls)	✓ (OpenDNS-based Live Parental Controls)	✗	✗
	✗	✗	✗	✗	✗
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✗
	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✗	✗
	✗	✓	✗	✓	✗
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✗
	✗	✗	✗	✗	✗
	✓	✓	✓	✓	✗
	✓/✓	✓/✓	✓/✓	✗	✗
	✓	✗	✗	✗	✗
	✓	✗	✗	✗	✗
	✓	✓	✓	✗	✓

NETGEAR R7000 NIGHTHAWK AC1900

OUTLANDISH DESIGN, BUT RIP-ROARING PERFORMANCE LEADS TO
A WELL-DESERVED A-LIST AWARD FOR NETGEAR'S FLAGSHIP ROUTER

PRICE $320
SUPPLIER www.netgear.com.au

If A-List awards were handed out on looks alone, the amusingly named Netgear Nighthawk would have things sewn up before we'd even taken it out of the box. Its flat, angled sides, shark-like nose and tail fin-shaped antennas make it look like something out of a James Bond film.

Despite its outlandish looks and name, the Nighthawk has a humdrum job to do, which is to provide wireless access to your home network and internet connection. This task it carries off with considerable aplomb.

CORE FEATURES

There's no built-in ADSL modem, just a Gigabit WAN port, so ADSL users may need to factor in an extra $30 or so for an external modem, but on every other count, the aggressive-looking Nighthawk is as fast as they come. It supports dual-band concurrent 2.4GHz and 5GHz networks, just like every other router in this Labs, and has four Gigabit ports at the rear, as well as a single Gigabit port for the internet connection, which is a typical configuration for this sort of device.

Along the front edge of this router is a USB 3 port for shared storage, and there's another USB 2 port on the rear should you wish to plug in another drive or share a printer across your local network.

Netgear's marketing describes the Nighthawk as a 3×3 MIMO stream AC1900 router, the fastest available. This is effectively a totting up of the maximum link speeds on both 802.11ac and 802.11n networks. You won't see Windows report a 1,900Mbits/sec connection: over 802.11ac, its maximum is 1,300Mbits/sec, and over 802.11n it will connect at up to 600Mbits/sec. As with other 600Mbits/sec 802.11n routers, you'll only see the top speed when connecting with a TurboQAM-enabled

WHAT IS TURBOQAM?

TurboQAM is a proprietary technology, implemented in Broadcom chipsets. It allow 802.11n clients and routers to employ the same advanced 256-QAM modulation technique (see p134 for more details) used by 802.11ac to bump top speeds up from 450Mbits/sec to 600Mbits/sec. To connect at this top speed, however, your router and adapter need to support TurboQAM. For most laptops, the top link speed will remain 450Mbits/sec for those with 3x3 stream adapters, and 300Mbits/sec for those with 2x2 adapters.

▶ Along the front edge sits a USB 3 port for shared storage, while the back has a USB 2 port to allow you to plug in another hard drive or share a printer

adapter (see above for an explanation of what TurboQAM can do).

WIRELESS PERFORMANCE

Whether you're connecting with a TurboQAM-enabled adapter or not, though, this is one seriously quick router. Over 802.11ac from our 3×3 stream PCI Express card, it registered an average of 68MB/sec; not the fastest in this group, but quick enough to make large backup jobs and file transfers over wireless a distinct and useful possibility.

Where this router really shines, however, is in its consistency and speed at long range. Moving to a distance of 30m from the router, with a wooden wall in the way, we saw 802.11ac speed fall by only 34% to 45MB/sec. Its 3×3 stream 802.11n performance in the 30m test topped the tables with a score of 13.4MB/sec.

When testing with the iPad Air, which supports only 802.11n connections and has a 2×2 MIMO stream antenna setup, the Netgear ran out the clear winner at long range, too, scoring 10.8MB/sec over 5GHz and 5.6MB/sec over 2.4GHz. It would appear that Netgear's inclusion of universal beamforming (see p69) has paid real dividends with this device.

SOFTWARE AND EASE OF USE

You might expect a router as thoroughly modern as this to boast the latest in-app driven interface design; alas, this is the one area where the Nighthawk falls short. Compared with the Linksys Smart

Wi-Fi, Netgear's basic HTML UI is rudimentary and opaque.

This is a shame, since there's plenty of power on tap if you have a dig around. We particularly like Netgear's Live Parental Controls system, which allows you to quickly hook the router up to OpenDNS's web-content filtering. Once you've set it up, you can use the tool to block websites by category, and apply different levels of filters on a scheduled basis.

Elsewhere, there's DLNA media server support, plus HTTP and FTP file-sharing from connected USB storage devices. Install the Netgear Genie client software on a PC or laptop, and the router's ReadySHARE Vault feature lets

▲ Netgear's Live Parental Controls system will let you quickly hook up to OpenDNS's web-content filtering

you set up a scheduled backup to a USB storage device. There's plenty of speed on tap – we measured USB speeds of 60.8MB/sec over a wired Gigabit connection. It's also possible to turn any printer into an Apple AirPrint-enabled device by simply plugging it into one of the Nighthawk's USB ports.

VERDICT

In all, despite the clunky web user interface, the Netgear R7000 Nighthawk AC1900 is a triumph. It may not deliver the fastest top speed over 802.11ac, but its class-leading range across all network types more than makes up for this slight lack of top-end grunt.

Combined with a raft of genuinely useful features, including content-based parental controls, Android and iOS app support, and free backup software, it's a true winner and our new A-List wireless router champion.

PERFORMANCE	★★★★★★★
FEATURES&DESIGN	★★★★★★★
VALUE FOR MONEY	★★★★☆☆

OVERALL ★★★★★☆

ASUS RT-AC68U

THE SECOND-BEST ALL-ROUNDER ON TEST, ASUS' FLAGSHIP 802.11AC ROUTER DOES ALL THE BASICS WELL, AND ADDS EASE OF USE TO ITS LIST OF ACCOMPLISHMENTS

PRICE $259
SUPPLIER www.asus.com.au

We made the Asus RT-AC68U our A-List router when we first reviewed it at the end of 2013, but despite a six-month gap, it remains superior to most of its rivals when it comes to all-round performance. Its vital statistics still stack up well, too. As far as wireless is concerned, its top link speeds of 1,300Mbits/sec over 802.11ac connections and 600Mbits/sec over 802.11n are as good as any on test. Don't forget, though, that you won't experience the 600Mbits/sec link speed unless you have an adapter that supports 256-QAM (TurboQAM) over 2.4GHz; currently, few support the standard.

Nevertheless, there's plenty else here to get excited about. At the rear of the router are four Gigabit LAN ports, accompanied by a single Gigabit WAN socket. You get one USB 3 port and one USB 2, a switch to toggle the LEDs on the front on and off, and the three removable antennas can be positioned to help you fine-tune the direction and spread of your particular network's coverage.

Software-wise, the RT-AC68U is extremely simple. Its web interface is sensibly laid out and easy to get to grips with, and it makes advanced features (such as remote access to router settings, and enabling media streaming and cloud storage via the iOS and Android apps) embarrassingly pain-free to get running.

There's little to complain about when it comes to performance. Over 802.11ac, the RT-AC68U is no longer king when it comes to raw throughput. In our testing with the latest firmware version, transfer speeds hit a top speed of 64.8MB/sec, which is fast, but trails the best we've seen. The RT-AC68U's real strength is its consistency across all connection types. At long distance, its 802.11ac speed moves up the table, and gets much closer to challenging for top honours. Only three other routers are quicker. At close range to our 3×3 stream, TurboQAM-enabled PCI Express card, 2.4GHz 802.11n speeds hit a table-topping 33.3MB/sec.

Even without a full-speed adapter, however, this excellent router gives a stunningly consistent performance. Targeting our 2×2 stream iPad Air at close range, transfers over both 2.4GHz and 5GHz 802.11n connections outstripped every other router on test. At long range over 802.11n, only the Netgear Nighthawk was faster.

When we plugged in our USB 3 drive and tested it across a Gigabit link, the performance was second to none, hitting a top speed of 63.6MB/sec. If you're looking for your router to double as a NAS, this speed – coupled with DLNA, iTunes and FTP servers, a torrent downloader, Time Machine support and cloud sync tools – makes the RT-AC68U a prime candidate.

The Asus is a cracking wireless router, and one that we recommend to anyone looking to move into the world of 802.11ac. Its all-round speed is what impressed us most, performing just as well with slower 802.11n devices as with superfast 802.11ac units.

It misses out on the Labs Winner award this month by a hair's breadth, only because the Netgear Nighthawk is slightly quicker. If you buy the Asus RT-AC68U, however, you won't be disappointed.

PERFORMANCE	★★★★★★
FEATURES&DESIGN	★★★★★☆
VALUE FOR MONEY	★★★★★☆

OVERALL ★★★★★☆

AVM FRITZ!BOX 7490

AN ASTONISHING BREADTH OF FEATURES, INCLUDING ADSL2+, VDSL AND CABLE CONNECTION COMPATIBILITY, PLUS DECT, VOIP AND ANSWERPHONE FACILITIES

PRICE $369
SUPPLIER www.fritzbox.com.au

Router manufacturer AVM is a big name in its native Germany, where its spaceship-style Fritz!Box routers can be found everywhere. Although less common in Australia, there are several reasons you might consider one; in particular the flagship Fritz!Box 7490.

The first is the sheer breadth of features on offer, which even in the company of this Labs is extraordinary. The first sign of this is the number of ports around the edges. Not only are there the usual four Gigabit LAN ports (one of which can be designated a WAN port for external modem connection), but also a host of others.

There's a port for direct ADSL2+ and VDSL fibre connections, without need for an external modem, plus a pair of USB 3 ports. There's also a trio of extras: two ports for connecting standard cabled telephones, and a socket for ISDN phone lines.

Clearly, this is no standard router. In fact, it's intended to be

a complete home communications system, combining DECT cordless phone base-station facilities with an integrated answering machine, as well as VoIP support for making calls over the internet.

Despite all the features, the 7490 remains easy to use. The front-end may not look modern, and it isn't the best organised, but it's packed with useful tools. Our favourites include the bandwidth-monitoring and radio frequency interference tracking tools, and the NAS front-end that allows you to browse, upload and download files to connected storage. A selection of Android and iOS apps extends the router's capabilities further, allowing you to manage the unit remotely, stream media, and even answer incoming land-line calls from your mobile phone.

It's a mind-bogglingly broad selection of capabilities, and the Fritz!Box 7490 is no slouch on the wireless front, either, boasting the latest in top-line 802.11ac tech. Inside is a 3×3 stream MIMO antenna configuration with a top link speed of 1,300Mbits/sec over 802.11ac and 450Mbit/sec over 802.11n.

Annoyingly, the router comes set up with both 2.4GHz and 5GHz networks on the same SSID, so you have to rename them if you want to use each one discretely; we were also confused by the fact that three of the four Gigabit LAN ports were initially set to 100Mbits/sec speed. (They can be set to Gigabit if you wish.)

Even with everything set up optimally, we found performance in testing fell a little short. The fastest speed we achieved over 3×3 stream 802.11ac was 48.3MB/sec; that's perfectly acceptable, but a long way behind the fastest routers here. Performance over distance, and with 802.11n in general, was weak. We saw transfer rates fall to 21.1MB/sec over 802.11ac, and long-distance speed over 5GHz 802.11n to our 2×2 stream iPad Air was a woeful 3.8MB/sec. Top speed over the USB 3 sockets lagged just as far behind, hitting a top speed of 24.3MB/sec, less than half the speed of its rivals.

For all its weaknesses, though, there's something undeniably appealing about the Fritz!Box 7490. It's crammed with features, it's easy to use and AVM's policy of releasing updates more regularly than most manufacturers should extend its useful lifespan.

PERFORMANCE	★★★★☆☆
FEATURES&DESIGN	★★★★★★
VALUE FOR MONEY	★★★★☆☆
OVERALL	★★★★☆☆

D-LINK DIR-868L

UNCONVENTIONAL LOOKS MASK A LOW-COST, HIGH-PERFORMANCE ROUTER THAT REALLY DOES THE BUSINESS

PRICE $249
SUPPLIER www.dlink.com.au

Unlike some of its rivals, there isn't much in the way of ostentatious flair with D-Link's latest 802.11ac router. Built in the same tall, cylindrical chassis the company has employed for some time, there isn't much in the specifications to get the pulse racing either. The DIR-868L's top 802.11ac link speed is 1,300Mbits/sec, and with 802.11n it maxes out at 450Mbits/sec. This places it one rung down the ladder from flagship routers such as the Linksys WRT1900AC and the Netgear Nighthawk, but

considering the low price, it's still a respectable specification.

Elsewhere, you get only a single USB socket, although it is of the faster USB 3 type. There's no ADSL modem, only a Gigabit Ethernet WAN port, but external modems can be picked up for less than $30.

Log into the router's web interface and the D-Link continues to underwhelm. The clunky UI has hardly changed in years, and although it has plenty of features, its front-end is complicated to navigate and will be daunting to less-technical users. We're also disappointed to see there's no form of content-based parental control,

although you get the option to block access to specific devices at predefined times. It's possible to block URLs, too, or run a whitelist – so only URLs in the list are accessible – if you really want to lock down your internet connection. But setting up these features isn't straightforward.

The D-Link's old-school UI sits at odds with the quality of features on offer. Its cloud management tools are good, and capable enough to rival Linksys' Smart Wi-Fi features. You don't get app extensibility, but you can monitor your network remotely from your PC and change core settings by registering the router with the cloud-based mydlink service. We like the way you can monitor how much data individual connected devices are consuming, and block those devices if necessary.

There are also iOS and Android apps: mydlink Lite lets you carry out basic monitoring and settings changes, and block devices remotely, although it lacks the live data-consumption meter; SharePort Mobile enables remote media streaming from a connected USB stick or hard drive; and QRS makes setup easier for those without access to a laptop or PC.

Performance is key, however, and it's here that the D-Link shines. At close range, it delivered the fastest speeds we've seen so far over 802.11ac, outstripping routers more than twice its price. It hit 79.7MB/sec from a distance of 2.5m, and speeds over 802.11n were also impressive.

In our long-range tests at 30m, it faded somewhat. Its 5GHz speeds took the biggest hit, throughput dropping 71% on 802.11ac to 23.2MB/sec and 66% to the 2×2 stream iPad Air. Its speeds over 2.4GHz, however, were more consistent, falling by just over 50% to our 3×3 stream PCI Express card, and a similar amount to the 2×2 stream iPad Air.

Despite that, speeds in this test never dipped below average compared with the rest of the routers in this group. Throw in atop USB speed of 39.4MB/sec and you have a good-value all-rounder. At $259, the D-Link DIR-868L is solid value.

PERFORMANCE	★★★★☆
FEATURES&DESIGN	★★★★☆☆
VALUE FOR MONEY	★★★★★★
OVERALL	★★★★★☆

LINKSYS WRT1900AC

JAW-DROPPING SPEED AND RANGE SEE THIS BEAST OF A ROUTER JOSTLE WITH THE FRONT-RUNNERS, BUT THE PRICE IS STEEP

PRICE $295
SUPPLIER www.linksys.com

The striking blue-and-black case of the Linksys WRT1900AC is a deliberate homage to the famed WRT54G router that was originally released in the 1990s. Wireless technology has come a long way since then, and this, its spiritual successor, is a breed apart.

Everything about this cable router is top of the range, including the price. It's solidly built and feels more than capable of surviving years languishing in the router cupboard. It has four removable, positionable antennas so you can fine-tune the spread of your wireless network, and its wireless credentials are impeccable.

For $295 you get a 3×3 MIMO stream router with a top 802.11ac link speed of 1,300Mbits/sec and 600Mbits/sec on 802.11n. The router has four Gigabit LAN ports on the rear, accompanied by a single Gigabit WAN port for hooking up to your broadband modem. There's also a pair of USB 3 ports, one of which can double up as an eSATA connector (an odd choice), plus a power switch – but there's no wireless on/off toggle.

Log on to the WRT1900AC's web interface, and more treats are in store. The router sports Linksys' excellent Smart Wi-Fi front-end, and it delivers the most user-friendly router experience on the market. The widget-based approach makes settings extremely easy to understand, and it's a snip to set up features such as parental controls and guest networks.

We particularly like the network map, which gives you a visual lowdown on all attached devices and lets you drill down to view bandwidth use by device. The QoS feature is a boon, and making it easy to assign network priority on the basis of application or device.

You can also use your iOS or Android device to manage the router and add features via in-app extensions. Sadly, there's no built-in integration with content-based website filtering tools, such as OpenDNS or Norton, but you can control access on a device and time-slot basis, and blacklist individual URLs as well.

When it comes to performance, the WRT1900AC keeps the tempo high. Up close, from our 3×3 stream PCI Express card, file copies averaged 71.9MB/sec over 802.11ac and 19MB/sec over 2.4GHz, while speeds to our iPad Air averaged 13.2MB/sec. It isn't the fastest router in these tests, but it's not far off. At long range, however, speed takes a hit. 802.11ac results were fine, hitting an average of 29.3MB/sec, but in the rest of the tests, over 802.11n 2.4GHz and 5GHz, we were disappointed to see transfer rates pull the overall average down to 11.6MB/sec.

There's clearly plenty of power behind the USB controller, however: transfer rates of up to 60.7MB/sec mean that using the WRT1900AC as a basic NAS drive is a possibility.

The WRT1900AC's big problem isn't its performance, however, it's the price. For $295, we expect the very best in performance at close range and long range, and this router doesn't quite deliver here. There are plenty of other 1,900Mbits/sec routers offering 1,300Mbits/sec 802.11ac speeds that don't cost anywhere near this amount. Unless the price comes tumbling down, we recommend you plump for one of those instead.

PERFORMANCE	★★★★★★★★★☆
FEATURES&DESIGN	★★★★★★★★★☆
VALUE FOR MONEY	★★☆☆☆☆☆☆☆☆

OVERALL ★★★★★★★☆☆

ZYXEL NBG6503

ALTHOUGH IT'S UNBELIEVABLY CHEAP FOR AN 802.11AC ROUTER, THE 10/100 ETHERNET PORTS HAMPERS ITS POTENTIAL

PRICE $125
SUPPLIER www.zyxel.com.au

The ZyXEL NBG6503 is as cheap as 802.11ac routers get right now. At a mere $125 (street price), this cable router is a fraction of the price of anything else we've tested this month.

It's great to see the latest wireless technology at such a good price, but it comes at a cost: the NBG6503 provides the bare minimum of features. We like the fact that it has external, adjustable antennas, but there are only two of them, supporting 2×2 spatial streams – and that places a limit on the router's top performance.

In fact, in terms of maximum link speeds, the NBG6503 is the slowest 802.11ac router on test this month, rated at 300Mbits/sec for 2.4GHz 802.11n connections and 433Mbits/sec for 5GHz 802.11n and 802.11ac.

Physical ports are limited, too. This router is the only one in the group without a USB port, so you can't share a thumbdrive or hard disk over the network, and it's also the only unit with no Gigabit Ethernet ports.

The latter is the key restriction here, since it places a hard limit on the speeds the NBG6503 can hit. Thus, in our close-range wireless testing, transfer rates never rose above 11.6MB/sec, while the other 2×2 stream routers in this Labs delivered faster speeds.

This limitation is felt even in our long-range testing at 30m, with speed over 802.11ac once again topping out at 11.6MB/sec. In other tests, speed at range was less impressive, with 2.4GHz 802.11n speeds to our PC averaging 7.2MB/sec, and rates dropping further to 3.6MB/sec and 2.3MB/sec to the iPad Air over 5GHz and 2.4GHz connections. Overall, this ZyXEL is the slowest

802.11ac router we've tested, which shows in the scores we have awarded it. The lesson to be remembered here is that the 802.11ac specification, at face value, masks its true weakness. The ZyXEL NBG6503 is temptingly priced, but it's sorely lacking when it comes to core hardware capabilities; frankly, we'd rather buy an 802.11n router with Gigabit than an 802.11ac unit without.

PERFORMANCE	★★☆☆☆☆
FEATURES&DESIGN	★★☆☆☆☆
VALUE FOR MONEY	★★★☆☆☆
OVERALL	★★☆☆☆☆

NETGEAR D6200

ALTHOUGH IT LOOKS GOOD ON PAPER, PERFORMANCE IS WEAK AND THE PRICE ISN'T LOW ENOUGH TO COMPENSATE

PRICE $189
SUPPLIER www.netgear.com.au

On paper, the Netgear D6200 offers an impressive array of features. It has dual-band, concurrent network support over 802.11ac and 802.11n, an integrated ADSL2+ modem, support for cable connections with a separate Gigabit WAN port, four Gigabit LAN ports on the rear panel, plus a USB 3 port for sharing storage and printers.

If the specification raises hopes, testing thoroughly dashes them. It starts with a sluggish, outdated web front-end. Where Linksys, AVM and Asus have been working hard at crafting usable, powerful on-router software, Netgear is stuck in the past. You can get everything you need done with it, but it's slow and needlessly complicated. It's just as well there's Android and iOS app support to help with management and configuration.

Its performance is equally disappointing. Although the D6200's 2×2 stream MIMO configuration appears to offer a top link speed of 867Mbits/sec 802.11ac speed and 300Mbits/sec 802.11n speed, in practice this isn't the case. To achieve the rates in our graphs, we had to reduce the speed of the 2.4GHz 802.11n network to 145Mbits/sec; with the 2.4GHz network set to 300Mbits/sec, 802.11ac speeds at close range nearly halved.

Even with these settings in place, the D6200 disappointed. Testing at close range on an 802.11ac stream connection, speeds hit only 29.2MB/sec, and this fell to 12.2MB/sec on 2.4GHz 802.11n. In the long-range test its transfer rate over 802.11ac held up well, falling to 25.1MB/sec, but in other tests it was sluggish, gaining only 3MB/sec over 2.4GHz 802.11n when tested with our 3×3 stream PCI Express card, and providing terrible long-range speeds to our iPad

Air. Physical storage fared little better, and the D6200's single USB 2 socket saw shared storage speeds max out at an underwhelming 14.1MB/sec. Despite its comprehensive list of specifications, then, the D6200's performance and range aren't up to scratch. We'd expect much better at this price.

PERFORMANCE	★★★☆☆☆
FEATURES&DESIGN	★★★★☆☆
VALUE FOR MONEY	★★☆☆☆☆
OVERALL	★★☆☆☆☆

The 802.11ac advantage

With a fair wind, 802.11ac is super quick. You need only glance at this month's results to see that most routers can top wireless-transfer speeds of 50MB/sec at close range. That's pretty impressive: in our last wireless routers Labs, the highest speed we saw was an 802.11n connection at 26.6MB/sec. This month's fastest hardware delivered three times the throughput.

How does 802.11ac achieve such speeds? Primarily through three technical advances, which in combination deliver performance that's both faster and more reliable than what was previously possible.

80MHZ CHANNELS

Probably the biggest innovation in 802.11ac is the ability to use 80MHz-wide channels in the 5GHz spectrum, as opposed to the 40MHz channels of 802.11n. This enables far greater data throughput. The specification also supports 160MHz channels, but we've yet to test any hardware with support for this.

These wider channels are a double-edged sword. Extending the channel width increases the potential for interference, just as with 40MHz channels in the 2.4GHz spectrum. Indeed, since many routers and adapters support only a slice of the available 5GHz, multiple 80MHz 802.11ac networks that are in close proximity will very likely interfere with one another.

For now, this isn't a major problem since comparatively few consumer devices are using the 5GHz spectrum. However, as more people hop on the 5GHz bandwagon, we can expect the advantage of 80MHz channels to be eroded.

One modulation symbol — One modulation symbol
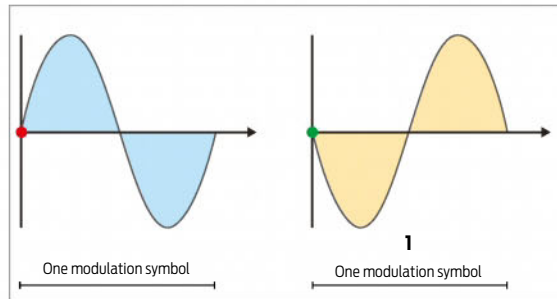
256-QAM

It isn't only wider channels that deliver more bandwidth. 802.11ac also packs more data into its radio signals by employing a more advanced form of modulation than previous standards. 802.11n uses a system called 64-QAM (quadrature amplitude modulation), which exploits phase-shifting techniques to encode six bits of binary data into one discrete pulse of the waveform (one "symbol").

802.11ac takes advantage of a more complex encoding method called 256-QAM to raise this to eight bits per modulation symbol. However, 256-QAM will only be employed by a router in extremely good RF conditions. As signal strength deteriorates and interference from other RF sources lowers the signal-to-noise ratio, it becomes more difficult to decode such complex modulation, and the router will drop back to 64-QAM or lower.

Although 256-QAM is part of the 802.11ac specification, some manufacturers have started using Broadcom's proprietary implementation of 256-QAM (dubbed TurboQAM) to boost 802.11n speeds in a similar way. This is why the maximum connection speed of such routers is quoted as 600Mbits/sec instead of 450Mbits/sec.

▲ Beamforming adjusts the timings of the signals emitted from the router's antennas to reinforce the signal at the point of reception

BEAMFORMING

Beamforming is a technology that allows the router to "focus" the wireless signal on a single point, improving its strength and thereby helping to transmit data at a higher rate. It has little effect at close range, where the signal is already strong, and it won't extend the range of your router; at medium range, however, it can improve the performance of your wireless network.

Beamforming isn't technically new in 802.11ac; the core technology was included in the 802.11n specification as an optional extra, but there was no standard method for implementing it, so most manufacturers steered clear. In 802.11ac, beamforming still isn't mandatory, but it has been standardised, so it's much more likely that products from different manufacturers will work together, and the technology will soon move into the mainstream.

> ## "This month's fastest hardware delivered three times the throughput"

Technically speaking, beamforming has nothing to do with "beaming" a signal in any particular direction. It works by adjusting the timings of the wireless signals emitted by the router's multiple antennas, so that the radio waves reinforce each other at the point of reception. This works to improve the overall strength of the signal.

To confuse matters further, there are two types of beamforming. In explicit beamforming, the receiver sends data back to the sender regarding the state of the wireless signal it's receiving. This enables the technology to perform at peak efficiency, but it requires both the receiving device and the router to fully support the technology.

Implicit, or universal, beamforming aims to strengthen signal quality for 802.11n clients in both the 2.4GHz and 5GHz bands, and hardware support isn't needed at the device end. The Labs-winning Netgear Nighthawk and the recommended Asus RT-AC68U support both types of beamforming, and it's no surprise to find them at the top of the chart in our long-range speed test.

No beamforming | Beamforming enabled
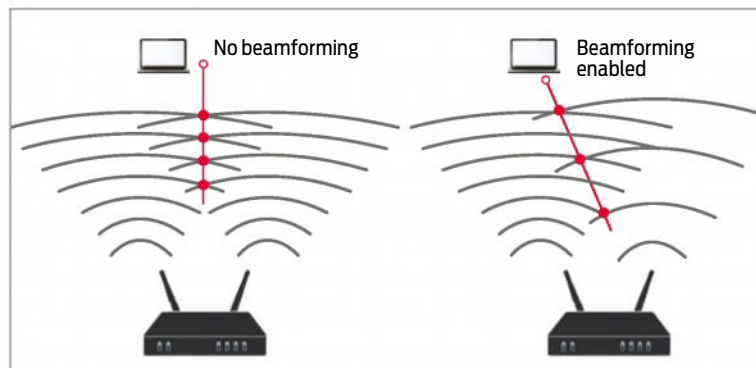
◄ The most basic form of modulation is phase-shift keying (PSK), which encodes a single bit per waveform

Best of the rest: review roundup

ASUS RT-AC56U

PRICE $199
SUPPLIER www.asus.com.au

Asus' second entrant in this month's Labs is the budget version of the award-winning Asus RT-AC68U cable router. It doesn't have the external antennas of that router, and the maximum wireless speeds are lower due to its 2×2 MIMO stream antenna configuration. It delivers up to 867Mbits/sec over 802.11ac and up to 433Mbits/sec over 802.11n. It also has only one USB 3 socket.

However, these are the only areas in which the RT-AC56U is found wanting. Performance in our wireless tests was top-notch: we found it delivered 71.2MB/sec over 802.11ac at close range and 36MB/sec in our long-range tests.

Oddly, in these tests it's a little quicker than its higher-spec sibling, matching it for USB transfer speeds and falling behind only when it comes to 802.11n

▲ The budget version of the RT-AC68U, the AC56U delivers a close-range speed of 71.2MB/secr waveform

performance. Overall these results, when factored in with the affordability of this router must make it a top choice for any home Wi-Fi envoronment. It's an excellent router, and worth considering alongside the also excellent D-Link DIR-868L if your budget is restricted.

OVERALL ★★★★☆

LINKSYS EA6900

PRICE $259
SUPPLIER www.linksys.com.au

We're big fans of Linksys Smart Wi-Fi router software. It makes setting up and maintaining the firm's routers (remotely and from the local network) a doddle compared with most others.

We like the performance, too. The EA6900 is one of the best we tested this month, offering link speeds of up to 1,300Mbits/sec over 802.11ac and 600Mbits/sec over 802.11n, four Gigabit LAN ports plus one Gigabit WAN port for hooking up to an external modem, and a pair of USB ports for sharing storage.

The results in our performance testing place it fifth overall this month, with superb close-range speeds over 802.11ac of

▼ Linksys' EA6900 performed well over 802.11n, plus it's easy to use as well

70.1MB/sec and 35.4MB/sec from 30m away. It put in consistent results over 802.11n in our 3×3 stream and 2×2 stream tests, and USB speed was good, at a peak of 48.1MB/sec, but some way behind the fastest.

The EA6900 is an excellent product, and reasonably priced, but it falls between two stools: it's neither cheap enough nor quite fast enough all round to achieve an award.

OVERALL ★★★★☆

TP-LINK ARCHER D7

PRICE $179
SUPPLIER www.tp-link.com.au

This router boasts a lot of features for a decent price. The wireless specification is excellent, with a top link speed of 1,300Mbits/sec over 802.11ac and 600Mbits/sec over 802.11n, thanks to its external 3x3 stream MIMO antennas. It has an integrated modem for ADSL2+, and you can sacrifice one Gigabit Ethernet port for use as a WAN port with external fibre and cable

modems if you so desire such a configuration.

The software UI design is intimidating, but it's well organised and offers plenty of control. Raw speed isn't this router's strength. Its top speed over 802.11ac of 59.5MB/sec is good, but some way short of the winners this month, and its USB performance lagged well behind the best on test, delivering a peak of only 15.4MB/sec. However,
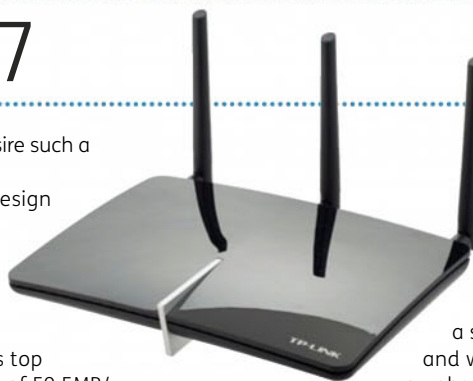
▲ Consistent performance across the board, but not the quickest over 802.11ac

we were impressed with its consistency and long-range speeds over 2.4GHz and 5GHz 802.11n.

The TP-Link Archer D7 isn't fancy, but nor is it intended to be, what it is, is a solid and reliable performer and would be a good option if you absolutely must have a one-box ADSL router that can do it all simply and without fuss.

OVERALL ★★★★☆

VIEW FROM THE LABS

Wireless networking has advanced slowly since its rise in the late 1990s. After 802.11g boosted connection speeds to 54Mbits/sec in 2003, it took almost a further decade for 802.11n to replace it as the de facto wireless standard.

Even since then, device manufacturers have been frustratingly slow to take advantage of one of 802.11n's major strengths, namely its optional use of the 5GHz radio frequency spectrum. These days, the 2.4GHz spectrum is as congested as Paramatta Rd during rush hour, while the 5GHz band is far less troubled by interference. While laptop manufacturers and makers of cheap tablets continue to use single-band 2.4GHz adapters, connection speeds carry on suffering as a result.

This year could well represent a turning point, thanks to 802.11ac. Since the new technology is 5GHz-only, it pushes us away from that saturated 2.4GHz spectrum towards a rosier wireless future (although all of this month's routers remain backwards-compatible with 802.11n over both 2.4GHz and 5GHz).

Perhaps even more significant is 802.11ac's ability to transmit and receive much more data per MIMO stream than 802.11n. This hugely ramps up the top-speed potential of domestic wireless installations, and will hopefully

"802.11ac routers benefit not only the latest devices, but also older hardware"

give manufacturers of compact mobile devices – where implementing 2×2 or 3×3 antenna configurations is tricky – the push they need to build the technology into their products. Flagship smartphones and tablets such as the Samsung Galaxy S5, HTC One (M8) and Galaxy TabPRO 8.4 already support 802.11ac, and we've recently seen a healthy selection of ac-enabled laptops

arriving in the *PC & Tech Authority* Labs as well.

If you don't currently own an 802.11ac-compatible smartphone or laptop, you may be understandably reluctant to upgrade your router. But bear in mind that 802.11ac routers (unlike previous generations of wireless technology) can bring benefits not only to the latest devices, but also to older hardware. Techniques such as implicit beamforming can improve the reliability of 802.11n signals, for example, enhancing the general reliability and speed of wireless networks for all types of connected devices.

You should also be looking forwards. Even if you have no 802.11ac devices at home right now, the next one you buy will more than likely have it on board, and in the case of a laptop it may be available as a low-cost upgrade.

Investing in an 802.11ac router will ensure you get the best possible wireless connection now, and will prepare your home network for future upgrades as well.

STAR CITIZEN ARENA COMMANDER

OUR FIRST FORAY INTO THE GAME WORLD WHERE SO MANY FUTURE HOURS AWAIT...

DEVELOPER Cloud Imperium Games
PUBLISHER Cloud Imperium Games
WEBSITE www.robertsspace
industries.com

As crowd-funding for Star Citizen hurtles towards the US$50 million mark, backers finally got their first taste of the game with the release of the hellishly long-awaited Arena Commander module.

It was about six months late, and the usually fawning forum community were starting to get itchy fingers. Total transparency from the team at Cloud Imperium Games kept the emotions under control, though, and it was easy to see that the delay came from over-ambitious planning, not any kind of inability for CIC to realise the dream.

Arena Commander is free to backers or US$5 for newer backers who came in too late to score the free Arena Pass. Initially just three ships are available: the Aurora and 300i light personal craft, and the Hornet fighter. Others will be added, but not all Star Citizen ships will make it into this module. Free roam, albeit in a very small space of space, vs AI dogfighting were there to enjoy up front, while the multiplayer is being progressively rolled out across territories as servers are brought on line region by region as load testing is analysed and further deployment deemed wise. Through it all bugs are squashed, patches released and, the whole idea of it all; volumes of game tester feedback digested.

For us, the whole idea was to finally get in a cockpit (the game forces you into cockpit view – 'immersion'), see how the ships look and fly, check out the space graphics and the general job CIC did with the CryEngine, upon which it is all built.

My first impression was a good one. It reaffirmed the notion that CIC are about quality and detail. While small, the orbital playground we

were supplied fitted my expectations. Floating asteroids showed great detail and the environment didn't seem to chug too much on my 290x-based system. Crossfire and SLI are unusable (at the time of writing), as terrible flickering is everywhere.

There's no control configuration screen, so for now control comes via keyboard and mouse, an Xbox control pad or Saitek X52 and X55 HOTAS sticks. By fiddling with an .xls sheet it's possible to create a custom profile, and the community has stepped up with profiles for an increased range of controllers.

Flying is difficult, but only because the game wants so badly to abide by real physics. A bit of practice and it all comes together, though there's still refinement to come. By default, ships start in a 'coupled' mode – which has them flying the same way an atmospheric craft would (i.e. no physics). But 'decouple' and your ship is now only following the trajectory momentum dictates, while the body of your craft is free to point in any direction as it sails along. This introduces fascinating dogfighting mechanics. The most obvious being to decouple if someone's on your six, spin the ship to face them and unleash forward firing guns at them while your ship continues on its original path.

Ships can couple and decouple instantly, so very skilled pilots will constantly be switching modes to keep their weapons pointed at enemies off at extreme angles, while creating a confusing flight path that jumps around deliberately erratically.

Another mode turns on or off the system that stops the ship from pulling enough G's to cause black out or red out. So again, the better pilots will run with this mode disabled to gain a few more degrees of turning and, well, use the force to keep a mental bearing of where they're pointing.

The cockpits are beautiful. Oculus Rift is supported from the beginning,

PLATFORMS
PC only
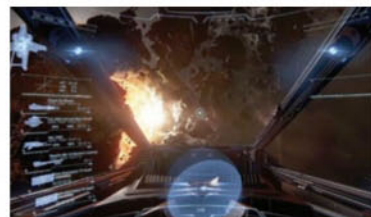
and by all accounts the situational awareness that comes with free look around the cockpit is both deeply immersive and tactically advantageous. TrackIR isn't yet supported but will be. These two devices are going to be particularly important. Besides the huge advantage in tracking a manoeuvring target, free look also lets you keep the helmet's HUD in view as your view shifts. Type 2 weapons (like turrets) can be targeted using the helmet HUD, so swivelling your head to acquire and fire will be a tremendous plus. Mouse and control pad users can also engage free look, but lose control of the ship when they do.

The other HUD is affixed to forward view, and it has several modes but mostly covers ship systems. Weapons overheat and ammo monitoring, as well as a neat triangular power distribution system are the key elements. Power can be moved to weapons, shield or engines by shifting a dot in the triangle around, and this will be another thing to get good at if fighting is your style.

It's a solid and impressive start, and the beginning of endless pressure on CIC to make it all amazing.

Ben Mansill
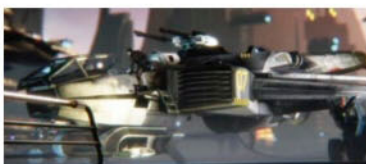
atomic

Now actually playable, the fruits of our backing and CIC's hard work are becoming a reality.

RATING ★★★★☆

WOLFENSTEIN: THE NEW ORDER

TIME TO SAVE THE WORLD BY SHOOTING STUFF IN THE FACE.

DEVELOPER Machinegames
PUBLISHER Bethesda
WEBSITE www.wolfenstein.com

Think back over the history of videogames and there are a few titles that stand out as pioneers, setting up genres that have generated countless billions of dollars and many more hours of enjoyment. Trace back the history of the first person shooter and you arrive at Wolfenstein, a game that gave birth to the biggest gaming franchises out there. Even more importantly, it gave birth to 3D graphics, the rudimentary corridors of the titular castle, blowing minds as people were able to walk around a game like they did in real life.

It is a little surprising then, that despite numerous remakes, Wolfenstein has never climbed the lofty heights of other franchises. This time around id Software has handed the franchise over to developers who go by the name Machinegames, and the result is one of the best single player shooters in years, one that manages to deftly merge over the top action with a fascinating storyline.

The New Order sets out to reboot the franchise in an interesting way. It starts with a bang, with a fantastic opening sequence that both acts as tutorial and sets the scene for the game. This ends with your character, the eponymous BJ Blazkowicz falling into a coma and waking in the early sixties to a world in which the Nazi's won the Second World War, and now rule the world.

He faces a world that has had quite a bit of thought put into it, and despite this being a relatively linear experience, it is dripping with little touches that act

to make the scenario plausible, despite the fact that the Nazis have landed on the moon, use rudimentary computers and augment their fighting force with robots and mechanised armor.

As it was way back in the first Wolfenstein game, BJ's solution is to shoot every Nazi in sight. Rest assured, that while this is a very well crafted world, Machinegames hasn't strayed too far from the central tenets of the original. There are some mild puzzle-ish bits, and some levels where BJ is armed only with a knife, but generally speaking his solution to challenges put in from of him is to shoot it with at least one, but preferably two, guns.

What results is some of the most enjoyable single player shooter action in years. The guns feel great to use, the levels look gorgeous thanks to the id Tech 5 engine that was used to much lesser impact in Rage a few years ago, and gunfights are challenging without being overtly brutal. Even the sections where you can only engage in hand to hand combat work spectacularly - the developers were previously responsible for founding Starbreeze Studios, whose Chronicles of Riddick Game had one of the best first person implementations

atomic
Hit
hot award

PLATFORMS
PC · Xbox One · PS4 · Xbox 360 · PS3 · Tested on PC

of melee combat to ever grace a game, and the heritage shows.

Of course, a game like this doesn't come without a few caveats. The first will be seen as a blessing by some, and a curse by others, but it is purely a single player experience. We actually really appreciate the fact that all of the time and effort has gone into single player, especially as the *PC&TA* team has become more and more jaded with the big name franchises like Battlefield and Call of Duty, which treat single player as a curiosity. It is refreshing to play a shooter where all the time and effort has been focused on making the single player enjoyable, rather than the endless balancing and tinkering that happens with most multiplayer focused games.

The other caveat is that the subject matter can be pretty full on at times. These are very much actual Nazis, not the bumbling Hogan's Heroes style ones. You'll encounter quite a few horrors over the course of the nine or so hours of gameplay, and the game does earn its R18+ rating.

Ultimately, while we loved The New Order, it falls a smidge short of classic status, thanks largely to it losing pace a bit in the second half of the story. After such strong opening sequences, the back half of the game just doesn't grab us as much, although the ending is well worth the payoff. However, if you enjoy playing shooters on your own, this is a must have game.
John Gillooly
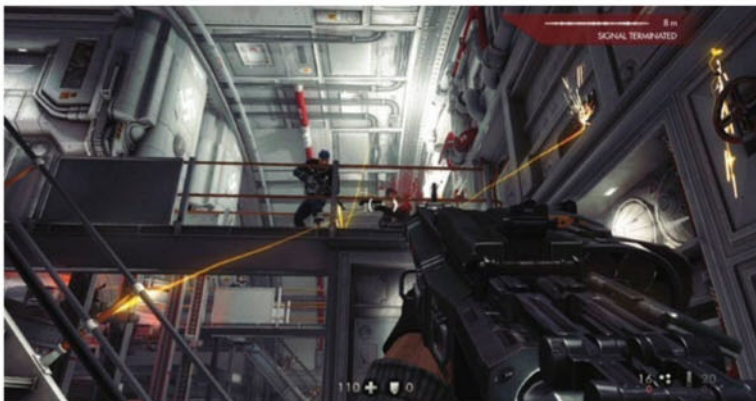
atomic
The best single player shooter in ages, one that delivers enjoyable story and great action from beginning to end

RATING ★★★★★

WATCH DOGS

UBISOFT'S SPRAWLING SAGA OF HACKING AND OPEN WORLD EXPLORATION FALLS A LITTLE FLAT.

DEVELOPER Ubisoft Montreal
PUBLISHER Ubisoft
WEBSITE www.watchdogs.ubi.com

The world of Watch Dogs - a kind of semi-now, semi-futuristic version of Chicago that's run by an all-seeing, all-knowing city-wide operating system – is undeniably large. It's interesting, too, packed with people with seemingly rich histories, along with a range of items that you can hack into and control.

Want to stop pursuing police? Change traffic lights as you rush through. Not sure what's around a corner? Hack into a camera and scan hidden areas. You can even hack enemy grenades to detonate prematurely, with semi-hilarious results.

But for all the richness of gameplay, Watch Dogs still feels empty.

Partly that's as a result of the main character. If you're just getting into Watch Dogs for shiny car-chases and open-world antics, you'll be fine, but if you're looking for a charming protagonist and story that at least compels even if it doesn't make sense, you've come to the wrong dystopia. Pearce is a grim figure at the best of times, haunted by demons from his past and committed to hacking his way to a better future. And the story around

him is… well, when you can make sense of the labyrinthine twists and turns, it's still pretty vacant.

As open worlds go, there's a tonne to do. You can wander around, using your trusty hook-up to the city-AI to fight crime, but at the same time you also have the opportunity to peek into people's private lives; Ubisoft's effort at giving practically every NPC you see a potted history is laudable, but the game's system of morality is a little too basic, and really doesn't stop you from both being a crime-fighter and a petty thief yourself. But even without side quests, mini-games, and collecting, just wandering around and soaking up the life of the city is pretty good.

But when the game does it get it right, the effects can be breathtaking. The aforementioned car-chases are fast and furious, even if the game's cops are a little too persistent, and a little too overpowered. Regardless, the sense of rushing down packed streets, desperately attempting to avoid civilians, while changing green lights to red, opening and closing electronics gates, and generally abusing your power… is pretty awesome. Similarly, Ubi's really smoothed the process of urban navigation, making the game's parkour-inspired leaping and sliding feel more intuitive and natural than ever.

PLATFORMS
PC · Xbox One · PS4 · Xbox 360 · PS3 · WiiU · Tested on PC

There's a range of multiplayer options, too, from simple team and co-op matches running about the city, to the more intriguing ability to drop on another player's single player game and hack them competitively. In practice, though, it's not so much fun, but ten out of ten for trying something different, and integrating that into an iPad application as well.

The game looks good, too, though not nearly as good as advertised, which is bit of a story in itself (see below), and the launch of PC has been plagued with enough issues that Ubisoft has promised to deliver a patch that will fix performance issues such as stuttering, and frame tearing. Not every PC gamer has had these issues, but at this stage if you want to play and have a choice of platforms, you may want to avoid PC for now.

David Hollingworth

THANK THE MODS!

As of writing, the official PC patch is unavailable. But a hard-working modder has found some assets buried in the game from the original E3 2013 demos. The Worst - great name - has released a small patch and instructions that may boost game performance. It didn't for us, but it's worth trying: http://www.mediafire.com/download/k74681m7v96ek8z/

atomic
Not quite the masterpiece we hoped for, with a dull story and a troubled release on PC.

RATING ★★☆☆☆

SID MEIER'S CIVILIZATION: BEYOND EARTH

IT IS TIME TO LEAVE EARTH BEHIND AS THIS ICONIC SERIES HEADS BACK TO THE STARS.

DEVELOPER Firaxis
PUBLISHER Take 2
WEBSITE www.civilization.com

There are few game series as enduring and iconic as Sid Meier's Civilization. After 23 years, five games, several spin offs and numerous expansion packs, this turn based strategy icon has been one of the few constants in gaming. But for many the high point in the series is still Sid Meier's Alpha Centauri, a game made by a fledgling company called Firaxis when it seemed that Sid Meier had lost the rights to the game bearing his name.

Alpha Centauri was a game designed to answer the big question of what happens to the denizens of earth when they head for the stars. Building a spaceship and leaving earth has been one of the major constants when it comes to winning the Civ games, and with Alpha Centauri the human race faced some very specific challenges from a hostile Alien world.

Sid Meier's Civilization: Beyond Earth can loosely be seen as a spiritual successor to Alpha Centauri, in that it is a game that starts with the human race departing earth, but it is shaping up as a uniquely different experience. After all, when those ships full of colonists head off into the great unknown, they could end up on any habitable speck in the night sky, and the likelihood of two independent expeditions sharing the same experience is low to say the least.

This unknown aspect has blown through the Civilization developers at Firaxis like a blast of fresh air, and has enabled them to stretch their minds and imaginations in a way that is virtually impossible when making a game based upon the history of humanity. And this unknown aspect is manifesting itself beautifully in new game systems, new units, new technologies and a very different looking experience for players.

It doesn't take long for the game to diverge from what players have come to expect from Civilization. After setting up your expedition by choosing a race, ship, cargo and ideology, your colonists find themselves alone on a planet. Apart from the native Alien life forms that is. These initially sound like the mindlessly destructive barbarian units that plague the early turns of a game of Civilization. But it doesn't take long for you to realise that there is a lot more to the ecosystem than endless warrior spawning. Instead each type of Alien has its own motivations, level of intelligence and relationship with the strange humans that have landed on its home world.

In Beyond Earth you don't actually encounter other human factions until later in the game, so your early experience will involve exploring the planet and dealing with the Alien based hand that fate has dealt. You may be able to peacefully avoid them, or be forced into confrontation as you expand, but your actions will have consequences, as will the way in which your civilisation grows on its new world.

There are three basic paths, called affinities, to take in the game - Harmony, Supremacy or Purity. These are more than just analogs of the

policies in Civ 5, however. In Beyond Earth these paths will govern not only the way in which you develop technologically, but what your win conditions are.

Harmony involves making peace with the planet and its life forms, leaning towards research into biology. Supremacy is the path of the warmonger, the conqueror of the planet. Whilst Purity is all about keeping the human race human. These all play directly into your eventual win conditions for the game, as well as driving one of the most significant alterations to the core Civ Gameplay.

This is the tech web, a sprawling array of researchable technologies that you progress through. Unlike the rigid, historically defined tech tree of Civilization, the tech web is designed around the inherently unknown nature of the future. As you stride out in one direction you'll likely miss entire swathes of development, which not only makes each play through different, but involves a commitment to scientific direction that just isn't seen in Civ.

Due sometime later this year, Beyond Earth is shaping up as one of the most fascinating titles on the horizon, and a fitting way to move beyond Civilization V and its expansions and prepare for a sixth generation of the game. We can't wait to lose the inevitable hours and days to taking on a brave new world in a very different kind of Civ title.
John Gillooly

THE A-LIST

ONLY THE BEST OF THE BEST MAKE IT TO *PC & TECH AUTHORITY*'S A-LIST

This month's group test yields us a new router for the top spot in our best router category. We're not massively surprised that the rather amazing looking Netgear Nighthawk won. Netgear went all-out with this product to make a winner, and that's indeed what it is. It's not often that we get excited about routers, but this time we genuinely are.

NEW

WHAT WE SAID:

Whether you're connecting with a TurboQAM-enabled adapter or not, though, this is one seriously quick router. Over 802.11ac from our 3×3 stream PCI Express card, it registered an average of 68MB/sec; not the fastest in this group, but quick enough to make large backup jobs and file transfers over wireless a distinct and useful possibility.
Where this router really shines, however, is in its consistency and speed at long range. Moving to a distance of 30m from the router, with a wooden wall in the way, we saw 802.11ac speed fall by only 34% to 45MB/sec. Its 3×3 stream 802.11n performance in the 30m test topped the tables with a score of 13.4MB/sec.
In all, despite the clunky web user interface, the Netgear R7000 Nighthawk AC1900 is a triumph. It may not deliver the fastest top speed over 802.11ac, but its class-leading range across all network types more than makes up for this slight lack of top-end grunt. Combined with a raft of genuinely useful features, including content-based parental controls, Android and iOS app support, and free backup software, it's a true winner and our new A-List wireless router champion.

PCS DESKTOPS ▼

HIGH-END PC&TA EDITOR'S CHOICE

★★★★★

PRICE $3414

An extreme PC able to deliver perfect gaming performance, but also be equipped to handle the most demanding desktop apps. See page 18!

SPECIFICATIONS i7 4770K CPU; ASUS Radeon R9 290x DirectCU II OC 4GB graphics; Corsair Dominator Platinum DDR3 16GB; ASUS Maximum VI Extreme motherboard; ASUS ROG Front Panel; Coolermaster Cosmos SE case; Coolermaster V1000 PSU; Sandisk Extreme 2 240GB SSD; 2 x SanDisk Ultra Plus 256GB SSD; WD Black 2 SSD + 1TB HDD

MEDIA PC&TA EDITOR'S CHOICE

★★★★★

PRICE $1159

This versatile media box is also perfectly capable of doing double-duty as a lightweight TV game box. Built to a budget with performance in mind.

SPECIFICATIONS: Bitfenix Prodigy; Kaveri A10-7850K APU; – Gigabyte GA-F2A88XN-WIFI; Corsair Dominator 8GB; Thermaltake Water 3.0 Pro; Seagate 4TB SSHD; Corsair RM 650 PSU; Logitech Wireless Touch K400

ALL-IN-ONE APPLE IMAC 27IN

★★★★☆

PRICE $1949 **SUPPLIER** www.apple.com/au

If you can afford it, the 27in iMac is the finest piece of all-in-one engineering on the market. A truly powerful beast with performance to match its looks.

SPECIFICATIONS 2.7GHz Core i5-2500s; 4GB DDR3 RAM; 1TB Western Digital Caviar Black HDD; DVD writer; AMD Radeon HD 6770M graphics; 27in 2560 x 1440 LCD.

HANDHELDS ▼

SMARTPHONE HTC ONE M8

★★★★★

PRICE From $820 **SUPPLIER** www.htc.com.au

A beautiful, highly competent smartphone that's packed with clever features. Right now it's the best Android smartphone you can buy.

SPECIFICATIONS Quad-core 2.3GHz Qualcomm Snapdragon 801 CPU • Adreno 330 GPU • 2GB RAM • 16GB storage • 5in 1,080 x 1,920 display

TABLET APPLE IPAD AIR

★★★★☆

PRICE $539 **SUPPLIER** store.apple.com/au

The new iPad is pretty much the king of the hill when it comes to tablets, smaller and more powerful than ever before.

SPECIFICATIONS 9.7in 1536x2560 widescreen Multi-Touch display; 1GHz A5X processor, 16, 32 or 64 GB available; 3G and/or Wi-Fi connectivity; max 652g weight.

EBOOK READER KINDLE

★★★★★

PRICE $109 **SUPPLIER** www.amazon.com

The new model is quicker, slimmer, lighter and cheaper than before. If all you want to do is read books, its simple design and performance are perfect.

SPECIFICATIONS 6in e-Ink screen, 170g weight, 114 × 8.7 × 166 mm, 2GB memory, 10-day battery life . WEB ID 279534

PCS LAPTOPS ▼

VALUE ASUS T100

★★★★☆

PRICE $550 **SUPPLIER** www.asus.com.au

Thanks to Intel's new Atom CPU, the Transformer Book T100 delivers full Windows 8.1 in a tiny, affordable package – the netbook is back. The T100 delivers everything you could ask for, and it's ludicrously affordable.

SPECIFICATIONS Quad-core 1.33GHz Intel Atom; 2GB DDR3; 64GB eMMC; 10.1in 1366x768 Touch LCD; Wi-Fi; Ethernet; HDMI.

PROFESSIONAL APPLE MAC BOOK RETINA

★★★★☆

PRICE $3199 **SUPPLIER** www.apple.com/au

The machine that does everything right, and looks the part, too. We've chosen the top-end 2.3GHz i7 model with 16GB of RAM and a 512GB SSD plus GT 750M graphics.

SPECIFICATIONS 2.3GHz Intel Core i7; 16GB RAM; 512GB SSD; 15in 2880 x 1800 LCD; 1 x USB 3; 2 x USB 3; 2 x Thunderbolt 2; dual-band 802.11abgn Wi-Fi; Bluetooth 4; 3G

PERFORMANCE AORUS X7

★★★★☆

PRICE $2999 **SUPPLIER** aorus.com

Super-sleek, light, outrageously powerful and with a spec-list that outclasses many high end desktop systems.

SPECIFICATIONS Q4-3.4GHz i7-4700HQ • 4GB/8GB DDR3L 1600, 4 slots (Max 32GB) • 17.3" Full HD 1920x1080 • NVIDIA® GTX 765M SLI GDDR5 4GB • mSATA 128GB/256GB, 2slot 2.5"HDD 500GB/750GB/1TB 5400rpm

ULTRA PORTABLE LENOVO CARBON X1

★★★★☆

PRICE $2499 **SUPPLIER** www.lenovo.com/au

Lenovo inherited – and built upon – IBM's legendary ThinkPad build quality, and added a much-needed dose of style to this highly capable machine.

SPECIFICATIONS 2.1GHz Intel Core i7-4600U; 14in touchscreen (2560 x 1440); 8GB RAM; 256GB SSD; 802.11ac/abgn; Bluetooth 4

PERIPHERALS ▼

WIRELESS ROUTER NETGEAR R7000 NIGHTHAWK AC1900

★★★★☆

SUPPLIER www.netgear.com.au

802.11ac and Beamforming + technology that delivers fast and well-ranged performance.

SPECIFICATIONS 802.11ac Dual Band Gigabit wireless router; 5 x Gigabit Ethernet ports; 1 x USB 2; 1 x USB 3; simultaneous dual band; Beamforming +

DESKTOP STORAGE SEAGATE 2TB BACKUP PLUS DESKTOP

★★★★★

SUPPLIER www.seagate.com

This 2TB external drive still offers good value despite the rise of higher-capacity drives. The USB 3.0 adaptor makes for excellent transfer speeds.

SPECIFICATIONS 2TB external hard disk with NTFS; USB 3.0, with other docks available as optional; 44 x 124 x 158mm 894g.

NAS SYNOLOGY DISKSTATION DS214PLAY

★★★★★

SUPPLIER www.synology.com

The fastest NAS in our grouptest (*PC&TA 197*), with excellent media streaming capabilities.

SPECIFICATIONS 2.1GHz Intel Atom; 2GB RAM; 2 x USB 3 + 1 x USB 2; iOS and Androidmobile apps; RAID 0, 1, 5, 10; JBOD .

ALL-IN-ONE PRINTER CANON PIXMA MG5460

★★★★★

SUPPLIER www.canon.com.au

The winner of our most recent printer grouptest, this combines excellent print quality with decent costs and is just as good at printing photos as it is documents.

SPECIFICATIONS 9600 x 2400dpi print; 2400 x 4800ppi scan; USB; 802.11n WLAN; 125-sheet tray; 455 x 369 x 148mm

LASER PRINTER DELL B1160W

★★★★★★

SUPPLIER www.dell.com.au

The best all-rounder in our printer grouptest, with excellent text printing and decent costs.

SPECIFICATIONS 1800 x 600dpi resolution; USB 2; Wi-Fi; 150-sheet input trays; 331 x 215 x 178

SOFTWARE ▼

SECURITY KASPERSKY INTERNET SECURITY 2014

★★★★★★

SUPPLIER www.kaspersky.com/au

The winner of this year's security software grouptest, a big improvement over recent years, and a good solution for beginners and more advanced users. Kaspersky AV software runs well on even low-end machines, and operates relatively seamlessly and with a small memory and OS footprint.

BACK UP ACRONIS TRUE IMAGE 2013

★★★★★

SUPPLIER www.acronis.com.au

A clear and well-organised front end makes this easier to use than ever. Not much has changed from previous years, but it remains our go-to backup solution.

OFFICE SUITE MICROSOFT OFFICE 365 HOME PREMIUM

★★★★☆

SUPPLIER www.microsoft.com.au

The easiest to use Office to date.

WEB DEV ADOBE DREAMWEAVER CS5

★★★★☆

SUPPLIER www.adobe.com.au

This edition makes PHP and CMS its core focus, which gives it the new lease of life it so desperately needed.

AUDIO CUBASE 7.5

★★★★☆

SUPPLIER www.steinberg.net

The addition of better filters solidifies this program's continued place on the A-List.

VIDEO SONY VEGAS MOVIE STUDIO HD PLATINUM 11

★★★★☆

SUPPLIER www.sony.com.au

May not have the bells and whistles of other consumer editing packages, but its tools are efficient.

PHOTO ADOBE PHOTOSHOP LIGHTROOM 5

★★★★☆

SUPPLIER www.adobe.com.au

An excellent tool for photo management and light editing, as used by the pros and now available at a

KITLOG

We are on the cusp of quite significant changes to Kitlog. But not this month... With the new 9-series boards out and hot new CPUs from Intel due any day now, it's highly likely that we will be updating the motherboards and CPUs in Kitlog for both the Game Box and Perfect PC.

But that will have to wait. The current motherboards we reccomend still offer fantastic performance and value, and we haven't been able to take a close look at all of the great many new 9-series boards that have only just been released. We've had half a dozen new 9-series boards in our Labs, but our trip to Computex in Taiwan was a startling reminder that when a new chipset comes out, motherboard makers truly seize the day. A rough reckoning is that there are about 100 new 9-series motherboards out now, or in the next month or two... we need to take a closer look before jumping in with a new Kitlog inclusion. But, we promise to do that for next issue.

Similarly with the new CPUs, we will hold off on recommending Intel's latest until we have had a chance to properly test them, and alas they won't quite make it to the Labs in time to be considered this issue. That said, it's perfectly possible that we decide to keep the current CPUs unchanged if the performance gap in minimal and Intel prices the new chips higher than we think represents decent value.

THE GAME BOX

CPU

INTEL CORE I5 4670K
PRICE $275
Gamers can do without Hyperthreading and save $100 or more, compared to an i7. The K version is unlocked for easier overclocking.

MOTHERBOARD

ASUS ROG RANGER
PRICE $259
Fully featured, extremely well engineered and with respectable overclocking headroom, all running off a new Z97 chipset.

MEMORY

KINGSTON HYPERX BEAST 16GB
PRICE $240
Our roundup award winner, it's well-priced, fast and overclocks very well.

VIDEOCARD

GIGABYTE GTX 760 OC 4GB
PRICE $360
An excellent price/performance balance, and with 4GB of memory to handle high resolutions or games with large textures.

THE PERFECT PC

CPU
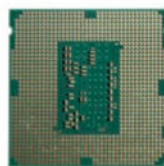
INTEL CORE I7 4770K
PRICE $400
Intel's top-of-the-line quad-core i7 delivers huge performance and can overclock easily to around 4.4GHz with the K version.

MOTHERBOARD

GIGABYTE G1 SNIPER M5
PRICE $275
We've upgraded this from the Sniper 3 to the newest model, which happens to also be $100 cheaper! Fully featured and fast!

MEMORY

CORSAIR DOMINATOR PLATINUM CMD32GX3M4A2133C9 32GB
PRICE $619
These memory chips are hand selected and tested, and 32GB of fast RAM will keep things smooth and fast in intensive tasks.

VIDEOCARD

MSI GTX 780TI
PRICE $800
This single-GPU powerhouse is cool and quiet yet has the power to push though anything effortlessly. Mature drivers and good cooling help.

Like to save big? We're the way to go.

SUBTOTAL: **$2742**   RIG ONLY: **$2123**

COOLER

COOLERMASTER NEPTON 140XL
PRICE $140
Easy to install AIO CPU cooling, relative quiet and performance to rival twin-radiator units.

CASE

BITFENIX RONIN
PRICE $99
Bitfenix continues to deliver great budget cases that look terrific and are easy to build in.

SYSTEMDRIVES

SAMSUNG 840 EVO 250GB
PRICE $190
Super-fast, cheap and space for the OS and your games.

WD BLACK 2
PRICE $340
An extra 128GB of SSD storage plus another 1TB of HDD space, all in a tiny 2.5in size.

KEYBOARD

RAZER ARCTOSA
PRICE $50
A cool-looking keyboard that'll serve you very well if you can't afford the jump to mechanical.

DISPLAY

LG IPS277L
PRICE $400
27 inches of IPS glory. The resolution isn't perfect, but the price is. The thin bezel makes this a very attractive screen.

MOUSE

TT SPORTS VOLOS
PRICE $89
The easy first choice at *PC&TA* HQ where we play hard and test every mouse. Also superb value.

AUDIO

TT ESPORTS CRONOS
PRICE $80
Fantastic set of headphones that delivers great 2.1 audio for gaming and music without swamping you with bass.

SOUND BLASTER X-FI XTREME
PRICE $80
The best positional game audio and pretty good music quality, too.

POWER SUPPLY

CORSAIR CS650M
PRICE $140
It's quiet, reliable, and at 650W is more than we need for this build, but has the headroom for additional graphics.

SUBTOTAL: **$5192**   RIG ONLY: **$4198**

COOLER

CORSAIR H105 WATER COOLER
PRICE $160
Best-of-breed cooling plus nice and quiet equals a happy CPU.

CASE

COOLER MASTER COSMOS II
PRICE $400
The only case you'll ever need. Premium luxurious bliss.

SYSTEMDRIVES

SAMSUNG 840 EVO 1TB SSD
PRICE $680
Samsung has conquered the market with its 840 EVO, so fill up with 1TB of incredible speed and storage.

WD BLACK 2
PRICE $340
Supplement the EVO with this hybrid drive and 128GB of SSD + 1TB of HDD space.

KEYBOARD

CORSAIR VENGEANCE K95
PRICE $179
The perfect keyboard. Lovely Cherry Red mechanical switches, a slick and attractive aluminium body and customisable backlighting make this The One.

DISPLAY

ASUS PB278Q
PRICE $690
One of the best 27in monitors on the market, with a pricetag that makes us forget the competition even exists.

MOUSE

RAZER OUROBORUS
PRICE $125
An excellent performer and highly configurable mouse that suits both left- and right-handers.

AUDIO

ASUS XONAR ESSENCE ST/X
PRICE $175
The go-to card for perfect music quality, though the motherboard's onboard sound is fine if this isn't so important to you.

POWER SUPPLY

CORSAIR AX1200
PRICE $349
Reasonable value for this mighty power unit, delivering stable power and able to handle quad-graphics.

www.brennanit.com.au/shop

BRENNAN IT
online tech store

12 ISSUES FOR JUST $75

Subscribe to *PC & Tech Authority* today and you'll receive 12 issues for only $75 - **that's just $6.25** an issue! You'll have a year's worth of magazines delivered direct to your door, and **SAVE OVER $44 ON THE COVER PRICE!**

Subscribe online at
www.mymagazines.com.au

HOW TO

Each month our experts get under the hood to provide you with detailed How To guides on hardware, software and everything in-between.

SYSTEM BUILDER:
Lounge PC — the final bits

DAVID HOLLINGWORTH CLEARS UP A FEW THINGS ABOUT HIS LOUNGE PC BUILD FROM ISSUE 199.

So, normally with our letters, we normally pass them on to the biggest brain the house, Dan Rutter, to answer, or we just respond on our Inbox page if they're more general. However, we've had a couple of enquiries from readers that's worth touching on in more detail – so that's this month's System Builder topic!

A READER WRITES…

I enjoyed your article on the perfect lounge pc, but there was something that I felt was sorely missing.

That is: what software do you recommend to run on it? You mentioned that it would be part home theatre, part NAS. This is exactly what I need - I'm not really into gaming that much (sorry), but my son is, so I do like the specs you have put together.

One other thing is what is the model of 4TB drive? I am having a little trouble working out which one you used. I take it that it is a hybrid SSD and mechanical drive. I have priced the components and they add up to approx. $1500 here in NZ, so that is fairly comparable to your cost given the exchange rate.

    Richard.

Well, to start with, at the most basic level we need to choose an operating system. It's actually a little more difficult than you might think, but – personally, at the least – since we want this to be a versatile system capable of taking advantage of a full range of games, some flavour of Windows is the best choice.

At home, I have a relatively old install disc of Windows 7 I am jealously guarding, since I'm somewhat of an old man and fear change. That's what I've installed on my build, but Windows 8 would be just as serviceable. Of course, this

► The media centre PC we recently built

decision is also influenced by what the rest of your network is running. In my case, that's mostly Windows PCs, so that's the choice I'm taking. Your own mileage may vary.

One of the neat things with continuing with Win 7 is that it comes with Windows Media Player

> ## "This is a great solution for most media consumers, but it's not perfect."

as standard. On Win 8, you've got to shell out more cash for the media center functionality; on the upside, it is an excellent front-end for browsing and watching media, and with a video card thrown into your loungeroom PC, can even double up as a DVR.

By default, WMC will only look for videos in your My Videos folder,

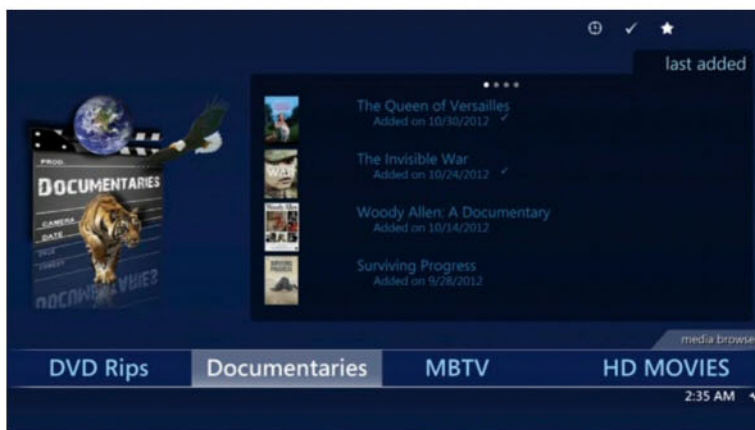► No more searching through oddly named files

and so on for other media types, so if you have content elsewhere, go into the Settings for the program and tell it where to look. It will then stay automatically connected, and even give you options to download album covers for all your music.

This is a great solution for most media consumers, but it's not perfect. For instance, it will not play .mkv files, and if you have a collection of Blu-rays that you've backed up digitally, chances are that's exactly the format they'll be in.

Thankfully, there's a solution. Advanced Codecs for Windows 7 and 8 (currently at version 4.6.4 as of May this year: http://www.majorgeeks.com/files/details/win7codecs.html), pretty much ditches all your current codecs, and completely updates them so that your PC can play just about anything, including .mkv files. Be careful, though, as unless you say otherwise,

ALTERNATIVES

Unsurprisingly, there's a wide range of different ways to set up a media PC. The Win8/WMC combo is probably the most convenient solution, but it's not for everyone. Here's a few different ways to approach setting up your loungeroom media machine:

XBMC - If you're looking for an alternate to Windows Media Center, XBMC is open source media player designed not just for PCs and mobile devices, but also for large televisions. It can handle a range of media formats, including MKV files, can sort photos and music, and even features a range of optional add-on functionality for other services, such as the popular Reddit and Soundcloud.

It runs like any other media player on Windows, or you can go with XBMCUbuntu, a dedicated media player OS – though that set up is a little more involved.

OpenELEC - Standing Open Embedded Linux Entertainment Center, OpenELEC is another complete Linux distro designed around the XBMC model. It's free, doesn't take up much space, and is designed with lower-powered hardware (such as Intel Atom builds) in mind.

◀Smartphone or tablet apps offer a cheap or free controller

"**I like the idea of a control device that's a little bit more discrete**"

you'll end up installing a range of bloatware, so make sure you pay attention during the install process.

Otherwise, once installed, you can then go into the Settings, and to the MKV tab, and check the boxes labelled "Disable the DivX Media Foundation Splitter" and "Enable Linked files(Haali)".

With that done, you need to install the x64 Components Add-on (http://www.majorgeeks.com/files/details/x64_components.html). Again, avoid bloatware, head into Settings to the MKV tab, and check the same boxes.

And everything should then work just fine.

Of course, if you're happy operating without a fancy front-end, that's possible too. Everybody has different attitudes about audio, and since it also may be informed about

▼ Media centre PCs are the future of archived media

your mobile devices, it really is up to the individual. WMC does the job just fine, and we were pretty fond of iTunes for a while, bit at the moment we're feeling a deep affection for Google Play Music.

For $10 a month, you can access all the music on the service, download it to your phone (well, if you're in the Android ecosystem, so – again – your mileage may vary), and even upload your own ripped music to the cloud, so it's a kind of best of both worlds perfect solution.

Finally, for video, you really can't go wrong with DivX itself: http://www.divx.com/.

As to the drive, this is the exact model we're using right here: http://www.seagate.com/internal-hard-drives/solid-state-hybrid/desktop-solid-state-hybrid-drive/

ALTERNATE HARDWARE
We also had a helpful suggestion from another reader:

System builder, June 2014, lists the Logitech K400 as a suitable keyboard for this build, and it will do what is required, however, I suggest that the Logitech TK820 keyboard would be a better option. Has a larger track-pad making it easier to use, works with Windows XP and above. Slightly more expensive however.

Cheers
Tony

This is something we talk about lot – when it comes to peripherals, one person's solution is not going to fit all.

One of the things that appealed about the K400 was size and price. Regarding the former, with limited lounge space, I like the idea of a control device that's a little bit more discrete. In regards to the later, saving pennies is always good, but in this particular instance it was a drinks spill that killed my last keyboard, and given how often there's drinking in my loungeroom, I don't want to be destroying an expensive keyboard every time my cat knocks a glass of water over.

There are other ways to control your home theatre PC that are a bit more loungeroom-traditional, too. There's a number of universal remotes that are also designed to work with HTPCs, give you an all in one device that can work not only for your PC, but your receiver and any other connected devices.

Alternately, if you've a recent smartphone, you can find a range of apps for pretty much every OS under the sun that will turn your phone into a remote control. Plex Constellation for iOS, Gmote for Android, and much more are all easy to set up and use. The only issue is that it can really lead to remote control arms races, as everyone in your loungeroom with a smartphone could potentially hijack your television.

14cm fan for better cooling

PSU status monitor

Cable management

What the critics say:
The Thermaltake Toughpower XT 875W offers a great combination of features, aesthetics, quality, versatility, and performance. If you're a person that appreciates quality design and construction, then the Toughpower XT 875W will not disappoint you. – Pure Overclock

HOW TO:
Get Netflix now

IT'S THE LEADING SOURCE OF ENTERTAINMENT ON THE INTERNET, AND AUSSIES ARE BANNED FROM USING IT. THAT CHANGES NOW. **ADAM TURNER** BREAKS DOWN THE WALL.

Frustration with Australia's free-to-air television and internet video services has driven many people to piracy over the years, but there are alternatives if you're prepared to bend the rules. It's not hard to bypass the geo-blocking which keeps us out of US streaming video services like Netflix, letting you pay your way rather than download media content for free via BitTorrent.

It's worth pointing out that Netflix isn't the Holy Grail some people make it out to be. You won't find shows the day after they screen on US television. When it comes to HBO shows like *Game of Thrones* you won't even find old episodes let alone new ones. Australia's Quickflix has dropped its prices and expanded its library in the last few years, so it's worth comparing Quickflix with Netflix to see if the local option meets your needs.

SHUT UP AND TAKE MY MONEY
Netflix isn't officially open to Australians, so you need to be a little creative when it comes to signing up and handing over your money.

The easiest way to access the Netflix website is to install a browser plug-in such as Hola <hola.org> or Media Hint <mediahint.com>. These can trick Netflix into thinking you're visiting from the US. Rather than the usual "Sorry, Netflix is not available in your country" warning, you'll see a big blue button inviting you to start your one month free trial. The basic Netflix plans only stream to two devices at once. If that's not enough for your needs, consider upgrading to the four-user family plan.

Sneaking into Netflix is an ongoing game of cat and mouse, so your mileage may vary when it comes to payments. Avoid using an

> ## "Sneaking into Netflix is an ongoing game of cat and mouse..."

email address ending in .au, it might be easier to set up a fresh gmail account specifically for all your geo-dodging activities.

Netflix accepts a wide range of Australian credit cards, although
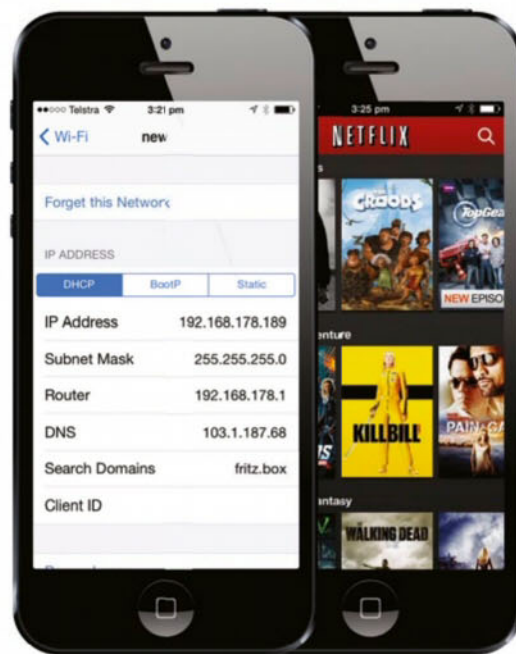
▲ Enjoying Netflix content on your iOS device isn't complicated, but does require that you manually configure the DNS servers.

you need to enter a valid US mailing address and phone number. Googling the details of any major US fast food or coffee chain should do the trick, but go a step further and opt for a state such as Delaware or Oregon which doesn't add sales tax.

If you don't have any luck, try connecting your Netflix account to a US PayPal account. Alternatively you might try a pre-paid Visa card or a virtual credit card service like EntroPay. Netflix's gift card service <netflix.com/gift> had been offline for several months at the time of writing, but even if you have a gift card you still need to register a payment method.

LET ME IN
Once Netflix accepts your money it's simple to sneak past the relatively simple geo-blocking.

If you're only watching on a computer then it's easiest to stick with a browser plug-in like Hola. Alternatively you might use a Virtual Private Network service like WiTopia, or experiment with proxy servers like hidemyass.com and proxy browser plugins such as FoxyProxy. VPNs and proxy servers don't always offer sufficient bandwidth to stream video smoothly, so it can be a case of trial and error.

If you want to watch Netflix on your home entertainment gear then the easiest option is to use a

▲ Apple TV is a simple UI yet still allows advanced settings.
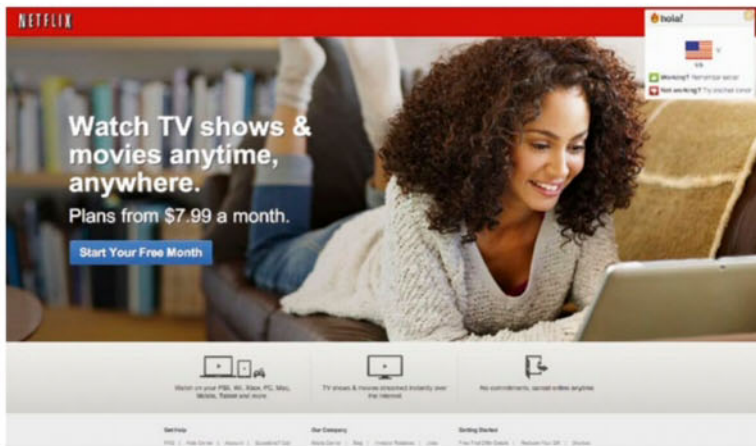
▲ We use Hola.org to easily bypass geo-blocking and access Netflix on a PC. This method involves no manual configuration whatsoever and is the easiest method of all.

"**Apple's little media player offers one of the easiest ways to watch Netflix on your television.**"

▼ As with iOS, the proceedure for Android includes a custom DNS configuration.

▲ Even the tightly controlled media environment of the Xbox One presents little obstacle to defeating geo-blocking. An expensive Xbox Live account isn't required either.

DNS-based geo-dodging service like Unblock US, UnoDNS or Unlocator. If your Netflix playback device lets you edit its DNS settings, use their DNS servers instead of your ISP's DNS servers. If you can't change the DNS settings on your playback device, try changing them in your broadband modem – which applies the change to every device connected to your home network unless you override it on the device.

SIT BACK AND ENJOY

With your virtual Green Card enabled, it's time to check out what's on offer from the land of the free. Unless you're happy to only watch Netflix on your computer, the final step is to install the Netflix app on your playback device.

Methods vary, but here are a few tips for some of the more popular Netflix-compatible devices that you'll find in Australia – if you're using geo-dodging DNS settings in your modem then the job is half done. If you get stuck, Unblock US offers set up guides for various devices which might help. It often requires a reboot for these settings to take effect.

APPLE TV

Apple's little media player offers one of the easiest ways to watch Netflix on your television. You don't need a US iTunes account, just switch to the US store on the Apple TV and the Netflix app appears on the home screen. Next go to Settings, General, Network then set Configure DNS to manual and switch it to your DNS-based geo-dodging service.

Now pull the power on the Apple TV, count to 10 and plug it back in. If you see an "ATV-ui93" error when

accessing Netflix, try pulling the power again.

ANDROID/ IOS

To watch Netflix you can use the iOS/Android built-in VPN client, use a third-party app, change your modem's DNS settings or else dip into the device's Wi-Fi settings to manually configure the DNS servers. But you'll also ned to create a US account in order to download the Netflix app from the US app stores.

For iGadgets, log out of iTunes on your computer, switch to the US store by clicking on the flag, download the free Netflix app and follow the prompts to create a new Apple ID. You don't need to add a payment method to your iTunes account – if you're asked to verify your payment information, click
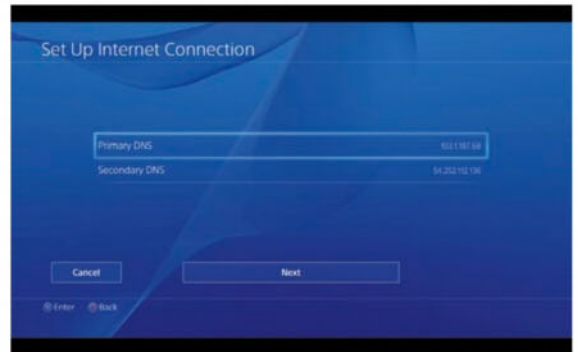
None as the payment option. You can use iTunes to transfer the app to your iGadget, or else you can log in from your iGadget.

To access the US Google Play store on Android you need to use the VPN client or install a VPN app like the free TunnelBear. Turn on Airplane mode and switch Wi-Fi back on then run your VPN. Now go to Settings, Application Manager, Google Play Store and press Force stop and Clear data.

You still won't find Netflix if you're logged into your Australian Google Play account. Go to Settings, Accounts, Add Account and create

PLAYSTATION 4 & PLAYSTATION 3

The first step is to create a US PlayStation Network account at us.playstation.com/psn, you don't need to mask your location. Now power up your PS4 and go to Settings, Network, Set Up Internet Connection, choose LAN or cable and then Custom. Choose the default options except for DNS where you manually enter your geo-dodging servers. Now go back to the Power menu and select Log Out of PS4. Create a new user and use your new US PSN details. The Netflix app will appear on the home screen under TV

> ## "To access the US Google Play store on Android you need to use the VPN client or install a VPN app"

a new Google account to act as your US alias. Now when you open the Play Store and pop out the menu on the left, there's a drop down arrow next to your email address, letting you switch accounts. Switch to your US account, search for Netflix and install. If the Netflix app doesn't show up in the app store, search for it in the browser and click on the link to view it in Google Play.

Once the Netflix app is installed you can disengage the VPN and use your geo-dodging method of choice. The method for changing your DNS settings varies between devices, but try long-pressing on the Wi-Fi network, selecting Modify Network Config and then switching the IP settings to static.

and Video, install the app and you're up and away.

Setting up on the PS3 is very similar. Go to Settings, Network Settings, Internet Connection Settings and then go through a custom set up but choose all the defaults except for the DNS servers. Now create a new user based on your US PSN account and launch the PlayStation Store (tell it you live in the US). Login with your US PSN details and install the Netflix app from the store. If this fails, try this workaround from Unblock US <tinyurl.com/6osbo6v>.

If you have no luck with DNS workarounds on either console, try running your console over a VPN (see Smart TVs and Blu-ray players).


▲ Gaining access to the Netflix app means creating a new US-based account to get it going.

▲ Wii U consoles can be surprisingly effective media devices, and aren't difficult to configure.

XBOX ONE & XBOX 360

Start by creating a US Xbox Live account online at xbox.com/en-US/live. You don't need to mask your location, nor do you need to subscribe to Xbox Live Gold in order to watch Netfllix – click on the Xbox Live Gold menu item and choose join Xbox Live. Now just sign up with your US address and new geo-dodging email address.

Now fire up your Xbox One and press the options button on the controller and go to Settings, Network, Advanced and change the DNS servers. Now add a new account based on your US details and go into Settings, System, Language & Location and switch to the United States. Now you'll find Netflix in the app store.

It's a similar story on the Xbox 360. Go to Settings, System,
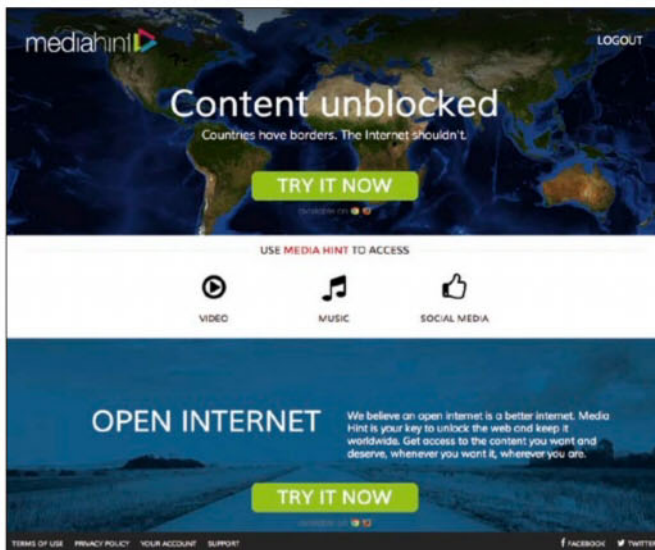
▲ Mediahint is the latest in a wave of slick and simple unblocking apps.
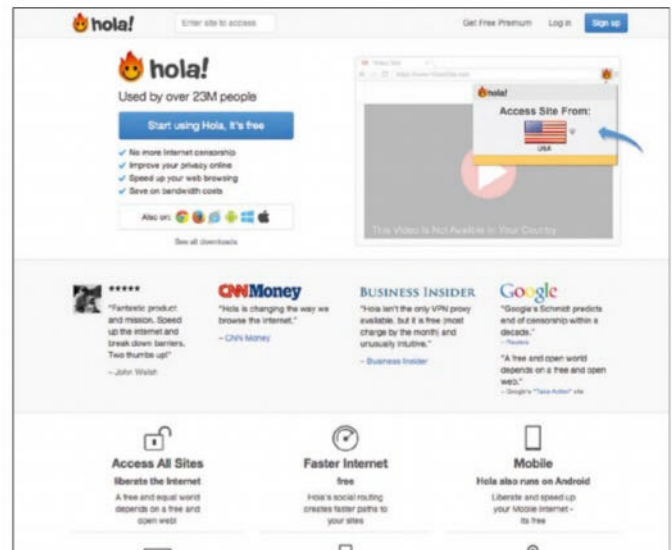
▲ Besides Netflix, Hola can access many other interesting content sources.

Network, choose wireless or LAN and set the DNS servers manually. Now reboot and download a profile – you new US Xbox Live account. Netflix is waiting for you in the app store. If you have trouble logging into your US account, try deleting the profile from your Xbox 360 and downloading it again.

If you have no luck with DNS workarounds on either console, try running your console over a VPN (see the 'Smart TVs and Blu-ray players' guide below).

WII U & WII
With the Wii U, go to Settings, Console Information and set your country to United Kingdom. Now go to Settings, Internet and press the A button. Click on Connections, select wired or wireless, change settings and then edit the DNS servers. Next add a new user (click on your avatar at the top left of the home screen), choosing London as the city, then and log in as that user where you'll find Netflix in the UK eShop.

As for the Wii, go to Wii Options, Wii Settings, Internet, Connection settings and open the active connection, then choose Change Settings. Click the arrows to the right and Set Auto-Obtain DNS to No and open Advanced settings to change the DNS servers. Next go to Wii Settings, Country and select United Kingdom. Now open the Wii Shop channel and search for Netflix under Wii Channels.

SMART TVS AND BLU-RAY PLAYERS
Every device is different so you never know your luck with internet-

enabled home entertainment gear – Google is your friend here. Start by switching the device's DNS settings to your geo-dodging service (or changing them in your modem). A reboot and/or refreshing of the app store might see the Netflix app finally appear.

If this doesn't work, try running a VPN on a notebook – with the notebook connected to your Wi-Fi network and the TV or player connected to the notebook's Ethernet port. Alternatively you could connect to your home network via Ethernet and create an ad-hoc Wi-Fi network for your home entertainment gear.

If your home entertainment gear doesn't like your ad-hoc network try creating a true Access Point, which might require using a USB Wi-Fi dongle rather than the built-in Wi-Fi card. This can be a hassle to set up, if you get stuck try Connectify

▶ Until Netflix is legitimately available locally, bypassing geo-blocks lets you access it via your TV just as it will be some distant day in Australia's future.

<connectify.me>. Once you've got access to the Netflix app you might be able to kill the VPN and just rely on a DNS workaround.

CHROMECAST
Like the first batch of Chromecasts from the US, the Australian-issued Chromecasts are programmed to ignore your DNS settings and look for Google's DNS servers. This means using Unblock US or UnoTelly DNS settings in your modem isn't enough to get into Netflix. One way around this is to run both the Chromecast and the device running Netflix behind a VPN (see Smart TVs and Blu-ray players). Alternatively, if your modem supports static routing you can block access to Google's 8.8.8.8 and 8.8.4.4 DNS servers. At this point the Chromecast will fall back to your modem's default DNS settings – which should be set to your geo-dodging DNS service. ■

HOW TO :
Encrypt your phone, tablet and PC

DAVE STEVENSON TRIES OUT THE APPS THAT CAN HELP YOU PROTECT SENSITIVE INFORMATION ACROSS ALL YOUR DEVICES

When it comes to data security, we're all living in the past. A decade or two ago, securing your data was relatively simple. Without a persistent internet connection, the risk was essentially limited to someone stealing your desktop PC from your home, or pinching a floppy disk from your bag.

We know things have changed, so why haven't we changed our security habits? Consider this: your data is almost certainly spread across a laptop, a smartphone and a tablet, each of them highly portable and easy to steal. The nature of the data we store on computers has changed as well. Documents and spreadsheets might hold sensitive information, but the contents of your inbox, photo editor and web browser are much more personal, and could prove financially disastrous if they fell into criminal hands. Those who use their personal devices for business may have even more to fear.

The answer is encryption. It's available across all platforms, it can be invisible in use and – crucially – modern systems are effectively unbreakable to someone not in possession of the appropriate password.

TYPES OF ENCRYPTION

Encryption arguably went mainstream in 1991 with Pretty Good Privacy (PGP). Phil Zimmermann's free encryption software offered 128-bit encryption to anyone who downloaded it – a military-grade degree of security that at the time qualified as a "munition" under US law, causing Zimmermann to come under criminal investigation. PGP and its derivatives are still used today: the free version was discontinued after Symantec acquired the company in 2010, but the source code remains open to all.

The modern standard for encryption is Advanced Encryption Standard (AES), which in 2003 was approved by the US National Security Agency for the encryption of top-secret data. Today, AES is used in Apple's iOS devices, in Windows' BitLocker software and

> ## "Even 40-bit security, with its trillion combinations, is considered insecure..."

also seen in Android's own native full-file-system encryption.

Other types of encryption in use include RSA and SHA; in practice, it doesn't normally matter which you use. A bigger issue is the size of the key – that is, the secret code number that's used to scramble your data. Key length is measured in bits, so a one-bit key could be either "0" or "1", and could be cracked by simply trying both possibilities. An eight-bit key has 256 possible combinations, so would take much longer to defeat by such a brute force attack.

With the amounts of computing power available today, even 40-bit security, with its roughly trillion different combinations, is considered relatively insecure: with dedicated hardware, such a key could be guessed in less than a day. The 128-bit keys that are commonly used today present more than a trillion times as many possible combinations. A modern computer, given a document encrypted with 128-bit encryption and a billion-year head start, would probably

BitLocker encryption is powerful and easy to use – but is sadly only included in top-end editions of Windows, such as Windows 7 Ultimate and Windows 8 Pro

a 48-character recovery code. Microsoft also allows you to save recovery keys to its OneDrive service. You'll find BitLocker in the control panel under System And Security; choose BitLocker and click on "Turn on BitLocker" to begin the process of encrypting your hard disk.

BITLOCKER TO GO

BitLocker doesn't just offer encryption of your main hard disk: BitLocker To Go can also encrypt the contents of USB storage. It's found in the same versions of Windows 7 and 8 as BitLocker, and doesn't require either a TPM module or a second USB device to store the key. To access an encrypted device, you simply plug it into a Windows 7 or 8 PC (any version can unlock the encryption) and enter the password.

You can turn on BitLocker To Go from the same place as you activate the standard version of BitLocker: if there's a USB device attached to your PC you can simply choose "Turn on BitLocker". You'll then be prompted to select a password, and the process of encryption will begin. The larger the drive, the longer this process takes: in our tests, a 4GB drive took the better part of 20 minutes. Turning on BitLocker To Go also prompts you to either print or save a BitLocker Recovery Key, which you can use in the event you lose the original password.

BitLocker isn't the only encryption baked into Windows. The Encrypting File System (EFS) has offered per-file or per-folder encryption since Windows 2000, although again it isn't present in all versions of Windows: only the Business, Enterprise and Ultimate editions of Windows Vista and 7 support it, and only the Pro and Enterprise varieties of Windows 8.

If you have EFS then you can encrypt any file or folder on an NTFS drive by going to the Advanced section of its properties dialog box and clicking "Encrypt contents to secure data". This encrypts files using a key that's linked to your

still be struggling on towards an eventual solution even today.

In other words, if you encrypt a document with the 128-bit encryption available on most devices, a data thief has no realistic chance of breaking in by brute force.

Be warned, though: if your encryption is protected with a poor password, an intruder could unlock your data through guesswork, making the strength of the encryption system itself entirely irrelevant.

ENCRYPTING YOUR PC WITH BITLOCKER

There are several options when it comes to encrypting your PC, but since Windows Vista BitLocker has provided out-of-the-box encryption for Windows Ultimate and Enterprise users – and for users of Windows 8 Pro (although not Windows 7 Professional). BitLocker is based on 128-bit AES encryption, or for ultimate peace of mind you can opt for 256-bit encryption instead. BitLocker provides whole-disk encryption, so instead of simply protecting your "My Sensitive Documents" folder, you'll be encrypting your entire startup disk.

BitLocker is at its most convenient when used on a computer with a Trusted Platform Module (TPM), which stores the decryption key. In this scenario, you'll be prompted to provide a PIN or password ("startup key") each time your computer starts up. This key confirms your identity to the TPM, which then unlocks the disk. The advantage of doing it this way is that if your disk is stolen and installed in another PC, it will be completely impossible to unlock, even to someone who knows
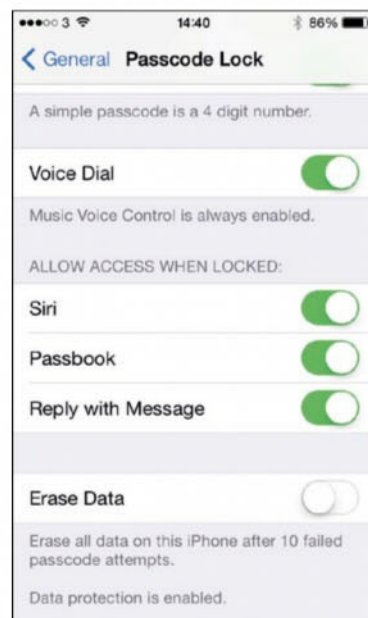
Once you protect an iOS device with a passcode, data and operations become tightly locked down

your startup key, as the actual decryption key remains hidden away inside your TPM. BitLocker can also be used without a PIN or passcode, to protect you against thieves or malware tampering with your PC, but it's no help if your entire computer is actually stolen.

As an alternative to a TPM module, you can store the BitLocker decryption key on a USB flash drive, as long as your PC can access USB devices during boot. Arguably this is more secure than using a built-in TPM, as if your laptop is stolen, it won't be bootable without the USB device. (Indeed, even if your laptop bag is stolen with your USB key inside, it won't be obvious how the two actually work together.)

If you lose your USB key, however, you'll need to use BitLocker's recovery feature; this involves either keeping a spare USB device, or manually entering

Windows user account, so there's no password as such; your data is always fully accessible while you're logged on, but encrypted files can't be accessed by other users, and will be unreadable if the disk is moved into another PC or is accessed from environments outside of Windows.

As well as working only on certain editions of Windows, both BitLocker and EFS lack multiplatform support, so they're not for everyone. One free option for Windows, OS X and Linux (as well as RISC OS and VMS) is GnuPG (**www.gnupg.org**). Besides encrypting files, it can integrate with Microsoft Outlook and other email clients, allowing you to encrypt and sign emails with a single click.

It's also possible to buy hardware with built-in encryption. A root through Amazon's shelves reveals a range of AES-equipped USB drives. For a shade under $20 you can buy a 4GB USB drive with 256-bit encryption built in, offering on-the-fly protection without needing extra software. Spend a little more and you can move up to the upscale USB 3, 4GB Kingston DataTraveler, which for around $30 offers 256-bit AES encryption, waterproofing to a claimed 4ft depth, and automatic data self-destruction after ten failed access attempts.

PROTECT YOUR IPHONE

Apple's iPhone is heavily marketed as a consumer device, but it's also made formidable inroads into businesses. That's partly thanks to a powerful security framework that makes today's iOS devices among the most secure handhelds available. Every iOS device uses 256-bit AES hardware encryption by default, and each device Apple makes includes a per-device key.

This doesn't mean everything on your iPhone is automatically secured against intruders. By default, as long as a device can be powered up, certain files and information, including photographs, messages and contacts, can be retrieved without any need to authenticate.

Once you attach a passcode to an iOS device, things get more serious. The passcode is "tangled" with your device's built-in key to enable what Apple calls "data protection", which encrypts your email and stored passwords, preventing access no matter how a device is accessed. If there's a weak point, it's the quality of the passcode you choose: the default four-digit passcode might be convenient, but a six-digit code, with the option to automatically wipe the device after ten wrong guesses, virtually guarantees a brute-force attack won't succeed.

If you want to encrypt other data on an iPhone or iPad, you'll need to look at third-party apps. Fortunately, apps are able to draw on iOS's encryption hardware, so there are plenty about. Photo Safe Pro, for example, is free and uses 256-bit AES encryption to protect photos.

In the event that your iPhone or iPad does fall into the wrong hands, because everything on an iOS device is encrypted, its data can be securely erased by simply wiping the encryption key and generating a new one. After this is done it may in theory be possible to recover old files from the iPhone's flash memory – but without the encryption key it will be impossible to decode them. The process takes seconds, rather than the hours it might take to securely overwrite every file in turn, so if your device is stolen you can securely wipe it almost instantly.

PROTECT YOUR ANDROID DEVICE

The out-of-the-box encryption available on Android devices works similarly to the whole-disk approach of Windows' BitLocker, so once you activate it, everything on the device is scrambled. To activate it, head to Settings, then Security, then choose "Encrypt device". The process of encryption is a long one – allow an hour, and longer if you own a device with a lot of onboard storage. Once it's done, you'll be prompted to enter a PIN or password every
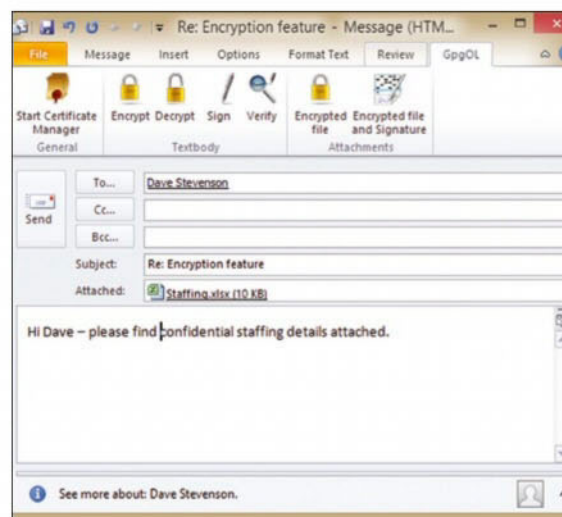
▲ Open-source software for Windows and OS X can encrypt email as well as individual files

▼ It's possible to buy USB flash drives with built-in hardware encryption

time you turn on your device. You can also choose to encrypt your external storage, if your device is equipped with the required microSD expansion slot.

Android's built-in encryption system isn't without compromises. Not only does the initial setup take a long time, it's handled in software – so you may see an impact on performance as processor cycles are diverted to the job of decrypting every single file and app that loads in from memory. It's a one-way street, too: if you decide you no longer want to use encryption, the only thing you can do is perform a factory reset.

As with iOS, there are plenty of third-party alternatives available on Google Play. For cloud-storage users, Boxcryptor will allow you to access and secure files stored on Dropbox and Google Drive, while the free app Secret Space Encryptor offers not only file encryption but a host of security tools. You can encrypt individual pieces of text, for example, or scramble entire files or folders using industry-standard, 256-bit AES encryption.

You could also try the excellent EDS Lite, which is also free. This allows you to create encrypted container files on your Android device to store your sensitive information.

ENCRYPTION AND THE CLOUD

In a multi-device world, cloud storage and services such as Dropbox and Google Drive are more useful than ever. If you plan to use such tools in a corporate environment, however, questions of security loom large. Both Dropbox and Google Drive store your data on

▼ WALKTHROUGH Use SSE to encrypt files on your Android device

▲ The main screen of SSE, a free Android app, is a simple dashboard: you can opt to add passwords to a cache of saved passcodes, encrypt strings of text and individual files or folders, or visit the Other Utils section. The latter offers handy tools such as a password generator and the option to securely wipe your device's clipboard – useful after copying sensitive text for encryption..
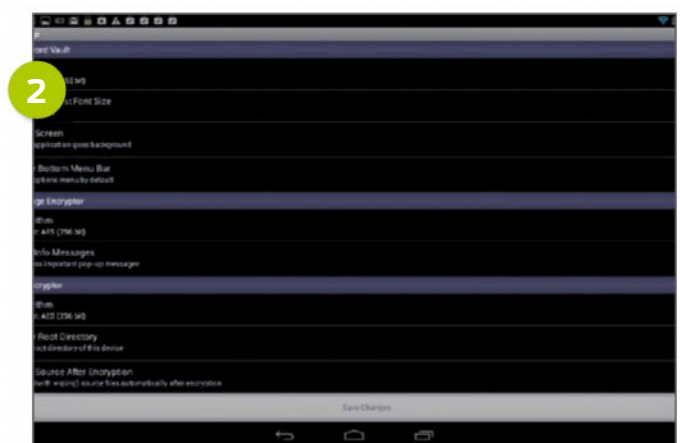
▲ To get started, tap Settings in the bottom left. Here, you can opt to lock SSE if you stop using it temporarily, and choose your encryption algorithm. You get a range of options; 256-bit AES is more than strong enough to defeat hacking efforts. The Settings menu also contains the option to securely erase files once an encrypted version has been created..
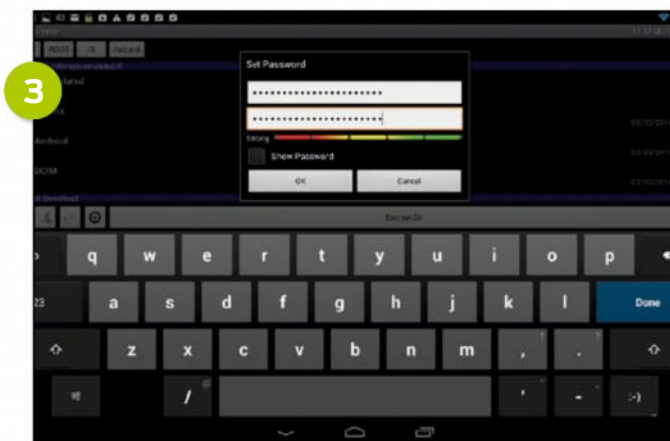
▲ The file encryptor is simplicity itself: simply navigate through your folders until you find the file you want to protect (any file type works), and tap Encrypt File. You'll be prompted to enter a password (this is where the password generator can help), after which your file is encrypted. You can also tap and hold a directory to allow SSE to encrypt a folder and everything in it..

▲ Files encrypted by SSE aren't limited to use on other Android devices. At www. pcpro.co.uk/links/238id1 you'll find Windows and OS X versions of SSE. Once the application is installed on your desktop, you can drag and drop SSE-protected files onto its window to decrypt them – although you'll need to know which encryption algorithm was used..

their servers in encrypted form, but they also manage the actual keys themselves.

This means the process of encrypting and decrypting files is conveniently transparent for the user, but it also means that both Dropbox and Google could in theory deliver your data to a third party in decrypted form, if legally required to do so (or somehow tricked into it).

If you want to combine the convenience of cloud storage with the benefits of unbreakable encryption, you'll need to encrypt your data yourself before then uploading it.

Boxcryptor (www.boxcryptor. com) is a tool for Windows and

OS X that can perform local, 256-bit AES encryption on your files before they're synced with your cloud service. Install Boxcryptor and an encrypted virtual drive is created on your PC. Folders within Dropbox, Google Drive or OneDrive storage can then be added to this virtual drive; and files saved will be encrypted locally, before being committed to a cloud host's storage. Even in the face of a court order, it will be impossible for the contents to be exposed without your say-so.

It's also possible to use cloud storage to host an encrypted container file, such as one created by EDS Lite. To set this up, create a new virtual drive in the regular way

and place the container file inside a cloud-synced folder.

This approach does negate some of the benefits of cloud storage, though. Your files won't upload immediately to the cloud – you'll have to unmount your virtual disk before it can be synchronised. And you'll need a compatible encryption client installed on every device you want to use to access your secure files. That's not as problematic as it may sound, though: Boxcryptor offers a Chrome browser plugin that allows you to connect to a cloud-storage service for file browsing, as well as native Android and iOS apps. Support for Windows Phone and Windows RT devices is coming soon.

The best reason to buy an iPad

Your favourite technology magazine now has an iPad edition featuring everything you love in the magazine plus exclusive extras each month including additional photography and video. Change the way you view your tech. Head to iTunes now to download the app.

Mourning a lost decade

IT'S BEEN A DISAPPOINTING TEN YEARS FOR MICROSOFT, BUT **JON HONEYBALL** IS HOPEFUL THAT THE COMPANY IS FINALLY GETTING A CLUE

April was a rather bitty month, in which a lot of important things happened. Some of this was fallout from the Microsoft Build Developer Conference, which I wasn't able to attend, having prior engagements in Japan. That meant I missed the annual National Association of Broadcasters event, too, which was equally annoying. As you'd expect, there was a lot of noise from Build – some exciting things were deliverable immediately, and many more interesting things are to follow in the future.

One item of huge importance to Windows developers is the convergence of development tools for the various platforms. This step is long overdue, and has been a considerable thorn in the side of Windows Phone developers. The Windows Phone market is still struggling, despite a few interesting ideas being brought to the table. I'm still far from convinced this convergence of tools will be radical enough to wrestle away any significant market share from Android and iOS, but it's clear since the acquisition of Nokia that this story isn't over just yet. Helping

> "Ballmer knew that Windows 8 was in trouble long before it shipped."

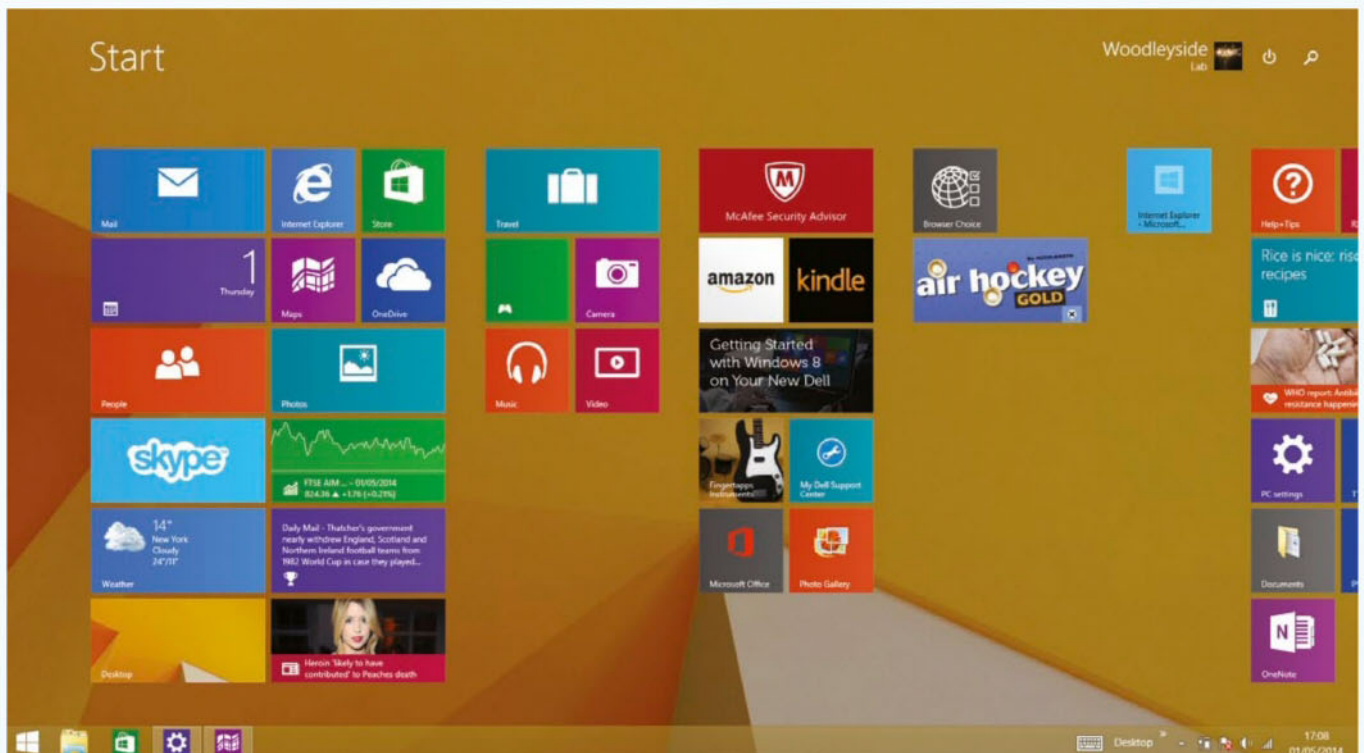▼ I'd go so far as to say that Windows 8.1 Update is as good as Windows 7

developers to generate code is always a good idea, and it must be remembered that Microsoft has a long-standing and very strong development-tools story. Indeed, development tools are one of the market areas in which Microsoft has delivered strongly (along with server and cloud systems).
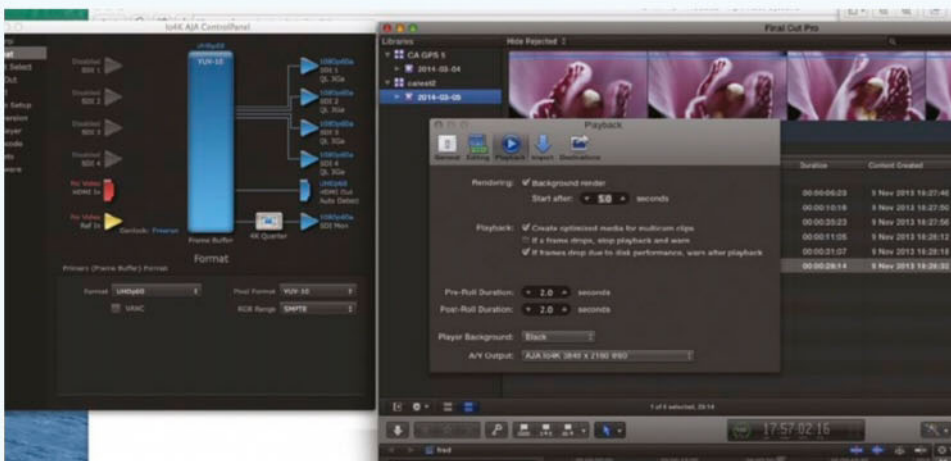
Many people think I pour too much scorn on Microsoft, and perhaps I do; my wrath is really reserved for the Windows desktop and the Office groups, though, both of whom have proved themselves to be lazy, parochial and out of touch in recent years. The other major teams have continued to deliver strong products and technologies, and are led by talented software engineers such as Scott Guthrie, for whom I have nothing but admiration.

With the final departure of Big Bad Ballmer, it's clear much is set to change at Redmond. The forthcoming autumn update to Windows 8.1, which will offer us a restored Start menu, is a significant step in that direction. There are hints this update will bring an interesting new twist on the Start menu, incorporating the Start screen, along

with the ability to put Windows Store apps (previously known as Metro-style apps) into their own windows. These all indicate that someone is finally listening to the disgruntled users. It would be too easy to claim this is all the result of Ballmer's departure and a new guard moving in: while that may contain an element of truth, it's clear that much of this effort must have been going on well before Ballmer cleared his desk. Microsoft has never moved quite quickly enough to have done so much in a month or two.

My own personal theory is as follows (and before I go any further, I have no concrete evidence for this, and could be entirely wrong): I believe that Ballmer knew that Windows 8 was in trouble long before it shipped. I'm sure he was receiving negative feedback from major OEMs, and heck, he was getting enough of it from the customers, which is why he hung Sinofsky out to dry so quickly. It was this removal that allowed him to stay on a little longer: keeping Sinofsky would have led to the inevitable removal of them both pretty quickly. With all of the problems surrounding Surface sales,

Aja Io 4K is a top-quality video interface that can go all the way to the bleeding edge of interface speeds. And it couldn't have been easier to set it up as a playback destination in Final Cut Pro X

and the huge financial write-down that followed, it was clear that the board had seen enough and it was time for Ballmer to go.

I sincerely hope this new guard will bring a much-needed clarity to Microsoft, which has suffered a decade of disasters. Let's start with XP. This might have been, and in many ways still is, the darling of the business community; however, in its Home version, the decision to allow all users to have administrative privileges for every action was utter folly, and ushered in a nightmare decade of malware infestations that was entirely avoidable. Then came Longhorn, and the non-delivery of all its promises of advanced file-system functionality. And then there was Vista. Windows 7 is a good enough platform, but it's fundamentally a dramatic set of bug-fixes for all the problems of Vista, and it entirely ignored the already emerging touchscreen marketplace.

Windows 8 was horrible on desktops, and the changes brought in with 8.1 are genuine improvements. I'd even go so far as to say that I consider 8.1 Update 1 to be about as good as Windows 7 64-bit on a desktop computer now. The promised changes ought to cement 8.1 Update 2 as the new best-in-class Windows platform. However, this can't disguise the fact that this truly was a lost decade for Microsoft's OS division, and it's hard not to be equally cynical about the Office team.

OFFICE FOR IPAD
I guess I should be delighted that Office has finally arrived on the iPad, and in many ways I am. It's good to see the Office team finally pull its finger out and deliver something that should have been here years

JON HONEYBALL
Computer journalist and consultant specialising in both client/server and office automation applications.

ago. The attempt to coerce customers into buying Windows in order to use Office has clearly failed, and this new arrival – along with an apparently forthcoming Office for Android – shows that finally someone, somewhere has obtained a clue.

The product itself is interesting and worthwhile. It's free if you want only to read Office documents, which is a compromise I can accept. You need an Office 365 subscription if you need read/write abilities, and again I can live with that. The iPad tools, unfortunately, are far from fully featured.

I've raised the question before about just what Excel is. I can accept that Office web tools will have limited capabilities, and are purely a convenience feature in case you need to quickly fire up an Excel worksheet or Word document. For some this may be enough, although their needs would have to be basic. I'm also happy to accept that only "workstation-grade" computers can manage the full package of capabilities working on both Windows and Mac.

The Windows version of Office recently upgraded to the 2014 version, whereas Office for Mac is suffering its customary delay and is still stuck in 2011. But eventually achieving feature parity must be the goal for the future – the anger I levelled last month at the severe limitations of OneNote for Mac had better not be an omen that the Office for Mac team is unable to deliver a high-quality product in the forthcoming Office release.

What will become of the soon-expected Windows Store edition of Office, the fully touch-enabled version aimed at Windows 8.1 users? Will it have all features or

only some? If only some, which ones? Only time will tell, but it's important to have the conversation now about what your needs are and what will satisfy them. Claiming "it's just Office" will cut no ice if key functions are missing, and although I can accept such compromises in the free Office Web Apps, I won't accept them as part of a toolset I pay for via my Office 365 Enterprise E3 accounts. This takes me back to Office for iPad.

The first thing I wanted to do was move my data onto the device. I use Dropbox, a service that works very well (although I'll confess I have a little disquiet over the recent appointment of Condoleezza Rice). However, on Office for iPad, I have to use OneDrive, Microsoft's recently renamed SkyDrive – they give me no choice. I've realised everyone's up to this game: Microsoft's pushing OneDrive, Google's pushing Google Drive, Apple's pushing iCloud. The battle isn't only for the app and its capabilities, but the storage too.

To move Office documents on and off my iPad, I'd have to set up OneDrive on another computer and use that to cross-sync stuff from my Dropbox storage folders. I daren't even try to set up OneDrive and Dropbox both looking into the same folder, since I can imagine all sorts of fire and brimstone resulting from such a outrageous attempt. And so I'm annoyed. Applications should be exactly that – I should choose an application based upon the capabilities I require. I shouldn't have to choose based on a combination of capabilities and then be locked into whichever cloud storage service it forces upon me. This will be a big deal, and one could argue that what the big boys really want is for relatively smaller players such as Dropbox and Box to be squeezed out of the market.

My fun didn't end there. Trying to be a good chap, I obediently downloaded OneDrive for Mac and installed it, then tried to log in using the same Office 365 E3 account information I had given to Office for iPad. Nope, that didn't work. Turns out that OneDrive for Mac won't work with E3 accounts, because they employ the shiny SharePoint Server back-end technologies. I needed to use OneDrive for Business for Mac, but unfortunately, like Pooh Bear, the more I looked the more it wasn't there, until finally I discovered that it hasn't yet been released. It might come with the new Office for Mac

version due later this year, but right now you're out of luck. I decided to ask Microsoft support about this on Twitter, and the conversation was so bizarre I feel obliged to quote it here in full:

@JonHoneyball: Am I missing something? Where is OneDrive for Business for Mac?

@MicrosoftHelps: Hello! What technical issues are you having with OneDrive? Tell us in greater detail what you are experiencing?

@JonHoneyball: Where is OneDrive for Business for Mac?

@MicrosoftHelps: Hi Jon! OneDrive for Business currently isn't available for Mac. Go here http://t.co/8dGU4X8oIB for any updates.

@JonHoneyball: So how do I log in to my E3 O365 account using OneDrive? It doesn't work, rejecting the account info.

@MicrosoftHelps: Check out this link http://t.co/VpIVDWM2tT for issues logging into O365. Try the steps and let us know if this helps you.

@JonHoneyball: Utterly useless. I can sign in fine through portal and via Outlook 2011. But not OneDrive.

@MicrosoftHelps: Hi Jon! Here are some solutions to assist. See here:

http://t.co/N124uEGslF. Keep us posted, we'd like to continue helping.

@JonHoneyball: Sigh. How do I download OneDrive for Business for Mac WHEN IT DOESN'T EXIST????

@MicrosoftHelps: @jonhoneyball Hi again! The app does exist. See here: http://t.co/1FzqLmzAQc. Previously you requested OneDrive Business for Mac.

@JonHoneyball: I give in.

@MicrosoftHelps: Please take a moment to tell us how we're doing http://t.co/49pN4IvEUX.

I confess the final "please take a moment" posting tipped me over the edge. In deepest Cambridgeshire, the sound could be heard of the lids opening on otherwise-abandoned ICBM rocket silos, aimed straight at Redmond. Mine is the last voice you will ever hear…

THUNDERBOLT 3
Thunderbolt continues to impress. My Thunderbolt fibre cables just work, and have yet to give me a single moment of worry. I see that Intel is starting to talk about the forthcoming Thunderbolt 3 specification, which ups the speed to 40Gbits/sec (from Thunderbolt 2's 20 and Thunderbolt 1's 10). More importantly, it will support HDMI 2, and up to 100W of power down a cable (obviously non-fibre). The

> **Mine is the last voice you will ever hear…**

chipset is codenamed Alpine Ridge, and 40Gbits/sec is fast enough for around 5GB/sec: sufficient bandwidth to send multiple 4K video streams from one controller, for example. Intel's documentation states it will be based on PCI Express Generation 3, which is a good move that should allow you to host video cards and GPU processing at the end of the bus in a better way than at present. For those doing the most extreme video crunching or GPU-based calculations, this will be a big deal. Timescale? Hard to say, but I wouldn't expect to see anything for a year or so. It should be backwards-compatible, so all current devices should still work.

In the meantime, I've been having fun with my Thunderbolt 2 implementation on the Mac Pro. You have to be careful about how you connect things: if you want to mix and match Thunderbolt 1 and 2 devices on the same bus, all the Thunderbolt 2 devices come first, followed by Thunderbolt 1 devices. Think about it as a chain, so this means connecting as Computer > T2 > T2 > T1. If you lay it out as Computer > T2 > T1 > T2, then that last T2 device will run only at T1 speed. In effect, T1 devices act like a barrier that restricts the speed of all downstream devices to match their own speed.

To work on 4K TVs running on HDMI 2 at 60Hz, you need serious connection power and interfaces that are leading-edge. However, the HDMI connector on the Mac Pro is HDMI 1.4, and so is limited to 30Hz at 4K resolution. Hence my interest in the new Aja Io 4K interface (**www.aja.com/en/products/io-4k**), which is a Thunderbolt 2 device. This is a video in/out interface box for the Mac Pro that gives you all the way to 4K at 60Hz on HDMI 2. In addition, you also get full SDI (serial digital interface).

With the latest firmware, you can just plug it in and power it up, then run the control panel utility and choose which interfaces you want to use and at which resolutions and speeds. I choose to set up the HDMI output to be "UHDp60", which means 3,840 x 2,160 at 60Hz. It automatically appeared as a playback destination in Final Cut Pro X, so I just plugged in a TV and it worked.

If you're looking for a top-quality video interface that can go all the way to the most bleeding edge of interface speeds, then this is definitely worth a look. ∎

IBEACON
iBeacons are small devices that you can put in useful places – within a shop, for example – where they can communicate with your smartphone by using the new Bluetooth 4 Low Energy (LE) specification. The idea being how they work is that whenever you come within range of one it triggers an event on your smartphone, whether that be a pop-up message, visiting a web URL, or something else entirely – it's up to you. These clearly look like interesting devices, so I placed an order for the developer's kit from Kontakt.io (**http://kontakt.io**).
There are three iBeacons in the kit, plus all the development code and utilities, and it didn't take long for me to set it up so that my carefully placed iBeacons in the lab would make my iPhone go "ping" as I approached them. At the moment, it's still locked in developer mode, but the website says that public working will be enabled soon. I'm intrigued by this device

▲ I'm very intrigued by the iBeacon development kit, which includes three of the Bluetooth LE devices

– Bluetooth 4 LE is a promising technology, and this ability to stick something tiny onto the underside of a shelf, or behind a cupboard, and have it trigger some useful action opens up almost limitless possibilities. Whether it will take off in the broader commercial environment isn't yet certain, but we need technologies such as these to explore those possibilities, and I'm having fun with them already.

DVD contents

Apps, games, essentials, full software, drivers & more!

As always, we do try hard to provide software on our disc that is both useful and a bit of fun. With that in mind Don Bradman Cricket 2014 is included in this issue's software collection.

Cricket games are notoriously difficult to get right, and it's been said by several game reviewers that Don Bradman Cricket 2014 is one of the best. The all-important mechanics for batting and bowling are natural to use and offer up just the right level of challenge.

Enjoy the demo we've included, and if you like what you see the full game was only just released (June 26th) so get in amongst it with your cricket-loving friends and family!

DON BRADMAN CRICKET 14

The first thing to think about when you start playing Don Bradman Cricket 14 is to forget what you know about Cricket games and start afresh... it's cricket like you've never seen it before! Take to the field with any of the 100+ teams provided or choose from over 4000 teams available online from the Academy. The full version of Don Bradman Cricket 14 includes:
• Career Mode, allowing you to take control of an aspiring young cricketer and take him through the ranks to International glory.
• Unique Batting and Bowling Controls, giving full 360 Shot control and Line and Length delivery.
• A fully featured fielding system that allows you to run down the ball and slide to prevent a Four, catch a high ball on the boundary rope, or knock down

the stumps to take a vital run out. You are always involved in the play at every stage of the game!
• Ball Physics giving realistic Edges, bat pad catches and movement off the pitch.
• A complete player physics system with individual attributes including weight and height – imagine running in a 2 metre bowler to delivery that perfect bouncer!
• Appeal and Electronic Review system allowing for the first time challenges of the umpires decision.
• Practice Nets, Hone your skills to perfection before taking to the field.
• Dynamic time of day, Weather System and Pitch Degradation that are based on real world data with effects occurring in real-time throughout a days' play.

Slideshow Studio 2013

Ashampoo Slideshow Studio 2013 enables users to quickly import and turn photos into digital slide shows. Select from a wide range of stunning transition effects, add text overlays as comments and apply ambient background music to wow your family and friends at your next evening slide show. Highlights:
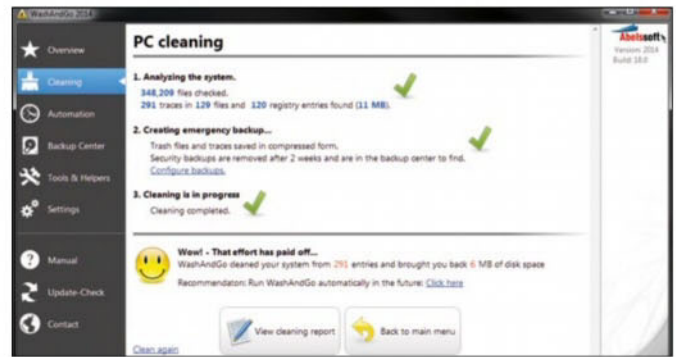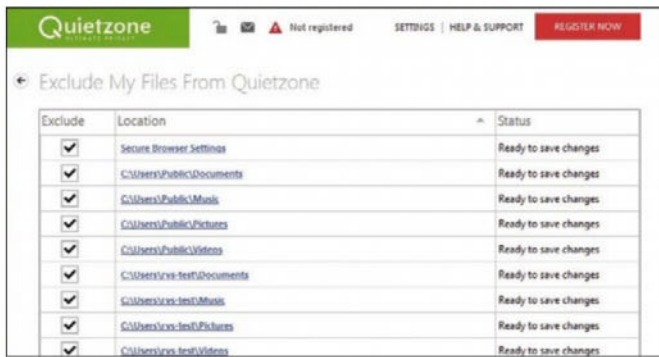- Simple and user-friendly handling
- Spectacular photo transitions, opening and closing credits, background music, text overlays and more
- Freely adjustable effects, panning and zooming (Ken Burns)

- Slide shows
The software is designed for beginners as well as experienced users so that anyone can achieve successful results.

Not to be sold separately

WINDOWS
CCleaner
CutePDF
Defraggler
DeepBurner
Foxit Reader
Apple iTunes
Malwarebytes' A/M
Sandboxie
Spybot S&D
VLC Media Player
WinRAR
WinZip
7Zip

INTERNET
AOL Instant Messenger
Vuze
Dropbox
Google Chrome
FileZilla
M/S Security Essentials
Mozilla Firefox
Mozilla Thunderbird
Skype
Steam
ZoneAlarm

TROUBLESHOOTING
Serial Codes
Blank Registration Website
Can't find a file?
Installation Error

HELP
Disclaimer
Damaged or faulty DVDs
Using this DVD
Installing software

EDITORIAL
Burning an ISO image
PC&TA Editorials

LINUX
Clonezilla

AUGUST 2014
ISSUE 201 DVD

PC
X TECH
AUTHORITY

FEATURES
Slideshow Studio 2013
Data Recovery Wizard
Returnil Quietzone
WashAndGo 2014
Don Bradman Cricket 14

DRIVERS
ATI Catalyst
NVIDIA Forceware

EaseUS Data Recovery Wizard

EaseUS Data Recovery Wizard Free is the best free data recovery software to solve all data loss problems - recover files from hard drive, external hard drive, USB drive, Memory card, digital camera, mobile phone, music player and more devices due to deleting, formatting, software crash, hard drive damage, virus attack, partition loss or other unknown reasons. It provides safe, quick and comprehensive data recovery solutions to countless data lost cases, which is trusted by millions of users. Only three steps and a few clicks, you'll retrieve whatever you lost!

Three recovery modes

Three customized recovery modes, designed for different data lost scenarios, help you recover lost data from dozens of devices:
1# Deleted File Recovery - Recover deleted files with their original file names and paths.
2# Complete Recovery - Recover data due to formatting, system reinstallation, power-off, virus attack, inaccessible and even raw partition etc.
3# Partition Recovery - Recover data from deleted or lost partition.

Returnil Quietzone

Quietzone is a simple to use, highly secure, privacy tool that gives you complete control over your Internet and PC privacy. With Quietzone you choose if and when:
• Your personal data is tracked or recorded
• Internet session data or events are left on your PC/ device
• Any software, data, tracking modules are left on your PC/device.
With Quietzone switched ON your Internet activity becomes private. Quietzone™ protects you from websites or software that might be trying to track and record your internet activity, personal data, or any software that might try to examine your PC subsequently.
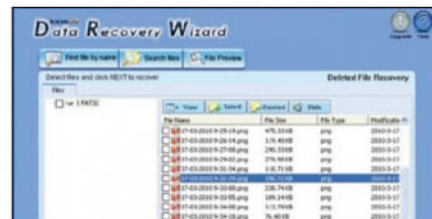
WashAndGo 2014

WashAndGo removes unnecessary garbage files. WashAndGo cleans your system and increases your performance significantly. The following garbage types are detected by WashAndGo: Unnecessary garbage files, Old log and dump files, Content of temp folders, prefetch files and unnecessary setup cache files, Unused backup files from service pack installations and Content of your own temp folders and may more. WashAndGo removes internet traces: The Browser-Cache, Cookies, the Browser-History and many more traces of the most common browsers.

DID YOU KNOW?
You can find a guide to using ISO files in the Editorial section of the DVD

PC & TECH AUTHORITY

DVD CONTENTS
No 201 / AUGUST 2014

WINDOWS: MALWAREBYTES' A/M + VLC MEDIA PLAYER + APPLE ITUNES + CCLEANER + CUTEPDF + DEFRAGGLER + DEEPBURNER + FOXIT READER + SANDBOXIE + SPYBOT S&D + WINRAR + WINZIP + 7ZIP **INTERNET:** AOL INSTANT MESSENGER + VUZE + DROPBOX + GOOGLE CHROME + FILEZILLA + M/S SECURITY ESSENTIALS + MOZILLA FIREFOX + MOZILLA THUNDERBIRD + SKYPE + STEAM + ZONEALARM **TROUBLESHOOTING:** SERIAL CODES + BLANK REGISTRATION WEBSITE + CAN'T FIND A FILE? + INSTALLATION ERROR **HELP:** DISCLAIMER + DAMAGED OR FAULTY DVDS + USING THIS DVD + INSTALLING SOFTWARE **EDITORIAL:** BURNING AN ISO IMAGE + PC&TA EDITORIALS **LINUX:** TINY CORE LINUX **FEATURES** + SLIDESHOW STUDIO 2013 + DATA RECOVERY WIZARD + RETURNIL QUIETZONE + WASHANDGO 2014 + DON BRADMAN CRICKET 14 **DRIVERS** ATI CATALYST + NVIDIA FORCEWARE

INSTRUCTIONS: Open Windows Explorer, navigate to your DVD drive and double-click Index.html in the root directory. **DISC PROBLEMS:** To replace faulty DVDs, please send the discs to: *PC&Tech Authority* DVD Replacements, Level 5, Building A, 207 Pacific Highway, St Leonards NSW 2065

Make sure to include your name and postal address on the back of the package so that we know where to send the replacements. For all other DVD related issues email **cd@pcauthority.com.au**. As the delivery platform only, *PC&TA* and Haymarket Media cannot and will not provide support for any of the software or data contained on these discs. Although all discs are virus scanned, Haymarket Media cannot accept any responsibility for any loss, damage or disruption to your data or computer system that may occur while using the discs, the programs or the data on them. There are no explicit or implied warranties for any of the software products on the discs. Use of these discs is strictly at your own risk.

Input Output

DAN RUTTER BRINGS THE ANSWERS TO YOUR QUESTIONS LIKE NO–ONE ELSE CAN

BANG! STINK! EVERYTHING'S FINE.

I Here's another letter for your "I'm typing this on my laptop because..." file.

Last night while I was using my PC there was a pop, and the screen went black. I just reflexively poked the power button and the PC started up again normally, but I soon noticed a weird smell, sort of like melted plastic, I don't know, I haven't smelt it before.

After the computer started up, I ran a browser and played some music and even started a game and everything was fine, and then I turned the thing off and unplugged it because I felt like I was totally asking for trouble. So now I turn to you for salvation: Do you have any idea what the hell happened to me? Power spike? Goblins?

Hamish D.

O I'd bet a small amount of money an electrolytic capacitor, or two, blew up. Probably in the power supply, possibly on the motherboard or a card.

The goop inside electrolytic caps has a distinctive unpleasant smell, familiar to electronics enthusiasts, electronics repair people, and delinquents who've stuck the pins of a low-voltage electro into the end of an extension cord, retired to a safe distance and plugged the other end in.

These troublesome components are popular, because they give a lot of capacitance for not much money. They're a ubiquitous choice for "smoothing" the output of DC power supplies, like the ones that power PCs.

If a smoothing capacitor has the decency to go open circuit – as opposed to short circuit – after it pops, then the circuit it was part of will continue to work, but with more variation of the output voltage. The practical effect of this may not be any significant loss of reliability at all. Open-circuit caps on the mobo or expansion cards are even less likely to be a problem.

Open up the computer and see if you can see any exploded cylindrical components. If you can't, then the

dead cap or caps are in the PSU, which you can also open up *fairly* safely when it's not plugged in. (The "fairly" is in there because high-voltage capacitors in the PSU that *haven't* blown up should have drain resistors to safely discharge them.)

If the dead cap isn't in the PSU, remove any distinctive smelly spirals of cap-guts, put the case back on the PC, and don't worry about it. If dead-cap is in the PSU, it is of course time for a new PSU, because there may be some more stuff on the way out.

SEVERAL STARTUPS

I When I open my "Startup" folder, there's nothing in it! Stuff seems to be running OK when I reboot, though. When I run msconfig.exe it shows that stuff in its startup list, and I'm pretty sure these are simple shortcuts in the startup folder, not things that run from registry autorun entries or something. But they're not there! Where's it finding the shortcuts?

J. Manning

O Did you "open all users" or just "open"?

If you just "Open" or "Explore" the "Startup" entry in the Start menu, you see what's there only for the currently logged-in user. If you use the "All Users" options, you see what everybody gets.

To see *everything* that runs on startup with a much better interface than MSConfig's little window, use "Autoruns", bit.ly/autoruns. Autoruns will also show you startup items that aren't working, and it lets you individually deactivate anything and everything you like.

Deactivating everything will give you a computer which boots very quickly, but does not work.

DO YOU WANT COMPUTER ANTS? BECAUSE THAT'S HOW YOU GET COMPUTER ANTS.

I Do you really need the slot covers on the back of a PC? Do they serve some important role in keeping the ventilation paths correct, or something?

▲ Windows startup - it's JUST THIS SIMPLE

The fact that there are cheap cases with slot covers that are part of the case and that snap off if you want to use that slot, suggests they're not completely essential. But cheap cases are often defective as manufactured, so perhaps that doesn't mean anything. Perhaps you're meant to replace the snap-off covers with some of the ten billion spare slot covers every long-time PC user probably owns if you don't use that slot any more.

I suppose with all the variation in possible PC cooling schemes this is an impossible question to answer, but I've wondered about it for a long time. Is there a rule of thumb?

Abi Beit

O Some PCs have carefully judged cooling-air paths that could be upset by extra holes at the back, but usually it's just in at the front, out at the back, and then hope for the best.

(Note also that PCs are generally perfectly happy to run with the case completely open, at least until a passer-by kicks the video card.)

There are situations in which patching all unused holes in a computer case matters, though: When you want to stop... stuff... getting into the case.

"Stuff", in this situation, includes metal filings, sawdust and/or miscellaneous other airborne debris, for industrial or home-workshop PCs. It also includes ants, wasps, mice, et cetera. The warmth inside a computer case can and does attract all kinds of little creatures.

If the only paths into and out of your computer case have a fan grille and filter over them (whether or not there's a fan mounted there as well), then an ordinary off-the-shelf non-"industrial" computer can survive a lot longer in terrible environments.

MY "ANSWER" IS "CORRECT"

Down the years, many years, too many years, of using Windows, I have a few times a year had the pleasure of looking at an "access violation" error message. For as long as I can remember, those errors have had a weird love for quote marks. They say some instruction with an address large enough to locate it to within one cubic metre of the local group of galaxies failed to read some memory, but that's not exactly what they say. Exactly what they say is:

The instruction at "XX" referenced memory at "YY". The memory could not be "read". Ever since seeing Austin Powers I now visualise this as the error message being delivered by Doctor Evil doing finger quotes.

Sam Blundell

O Those are kernel error messages – errors from the central core of Windows. That central core is like a lot of other pieces of Windows, in that just kind of grew into the shape it is now, under strong backward-compatibility pressure. That pressure has prevented the kernel from getting past approximately 1990 in the ways it tells the user that something is terribly wrong.

There's not much evolutionary pressure here, either, because the exact content of a showstopping bluescreen error like that is almost always of little value. (The thing that apparently killed the system is quite possibly just the thing that was killed by something *else*, like defective RAM or an overheated CPU.)

In this case, the Microsoft access violation error is stuck for backward compatibility with only three things it can stick into the template for

I/O OF THE MONTH

USB AIN'T USB

I have a Dell Optiplex Something Or Other, about 2006 vintage, that has specs quite good enough for my everyday computing needs but that didn't have a working hard drive or optical drive. No problem, I have a spare 1Gb hard drive in decent shape and you can install Win7 from USB, I've done it before.

I look in the BIOS, I see that it can boot from USB, so I plug my Win7 install thumb drive in and... the computer tries to boot from the empty hard drive and does nothing. Oddly, it will boot from the USB stick as long as the hard drive is not connected. This is not very useful, though I did run a Linux liveCD-on-USB-stick thing just to confirm that everything else worked properly.

Do you know what's going on here? How can I make it boot from the USB stick when a drive to install the damn OS on is also connected?

Carl Solares

▼ Everything is in the BIOS setup. EVERYTHING.

O Several BIOSes from around the age of your Dell have an odd quirk: They assume that any device that has what they recognise as hard-drive partitions on it is a hard drive. There are some different permutations of this, but the upshot is that when you connect bootable USB devices to them, whether the bootable USB device is a memory stick or an actual hard drive in a USB box, it will appear in the BIOS listing for hard drives, not in the listing for USB devices, so watch out for that.

The BIOS has been told to preferentially boot from USB, but there's nothing in its USB device list, so it goes to the next step, booting from hard drives, and the one actual hard drive in the system has the first boot priority, and you get the painful problem Carl describes.

The solution is simple, though; plug in the USB device and the hard drive, then go into the BIOS setup's drive list, and give the USB device a higher boot priority than the hard drive. Save and restart, and you should be booting from USB without trouble.

```
CMOS Setup Utility - Copyright (C) 4004 BC Chaldean Software

                                                        Item Help

  CPU Operating Speed        User Define
  - Multiplier Factor        x6
  - CPU FSB/PCI Clock        111/37MHz       Menu Level  ▶
  - Speed Error Hold         Disabled

  CPU Power Supply           User Define
  - Core Voltage             6.66V
  - I/O Voltage              6.66V

  Sacrifice Fuzzy Puppies    Yes
  Eat Souls Of Innocent      Yes
  Annoy Fred Nile            Yes
  Rise From Sea And Destroy
  Entire Biosphere           No

  WARNING! Read these instructions:


  F1: Help              ↑↓: Select Item
  F2: Save     Home/End: Top/Bottom
  F3: Load          PU/PD: Modify
  F5: Reset/Orig ESC: Exit
  F6: Reset/HW
  F10: Apply
```

every error: Two addresses, and the name of the operation that failed. The error page is in different languages depending on what language your version of Windows is in, and the kernel doesn't know how to conjugate verbs and construct sentences in different languages, so to be safe it just puts the operation name (which won't necessarily even be in the same language as Windows) in quote marks and calls it good.

Other operating systems do this

differently, though not necessarily better in any way beyond the cosmetic. You may get an informative error telling you more clearly what the problem appears to be, which probably won't be any more real use than a Windows error. You may get a multi-language screen politely requesting you reset the computer, without telling you what went wrong. Or you may get "Kernel panic - not syncing: Attempted to kill init!", or a magnificent stream of hexadecimal.

Has Microsoft finally dumped "Hidden UI"?

SIMON JONES EXAMINES THE COMPLEXITIES OF WINDOWS 8'S USER INTERFACE, AND WHAT COULD BE A RETURN TO A MORE USER-FRIENDLY EXPERIENCE

Two years ago, when Windows 8 was originally unveiled, I wrote in this column that the "Hidden UI" model of Windows 8 and "Metro-style" apps (which we're now supposed to call Windows Store apps) was far from intuitive, and would cause problems for users brought up on the standard Windows user interface experience.

Back then, I wrote: "One of the 'interesting' facts about the new Metro-style UI in Windows 8 is how much of it is hidden from the user until it's needed. This is one of the core design principles of Metro-style apps, that the application's content shall be king, and so all its UI chrome – which means buttons, textboxes and other widgets that make the app work – aren't visible most of the time. You may tap or click on anything you see, but this will represent only a fraction of what you can actually do with that particular app. To discover most commands, you'll have to learn how to swipe, flick or make other new gestures to uncover the charms, tabs and the app bar that hide them away.

"This is a fairly radical departure for most users brought up on Windows, with its multitude of menus, tabs, buttons and other visual cues. It's even further from the principles of Microsoft's previous Fluent UI - otherwise known as the ribbon – which strove to ensure that every possible command and action had a visible cue that made it discoverable, and so ensured the user could get the most out of the application. Microsoft's decision to hide most of the UI commands in Windows 8 Metro-style apps, while simultaneously introducing the ribbon to other Windows 8 applications such as Windows Explorer, feels strangely contradictory and is difficult to explain logically."

Sure enough, with the further evolution of Windows 8 through Windows 8.1 and now Windows

▲ The original Windows 8 Start screen in all its glory

8.1 Update, we're seeing more of the Hidden UI being made visible so that people can find it. First of all, the Windows Store gained a Search button, then a search box to type your query into. Now the Start screen itself has gained a Search button to search for installed applications, and a Power button to shut down or restart your PC – no more scrabbling around to find the charms. This was always easy enough to do on a tablet (if you can remember the gesture) but far harder on a desktop PC with multiple monitors: you have to hit a corner of the screen without overshooting onto the other display. Start | Power | Shutdown is shorter and far easier to find than Charms | Settings | Power | Shutdown was. Closing a Store app is easier, too, because Minimise and Close buttons appear on a title bar whenever you move the mouse to the top of the display. You no longer have to rely on remembering to use the Hidden UI trick of dragging the top of the app downwards and off the bottom of the display. Of course, the keyboard shortcuts have always worked, such as Alt+F4 to close a window, but they constitute yet another Hidden UI that you're expected to learn

SIMON JONES
An independent IT consultant specialising in Office Automation, Visual Basic and SQL Server.

without ever being taught it. Fully fledged Windows applications often remind you of their keyboard shortcuts in their menus or tooltips, but Store apps very rarely do.

Now we're seeing teasers for the next update to Windows – which might possibly be called Windows 8.1 Update 2, or else Windows 8.2 – which reinstates a proper Start menu, not just a button in the corner that dumps you back to the Start screen. The screenshots and video of the new Start menu show a standard list of pinned and frequently used applications on the left, with a search box at the bottom and a miniature Live Tiles display of installed apps on the right. It isn't quite the fully featured Start menu that was in Windows 7, but it's far closer to what people say they want. Teasers at the Build 2014 conference also showed a Store app running in a window on the desktop, just like any normal application. This makes Windows Store apps far more usable on standard desktop PCs and therefore should increase the market for them, which in turn ought to attract more people to write applications for the Windows Store, and then everybody wins. At least, that's the plan - having Store apps appear in windows on the desktop may
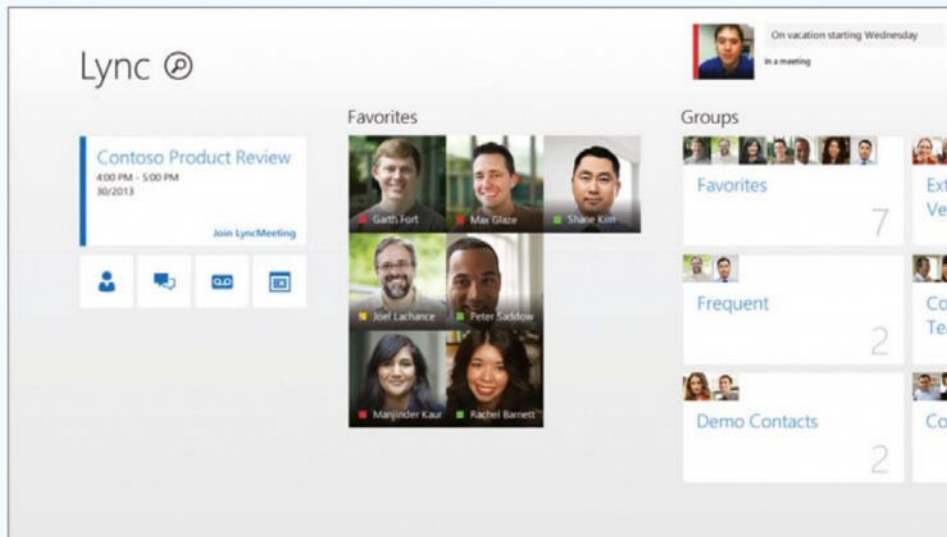
◀ The "Modern" version of Lync is very confusing and hard to use – it gets terrible reviews. You're better off sticking with the desktop version, if possible

▼ Windows 8.1 Update now includes onscreen buttons for Power and Search (top right) and an indication of where to find recently installed applications (bottom left)

not actually be delivered until the next-but-one update (Microsoft is being a little vague about that).

The current Office 2013 applications are just about usable on a Windows tablet: the ribbon has a special touch mode, which increases the space around its buttons, but this just makes the ribbon bigger and bulkier, taking up even more valuable screen real estate. With the onscreen keyboard already taking up half of the screen when in landscape mode, every pixel that can be used for content counts, and between the keyboard and the ribbon there isn't much space. I have to minimise the ribbon and turn off the onscreen keyboard far too often in order to see more of the document I'm working on; I'd like to be able to shrink the keyboard the way you could in Windows 7.

In portrait mode, the keyboard isn't so intrusive, but the ribbon is squashed horizontally, which makes it far harder to work with. Because each tab contains many groups of buttons, it often happens that most – if not all – of these groups will be collapsed down to a single button that you have to tap to see the controls in the group. This adds a new level of complexity that I could do without. The ribbon was designed for large desktop displays, and some compromise is certainly inevitable when moving to smaller tablet screens.

There are only two Store Office apps at the moment, Lync and OneNote. Lync is a poor, confusing affair quite unlike its desktop counterpart. It's seriously difficult to get to grips with. The Hidden UI and lack of documentation leave you

jabbing around, trying to find out how to do the most basic things.

I'm sure it made sense to its developers, but they probably had reams of design documents to show them how it was supposed to work – a luxury we users don't have. It's equally useless on a desktop PC, because it wastes so much of the screen with its huge buttons surrounded by acres of white space. It will just about do if you really can't use the Lync desktop client, as, for example, when you're using Windows RT on an ARM-based tablet, but if your tablet can run full Windows applications, then stick with the Lync desktop client.

OneNote's Windows Store app is much better. It's closer to the full desktop application, but with the addition of an innovative radial menu that brings all the common controls within easy reach, without

> "We're seeing more of the Hidden UI being made visible so that people can find it"

taking up anywhere near so much screen space as the ribbon. It's still limited in some fundamental ways, however, such as not having the ability to print or handle audio notes. I still prefer to use the full desktop version even on a tablet, so that I don't have to relearn how to do things.

The new Office for iPad shows off all of its UI to the users, presented via a cut-down ribbon interface – just tabs with one row of buttons, suitable for the restricted screen real estate of the handheld device and the reduced functionality of the applications. This design is indicative of the shape of a forthcoming "touch-first" version of Office for Windows, a small demo of which was also seen at Build. Only touch-first PowerPoint has been shown so far, and Microsoft has been careful to say each time

that this is an "early experience", meaning that it may look a little different by the time it comes to market. As you can see from the screenshot to the right, it has a similarly cut-down ribbon, with only one row of touch-friendly buttons. The tabs are mostly the same as in the full desktop applications, but there are fewer features on each one.

ONE SIZE DOESN'T FIT ALL

Another announcement from the Build conference this year was the concept of "universal apps", which enables Microsoft and other developers to create applications that can run across Windows Phone, Windows RT and Windows desktop (eventually, universal apps will be able to run on Xbox as well). One way to achieve this is by building new Modern UIs on top of an existing application.

If your applications are already written with good separation between their UI code and their business logic and data layers, then you'll be able to write a new Modern UI on top and reuse all the common code in a relatively seamless way. If your code is more monolithic or spaghetti-like, as many old applications are, then you'll have to do a considerable amount of re-factoring and hence more testing of the revised original UI as well as the new UI.

Microsoft is already using the universal app features in its forthcoming Modern version of Office, whereby the same code is used on Windows RT tablets and Windows Phones. The tools for creating universal apps will become available to other developers though Visual Studio.

The idea of having one application with multiple front-ends isn't new, and indeed, Microsoft has been enabling it in a small way for a couple of years now through Visual Studio's LightSwitch. This is a library that lets you build applications with either a Silverlight front-end for a rich-client experience, or an HTML front-end for a lightweight, mobile-device oriented experience.

One solution will have a project for each front-end, with common back-end code shared between all of them. Because the middle-tier business logic and the back-end database of your application are common to both front-ends, you'll end up reusing an awful lot of the code if you build both front-

> **Lync wastes so much of the screen with its huge buttons surrounded by white space**
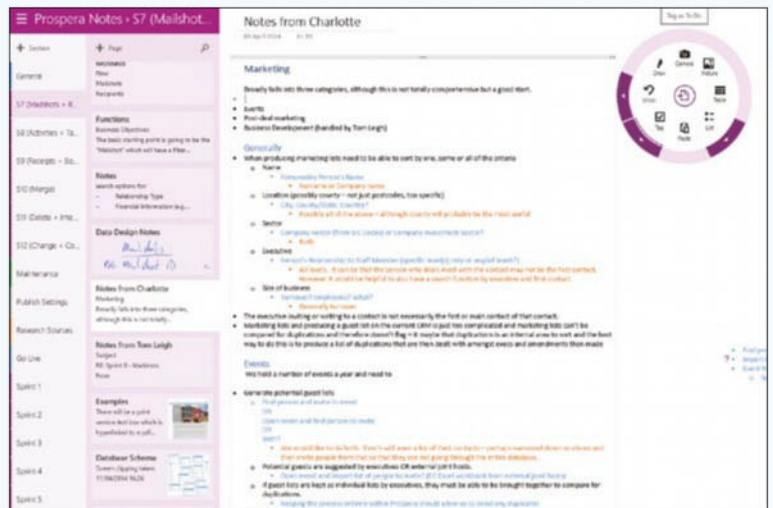
ends. The database model puts all the business logic and validation into one project in the Visual Studio solution, with each front-end going into a separate project, and universal apps will work the same way.

This means you can build the right UI for the device you're targeting, to fit its screen size and input capabilities. A phone and an Xbox may have speech input, but a 4in phone screen needs a completely different display to that of a 40in smart TV.

Tablets and phones may have gesture input, but that will be quite different from the whole-body gestures you use in the Kinect interface on an Xbox.

A desktop PC's natural interface is the keyboard and mouse, while tablets and phones often have onscreen keyboards that take up a lot of the display space and are less than optimal to use. The Xbox's onscreen keyboard is slow

and clunky to use via the game controller, so users aren't going to want to type lots of text on an Xbox. You'll have to make it easier to choose input data from lists that you might have typed afresh on a traditional PC.

Each of these strengths and weaknesses has to be taken into account when designing the UIs for each different platform. Expecting a single, web-based, application to automatically adapt to different screen sizes was never a complete answer to the different form factors and capabilities of these devices; it failed to use the full potential of the more capable devices, and automatic display scaling can't get it right every time.

Microsoft seems finally to have woken up to these facts and to have started providing the tools developers need to properly customise a UI to each type of device. That is the revolution Windows 8 should have aimed for. ∎
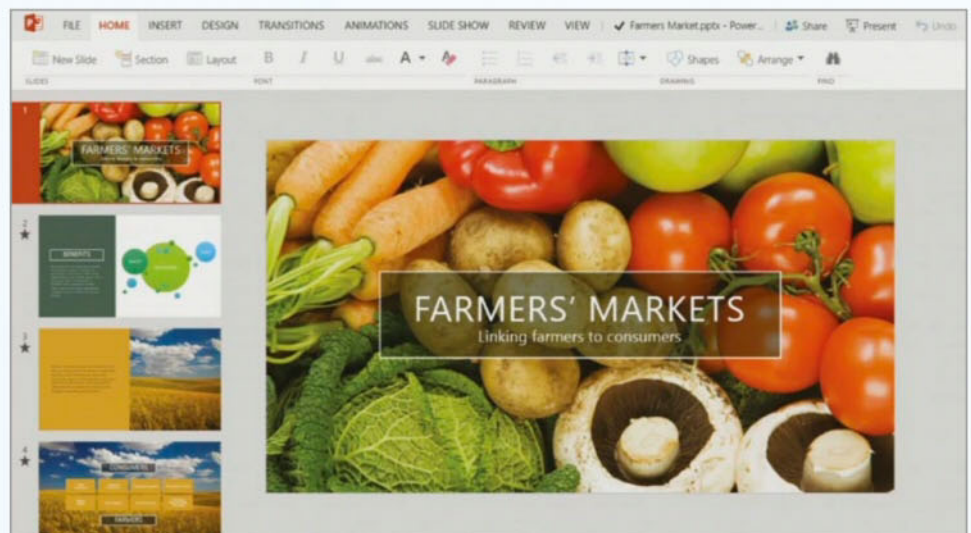
Tracking goes global

PAUL OCKENDEN HELPS A USER LOOKING FOR WORLDWIDE COMMUNICATION, AND SNAGS HIMSELF A NEW HIGH-RESOLUTION LAPTOP

There's much debate about privacy these days. While some are worried about data protection and loathe our intrusive Big Brother state, others proclaim that those with nothing to hide have nothing to fear. As usual, the reality lies somewhere between these two extreme opinions, but even so, concern about privacy is genuine. Location tracking is a particular concern. I was somewhat surprised, then, to receive a tweet from a reader asking for help to enable other people to track him.

The reader, Jack, is a student who's going travelling for a year. While he's away, he wants his family and friends to know where he is, and perhaps even contact him, electronically. My first suggestion was to rely on the tracking facilities that are built into most modern smartphone ecosystems (see Where have you been?, p107), but Jack replied that for much of his round-the-world trip he'll be in locations where receiving mobile reception will be problematic – such as crossing the Pacific in a small sailing boat, trekking through jungles, driving across deserts and so on.

The lack of 4G, 3G, or indeed any G, over much of Jack's itinerary ruled out mobile-phone-based tracking, so we needed to look at other solutions. I say "solutions", but there's really only one option – namely, satellite-based tracking and communication.

March's sad events concerning flight MH370 over the southern Indian Ocean, and the subsequent data analysis, showed how satellites are able to track devices based solely on the round-trip time of their data stream, especially if you know the approximate path the device will be taking. However, better still is to combine satellite data with GPS positioning.

The piece of kit I'd therefore suggest for Jack is something I've been testing for a few months now – the Spot Gen3. It's a small mobile tracking device (about the same size as a computer mouse), perfect for someone doing a round-the-world trip. Spot is a subsidiary of Globalstar, and uses the company's own satellite network. It's a simplex device - that is, it can

> "The Spot Gen3 is a small mobile tracking device, perfect for a round-the-world trip"

▲ The Spot Gen3 is a brilliant gadget for anyone going out into the wilds. You can let people know where you are, and summon help if you get into trouble

communicate only one way, which in this case means it can send but not receive. It has coverage in most of the world's inhabited places, the exceptions being the southernmost countries of Africa and the extreme southern tip of South America. Most importantly for Jack's sailing trip, there's coverage across the whole of the Atlantic. You can set up the Gen3 either to track you continuously (from a range of once an hour down to every two-and-a-half minutes) or – for times when you don't want to be tracked so closely – you can opt to put a pin onto the map only when you press a button on the device.

The ergonomics of the device are good - it has several buttons, all clearly labelled with symbols and, crucially for a device that might suffer rough treatment, they all need to be held down for a second or two before they'll activate. A couple of the buttons have extra protection to ensure that you can't press them by accident, something which I'll come to in a minute.

The three main buttons include the one I've already mentioned – the Check In button, which drops a pin onto the tracking map, sends emails and SMS messages to a pre-prepared list of contacts to show them where you are, and lets them know everything is okay via a pre-programmed message. A

second button switches continuous tracking on and off, and the third, Custom Message, is an alternative check-in that employs a different message and list of contacts. Jack can use the primary Check In button to let his family and friends know where he is, and the Custom Message button once a day to his special someone (maybe his mum), telling them how much he loves them.

Beneath a flap sit two additional buttons, the first of which is the Help/Spot Assist button that will send out an emergency message to your contacts list telling them you need assistance. That's intended for non-life-threatening incidents such as losing your passport or getting a flat tyre. It's left up to your contacts to arrange the help.

The other is the S.O.S., which is intended for life-threatening situations: when activated it sends a distress message containing your positional co-ordinates to the GEOS International Emergency Response Coordination Center (**www. geosalliance.com**). GEOS then summons help from the relevant emergency services, based on your position and personal details. The list of emergency services informed may include police, highway patrol, coast guard, your national embassy

or consulate, other emergency-response centres and search-and-rescue teams.

It's obviously important to ensure the S.O.S. button is pressed only in exceptional circumstances. If you're playing with this gadget at home, do not test the S.O.S. function, since you're likely to find a police car screaming down your road or a helicopter landing on your lawn. If you do want to test one of the emergency functions, make it the Help button (and pre-warn your friends) rather than the S.O.S. function, which will summon GEOS. If you abuse the system

When its huge antenna is tucked away, the GSP-1700 is quite a neat unit

> "Like all satellite phones it requires a pretty huge antenna, but this collapses down"

you're likely to face penalties (such as a hefty fine, or even imprisonment, depending on which part of the world you're in) for the misuse of emergency services.

So that's Jack's tracking and emergency assistance sorted, but since the Spot Gen3 is a simplex device, he can't use it for two-way communication. So what are his options if he wants to phone home or speak to his friends? The only one that will work globally is a satellite phone, which I've covered here previously when I tried out Inmarsat's offerings. However, it makes sense for Jack to look into the options offered by the company providing the tracking services, so that the satellite footprints will properly match.

At the very fringes of Globalstar's coverage map, only simplex devices such as the Gen3 will work – you need to be further in range before

you can operate duplex devices such as phones and data terminals (that is, devices that can communicate both ways). Globalstar deploys a fleet of low-Earth-orbit satellites, which you might expect to cover the whole globe but, unlike some rival systems, there's no communication between these satellites. Each simply acts as a repeater between a user and a local base station, so in those parts of the world with no base station, there's no coverage. However, there's full duplex coverage in all the world's major population centres, so this will be less of a problem.

Like most satellite telephony providers, Globalstar offers pay-as-you-go and monthly airtime contracts. Note that pay-as-you-go excludes certain countries, such as Mexico and Russia; for that reason, I'd advise Jack to opt for a monthly contract. These minutes include data as well as voice calls, but the data rate is limited to old-school dial-up modem speed, so he's won't be uploading any video (or photos for that matter). For that he'll need to wait until he reaches somewhere with Wi-Fi.

Globalstar offers two handsets, the older SAT-550 and the newer GSP-1700; I'd definitely recommend the latter: it's far smaller and lighter than first-generation satellite phones such as the SAT, but not at the expense of its excellent build quality. The extent of the LEO network means there's minimal echo and delay on voice calls, and its call quality is among the best I've experienced on any of the satellite networks. Like all satellite phones it requires a huge antenna, but this collapses down and stores neatly into the back of the phone when not in use. One tip: while you're waiting for the phone to register on the network, leave the phone at the 90-degree position (normally employed only when using it as a modem), since when it's in either of the two phone-call positions it won't stand up on its base.

You shouldn't expect a satellite phone to work as well as a mobile phone – there'll be times when the signal will fade, especially when you don't have a full view of the sky. With the antenna in the stowed position, there's also a possibility that an incoming call

won't cause the phone to ring – you should therefore either restrict your usage to outgoing calls only, or else arrange a particular time every day when people can call you, then leave the antenna extended at those times. Hopefully by taking a Spot Gen3 and GSP-1700 with him, Jack will be able to enjoy his round-the-world adventure, safe in the knowledge that he'll never be completely off the grid, that his friends and family at home will be able to follow his travels, and that he'll be able to summon help if the need arises.

NEW LAPTOP TIME

I love my MacBook Pro with Retina display and would go so far as to say it's the nicest (and certainly fastest) laptop I've ever owned. Most of the software I use on a daily basis – from a web browser to several of Adobe's excellent Creative Cloud applications, and even Microsoft Office – has a native OS X version. If truth were told, the latest Mac version of Office 2011 is a bit of a dog – especially Outlook, which is simply awful – but I still persevere with it.

For most of my other Windows-only applications, I use Parallels Desktop. I've run through the whole gamut of virtualisation tools and PC emulators, but always seem to end up reverting back to Parallels – it's stable, fast and integrates nicely with OS X. Windows applications fire up in a window alongside your other Mac applications, offering seamless cut-and-paste, task switching and so on. It's a very productive environment – apart from one thing, that is.

I absolutely loathe people touching my computer screen and the fingerprints they invariably leave behind, but there's no getting away from the fact that Windows (particularly with the 8.1 release) is starting to become a more touch-based environment. Sure, you can still use the mouse for pretty well everything, but it's obvious that application designers are (in some cases) starting to think of the screen pokers first and the mouse twiddlers second. This is the one area where running Windows under Parallels on my MacBook Pro simply doesn't cut the mustard, since no touchscreen hardware is available. When I'm running Windows 8.1 in an emulator, I do find myself tapping the screen occasionally. The new interface seems to draw you in to its touch-based way of working,

PAUL OCKENDEN
Owner of one of the UK's oldest web agencies, Paul works on award-winning sites for many blue-chip clients.

▲ The Lenovo IdeaPad Yoga 2 Pro can be folded back and used as a tablet, or even used in "tent" mode as shown here
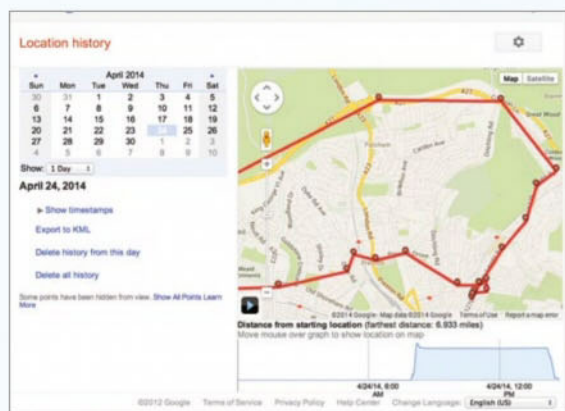
even for a diehard mouse-and-keyboard type like me.

Anyway, I went on a hunt for a MacBook-Pro-like Windows laptop. As always, I started from a load of PC Pro reviews and our A-List, then gradually narrowed things down. PC superstores are great places to try out hardware. Even if they don't have the exact model you want, you'll probably find something from the same manufacturer and with a similar model number. From this you can be fairly sure that features such as the keyboard and touchpad will be common across the range, even though the likes of the processor, RAM and hard drive configuration varies. There were a couple of machines on my shortlist that I couldn't find in the shops – even after a long wander up London's Tottenham Court Road – so I'm almost embarrassed to admit that I played the "press" card and managed to get various PR agencies to send me some samples to play with.

In the end I found an obvious winner, the Lenovo IdeaPad Yoga 2 Pro. This really is a fantastic little machine. It doesn't quite have the build quality of my MacBook: it's slightly more plasticky in places, its hinge isn't quite so solid, although there's a good reason for that. As well as being an Ultrabook, the Yoga's 360-degree hinge allows you to fold the keyboard back behind the screen and use it as a tablet (admittedly, quite a chunky one). Even in normal desktop/laptop mode, Windows 8.1 does have you tapping the screen from time to time, but it's when you use it in

▲ People often seem surprised when I show them how Google tracks the places they've been

tablet mode that the whole touch interface – and particularly the bit that used to be called Metro – starts to make more sense. The screen on the Yoga 2 Pro has an incredible 3,200 × 1,800 pixel resolution, which according to my calculator is 275dpi – far more dots than anyone really needs.

There's a slight problem, however: Windows hasn't really caught up with these high-DPI screens in the way that OS X has. The machine itself is fine, and Windows is mostly fine too, so long as you tell it to scale its fonts by 200% (although even that can look a bit small). No, the real problem lies in the fact that many Windows applications simply become unusable on a high-DPI screen. You can scale everything on OS X, not only the

OS. It's a bit like setting a laptop to a lower-than-native resolution, but with one important difference: for applications that are Retina-aware, which is most of them these days, the text and graphics will use the fine native resolution rather than the chunkier scaled-up version.

Windows approaches things differently by running everything at native resolution and permitting you to scale up fonts, buttons and so on, but only in applications that are high-DPI aware. On the Mac, non-Retina applications simply look slightly blurry, but the equivalent applications on a high-DPI Windows machine are effectively unusable. I was going to include a few example screenshots with this column, but I realised you probably wouldn't get the full effect in print.

Instead, head over to a blog post that I found at http://tinyurl.com/lbm92hq, whose author has posted screenshots from various Windows applications running on a high-DPI screen. It provides many useful tips to help overcome what is quickly becoming a serious problem.

My main use for the Yoga is to run Visual Studio, and this works fine. In fact, most of Microsoft's own applications cope with the screen really well, although I occasionally stumble across minor problems; for example, Word works just fine, but its equation editor is pretty much unusable.

On various forums you'll find people suggesting that you drop the resolution down to 1,600 × 900 (which is still higher than many 13in laptops), but I'm loath to do that. In no way am I slating Lenovo since the IdeaPad Yoga 2 Pro is a lovely bit of kit. I am laying some small blame at Microsoft's door for the clunky way Windows handles high-DPI screens, but mostly I'm blaming lazy application writers who haven't been following Microsoft's guidelines and have created a mess where hardware is leading software development. ◼

WHERE HAVE YOU BEEN?

If you have an Android phone, or make extensive use of Google services, look at **https://maps.google.com/locationhistory/b/0/**. You'll be amazed how much Google knows about where you've been. On an iPhone, go to Settings | Privacy | Location Services | System Services | Frequent Locations for similar details. It's great if you're doing your expenses and can't remember where you were on a certain day, but dangerous if you're doing things you'd rather others didn't know.

Red Hat Summit 2014

AFTER A TRIP TO SAN FRANCISCO, **STEVE CASSIDY** THINKS IT'S TIME WE STARTED PAYING ATTENTION TO THE OPEN-SOURCE SERVER DISTRO

My invitation said it was Red Hat Summit 2014, and that I should come to San Francisco for three days of solid Linux brain-sharing, to mix and mingle with the leading-edge minds in the world of enterprise Linux software engineering. Even in my own estimation, I'm not the world's best-informed Linux person, so I was reluctant to go; but on reflection I realised there were a few powerful reasons to rethink my initial rejection. After you've read my rationale, as presented in this column, then try putting yourself in my shoes, especially if you're a 20-year+ Windows old lag like me. Would you have gone?

The first factor in favour is that Red Hat has become a bit of a commercial phenomenon, as this mag reported just before Easter. It's now a billion-dollar company, which isn't the kind of image you probably have of Linux people and of the way their loosely coupled alliance actually operates. Quite a lot of Linux surface propaganda has a tinge of anti-materialism, as in "yeah, so the other guys have all the money, but we're smarter" (this delivered with a certain degree of jealousy mixed in with the contempt). But Red Hat itself doesn't do that stuff. While it may be true that there's a common outlook and a public transparency of discussion throughout the entire Linux universe, you have to carefully distinguish between the loose cannons of the blogosphere and the grown-ups.

Second plus factor: there's something about big shows in San Francisco and upstart IT businesses. The last jaunt of this kind that I took was to VMworld in around 2006, and the similarities are fairly striking. Back then, both Jon Honeyball and I decided that we really needed to get under the skin of a technology that Windows had so far handled only in a desultory manner, namely virtualisation. VMware was the market leader, and we both recognised that putting together a big show was a sign of intent. They were saying "we're here to stay," and that other prominent businesses wanted to be associated

with them. Fast-forward by eight years and these same signs are visible for Red Hat, although perhaps not in quite the same clear-cut single sector.

Just like the other major server Linux distros, Red Hat offers a broad platform for general-purpose enterprise computing, complete with a list of bits and add-ons that sound remarkably similar across the entire market. A major motive for Red Hat to want to make contact with people like me is that it's beginning to display a certain distinct competitive advantage when it comes to the rather specialised world of VM containers. I'm not going to dive too deeply into what distinguishes a container from other types of VM here: let's just say that containers on a host server all have to run the same OS and receive the same updates. In fact, containers look more like an old-fashioned multi-user login than they do a VMware-style collection of diverse black boxes in a warehouse.

For Red Hat's traditional audience – who are usually running classic web servers with Apache, MySQL and PHP as their standard toolkit – the ability to tie together a pool of servers all doing the same job – and manage all of their annoying updates and repeatable processes

STEVE CASSIDY mixes network technologies with human resources consultancy work.

together – is a basic advantage, so long as all of your clients need more or less the same things from their web server software platform. And there are a lot of these people, enough to put thousands of bums on seats in the Moscone Center earlier this year. There were even enough, I later discovered, to sponsor quite an impressive parade of secondary meetings in the nearby hotel, with little, wobbly signs on sticks using terms such as "government", "interest group" and "forum". (I'd never have seen these had the press centre not been situated in a venue where the floors all look the same: I almost sat down in one of these meetings by stumbling out of the lift with the herd and staggering along with them, until I realised that everyone around me was wearing a suit and tie, which most definitely isn't traditional Linux fan attire.)

A great deal of Red Hat's value and strategic direction comes from this type of audience, who like the idea of not paying for software, but need a long-term presence and resource to draw upon: what they want to do with that software is itself long-term, stable and all about dependability. Such long-term participation won't magically appear out of the mist of anti-capitalist sentiment, group co-operation and the wonders

of the internet: it takes money and a lot of conversations to understand what these priorities mean, and whether your answers are apposite and workable. This results in a relationship that starts to resemble the traditional kind presented by IBM and more recently by Microsoft.

In fact, IBM was there in San Francisco, with a socking great mainframe adorned with little paper slips, carrying duff, six-core, mainframe CPU chips. There's a considerable degree of common purpose between such a mainframe hardware platform and a container-based population of largely identical VMs all running as web servers. IBM was showing its usual sense for the nature of the audience, by putting a cheery den-mother type on its stand to welcome passersby into taking a look at the black monolith and at one of the gold-effect coins struck by IBM to commemorate 50 years of mainframe computing.

HARDWARE HEAVEN

As always, the show floor at an event such as this is in many ways easier to interpret than the largely ritualistic keynote speeches and product announcements (if you're interested, Red Hat's new container-specific OS flavour is called Atomic. It also released some stuff related to a rarefied utility and middleware platform called JBoss). However, at this Red Hat Summit, the proposition was very different from what I've become used to at VMworld or Microsoft TechEd. Red Hatters occupy a completely different

ecological niche from their Microsoft counterparts: at Red Hat it's quite likely that any randomly chosen delegate will have had a hand in some part of the open-source process that delivered the currently running version of their OS, so there's comparatively little the organisers can tell them about the software side of the equation. That's fine, especially since there's been a bit of a development hiatus in the software – it's all been later versions of things, mostly, or more VMs for your buck.

All the really exciting work has been going on in hardware, whether that be solid-state storage, radical departures in server architecture, or hyperspeed network interfaces. Perhaps I'm betraying my own bias towards hardware here, but it seemed to me that – while walking from IBM's stand with its six-core 5.5GHz PowerPC chips, past ARM's stand with Internet-of-Things computers the size of a mobile-phone battery, and onward past HP's Moonshot server demo – that there were plenty of very happy hardware people to visit. And none happier, as I discovered, than the good chaps from SeaMicro.

Go and take a look at **www. seamicro.com/sm15000** for one view of SeaMicro's example modular server: the snapshot on the following page is my attempt to show the way its design allows different CPU speeds and specifications to be mixed within a single chassis, with the secret sauce being the board interface chipsets. These forsake any attempt to work like a classic PC motherboard,

> "
> The density of compute power you can pack into new form factors is startling
> "

▼ Even Linux gurus use Macs when it comes to presenting to an audience this big

and instead treat the server backplane as one giant virtual switch. The specification page mentions the Atom CPU as one of the options for building up an enormous machine, but even though my happy demo specialist had a board there for me to photograph, it was clear even from his expression that the entire platform really takes off and flies only with the various AMD Opteron boards loaded. Lots of them. The density of compute power you can pack into new form factors such as these is startling, changing the way a designer thinks about how to run a data centre. Not least of the difficulties is getting enough storage close enough to all those CPUs, both physically and in terms of what protocols to use to ship all those bytes around and present them to the processors. One had to walk only a few yards from SeaMicro to arrive at the stand of SolidFire, a company that's stacking up flash storage at prices it thinks compare directly with spinning disks.

There's a lurking problem with flash storage, and it's not the one that attracts the most techie attention on the web, however, where everyone seems to have either a dead SSD story or a long-held, perfectly formed opinion about the low-level bit-shuffling that takes place within the actual flash chips. The problem to which I'm referring is rather that the rate of change in the storage business is accelerating, even by the standards of the post-recession IT sector. The guys from SolidFire had a lot to say about how they keep up the performance in sizeable multipetabyte installations. They talked about how the power consumption and use of lower-level services such as deduplication within the storage platform itself can bring costs right down to compete with spinning-disk products in mostly relevant like-for-like comparisons. But you can't strictly call an old fibre-channel disk array a "like-for-like" comparison in the first place!

So much of what makes these products interesting isn't their headline components, but lies in their breaking away from traditional hardware architectural constraints in those unsung, small-print parts of the system. SolidFire uses a separate "storage OS" because its storage boxes have their own CPUs built in. SeaMicro has custom chips dedicated to traffic movement across its custom server bus, which makes the difference between the performance you'd expect from scaling up

The variety of CPU boards available for the SeaMicro server chassis is phenomenal

a regular home PC and what is actually delivered by these custom technologies.

Incidentally, I don't mean to sneer at dedicated home PC enthusiasts here (even if I've lost count of the number of times I've had to remind people that a 1TB USB drive isn't "a backup"). The point I'm making is that it's unrealistic to keep calling any of these boxes "PCs" any longer, even though you could nip over to the Fedora stand at the Red Hat Summit, grab a live-demo USB key and then boot either your own laptop or a quarter-ton new blade server from the same key. Perhaps the really exciting bit about the code platform here, and the work of the audience rather than the company, is that they've seen the value in keeping the software platform pretty constant, enabling the hardware to rush off in a million different and enormously high-performance directions.

COLLABORATORS VITAL TO THE RED HAT CAUSE

I think I made a bit of a fool of myself while sitting with Paul Cormier of Red Hat. He's president of products and technologies, and presenter of the best of the keynote addresses this year, to my mind. My faux pas concerned the way that Red Hat coexists with its software partners. The real standout here was Docker (**www.docker.io**), a tool for managing and delivering the container VMs that Red Hat enabled in its most recent revision. The frequency of mentions for Docker in Red Hat's presentations made me expect a stand the size of, well, a dock, but actually – in common with most of the software crews present on the show floor – it was a modest stall that mostly existed to dispense

various T-shirts, USB keys and many free pens.

Anyway, if you're intending to run a whole lot of VMs that are similar to each other (by the standards of the long-standing virtualisation community), then it's likely that Docker will provide the appealing cherry on top of an otherwise Red Hat installation in your big VM centre. I made a fool of myself by thinking too commercially and asking Paul Cormier: "So, when are you going to buy Docker?" It's actually more difficult to adapt to the business philosophy of these Linux software providers than it is to adapt to their actual software: the gap could hardly be any wider or stranger between our commercial buy/sell/hire/fire world of Microsoft and its friends, and the rarefied, government-friendly, academically based and far more transparent world of Red Hat.

In this world, allegiances take the place of takeovers, and agreements tend to be as open as the source code of the projects that they enable. Why would Red Hat buy Docker, when Docker's entire mantra is about portability between supported platforms? The more portable a Docker package (a "VM" to you and me, but a VM that's exceedingly similar to all the other VMs around it), the more the users will like it and the platforms that support it.

Even though we were mostly talking to improve in my understanding of the rule-breaking part of container VMs (Paul was very patient with me on that score), I had to keep stopping myself from thinking up sly, Machiavellian motives for these companies to be co-operating with one another, which would appear not to be applicable

to this business at all. Of course that seems very appealing, and the utilitarian logic of the two- or three-year forward-looking software roadmap is almost impossible without a considerable level of agreement. I have to remember, however, that while this is a billion-dollar company, it's living in a region of the computing and networking world that doesn't have the variety of pressures, nor the longevity of systems and services, that has been the reward for Windows for being so incredibly broadly applicable.

CONTAINERS COME OF AGE

It may well come to be the case that a vast and ever-increasing number of simple web servers will run more efficiently and more profitably in containers than they did either as super-refined, special-purpose hardware, or as old-school, black-box VMs. If a regular VM is a black box that can't tell whether it's been virtualised or what its neighbours are up to, then a container VM is more like a battery hen. The virtue of this mass of battery hens lies precisely in their similarity: a tiny code change made at Red Hat HQ can be sent out there to hundreds of millions of Red Hat Enterprise servers via the centralised update service.

I have no doubt at all that if you can express what you want to do as a web page with a MySQL database behind it, then you're very likely to start thinking about this platform in the next few years – especially Docker. I don't believe, however, that this encompasses the entirety of the computing world, or that those at the leading edge of this kind of resource will automatically be able to solve every problem.

After all, it was impossible to do anything at the show without downloading the mandatory (Android- or iPhone-only) show app, which crashed on my tablet three times, started every day with another multimegabyte download, and then showed me remarkably little that couldn't have been presented as an open-standard, easily portable, multiplatform PDF. ∎

SOCKET TO ME

Ironically, after I got back from San Francisco I was chatting to a very heavy Linux server user about Red Hat. "I prefer SUSE," he said immediately, "but they have per-socket licensing, and that rules them out for me." Rather a long way from the "free software" movement that was still visible at the Red Hat Summit.

Maximise your IT career

FIONA TEAKLE HAS GREAT ADVICE FOR THOSE LOOKING TO GET THE MOST OUT OF THEIR IT JOB.

As a young professional, I always get asked, "where do you want to go next?" or "what training are you looking to go on?" Overall, I have an idea of where I feel my career is heading in the next few years, but what about my skills is going to set me up for the next 10-15 years and that's where I start to get a bit lost about what to do.

When you are looking at professional development, there are two aspects that I feel you need to consider and ensure you cover, the technical side (or your speciality) and the non-technical side. When we focus on training we are always looking to ensure we are focused on our specialised area, which is critical to stop on top of our fields and ever changing industry. However how many of you are also ensuring the focus on the growth on the other side, the soft skill side. For a lot of ICT professionals the soft skills may not come as easy as the technical, yet as the industry continues to evolve this is the area that we need to also excel at.

TEAM LEADERSHIP

Ensuring you or your staff are adequately trained can not only affect ability to deliver, but to retain staff in a company. Recently I have had colleagues move interstate to go and work with a manager who they worked for 10 years ago, because they felt he was not only a good leader but treated his team properly. People are more likely to leave a job or company if they do not feel they are being respected or treated right by their managers. With the right leadership, people will stay and maybe stay longer than they had anticipated.

To give you an idea of the benefits of looking at soft skills, I would like to look at engagement. Julie Gebaur in her book "Closing the Engagement Gap" asks some of the following questions: Do you inspire employees to do what it takes so the organization can meet its goals? Do you inform people about how they can contribute to the organization's performance? Do you show appreciation and recognize the efforts of work well done? In your company what is the response

> **Think about mapping your skills to help identify your skill gaps and ensure your education is focused.**

to these? If positive then you are on track to help breed and keep the best employees. However, what if you aren't? What's the impact of having disengaged employees? Think also about companies that do this well, Google, Facebook to name a few and the positive experience employees have. This is only one positive example of the benefits of focusing of soft skills as well as technical.

WHAT TO DO

Unfortunately most companies expect you to know how to stand out in the soft skill areas such as leading an effective team, problem solving, delegating, motivating etc, but if you have not been fortunate enough to work with someone that has strong qualities that you can learn from or they do not come naturally to you,

FIONA TEAKLE is Director of the ACS Young IT Board. You can contact her at fionateakle@ acsmail.net.au

then where to?

With this in mind, the question is where to start? There are many methods and opportunities for training provided, but ensuring you are focused on the right area for what you are lacking is essential.

As a member of the ACS, you have access to the MySFIA tool. MySFIA helps you navigate this constant technological change and map your path to career success. Based on the Skills Framework for the Information Age (SFIA), MySFIA enables you to determine your current skills profile, identify possible career roles, and recognise development areas to focus on to help achieve your goals.

CLEAR VISION

While there are other free tools around that may provide the opportunity to also do this, the advantage to mapping your skills through MySFIA is that is an accredited tool, specialising in ICT. SFIA has not only been adopted by the ACS in Australia, but also in other professional societies and organisations around the globe. This is able to give you an international understanding of what an ICT role actually involves and identifies the skills required.

Having a clear picture on the skills that you need to develop in order to be the more efficient and effective employee, allows you to go to your management with a plan forward on how to improve and sets realistic goals that you can realistically measure.

Whether you are looking to take your career global or just to the next step, think about mapping your skills to help identify your skill gaps and ensure your education is focused on the right areas.

The end of July is also National ICT Careers week, which is a key annual event the Australian Computer Society puts on. It features many events, workshops and careers fairs being run around the country, and I do encourage you to check out what may be happening in your local area via our site at **www.ictcareersweek.info/**.

Jon Honeyball revs up his anger at the poor thinking behind in-car technology

" Car manufacturers confuse me. In some aspects, they bring truly amazing technology to the public. In others, they fail so spectacularly it's embarrassing.

To start on a positive note, no-one who has followed the progress of automotive engineering over the past three decades can fail to appreciate the impact of the microprocessor. Back in the 1970s, it was an analogue world: engineers worked from estimates based on historical data and world-class hunches. With the move to CPU-based modelling, it's possible to find out how a whole vehicle, or just one component, will work before you even build it. The CPU has enabled incredibly detailed modelling, from aerodynamics and simulated crash testing to the way heated air flows through the cabin.

Then there's the technology within the car itself. Engine-management systems have brought mind-boggling improvements in efficiency due to the ultra-precise control of fuel injection, spark timing and so forth. Just take a look at the power outputs per litre: 30 years ago, 100bhp per litre was considered almost a race-engine output. Today, mainstream engines are delivering almost twice that.

No detail, it seems, is too small for the CPU to take control. Soon you'll be able to run your headlamps on full beam all the time; you won't need to dip the lights when you come up behind another vehicle. How can this be? Well, when a camera sees the vehicle in front, the car then steers and modifies the beam to make a dark "tunnel" in the light pattern so that the car in front is excluded. This happens in real-time, so the tunnel is always in the right place irrespective of the twists and turns of the road. When there is an oncoming car, the camera system sees this too, and makes another tunnel. It's truly incredible technology, bringing together cameras, artificial intelligence and steerable LED headlights, all bound together by the power of the CPU.

Which is why it's quite extraordinary that car manufacturers do such an appalling job within the cabin. After a recent unfortunate car crash (with no-one injured, thankfully) my 17-year-old Mercedes-Benz E-Class was written off and we needed a new car immediately. A local Audi dealer had a two-year-old A3 DSG diesel that ticked all the boxes. It even had Bluetooth for a phone connection and an iPod mounting system in the glovebox. As a starting point for a car we intended to keep forever, it seemed a big leap forwards over the old Mercedes.

The reality, however, has proved somewhat different. Yes, it has an iPod mount, but the device appears to the in-car head unit as a six-disc CD autochanger. The first five "discs" are the first five playlists on your iPod. The sixth is everything else. Scrolling through can only be done one track at a time, there's no searching and it's ordered by alphabetical track number. The display goes to track 99 and then wraps to 01 again (although this is actually track 101). Handling a 160GB iPod filled with music is beyond a nightmare – it's impossible.

I could improve things by fitting the Audi iPod media interface box, but that would require pulling out the perfectly usable radio/CD head unit and replacing it with the full satnav system. The price tag for this is well into four figures, because in-car satnav seems to be one of the last bastions of true customer rip-off in the car industry.

Then there's Bluetooth. In some ways, this works incredibly well: the sound quality is excellent and I can scroll around the phone book with ease via the controls on the steering wheel. The voice-control system, however,

" I plugged in an iPod in Seattle and it said it was indexing the device. By the time I got to San Francisco, it was still indexing "

appears only to work for someone with an extraordinarily weird accent, so I've given up. But that's not the worst part: you can pair up to four phones with the system, but only one can be connected at once. If two people get into the car, and their phones are paired, then only one works. And it's random as to which one is grabbed first.

You'd think the computer manufacturers would have an answer for all of this. Well, Microsoft tried with its Sync system, but I rent a lot of cars in the USA and every time I've used Sync it has been a horrible mess. Once I plugged in an iPod in Seattle, and it said it was indexing the device. By the time I got to San Francisco, it was still indexing.

Is there any surprise that the industry is looking to Apple to sort out all of this? "

Brateck
BRACKET TECHNOLOGY

PORTABLE TV CART
- 3-in-1 trolley; TV, DVD, etc
- Supports 60" - 40kg
- Shelves for DVD, Keyboard, etc

$349⁰⁰
ANBTT1018

PORTRAIT TV BRACKET MOUNT
- Universal mounting pattern
- Large TV size: 32"-65"
- Load Capacity: 75 kg
- Maximum VESA: 200×600mm

$37⁹⁸
ANBTPWB01

Quality you expect at prices you don't!
Brateck's enormous range includes brackets
available to suit any application, including:

- Shop Displays
- Home Theatre
- Living Room
- Digital Signage
- Home Office

ROTATABLE 27" MONITOR DESK STAND
- For screens up to 27"
- Rotatable: Landscape to Portrait
- Built-in tool-free screen height adjustment

$45⁰⁰
ANBTLCDT15

SECURE ENCLOSURE FLOOR STAND
- Secure iPad display with lock
- Bolts to floor for added security
- Padded internally to protect iPad

$89⁹⁵
AWPAD1202A

FREE STANDING DUAL MONITOR STAND
- DUAL Horizontal Monitor Stand 13 - 27"
- Adjustable height, tilt / pan and rotation
- 10 Year Warranty

$98⁰⁰
ANLDT02T02