**THE PERFECT 4K GAMING SCREEN**
Philips' £600 40-inch UHD panel reviewed

**BUILD YOUR OWN HOME SERVER**
Unlock the power of Zentyal gateway

**IS THE TIME RIGHT FOR eSPORTS?**
Why 2015 is going to change PC gaming

# PCFormat®

PERFORMANCE GEAR & GAMING

ISSUE 301 • FEBRUARY 2015

## GET MORE SPEED FOR FREE!

- 52 techie tips and tricks
- Get to your games faster
- Overclock your hardware

## THE COOLEST CHIP CHILLERS

Closed-loop water cooling put to the test

**BUILD IT!**

## A FULL HD GAMING PC FOR £477

**PLUS** The ultimate PC buyer's guide

## No.1 FOR PC HARDWARE

Asus Sabertooth Mark S • XFX Bravo • Samsung 850 Evo • Creative SoundBlaster E5

Future

FEBRUARY 2015

Cyberpower recommends Windows

# CYBERPOWER

Create the PC of Your Dreams





To Custom Build
Your Ideal Desktop
or Laptop, Visit :

**www.cyberpowersystem.co.uk**

**0844 371 2727**

## Infinity Hercules GT

Extreme Performance Gaming Station

**Windows 8.1**

Asus® Z97-P with SATA III, USB 3
16GB Kingston HyperX Fury 1866Mhz DDR3 Memory
120GB Kingston V300 SSD
2TB 7200rpm SATA III 6.0Gb/s 64MB HDD
4GB Nvidia® GTX 970 Video Card
Coolermaster Cosmos SE Full-Tower Gaming Case
Corsair H55 Cooling System
LCD monitor is not included but optional

| | |
|---|---|
| **Intel® Core™ i7 Processor** | |
| 4790K 3.6Ghz | £1245 |
| 4790 3.4Ghz | £1215 |
| **Intel® Core™ i5 Processor** | |
| 4690K 3.4Ghz | £1149 |
| 4690 3.4Ghz | £1129 |
| 4590 3.2Ghz | £1119 |

From £1119 Inc VAT and Del

DVD 24X±RW · HD 7.1 · CoolerMaster · CoolerMaster · 12-in-1 Card Reader · CoolerMaster B600 Power Supply · Free Xtreme Overclocking

## Infinity Hercules

A Media Dream for Photo/Video Editing
4th Generation Intel® Core™ Processor

**Windows 8.1**

Gigabyte® Z97-HD 3 with SATA III, USB 3
8GB Kingston HyperX Fury
1866Mhz DDR3 Memory
2TB 7200rpm SATA III 6.0Gb/s 64MB HDD
2GB Nvidia® GTX 960 Graphic Card
NZXT Phantom 410 Mid Tower White
Corsair H55 Cooling System
LCD monitor is not included but optional

| | |
|---|---|
| **Intel® Core™ i7 Processor** | |
| 4790K 3.5Ghz | £955 |
| 4790 3.4Ghz | £925 |
| **Intel® Core™ i5 Processor** | |
| 4690K 3.4Ghz | £855 |
| 4690 3.4Ghz | £839 |
| 4590 3.2Ghz | £825 |

From £825 Inc VAT and Del

DVD 24X±RW · HD 7.1 · CoolerMaster · CoolerMaster · 12-in-1 Card Reader · Coolermaster 500 W Power Supply

# Unleash The Power

- Free UK delivery*
- All desktops come with 3 year warranty**
- Flexible finance available and secure online payment

*UK mainland only, see our website for detail
**See our website for detail

# Infinity Xtreme Pro

Extreme CPU & VGA Water Cooling Gaming Monster
Intel® Core™ Processor i7-5960X

**Windows 8.1**
ASUS® X99-A Mainboard
16GB 2133mHz DDR4 Memory
240GB Intel 730 series SSD
2TB SATA III 6.0Gb/s 64MB HDD
4GB Nvidia® GTX 980 Graphic Card
16X Pioneer BluRay BDR-209DBK Writer Black
CoolerMaster Staker 935 Gaming Case
Cyberpower Advance Water Cooling system Medium Size
LCD monitor is not included but optional

**Intel® Core™ i7 Processor Extreme Edition**

| | |
|---|---|
| 5960X 3.00Ghz 20MB | £ 2575 |
| 5930K 3.50Ghz 15MB | £ 2145 |
| 5820K 3.30Ghz 15MB | £ 1959 |

From £1959 Inc VAT and Del

Blu Ray 16X Writer · HD 7.1 · CoolerMaster · CoolerMaster · 12-in-1 Card Reader · CoolerMaster 750W Power Supply · Free Xtreme Overclocking

intel inside™ CORE™ i7

# Infinity Hercules SE

Great Value for Money Home PC with Water Cooling
Intel® Core™ i5 Processor

**Windows 8.1**
ASUS® H81M-D Plus Mainboard
8GB Kingston HyperX Fury 1866Mhz DDR3 Memory
2TB 7200rpm SATA III 6.0Gb/s 64MB HDD
1GB AMD® Radeon™ R7 250X Graphic Card
CoolerMaster HAF 912 Gaming Case
Corsair H55 Cooling System
LCD monitor is not included but optional

**Intel® Core™ i7 Processor**

| | |
|---|---|
| 4790K 3.6Ghz | £ 795 |
| 4790 3.5Ghz | £ 765 |

**Intel® Core™ i5 Processor**

| | |
|---|---|
| 4690K 3.4Ghz | £ 695 |
| 4690 3.4Ghz | £ 679 |
| 4590 3.2Ghz | £ 669 |

**Intel® Core™ i3 Processor**

| | |
|---|---|
| 4360 3.6Ghz | £ 619 |
| 4350 3.5Ghz | £ 619 |
| 4160 3.4Ghz | £ 589 |

From £589 Inc VAT and Del

DVD 24X±RW · HD 7.1 · CoolerMaster · CoolerMaster · 12-in-1 Card Reader · 450W Power Supply

# Infinity Xtreme GT

High Performance All-Rounder
Intel® 4th Generation Core™ Processor

**Windows 8.1**
MSI® X99S PLUS Mainboard
16GB 2133Mhz DDR4 Memory
240GB Kingston V300 SSD
1TB 7200rpm SATA III 6.0Gb/s 64MB Cache HDD
4GB Nvidia® GTX 970 Video Card
16X Pioneer BluRay BDR-209DBK Writer Black
Inwin 904 Gaming Case
Corsair H55 Cooling System
LCD monitor is not included but optional

**Intel® Core™ i7 Processor Extreme Edition**

| | |
|---|---|
| 5960X 3.6Ghz | £ 2179 |
| 5930K 3.4Ghz | £ 1755 |
| 5820K 3.7Ghz | £ 1559 |

From £1559 Inc VAT and Del

Blu Ray 16X Writer · HD 7.1 · CoolerMaster · CoolerMaster · 12-in-1 Card Reader · CoolerMaster B600 Power Supply · Free Xtreme Overclocking

# FANGBOOK EVO HX6-100

Gaming Laptop with 4th Generation
Intel® Core™ i7-4940MX Extreme Mobile Processor
Intel® HM87 Chipset
WiFi Link 802.11 A/B/G/N Wi-Fi + Bluetooth Combo

**Windows 8.1**
8GB DDR3 1600 SODIMM Memory
500GB 5400RPM SATA HDD
15.6" HD 1920 x 1080 Display
2GB Built-in Nvidia® GeForce® GTX 860M Video Card
Built-in LAN & Wireless N Network Card
Built-in 720 Pixels HD Webcam

**Intel® Core™ i7 Processor Extreme Edition**

| | |
|---|---|
| 4940MX | £ 1455 |
| 4910MQ | £ 1045 |
| 4810MQ | £ 905 |
| 4710MQ | £ 779 |

From £779 Inc VAT and Del

1x HDMI · 2x USB 3.0 · 3 hr · 2.58 kgw · DVD 8X±RW · Built-in Wireless

# FANGBOOK EVO HX7-200

Gaming Laptop with 4th Generation
Intel® Core™ i7-4940MX Extreme Mobile Processor
Intel® HM87 Chipset
Intel® Dual Band Wireless- AC 7260HMW
802.11AC, Wi-Fi + BT 4.0 combo

**Windows 8.1**
16GB DDR3 1600 SODIMM Memory
120GB Kingston V300 MLC SSD
1TB 5400RPM SATA HDD
17.3" Full HD 1920 x 1080 Display
6GB Built-in Nvidia® GeForce® GTX 970M Video Card
Built-in 720P HD Webcam

**Intel® Core™ i7 Processor Extreme Edition**

| | |
|---|---|
| 4940MX | £ 1889 |
| 4910MQ | £ 1445 |
| 4810MQ | £ 1279 |
| 4710MQ | £ 1159 |

From £1159 Inc VAT and Del

1x HDMI · 3 hr · 3.04 kgw · DVD 8X±RW · Built-in Wireless

# The Photography Show

21-24 MARCH 2015
THE NEC, BIRMINGHAM

*The event that puts you in the picture*

**The Photography Show is the event for aspiring photographers of all levels.**

With an incredible line-up of exhibiting brands, show bargains, live demos and inspirational speakers, you'll enjoy a great day out dedicated to all things photography.

**Register your interest today at:**

**photographyshow.com**

@ukphotoshow

PCFormat

Future Publishing Ltd, Quay House,
The Ambury, Bath BA1 1UA
**Tel** 01225 442 244 **Fax** 01225 732 275
**Email** pcfmail@futurenet.com
**Facebook** www.facebook.com/pcformatmag

**EDITORIAL**
**Editor** Alan Dexter
**Deputy editor** Dave James
**Technology writers** Jeremy Laird, Luis Villazon
**Art editor** Fraser McDermott
**Production editor** Andrew Westbrook

**CONTRIBUTORS**
**Editorial** Graham Barlow, Simon Crisp, Tamoor Hussain, Phil Iwaniuk, Chris Livingston, Tom McNamara, Nick Peers, Dom Reseigh-Lincoln, Ed Ricketts, James Russell, Mayank Sharma, Henry Winchester
**Cover manipulation** Future PreMedia
**Photography** Future Photo Studio, ThinkStock
**Illustration** Kevin February

**ADVERTISING**
**For ad enquiries please contact**
Richard Hemmings richard.hemmings@futurenet.com

**MARKETING**
**Marketing manager** Richard Stephens

**PRODUCTION & DISTRIBUTION**
**Production controller** Vivienne Calvert
**Production manager** Mark Constance
**Printed in the UK by:** William Gibbons & Sons Ltd on behalf of Future
**Distributed by:** Seymour Distribution Ltd, 2 East Poultry Avenue, London EC1A 9PT, Tel: 0207 429 4000
**Overseas distribution by:** Seymour International

**CIRCULATION**
**Trade marketing manager**
Juliette Winyard (07551 150 984)

**SUBSCRIPTIONS**
**UK reader order line & enquiries** 0844 848 2852
**Overseas reader order line & enquiries**
+44 (0)1604 251045
**Online enquiries** www.myfavouritemagazines.co.uk
**Email** pcformat@myfavouritemagazines.co.uk

**LICENSING**
**International director** Regina Erak
regina.erak@futurenet.com
+44 (0)1225 442244 Fax +44 (0)1225 732275

**MANAGEMENT**
**Content & marketing director** Nial Ferguson
**Head of content & marketing, technology** Nick Merritt
**Group editor-in-chief** Paul Newman
**Group art director** Steve Gotobed

**Next issue on sale 12 February 2015**



# Alan Dexter, Editor

# CHANGE ISN'T BAD. IT'S THE SEARCH FOR SOMETHING BETTER

**CHANGE EQUALS DIFFERENT**, and there's always a chance we may not like the new thing. That's the generally perceived wisdom. The truth is, change is often an improvement. It's also what keep us on our toes, keeps us thinking about what might be happening next and stops things from getting stale. It readies us for new possibilities and helps keep us interested.

This issue we've changed the magazine. Hopefully you'll agree with us that it's for the better. We're still looking at the latest and greatest hardware and gaming, featuring the latest advances in PC system building, while showing you how to get the most out of your current machine and how to upgrade it to get more out of it than ever before. We really like the new design on the magazine, but do let me know what you lovely folk think of the new look *PC Format*.

We PC people are a robust breed, more accustomed than most to the challenges of the new. Indeed, we get excited about it. Chances are that 'the new' is often better, underpinning advances in a platform we love so much. After all, we always want to do more and we want to do it faster. That's the rule that's seen CPUs go from just under 5MHz to well beyond 4GHz, from single core processors up to 8-core monsters. From TnL hardware 3D to the supercomputer levels of polygon manipulation that we now take for granted in the latest graphics cards.

The hardware is just part of the story though. No matter how fast the individual components get, there are a couple of things you need to do to ensure you're getting the most from them. You need to ensure that you're keeping your components cool and that the software side of things is configured optimally. This issue we cover both of these areas in depth. Our guide on speeding up your PC starts on page 52, while our guide to the latest CPU water coolers can be found on page 8.

Do let us know what you think about the issue and we hope you enjoy it!

Alan Dexter, Editor

↘ submit your questions to: alan.dexter@futurenet.com

PCFormat

# CONTENTS

ISSUE 301 FEBRUARY 2015








## Inside this issue...

### Featuring...





### In the lab



Asus STRIX Tactic Pro

**80 Build it:**
**The anatomy of a powerhouse**

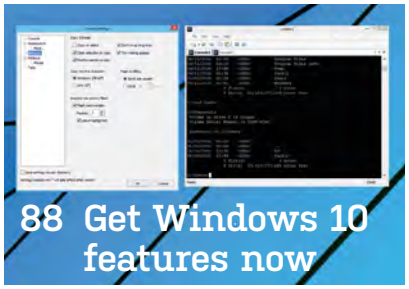
# Find the perfect closed-loop water cooler for your overclocked CPU PAGE 14

## How to...

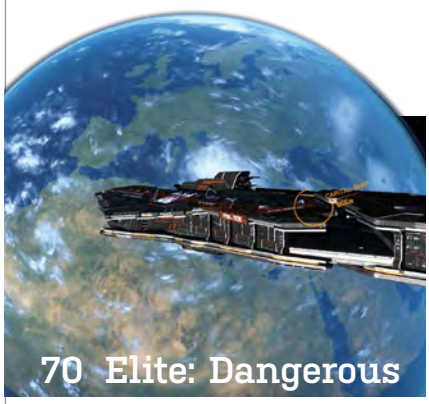


## Gaming





88 Get Windows 10 features now



70 Elite: Dangerous



## Regulars...

# Everythi

The first rule of thermodynamics is: you do not talk about thermodynamics*. The second rule of thermodynamics is: if you have a hardware problem, there's a good chance heat is to blame. Heat is the nemesis of pretty much everything you're trying to do with your system. Want to run your processor faster? Heat is holding you back. Speed up graphics? Heat will happily shut that door in your face. Pack more juicy components into your chassis? You'd better allow for good airflow or the whole lot will be brought to its knees gasping for air.

The ways we tackle heat production has evolved over the years. Original PCs didn't go in for all this active cooling malachy. Indeed it wasn't too long ago (in human evolution terms at least) that your CPU would've needed to be something special to boast even a heatsink. As time has passed though, and processor designs developed, more aggressive cooling has been needed. And despite a few blips along the way, we now find ourselves at a point where an aftermarket cooler is pretty much expected – especially if you're looking to get the most from your processor.

We're not just talking about overclocking when we say that either, because as CPU designs have developed, so effective heat management has become essential. This in turn means that part of the silicon in the latest CPUs is there to monitor just how hot the chip is getting, and thus it can control the speed at which it is operating. This is the basis of Intel's Turbo mode. The Core i7-4770k for instance may have a base frequency of 3.5GHz, but if the chip is cool enough it can up the frequency to 3.9GHz on the fly. The trick therefore is to make sure it has that headroom available, and one of the best ways of doing that is to toss out the basic CPU cooler that came with your chip and replace it with a closed-loop water cooler.

* NOTE: These rules should not be confused with the laws of thermodynamics, which are far scarier and essentially state that chaos will ultimately win.

# ng's Cool

## Understand your PC's thermodynamics to unlock its true power

**Check out the specs sheets of your CPU, and you'll find reference to its TDP. Standing for thermal design power, it's an indication of how much heat a component produces when used. It may not be immediately obvious what the TDP is actually referring to, but it's not the peak wattage you can expect a given chip to run at. In fact, it's defined as the average power dissipation when running at the base frequency. So not at the turbo frequency even.**

Rather than being the peak thermal power you need to allow for in a worst case scenario, the TDP of a processor is actually the thermal point that you're likely to see in normal day-to-day usage. This is a reason why TDP is sometimes referred to as the thermal design point. To give an example, the TDP for the Core i7-4770K is 85W, so in order to keep the chip running optimally, the chip's cooler has to be capable of shifting at least 85W of energy.

That this isn't the peak heat output is important – you can work out the thermodynamics of your system to a wonderful degree, only for the chip to overheat and bring your system to its knees when really thrashing it. Overcompensating on your cooling means your CPU won't be throttled, which in turn means you'll be getting the very best from it. Or, put another way, getting what you paid for. And the best way of overcompensating is to water cool your chip.

Water cooling has been held up as the pinnacle of cooling by the modding fraternity for years, but for many the hassle of setting up such a system outweighs the benefits. It's simply too much trouble for the vast majority, with the added fear of throwing water all over your motherboard. This is where closed-loop solutions ease into view and offer most of the benefits of a full water-cooling system, but in a much easier-to-swallow form.

Compare the cooling afforded by a closed-loop water cooler with a decent air cooler and you'd be forgiven for thinking there wasn't a lot in it. Simply look at the operating temperatures at full load and then the differences can indeed be slight. However, that isn't the whole story. An important factor in these days of turbo mode is the time it takes to go from the high temperatures of full-load down to the idle temperature, and it's here that closed-loop water coolers really come into their own – as generally they'll drop back down to idle levels in seconds rather than minutes. And that means the CPU can turbo much sooner once again.

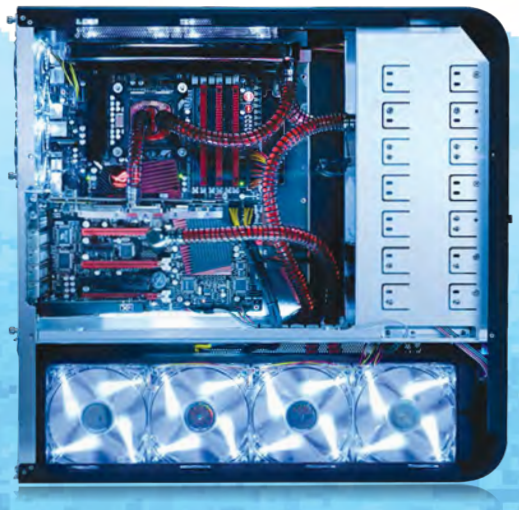
**ABOVE LEFT:** **No need to worry about drowning your Z97 with a closed-loop system.**

**ABOVE RIGHT:** **If space is an issue for you, try a 120mm cooler.**

## COOL WATER

In a standard water-cooling system you have one or more water blocks in contact with the components you wish to cool. A flow of water is maintained through these blocks and the radiator that cools the water down again through the use of a water pump. In order to improve the efficiency of the radiator, one or two fans are used, while a reservoir is

**Your cooler size is largely dependent on your case size.**



**It's vital your system has good contact with your processer.**

DOMAINS | MAIL | **HOSTING** | eCOMMERCE | SERVERS

# WEB HOSTING

**TOP APPS NOW EVEN BETTER!**


## WordPress and more with 1&1!

- Easy installation with 1&1 WP Wizard
- **1&1 Expert App Support 24/7**
- Evaluation version for all applications
- Security notifications and automatic updates
- Up to 2 GB RAM guaranteed
- Optimised for WordPress and over 140 more apps (Drupal™, Joomla!™, TYPO3...)

## Powerful Tools

- NetObjects Fusion® 2013 – 1&1 Edition included
- 1&1 Mobile Website Builder
- **PHP 5.6**, Perl, Python, Ruby, ASP.NET and more...

## Successful Marketing

- 1&1 SEO Pro
- 1&1 Search Engine Marketing
- Facebook® and Bing® credits
- 1&1 Newsletter Tool

## State-of-the-Art Technology

- **Geo-redundancy** for maximum availability
- Over 300 Gbit/s network connectivity
- 1&1 CDN with Railgun™

## All Inclusive

- Free domain for package lifetime (.co.uk, .com, .net...)
- Unlimited power: Webspace, Monthly Traffic, E-mail Accounts and MySQL Databases

**COMPLETE PACKAGES**

Starting at **£0.99** per month* excl. 20% VAT

1 TRIAL TRY FOR 30 DAYS

1 MONTH SHORT TERM CONTRACTS

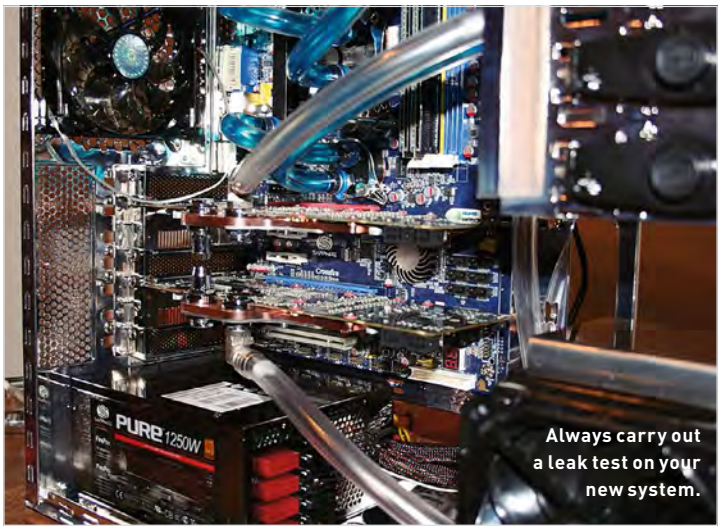
1 CALL SPEAK TO AN EXPERT

0330 123 0274

1&1

1and1.co.uk

* 1&1 Basic £0.99 per month for 12 months with 3 month billing cycle, paid in advance, then regular price applies. Prices exclude 20% VAT. Visit www.1and1.co.uk for full offer details, terms and conditions. Rubik's Cube® used by permission of Rubik's Brand Ltd.



Always carry out a leak test on your new system.

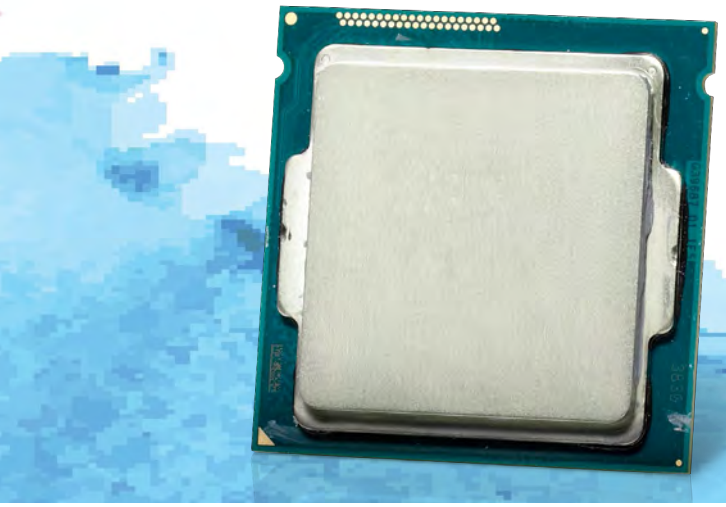
also present to ensure that there's enough liquid in the system to keep things running smoothly.

All these elements are present in closed-loop systems too. The reservoir is often combined into the water block, while the water pump either sits in the radiator or in some cases on top of the water block. The specifics differ between products, with the number of fans ranging from one 120mm cooler all the way up to three fan systems. Two fan systems are quickly becoming the norm though, either on a 120mm-long radiator with a fan on each side, or a 240mm radiator with the fans next to each other. Which one you go for is largely determined by how much money you have available to spend on cooling and how much room you have in your case.

One thing to consider when making the move to a closed-loop water cooler is that it moves the main heat pump away from the centre of your rig. Depending on the air cooler that you're replacing and the layout of your case, this can either be a good or bad thing. It may mean that you have to add extra system cooling to ensure there's still a good airflow over your motherboard, and specifically over the power regulators that are behind the ATX connectors. Good airflow is also a good idea for your system storage of course. Going down the closed-loop water cooling route isn't going to solve all of your system-cooling needs with one unit, in other words.

Closed-loop systems are gaining traction in other areas though. You only have to look at AMD's R9 295X2 cards to see that closed-loop solutions aren't limited to just sorting out the heat generated by your processor. Indeed traditionally, water cooling configurations would often include water cooling for your graphics card, processor and in some cases the power circuitry of your motherboard as well.

And there's nothing to stop you going down the full system cooling route even today, of course, although for this month's group test we're limiting ourselves to the latest and greatest closed-loop systems for the sakes of clarity. ■


Keeping cool is the name of the game for CPU performance.

## INSTALLATION FUN AND GAMES

**Installing CPU coolers is, we're pretty sure, one of the circles of Hell described in *Dante's Inferno* – as a chore to be carried out by telephone conmen who talk the elderly into installing viruses onto their PCs. Either way it can be a real pain. Often literally. Most closed-loop coolers are every bit as tricky as awkward air coolers on this front – the good ones use easily accessible clips and thumb screws, while the worst offenders have you stripping the skin off your fingers to actually attach the main block on top of your precious CPU. Removing your motherboard from the case is often a requirement, even if said chassis has a cutout on the motherboard mounting. Accept that you're going to have to do this and get on with it is our only advice.**

**There is an added complication with closed-loop water coolers though, and that's the huge fan/heatsink combo you need to trail through your system and somehow attach to your case. If you've spent a good chunk of cash on your chassis then this may not be too much of a problem – but still check the measurements of the cooling array to make sure you have enough room; particularly if you're going for a 240mm, double-fan cooler. Even single-fan radiators can be tricky though, due to the thickness of the fan and radiator combined.**

**Again, make sure you've got enough room in your case before you buy one. Such coolers are usually installed in the top of the case, although single-fan 120mm can sometime squeeze in above the CPU socket on the rear. Make sure the water pipes aren't twisted between the CPU and the radiator, and don't forget to attach the pump power cables either – forgetting this is a great way of seeing just how quickly your CPU can hit maximum temperature, but it's rubbish for getting the most out of your CPU.**

DinoPC.com

## Griffin 15.6" 840M

- Intel® Core™ i3 4100M processor (2x2.5Ghz)
- Windows 8.1 (64-bit)
- 8GB DDR3 1600Mhz RAM
- NVIDIA GeForce 840M 2GB
- 8x DVDRW
- 500GB S-ATAIII HDD
- 15.6" HD 1366x768 LED
- 2.0M Webcam + Card Reader
- Wifi + Bluetooth

**£549** inc VAT

intel inside™ CORE™ i3

Elegant and slim laptop with superb all-round performance

# The Winning Species

Trust us to build you a champion's PC for less.

### Slayer 15.6" — £1,099

- Intel® Core™ i7 4710MQ processor (4x2.5Ghz)
- Windows 8.1 (64-bit)
- Corsair 8GB Vengeance 1600Mhz RAM
- 240GB SSD
- NVIDIA GeForce GTX 870M 6GB
- Wifi + Bluetooth
- 15.6" Matte LED (1920x1080)
- 2.0M Webcam + Card Reader


"Bettery life is good...And there is plenty of horsepower under the hood"

### Infernodon — £1,499

- Intel® Core™ i7 4790K processor (4x4.5Ghz)
- Corsair Hydro H100i Water Cooling
- Windows 8.1 (64-bit)
- Gigabyte Z97X-Gaming 3 Motherboard
- Corsair 16GB Vengeance Pro 2400Mhz RAM
- NVIDIA GeForce GTX 980 4GB
- Plextor 128GB M.2
- Seagate 1TB Hybrid SSHD
- NZXT H440 Chassis
- Corsair CS 650W Modular PSU


"This superb Devil's Canyon machine won't disappoint"

### Microraptor — £1,049

- Intel® Core™ i5 4690K processor (4x4.3Ghz)
- Windows 8.1 (64-bit)
- Gigabyte Z97N-Wifi Motherboard
- Corsair 16GB Vengeance 1600Mhz RAM
- 120GB SSD
- 1TB S-ATAIII 6.0Gb/s HDD
- NVIDIA GeForce GTX 970 4GB
- Coolermaster Elite 130 Chassis
- Corsair CX 600W PSU

GIGABYTE™


"A gaming PC that delivers excellent performance for the price"

**Discount Code:**
**PCF32G3W**

Free 32GB drive +
3 working day priority

DinoPC.com

www.dinopc.com
0844 999 4123
Or visit our London office


# COOLER MASTER NEPTON 240M

## Easy to use and quick to cool

**A great all-rounder that's our king of the coolers.**

**COOLER MASTER, somewhat unsurprisingly, sure does know its CPU cooling tech. The previous Seidon range was one of our favourite ever closed-loop liquid chip chillers and we had the 240mm version keeping the *PC Format* test rig under control since it arrived in the lab. That was until Jeremy's tech-battering testing methods stripped the power cables from the pump anyways...**

The new Nepton lineup is most definitely built from the same cooling DNA as the Seidon. It uses an almost identical mounting setup as the previous generation, but ever-so-slightly more evolved. The big win for the Cooler Master bracket is the fact you attach the mounting mechanism to the board first and then the pump to that secured bracket. When you're replacing the CPU cooler on a machine that's already built into a chassis, that's a freakin' god-send.

It means you don't need a third hand to juggle the cooler, bracket and screwdriver when fitting the Nepton – so long as you've got a big enough cutout in the chassis' mounting tray behind the CPU socket fitting is a doddle. The use of long-stem thumbscrews on the twin fans is a neat touch, too. Attaching them to the 240mm radiator is simple. Just like everything else with the Nepton's mounting setup.

Fingers crossed though you only need to go through the trials of fitting it once, which means that while installation is an important factor, cooling performance trumps it. Thankfully the Nepton is also a mighty impressive chiller too. It's not the absolute coolest in our testing – the Zalman Reserator 3 Max Dual just about takes the honours with the lowest CPU temperatures – but Cooler Master is only just a little shy with this Nepton. Where it does win is in just how quickly it can return your CPU from peak to idle temperatures. Even running with a 4.5GHz overclock the Nepton brought our 4770K back to idle in just 15 seconds - the Water 3.0 Ultimate needs its full 360mm radiator to be able to manage that sort of cooling performance.

### TICKING ALL THE BOXES

The peak-to-idle temperatures are so important because of the variable speeds of today's processors. When you've got CPUs switching from 800MHz all the way up to 4.5GHz, there's a huge amount of variation and your cooler really needs to be able to keep up. There's no use in your chip chiller letting the processor's heat get out of hand after it's done all its heavy number-crunching and is just sitting there, kicking back and twiddling its thumbs.

And there's another reason why the Nepton takes the win in this test. The huge Thermaltake radiator is very effective, but simply too awkward to fit in most chassis. The extra length of its 360mm radiator is great on the cooling front, but needs an absolute monster of a PC case to be able to cope with it. In these days where even mini-ITX cases have space for a 240mm radiator, the Water 3.0 Ultimate looks out of place.

The svelte Cooler Master radiator, with its effective performance and plain ease of fitting makes the Nepton our pick of this month's offerings. Upgrading your PC's cooling is not all about performance. Being able to get your new chip chiller to fit, and do it without requiring a complete rebuild, is arguably more valuable than a few less °C on average which you're never going to notice. The Nepton 240M then may not be the outright coolest chip chiller we've tested, but it's the finest all-round package.

VERDICT **9**

**Cooler Master Nepton 240M**

**MASTER** Simple to fit; robust build; impressive cooling performance; a great all-rounder.

**ACOLYTE** Not quite the coolest.

£78, www.coolermaster.com

# THERMALTAKE WATER 3.0 ULTIMATE

## We're gonna need a bigger case...

**Mightily impressive performance, if you have the space.**

**WHEN IT COMES TO CPU COOLING, bigger is pretty much always better. If you can have a massive heatsink and fan strapped to your processor it will deliver far better cooling than a diddy Intel or AMD stock cooler. The same goes when you're talking about water cooling reservoirs. There's a reason some open-loop systems use big external reservoirs. But when we're talking about closed-loop chillers, 240mm coolers have been the biggest we've seen. Until now. C'mon, you knew that was coming...**

This massive 360mm long Thermaltake Water 3.0 Ultimate is a good third bigger than any other water cooling chip chiller we've ever tested. On the plus side, that makes it absolutely the most effective CPU cooler of the bunch we're checking out this month. On the negative there are likely to be some issues for folk trying to fit it in their existing chassis.

But first the positives. Boy, can this thing cool. Zalman's crazy-looking Reserator *just* about takes the peak cooling win, but only by a single degree centigrade with our overclocked Haswell processor. The Water 3.0 Ultimate though totally hoses the Zalman when it comes to peak-to-idle performance – in fact it beats every single other cooler in the test, even the otherwise excellent Nepton 240M. That's where the mammoth 360mm cooler really comes into its own, making it perfect for some seriously overclocked systems.

With a stock-clocked CPU Thermaltake's Ultimate is able to bring the temperature back down to idle almost instantly. It took just four seconds to reach the initial temps, which is an astounding feat of PC cooling. When overclocked it's not much more, at some 13 seconds.

### SIZE DOES MATTER

Thermaltake has also taken the 'Ultimate' tag to heart with the mounting bracket as well. It's essentially the same setup as the standard Water 3.0 – which is simple and effective – but has tweaked the backing plate that you screw the pump into. The plate on the Pro version, and older Thermaltake chillers, has a flaw which means the bolts you're screwing into can spin in their plastic housing, meaning it's sometimes tough to get a tight fit. This Ultimate version's redesign has fixed that issue, making it a far more robust fit in general.

The struggle for Thermaltake's Ultimate though is that the vast reservoir just takes up a huge amount of room. Most standard ATX chassis simply don't have the necessary space to accommodate such length. That makes it a bit of an awkward chiller to recommend as an in-place upgrade. But if you happen to be building an overclocked rig from scratch, however, you could tailor your choice of case to match the awesome cooling on offer. If you're looking for a partner for an expensive, overclocked chip, that you're really going to be thrashing on a regular basis, this is probably the ultimate off-the-peg cooling solution you could buy right now.

And if you're looking for it to partner a pricey chip then you're probably not going to baulk at its relatively high price. Realistically though, you are going to struggle to justify the extra £35 the Ultimate costs over the almost-as-good Cooler Master Nepton 240M. It is a more effective cooler, but is it really £35 better? We'd say probably not. So, yes, it's an incredibly efficient water cooler, but you really do have to pay for the privilege, and not just in terms of cost, but of space too.

VERDICT **9**

**Thermaltake Water 3.0 Ultimate**

**+ ULTIMATE** Incredible cooling; robust fitting design; quiet.

**– BASIC** Massive radiator could be awkward; rather pricey.

£113, www.thermaltake.com

# ANTEC KÜHLER H20 950

## An oddly massive 120mm cooler


Bizarre design makes fitting tricky, despite its modest size.

**QUITE WHAT ANTEC HAS DONE** with the latest Kühler range we're not entirely sure. For reasons best known to itself, it's decided that having the water pump sitting atop the CPU itself is a problem. A problem that no-one else seems to have. As such the pump has been repositioned to protrude from the front of the main 120mm fan, which is firmly and irretrievably attached to the radiator.

When you attach the second 120mm fan on the opposite side of the radiator, in a push-me-pull-you configuration to increase airflow, the Kühler 950 becomes enormous. The radiator itself is already a chunky 49mm and, when you add on the size of the two fans and the weird pump proboscis poking out of the front, it becomes as deep as it is wide as it is high. That can make it a little bit awkward to squeeze inside the smaller chassis, and when you're working with a 120mm radiator you'd almost always expect to be able to jam it in whatever case you're packing.

In terms of peak cooling performance, none of that extra girth can help the Kühler avoid being bottom of the class when it comes to overall temperatures. But none of the coolers we've tested are necessarily *bad*, so even if its temps aren't the lowest they're certainly not going to leave your CPU roasting. And because of the depth of its radiator, and the twin fans, the peak-to-idle timing on a stock chip is stunning. It's also mighty cheap and very, very quiet.

It's not the most effective cooler nor the simplest to fit, but the silent performance, low price and speed of cooling means it's still worth a look.

VERDICT **7**

**Antec Kühler H20 950**

**KÜHL** Quiet operation; quick stock cooling.

**NOT-KÜHL** Awkward fitting; highest temps on test; poor software; BIG.

£56, www.antec.com

# COOLER MASTER NEPTON 120XL

## Why to buy 240mm coolers

Far less impressive than its best-in-class big brother.

**THE LESSON TODAY** explains why you pick a 240mm radiator to fit to your overclocked CPU as opposed to a wee 120mm job. And to help us illustrate that point is the new Cooler Master Nepton series of chip chillers. We've already spoken about how impressed we've been with the Nepton 240M, but this 120XL version perfectly highlights the extra cooling performance you get from a larger radiator.

As we've said, none of the coolers on-test are bad, but the cooling performance of the 120XL is noticeably worse than the 240M. It's still cooler than the Antec, but the problem is the time it takes to return the CPU back to its idle temp after running at full pelt. Even at stock processor speeds the 120XL took over two minutes to get back to the idle temps. When the Nepton 240M, with effectively the same overall design, is able to deal with a stock-clocked 4770K in just eight seconds, you can see how much difference that extra rad space makes.

Elsewhere though the 120XL is very much like its larger sibling, from the simple and effective mounting mechanism to the fans themselves. The way the 120XL attaches to the chassis is well thought out too, with a fitting that's versatile enough to allow you to mount the secondary fan either inside or on the outside if there's no room.

That all means we end up with a cooler that's simple to fit, but might leave you wanting in the cooling stakes. Where the 240M sits at the top of the tree this smaller Nepton sits behind all the other 120mm coolers we've tested.

VERDICT **6**

**Cooler Master Nepton 120XL**

**XL** Simple fitting; sturdy build; versatile.

**SIZE ZERO** Slow cooling performance; quite expensive.

£69, www.coolermaster.com

# CORSAIR H100i

## Old age doesn't have to be a barrier to cooling

Still solid, but now struggles to match the best.

**THE BIGGEST SURPRISE** isn't the fact the Corsair H100i is still a very competitive water cooler. No, the big surprise is the fact it's been around so long. The H100i demonstrates just how good Corsair's original design was – it's barely had to change the design since it was released.

There have been updates, such as the H105 and H110, but we're still fans of the original's solid mounting bracket which made it so easy to switch chips around. Before we had the Cooler Master Seidon chilling our test rig the Corsair H100i had that responsibility. It's simple, elegant design is matched by the software support too – the Link tech allows different Corsair peripherals and components to talk to each other. It allows you to manage the cooling throughout your system and you could easily lose days to testing and tweaking the different settings to deal with hotspots.

Sadly though the stock performance isn't as competitive as it once was compared as it now is with other, more recent coolers in this month's test. It's far more than adequate though, and you wont end up disappointed, but it's noticeably off the pace compared with the top chillers.

The H100i is very consistent in its performance, however, and never takes long to return the CPU back to its idle temperatures once it's stopped being thrashed. It's not topping the cooling charts, but is capable. Interestingly though the peak-to-idle timing dropped as we started pushing up the clockspeeds of the CPU, which speaks to the Corsair design of the cooler. Still a worthy chiller then, but no longer one you'd rush out and buy... unless maybe you had a Corsair chassis too.

VERDICT **8**

**Corsair H100i**

**VINTAGE** Solid fitting; reliable cooling; Link software.

**CODGER** Off the pace with the top chillers.

£84, www.corsair.com

# ENERMAX LIQTECH 240

## Decent cooling, not sure about the licky naming


A good design, an easy fit.

**WE WERE BIG FANS** of Enermax's first water coolers so were intrigued to see how its latest liquid chillers fit into this suddenly super-saturated market. The good news is that the Liqtech 240's unpleasant name doesn't lead to any unpleasantness when it comes to actual performance.

First impressions of this 240mm cooler are very good. The overall package is well-presented and the design of both pump and radiator make it seem like Enermax has genuinely spent time making it stand out without making it needlessly complicated. Simple details, such as the rubber dampeners lining either side of the radiator to keep the fans and mounting extra quiet, really help. Speaking of the fans, both come with physical settings to let them peak at 1,300, 2,000 or 2,500 RPM if you want to push the cooling. We're also pleased to find two tubes of thermal paste in the package.

The fitting is one of the easiest of the lot. The mounting bracket is secured in place with four plastic grommets rather than the potentially PCB-scraping metal bolts of the Cooler Master. The pump itself comes with a versatile Intel fitting in place, and doesn't need any adjustment to fit on either Socket 775, 1150/55/56 or 2011. It makes sticking it to a motherboard and chip already installed in a case a doddle.

The cooling performance itself is steady and consistent. Not topping the class, but it's not far off. Interestingly the cooling times are identical whether overlocked or at stock speeds; something none of the other chillers managed.

VERDICT **8**

**Enermax Liqtech 240**

**TECH** Super consistent; nice overall package; simple fitting.

**LICK** Not the overall coolest or quickest.

£79, www.enermax.co.uk

# THERMALTAKE WATER 3.0 PRO

## Length or girth? Length please

Earplugs at the ready when firing up this fatboy.

**THE PAIR OF THERMALTAKE** Water 3.0 coolers in this month's test offer two ways of looking at the whole liquid-chilling process – do you go for a super-long, 360mm radiator or do you plump for a 120mm fat-boy? This here Water 3.0 Pro is that fatboy, offering a radiator that's getting on for twice the girth of its Ultimate sibling.

And, were it down to pure cooling performance alone, you could easily make a case for this chubby bast. It is the absolute coolest of all the 120mm coolers in the test, and is capably trading blows with the downright chilliest of even the 240mm jobs. It's not just about the peak cooling performance either – the time to get back to idle temps is impressively quick too, especially for a smaller radiator.

But that's not the whole story. The Water 3.0 Pro is easily the shoutiest cooler we've tested, taking one of the main reasons to opt for water cooling outside and giving it a bit of a shoeing. We'd generally say one of the benefits of a good water-based chip chiller is the fact it'll operate its fans at lower RPM than an active air cooler. That should mean your whole system gets a bit quieter. Not so with the Pro.

Whether it's looking after a stock or overclocked processor the Pro gets super loud as soon as you start pushing the CPU towards 100 per cent load. It's not even the speeds at which they rotate that's the problem; there's a whiney note to their pitch which makes them all the more noticeable. So, while the actual performance is rather impressive, the noisy operation makes it difficult to recommend.

VERDICT **7**

**Thermaltake Water 3.0 Pro**

**PROFESSIONAL** Great cooling performance; decent fitting.

**AMATEUR** Loud fan noise under load.

£85, www.thermaltake.com

# ZALMAN RESERATOR 3 MAX DUAL

## Bizarre looks means Reserator

Great at cooling, but overly complicated.

**THIS REVIEWER'S FIRST EXPERIENCE** of a water cooled PC was with Zalman's original Reserator. It was a huge water tower which stood outside your machine, cycling hot water out and feeding cold water back into the chassis. Since then Zalman has become one of the biggest names in PC cooling; it was a bit of a worry when it s filed for bankruptcy protection in late 2014.

Thankfully Zalman looks to have escaped by the skin of its heatsinks, which is good news given how effective this weird-looking Reserator 3 Max Dual is. Of all the coolers in this test, the Zalman offers the lowest peak temperatures both at stock speeds and with the overclocked i7-4770K. It manages this in a slightly different way, using a heat-pipe/heatsink combo which looks more vapour chamber than water cooler.

The looping heat-pipes are attached to rubber hoses which push and pull the coolant to and from the CPU block. The mounted fans then chill those aluminium pipes. It's an effective method of dropping peak temps, but doesn't make the setup quicker at returning the chip to its idle temp. The relatively small amount of liquid in the system means it's not as fast as either the Nepton 240M or the Ultimate. Even the old Corsair H100i is quicker and that's having to do it with a larger temperature delta too.

We'd hoped the permattached fans would make fitting easier, but there are a huge number of tiny screws to contend with and a bizarrely complicated mounting mechanism for attaching it to your case. The latest Reserator then is a good cooler, but feels almost needlessly complex.

VERDICT **8**

**Zalman Reserator 3 Max Dual**

**MAX** Great cooling performance with very low peak temperatures; innovative design.

**MINI** Awkward fitting; relatively slow peak-to-idle; expensive.

£99, www.zalman.com

# palicomp

Your PC Your Way

## CARBON AMD Base Unit

**£219.99 Inc Vat**
{Quickfind Code - CAR2}

AMD AM1 Sempron 2650
Dual Core CPU @ 1.45Ghz Per Core
ASUS AM1M-A
CRUCIAL 4GB DDR3 1333Mhz
SEAGATE 500GB SATA3 HDD
SAMSUNG 24X DVD+/-RW Drives
KNIGHT Black Mesh Case With 450W PSU
Windows 7 Or 8.1 Included

AMD AM1 PLATFORM

Windows 7 OR Windows 8.1

## AMD MINECRAFT 6CORE Gamer

**£399.99 Inc Vat**
{Quickfind Code - BUL1}

AMD Bulldozer FX-6100
Six Core CPU @ 3.3Ghz Per Core
ASUS M5A78L-M/USB3
CRUCIAL 8GB DDR3 1600Mhz
SEAGATE 1TB SATA3 HDD
SAMSUNG 24X DVD+/-RW
VANTAGE Gaming Case With 450W PSU
Choose From Blue, Red Or Green Case
AMD 6450 2GB Graphics Card

RADEON GRAPHICS AMD

## INTEL HASWELL HYDRO-780

**£1399.99 Inc Vat**
{Quickfind Code - HAS7}

INTEL Haswell Core i7 4770K (FREE Upgrade to 4790K)
Overclocked To 4.4Ghz Per Core
Water Cooled With Corsair H100 CPU Cooler
ASUS Z87-PRO
CRUCIAL BALLISTIX 16GB DDR3 1600Mhz
CORSAIR 240GB LS SATA3 SSD
SEAGATE 3TB SATA3 HDD
SAMSUNG 24X DVD+/-RW
CORSAIR C70 Gaming Case
Choose From Black, Green Or White Case
NVIDIA GTX780 3GB Graphics Card

Computer Shopper - 5 Stars
Expert Reviews - 5 Stars
PC Format - Gold Award
PC Gamer - 5 Stars (Editors Choice Award)

Gold PC Format Gold

PC GAMER EDITOR'S CHOICE ★★★★★

expert REVIEWS ★★★★★

**CORSAIR C70 COLOURS**

Gunmetal BLACK -
Military GREEN -
Arctic WHITE -

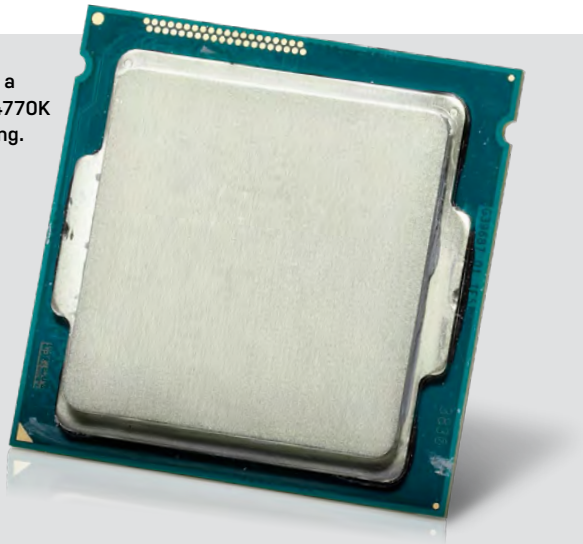
# www.palicomp.co.uk

01270 898104
Mon - Fri 9am-6pm & Sat 10am-3pm

sales@palicomp.co.uk

# HOW WE TESTED

Testing water coolers is a necessarily time-consuming process. Fitting them alone can take upwards of 20 minutes from scratch and that's on an open test bench. To start with we test on a stock-clocked Core i7-4770K system, measuring first the idle temperatures with RealTemp, tested after around 10 minutes of up-time. Then we use a tool called MaxCPU to push the CPU to 100 per cent load and leave it running for 20 minutes before we measure the peak temperatures. We then measure the time it takes for the temperature to drop from the peak to the idle temperature. Finally we go through the whole process again, this time overclocking the CPU to 4.5GHz.



We used a Core i7-4770K for testing.

## BENCHMARKS

| Intel Core i7-4770K | Cooler Master Nepton 240M | Thermaltake Water 3.0 Ultimate | Antec Kühler 950 | Cooler Master Nepton 120XL | Corsair H100i | Enermax Liqtech 240 | Thermaltake Water 3.0 Pro | Zalman Reserator 3 Max Dual |
|---|---|---|---|---|---|---|---|---|
| Idle temperature | 39 | **36** | 41 | 39 | 39 | 39 | 37 | **36** |
| Peak temperature (stock clocked) | 53 | **50** | 57 | 55 | 54 | 53 | **50** | **50** |
| Peak-to-idle time (stock clocked) | 8s | **4s** | 7s | 122s | 35s | 16s | 11s | 26s |
| Peak temperature (overclocked) | 62 | 60 | 69 | 66 | 66 | 63 | 61 | **59** |
| Peak-to-idle time (overclocked) | 15s | **13s** | 84s | 172s | 21s | 16s | 46s | 32s |

Best scores are bolded.

## SPECIFICATIONS

| | Nepton 240M | Water 3.0 Ultimate | Kühler H2O 950 | Nepton 120XL | H100i | Liqtech 240 | Water 3.0 Pro | Reserator 3 Max Dual |
|---|---|---|---|---|---|---|---|---|
| Manufacturer | Cooler Master | Thermaltake | Antec | Cooler Master | Corsair | Enermax | Thermaltake | Zalman |
| Price | £78 | £ 113 | £56 | £69 | £84 | £79 | £85 | £99 |
| Website | www.coolermaster.com | www.thermaltake.com | www.antec.com | www.coolermaster.com | www.corsair.com | www.enermax.co.uk | www.thermaltake.com | www.zalman.com |
| Radiator size | 240mm | 360mm | 120mm | 120mm | 240mm | 240mm | 120mm | 240mm |
| Radiator thickness | 27mm | 27mm | 49mm | 38mm | 27mm | 27mm | 49mm | 73mm |
| Fans | 2x 120mm PWM | 3x 120mm PWM | 1x 120mm PWM (attached) 1x 120mm PWM | 2 x 120mm PWM | 2x 120mm PWM | 2x 120mm PWM | 2x 120mm PWM | 2x 120mm PWM (attached) |
| Motherboard connections | 2x 4-pin | 2x 4-pin | 1x 3-pin, 1x USB | 2x 4-pin | 1x 3-pin, 1x 4-pin, 1x USB | 1x 3-pin, 1x 4-pin | 2x 4-pin | 1x 3-pin, 1x 4-pin |
| Score (10/10) | 9 | 9 | 7 | 6 | 8 | 8 | 7 | 8 |

Best on test in blue.


## And the winner is...

# COOLER MASTER NEPTON 240M

**NORMALLY YOU MIGHT EXPECT that with testing CPU coolers the winner would simply come from picking the best spread of wins from the benchmarks, but that's not the case with this month's test. Cooler Master's Nepton 240M doesn't actually win *any* of the benchmarking and yet we've decided to name it the champ. What gives?**

Well, it's not just about the outright cooling of the system. You need to be able to get the setup into your rig and be able to do it with the minimum of fuss, without necessarily having to entirely remove the motherboard either. Ideally you also want to be able to do it on your own, too. This is where the Cooler Master wins out. Its fitting is excellent and, because the bracket attaches to the motherboard before you bolt the actual water block onto the CPU, you can easily fit it inside your chassis, without needing to grow a Beeblebrox arm.

It's also got really excellent cooling performance. The Nepton 240M isn't top-of-the-class at anything, but does everything very well indeed – only a few points off the best at most. The peak-to-idle performance is a particular highlight and doesn't matter if the processor is being seriously overclocked or not. The Nepton is also very, very quiet in both fan noise and the operation of the pump. And at just £78 it's a great value chip chiller too.

The struggle with Thermaltake's Water 3.0 Ultimate on the other hand is that actually getting the behemoth into your chassis is going to be the biggest challenge. To fit this monster you need to hold the bracket on with one hand on the rear of the motherboard, your other hand holding the pump in place atop the CPU, and *your other hand* screwing it all in place. Tech juggling at its finest. Either that, or you have to remove everything from your PC and attach it to your motherboard outside of the case.

But that's the same with a lot of other coolers. The big issue is that this super-long radiator may well deliver top-of-the-class cooling, but you may have to do some shopping around to find a chassis capable of housing it. If you're all about the cooling though, and in the market for a new chassis too, then the extra size and extra expense of the Ultimate might well seem worth the headache. It's a close run thing with these top two, but for our money the cheaper Nepton 240M is just too good to miss.

What about if you're after the top 120mm cooler? After all, not every chassis can house even a 240mm radiator, let alone a 360mm one. Thermaltake would probably take the win here if it was again all about performance. Sadly the Water 3.0 Pro is let down by seriously shouty push-me-pull-you fans. We don't even think it's the speed they're going – the pitch of the noise makes it piercing even when you've got a headset on. Which makes it a toss-up between the Nepton 120XL and the Kühler 950. One has better overall cooling and the other is quicker to push down the temperatures. In the end though the bargain price of the Kühler helps it win out.

A special mention has to go to both the Corsair H100i and the Zalman Reserator 3 though. Corsair's quality fitting and Link software makes the H100i a very worthy cooler, especially if you're rocking a Corsair chassis. Zalman's cooling know-how is also very evident in the Max Dual's chip-chilling performance. It's about the coolest on the test, just a little slow to return to idle temps and a bit bonkers to fit. ■

# www.scan.co.uk

t: 01204 47 47 47

SCAN COMPUTERS

COMPUTER SHOPPER 2014 AWARDS | PCFormat | CUSTOM PC AWARDS 2014 Best PC Manufacturer | CUSTOM PC AWARDS 2014 Editor's Choice Best Desktop PC | CUSTOM PC AWARDS 2014 Highly Commended Retailer | PC GAMER EDITOR'S CHOICE ★★★★★ | PC PRO Excellence AWARDS 2014

## "Perfect for 4K gaming and multi-threaded workloads"


## "Stunning, slick-looking and striking" – Custom PC

Finance Available on PCs above £300

Fully 3XS configurable

Fully soak tested

Built by award winning 3XS team

Scan 3XS overclocked

3 YEARS STANDARD
3 Year Warranty Parts + Labour

## 3XS gives you exceptional Specifications, exceptional Service and exceptional Satisfaction

intel inside™ CORE™ i7

### Scan 3XS X99 Cyclone SLI

- Intel® Core™ i7 5820K Overclocked to 4.5GHz
- Two 4GB NVIDIA GeForce GTX 980 in SLI
- 16GB Corsair Vengeance 2666MHz DDR4
- 500GB SSD + 2TB HDD

The X99 Cyclone SLI is a fully water-cooled PC that features a hex-core Intel Core i7 5820K CPU with Hyper-Threading which we overclock to 4.5GHz for amazing performance in your favourite games. It also has two 4GB NVIDIA GeForce GTX 980s graphics cards, which are also water-cooled so remain cool and quiet even in the most frantic games. Also included is 16GB of 2666MHz Corsair Vengeance DDR4, an Asus X99-S motherboard, a 500GB Samsung Evo SSD and a 2TB hard disk.

Don't buy hardware without Scansure protection. 28 day installation damage insurance www.scan.co.uk/scansure

SF Scan Finance. Buy now, pay 10% deposit* and spread the cost over 36 or 48 months when you spend £300 (inc vat) or more.

Classic credit options (36 or 48 months). Customers will initially only have to pay a 10% deposit, with the original loan amount payable over 36 or 48 months. *Example: £1,000.00 Deposit:£100.00 Amount of loan:£900.00 Total charge for credit:£276.12 Total payable:£1276.12 Total 36 Monthly Instalments of:£32.67 APR:19.9%. Terms and Conditions Apply

*Prices and specifications subject to change, please go online to see latest prices. Images for illustration purposes only.

Scan manufactures over 1,000 custom-built systems per month, so whether you want a ninja gaming rig, a small form factor media PC or a gaming laptop we can spec it and build it for you. Here are nine featured systems from our huge range, all of which can be fully customised with different components and cases.

## GAMING EXPERIENCE: VETERAN

★★★

You don't have to spend a fortune to get a PC that can play the latest games. Our 3XS systems are competitively priced so you have more money to spend on buying and experiencing new games.

### 3XS Z97 OC5

- Intel® Pentium® G3258 overclocked to 4.6GHz
- Asus Z97-K Motherboard
- 8GB Corsair Vengeance Pro 2133MHz
- Arctic Cooler Freezer 7 Pro

**£275**


### Scan 3XS Graphite LG156

- Intel® Core™ i7 4710MQ
- 8GB Corsair Vengeance DDR3 1600MHz
- NVIDIA GeForce GTX 860M
- 1TB HDD
- 15.6" 1920 x 1080 screen

**£888**


### 3XS Z97 Performance GT

- Intel® Pentium® G3258 overclocked to 4.4GHz
- 8GB Corsair Vengeance Pro 2133MHz
- 2GB NVIDIA GeForce GTX 760
- 1TB HDD

**£639**

## GAMING EXPERIENCE: ELITE

★★★★

Our 3XS systems have been engineered to give you an edge over your competitors in the latest games. Each model has the perfect blend of cutting edge components to help you pwn noobs without breaking into a sweat.

### 3XS Z97 OC10

- Intel® Core™ 4690K overclocked to 4.6GHz
- Asus Z97-K motherboard with SLI and CrossFireX
- 8GB Corsair Vengeance Pro 2133MHz
- Phanteks U-Type

**£425**

### Scan 3XS Graphite LG1720

- Intel® Core™ i7 4710HQ
- 8GB Corsair Vengeance DDR3 1600MHz
- NVIDIA GeForce GTX 970M or 980M
- 1TB HDD
- 17.3in 1920 x 1080 screen

**£1154**

### 3XS Z97 Performance GTK5

- Intel® Core™ i5 4690K overclocked to 4.6GHz
- 8GB Corsair Vengeance Pro 2133MHz
- 4GB NVIDIA GeForce GTX 970
- 240GB SSD
- Water-cooled whisper quiet

**£1049**

## GAMING EXPERIENCE: GODLIKE

★★★★★

Unlock your true gaming potential with one of our 3XS systems. These no compromise systems provide the very best in frame rates in games thanks to their combination of overclocked CPUs and graphics cards.

### 3XS Z97 OC15

- Intel® Core™ i7 4790K overclocked to 4.6GHz
- Asus Republic of Gamers Maximus VII Ranger
- 8GB Corsair Vengeance Pro 2133MHz
- Corsair water-cooler

**£559**

### Scan 3XS Graphite LG1725

- Intel® Core™ i7 4710MQ
- 16GB Corsair Vengeance DDR3 1600MHz
- Dual NVIDIA GeForce GTX 980M in SLI
- 1TB HDD
- 17.3in 1920 x 1080 screen

**£1965**


### 3XS Z97 Vengeance 980

- Intel® Core™ i7 4970K overclocked to 4.7GHz
- 8GB Corsair Vengeance Pro 2133MHz
- 4GB NVIDIA GeForce GTX 980
- 250GB SSD + 2TB HDD
- Water-cooled whisper quiet

**£1499**

OPTIONS CUSTOM AVAILABLE

## Custom options are available on our entire 3XS range - we'll build it how you dream it

# HARDWARE

PERFORMANCE GEAR, UNCOMPROMISING VERDICTS

# What Are You Doing, Dave?

Trying to figure out what Microsoft's up to...

"We've been rolling along happily without its abortive GFWL shenanigans."

**MICROSOFT SAYS IT'S TIME** to talk about gaming on Windows, but we've all been doing that for a couple of decades now. It's ubiquitous operating system is the best facilitator for PC gaming, offering access to third-party software and a vast catalogue of games, so do we actually need Microsoft to do anything else?

We've been rolling along quite happily without its abortive Games for Windows Live shenanigans so I'm not really too fussed over Xbox head Phil Spencer suddenly saying it's time for Microsoft to start discussing what it's doing with gaming in Windows 10. An event on 21 January was set for it to discuss the consumer features of its next operating system, and because of Spencer's words we've been expecting some noises about a closer integration of the Xbox ecosystem with Windows.

VIEWSONIC'S BARGAIN IPS SCREEN PG. 28

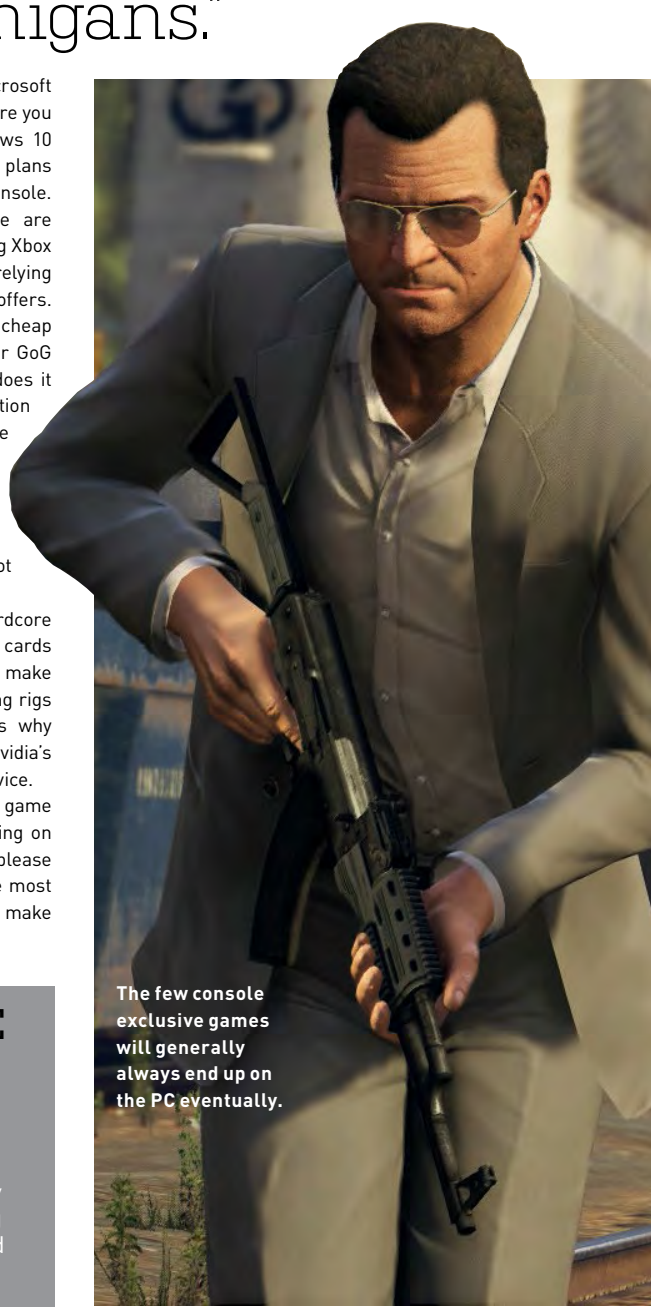
Quite what shape that's going to take is still up for debate – is it just going to be a bit of an update on how DirectX 12 is coming along, or the final admission that it's restricting the fancy new graphics API to Windows 10 only? That wouldn't be particularly interesting, but the tantalising leaked shots of a new Xbox app and the suggestions of a new Microsoft game streaming service indiciate that there might be something more intriguing to come.

Code-named 'Arcadia' it could be Microsoft's answer to Sony's Playstation Now service. That service allows folk to play PS3 games on their PS4, Vita and compatible Sony TV. If Microsoft is able to create a streaming service where you can play Xbox games through a Windows 10 application, that would be in line with its plans to blur the boundaries between PC and console.

But who does that help? If people are streaming Xbox games, they're not buying Xbox hardware, and so Microsoft would be relying on a monthly subscription to fill its coffers. When PC games can be so incredibly cheap to buy outright, such as in the Steam or GoG sales, or the worthy Humble Bundles, does it make sense to create a subscription streaming service? Sure, there are a few Xbox exclusives where a streaming service to your Windows PC would be the only way to play without an Xbox console, but surely not enough to make it a vital.

That's all well and good for us hardcore PC gamers, with our powerful graphics cards and big screens, but such a service could make any PC a gaming machine. The streaming rigs don't need gaming hardware, which is why you can play top quality PC games on Nvidia's SHIELD Tablet via its GRID streaming service.

But if Microsoft isn't just talking about game streaming as its next big thing for gaming on Windows, what could it be? Dear Bill, please don't let them try and make out that the most exciting thing for Windows 10 would be to make *Halo* available for PCs. We just don't care.



The few console exclusive games will generally always end up on the PC eventually.

## GOLD AWARD


This is the ultimate badge of hardware excellence. Only truly outstanding gear gets this coveted award. Oh, and there are no prizes for runners-up here.

## OUR HARDWARE MANIFESTO

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty PC Format Gold Award on its lofty pinnacle.

# Editor's One to Watch

## Broadwell *and* Skylake CPUs to launch in June?

**INTEL HAS LEFT ME VERY CONFUSED** about what's going on with the new processor and chipset launches set to happen throughout this new year. CES has seen the tech world rocking Las Vegas this month and Intel's big chip news is that Broadwell CPUs are finally here! But it's all in the same way that the 14nm Broadwell processors were released before Christmas, meaning that we're only seeing a few low-power mobile SKUs trickling out in January.

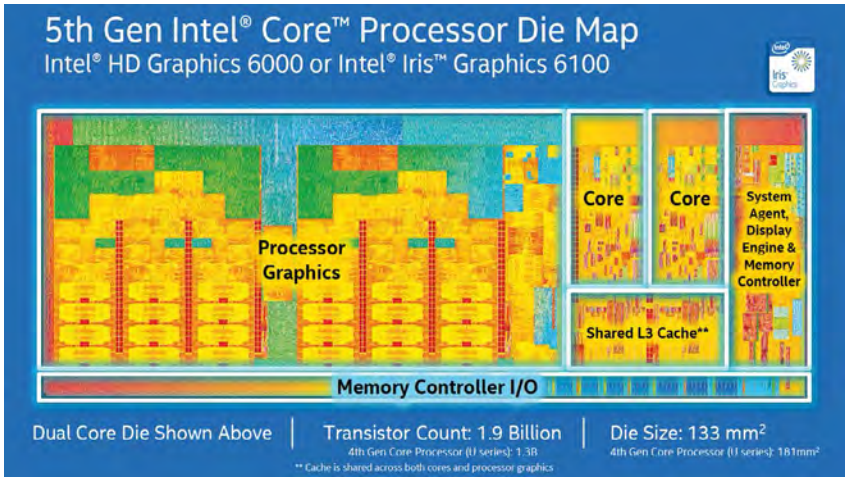
There will be higher-powered mobile quad-cores coming out, with the latest Iris Pro graphics technology, but that will be later in January or the start of February. But what of the desktop parts? Where are our first 14nm desktop chips, and where are the socketed Broadwell and Iris Pro CPUs we were promised at IDF this year?

Well, according to a recent conference call with Intel, the Broadwell desktop parts will be arriving in the middle of this year. That's including the unlocked K-series, so we should expect the new performance chips some time around Computex in June. That's quite late. I'd expected maybe March, April at the latest, most definitely not in the summer. But that was mostly born out of the announcement at IDF 2014 that the brand new Skylake Core architecture was due in the second half of 2015. Surely Intel wouldn't be releasing Broadwell and Skylake desktop chips at the same time, would it?

Turns out that Intel might do exactly that. Speaking with other manufacturers, they are expecting to see the Z170 motherboards – with the new Skylake LGA 1151 socket and DDR4 support – being launched at Computex in June too. These boards are completely incompatible with any CPU out in the market – the Broadwell desktop chips will be working in the standard 9-series boards, with Skylake being the only one to take advantage of the 100-series chipset.

So, what gives? Well, it looks like the plan might be to release the unlocked Broadwell K-series chips. Then, around the same time, launch the standard Skylake-S parts. That would then leave the Skylake-K overclocking-friendly chips as a victim of Intel's marketing bods, left out of reach on the tech shelf until it decides it's sold all the Broadwell-K chips it can.

We knew there would be some overlap between Broadwell and Skylake but we didn't think the desktop chips would be launched at the same time. It does though beg the question of why anyone would be interested in buying a Broadwell chip when the Skylake platform is ready and waiting. Intel's response to that question at IDF was to tell me people wanted a socket-compatible upgrade path which is what the Z97/Broadwell platform offers. My big fear with all this though is that we end up with a three-tier setup. Where at the moment we've got the standard Z97/Haswell and X99/Haswell-E, it will translate to Z97/Broadwell, Z170/Skylake and finish with X99/Haswell-E. The Skylake platform might then end up being priced artificially high as a consequence, benefiting none of us.




**The first Broadwell CPUs won't be our beloved desktop chips, they'll be mobile parts.**

## HIGHLIGHTS THIS MONTH...








# Philips BDM4065UC

## Is this the screen we've been searching for?


Philips has adapted one of its 4K HDTVs to create a no frills 40-inch monitor on a relative budget.

**TEN YEARS.** It's a staggeringly long time in tech. Back in 2005, you'd be looking at a dual-core Intel Pentium D and its craptastic NetBurst architecture. On the graphics side, it's Nvidia GeForce 6800 and 16 pixel pipes. Wowee. As for storage, the notion of an SSD wasn't even a twinkle in the NAND industry's eye. It was a very different time.

Yet it was nearly a decade ago Dell wheeled out the monitor by which pretty much all others have since been measured, the 3007WFP, and then the 3007WFP-HC. And, yes, more recently some interesting technologies have cast doubt on the Dell's mastery, that's for sure. But the broader point holds: a decade-long reign at the top is extraordinary. It's impossible to imagine for any other major component.

But here we are in early 2015 and it looks like a new high-end default in the monitor market has arrived, at least in terms of the form factor – if perhaps not this actual Philips model. Let's find out why.

## PIXEL PERFECTION?

Even before the Philips BDM4065UC arrived at PCF Towers, we had a notion that when it came to 4K PC monitors, the HDTV market was going to be particularly relevant. HDTVs have always offered better value for money than monitors because they're cranked out in mega volumes. The problem is, until recently, they've all been 1080p models at best. Once you get beyond 24 inches, that means pretty big pixels. Step that up to 40 inches or more and things get really ugly. Conventional HDTVs, then, have made pretty poor PC monitors.

Meanwhile, the first budget 4K monitors have appeared, but offered just 28 inches, diagonally. Hardly titchy, but when you've got nearly 4,000 pixels across the horizontal, the dot pitch is tiny – and that generates all kinds of problems in Windows. Either you leave the scaling at 100 per cent so that everything is squnitingly small, or you tweak the Windows and browser scaling settings and everything looks hideous.

But what if you had a 4K PC monitor that was 40 inches in diagonal? Then you'd have a monitor on an epic scale with a pixel pitch in that workable window where it's fine enough to enable a crisp, sharp image, but not so fine you have to deal with the scale-or-not-to-scale dilemma. And guess what, 40 inches is bang into budget HDTV territory in terms of panels and production volumes. That explains why this massive, 40-inch, 4K Philips is cheaper than existing 30-inch 2,560 by 1,600 pixel monitors.

Hold on though, you can't just take a 4K HDTV off the shelf and use it as a PC monitor. That's because the bandwidth limitations of the current HDMI standard restrict it to just 30fps over a single connection. What you need is the latest DisplayPort 1.2 interface, and you don't get that with TVs. Instead, Philips has taken one of its budget 4K HDTV models, ripped out the TV tuner guff, and bunged in a DisplayPort 1.2 interface to allow a 60Hz refresh from a single transport stream. No frills – just the minimum you need from a PC monitor.

That's great news. The main upsides are the affordability – okay, £600 is still a lot of money, but spread that over five, six, seven or more years and the annual cost looks reasonable. Then there's the slimline shape of the chassis and the super-skinny bezel in traditional HDTV style. Sitting next to that epoch-defining Dell 3007, the old master looks tiny, dated and knackered.

## NO 4K FRILLS

However, it's not all good news. The most obvious downside is a stand that doesn't adjust. At all. Though you do have the option of using the 200mm VESA mounts on the back to cook up something.

No, the real problem is with the panel itself. In some ways it's a glorious thing on a wondrous scale. Once you've seen something like *Shadow of Mordor* running at 4K on a 40-inch panel, you're pretty much ruined for other screens. Even those 34-inch, 21:9 aspect screens – which we still love – look a bit puny. Actually, it could be too much of a good thing, with the 4K pixel grid exposing any low-res textures with ruthless efficiency. Oh, and if you're wondering, the semi-gloss panel surface works well. It had us a bit worried, but reflectivity is blessedly limited.

Where the HDTV-ness kicks in with an unambiguous negative is the VA, or Vertical Alignment, rather than IPS panel tech. It delivers lovely deep blacks and nice, rich colours, but also serves up viewing angles that are basically a bit broken. The problem is most obvious at the extremities of the display, especially along the bottom. If you sit back far enough, the issue resolves – but this is a PC monitor and the whole point is that you sit close. Is it a deal-breaker? Probably not, but it is enough, along with the stand, to make us wonder whether the BDM4065UC is only suitable for early adopters willing to make compromises.

Of course, what we haven't mentioned is the sheer load any 4K panel puts on your graphics card; no single GPU is currently up to the job of running the latest games at 4K and full detail. Even multi-GPU setups with high-end cards will struggle. In mitigation, this screen looks pretty decent running 1440p interpolated. So you could take the long term view – buy now and plan on a GPU upgrade in a couple of years – that should see you enjoying many years of native-res 4K gaming. But it's a different psychology from buying something that performs at its best from the beginning.

Plenty to think about, then, and at the very least a tantalising glimpse of the 40-inch 4K form factor that could be the weapon of choice for high-end gaming for the foreseeable future. **–JEREMY LAIRD**

### SPECIFICATIONS

| | |
|---|---|
| **Size** | 40 inches |
| **Native resolution** | 3,840 x 2,160 |
| **Panel type** | VA |
| **Colours** | 8-bit |
| **Contrast** | 5,000:1 |
| **Viewing angles** | 178/178 degrees |
| **Response** | 8ms G-to-G (3ms with overdrive) |
| **Inputs** | DisplayPort, HDMI, MHL, VGA |
| **Stand** | Non-adjustable (200m VESA support) |

**VERDICT** 8

**Philips BDM4065UC**

**+ NEW WORLD** Really nice HDTV-style chassis and bezel; 40-inch 4K; cheaper than many 30-inch monitors.

**– OLD WORLD** Vertical Alignment issues; stand not adjustable; still quite expensive.

£608, www.philips.co.uk

Now we just need a white keyboard and our storm-trooper PC setup will be complete.

# Viewsonic VX2363Smhl

## Is this budget IPS a false economy?

**LAST MONTH SAW US GOING A LITTLE GIDDY** over a huge range of different monitors we had set up in the office. From super-wide to super hi-res to super-quick, we had the lot. Well, if you were prepared to spend a fair chunk of cash anyways. What we didn't have was any budget-oriented screens, just high-spec panels.

What do you do if you don't have the ready reddies to spend on a massive panel? Thankfully Viewsonic has been creating good-value monitors, with our favourite panel technology inside, for years. We've been recommending the 23-inch VX2370Smh as our pick of the budget screens for a good long while now, but such things don't last forever and that monitor is now getting harder and harder to find. Thankfully it's getting replaced by this slightly smaller, but still happily IPS-laden, VX2363Smhl.

This vision in white plastic is reminiscent of some of the budget AOC IPS screens we've seen in the past, using a recessed bezel to make it seem like the panel stretches out to the very edge of the monitor's face. That gives the screen a nicely classy look on your desktop and the actual panel doesn't disappoint either.

At this price you'd maybe expect to have TN tech forced upon you, but even these 6-bit IPS panels have much better visuals than an old budget TN screen. The viewing angles aren't up there with the finest panels we've seen recently, but the colours are still vibrant and the contrast levels are good, as well. The black levels and white saturation of this screen, even straight out of the box, are also really impressive.

### NOT SO PRO

We're not going to pretend this panel is totally perfect, or will work for photo professionals, but for a seriously budget IPS screen the VX2363Smhl is really impressive for the money. The surrounds, however, are a little less impressive. The stand is a very basic tilt affair, while the sheer mass of plastic on show speaks to its budget heritage, too. But when you're plugging Kyrat's endangered species in glorious Technicolor, you're not going to give a pair of fetid Sky Tiger kidneys what's surrounding your screen. All you want are the visuals being piped directly into your eyeballs with decent panel tech.

We would also argue there's little point in spending more money on a 1080p panel. If you're going to be splashing any more cash we'd recommend pointing it at a larger, higher-resolution monitor. The way things are going you're likely to want to upgrade to a higher resolution monitor fairly soon anyways – hardware performance has nailed 1080p even in the lower echelons of GPU tech, so we're moving forwards to 1440p and 4K next.

Spending £110 on this screen will keep you happy with your current rig, offering pleasing IPS visuals without shredding your wallet. It should also keep you going until your next hardware upgrade, at which point you may well be looking to pick up a better screen to show off your nice new hardware, too. –DAVE JAMES

### SPECIFICATIONS

| | |
|---|---|
| Panel size | 22-inch |
| Native resolution | 1920 x 1080 |
| Panel technology | IPS |
| Refresh rate | 60Hz |
| Pixel response | 5ms |
| Inputs | 2x HDMI, 1x VGA |

VERDICT 8

**Viewsonic VX2363Smhl**

+ **LOVELY VIEW** IPS panel, great price, invisi-bezel.

– **BRICK WALL** Plasticky chassis.

£110, www.viewsonic.com

# NO SOUND UNHEARD


## FULL PC GAME INSIDE




## ROCCAT™ KAVE XTD 5.1 DIGITAL

### PREMIUM 5.1 SURROUND HEADSET WITH USB REMOTE & SOUND CARD

Take the most successful surround sound gaming headset ever created, rebuild it from the ground up, add game-changing innovations and performance-improving refinements, and unleash it on the world. That is the ROCCAT Kave XTD 5.1 Digital Gaming Headset. With 5.1 surround sound, enhanced comfort for marathon gaming sessions, a robust design, and an unrivalled, feature-packed desktop remote functioning as an audio command center, the XTD 5.1 Digital is a legend in the making.

**LIMITED LOGO PACK ONLY - GET A FREE VOUCHER TO DOWNLOAD**

**Assassins Creed Unity with purchase of Kave XTD 5.1 Digital Gaming Headset.**



ROCCAT KAVE XTD 5.1 | DIGITAL


UBISOFT

18 www.pegi.info

**Looking like the most useful hard drive caddy ever.**


# Creative Sound Blaster E5

## Sounds like super-versatile audio fun to us...

**THE WORDS 'SOUND' AND 'BLASTER'** are as indelibly etched into our old-school PC gaming psyche as 'autoexec.bat' and 'config.sys'. We spent unknowable hours configuring DOS-based games to make sure we got compatible audio out of them. Sound Blaster basically became synonymous with PC gaming audio right from the outset.

And then onboard motherboard sound got good enough that we stopped buying discrete soundcards, plus USB headsets now bypass them both. Chances are then that you don't have a Sound Blaster in your PC any more.

And that's a shame because Creative still make outstanding PC audio devices and this USB-based portable headphone amp is testament to that fact. The Sound Blaster E5 is an HDD caddy-sized lump of audio loveliness, packing the excellent SB-Axx1 audio processor and a hi-res digital to analogue converter (DAC) into its unassuming package. That sound silicon is the same as in Creative's Sound Blaster EVO headsets and with the controller software you can tweak away to your heart's content. From the equaliser to the Crystaliser, you can tailor the audio to suit whatever you're doing with your machine at that moment. Want super-clear dialogue? Tweak this. Want eardrum-shattering bass? Go ahead, tweak that.

At £170 it's a lot of money to spend on your PC's audio, especially considering you can pick up a decent Asus Xonar or Creative Sound Blaster PCIe soundcard for less than half the price. But bear in mind that this thing is seriously powerful and a hell of a lot more versatile than a single slab of audiophile PCB.

### AUDIO ALL-STAR

Sat on your desktop though you can have it USB'd into your machine, cleaning up the audio and boosting it with Creative's years of audio processing know-how. The comprehensive software controller suite is excellent and easy to use and with a good set of analogue headphones attached you can really hear the improved aural quality the E5 provides. And that's where this Sound Blaster is at its best, when it's attached to some quality cans.

The Bluetooth NFC-able connectivity means you can wirelessly connect to your phone while it's running your PC's audio. So if you don't want to miss an important call, or you're happy chatting to your mum via your headset while you gad about the galaxy in your souped-up Sidewinder, it'll work seamlessly.

It doesn't necessarily need to be plugged into your PC either. There are Android and iOS apps available for it, too, and the 3,200mAh battery will keep it going for hours. And, if you're into sharing, there's a pair of headphone outputs to share an audio stream between a couple of connected cans. See, versatile, innit?

But you do have to really care about your audio to spend the big bucks on it. And if you don't have a decent non-USB headset you're not going to get the full audiophile benefits of the SB-Axx1 processor. But the Sound Blaster E5 is a neat, compact and versatile mini amp that defies its scale with some seriously big sound. **–DAVE JAMES**

VERDICT **8**

**Creative Sound Blaster E5**

**+ SOUND** Compact; well-built; great sound; good software; incredibly versatile.

**– SHAKY** Seriously pricey.

£170, http://uk.creative.com


The limited edition Mark S is a stunning-looking board, but its performance is a little off the pace for the price.

# Asus Z97 Mark S Sabertooth

## A super-special Z97 primed for Winter warfare

**SO, YOU WANT TO STAND OUT** from the crowd and build an all-white PC? Well let's see how far you can get. Case, no problem. Many case manufacturers make them. PSU? Check. There's a few of those around as well. Graphics card? Tick. Harder to find but there are one or two available. White motherboard? Well, that's much more of a problem, sir. White motherboards are like the Holy Grail of the modding world. In fact, giving it some serious thought, we can only think of two board manufacturers that ever ventured into the expensive world of producing white PCBs: Sapphire and Soyo. Hold on, ancient Abit made one too, so that's three. And mentioning those last two long-forgotten names will give you an idea of how long ago it was.

### BATTLE READY

All is not lost however because Asus has come to the rescue with a limited edition white version of its Z97 Sabertooth motherboard. The Sabertooth Mark S (which carried the codename Sabranco for a while) is an absolute stunner, too. It may seem a little shallow to get excited about how a motherboard looks, but it must be said that even this cynical old hack cracked a smile and must tip his hat in approval at just how classy the Mark S looks. The Mark S isn't an unrelenting sea of white, however, as the TUF Sabertooth 'thermal armour' sports a natty white and grey camo scheme, beloved of Arctic-based Special Forces teams and *Battlefield 4* players.

It's up to you to decide whether this enhances the white PCB or makes you wish Asus had gone the whole hog and made everything just plain white, we're still not sure. Even the reinforced back plate, or TUF Fortifier technology as Asus calls it, gets the camo treatment. But, why oh why Asus, do you go and compromise the scheme by adding a couple of green and beige ports when every other port and slot is black?

### DONE AND DUSTED

Hardware-wise the board follows the lead of the Sabertooth Mark 1; two PCIe 3.0 x16 slots running at x16 with a single graphics card, or x8/x8 when two cards are used. Connectivity extends to a single PCIe 2.0 x4 slot which sits near the bottom of the board and another three PCIe x1 slots. Six edge-mounted SATA 6Gbps ports are supported by the chipset along with a SATA Express port. A further two SATA 6Gbps ports placed towards the base of the board are looked after by an ASMedia controller. One thing notable by its absence is the chipset-supported M.2 slot. But pull off the 'thermal armour' and it becomes plain why it doesn't feature – there's simply no room.

Asus' TUF range is all about cooling flexibility and thermal monitoring, and one look at the Thermal Radar 2 section in the Asus software AI Suite shows it isn't mucking around. It's probably the most comprehensive thermal management package available of any motherboard currently available, with no less than 13 pages of settings that enable you to tinker with just about everything on the board, cooling wise. A quick word about the dust prevention package Asus has included in the box; that word is comprehensive. If it's a port and it's not being used, there's a rubber bung for it, but keeping with the overall scheme, the covers for the spare PCIe and memory slots are coloured white.

The problem is that the special edition premium adds a special premium amount onto the price tag. That wouldn't be an issue if there was the sort of feature set you get with the expensive RoG boards, or the same benchmark levels. Unfortunately the whitewash aesthetic is what you're paying for here, not some beefed-up PC performance. **–SIMON CRISP**

**BENCHMARKS**

| | Asus Z97 Mark S Sabertooth | Asrock Z97 Extreme4 | Gigabyte Z97-X SLI |
|---|---|---|---|
| Cinebench R15 (Index score) | 756 | **778** | 746 |
| X264 v4.0 (avg fps) | 45.69 | **47.12** | 45.32 |
| AS SSD Seq. Rd (MB/s) | **502** | 480 | 482 |
| AS SSD 4k Rd (MB/s) | **24** | 21 | 20 |
| Price | £234 | £110 | £91 |

Best scores are bolded.

VERDICT **8**

**Asus Z97 Mark S Sabertooth**

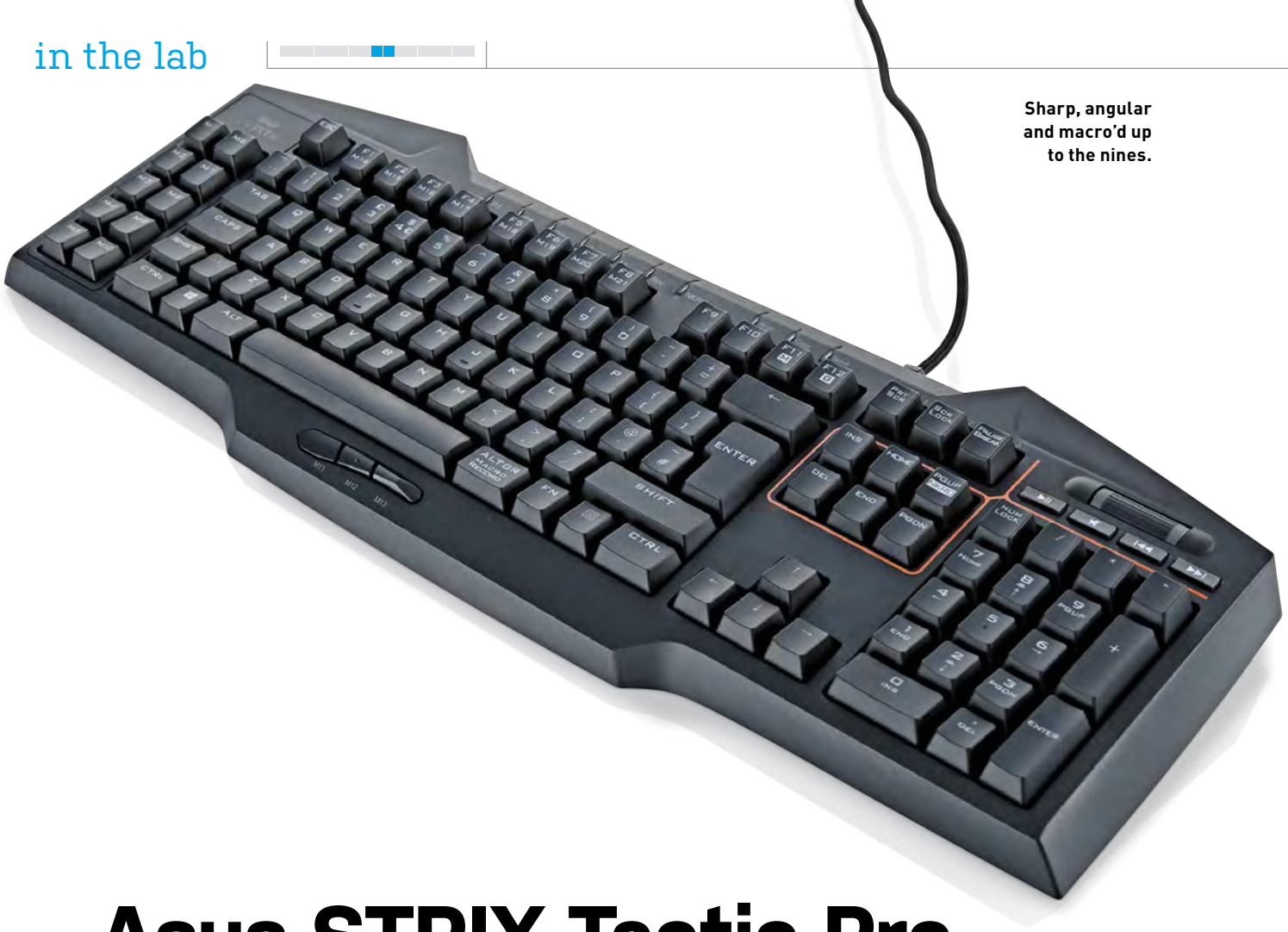
**+ BIG CAT** Looks cool; great thermal management and dust prevention packages.

**– ALLEY CAT** Too expensive; no chipset-supported M.2 slot.

£234, www.asus.com

**SPECIFICATIONS**

| | |
|---|---|
| Socket support | Intel LGA 1150 |
| Chipset | Intel Z97 Express |
| Memory support | 4 x DDR3 DIMM up to 1,866MHz |
| Max memory supported | 32GB |
| Storage | 8 x SATA 6Gb/s, 1 x SATAExpress |
| Warranty | Five years |



Sharp, angular and macro'd up to the nines.

# Asus STRIX Tactic Pro

## Shouldn't a mechanical owl keyboard be called the BUBO Tactic Pro instead?

**ASUS' OWL-INSPIRED STRIX RANGE** is crossing the entire breadth of Asus gaming goodies, only seeming to draw a line at its laptops and motherboards. Everything else, from graphics cards to headsets is being given the orange, angular treatment and now we've even got a new mechanical switch keyboard to add to the collection.

The STRIX Tactic Pro is classic gaming keyboard fare, with a bevvy of macro keys, media functions and your choice of different Cherry MX switches depending on your particular preference. You can select either black, blue, red or brown. If you already have a preference then you'll know what we're on about. If not, it's all about how 'clickety-clacky' you want your keys to sound and just how gritty you want them to feel. Blue and brown Cherry MX switches are the ones with the actuation-point click that makes this reviewer feel a bit queasy when typing. The blues are the loud, "I'M TYPING!" ones and the browns are softer, but still have that gritty feel.

If none of that sounds at all pleasant, just stick with the classic red switches our review board arrived with; they're the most accommodating to mech-switch n00bs. The black option is mainly just a stiffer version of the red, with a touch more resistance when you're hitting them.

In keeping with the rest of the STRIX crew the Tactic Pro is all orange highlights and angular edges. All you'd need is to replace the alpha-numeric characters with Klingon glyphs and you'd have the perfect keyboard for a Bird of Prey.

### PLUG AND PLAY

It's definitely a product of our time, borrowing heavily from the successful keyboards which have come before, but without really innovating itself. The media keys look to have been cut-and-pasted from the design sheets for Corsair's Vengeance K-series and the three little macro buttons beneath the spacebar have been cribbed directly from Roccat's keyboard hymn sheet.

But it actually feels a little lacking compared to the Tactic Pro's rarified competition. Sure, it's got the necessary mech switch keys, lots of macro buttons and full N-key rollover, but there's no USB pass-through or audio inputs. There's also no lighting control on the board or in the software. The 'breathing' individual orange LEDs frankly don't do much for us and that seems to be all you're really left with.

But let's take a minute to talk about that software a little. We've been checking out Asus' much more impressive STRIX Claw mouse at the same time as the Tactic Pro. Given that they're from the same manufacturer, and part of the same gaming range, we naturally assumed the software might link up. And they kind of do. Booting up the software, with both keyboard and mouse plugged in, the STRIX app displays both products yet doesn't allow you to switch between them. Which is odd.

For the most part though the Tactic Pro is a plug and play affair, which is just as well seeing as the board comes without the supporting software included.

We've not been entirely taken by Asus' gaming keyboard. It's trying to ape the best features of modern boards, but it just feels off the pace. If it was a more budget-oriented option that would be totally acceptable, as would the lack of staples like USB pass-through or audio inputs, but given that it's almost £100 we're really missing that premium feel. –DAVE JAMES

VERDICT **6**

**Asus STRIX Tactic Pro**

**+ STRIX** Solid key response; sturdy build quality.

**– LAX** Overly plastic aesthetic; expensive; lacks the premium feel; poor software; no USB pass-through; no audio connectivity.

£96, www.asus.com

Asus STRIX Claw is an accurate optical rodent.

# Asus STRIX Claw

## This is no optical illusion

**STRIX OR ROG, ROG OR STRIX?** That's been the question surrounding Asus' peripheral range over the last month or so. At the high-end it has long been the Republic of Gamers goodies which have been taking all the attention, but it has just started shipping a more affordable range of techie kit under the STRIX banner.

We checked out the first STRIX-branded graphics cards last month and this issue we've got a pair of peripherals to peruse. But as vaguely disappointed as we've been with Asus' STRIX Tactic Pro mechanical keyboard, we've been rather taken by the accompanying mouse.

Like the RoG Gladius we reviewed in our last issue, the STRIX Claw uses an optical sensor as opposed to a laser optical one. That means the Claw can be far more sensitive to the surface it's operating on than a laser mouse can – so it's a good job there are STRIX-branded mousemats available too. While that surface-related downside might put you off an optical rodent, there are some definite benefits to an optical sensor.

One of the reasons you get some pro-gamers preferring optical sensors as opposed to super-quick laser mice is that they don't use any hardware acceleration to hit their tracking speeds. Laser sensors' hardware acceleration can cause inconsistencies when moving at high speeds across a surface, with the optical sensor working on a 1:1 basis you get consistent tracking.

It used to be though that using an optical mouse meant putting up with low DPI settings, and with today's high-resolution displays it would take half an hour to get across a 4K panel. Thankfully we're starting to see really competitive, high DPI optical sensors hit the market. The RoG Gladius has a top setting of 6,400DPI, but at some £70 it's a mighty expensive option. The STRIX Claw can't quite manage that peak, but at 5,000DPI it's really not going to leave you really wanting.

### GETTING A GRIP

At top speed the Claw is responsive and accurate in-game and has four DPI settings you can flit between at will. There's also a DPI Clutch button sitting just below the forward/back buttons by your thumb. You can use this to instantly drop the DPI to a super-low setting to aid in your sniping activities while you're holding the thumb button down. Considering this is a much cheaper gaming rodent than the Gladius, it's nice to see the STRIX getting some extra functionality.

Physically we're big fans of the STRIX Claw too. The ergonomic design is 100 per cent laid out for the right-handed gamer, making it a frustrating one for the lefties. But it's a comfortable fit for either the titular claw-grip player or palm-grippers. It also feels nicely chunky in-hand despite being very lightweight, which allows it to glide across your mousemat with ease. Its design puts us in mind of a slightly larger Logitech G9, with a touch of Razer flaring on the two main mouse buttons.

Our one real concern with the Claw though is one shared by the Tactic Pro; – the software. It doesn't look too bad when you first start it, but it can be rather flaky in operation. Nailing down the DPI settings was simple enough, but every now and then we'd find ourselves playing with the limited lighting controls and they simply wouldn't respond. Considering you hardly need to spend much time tweaking it, the weak software isn't a huge issue, but it's something Asus definitely needs to work on. It's an area that they do well in with other peripherals, so this is odd.

That slight issue aside, the Claw is an excellent optical gaming mouse. We're still Ballista Mk-1 lovers on the laser side, but the Claw is starting to turn our heads towards the optical side. –DAVE JAMES

VERDICT 8

**Asus STRIX Clao**

**CLAW** Responsive and accurate, comfortable design, good-value for functionality.

**HANG-NAIL** Weak software.

£47, www.asus.com


**You'll just want to start grabbing components and jamming them in.**

# Corsair Carbide Air 240

## A chassis you can't help but want to build in

**WE'RE SERIOUSLY STRUGGLING** writing this review of Corsair's mighty mini-PC chassis. Mainly because we really don't want to trot out the old 'perfectly formed' trope. But when Corsair is busy making small form-factor PC cases that are this damned good, it becomes a bit tricky.

The Carbide Air 240 is basically a 'honey, I shrunk the Air 540' case being an almost exact copy of that chunky, server-esque PC box. The original Air 540 was a cuboid chassis we couldn't help but love too. Its neat design hid away the Cthulu power tentacles of your PSU, together with those boring lumps of storage, in one compartment, while leaving the sexy bits on display in the opposite side with a huge Perspex panel to show them off.

And Corsair has simply taken that design and scaled it down perfectly to fit the mini-ITX form factor the Air 240 is aimed at. Well, actually we're sure it was anything but simple, because Corsair has had to re-engineer and rejig the internals to cope with less space but essentially the same size components.

Somehow though it has managed to create a mini-ITX case that at once feels small but also incredibly roomy too. Pulling it apart and delving into the impressive space inside we couldn't help but immediately want to start building a PC in it. That's got to be a good sign for any chassis; you can easily imagine the potential machine you could build in the Air 240. It really is impressively well-designed, with easy access to both 2.5 and separate 3.5-inch drive bays – a very healthy three of each – and a huge amount of cutout space behind the mobo to attach and adjust your CPU cooling mounting.

### PLASTIC FANTASTIC

And, speaking of cooling, there's a wealth of space inside for either a relatively tall tower cooler or a chunky 240mm water cooler attached to the front vent. There's also room for two 120mm fans in the roof and, with three already included in the package, you can create a serious amount of airflow throughout with one of the water coolers in this month's group test.

The Carbide Air 240 has retained that large expanse of Perspex on the side panel too, which means your diddy motherboard and powerful gaming components are going to get the display case they deserve. The motherboard is the only thing you really need to make sure is mini-ITX compatible too. You can fit a full ATX scale power supply and there is ample space in the case for even a super-long AMD graphics card as well. You're not limited to dual-slot cards either, as the Air 240 could cope with even a triple-slot setup.

But it's not the smallest mini-ITX chassis. The fact it's almost a cube makes it perfect for Chillblast's Borgified aesthetic from last month's Assimilator machine, but does mean it's quite a chunky beast of a small form-factor case. That's the only vague negative we can find though, and that's really stretching it too. Because of its size, the only component compromise you need to make is on the motherboard, and with today's mini-ITX marvels that's almost no compromise at all. If you go for a chassis that's even smaller than this you're having to make serious compromises everywhere. Which all means the Corsair Carbide Air 240 is small, but perfectly formed... damn it. –DAVE JAMES

VERDICT **9**

**Corsair Carbide Air 240**

+ 02 Compact; smart design; ample space.

– C02 A little chunky.

£71, www.corsair.com

# Quietpc.com

*hear yourself think*

**www.quietpc.com/systems - 01653 668000**

FREE DELIVERY

## MONO ALL-IN-ONE

A high-end 1080p widescreen display combined with a top spec PC
Choice of graphics cards for desktop-calibre gaming performance
Beautiful flat design available in 21", 23" or 27" panel sizes
Available with up to 16GB RAM and up to a Core i7 4790K processor

**From £759 inc. VAT**

## QUBE FANLESS SERIES

Incredible performance in a stunningly tiny aluminium chassis
Available in three sizes – NanoQube, MicroQube and MiniQube
Configurable with up to 16GB memory and a choice of six processors
Optional UHD 4K graphics; 3840 x 2160 @ 60Hz (Micro / MiniQube)

**From £565 inc. VAT**

## NOFAN A490

Totally silent running – no moving parts, noise or dust
Available with up to 32GB memory and up to Core i7 4790K processor
Beautifully lightweight precision aluminium chassis
Air-cooled X490 version available with up to 8 cores and 64GB memory

**From £1,299 inc. VAT**

## UltraNUC PRO FANLESS

Tiny, yet a very capable desktop PC which is the size of your hand
Tranquil PC H22 fanless monobloc chassis gives zero noise
Choice of Core i3 or Core i5 processor with Intel HD 5000 graphics
Configurable with up to 16GB memory and 2TB of storage

**From £499 inc. VAT**

Quiet PC is a North Yorkshire-based PC manufacturer which designs and builds award-winning silent and quiet computers for customers all over the world. With fifteen years in business, you can depend on our computers for speed, stability and silence. We also supply components separately for self-builds and upgrades.

Use offer code **MOMOBOT** on our website before Saturday 28 Feb to claim a special 5% discount for PC Format readers!



Windows 7 · Windows 8.1 · ubuntu

intel inside CORE i7

TRUSTPILOT

★ ★ ★ ★ ★

**Rated 9.9 / 10**

**over 1,500 reviews**

# Samsung 850 EVO 500GB

## 3D stacked memory enters the mainstream


Not much to look at, but there's a lot of neat tech in there.

**HERE WE GO.** The very first mainstream drive with 3D NAND memory. So is it a revolution in solid-state storage or the same old 6Gbps SATA stagnation with a fancy name?

The 850 EVO is the latest in Samsung's affordable line of performance SSDs and shows its desire to push the solid-state game along, even at the lower end of the price/performance stack. Samsung has certainly nailed its colours to the mast when it comes to solid-state drives – it's going to be first to market with new technologies, it's going to aggressively drive prices down and it's going to do it all alone.

To that end, the 850 Pro was the first consumer SSD to arrive on the scene with 3D stacked memory making up its various capacities. The EVO follows this trend, using another spin of the V-NAND technology for its more price-conscious range of SSDs. And, as is its wont, Samsung is keeping it all in-house and purely using its own technology – both its own memory and controllers – for these drives.

The new 3D V-NAND (Samsung is calling it vertical NAND) is designed to offer a path up to higher capacity SSDs in the coming years. The literal idea of stacked memory is to pile NAND chips on top of each other, with through-silicon vias (TSV) providing connections down directly through the stack. This helps boost the bandwidth, as the connections are physically closer, but also means higher capacity drives can be made without relying on the ever-shrinking of NAND modules which make up our SSDs.

## THANKS FOR THE MEMORY

Samsung's second-gen 3D V-NAND is made up of a full 32 layers stacked atop each other in each module. Those modules have a total density of 128Gb. Now, that's not the highest density NAND you'll find in today's drives – both Crucial and Intel are throwing out drives with 128Gb density NAND in them and have partnered up to create their own 256Gb 3D NAND for 2015 – but the difference is Samsung is only using 40nm 3-bit MLC silicon to get there.

Because of the celebrated shrinking of production processes in all spheres of computing – from processors to memory to graphics chips – it might at first seem like this is a backwards step. We have, after all, become used to using 19nm NAND in our SSDs, so using a production process that's twice as large would surely undo all the performance and efficiency boosts we picked up along the way down.

But because of 3D V-NAND's ability to hit these high densities with such chunky lithographies, combined with the bandwidth boosts of the TSVs inside the stacked modules, the larger dies don't impact relative performance. The efficiency gains from previous production shrinks are also largely offset by the power reductions in the switch from 2D to 3D NAND.

Samsung estimates a 30 per cent reduction in operational power with the Samsung 850 EVO compared with the older Samsung 840 EVO. The 40nm process comes into its own though when we start talking about endurance. The biggest benefit is the fact the larger production processes are more reliable and longer-lived than their smaller descendents. When you're making the switch, as Samsung is, from the 2-bit multi-layer cell (MLC) design of its higher-end 850 Pro to the less-robust 3-bit MLC, any endurance boost is welcome.

## CLOSE, BUT NO CIGAR

But what of performance? Sadly this is where we're in a bit of a holding pattern with solid-state drives at the moment. Because of the performance limitations of the SATA 6Gbps interface there's a hard 600MB/s speed limit in place on connected drives. The Samsung 850 EVO *is* definitely quicker than the older Samsung 840 EVO, but not by the sort of performance metrics that are going to have you rushing out to upgrade if you're rocking the last-gen drive.

The biggest change has been in the write performance of the new Samsung 850 EVO. In sequential terms you're looking at some 20 per cent quicker than the Samsung 840 EVO and a full 30 per cent quicker for the 4K random writes. Those are decent improvements and mean that in the real-world we saw our 30GB Steam folder transfer test resolve 22 seconds quicker than the Samsung 840 EVO.

Those are the results for the 500GB version of the Samsung 850 EVO, but the introduction of a new Samsung controller – the MGX – for the capacities of 500GB and below has been primarily tuned to provide consistent performance across the range. That means the performance of the cheaper 250GB version is almost identical.

## COMPETITION CRUSHER?

When we're talking about the generational update of an SSD range it's natural to compare it to its predecessor, but arguably the more pertinent comparison is with the competition. The biggest competitor to the Samsung 850 EVO is Crucial's MX100.

Crucial, along with its parent company Micron, is another big name in SSDs at the moment and its MX100 range is the price/performance hero right now – especially in the 512GB capacity. It's a tough battle with the 500GB Samsung 850 EVO, as both post similar synthetic numbers. This new Samsung drive is quicker in terms of sequential writes and 4K reads, but the difference is practically invisible in real terms. The Crucial drive doesn't use any special caching shenanigans to hit its speeds, which explains why its real-world tests are quicker.

If you're looking lower down the capacity stack it quickly becomes a no-brainer – the Samsung 850 EVO is clearly the go-to affordable SSD. It's the quickest 250GB drive around and comes with a confidence-boosting five-year guarantee thrown in. Overall, 850 EVO is the fastest mainstream, consumer-class SSD around. It's just not quick enough to make it a killer upgrade over the previous generation EVO. Which is a shame. **–DAVE JAMES**

VERDICT **9**

**Samsung 850 EVO 500GB**

**+ EVOLUTION** Speedy performance; good-value; generous five-year warranty.

**– DEVOLUTION** Not a big generational leap; definitely consumer-class SSD.

£198, www.samsung.com

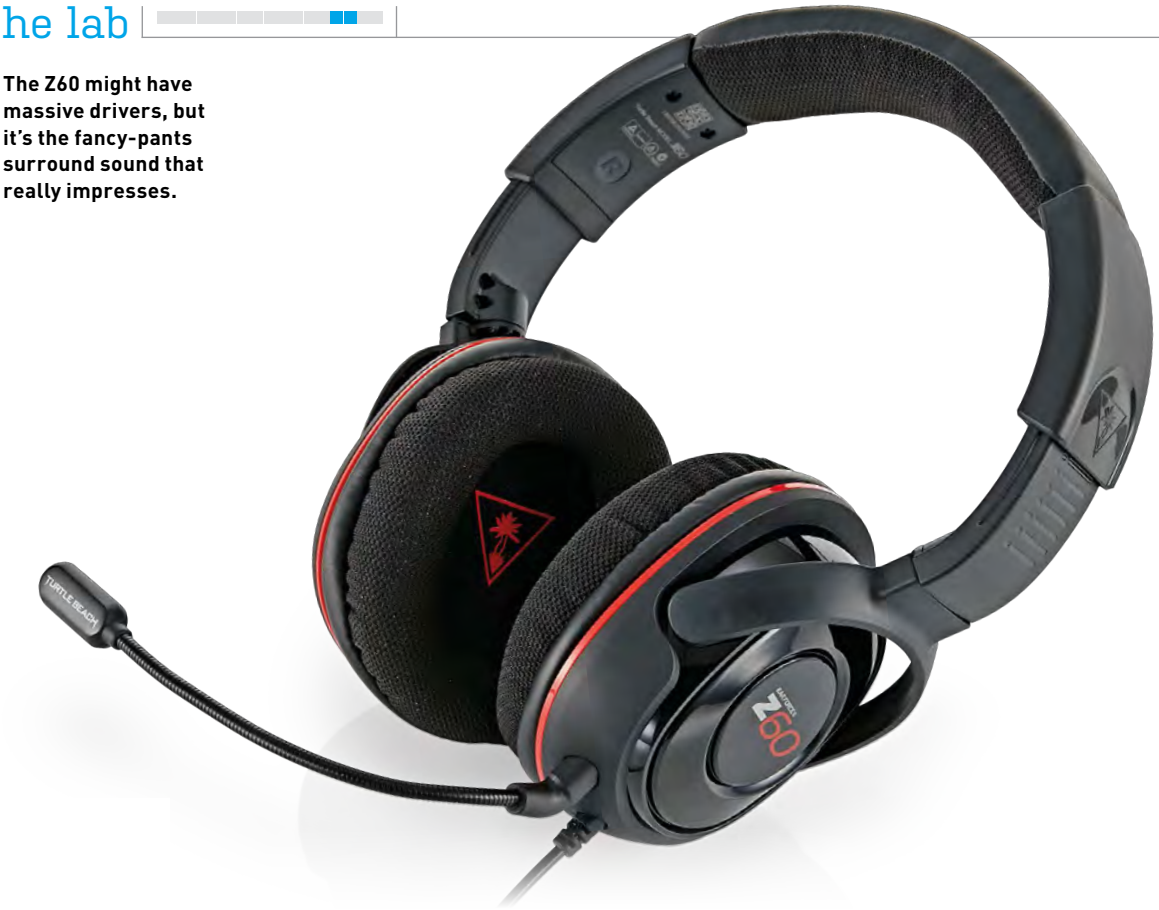
### BENCHMARKS

| | Samsung 850 EVO 500GB | Samsung 840 EVO 500GB | Crucial MX100 512GB | SanDisk Extreme Pro 480GB |
|---|---|---|---|---|
| Atto Peak Rd/Write (MB/s) | 553/533 | **549/441** | 553/506 | 554/520 |
| AS SSD Random Rd/Write (MB/s) | **36/108** | 26/82 | 24/106 | 30/103 |
| PCMark Expanded Storage Consistency (Index score) | 4,474 | 4,317 | 4,291 | **4,929** |
| Steam Folder Transfer (seconds) | 208 | **230** | 191 | 191 |
| Price | £198 | £171 | £145 | £264 |

Best scores are bolded.

### SPECIFICATIONS

| | |
|---|---|
| Capacity | 500GB |
| Memory controller | Samsung MGX |
| Memory | 128Gb Samsung 40nm MLC |
| Cache | 512MB DDR2 |
| Warranty | Five years |



**The Z60 might have massive drivers, but it's the fancy-pants surround sound that really impresses.**

# Turtle Beach Ear Force Z60

## Are 60mm drivers the new gold standard for gaming headsets?

**IF YOU'VE HAD THE PLEASURE** of trying out Kingston's superlative HyperX Cloud headset and sampled its *thunderous* bass, you'd say its 53mm driver units were big enough to power any gaming audio kit. The industry, however, apparently disagrees. We looked at the Asus Strix Pro last issue, which boasted 60mm drivers and now Turtle Beach is getting in on the act with its Z60. The cynic in us wonders if the value in increased driver size isn't more about marketing than consumer benefit; it's a nice number to imply a quantifiable benefit over rivals, but driver circumference alone is far from a gold seal of quality.

There's substantially more on offer from this £100 surround sound headset. Did we say surround sound? Sorry, we meant DTS Headphone: X, which is a "revolutionary" new 360-degree, 3D surround tech that gives not just space but height to sound cues. If that sounds a bit far-fetched, but... it isn't. You really do hear the illusion of sounds coming from high above as well as behind or around you. Turtle Beach has made a fine name for itself on the console market by combining great surround sound with strong build quality, but doesn't tend to release as many models for us PC users. It's really bringing its A game to our realm with this model, though.

The headset itself connects to an inline control which offers preset sound behaviours for gaming, music and movies (as well as the usual volume/mic controls). Movie mode boosts the frequency range that speech most commonly occurs at to keep dialogue clear, while also pumping up the bass to keep the sound effects hard-hitting. It's designed with J.J. Abrams in mind, rather than Werner Herzog.

Game mode goes even further with the bass, boosting low frequencies to a level you can feel as much as hear. This is where the 60mm drivers come in – they're positively violent. Turtle Beach works them harder than Asus's Strix Pro cans, the end result being hilariously OTT gunfire, explosions... basically anything occupying a lower frequency range than Brian Blessed.

Music mode is as close as the Z60 comes to placating the audiophiles, flattening out the frequency response so your songs don't sound like mush. But it's only partially successful. Kingston's HyperX Cloud delivers more satisfying bass, but still scrubs up well when you need flat, 'true' sound – aural evidence that driver size isn't the last word of the argument.

### YES YOU CAN

The headset design is very similar to more expensive console models such as the PX4, and as such it's very adjustable, breathable and strong. Construction materials are predominantly plastic, but are finished to a really high standard and are near-silent when you're fiddling with them. The microphone is perfectly functional and easily adjustable, and can also be removed if you want to use the Z60 as headphones for your MP3 player. You'll need a USB connection to make use of the surround, but there's a handy 3.5mm jack connecting the cans to the inline remote.

The Ear Force Z60 is a good all-rounder, as you'd expect given Turtle Beach's previous cans. We'd hesitate to say it's overpriced, but you can find rival offerings for much less if you're willing to ditch surround for sound quality. **–PHIL IWANIUK**

**SPECIFICATIONS**

| | |
|---|---|
| Frequency response range | 20Hz-20KHz |
| Driver size | 60mm |
| Connection type | 3.5mm/USB |
| Cable length | 3m |
| Mic | Omni-directional |

**VERDICT 8**

**Turtle Beach Ear Force Z60**

**+ JEDI MASTER** Surround sound that's more than marketing bluster; very adjustable.

**– PADAWAN** Not the best overall sound reproduction on the market.

£100, www.turtlebeach.com

**The RAW Prism is minimalist, but what it does, it does well.**

# SteelSeries Siberia RAW Prism

## A features-light headset as reliably colourful as the language you shout into it

**THE MAJOR SELLING POINT** of SteelSeries' new budget gaming headset, the RAW Prism, is colour. Over 16 million different colours, actually. Prism is the name of the company's RGB colour customisation tech, used to change the hue of the illuminating rings around each earpiece. So, once you plug these cans in via USB and load up some proprietary software you can obsess about the exact shade of varicose vein blue you want your head to emit. The downside of that connection type of course is your subsequent inability to connect the Raw Prism to your phone or plug it directly into a soundcard, so there's a real trade-off here in the name of colour customisation.

That's about it for standout features on this minimalist headset, except for its discrete internal mic. SteelSeries fits retractable microphones across its entire range, but the RAW Prism's is different. There's just a barely noticeable nub on the left-hand side which picks up your voice quite competently, though you'll be quiet over the chat channels until you boost your outgoing signal in Windows or the mic calibration tab of SteelSeries' software. In the name of simplicity (or cost-saving) there's no inline remote – although there is a mute button on the left earcup.

Despite the indubitable fact that 'RAW Prism' sounds like a bar in Shoreditch where they'd serve locally brewed moonshine in jamjars, this headset ain't putting on airs and graces with its feature list. If you want a travel bag, swappable earpieces of different fabrics and other such gubbins, then look elsewhere.

However, what the RAW Prism does, it does very competently. It's a very comfortable headset for the money, thanks mostly to its lightweight materials but also some generous padding on both ears and the headband. The absence of frivolities like brushed metal (usually used in the headband) means there's also very little noise when adjusting the cups in any direction. We were a little bit worried to see signs of wear and tear on the material around the ears after just three weeks of use though, so don't expect bomb-proof construction.

### BUDGET BASS

Naturally, sound quality overrides all the above considerations, and this is another area in which the RAW Prism walks the walk. It's a simple two-channel stereo offering rather than surround sound, but the stereo spread is nice and wide so you'll hear panned sound cues (like a voice coming from the corner of a room, or footsteps behind you) quite accurately.

The cans do give away their pricing in their muddy bass reproduction, though. Low-end certainly isn't overpowering, quite the opposite – you hear the low-mids much louder than anything else, giving a 'honking' effect that isn't uncommon in cheaper headsets. It's important to point out that this is really only noticeable at higher volumes. At low and medium volumes it's still far from stunning but the difference in quality between the Prism and competitors £10 either side is minimal.

It's an overall success for these colourful cans thanks to affordable pricing and the absence of any real annoyances. In truth the idea of fiddling around with LED shades isn't a massive draw to us, but if you think in RGB, the RAW Prism could be your dream headset. –PHIL IWANIUK

**SPECIFICATIONS**

| | |
|---|---|
| Frequency response range | 20Hz – 20KHz |
| Driver size | 40mm |
| Connection type | USB |
| Cable length | 1.5m |
| Mic | Omni-directional |

VERDICT **8**

**SteelSeries Siberia RAW Prism**

**CAN DO** Unfussy and reliable cans that don't disappoint in terms of sound and comfort; colourful too.

**NO CAN DO** Obviously budget; lacks features; can't connect to your phone.

£48, www.steelseries.com

**Despite its cheap price tag, the Core 2300 is a well-built case that offers plenty of air or liquid cooling options.**


# Fractal Design Core 2300

## The Swedes' latest is compact but capable

**THE LATEST ADDITION** to Fractal Design's growing Core chassis range is the Core 2300, a compact midi-tower which, despite its smallish size and even smaller price tag, can support an impressive seven fans or three water cooling radiators. The Core 2300 is a no-nonsense sort of case and what you see is definitely what you get, which should come as no great surprise given its price. But even so, there's always that little Fractal Design quirk to make you sit up and take notice – in the 2300 it's how the drives are mounted.

The drive bracket is a flat plate of metal which sits vertically in the case attached to the bottom of the 5.25-inch drive bay with two thumbscrews. The base is held in place by a single thumbscrew which sits underneath the case, which can be a pain to access if you use heavy components.

Actually, that simple, flat bit of metal has been carefully designed so that it can hold both 3.5-inch and 2.5-inch drives at the same time. The drives are fitted vertically and up to three drives of each size can be used. The mounts even have vibration-damping rubber grommets. If you're only using a single solid-state drive then there's a single mount at the base of the motherboard plate so you could get rid of this bracket entirely if you wanted some extra aid in cooling.

A couple of things to beware of though with this bracket. If you have a bottom fan fitted then you won't be able to use the bottom inside drive mount. And similarly, if you have a long graphics card, you will need to think quite carefully about which mounts to use.

### TOTALLY RAD

Cooling-wise the case comes with two pre-installed Fractal Design silent (1,200rpm) fans, one in the front and one in the rear panel. The front one can be swapped for a 140mm job and there is a second mount under it for a further 120/140mm fan. There are mounts in the roof of the case for a pair of 120/140mm fans and there is the same sized mount in the base of the case for a single fan. Finally a 140mm fan can be installed in the side panel. It can also support up to three liquid radiators. *Three*. The top panel has mounts for a 240mm long rad but can only support one up to 32mm in thickness. A 240 or 280mm unit can be housed behind the front bezel while the real panel will support a 120mm rad.

The method Fractal has devised for mounting drives is a novel approach to dealing with fitting larger graphics cards in mini-chassis. You can fit cards up to 380mm in length in the latest Core, without the need to remove drive cards. The only annoying aspect of the drive bracket is the positioning of the bottom thumbscrew underneath the case. And, because of the 2300's compact nature, another problem is running cables behind the mobo tray.

Unless you happen to be using a power supply with super-thin braided cables, there's very little room to play with. Cable-tidying obsessives are going to struggle to scratch that itch... –SIMON CRISP

**SPECIFICATIONS**

| | |
|---|---|
| Motherboard support | ATX, m-ATX, m-ITX |
| Dimensions | 195 x 431 x 450mm |
| CPU cooler max height | 162mm |
| Graphic card max length | Up to 380mm |
| Storage support | 2 x 5.25in, 3 x 3.5in, 4 x 2.5in |

VERDICT **8**

**Fractal Design Core 2300**

**+ TIGHT SHIP** Cheap; well-built; there's plenty of space for air and/or liquid coolers.

**– LEAKY SHIP** Lack of space for cabling; annoying thumbscrew in base.

£39, www.fractal-design.com


**The Bravo's black finish looks snazzy, as long as you don't go near it with your grubby fingers.**

# XFX Type01 Bravo

## Veteran of the graphics card and PSU markets ventures into the case business

**WELL KNOWN FOR ITS RANGE** of graphics cards and power supplies, XFX has now branched into the world of PC enclosures with its first case design – the Type01 Bravo. And XFX certainly hasn't just opted for an off-the-shelf look – its design means you won't mistake it for any other case. Not only because of its unique looks, but also because of just how big it is. The Bravo is one chunky ol' mid-tower, that's for sure.

Although the external skin of the case is mostly ABS and Acrylic black-finished plastic, it has a 0.7mm steel frame (also finished in black) which is the reason why it weighs a respectable 10.5Kg. Perfect for bench pressing.

The case has plastic looped surrounds on the top, at the front and the back. They give the impression they're handles to pick the case up by - our advice, don't even try it. The plastic is nowhere near strong enough to support the case when its empty, let alone with a system inside it. The loops on the base make more sense though. They support the case and, because they raise the chassis off the floor, they also allow air in through the filtered bottom vent. So, on the top it's all aesthetics while underneath the Bravo's style is actually functional. But be prepared to live with the fact the Bravo's black finish is a fingerprint magnet.

When it comes to active cooling the Bravo is quite well-served. Lurking behind the front bezel is a 200mm fan (though this can be replaced by a pair of 120mm units) while a 140mm exhaust fan sits at the top of the rear panel. Additional mounts for three 120mm fans can be found in the side panel with single 120/140mm mounts in the base and roof. As for water cooling support, well the easiest thing would be to mount an external rad. But that's obviously a relative term as external radiators can be an absolute bast to fit...

There are three 5.25in drive bays with tool-free mounts, while the two internal drive cages can support up to eight drives. That all sounds pretty straightforward but it's actually a bit more clever than that. The bottom cage holds up to three 3.5/2.5in drives and the top cage can support up to five drives. The crafty bit is that this top cage has a movable side support, so if you're only going to fit 2.5in drives in it you can make the cage narrower to allow for longer graphics cards to be used. Should you go down this route, XFX has supplied narrow drive bays in the bits box. All the drive trays are tool-free plastic offerings but it must be said the 3.5in trays do feel a little on the flimsy side.

### FUTURE PROMISE

To keep your machine all tidy, the motherboard tray has plenty of rubber grommeted holes around it to get cabling out of the way. And, with around 18mm of clearance behind the mobo tray, there's plenty of space before your cabling starts getting crushed by the side panel.

As a first foray into the world of case-building, XFX's Bravo feels like a good first try, and leaves us hopeful that subsequent Bravos will have a little more about them. But we're still disappointed about the lack of support for larger closed-loop water-cooling sets – that seems a bit of an oversight for a gaming case. **–SIMON CRISP**

### SPECIFICATIONS

| | |
|---|---|
| **Motherboard support** | ATX, m-ATX, m-ITX |
| **Dimensions** | 232 x 562 x 518mm |
| **CPU cooler max height** | 175mm |
| **Graphic card max length** | 340mm (3.5in drive cage) 370mm (2.5in drive cage) |
| **Storage support** | 3 x 5.25in, 8 x 3.5in/2.5in |

**VERDICT** 8

**XFX Type01 Bravo**

**BEGINNER'S LUCK** Good value for money; nice-looking while still functional; adaptable drive cage.

**ROOKIE ERROR** Lacks support for liquid-cooling; trays aren't the strongest.

£70, www.xfxforce.com

# RIG BUILDER

BY DAVE JAMES

# Build Your Perfect PC

## Whether you're upgrading your PC or starting anew, this is the best kit

**ONE OF THE JOYS OF OWNING A PC** is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. Want more power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can change slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then, the best possible upgrade is to dump your current rig and start afresh by building a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work well together? How much should you be budgeting for? That's a lot of questions, and getting the right answers means having to go and research all the current trends in order to make the best decision. Before you do that, though, take a look at our guide. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets. Our budget PC will get you gaming at 1080p for a bargain price, our mainstream machine will cope with pretty much anything at 1440p, and our high-end rig will do pretty much whatever it wants...

On these pages are our recommendations for putting together those budget, mainstream and silly high-end machines. These rigs all include a screen and peripherals in the ticket price, so if you're keeping your existing goodies then you'll have more cash to spend elsewhere. And what's our recommendation if you find yourself with that pleasant problem? Either get a larger SSD or a more powerful GPU. Happy building you lovely people!

## HOW TO... BUY A CPU COOLER

**PICKING THE RIGHT COOLER** is an important choice when putting your perfect PC together. That's the thing which will keep your processor operating at peak efficiency, but will also impact on the aural performance of your rig. CPU coolers can be loud little things, so you need to make the right choice for you.

But that doesn't necessarily mean opting for the biggest water-cooler you can find, because that might not actually be needed. The budget machine can happily make do with the stock Intel cooler because the Pentium Anniversary chip runs so cool – even when overclocked. Third-party air-coolers can be just as effective, in terms of peak cooling performance, as the top water-coolers and just as quiet. What a closed-loop liquid chip chiller can offer though is a much faster way of returning your CPU to its idle temperature from fully loaded. In these days of variable frequencies that's important for the higher-clocked processors.

### BUDGET

| | |
|---|---|
| **MOTHERBOARD** | |
| Gigabyte B85M-D2V | £41 |
| **CPU** | |
| Intel Pentium G3258 | £50 |
| **MEMORY** | |
| Crucial 2x 2GB DDR3 1,600MHz | £25 |
| **GRAPHICS CARD** | |
| MSI GTX 750 Ti OC | £108 |
| **SOLID-STATE DRIVE** | |
| OCZ ARC 100 240GB | £80 |
| **CPU COOLER** | |
| Intel Stock Cooler | N/A |
| **POWER SUPPLY** | |
| SilverStone Strider E 500W | £38 |
| **CHASSIS** | |
| Corsair Carbide 200R | £45 |
| **OPTICAL DRIVE** | |
| LiteOn IHAS124-14 24x DVD±RW | £10 |
| **SCREEN** | |
| AOC E2250SWDNK | £80 |
| **TOTAL** | **£477** |

### MAINSTREAM

| | |
|---|---|
| **MOTHERBOARD** | |
| Asus Z97-A | £110 |
| **CPU** | |
| Intel Core i5-4690K | £168 |
| **MEMORY** | |
| Corsair Vengeance LP 8GB | £70 |
| **GRAPHICS CARD** | |
| Sapphire R9 285 | £170 |
| **SOLID-STATE DRIVE** | |
| Crucial MX100 512GB | £150 |
| **CPU COOLER** | |
| Enermax ETS-T40 | £27 |
| **POWER SUPPLY** | |
| OCZ ModXStream Pro | £64 |
| **CHASSIS** | |
| Cooler Master CM690 | £54 |
| **KEYBOARD** | |
| Corsair Vengeance K65 | £70 |
| **SCREEN** | |
| Viewsonic VX2363Smhl | £121 |
| **TOTAL** | **£1,004** |

### HIGH-END

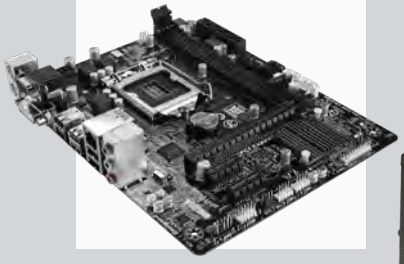
| | |
|---|---|
| **MOTHERBOARD** | |
| Asus X99 Deluxe | £295 |
| **CPU** | |
| Intel Core i7-5960X | £813 |
| **MEMORY** | |
| Corsair Vengeance LPX 16GB | £198 |
| **GRAPHICS CARD** | |
| MSI R9 295X2 | £491 |
| **SOLID-STATE DRIVE** | |
| Samsung 850 EVO 1TB | £368 |
| **CPU COOLER** | |
| Cooler Master Nepton 240M | £87 |
| **POWER SUPPLY** | |
| CM Silent Pro Gold 1,000W | £171 |
| **CHASSIS** | |
| CM Cosmos 2 Ultra | £250 |
| **KEYBOARD** | |
| Corsair Vengeance K70 | £90 |
| **SCREEN** | |
| Philips BDM4065UC | £607 |
| **TOTAL** | **£3,370** |

# BUDGET

## When every pound counts, spend them wisely

### MOTHERBOARD
Gigabyte B85M-D2V

This micro-ATX board is the perfect foil for Intel's bargainous Pentium Anniversary CPU, with good connectivity and decent overclocking chops to boot.



### CPU COOLER
Intel Stock Cooler

The Pentium Anniversary chip is a very cool-running CPU, even when overclocked. We managed a stable 4.2GHz on this stock Intel cooler.

### MEMORY
Crucial 4GB 1600 DDR3

Memory pricing continues to be incredibly volatile, but it's still a great time to squeeze more sticks into your rig. You really should see 4GB as the minimum.

### CPU
Intel Pentium G3258

Poor AMD, it's a clean sweep for Intel on all our recommended rigs. The new Pentium is simply the best budget chip around right now, offering Haswell for peanuts.

### GRAPHICS CARD
MSI GTX 750 Ti OC

Nvidia's latest GPU is quite a feat of engineering because of that brand new Maxwell architecture. The MSI card is a bargain.

### SOLID-STATE DRIVE
OCZ ARC 100 240GB

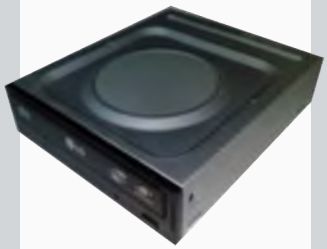
OCZ's ARC 100 drive may not be the quickest, but it's great value, incredibly consistent and quicker than Crucial's MX100 at this capacity.

### POWER SUPPLY
SilverStone Strider E

We may be talking about a budget rig here, but it's still a hefty chunk of cash to risk on a no-name power supply. This 500W SilverStone PSU will give you peace of mind and all the PCIe leads you need.

### OPTICAL DRIVE
LiteOn IHAS124 DVD+RW

We really wonder whether you actually need an optical drive anymore, but for now we'll err on the side of caution and include one in the list. Don't feel bad if you forget to buy it though.



### CHASSIS
Corsair Carbide 200R

Much more impressive than its price tag may lead you to believe, the clean lines and added extras of this chassis make it the budget case to beat. An understated bargain.

### SCREEN
AOC E2250SWDNK

This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks pretty good despite that ridiculously low price tag. It's no IPS-beater, but it'll do for half the cash.

# MAINSTREAM

## A stunning rig doesn't have to cost a fortune

### MOTHERBOARD
Asus Z97-A

We've seen a lot of Z97 motherboards since this Asus offering landed, but nothing newer has managed to push it off this list. Great features at a great price. Simple really.

### CPU
Intel Core i5-4690K

For almost the same price as the ol' 4670K you can pick up one of the newer Devil's Canyon CPUs. It's only got a 100MHz clock boost, but the new TIM helps with overclocking.

### POWER SUPPLY
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power the rig, with extra to spare. It's quiet as well.

### CPU COOLER
Enermax ETS-T40

Enermax has simply amazed us with this, its first CPU cooler. The performance is excellent, the price is astonishing, it's easy to fit and it isn't so big that it limits your case or mobo choices.


### KEYBOARD
Corsair Vengeance K65

We love a good mechanical switch keyboard here on *PC Format*, and Corsair is making some of the best. The K65 is a great compact option, with a compact price to boot.

### CHASSIS
Cooler Master CM690

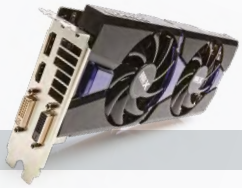
The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside, and all at a reasonable price.

### MEMORY
Corsair Vengeance LP 8GB

This pair of 4GB sticks will give you all the performance you could ever want, and they're in stormtrooper white. They'll only take up two slots in the board for upgrading, too.


### GRAPHICS CARD
Sapphire R9 285

The newer Tonga Pro GPU in AMD's R9 285 is an impressive wee thing, making it our favourite sub-£200 card. The 2GB frame buffer might be a worry for the hi-res future, but it's a beauty.



### SOLID-STATE DRIVE
Crucial MX100 512GB

Crucial has made a big splash in the SSD market with this chunky drive. The 512GB version is quicker, larger and cheaper that the 480GB M550.


### SCREEN
Viewsonic VX2363Smhl

The old 23-inch Viewsonic IPS seems to be EoL now, but this white one has got the budget IPS panel and decent performance for its bargain £121 price tag.

# HIGH-END

## For when you *really* want to treat yourself

### MOTHERBOARD
Asus X99 Deluxe

As usual this Deluxe board from Asus is absolutely stuffed with funky features. It's one of the finest, and best-looking, X99 boards around and not a bad overclocker either.

### CPU COOLER
Cooler Master Nepton 240M

Why settle for a reasonable overclock when you can hit 5GHz? This kit is speedy, boasts incredible performance and is quiet in operation. Everything you'd want, in other words.

### MEMORY
Corsair Vengeance 16GB

The Haswell-E platform is the first to bring DDR4 to the consumer. That does come at a hefty price, but it's damned quick...

### CPU
Intel Core i7-5960X

If you're after the fastest, most advanced CPU around, then this 8-core, 16-thread Haswell-E is it. There is also the 6-core i7-5820K for a more reasonable £300, but the 5960X is the pinnacle of modern CPUs.

### GRAPHICS CARD
MSI R9 295X2

The dual-GPU R9 295X2 is undeniably the quickest graphics card around. We still worry about these sort of cards, but the liquid-chilling helps those concerns, and besides, it's a beast at 4K.

### SOLID-STATE DRIVE
Samsung 850 EVO 1TB

This new spin of the Samsung's 3D NAND means high-capacity is no trouble for its mainstream SSD range. And the 1TB drive has the performance to match its new endurance.


### POWER SUPPLY
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks managed to scoop the gold award in our exacting test way back in PCF246.

### KEYBOARD
Corsair Vengeance K70

Corsair's update to the older Vengeance keyboard rights all its older sibling's wrongs. It's also a truly stylish gaming board with the red backlight glowing against its black-brushed metal chassis.

### CHASSIS
CM Cosmos 2 Ultra

Cooler Master has always been an impressive maker of cases, but it has truly stunned us with this chassis. Yes, it's expensive, but if you can afford to drop this much on your case, you'll be more than happy.

### SCREEN
Philips BDM4065UC

This 40-inch 4K behemoth is the first screen to make us think that super-high resolution actually looks super. It's a decent VA panel and a great price, too, and will really take advantage of the R9 295X2.

# SUBSCRIBE TO PCFormat

PERFORMANCE GEAR & GAMING

**No.1 for kit** The hardware magazine for PC gamers

THE UK'S BIGGEST PC PERFORMANCE MAGAZINE

- MORE REVIEWS
- MORE FEATURES
- MORE GAMING

## READ WHAT MATTERS TO YOU WHEN AND WHERE YOU WANT. WHETHER YOU WANT PC FORMAT DELIVERED TO YOUR DOOR, YOUR DEVICE OR BOTH EACH MONTH, WE HAVE THREE GREAT OPTIONS TO CHOOSE FROM...



## Print only £31.49

Every issue delivered direct to your door at a fraction of the cost.

Your subscription will then continue at £31.49 every 6 months – SAVING 19% on the shop price.

## Digital only £12.99

Instant digital access on your iPad, iPhone or Android device.

Your subscription will then continue at £12.99 every 6 months – SAVING 50% on the shop price.


FROM JUST £37.99!

# Print + digital only £37.99

■ Every new issue in print and on iPad, iPhone or Android ■ Never miss an issue, with delivery to your door and your device ■ Huge savings, the best value for money, and a money-back guarantee ■ Instant digital access when you subscribe today

Your subscription will then continue at £37.99 every 6 months –
SAVING 19% on the shop price and giving you a 75% discount on a digital subscription.

## Two easy ways to subscribe...

Go online **myfavouritemagazines.co.uk/PFDsubs**

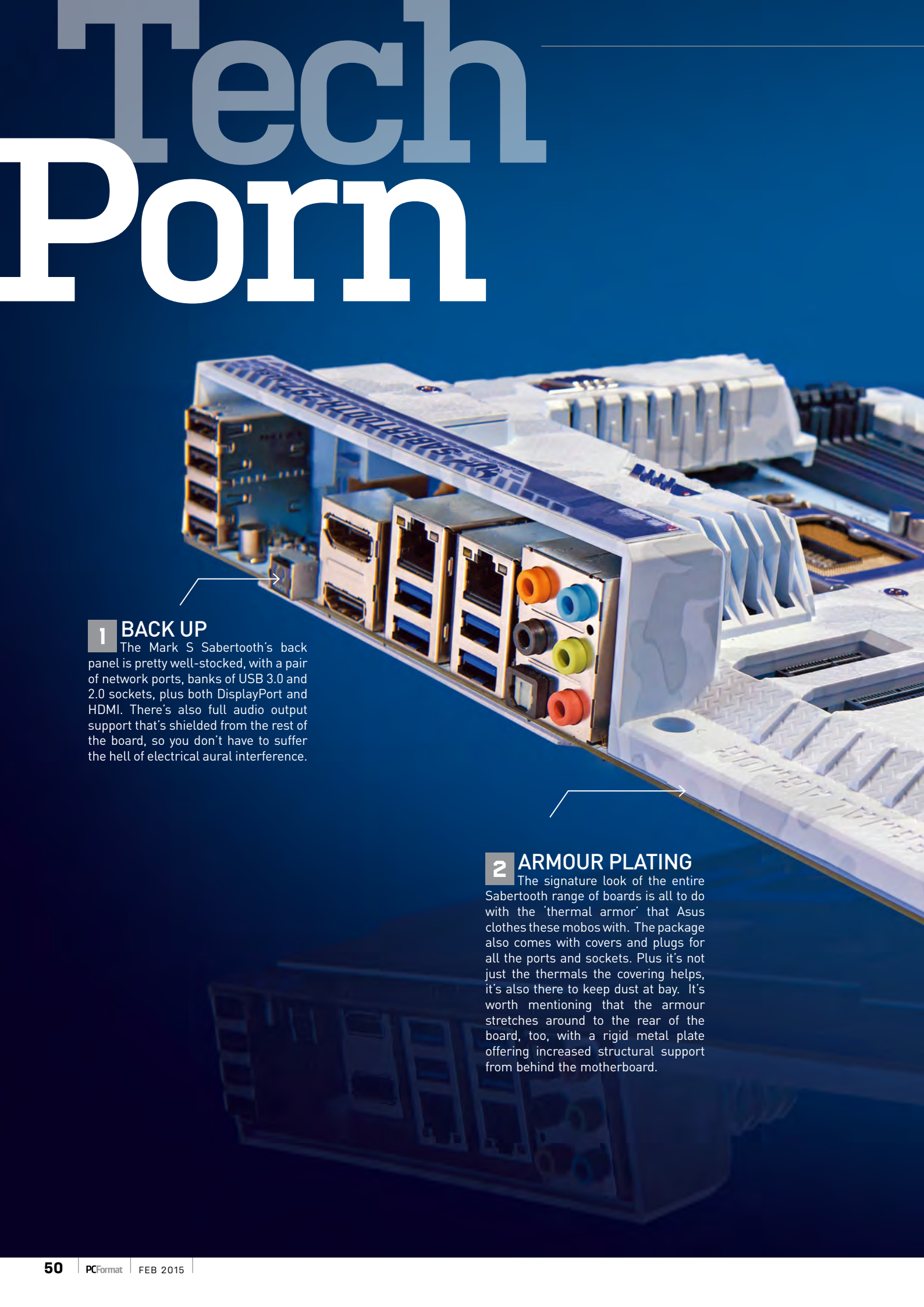
Call now on **0844 848 2852**

(please quote PRINT15, DIGITAL15 or BUNDLE15)

**Terms & conditions**

Prices and savings quoted are compared to buying full-priced UK print and digital issues. You will receive 13 issues in a year. If you are dissatisfied in any way you can write to us or call us to cancel your subscription at any time and we will refund you for all unmailed issues. Prices correct at point of print and subject to change. For full terms and conditions please visit: myfavm.ag/magterms. **Offer ends 12/02/2015**.

# Tech Porn



## 1 BACK UP

The Mark S Sabertooth's back panel is pretty well-stocked, with a pair of network ports, banks of USB 3.0 and 2.0 sockets, plus both DisplayPort and HDMI. There's also full audio output support that's shielded from the rest of the board, so you don't have to suffer the hell of electrical aural interference.

## 2 ARMOUR PLATING

The signature look of the entire Sabertooth range of boards is all to do with the 'thermal armor' that Asus clothes these mobos with. The package also comes with covers and plugs for all the ports and sockets. Plus it's not just the thermals the covering helps, it's also there to keep dust at bay. It's worth mentioning that the armour stretches around to the rear of the board, too, with a rigid metal plate offering increased structural support from behind the motherboard.

# Asus Z97 Mark S Sabertooth

**THE SABERTOOTH RANGE OF MOTHERBOARDS** has given us some of our favourite mobos since Asus first introduced this second-tier selection. Sitting a little behind the seriously high-end Republic of Gamers range, the Sabertooth boards have offered a heady mix of solid performance and overclocking support, as well as good looks. And this latest, special edition of the Z97 Sabertooth takes that focus on aesthetics even further.

The Arctic Action Man camo look covers the thermal armour that Asus has protecting the whole board. But it's not just the plastic shroud which has experienced the white effect. The entire PCB is pristine white. If you've spent the money on a Stormtrooper-white Corsair chassis and are desperate to have it filled in matching colours, then the Mark S is going to be the Z97 board for you.

The issue is that the special edition price premium makes this board incredibly expensive. All that white paint and camo detailing costs money, you know. And, while the Sabertooth range hasn't been as well-featured as the RoG boards, we'd still have expected to see the M.2 standard being adopted rather than the less-used SATA Express. But if you've been craving a colour-coordinated system then the Mark S is your best option. –DAVE JAMES

## 3 SLOT SUPPORT

The Mark S comes with full CrossFireX and SLI support for its PCIe slots, which is desirable but not unexpected. What *is* neat though is that if you're matching the board with Asus graphics cards, the Thermal Radar 2 tech will allow the board to directly access and control the fans on your graphics card, as well as your case.

# GET MORE SPEED FOR FREE!

## 52 Time-Saving Tips and Tricks

BY ALEX CASTLE

After a while, every PC starts to show its age. Programs that used to be lightning fast suddenly start to go slow. Tasks that used to take five minutes now take 10. Using your computer for anything in fact starts to feel like a chore. In short, a once-lovely machine becomes a liability, dragging your productivity through the dirt and wasting your precious time.

Fortunately, there's always a way to speed up a PC, whether it's a seven-year-old clunker or last year's model that's just starting to slow. Hell, you can even wring some extra performance out of a brand new PC, if you know what to do. In this article, we're going to share a whopping 52 ways to get more horsepower out of any PC, covering hardware, software and operating system tweaks. Best of all, every one of them is completely free. Everyone who's ever said there's no such thing as a free lunch is wrong – you can reclaim lost speed without ever spending a penny. Why not start right now?

COVER & MAIN FEATURE IMAGE: OVERCLOCKERS UK WWW.OVERCLOCKERS.CO.UK

# SORT OUT YOUR SOFTWARE

## Transform your PC into a steroid-stacked sprinter by fine tuning your OS and other software

**Although a computer is a machine, the most common sources of slowdown are anything but mechanical. Instead, it's the operating system and software that cause most of the problems that can turn a new computer into a plodding soul-destroying mess. And it's those same two layers where most of the easiest performance gains are to be found.**

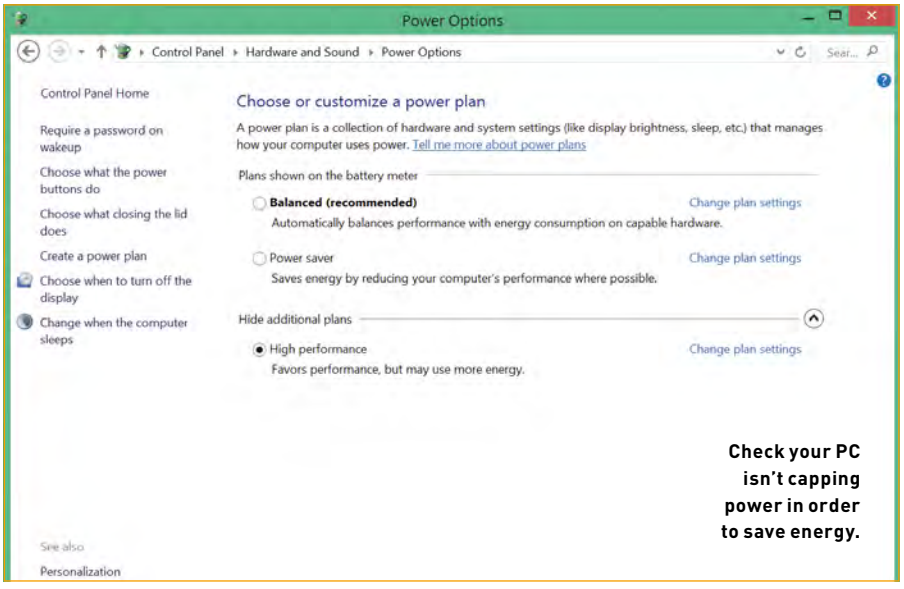
**On the following pages, we're going to look at fixes for common software speedbumps, as well as Windows tweaks that will get your computer running faster than ever before.**

## OS TWEAKS

The operating system you're using is the foundation of your computer, which means that even the fastest software will limp slowly if the operating system it runs on is sluggish and simply not up to the task. Accordingly, the first place you should always look for speed-boosting tweaks is within Windows itself.

### 1 CHANGE THE POWER SETTINGS TO HIGH PERFORMANCE

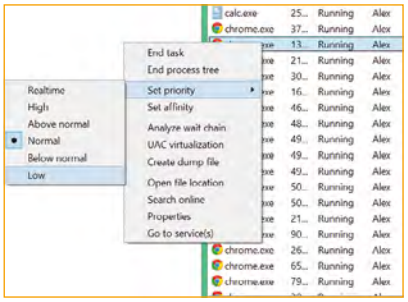
If your computer seems like it's going slower than it should, check the Power Options menu in the Hardware and Sound section of the Control Panel and make sure you have the 'High Performance' setting selected. On a laptop, Windows will sacrifice performance in the name of increased battery life, by putting components like hard drives to sleep faster, or even capping the maximum output of the CPU. For fine-grained control over your PC's power settings, click the 'Change plan settings' link next to the power plan you've selected, then click 'Change advanced settings'.




**Check your PC isn't capping power in order to save energy.**

### 2 TURN OFF AERO

First introduced in Windows Vista, Aero is the name for the set of interface eye candy that includes transparent UI elements and animated window transitions. It makes post-XP Windows look slicker and more modern, but it can have a surprising effect on system performance. In particular, older systems without discrete graphics hardware can get a substantial performance boost by disabling Aero in the Appearance section of the Control Panel. You'll miss out on a bit of graphical flair, but the actual functioning of Windows will be completely unaffected.



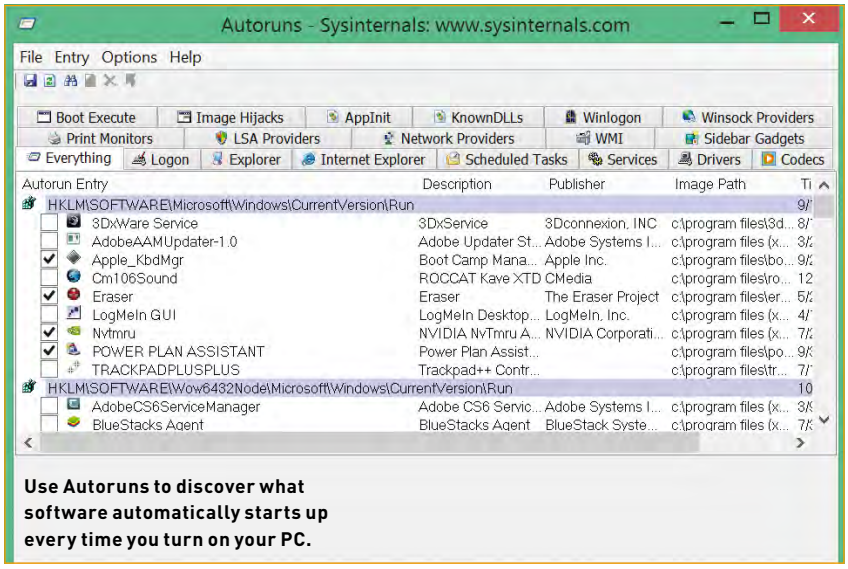

### 3 MANUALLY SET THE PROCESSOR PRIORITY LEVEL

Nothing will bring your computer grinding to a halt faster than a program that's monopolizing your processor. Even if your PC isn't actually locked up, other software you try and use will be miserably laggy. When the resource-hogging program in question is something you actually need to let finish, it can leave you with no good option – you either don't let the program finish, or you give up on doing anything else until it's done. Fortunately, Windows has an easy way to manually set processor priority. Just open the Task Manager, click over to the 'Processes' or 'Details' tab, then right-click on the offending program, and set the priority to 'Low'. Now Windows will know to allocate resources to other programs first, and your original program will still be able to complete without a fuss.

### 4 USE RESOURCE MONITOR TO SPOT THE SLOWCOACHES

Speaking of the Task Manager, you should know there's a more powerful version of that tool built right into Windows 7, 8 and Vista. Just open the Task Manager,

*37* Reboot! It has to be said – a lot of problems will be solved with a system reboot. *38* Restart the router Mysterious problems taskbar app by pressing [WIN] + the number key corresponding to that program's position on the taskbar. *40* Switch to OpenDNS

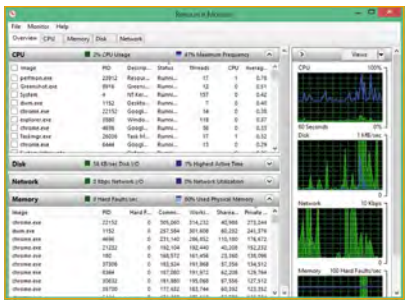



**Use Autoruns to discover what software automatically starts up every time you turn on your PC.**

then click on the 'Performance' tab. Towards the bottom of that menu, you'll see a button to open the Resource Monitor. The Resource Monitor is an exceptional tool for finding the programs that are slowing down your PC, with very detailed usage charts for CPU, memory, hard disk space and even network bandwidth that they're taking up.

### 5 CLEAN UP YOUR STARTUP FOLDER

A major sign of a computer in need of maintenance is a slow boot time. If your computer takes forever to get started, it generally means you've got a lot of software starting up whenever your operating system starts, that's bad for a number of reasons. First, it means Windows has to get more done before it finishes booting. Also, all that software running in the background drains system resources and causes an overall slowdown. One of the best things you can do to speed up your PC is to use a free program such as Autoruns (http://bit.ly/MIIdLk) to examine what's starting up with your PC. Chances are you'll find a lot of stuff on the list that shouldn't be there. Have a thorough look through it and disable anything you really don't need.



**Resource Monitor will hunt down the programs making your PC run slower.**

## OTHER SOFTWARE TWEAKS

Software can be part of the problem or part of the solution. Some programs are well-intentioned, but make your whole system slower, while others are actively malicious. On the other hand, the right software can help you reclaim lost speed and keep you safe. In this section we'll look at both.

### 6 CLEAR UP WASTED SPACE WITH CCLEANER

It never pays to be a software hoarder. As with the startup folder items described in the previous tip, excess installed software eats up your hard drive space and jams up your Start Menu, context menus and more. You can try and uninstall unnecessary programs by hand, but it's a lot easier with the aid of an uninstaller app such as CCleaner, which presents a list of your installed applications, and lets you perform one-click uninstalls. Visit www.piriform.com/ccleaner to download it.

### 7 DO A MALWARE SCAN

If your computer has experienced a sudden and dramatic slowdown, the most likely culprit is malware. Even if you're sure you never installed anything untoward, it's a good idea to periodically run a malware scan. You can't go wrong with Malwarebyte Anti-Malware (www.malwarebytes.org).

### 8 DROP THE COMMERCIAL ANTIVIRUS

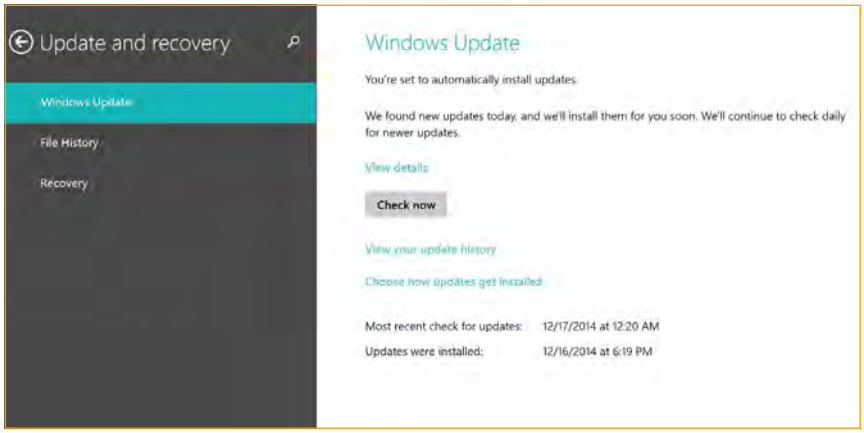
These days, commercial antivirus is likely to cause as many problems as it fixes. If you keep Windows current, then the included Windows Defender antivirus will be enough to protect your computer from common attacks. Practice basic web safety (don't open email attachments from people you don't know, etc.) and you'll stay safe without any security bloatware.

### 9 MAKE SURE WINDOWS IS ALWAYS UP TO DATE

As described previously, you have to keep Windows current in order for Defender to do its job. Automatic updates might be a pain when they happen, but you'll save time in the long run if you keep your computer secure. You can find Windows update settings in the System and Security tab of the Control Panel.

### 10 UPDATE YOUR VIDEO DRIVER

Most drivers are handled automatically these days, but you should still regularly check your video driver is up to date, especially if you plan to do any gaming. The video driver is performance-critical, and can be the source of a lot of in-game glitches. Additionally, updates are frequently published that increase speed in newly-released games, so check back often and you might be pleasantly surprised.

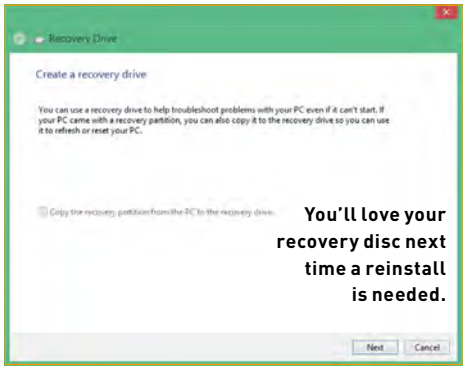



**Keeping Windows updated helps Defender do its antivirus job.**

plaguing your internet connection? A simple router/modem reboot can help. *39* Launch taskbar apps with a hotkey Launch any
If your ISP's DNS server is slow, web pages will take a long time to load. Switch to OpenDNS at www.opendns.com. *41* Move files

# MORE SOFTWARE TWEAKS

## From Linux to LibreOffice, don't be scared to try the alternatives




**You'll love your recovery disc next time a reinstall is needed.**

## REINSTALL WINDOWS

Most of the issues that slow your computer down can be fixed with a little TLC. As we've been discussing, malware can be cleaned up, application clutter can be pruned and so forth. Still, sometimes a computer can become so completely, utterly hosed that no amount of maintenance can fix it. The only way to un-hose such a machine is to start fresh with a new Windows installation. If you've reached that point with your computer, here's a few things to keep in mind as you reinstall Windows.

### 11 RECLAIM YOUR PRODUCT KEYS

It's frustrating to reinstall your OS only to realise you've forgotten a CD key and can't reinstall important software. A program such as Enchanted Key Finder (sourceforge.net/projects/ekeyfinder/) can automatically find most or all of the active CD keys on your system. Especially for industry-level applications like Photoshop, you should manually deactivate your software before uninstalling, in order to save yourself time later on.

### 12 MAKE A RECOVERY DISC

Make your life easier next time you have to reinstall by creating a recovery disc of your newly-clean PC. In Windows 8, you access the recovery media utility by opening the Start screen, typing "recovery" and selecting the option labelled "Create a recovery drive". The recovery drive will allow you to restore your computer to exactly this lovely fresh state without having to do a full reinstall.

### 13 BACK UP YOUR FILES

This goes without saying, and is something you should be doing anyway. Make sure you've got all your important files backed up to an external drive or the cloud. Even if your files are on a separate partition from your Windows install, it's better to be safe than sorry.

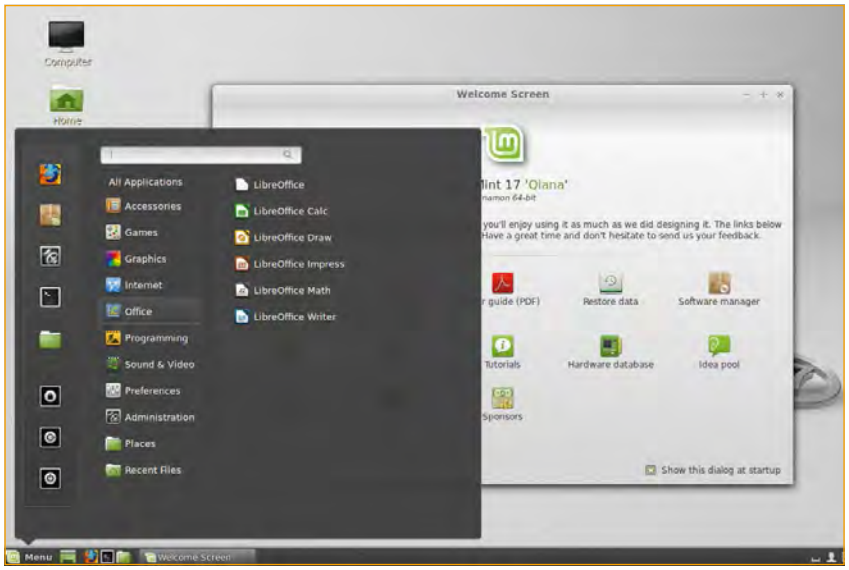
## TRY A DIFFERENT OS

Though we're generally big fans of Windows, we'd be remiss if we didn't mention that reinstalling Windows isn't the only way to get a clean start.

### 14 MINTY FRESH

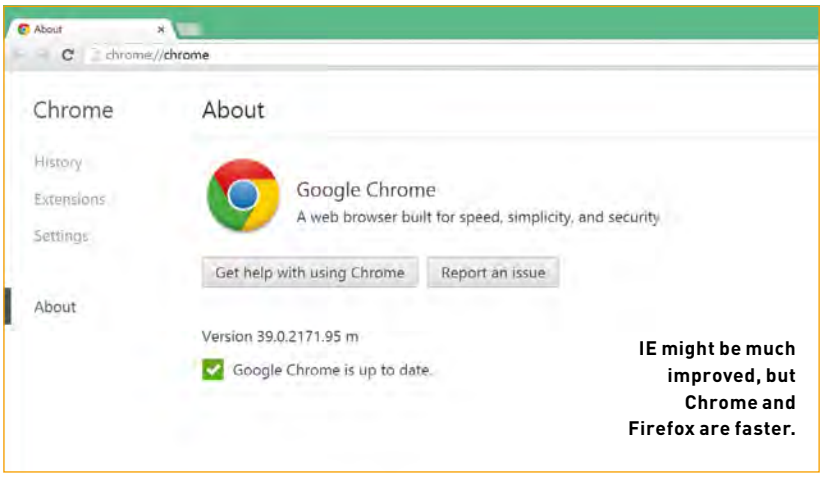
You could also try a shiny new installation of a free alternative OS from the Linux family. Linux OSes are lighter-weight than Windows, and generally have much easier system requirements. You can install one as a secondary OS, and only boot to it when you want a more minimal desktop experience. If you've never tried Linux before, it might seem daunting, but it's actually not that tricky with today's user-friendly Linux distros. In fact, the hardest part might be picking which distro (a specific Linux-based operating system) to install. For years, the standard recommendation for newbies has been Ubuntu, which is polished, well-supported and very user friendly. It's still a great option, but lately we've taken to recommending Linux Mint (www.linuxmint.com) instead.

Linux Mint is based on Ubuntu, and offers the same professional-quality experience and easy installation. Where it differs is in the user interface – the UI in Mint is a little more minimalist and will be more familiar to those coming from Microsoft OSes. There will obviously still be a learning curve, but you can generally get set up with a fully functional Linux desktop in an afternoon.




**Alternative operating systems such as Linux Mint are less demanding on your system.**

quick with Send To Right-click a file and expand the Send To options to immediately move it to a number of commonly-accessed prompt anywhere In File Explorer, hold [Shift] and right-click in a folder. You'll see an option to open a new command prompt in




**IE might be much improved, but Chrome and Firefox are faster.**

## TRY A FEW DIFFERENT APPS

Sometimes the best way to get a quick performance boost is to replace an often-used piece of software with a speedier alternative. That can mean giving up some functionality, but more often than not that's a tradeoff worth making. Here are five common apps you might replace:

### 15 INTERNET EXPLORER

It used to be the case that the best advice you could give someone regarding their web browser was to drop Internet Explorer as fast as humanly possible. Fortunately, IE isn't the absolute stinker it used to be, and IE 11 is actually very competitive in some benchmarks, such as JavaScript performance, where it blows away the competition.

Still, for most common browsing, you're going to see a speed increase if you switch from IE to Chrome or Firefox. Chrome is arguably the fastest of the bunch overall, but it's also noticeably more system resource intensive than Firefox, so if you're trying to speed up an old PC, the latter might be a better choice.

### 16 MICROSOFT WORD

Microsoft Word is the industry standard for text editing, but its expansive feature set comes at a hefty price to your system's resources. Ask yourself if you really need everything that Word has to offer, and if you wouldn't be better off using an alternative.

If you need a full-featured word processor with a smaller footprint, you can try Writer, part of the LibreOffice suite of free Office replacement applications. It offers nearly all the features of Word, with a much lighter set of system requirements. If you want to do some very light writing or note taking, consider the WordPad app that comes installed with Windows – it's low on features, but very fast.

### 17 PHOTOSHOP

Adobe's Photoshop is another widely-used app that can put a major strain on your system resources. If you're using an older system that's not up to running Photoshop CC (or if you just want to save a lot of cash), check out GIMP (www.gimp.org). It's an open-source image editor that can do almost everything Photoshop can. The interface is a little clunky and has a steepish learning curve, but GIMP will run much better on old PCs than newer versions of Photoshop.

### 18 ADOBE READER

Not to spend too much time harping on about Adobe, but the basic PDF Reader is one of the slowest, most frustrating pieces of software on your computer. You wouldn't think something as simple as displaying a multimedia document (which your browser does in fractions of a second) would be slow and require a bulky install—and it doesn't have to.

To reclaim lost speed, install the alternative, a free version of Foxit reader (www.foxitsoftware.com/downloads). It has a nice interface, takes up very little disk space, and runs faster than Adobe Reader.

### 19 REPLACE WINDOWS MEDIA PLAYER WITH VLC

Speed is only one of the many reasons to replace the default Windows Media Player with a different application, such as VLC (www.videolan.org). Though VLC is quicker to start playback on media files, the real time savings come from the app's flexibility. Watching a video in other players can be a stop-and-go experience involving tracking down codecs or differently-formatted media files. With VLC, you know most any file will just work, and it'll work fast.

## EVEN MORE SOFTWARE TWEAKS

### 20 HAND-TUNE GRAPHICS SETTINGS IN GAMES

If you're experiencing slowdown in games, make sure you're taking advantage of customisation options available in the preferences menu. Lowering resolution is the obvious way to get better performance, but make sure you're looking at other options as well – turning down anti-aliasing or shadow quality can make a huge difference.

### 21 CUSTOMISE YOUR GRAPHICS SETTINGS AUTOMATICALLY

Try out GeForce Experience (for NVIDIA GPUs) or AMD Gaming Evolved, both of which automatically tweak game settings. They profile your hardware, then consult a constantly refined database of hardware data to suggest optimum settings, without any trial and error.

### 22 LEARN TO LOVE JUMPLISTS

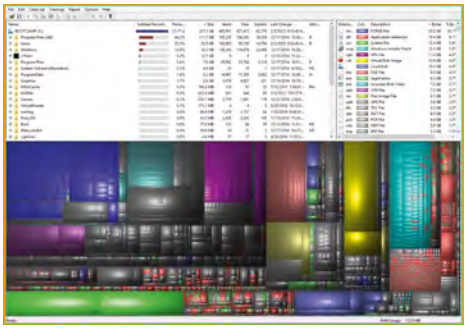
Introduced in Windows 7, jumplists are a fast way to access recent or frequently used documents or features of programs. Instead of left-clicking on an icon to open it, right-click on it instead – you'll see a context-sensitive list of shortcuts or documents for that program.

### 23 FREE UP DISK SPACE

Freeing up hard drive space won't always make your computer faster, but it can make a big difference if your drives are almost at capacity. If you're having a hard time figuring out what to delete, use a free drive visualiser such as WinDirStat (windirstat.info) to pinpoint greedy programs and docs.

### 24 CLEAR UP UNNECESSARY BROWSER EXTENSIONS

It's great how extendable modern browsers are, but it's easy to slow down your web browsing by installing too



**If you're unsure what to delete from your hard drive, WinDirStat will help.**

folders. 42 Minimise everything in a hurry Press [WIN] + [M] to minimise every open window at once. 43 Open a command this location. 44 Switch to full screen and back If you like to switch in and out of full-screen view in your web browser, use [F11]

many add-ons and extensions. Go into the settings for your browser, and make sure you actually use any active extensions. If you have a toolbar that you can't figure out how to uninstall, try CCleaner, described on page 55.

### 25 INSTALL AN AD-BLOCKER

Not every extension slows down your browser. A good ad blocker (like AdBlock or AdBlock Plus) will speed up your browsing a lot, by preventing web ads from loading. Just search for "AdBlock", plus the name of your preferred browser – it's free and installs in seconds.

### 26 SPEED UP YOUR FILE SELECTION WITH SELECT-INVERSE

If you've ever found yourself trying to select all but a few files in a large list, you know it can be an exercise in tedium and frustration. Rather than wearing your left-click button out, try this neat trick: Just hold [Control] and select the files you *don't* want, then click on 'Invert Selection' in the options menu.

### 27 INSTALL EVERYTHING FOR FASTER SEARCHES

Windows search has gotten a lot faster over the years, but it can still be slow, particularly if you're searching for a file outside the User folder. For near-instant searching through every file on your PC, download the free program Everything from www.voidtools.com.

### 28 LAUNCH ANOTHER INSTANCE FAST WITH SHIFT-CLICK

There's a fast way to open up a second window or document in a program that supports multiple simultaneous instances (like your web browser, or Microsoft Word). Instead of manually creating a new doc, just hold down the [Shift] key and click on the taskbar icon for the program. Clicking the middle mouse button will do the same thing.

### 29 SET UP YOUR FAVOURITE FOLDERS

A lot of users overlook one of the handiest features in the File Explorer: the favourite locations list in the upper left. If you find yourself frequently navigating to the same file location, save it to the Favourites for easy access. All you have to do is drag the folder to the Favourites area, and it'll be saved forever.

# OVERCLOCKING

## Become an expert in getting the most out of your hardware

**If you've never done it before, overclocking might seem like black magic. The practitioner delves into the shadowy, mysterious world of the BIOS, tweaks some arcane symbols, and when they resurface, the PC is somehow faster.**

**But the truth is, anyone with the right hardware can overclock with just a little patience. Here we'll talk about overclocking every part of your PC, from the CPU to the GPU to the RAM.**

**We should mention that the guides presented in this section are very cursory – there's just not enough space to really get into the details of the overclocking process. That said, we've tried to give you a good idea of the basic process involved. There's a ton of information about overclocking available online, and we encourage you to search for info pertaining to your specific hardware before jumping in.**

**If you follow these procedures you're very unlikely to damage your hardware, but a component-specific guide can reduce the guesswork required.**

## CPU

Before we get into the process, we should point out that only certain CPUs can be overclocked, so you should do a search to see if you have an 'unlocked' processor. The basic rule for recent Intel processors is that CPUs with model numbers ending in the letter "K" are unlocked.

### 30 PROCESSOR OC'ING

For space purposes this guide will only discuss Intel CPUs, but the basic process is the same for AMD chips. You'll also need a motherboard with overclocking capabilities. The Intel mobos with model numbers starting with "Z" are overclocking-ready, but for other brands you'll have to search to find out if yours can overclock. Finally, for all but the smallest overclocks, you will almost certainly want an aftermarket CPU cooler.

### STEP 1 GET READY

There are several apps you need while you overclock your CPU. First, you'll need CPU-Z (http://bit.ly/QhR6xF), an application which allows you to view detailed information about your CPU from within Windows. The actual overclocking will be done in the BIOS, but CPU-Z will let you make sure your settings are properly applied during testing. You'll also need RealTemp (http://bit.ly/JBWaJA), which shows you your CPU temperature, and Prime95 (http://bit.ly/1kVNJZh), to stress-test the CPU.

Once you've installed the necessary software, reboot and press whatever keys are required to get into your motherboard's BIOS. If you don't know those keys and it doesn't say during the boot sequence, you'll have to do a web search.

### STEP 2 ADJUST THE MULTIPLIER

Once in the BIOS, you'll need to find the settings menu for adjusting CPU performance. This will probably be easier if you search for documentation about your particular motherboard, but you can also just look for the menu that features options like "baseclock", "core voltage" and "CPU Ratio". That last option is what we want to increase. Increasing the CPU Ratio by one (from 34 to 35, for instance), increases the final clock speed of the CPU by 0.1GHz (from 3.4GHz to 3.5GHz). To successfully overclock the CPU, we'll increase this multiplier by one, save, and reboot the OS.

### STEP 3 TEST AND ADJUST VOLTAGES

Now that we've performed a small overclock, we need to make sure everything's still working. In Windows, launch CPU-Z and check the ratio (also called a "multiplier") is what you set it to. Next, load up RealTemp and then run Prime95, while watching your core temperature. If your CPU temperature rises above 80°C, then your overclock is unstable and may degrade your CPU

to do it quick. *45* Open the Run menu fast The Run dialog option lets you open almost anything. Get there fast with [WIN] + [R]. Send Windows to the sides of the screen To quickly snap windows to either side of the screen in Windows 7 and 8, hold [WIN]

## GPU

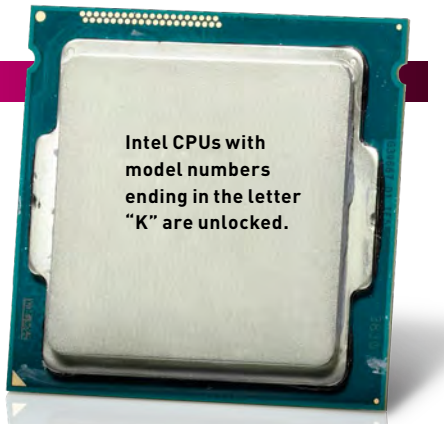
For a gaming PC, your GPU performance may well be more important than your processor's. Most modern games are GPU-bound, so eking a little more performance out of your GPU will have a more dramatic effect on your gaming experience than a similar improvement in the CPU.

Overclocking your graphics card will have the biggest effect on gaming.

### 31 MORE GRAPHICS GRUNT

Fortunately, basic GPU overclocking has become incredibly simple in recent years, thanks to very user-friendly overclocking tools that do most of the heavy lifting for you.

If you have an NVIDIA card, grab EVGA PrecisionX from www.evga.com/precision/ (note it doesn't have to be an EVGA card), or if your card is AMD you can actually overclock it directly from the Catalyst Control Centre.



Intel CPUs with model numbers ending in the letter "K" are unlocked.

### STEP 1 BENCHMARK

Before you begin, you'll need to download a suitable benchmark, which serves two purposes. First, it will allow you to quantify your computer's graphics performance, so you can tell how much of a difference your overclocking actually makes. Second, running the benchmark acts as a stress-test on your graphics card, so that as you tweak your overclock settings you'll quickly see if you've pushed things too far.

Visit unigine.com/products/heaven/ to download Heaven, the current standard for graphics benchmarks. Set a baseline by running through it once at full-screen resolution. Record your results.

### STEP 2 MEMORY

In your overclocking software, you'll see sliders for power limit, memory clock and core clock. We'd adjust all of these, starting with the power limit. Simply set it as high as it will go.

Next, we'll overclock your graphics card's RAM. All you have to do is run the Heaven benchmark in a window, and gradually start increasing the memory clock setting until you see glitches or visual artefacts in the benchmark. Increase the memory clock in increments of 5-10MHz. If you go too high too fast you might crash the system (though it will be fine after a reset).

### STEP 3 GPU

After you've found the sweet spot for your memory clock, set it back to default and move on to the core clock. Again, up the clockspeed in small increments, until the Heaven benchmark shows the strain. These visual artefacts can take a number of forms, including coloured blobs, full-screen flashes or stray pixels. When they start to appear, dial the GPU clock back until the benchmark is once again stable. Also keep an eye on the temperature of your graphics card. Even if no visual artefacts appear, you'll want to keep the average GPU temperature below 80°C, or you'll wear it out faster.

### STEP 4 MAKE SURE IT'S STABLE

Once you've found the ideal overclock for both the video memory and the GPU, you're ready to activate both at the same time and run the benchmark in full screen again. There's a chance that with both active you'll see new artefacts or your PC will crash. If that happens, just tweak both overclocks down by a small amount and try again.

Even if your benchmark is stable for now, there's a chance it will overheat during longer sessions. We recommend you run the Heaven benchmark for 15-20 minutes to make sure that this isn't the case.

– you'll have to boot back into the BIOS and return the multiplier to its previous setting. On the first test, this shouldn't be the case. Alternatively, Prime95 might throw up an error, or your computer might crash. If that happens, your voltage is too low.

### STEP 4 ADJUST VOLTAGES AND REPEAT

Whatever happens, restart your PC and boot back into the BIOS. If you had no issues whatsoever, just increase the multiplier by one more and go back to Step 3. If you experienced a glitch or a crash, you need to increase the CPU voltage, so increment that value by .05. It's a good idea to do a search for the maximum safe voltage for your particular CPU. Return to Step 3 and repeat the process, increasing the multiplier when possible and voltage as needed, until your temperature gets too high or you approach the maximum safe voltage.

## MEMORY OVERCLOCKING

### Is it worth it?

**It's possible to overclock your memory if you have the right hardware, but it's much less commonly done than CPU or GPU overclocking. So, should you overclock your RAM? In our opinion, no.**

**The reason we don't recommend overclocking RAM is a simple cost-benefit analysis. The cost, like with any overclock, is in stability. Especially with an aggressive overclock, you run the risk of wearing your part out prematurely, or of making it unstable and causing system crashes. The GPU can recover from a glitch without crashing the whole system, but not your RAM. Also, because RAM overclocking isn't quite as common, there are fewer resources available to help you.**

**On the flip side, the benefits to overclocking your RAM just aren't very substantial. Overclocked RAM has faster throughput, but memory throughput is almost never a bottleneck, and will have a negligible effect on gaming performance. The risks of overclocking memory aren't huge, but there's just not much reason to do it.**

*46* Open the Users folder from Run With the Run dialog open, enter two full-stops then press [Enter] to open your Users folder. *47* and press the left or right arrow keys. *48* Lock in a hurry Throw up the windows lock screen immediately by pressing [WIN]

# MORE HARDWARE TWEAKS

## Five more ways to get your PC back to its speedy best

### 32 DEFRAG HDDS

One of the oldest computer tricks in the book, defragging your hard drive isn't quite the performance booster it used to be. For one, more and more computers now come with SSDs, which do not benefit from defragging. Also, Windows 7 and 8 defragment on an automatic schedule, so it's unlikely your drives are fragmented if you use one of those systems. On older versions of Windows, fragmentation can still slow your hard drives down, so it's worth running a disk defragmentation program, such as the built in Windows Dfrg.msc or the free Defraggler (www.piriform.com/defraggler).


**TRIM helps SSDs stay fast, even once they start filling up.**

### 33 KEEP IT TRIM

SSDs don't need to be defragged, but there is one optimisation that can make a big difference, called TRIM support. TRIM prevents an SSD from slowing down as it gets filled with data, and increases its expected life span.


**You can speed up your USB drive, as long as you remember to safely remove it.**

The good (or bad) news is that Windows 7 and 8 automatically enable TRIM for SSDs, so you won't be able to get a speed boost there. However, if you're running Windows XP or Vista, it's definitely worth enabling it. To do this, you'll have to use the third-party management software available from the manufacturer of your SSD.

### 34 CLEAN OUT FANS

Not every problem that slows your PC is a high-tech one. Old-fashioned dirt and dust can build up, blocking fans and vents. It may seem trivial, but a jammed vent can cause your PC to overheat and chug. Airflow obstructions are especially likely in homes with hairy pets. In the worst cases, high heat will cause your components to degrade faster. Get in there with a can of compressed air and make sure nothing's blocking your vents, fans or the fins of your CPU cooler.

### 35 ADJUST USB STORAGE FOR BETTER PERFORMANCE

If you have an external USB drive you frequently transfer data to or from, you can get a small speed boost by disabling write caching on the drive. The drawback is that write caching protects USB drives from data loss if they're removed in the midst of a transfer. If you're willing to make sure to press the 'safely remove drive' button every time, you can improve performance by opening the Device Manager, navigating to the drive, then right-clicking it and opening the Properties menu. In the Policies tab, click 'Better Performance'.

### 36 RUN A SMART TEST

Hard drive failure is one of the most alarming things. Even with a back-up strategy (which you have, right?) the temporary loss of your data is a major inconvenience. Save yourself some time down the line by running a SMART test on your hard drive – a process that will help you identify soon-to-fail drives. Just download a free SMART diagnostic tool like CrystalDiskCheck (http://bit.ly/TKZ1VK), and run it to test your drive. If the drive fails any of the tests, it's time to get a new one.

## ALL IS LOST When to admit defeat

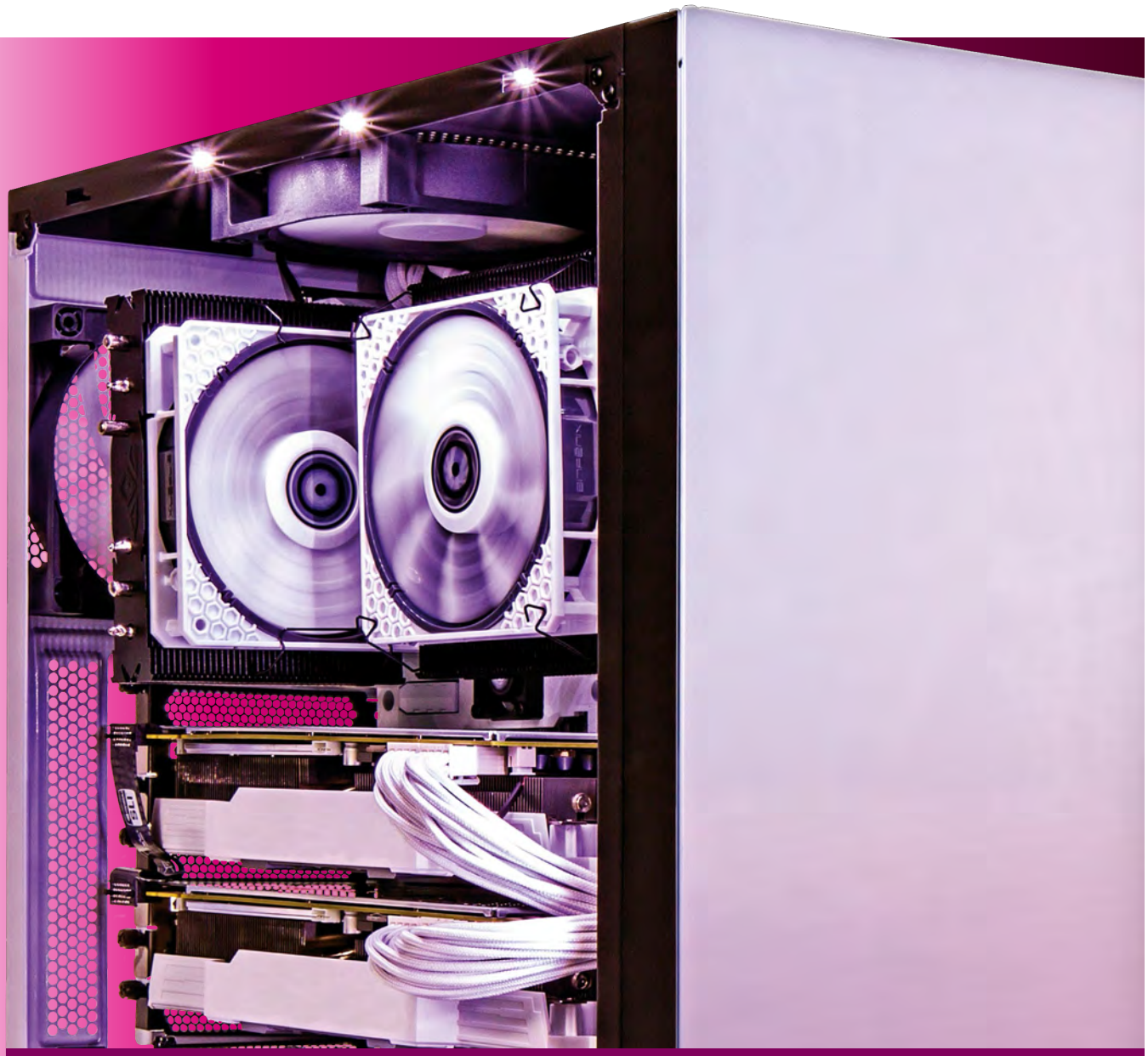
So far in this article, we've taken the generally optimistic stance that every computer can be sped up with nothing more than a little bit of elbow grease. And while it's true that it's very hard to mess up your PC so badly you can't fix it, it's not impossible. It's easier still to get into a situation where repairing the damage is going to be more work than just starting fresh, and knowing when this is the case will save you a lot of time. Here are our standards for when to throw in the towel.

A bad virus infection: A lot of malware can be easily removed using a tool such as Malwarebyte Anti-Malware, but sometimes an infection is just too bad to fix. Don't worry, you'll know it when you run into a PC like this – the Malware scanner will have a red flag list that's hundreds of items long, and includes viruses and other more malicious software. You don't want to risk clearing out most of the malware while probably leaving only the most sophisticated and dastardly to carry on running in secret.

When upgrading to a new version of Windows: When you're ready to move on to the latest, greatest version of Windows, it's worth doing a clean install. Microsoft gives you the option to do an "in-place" install, keeping your files intact, but in our experience it's not worth it. Follow proper backup procedures and start over with a nice, clean Windows installation. You won't have to worry about any complications from the in-place upgrade, and it will give you an opportunity to re-evaluate which programs you really need installed.

A Windows XP computer: We know, some of you still love Windows XP very much, but it's simply time to upgrade to a more modern OS. It's not worth trying to speed up a Windows XP PC, because even if you get it to like-new condition, you'll still have a computer that's not secure.

+ [L]. *49* Cycle with the keyboard You can cycle through options in any menu by pressing the [Tab] key to cycle forward, and key, then start typing. *51* Recover lost tabs Didn't mean to close a browser tab? Press [Ctrl] + [Shift] + [T] to get the most recently



# THE FINAL WORD

## Stay lean, get mean and keep it clean

If you've made it through all the tips in this article, you've probably noticed that none of the steps individually are that big or difficult. Instead, what it really comes down to is cultivating a set of habits that keep your PC organised and efficient. To try and contextualise it a little more, here's a big picture look at how to keep your PC running as fast as it can.

On the hardware level, basic maintenance is all you really need. There are a few tweaks to be made, but as long as you keep your system physically clean and occasionally run a test to check the integrity of your hard drives, you'll be fine. You can get a significant speed boost by overclocking your hardware, but only if it's a good component to begin with.

There are lots of ways to improve your system at the OS and software level, but they basically boil down to a few central principles. For one, try and keep things lean. The more software you install, the more things start up with your PC. The fuller your hard drives are, the slower your computer's going to run. Don't stress about every little thing you install, but if you can delete a few programs every now and then your computer will be better off. Similarly, consider replacing some of your more heavy-duty programs with lightweight ones, if you don't need all the features of the former.

Finally, you have to acknowledge that sometimes the best thing you can do is to just start fresh. We described when you should reinstall, the best way to do it, and even how you can start again with a whole new operating system. Hopefully your computer isn't at that stage yet, and you'll be able to put some of the tips from the last 10 pages to good use. ■

[Shift] + [Tab] to go back. *50* Search Windows 8 immediately The fastest way to search in Windows 8 is to press the [Windows] closed tab back. *52* Quick zoom Zoom on webpages or documents by holding the [Control] key and scrolling the mouse wheel.

Future

# lifehacker | UK

## Helping you live better & work smarter


# LIFEHACKER UK IS THE EXPERT GUIDE FOR ANYONE LOOKING TO GET THINGS DONE

- Thousands of tips to improve your home & workplace
- Get more from your smartphone, tablet & computer
- Be more efficient and increase your productivity

## www.lifehacker.co.uk

twitter.com/lifehackeruk facebook.com/lifehackeruk

# GAMING

BECAUSE GAMING IS A WAY OF LIFE

# What Are You Playing At?

One man's love for a xenomorph...

## "Creative Assembly and Sega *are* discussing the 'possibility' of a sequel."

**OKAY, WE'RE GOING** to just come out and say it: *Alien: Isolation* is, without a shadow of a doubt, our favourite game of 2014. The careful handling of an oft-abused licence; the palpable distillation of stealth and horror into one, potent experience; the way it tears you away from decades of reliance on firepower and aggression, forcing you to realise you can't beat this killing machine, but maybe – just *maybe* – you can outsmart it and live long enough to escape the Sevastopol. *Alien: Isolation* is, in a word, nigh-on exquisite.

So, beyond the ever-so-slightly forgettable day one DLC, where does Creative Assembly go next with its re-energised xenomorph? If at all? Thankfully, Creative Assembly and Sega *are* discussing the 'possibility' of a sequel, but it's very much at a hypothetical 'having a chat round the water cooler' stage. In an interview with AvPGalaxy, lead game designer Gary Napper admitted the idea of a new instalment has been bouncing around the Horsham-based studio, but was quick to stress it was unlikely to move into the more action-packed genre that made *Aliens: Colonial Marines* such a vapid experience. "I think the action-oriented 'Aliens' style game is very different from what *Isolation* is," says Napper. "If we made a sequel I'd like to stick to the same terrifying single alien approach but do more with the environment and interactivity within it."

At the risk of this column turning into the *Alien: Isolation* infatuation brigade, Creative Assembly also released a new update last month that added two new difficulty settings. Novice makes the xeno dumber, makes hiding spots safer and ups the number of crafting parts available. Nightmare, on the other hand, throws it the other way, totally breaking your motion tracker. More like dreamy, we say...

*Counter-Strike: Global Offensive*, meanwhile, finally received the updates the community had been crying out for. We still love a Bomb Disposal or 10 on the glorious Overpass, but that flippin' CZ-75 auto pistol was beginning to get stuck in our craw. Overpowered and imbalanced, Valve has now nerfed its deadliness. The popular 'nospread' hack, which gave naughty players impossible accuracy, was also coded out. Aww, we can hear those cheaty tears splashing onto keyboards as we write. –DOM RESEIGH-LINCOLN

WHY 2015 IS THE YEAR OF eSPORTS PAGE 64

## HIGHLIGHTS...

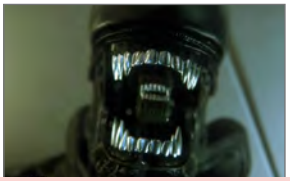
**70**
Elite: Dangerous


**72**
The Crew

**74**
Metal Gear Solid V: Ground Zeroes

## RECOMMENDED...

**CIVILIZATION: BEYOND EARTH** 2K
**PCF299 p62** Its foundation is familiar, but this is a game that's full of surprises and is difficult to master.



**ALIEN: ISOLATION**
Creative Assembly
**PCF298 p64** The game the *Alien* series has always deserved. A deep, fun stealth game set in an evocatively realised sci-fi world.

**WILDSTAR**
NCSoft
**PCF294 p64** Clever questing and a stand-out combat system make for an entertaining MMO that is as large as it is full of character.

**SMITE**
Hi-Rez Studios
**PCF293 p66** An addictive game makes the lane-pushing genre more approachable with smart tweaks to the old formula.

# Competitive gaming has broken out of bedrooms and into arenas – and 2015 will be its biggest year yet

BY HENRY WINCHESTER

Picture the world some 20 years from now: no flying cars, no space travel, no robots. And no people living in abandoned Moscow Metro stations. The one thing that's changed is that eSports has become massive. The first dedicated eSports stadium, the AMDNvidia Arena, opened in 2025. Built in the middle of the Pacific Ocean, exactly halfway between South Korea and North America, it's the single biggest stadium on the planet, so large it has its own airport, currency and nationality, and it's guarded by fearsome genetically modified sharks.

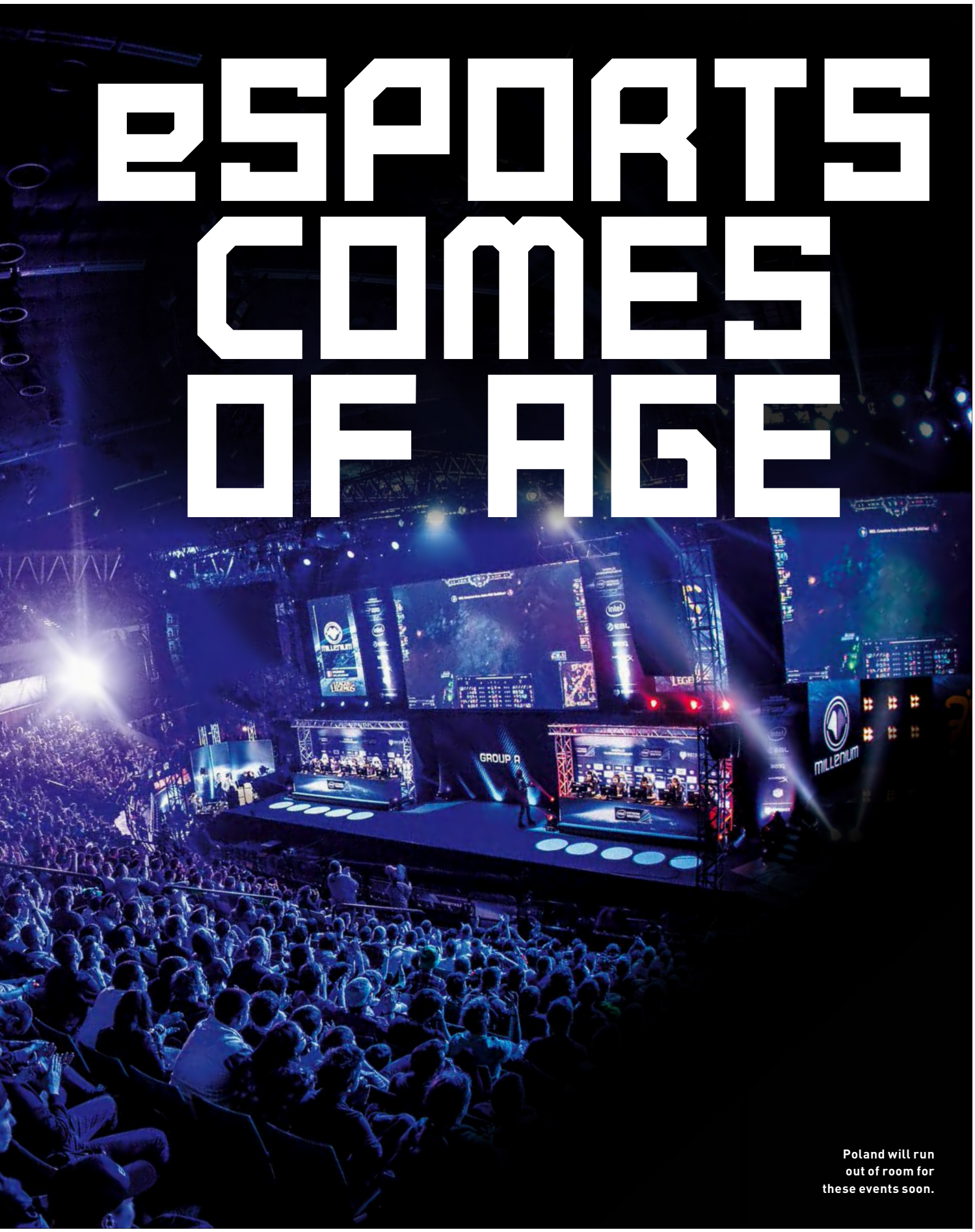
The eSports phenomenon has eclipsed all other sports. VR bars fill with punters wearing the latest generation of Oculus Facebook Rift headsets, which squirt neat alcohol into attendees' eyeballs so they don't miss a single click. Giant screens on Times Square and Piccadilly Circus broadcast the latest *League of Dota* and *Counter-StarCraft* games to the baying masses. The surface of the Moon is appropriated to advertise the R.A.T. 94, the first mouse with a dedicated zero-gravity setting.

The seeds of this future have already been sown. Esports is as old as gaming itself, but recent elements – Twitch, free-to-play games and massive investments – have come together to make it more popular than ever before. If 2013 saw large rises in terms of audience and participation, then last year it grew beyond anyone's wildest dreams. But as a genre and format it's still on the brink of accessibility by mainstream audiences – something which will change in 2015.

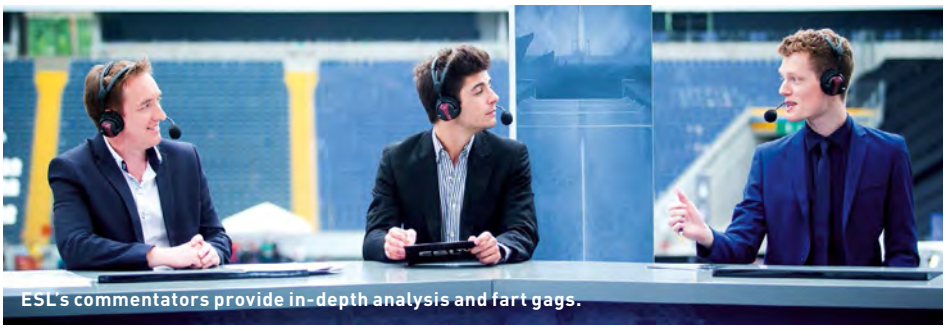
Here we look at how we've got this far, what the scene is like, and the challenges it still faces. Everyone we've spoken to is hugely enthusiastic about the future – almost to the extent that we can begin laying the foundations of the stadium-island. We won't bother with the genetically modified sharks... that would just be silly.

PHOTOGRAPHS: H. KRISTIANSSON

# ESPORTS COMES OF AGE




Poland will run out of room for these events soon.



ESL's commentators provide in-depth analysis and fart gags.

**Nestled in the 7th December 1972 issue of *Rolling Stone*, between features on Carlos Santana and the Hippie Mafia, is a piece on Stanford University's Spacewar competition. This proto-gaming event had, in fact, already gathered the elements that would shape eSports. It had mainstream coverage. There was a prize: a subscription to the magazine. But, most importantly, there was a group of young people who wanted to prove that they were the best at a certain game, that they could become the university athletes who could think their way to victory.**

From this early exposure the idea of gaming tournaments grew at the same rate as games themselves. A *Space Invaders* Championship held by Atari in 1980 attracted 10,000 participants across the United States. The US National Video Game Team was established in 1983. Players, games and tournaments were featured in the mainstream media: TV gameshow *Starcade* was broadcast; *Life* and *Time* magazines published features on these strange new gatherings of gamers; and the movie *The Wizard* had children in a *Super Mario Bros. 3* tournament.

These events were a wonderful thing for all the companies involved. People would turn out in their droves to see the Nintendo or Atari competition, to grab the freebies, to watch the champions reign supreme – and, of course, to buy the consoles so they could join and potentially beat these local heroes. If there was a problem, it was that gamers could only practise head-to-head against one another, and being able to beat a handful of friends was an entirely different proposition to being able to take on the gaming champs of a whole city, who at the time had ripped gloves and mohicans, just in case you didn't know that they were total badasses.

**ABOVE: The crowd goes wild in New York.**

**RIGHT: If you can't compete, you can always cosplay. This also applies to job interviews.**

Fortunately in the late '80s someone invented the internet and made everything better. *Netrek*, which is still played to this day, was the third game ever released to be played online, and the first with team battles. In 1993 *Doom* brought LAN and modem-based multiplayer battles, coining the term 'deathmatch' and introducing online gaming to a larger audience. The multiplayer element of *Doom* proved to be so incredibly successful that almost every shooter that followed felt the need to incorporate some form of online competition.

Gaming tournaments throughout the '90s tended to be dominated by beat-'em-ups, which neatly balanced players' skill with visceral, gratifying action which could be easily

## IN IT TO WIN IT

### Want to make money just by playing games? You'll need to know which to play

Last year a massive amount of prize money was divvied up among the world's most talented gamers. Sure, they're a long way from the many millions professional sportspeople are paid, but there's still enough for a sizeable number of gamers to make a living just from playing games. Play these titles well enough and you might become quite well-off... or you might bag a T-shirt and some RAM.

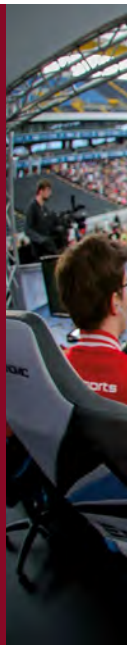
At over $10 million, Valve's arena strategy title *Dota 2* has by far the biggest prize fund available in any game. This kitty is funded in a unique way: every time someone buys a $10 virtual copy of *Dota 2*'s guidebook *The Compendium*, $2.50 of that cash goes into the pot. The first $1.6 million came from Valve itself, but the rest has been generated by somewhere around 3.3 million sales of the booklet.

*Dota 2*'s bigger prize fund doesn't mean you have a better chance of claiming your stake, though. To date it's had 665 players gaming across 278 tournaments. *League of Legends* has a prize fund of 'just' $2 million, but with 2,411 players across 1,110 tournaments it's a far less exclusive affair than Valve's genre stablemate.

The game's developer, Riot, has no plans to increase the fund, instead reinvesting money in the title's infrastructure so it remains attractive to free-to-play gamers. It's a smart move. After all, will *Dota 2* fans really want to keep buying *The Compendium* forever?

Lower down the rankings sit a fairly random assortment of games, with *StarCraft II* and its expansion *Brood War* rubbing shoulders with 2002's *WarCraft III*, 2004's *Painkiller* and 1999's *Counter-Strike*.

In terms of earnings, 14 of the top 20 in the world have amassed their riches from *Dota 2*, and nine of those players are Chinese. So, go *Dota 2* if you're generally quite lucky in gaming terms, and opt for a few quick bouts of *League of Legends* if you're generally not.



understood by any audience. But the internet was giving bedroom gamers a chance to hone their skills on fast-paced first person shooters and complex real time strategy games in a way that wasn't possible before. One minute they could be playing their friend down the street, the next they could be up against Australia's national champion.

Tournaments soon sprang up, and by the early 2000s they were seeping off the internet and into the real world. Ever ahead of the game, South Korea hosted the first gaming tournament as we know it today. The World Cyber Games, in 2000, included players from 17 countries fighting to the bitter end in games as varied as *Starcraft: Brood War*, *Quake III Arena*, *FIFA 2000* and *Age of Empires II*. The US's Major League Gaming followed in 2002, while the Germany-based Electronic Sports League's first Intel Extreme Masters tournament took place in 2006.

While these events have expanded considerably over the past decade or so, there's been a piece of the puzzle missing until recently. Esports leagues typically broadcast via their own platforms or media channels, resulting in fragmentation for fans of the various events. Twitch, founded in 2011 as a spin-off of livestreaming site Justin TV, has provided a go-to platform for gamers to watch live games. It's proved that gamers are every bit as interested in watching matches as they are in playing them.

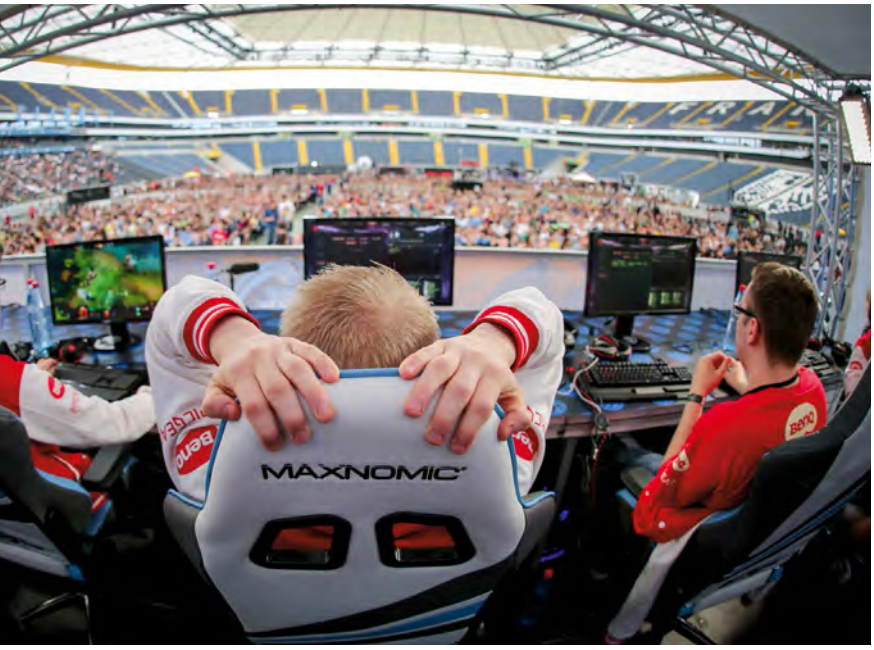
With Twitch in place, eSports has become a fundamental part of popular culture. Indeed 2013 was epic, with 44 million hours of ESL's games watched via Twitch, and $2.5 million total prize money handed out. But 2014 has pushed the boat out even further, with the first gamers becoming bona fide millionaires just through doing something they love. And in 2015 the interactive sports snowball will become so incredibly massive that you could film a remake of *The Empire Strikes Back* on it.

## LEAGUES AHEAD

"It's really insane," says James Lampkin, the Electronic Sports League's Canadian-born senior manager. "We've run events in Poland a few years in a row – the first year there were probably five or six thousand people there, the year after it's closer to 10, and last year there were 14,000 people. It's funny because now when we run an event that has 5,000 people everyone goes, 'Oh, y'know, it's only 5,000 people.'"

According to Lampkin, the factors behind the explosive growth are the enormous success of Twitch TV combined with the straightforward accessibility of free-to-play games. The latter have blossomed recently, going from dodgily implemented MMOs to fast-paced MOBA games – such as *League of Legends* and *Dota* – and polished genre efforts such as *World of Tanks* and *Hearthstone: Heroes of WarCraft*.

Free-to-play works really well in eSports because it's all about subtly increasing the challenge for players – you can either work your way around a barrier, or pay to get to the top. But almost all of these games




## COMMENTARY IS FREE

ESL commentator Alex Richardson talks about the vital link between in-game action and the audience

**What's your background, and how did you get into commentating for games?**
I've been commentating on games since I was 17, so for about four years. I came across SHOUTcasting via 'QuadV' where Deman, Joe, Redeye and TosspoT were casting *Call of Duty 4*, the first game I took a competitive interest in. I enjoyed listening but also said to myself, "Hey, I can do that!" I started doing so for fun, and a series of small opportunities led to my growth as a commentator, which eventually ended with me working for ESL.

**How do you keep a track of what's going on in all the various games?**
In shooters I tend to just focus on what an individual is doing and what their actions can influence, be it opening a bomb site or closing out the first map, perhaps coupled with a wider overview. In MOBAs I'm keeping track of 10 players at any given time. It's a bit of an adjustment and I'm still learning – thankfully from some of the best.

**What do you think are the most important qualities a commentator should have?**
A 'good' voice is definitely part of it, but most important is the ability to combine what you're saying – which has to be factually correct and interesting – with good inflection, while not getting ahead of yourself or too caught up in the moment. That's a place where the best commentators are born.

**How do you see the eSports scene changing in 2015?**
This year is going to be interesting. It will have been about enough time for game publishers and eSports organisers to recognise the success eSports games are enjoying and perhaps try and mirror them or follow their tournament design structure. I think eSports is starting to hit the mainstream, which is awesome, and I can only see that increasing as time goes on. People love games and people love competition – combined with the team-support aspect, we're in for a winner!

have their roots in more traditional, even single-player, models.

"The most important things in an eSports title are watchability and how good the game actually is – that's the core fundamentals," says Lampkin. "Before you can have a good eSport you have to have a really good game. What we see with the most successful titles is that they're really easy to get into, and really hard to become exceptionally good at. The skills ceiling is really high."

The biggest games for the ESL are currently *League of Legends*, *Counter-Strike* and *Dota 2*, but the popularity of games often rotates on a yearly basis. "In 2010, *StarCraft II* was by far the biggest game, even into 2011," says Lampkin. "Once *League of Legends* picked up popularity, *StarCraft* viewership stabilised and flattened out, whereas *League of Legends* just went on this massive growth curve. *Counter-Strike* and *Dota* have been following that same trend, because they're free to play and very accessible."

The biggest curveball eSports has been thrown recently has been *Hearthstone*, *World of WarCraft* developer Blizzard's card-based venture into free-to-play gaming. "It's really interesting because it's a card game, which is not traditional in the eSports arena – it's not a shooter," says Lampkin. "But the viewership on that is actually really high, and there's a very low barrier to entry, which is easier to get into."


**ABOVE: Ninjas in Pyjamas scoop a prize in Cologne.**

**RIGHT: ESL One's *Dota 2* competition hits New York.**

## WE NEED HEROES

Just like more conventional sports, eSports are all about icons and heroes. Jang Min Chul may be pretty much unknown outside the world of South Korean eSports, but within the *StarCraft II* leagues he's every bit as worshipped as David Beckham or LeBron James. It's a desire to emulate champions such as Jang that leads to the exponential growth of eSports audiences.

"We look at this in the same way you'd look at football," says Lampkin. "Everybody understands the idea is to kick the ball into the net, but when you see a Premier League player do an insane goal from halfway across the pitch you have this ability to form a relationship between your play and how good this person is."

As the eSports audience grows it becomes more interesting, too. Gaming is predominantly aimed at the 18 to 34 male demographic, which has high levels of disposable income, but at the same time is

# THE MAP AND THE TERRITORY

## How World of Tanks upped its game for eSports

Esports requires a completely different approach to games which have come before. First launched as a free-to-play MMO in 2011, Wargaming's *World of Tanks* debuted on the eSports scene at the World Cyber Games in 2012. Since then it's been rebuilt to move it further away from its origins and towards something more frenetic and suited to the fast-paced world of eSports.

Update 9.4, introduced in November of last year, brought with it Attack/Defence mode, which is specifically tailored to tournaments. While the original game featured 10-minute matches, Attack/Defence brings the time down to seven minutes, with those missing three minutes adding a palpable air of tension. As the name suggests, one team attacks while the other defends, rather than the free-for-alls that defined earlier games.

As well as rebalancing the team structures in terms of combined tank tiers, Attack/Defence also required Wargaming to rethink its maps. In a standard battle, Himmelsdorf, for instance, included two bases to the north and south. For Attack/Defence mode this is completely rebalanced, with the defending team given a spawn point to the northwest, and two bases to defend to the north and west. The attacking team, meanwhile, is positioned to the southeast. It's a similar asymmetrical layout to multiplayer online battle arena games such as *League of Legends* and *Dota 2*, and one which creates natural pinch points and prevents players from camping out.

Closing the loop is a complete redesign of the spectator interface, to make the game more watchable. Gone are the unreadable stat bars and dull layout, replaced with big numbers and at-a-glance tables. The result is a game that's more accessible, more cinematic and pounding, but one which retains its inherent tankiness.


**TOP: *World of Tanks* was redesigned to make it more spectator-friendly. BOTTOM: The old interface was deemed not at-a-glance enough.**

traditionally very fickle when it comes to marketing. In the past, gaming competitions would have been daubed with banners for OCZ or Creative or SteelSeries – brands largely unknown outside the pages of magazines like ours. The massive increase in audience has brought lucrative sponsorship opportunities.

"The interesting part for us is that, as the scene is exploding so much, we're starting to get a lot of attention in the non-endemic world, so you're seeing lifestyle brands like Red Bull and Gillette," says Lampkin. "Pizza Hut and T-Mobile sponsored one of our events in the US in October. We're beginning to see the whole world open up – these really big brands that say, 'How do we get in touch with this young group of males who are very hard to reach traditionally, and are moving away from television?'"

With such incredible audience growth and acceptance by mainstream brands, the inevitable question is exactly when will we be able to go to a sports bar on a Saturday afternoon and catch the big *League of Legends* or *Counter-Strike* match alongside viewers who would traditionally enjoy football. However, Lampkin believes that this is the wrong audience to pursue – and it's not for want of trying.

"A big question maybe four or five years ago was, how do we package it and twist it a bit so that the mainstream audience can enjoy it?" says Lampkin. "What we figured out at the time was that it was the wrong way to look at the problem. It was more about how we grow the scene rather than how we go after a group of people who just may not have been interested in it in the first place. It's more about how we get people who are in the gaming sphere who may just be casual gamers. We think there's a really large audience who aren't actively engaged yet, and that's the next step of growth for us."

Nevertheless, mainstream media is gradually becoming more interested in covering eSports, with *The Guardian* and the BBC both carrying headlines on events in the last year. "A few years ago we'd talk to the odd press outlet in the mainstream press, where the questions would be, 'What is this? We don't really understand it and we're not sure if we want to understand it,'" says Lampkin. "Now there are a lot of mainstream outlets coming to us and saying, 'This is a phenomenon, we don't get it, please explain it to us because we want to be involved.'"

## FUTURE SHOCK

Everything is in place to make 2015 the biggest year for eSports yet. Sponsorship deals will likely explode the budget eSports events have, mainstream press coverage will increase its acceptance as a worthy alternative to established sports, and there will be enough variety in the games to ensure there's something for everyone. The biggest game of 2015? *Counter-Strike*, says Lampkin.

**ABOVE: Intel Extreme Masters returns to Katowice in 2015 for its biggest tournament yet.**

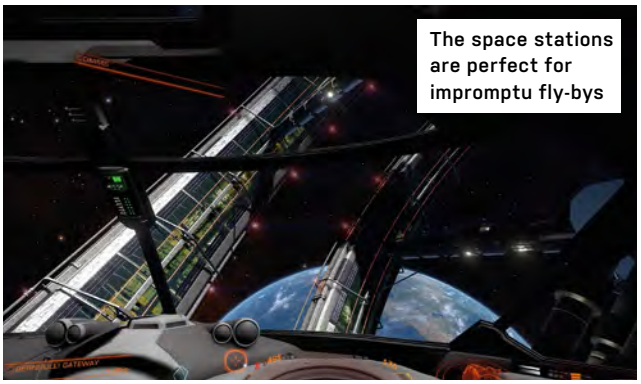
"Each event that *Counter-Strike* has seen over the past year and a half has been these one-off events, where you have a bunch of the big popular teams – and every three or four months they have these events, and the viewership just grows and grows and grows," he says. "When it first came out, a lot of people were really sceptical about whether it'll do well, and it sort of stalled a little bit at the start, but due to the work Valve has put into the game it's started picking up momentum, which is very rare for a game release."

As for the events themselves, Lampkin and the ESL have grand plans. In March they'll return to Katowice in Poland for the World Masters portion of Intel Extreme Masters, for the first time using two venues side by side. The long-term vision for ESL isn't just about packing lots of people into a sea-stadium – it's about doing it frequently.

"The real question going forward for us isn't 'Can you put people into a stadium?', because I think we've answered that," says Lampkin. "It's how often can you put people into a stadium. We're doing it five or six weekends per year, but the real growth for us is how you do it over and over again in all these different regions. Mainstream sport is doing it 25, maybe 30 weekends per year." ■


You don't have to kill in *Elite: Dangerous*, you can mine, explore and make your fortune from stellar cartography instead.

The space-based dogfights are glorious with a good stick and the almost vital TrackIR.



The space stations are perfect for impromptu fly-bys

# Elite: Dangerous

## Should have sent... a poet

**FROM THE DAYS AND NIGHTS** of my brother and I crowded around a tiny television, hooked up to his Spectrum 128k, trying to figure out how to dock in the first *Elite*, to finally getting *Frontier: Elite II* for Christmas on the Amiga, then bug-fixing my way through *First Encounters* on the PC, this peculiarly British franchise is utterly intertwined in my gaming life.

Thank the maker then that *Elite: Dangerous* isn't a stinker. I would have been utterly heart-broken to find David Braben had just phoned in this long-awaited sequel. But that's exactly what I was expecting when, on the back of an amazing pitch by Chris Roberts for *Star Citizen*, we saw Braben appear with a few sketches, some grand promises and his hand out for a bit of crowd-funded cash.

Having played *Elite: Dangerous* since the first alpha, though, I've been blown away by how polished and how dedicated Frontier Developments has been in creating this expansive space sim. It's robust, involving and continuously evolving. Plus this first release isn't the end; there will be future upgrades and expansions which promise to seriously affect the galaxy and your game.

### FORTUNE AND GLORY, KID

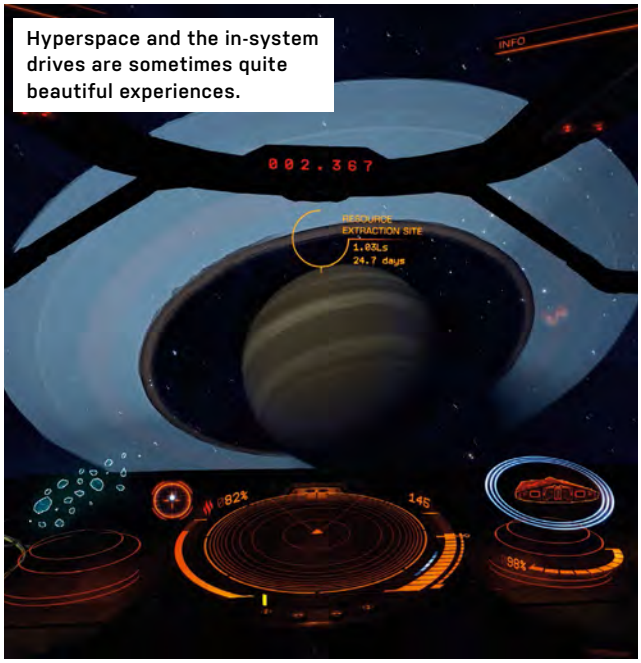
For the uninitiated, *Elite: Dangerous*, together with all its prequels, is a simulation of a life in space. It's an open universe in which you start out with a small ship, a thousand credits and an entire galaxy in which to make your fame and fortune. And there are many ways to make your way in this life – legal or illegal, trading or piracy, civilian or military.

It's not as initially ambitious as space rival, *Star Citizen*. At launch there is no getting out of your ship, there's no walking around space stations, having firefights with boarders or transitioning through a planet's atmosphere to land on its surface. That's all being planned for future updates but means Frontier Developments can concentrate on getting its initial phase as polished as possible. But don't think that makes *Elite: Dangerous* half a game at launch, there's still a huge amount to do.

This openness and the vastness of the galactic map though can be incredibly daunting in the beginning, even for a veteran *Elite* player. The 1:1 scale of the galaxy makes for an almost endless game world, but one that's meticulously modelled, offering the most accurate star map possible right now.

So, where to start? *Elite: Dangerous* is a complex beast and the pre-flight controls checklist you go through on your first flight offers barely a passing glimpse at the intricacies of your ship's controls and capabilities. Thankfully, there's a comprehensive offline tutorial section.


Earth. The birthplace of humanity and the home of the Federation. And its big ships.




Hyperspace and the in-system drives are sometimes quite beautiful experiences.


You can spend hours picking the perfect upgrades.

You begin your life in Federation space, some 40 to 50 light years from the birthplace of humanity, Sol. It's safe space. Mostly. There are the odd pirates and trigger-happy authority figures keen to exact retribution for any infraction of law, but for the most part you can avoid confrontation if all you want is a quiet trader/miner's life.

Frontier Developments knew the game needed at least some focus though and as *ED* has launched, the battle for the Imperial Throne has kicked off. The fight to succeed the dying emperor is the story thread of the game. Travelling to Empire-controlled space should be interesting... This is all told in text form though, in sparse feeds when docked at one of the varied space stations. From the off it all feels very far away and it's difficult to know how it really effects you when you're such a long way from the empire's heart in Achenar.

## TEXT ADVENTURE

The reliance on text as the only form of interaction in the game, outside of comms chatter with the scattered online human players, is one of the few disappointments with the otherwise polished *Elite: Dangerous*. The level of disconnection it engenders is potentially dangerous for players who want a little more direction in their gaming experience.

But *Elite* has always needed investment from the player and a willingness to immerse yourself in the role. This isn't a galaxy in which you are the chosen one, just another person trying to get by in life. It's certainly not the easiest game to get into, but the rewards can be great. Though again these rewards are entirely personal and mostly emotional – the feeling you get from that first big bounty kill, the satisfaction from spending an hour meticulously upgrading your ship, the first flight in a brand new craft or your first trip to Earth.

And these experiences are made all the more intense by the fact that David Braben has created an *Elite* MMO. But don't let that put you off – the galaxy is big enough that you don't need to fear eternal ganking the minute you leave dock. And you can opt to play solo, where you simply need a limited net connection to keep missions and the economy updated. Or you can play with friends in an exclusive group, experiencing the galaxy together with your friends, creating your own stories out in the inky black. The fact that everything is saved on an external server gives a rogue-like quality to *ED*. Every decision can be final and can be fatal. Ship insurance means you won't lose everything if you've left yourself enough emergency cash, but if not, those long journeys and battles can get awful tense.

I won't pretend it's the perfect game – it can get grindy scaring up cash for a new ship or vital upgrade – but your experiences in this brave new frontier will be entirely your own and brilliant. –DAVE JAMES

VERDICT 9

**Elite: Dangerous**

**ELITE:** Huge scope; open universe; striking visuals; great soundscapes; intense space battles; continually evolving.

**MOSTLY HARMLESS:** No hand-holding; little direction; can get grindy; text-only interaction breaks immersion.

**RECOMMENDED SPECS:** 2GHz+ quad-core CPU; 4GB RAM; Radeon HD 7000/GeForce GTX 600 series.

£40, www.elitedangerous.com, PEGI: 7


*The Crew* fails when it comes to one driving game necessity – good handling.

Time to ignore that mini-mission and head for Vegas...

... after assembling your crew, of course.

# The Crew

## A racer that owes more to the vastness of MMOs than the microscopic love-ins of most of its rivals

**SUCCESS AND FAILURE** seem equally absurd for *The Crew*. It's the most detailed and expansive playground a driving game has taken place in for years, and you're free to roam its every highway, dirt track and city block with your friends – sounds like a sure thing, right? Well, it's also an always-online, plot-driven driving game in which you play a street racer posing as an undercover cop pretending to be a street racer. Who, at times, drives through the wilderness to find comms towers which unlock activities on your map, because Ubisoft's nothing if not consistent. Suddenly that sure thing now has a large truck in front of it.

It begins with a narrative-heavy prologue in which the plot points of every *Fast and the Furious* and *Need For Speed* are duly ticked off the great driving game checklist – illegal racing gang, menacing electronic music, FBI involvement, scores to settle – and you're introduced to the salient gameplay systems. It's clear *The Crew* expects you to stick around for the long haul: the last of its five disciplines (street, dirt, performance, raid and circuit) unlocks at level 40.

However it also – mercifully – allows you a lot of freedom once you clear that prologue. Freedom to ignore the story mission pinging in your mini-map and drive from Detroit to New York on a whim, just to see how long it takes. Freedom to invite your friends into an eponymous Crew and just drive, taking in the sights of Florida's beaches as you natter over your headsets.

### THE OPEN ROAD

The world map is by far and away the game's strongest asset, packing enough environmental variation into its scaled-down USA for you to feel the culture shock when you arrive at the gaudy Las Vegas strip after minutes of cruising through serene mountainside scenery. Nobody does a Belgian motorway quite like *Euro Truck Sim 2*, of course, but for those yearning for a bit more drama in their long-haul virtual drives, *The Crew* is absolute wish fulfilment.

Perhaps if it had focused on doing that one thing really well, this would've been a better game. But by trying to also provide a facsimile of *Need For Speed*, *Burnout* and *Far Cry 4* (lest we forget the comms towers) it spreads itself too thinly and exposes the elastic bands powering the whole operation.

It's most pertinent during the many uninspired story missions. Sometimes you're asked to drive from A to B as quickly as possible, just because, while someone dutifully recites narrative exposition to you. Other mission types rely on mechanics that are simply too unrefined to glean enjoyment from – step forward sketchy police evasions and downright perplexing 'takedowns', in which you attempt to ram a wildly rubberbanding enemy.



**ABOVE LEFT** Hit the dirt to get the better of more powerful road cars.

**ABOVE RIGHT** Looks like it's time to introduce the next driving game cliché.

**TOP** There's a huge number of levels across five racing disciplines.

There are glimmers of inspiration among the busywork. One race pits you in a dirt car against a street racer on a route in which off-road paths intersect the road. Follow your opponent on the asphalt and you're hugely outpaced, but seek out the muddy alternate routes and you'll just squeeze the victory. It's unrealistic to expect every race to be so high-concept, not least because there are legions of them. But *The Crew* isn't *Planescape: Torment*, nor was anyone expecting it to be. It didn't need reams of story missions.

No, it needs a better handling model. One that lets you really enjoy the world on offer. It's by no means disastrous, but all the more annoying for always feeling one menu tweak away from 'right'. Any such deadzone/sensitivity alchemy is a fool's errand though. The shifting of weight will always feel slightly too sluggish; suspension always just a shade too spongy. And for a game that actively encourages corner-cutting, its kerbs are worryingly severe – mount the sidewalk as you wrestle for control in a corner exit and the game responds as if you're in a monster truck running over another, smaller, monster truck. Perhaps the streets of Chicago really are rubberised and four feet higher than the road, and we're displaying our ignorance.

## SOCIAL SPEEDER

Brave these not insignificant failings, and you'll still find enduring enjoyment from *The Crew* built on its online play (connection losses and crashes have just about cleared up after a turbulent launch week).

It's a uniquely social racer in which you can invite a few friends and drive aimlessly or take on a story mission together in four-player co-op. There's the faction war to involve yourself in, reppin' for a map region and contributing to its overall standing. And there's the simple, mindlessly compulsive PvP in which the most powerful car always wins and nobody cares because each race showers everyone in XP and money.

It's always easier to look favourably on a game that at least tries to do too much than on a focus-tested bore. Fortunately *The Crew*'s failings fall firmly into the former category, and though they're glaring and at times very frustrating, the potential to carve your own experience out of its rough-and-ready content saves it from mediocrity. Not perfect, but not awful either. –PHIL IWANIUK

VERDICT 7

**The Crew**

**SPEED KING:** Exciting, extensive and detailed racing environment; potential to craft your own unique experiences; freedom to take your own route.

**SLOW COACH:** Dull races; superfluous story lacks originality; poor handling model.

**RECOMMENDED SPECS:** Win8; Intel Core i5-750; 8GB RAM; Nvidia GeForce GTX 580 or AMD Radeon 6870 (1GB).

£50, thecrew-game.ubi.com, PEGI: 12


Snakes alive! Big Boss is back, and he's taking prisoners.

You can interrogate guards to find hidden weapons.

Vehicles are handy for quick escapes if you're spotted.

# Metal Gear Solid V: Ground Zeroes

## An intricate stealth sandbox with extra depth

**AT THE SOUTHERN TIP OF CUBA**, along a wind-battered coastline, lies Camp Omega. Here, prisoners of war are beaten, tortured and brutally interrogated, all in the name of protecting the US of A. Sound familiar? It's no accident this grim place draws close parallels with Guantanamo Bay. Despite its obvious fetishism for the military, the *Metal Gear Solid* series has always been anti-war, and this is writer/director Hideo Kojima's most provocative statement yet.

Prisoners in orange jumpsuits cower as rats scurry around their feet. Spotlights shine from towers through pounding rain, always watching. Armed guards – who seem almost as miserable as the detainees – patrol the base, their raincoats billowing in the howling wind. It's an overwhelmingly bleak, but powerfully evocative setting, and it's the centrepiece of *Ground Zeroes*, a single-level prologue to the forthcoming *Metal Gear Solid V: The Phantom Pain*.

You are Big Boss, a legendary former CIA operative who, after being betrayed by the government, formed his own mercenary army. Two prisoners are being held captive in Camp Omega, and he needs them alive. This is, like previous entries in the series, a stealth game. You'll want to sneak in, extract the prisoners, then escape without alerting anyone. But that's just one of many ways to complete the mission, and it's this freedom that makes *Ground Zeroes* worth spending cash on – despite the fact that, at first, it seems little more than a demo.

You'll see the credits roll and you'll think, is that it? But then you notice you're at 8 per cent completion. Clearing the main mission unlocks four more that alter the camp's layout, patrol patterns, weather and time of day, creating an entirely new set of challenges. In one mission you have to assassinate two war criminals. Another sees you destroying anti-air guns. They might not sound the best, but it's the sheer number of ways to approach each objective that makes *Ground Zeroes* special.

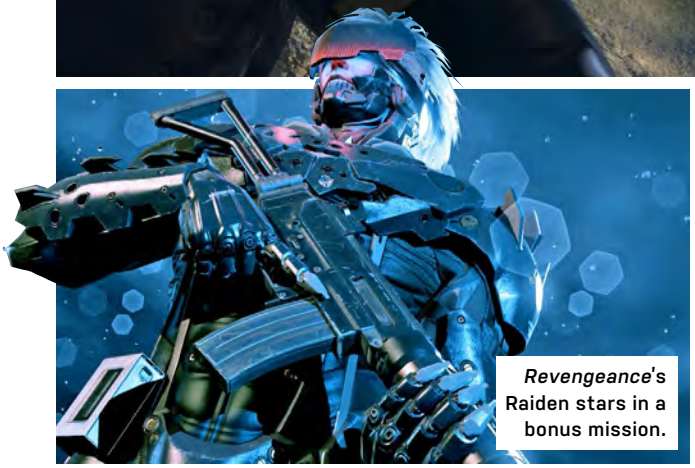
### HIDE AND SEEK

While *Metal Gear Solid* games are typically story-heavy, the focus here is squarely on the stealth. Except for intro and outro cutscenes, all of your time is spent playing. It's a remarkably detailed, interactive world, filled with clever, creative ways to evade, distract or subdue enemies.

The small army of guards feel like people, not drones. They're impressively reactive, and respond to suspicious noises with a mixture of curiosity and trepidation. If the alarm sounds, they'll work together to pin you down. They follow set routines, but sometimes they'll surprise you.

How you reach the prisoners is left entirely to your imagination. A ranking system rates you on how quickly, quietly

Big Boss admires his handiwork at the end of a mission.



*Revengeance*'s Raiden stars in a bonus mission.

Rescue other prisoners for bonus intel.

and efficiently you complete the mission. You can dumbly charge through the majority of the game with your guns blazing, but the fun (and challenge) lies in learning the map and outsmarting the AI to get the best score.

The camp is big, and a testing ground for *The Phantom Pain*'s open-world stealth, which is a first for the *MGS* series. But it's small enough that, after a few hours, you'll have a fairly accurate map of it in your head. It's a brilliantly designed space, and 15 hours in, we're still finding new ways to navigate it. There are vents to crawl through, towers to climb and roaming trucks to hide in the back of. By confining you to this single locale, the game can really push the limits of the stealth and AI. *Ground Zeroes* is, really, a proof of concept for a newer, more modern take on the series' established stealth. It retains that distinct *MGS* feel, but with tighter controls. Anyone who played the old games will recall the pain of wrestling with the clumsy three-step stand/crouch/prone button. This is gone. You can now transition seamlessly into a crawl or crouch from a run or walk. It's the first *Metal Gear* game where movement actually feels intuitive.

The controls are still slightly idiosyncratic in places. You have to play Twister with your fingers to simultaneously hold a guard up and interrogate him, for example. Like all third-person games, you'll benefit from using a pad. It's clearly been designed with a controller in mind, and the analogue stick is used to control the speed of Big Boss's movements. Nudge it slightly and you'll almost tiptoe. You can achieve the same effect by holding the [Control] key, but it feels more intuitive using the stick.

The rain-slicked cliffs that line the camp are a perfect vantage point for scouting. Using zoomable binoculars you can tag enemies, *Far Cry*-style, and a directional microphone lets you listen in on their conversations. It pays to be methodical, as tagged guards will be permanently marked by a HUD icon, even from a great distance.

Inevitably, you're going to be spotted. If a guard catches a glimpse, he'll come searching, and radio his commander. At night they'll shine their torches at any movement. On normal difficulty you can linger in an enemy's line of sight, from a distance, for a good few seconds, but they're much more perceptive on hard.

It's when the enemy gets a long, uninterrupted look at you that they'll enter combat mode, telegraphed by an exclamation mark above their heads and a shrieking *brrring* sound that *MGS* fans will know all too well. This will put the entire base on alert. Your best option is to run and hide. You can fight back, but reinforcements will arrive. Generous checkpointing lets you return to an earlier state if you mess up, but this will affect your final score.

## MEMORY LANE

Sneak up on an enemy and you can interrogate them. They'll reveal the locations of hidden weapons and tag nearby enemies. Stunned foes will eventually wake up and sound the alarm, so it's best to fire a tranq dart at them before you move on. They'll also mark XOF patches on your map, nine of which are hidden around the camp. They're worth finding, because they unlock two very silly bonus missions – Déjà Vu and Jamais Vu – that have been designed with fans in mind. These were previously console exclusives, but on PC we get both.

Déjà Vu sees you recreating key scenes from the first *Metal Gear Solid*, released for the first PlayStation in 1997. It's a shameless parade of callbacks, and anyone who didn't play *MGS* will find it deeply confusing. If you're a fan, the snow and wolves – which recreate the ambience of Shadow Moses, the setting of the original game – will make you all misty-eyed. Then there's Jamais Vu, which sees you playing as Raiden from *Metal Gear Rising: Revengeance*. Body-snatching aliens have disguised themselves as guards, and you have to identify them with your binoculars and kill them.

These missions are just extras, really. A bit of irreverent fun. The meat is in the main mission and side ops, which took us eight hours to complete. You might balk at the idea of paying almost £20 for a single level, but trust us: there's a *lot* in here. With just one location, it's deeper and more varied than some games a publisher would charge £50 for. –ANDY KELLY

VERDICT 9

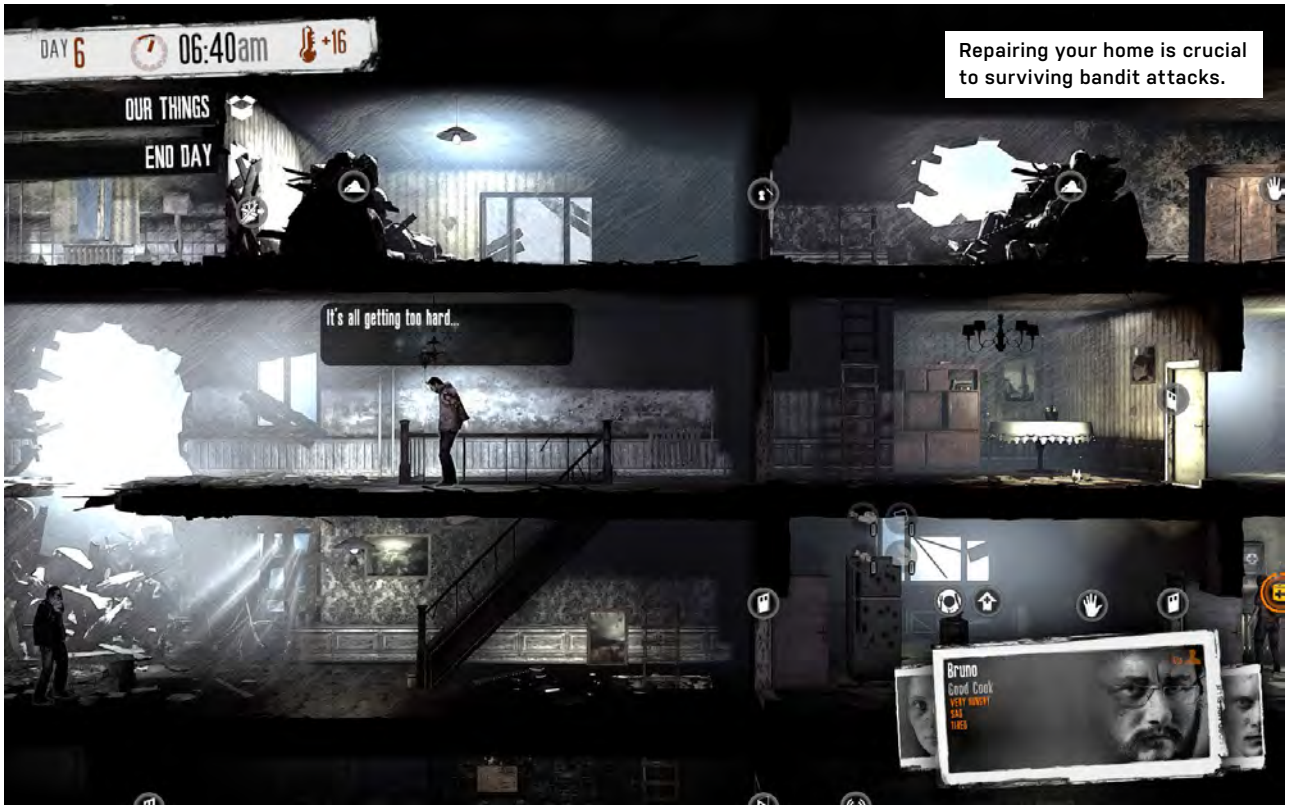
**Metal Gear Solid V: Ground Zeroes**

**SOLID AS A ROCK:** Deep, challenging and enjoyable stealth sandbox; movement has improved.

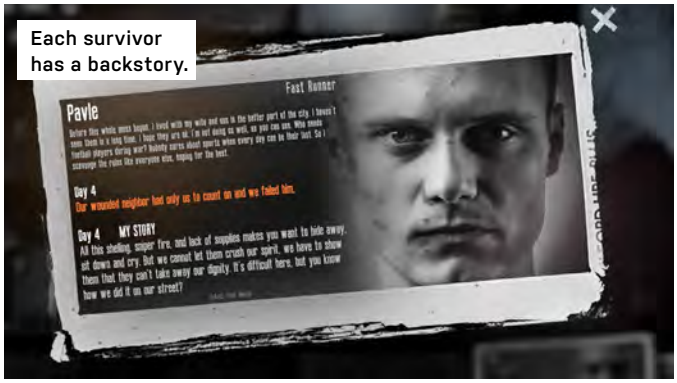
**SOFT AS PUTTY:** Controls can still be quite tricky; bonus missions a bit silly.

**RECOMMENDED SPECS:** GeForce GTX 970; Intel i5-3570K @ 3.4GHz; 16GB RAM.

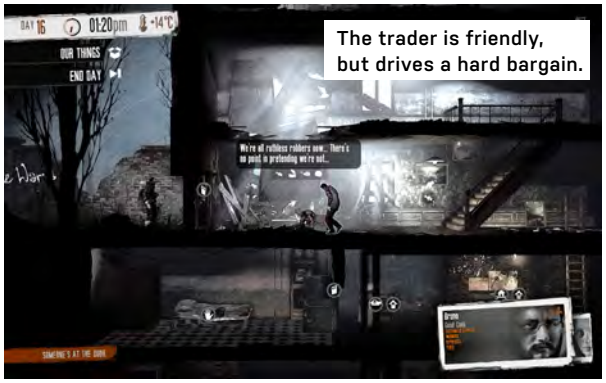
£17, www.metalgearsolid.com, PEGI: 18




Repairing your home is crucial to surviving bandit attacks.




Each survivor has a backstory.




The trader is friendly, but drives a hard bargain.

# This War of Mine

## A delicate statement on the struggles of survival

**WE'RE WATCHING, HELPLESSLY,** the final moments of a woman who has lost the will to live. Katya returned from studying abroad to a country where people scavenge to stay alive. A few days ago Anton, formerly a teacher, died of starvation. Before him Pavel, once a star footballer, was wounded when roving bandits besieged our base. Without bandages he bled out.

Cveta, mother figure of the group, becomes sick so Katya goes in search of medicine. A nearby house has the goods, but it's home to an elderly couple. Brandishing a knife she hobbles to their bathroom as the old man desperately pleads not take his sick wife's medicine. Katya isn't a bad person, she's desperate. But it's too late anyway. Cveta dies. Depressed and starved, Katya crumbles to her knees. We frantically click the tinned food icon hoping she'll eat, but she ignores our commands.

*This War of Mine* explores the harrowing realities of living amid conflict. Its resource management, life-sim and exploration game mechanics are simple, but they elegantly drive home their message: in modern war, you will die like a dog.

Each day plays out in two phases. In the light, snipers confine your characters to a musty building. As in a grim version of *The Sims*, you click to assign your people tasks, such as making food, building stuff, clearing rubble or administering first aid.

Resources are gathered at night when one character scavenges while others stand guard. Locations include abandoned schools, hospitals and churches. Walking is silent but slow, while running comes at the risk of making noise. There's real tension.

### HARSH REALITIES

Defenceless NPCs cower, others barter, still others respond with deadly force. Your characters are fragile, weapons are difficult to come by. You never feel safe. Whether pillaging an abandoned house or risking all in a fortified hotel, there's a feeling it could all go wrong in the blink of an eye.

When desperate children plead for food, turning them away impacts your characters' mental state, making them depressed, even suicidal. It's common to find a character has hung themself.

*This War of Mine* is one the most interesting games of the year, but it's also very difficult to play. Its world always has its boot to your throat, slowly upping the pressure until the life is drained from you. There's no happy ending, and that's the point. –TAMOOR HUSSAIN

**8**

**This War of Mine**

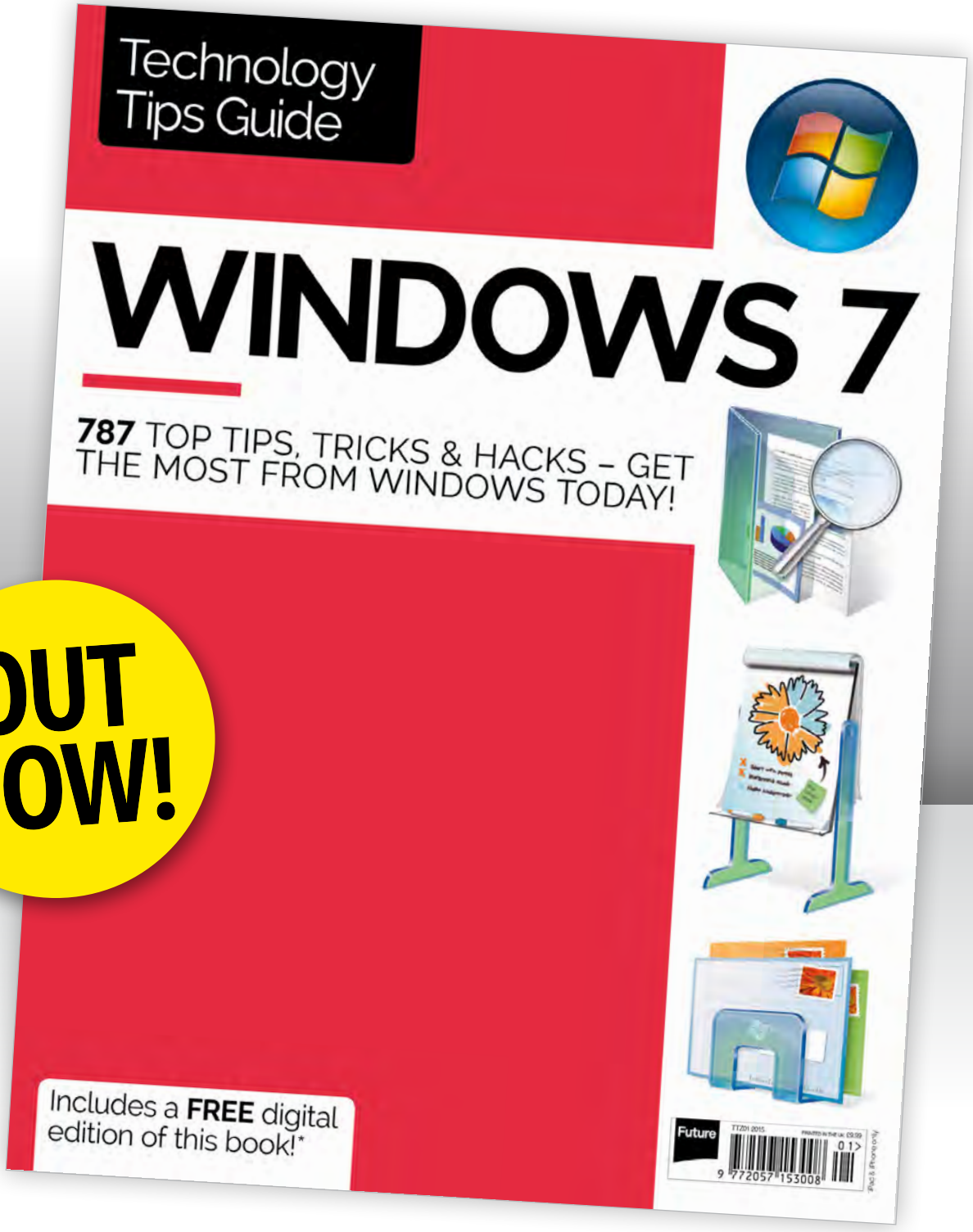
**+ APOCALYPSE NOW:** Hugely atmospheric; great stealth mechanics; intelligent.

**– PEARL HARBOR:** The unrelenting cruelty is a bit of a mood killer.

**RECOMMENDED SPECS:** GTX 650 Ti; Intel Core 2 Quad Q6600 @ 2.4GHz; 8GB DDR2.

£15, http://bit.ly/1ljUgOY, PEGI: 12

# Discover the ultimate guide to Windows 7




OUT NOW!

## DELIVERED DIRECT TO YOUR DOOR

Order online at **www.myfavouritemagazines.co.uk**
or find us in your nearest supermarket, newsagent or bookstore!

# HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

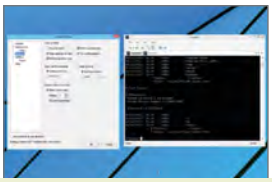
## IT MUST BE TRUE!

### YOU'RE FIRED! 'HADOUKEN' IS REAL. SORT OF

Come on, as if we're going to pass up the chance to cover a gadget that lets you launch fireballs from your hands? Fireballs! From your hands! Okay, it's technically a trick but still, we're that bit closer to a real life 'Hadouken'. Named the Pyro Fireshooter, this wristband uses sheets of highly-flammable flash paper to propel bursts of burning flash cotton from your wrist like a modern day wizard. Aimed at aspiring magicians, the current model (priced at $174) sold out within hours. Best avoid laughing at the next Ryu or Ken cosplayer you see. Chances are they've got a 'Hadouken!' up their sleeves.

## MAKE – USE – CREATE







GRAHAM BARLOW
CONTRIBUTING EDITOR

## GOOGLE GIVES AMAZON APP THE BOOT

It's always quite entertaining watching Amazon and Google come to blows. It's like two bullies from rival schools squaring up amid one of those rumbles that only ever happen in pre-pubescent urban myth. The current dust-up between the two online conglomerates centres around Amazon's app on the Google Play Store. Turns out Google wasn't too pleased when it found out the Amazon application available in its own library was linking directly to Amazon's own bespoke app store.

The app in question has actually been up on the Android marketplace for a considerable time, so why the fuss all of a sudden? Google made a few tweaks to its Developer Distribution Agreement in September – a series of changes that Amazon seemingly ignored (or failed to implement) leading to the app being removed in December.

In a statement to our sister site TechRadar, Amazon was quick to confirm its app had now been updated and reinstated to the Google Play store. "We launched a new Amazon App for Android Phones on September 9 that provides an award-winning mobile shopping experience, enables customers to discover and purchase all of Amazon's digital catalogue," said a spokesperson. "Google subsequently changed their Developer Distribution Agreement on September 25. As a result, we removed the app from Google Play and published the Amazon Shopping app."

↘ submit your How To project ideas to: pcfmail@futurenet.com

BUILD IT

BY TOM MCNAMARA

# The Anatomy of a Powerhouse

So an eight-core Intel CPU, three graphics cards and a new Samsung SSD walk into a bar...

LENGTH OF TIME: **2–4 HOURS** | LEVEL OF DIFFICULTY: **MEDIUM**


## THE MISSION

**OVER THE COURSE OF A YEAR,** hardware comes into the *PC Format* lair in trickles and deluges. We end up stockpiling things we don't have an ideal use for. This month, a convergence of timing and opportunity leads us to this point: something kind of ridiculous, but also very good-looking and beefy. In other words, perfect *PC Format* material. We try to do different kinds of systems for a variety of budgets, but sometimes it's just more entertaining to put pound signs aside and assemble the craziest Voltron we have the parts for.

One piece of gear – the CPU cooler – is so new that we've only just reviewed it this issue, while the Samsung 850 EVO SSD is fresh in the lab. In fact, the drive was still under NDA (non-disclosure agreement) as we were putting this system together. That means we might have gotten in trouble if we'd even publicly confirmed its existence. Now we can pull back the curtains.

## IF YOU BUILD IT, THEY WILL COME

**WE'VE BEEN MEANING** to put the Corsair 760T full-tower case to use for some time. Indeed, we've had it long enough that Corsair has produced the 780T as an evolution of it (it did very well in issue 297's case supertest). This build will make ample use of a full-tower's dimensions, and the 760T has generous options for airflow. We've played around with two GTX 980 graphics cards already, but not three. Powering them is a monster 1,600-watt EVGA power supply, which offers a lot more juice than this system will ever need, even if we were to add a fourth GTX 980 and overclock everything to the hilt. But it seemed a shame for such fine equipment to go unused.

We've built this machine around the eight-core Intel Haswell-E CPU. And this is the first time we've played around with the Cooler Master Nepton 240M CPU cooler and the Samsung 850 EVO SSD. We also have a motherboard from ASRock, which doesn't get a lot of representation at the premium tier. We've also added 32GB of Corsair Dominator DDR4 RAM into the mix. But if this all sounds complicated, it's really more like LEGO parts than rocket science. The most time-consuming element is just giving the system a clean look after putting this much gear inside.

### INGREDIENTS

| PART | | PRICE |
|---|---|---|
| Case | Corsair Graphite Series 760T | £156 |
| PSU | EVGA SuperNOVA 1600 G2 | £230 |
| Mobo | ASRock X99 OC Formula | £270 |
| CPU | Intel Core i7-5960X | £800 |
| GPU | 3x Nvidia GeForce GTX 980 | £1,290 |
| SLI Bridge | EVGA Pro SLI Bridge (3-way/2-way) | £18 |
| RAM | 4x 8GB Corsair Dominator Platinum DDR4 | £575 |
| HDD | 6TB HGST Ultrastar He6 | £485 |
| SSD | 250GB Samsung 850 EVO | £99 |
| Cable Kit | EVGA G2/P2 PSU Cable Set | £57 |
| OS | Windows 8.1 64-bit OEM | £71 |
| Total | | £4,051 |

## 1 YOU CAN ONLY HOPE TO CONTAIN IT

**LIKE THE CORSAIR** Obsidian 750D, the 760T has a magnetised cover on the top of the case. This time, it's hard plastic instead of a mesh. Since we're exhausting air and not pulling it in, the lower airflow isn't a big deal, and this style is a bit cooler-looking. The top of the 760T takes 280mm and 360mm radiators, as well. If you're into serious overclocking, then a CPU the size of the Core i7-5960X would benefit from larger rads.

As its name implies, our Nepton 240M cooler uses a 240mm rad, which is fine for less ambitious octo-core overclocking. However, if you want to install your fans on the underside of the rad, the 760T uses rubber grommets for which the Nepton's mounting screws are too short. You can get a variety of machine screws at your local hardware store.

## 2 BECOMING UNHINGED

**THIS NEXT SHOT** demonstrates a couple of interesting properties. The main one is the 760T's side panel. It's actually a swing-out door with a levered handle, like on the Thermaltake Level 10 GT. When it's rotated this far out, you can lift it off its hinge and set it aside. No screws to deal with.

We've also removed one 3.5-inch drive cage and mounted the other one right below the 5.25 drive bay. We did that mostly just to see what it looks like, but also to help visualise the placement of custom water cooling gear like reservoirs and pumps. Our SSD is secretly mounted behind the drive cage, on the same plane as the motherboard.

## 3 DOWN UNDER

**LOOKING AT THE UNDERSIDE** of the case, we have a set of six screws holding down the two drive cages. Two screws hold down the cage that's closest to the front of the case. It feels secure despite being half as many as we'd like, and you don't need to remove the case's front foot to access the screws holding down the cage. Removing the four-screw cage reveals a 120mm fan mount. This is ideal for intake, but you'll have to keep an eye on dust or add your own filter. To the right of that is the intake for the power supply, which comes with a slide-out filter.

## 4 GETTING IN MY GRILL

**THE FRONT OF THE CASE** has two 140mm fans pre-installed. The blades are made of clear plastic, presumably to let custom lighting shine through better. The case comes with a two-speed fan controller pre-installed, but we chose to skip it when wiring things up, in favour of testing the fan headers on the motherboard. We'd recommend a fan cable extension or two, because the cables on the front fans are not especially long. In contrast to the 750D, the fan grill on the 760T can be removed completely, making for easier access. In both cases, the grill snaps in and out easily. No screws or yanking required. If you remove the other 3.5 drive cage (or mount it over the 120mm fan on the bottom of the case) you could squeeze in a 240mm radiator, if you wanted. The 780T has even more room up front, enough to comfortably accommodate a 280mm radiator.

## 5 BUILDING BRIDGES

**ONE OF THE FUN THINGS** about building with Nvidia cards is their SLI bridges. This fancy job comes courtesy of EVGA, and its design matches that of our cards, which use the "reference" design of the base model. At 18 quid, the bridge is not cheap. But when this machine is powered on, the logo lights up green to match the lighting of the letters on the cards. The top section of the bridge is just barely short enough to wedge in underneath the case's pre-installed 140mm exhaust fan. It's one of the tightest clearances we've dealt with. You can flip it around and get a lot more space, but then the Nvidia logo is upside-down, which irks us. To get the GTX 980s installed this close together, by the way, you need to unscrew a raised plate near the cable connectors on the other end.


## 6 TANGLES AND DANGLES

**WITH THREE GRAPHICS CARDS,** five fans and two storage devices, there's a lot of cabling. We switched to the kit of individually sleeved cables to lend some flexibility, but we'd have liked to have made more adjustments, if we'd had time. The case comes with four 2.5-inch trays, but we removed all but one to make room. Since we didn't wire up the fan controller, we fed its cables back, tucking them into the empty 5.25-inch drive bay. The eight-pin PCI Express cables have two of their six pins on a separate cable, so we snaked the spares up with the fan controller cables. (The reference GTX 980 needs only six-pin cables.) The cable connecting the front USB 2.0 ports to the mobo was just long enough to reach. You can buy extension cables online.


**1 The heat-pipes on the mobo's heatsinks boost the heat the voltage regulators can handle, which helps with overclocks.**

**2 There's enough clearance above the motherboard to fit a 38mm radiator, rather than the standard 25mm kind.**

**3 Like Intel's X79 motherboards, the X99 version has eight RAM slots and can take up to 128GB of DDR4.**

**4 This power supply has so many plugs to choose from that we can connect all of these while leaving enough space to install a fan below.**

# THE THREE MUSKETEERS

**ONE OF THE ADVANTAGES** of working with an X99 system is it supports more than 16 PCIe lanes. The i7-5960X can wrangle a whopping 40 lanes, in fact. For a pair of high-end graphics cards, 16 lanes is enough, but just. With the rise of 4K, extra lanes are welcome. Even the best GPUs need to whip out the buddy system to handle a resolution that high.

With the GeForce GTX 980s, our gaming performance was significantly better than pretty much any machine we've built before. This month's system averaged 110fps in *Tomb Raider*, at 4K, with everything but anti-aliasing enabled. Not bad, not bad at all. *Hitman: Absolution* also recognised all three cards, so we averaged about 100fps there.

The case's dimensions came in handy when wrangling this much hardware. Despite these cards being over 10-inches long, we didn't need to remove any drive cages to fit them in. And despite all that cabling, there's plenty of space behind the motherboard. Sometimes, after you're done hooking up, you need to basically squish the side panel down until you can secure it. Here, we needed only the gentlest of pushes to close it.

The i7-5960X has a base clock of 3GHz, so it isn't easy to hit 5GHz, but because of Haswell-E's higher performance, plus the extra cores, multi-threaded performance is pretty incredible. We got this rig up to 4GHz, which is pretty respectable for a 240mm closed-loop liquid cooler juggling up to 16 CPU threads. When those are all fully engaged, this chip will trounce 12-thread CPUs that reach 5GHz. For pure gaming, an i7-5960X isn't perfect, but highly threaded tasks like video encoding feast on power like this. Ultimately, we'd recommend a custom cooling loop to get the most out of eight cores. You'd probably want a roomier SSD, too. We used the 850 EVO because it's new and interesting. ■

## BENCHMARKS

| | ZERO-POINT | |
|---|---|---|
| Premiere Pro CS6 (sec) | 2,000 | 1,288 |
| Stitch.Efx 2.0 (sec) | 831 | 768 |
| ProShow Producer 5.0 (sec) | 1,446 | 1,504 -4% |
| x264 HD 5.0 (fps) | 21.1 | 33.8 |
| Batman: Arkham City (fps) | 76 | 213 280% |
| 3DMark 11 | 5,847 | 14,354 |

0% 25% 50% 75% 100% 125% 150% 175% 200% 225% 250%

The zero-point machine compared here consists of a 3.2GHz Core i7-3930K and 16GB of Corsair DDR3/1600 on an Asus Sabertooth X79 motherboard. It has a GeForce GTX 690, a Corsair Neutron GTX SSD and 64-bit Windows 7 Professional.

# Create Your Own Gateway Server

## YOU'LL NEED THIS

**ZENTYAL LINUX**
A tailor-made server distro based on Ubuntu Linux. Its community edition is available for free as a 64-bit installable ISO.

**BLANK HARD DISK**
This will be taken over by Zentyal. You can test it inside a Virtual Machine.

**THERE'S NO SHORTAGE OF ENTERPRISE-GRADE OPEN SOURCE APPLICATIONS** for setting up everything from firewalls and web servers to creating virtual private networks. But setting up and configuring gateway servers requires time and effort, which is where Linux distro Zentyal comes into play. Unlike a regular desktop distro, Zentyal is designed as a one-stop server for small/home office users. You can roll it out as a unified threat manager, office server, communication server and more, thanks to the distro bundling some of the best open source server tools, such as the OpenLDAP directory server, Bind DNS server, Jabber IM Server, Zarafa groupware, Asterisk VoIP and DansGuardian for content-control management.

It also has a great collection of custom management tools for setting up, controlling and monitoring the various components. Although configuring these network services does require a certain level of familiarity with networking, Zentyal does its best to ease you through the process. –MAYANK SHARMA

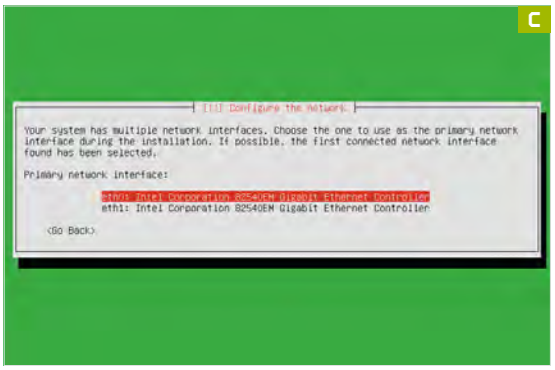
## 1 INSTALL ZENTYAL

A good server distro must be easy to deploy, set up and manage, which is why Zentyal releases are based on the Ubuntu Server Long Term Support (LTS) releases. The current stable release, Zentyal 4.0, is based on Ubuntu Server 14.04 LTS. Thanks to its Ubuntu underpinnings, installing it is simple – it's almost completely automated, as the distro is designed to take over the entire disk. However, you can do an Expert installation to manually partition the disk. You can also install the Zentyal server and its components on top of an existing Ubuntu Server installation.

» Head to www.zentyal.org/server and download the free community edition of Zentyal, burning the ISO image to a disc. Boot from this disc and select the default installation option, unless you're installing on a server with RAID or want to define your own partitioning layout – in which case select Expert mode (**Image A**).

» During installation, you'll only be prompted for basic requirements like your location and keyboard layout. When prompted to select a network card, choose the one connected to the internet, not your internal network. Also enter the login details of the admin user. The installer will transfer the core modules to your hard disk. When it reboots, the system automatically launches a desktop session with a browser to configure the server.





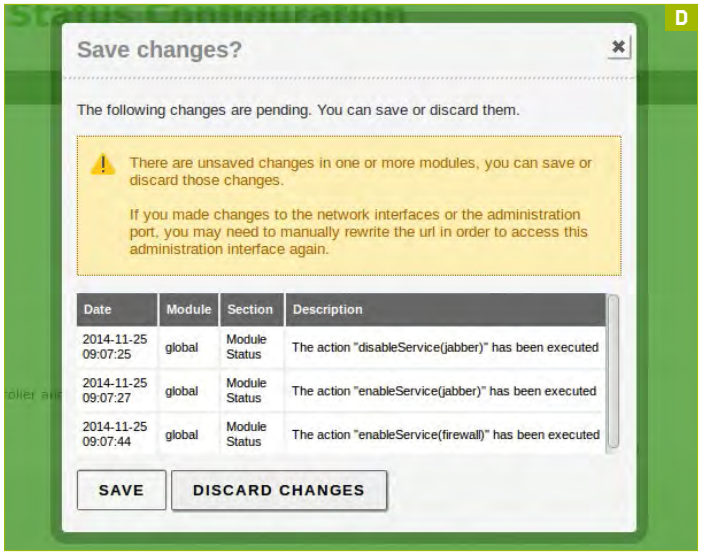

## 2 BOOTS 'N' ALL

When the distro boots for the first time, it will install some core packages by downloading them from the internet, so make sure it's connected. You'll be logged into Zentyal's sparse desktop, which has an open browser window to Zentyal's web-based administration console. Log into the administration section with the admin details you created during installation (**Image B**).

» Zentyal will then fire up a configuration wizard. From here you can install various servers and services such as DHCP Server, Firewall, Domain Controller and Jabber. The server will automatically resolve any dependencies, inform you about the additional components it will install and then fetch them all from the internet. You can skip this step and install them later if you prefer.

» One important part of this initial configuration wizard is the networking step. Typically, a Zentyal server will have multiple network interfaces – one pointing to the internet and the other pointed towards the internal intranet. In this step Zentyal shows you all the available network interfaces on your server and asks you to configure them (**Image C**). You'll first have to mark all available interfaces as either External (connected to the internet) or Internal (connected to the intranet). This will impact several settings, such as the default policies for the firewall, and sets up the default listen interfaces for other modules. Next you'll get the option to configure these interfaces by manually specifying an IP address or asking the server to use DHCP.

» The closing steps in this initial configuration wizard will vary depending on the servers you selected. For example, if you select the Domain Controller and File Sharing server, Zentyal will prompt you to select the type of server as well as the domain name of the server. Similarly, if you've selected the Mail and Groupware server you'll be asked to specify the domain name for your mail account. Again, you can skip configuring these servers for now and set them up later.




## 3 ACCESSING THE DASHBOARD

When you've finished with the initial configuration wizard, Zentyal will take you to the Dashboard. You can administer and monitor the Zentyal installation from this Dashboard. In addition to Zentyal's minimalistic LXDE-based desktop, you can also access this Dashboard remotely from any computer on the same network as the Zentyal server.

» To access it, simply enter the Zentyal server's IP address followed by the port it's running on, so for example https://192.168.2.5:8443. Dashboard can only be accessed through Secure HTTP and runs on port 8443 by default. Also note that since the admin portal is served via the HTTPS protocol, your browser will initially ask you to add a security exception (which you should), as the server lacks a signed certificate.

» From the Dashboard you can watch various server components, such as the CPU load, plus the status of all the installed components. From here you can also install any available updates to the underlying core Zentyal distribution. The navigation bar on the left of the Dashboard will list the various installed modules, as you add them.

## 4 SET UP A JABBER IM SERVER

You'll want to keep communications under your control, so to configure an instant messaging server, make sure you've installed the Jabber component. Head to 'Software Management → Zentyal Components' and click the 'View basic mode' link. Select 'Jabber' under the 'Additional services' page, scroll down and click the 'Install' button. Zentyal will show you a list of additional dependency modules that need to be installed. Click 'Continue' to install them all.

» Next head to Module Status, tick the Jabber box to enable the Jabber module and click the 'Save' button to activate it (**Image D**). To configure the service, go to Jabber in the left-hand menu and set the parameters for the server. Make sure you enter a Jabber domain – you'll then have to pass this on to your users so they can connect to this server (**Image E**). Feel free to enable/disable the other settings on this page. It's advisable to use the 'Allow SSL option' to make sure the chats are encrypted.

» Head to 'Users and Computers → Manage', which displays a list of Groups and Users on the Zentyal server. Click the [+] button to add a new user. You can similarly add Groups and associate users with them. Click a username, scroll down to the Modules configuration section and use the pull-down menu to 'Enable Jabber' for this user. You can also tick the box to give this user admin privileges if you want to.

» That's all there is to it – but before your users can begin chatting with each other they'll need to configure their Jabber client. Head to xmpp.org for a list of supported Jabber clients. The exact configuration steps vary for each client. Make sure you select 'Jabber' or 'XMPP' as the protocol (**Image F**). Then enter your username and password in the appropriate boxes, along with the domain name you specified when you were installing Zentyal.

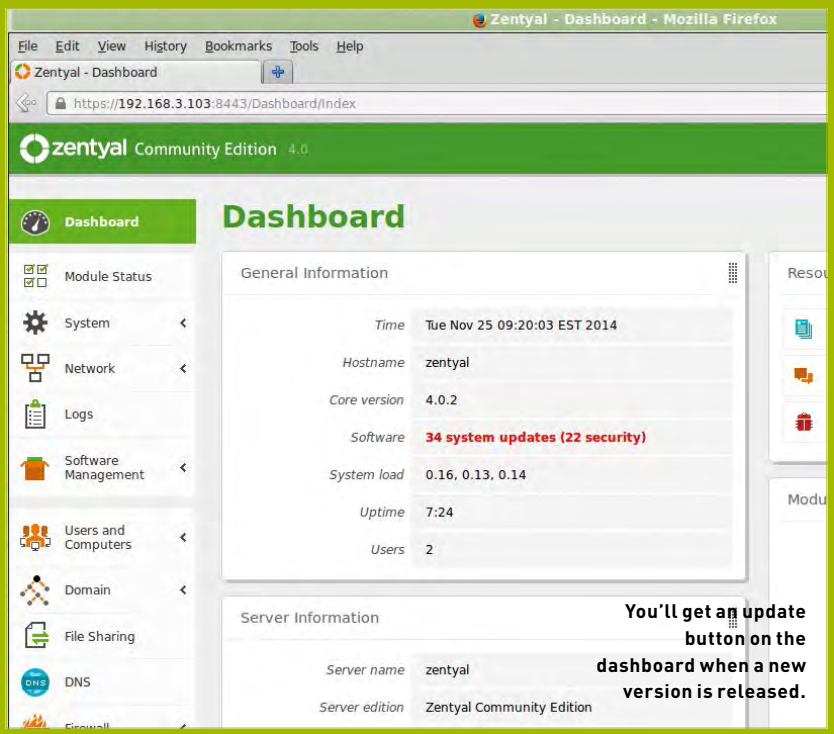
» All users will have to follow the same process. Once they've authenticated with the Jabber server, they can add each other and start communicating. Users can also change their password and other details. The Admin user gets some special powers and can see which users are connected to the server, set the message of the day, and broadcast a notice to all connected users.

# INSTALL ZENTYAL OVER UBUNTU

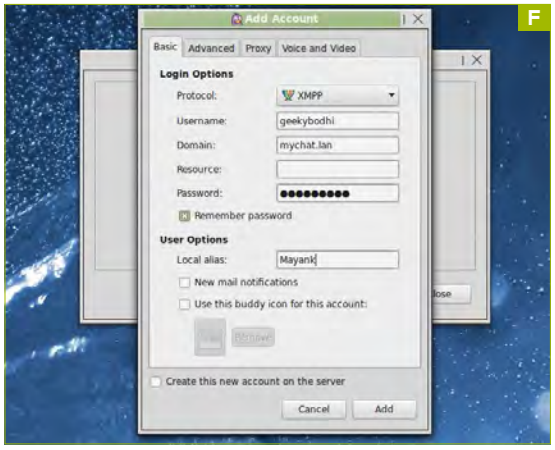
While it's advisable to use Zentyal's own ISO image to set it up, you can also deploy Zentyal on top of an existing Ubuntu Server installation. Begin by adding the Zentyal to your repository list with sudo add-apt-repository "deb http://archive.zentyal.org/zentyal 4.0 main".

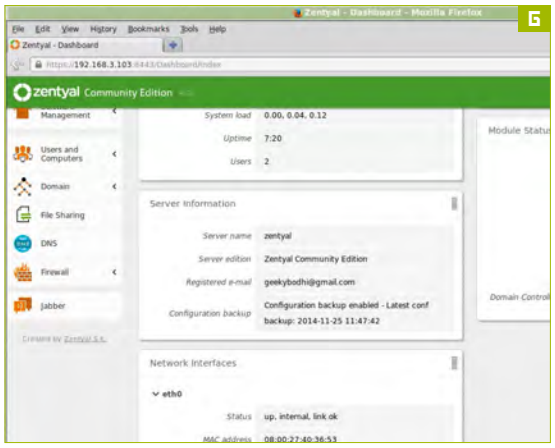
Then import its key to authenticate the packages with "wget -q http://keys.zentyal.org/zentyal-4.0-archive.asc -O- | sudo apt-key add -".

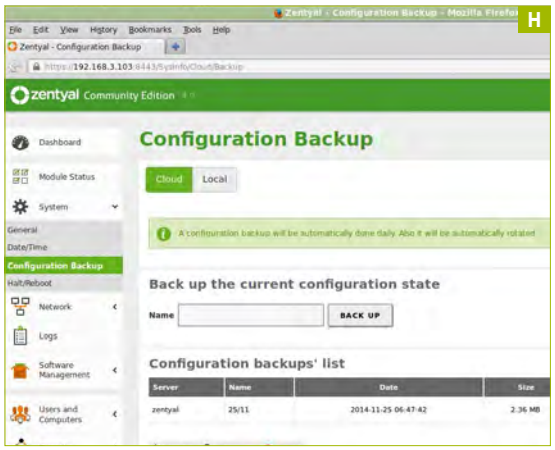
Now update the package lists with "sudo apt-get update" and then install Zentyal with "sudo apt-get install zentyal". After the core packages have been installed, you can use the web-based Dashboard and set up the Zentyal install as detailed in the tutorial. You can also optionally fetch the required Zentyal modules using Ubuntu's apt-get package manager. For example, "sudo apt-get install zentyal-gateway" will install all of the components required to use the Zentyal installation as a gateway server and "sudo apt-get install zentyal-firewall" will add firewall capabilities.




**You'll get an update button on the dashboard when a new version is released.**


### KEEP YOUR SERVER SHIP-SHAPE

You can monitor the health of the server from the main screen of the Dashboard. From here you can get general information about the server, such as its load average, uptime and number of connected users (Image G). Other sections give you details about the running status of the enabled modules and visualise network traffic. Head to the Logs section to configure and view detailed reports about all the enabled modules.

» To share your duties with another user, head to 'System → General' and click the 'Add New' button inside the Administrator Accounts section. On the following page you can define the login credentials of the new admin user. Other settings include changing the hostname and domain name of the server, as well as changing the default port for the dashboard from 8443 to something else.

» Zentyal can also save your server's configuration. Head to 'System → Configuration Backup', which allows you to save the settings either on Zentyal's cloud server or on your PC (Image H). For cloud backup, enter an email address and a password. Once set up, Zentyal automatically backs up settings daily. To restore them, browse the list of back-ups and use the 'Restore' button adjacent to the configuration you wish to restore.

» It's also important to keep your system updated. The Dashboard lists the number of system and security updates available under the General Information section. Click the number listed there or head to 'Software Management → System Updates' for more details. Security updates have a red shield in the component name. To update them all, scroll down the page and tick the 'Update all packages' option. ■

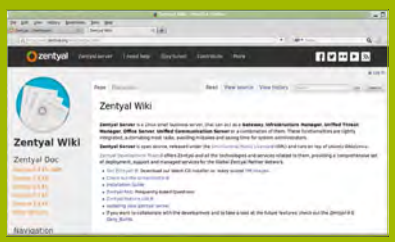
# DOCUMENTATION AND SUPPORT

While it isn't too complex to set up, Zentyal's offers plenty of options if you need some hand-holding. For starters, there's a dedicated website where you'll find extensive, well-illustrated documentation for the various components of the distro.

The distro also has very active forums where users share their tips and tricks based on the setup of their own networks. It might range from something that'll be of use to only a handful of users – such as a step-by-step guide to resizing Zentyal's default root partition – to something more general, such as connecting a network printer to Zentyal and mapping it automatically to Windows XP users.

Besides the freely available Community Edition, Zentyal also offers a commercial edition for larger setups that you can test-drive free for 30 days. This edition includes Zentyal's flagship Mail and Directory servers that are compatible with Microsoft's Exchange Server and Active Directory, along with thoroughly vetted software updates, regular detailed reports and alerts from your deployments, plus the ability to remotely monitor and manage the servers. Zentyal also has resellers all over the world.

Zentyal also runs a variety of online and offline courses through its training program to teach the ropes of server




management. There are courses for network technicians and for network administrators on how to deploy Zentyal most effectively, as well as advanced courses to help troubleshoot deployments and develop new Zentyal modules. The price for these courses starts from about £220.

# Get Windows 10 Features Now

## YOU'LL NEED THIS

**CLASSIC SHELL**
Get a new custom Start menu (www.classicshell.net).

**DEXPOT**
Create four sets of virtual desktops. Download it for free at dexpot.de.

**THE RELEASE OF WINDOWS 10** is still a good few months off, and if you're not quite brave enough to begin experimenting with the Technical Preview, you might be sighing in anticipation of all the new features that Windows 10 promises to bring to the desktop and elsewhere – not least the return of the Start menu.

Worry not though, because you can replicate many of those very same features in Windows 7 and 8 using a variety of (mostly free) third-party programs, as we'll demonstrate in this step-by-step guide. Some are quite well known – the amazing Classic Shell, for instance, has become a firm favourite among many Windows 8 users – but there are a few others you may not have known even existed. Once you discover them, you'll probably be hooked – and using them will get you ready to jump straight into Windows 10 when it lands later this year. **–ED RICKETTS**

### 1 GET CLASSIC SHELL

One of the biggest gripes many people have with Windows 8 is the lack of a proper Start menu, which is probably why Microsoft is bringing it back in Windows 10, with some extra improvements. There are many utilities available to 'fake' a Start menu in Windows 8, but the best is definitely Classic Shell – and it's completely free (download it at www.classicshell.net).

### 2 INSTALL THE SOFTWARE

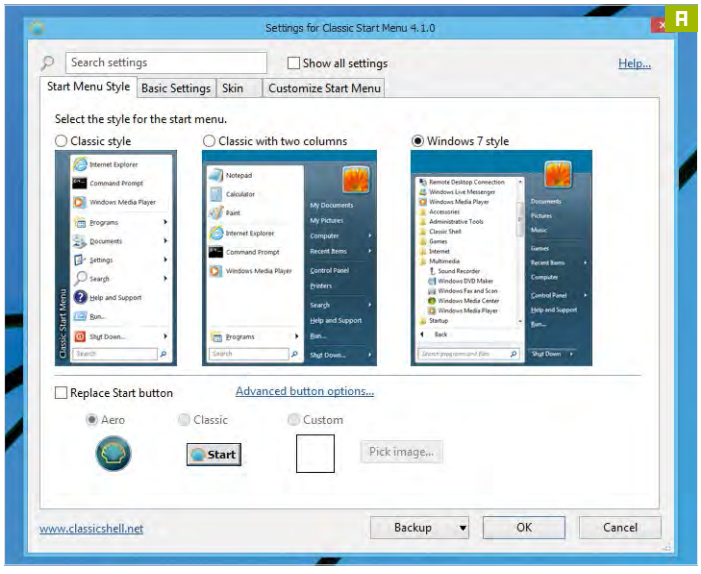
Classic Shell actually consists of three components: Classic Start Menu, Classic Explorer and Classic IE. If you just want the Start menu, you can safely ignore the other two parts. During installation, you can choose whether or not to install each component: just click and choose 'Entire feature will be unavailable' for Classic Explorer and Classic IE.

### 3 START WITH STYLE

Once it's installed, the next time you click the 'Start' button you'll see the Classic Shell Settings screen (**Image A**). First, choose which style of menu you like: 'Classic style' is more like Windows 95; 'Classic with two columns' is like Windows Vista; and of course 'Windows 7 style' exactly replicates the previous operating system's Start menu style. If you like, you can now click 'OK'.

### 4 GOING FURTHER

There are many more ways to customise Classic Start Menu though, and it's worth having a look through all of the options (just search for 'Classic' to access the settings program again). Click 'Show all settings' to display even more customisations aimed at more advanced users. You can even replace the Windows 8 Start button icon with the Start orb from Windows 7.





### 5 MODERN APPS IN A WINDOW

In Win10, Modern apps will be able to run in a window – unlike in Win8, where they can only run in full-screen mode. You can fix this with a program called ModernMix from www.stardock.com (**Image B**). The full version costs $4.99 but you can run a 30-day trial first.

### 6 IN THE MIX

ModernMix can run Modern apps full-screen, in maximised windows, or in normal windows. You can change the default behaviour for apps in the General settings; by default, it assigns the [F10] key as a hot-switch between each mode, or you can use the little icon that appears in the top right of the app window.

### 7 COMMAND CONTROL

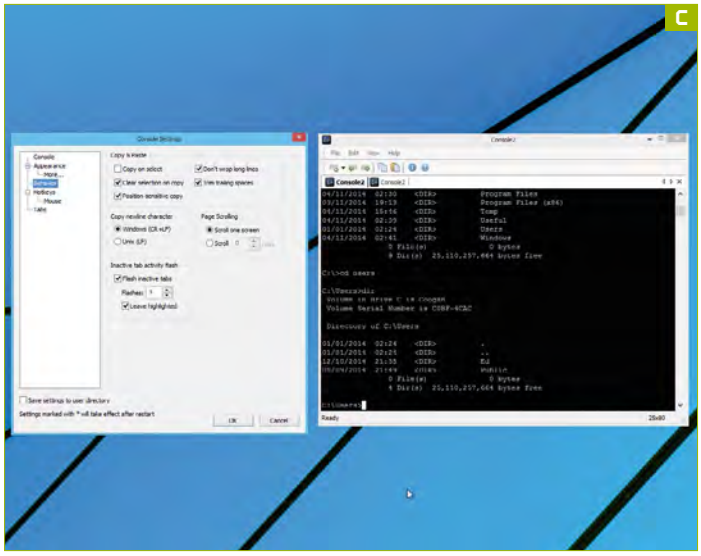
Windows 10 includes an improved Command Prompt window that now features – at long last – proper support for copy/paste keyboard commands, among other things. You can get this right now in Windows 7 or 8 with Console2 from sourceforge.net/projects/console. It's a free standalone program that offers many extra options over the basic Windows version (**Image C**).

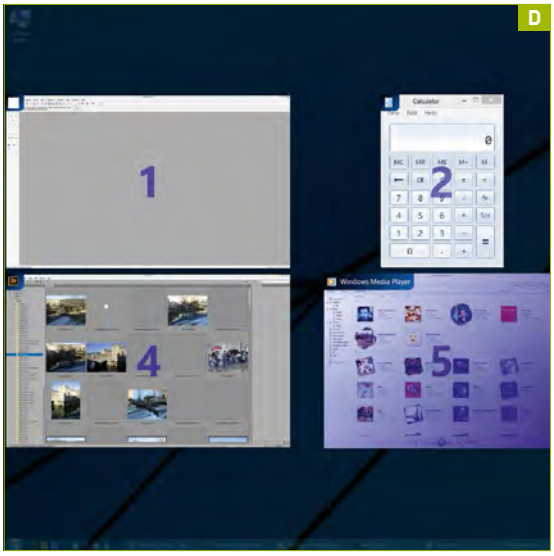
### 8 SWITCH IT ON

Task switching has been revamped in Windows 10, with a full-screen preview of all your open windows. There's a similar utility called Switcher 2.0, which runs on Windows Vista, 7 and 8, available at insentient.net. This gives you three different ways of displaying open windows, hotkeys for quickly switching between them, customisable window styles and more (**Image D**).

### 9 VIRTUAL DESKTOPS

The final major interface change in Windows 10 is virtual desktops, which enable you to group windows and apps into different sets of different 'screens'. Yet again, though, there's a well-established utility that

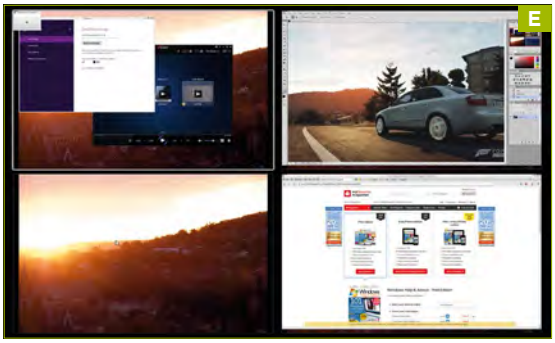




does all this and more, which is available for Windows 7 and 8. It's called Dexpot and you can find it at dexpot.de. The program is free for personal use.

## 10 THE POWER OF DEXPOT

Dexpot enables you to assign apps and windows to one of four different desktops (**Image E**). You can assign rules so that a particular app always opens on a particular desktop, and you can preview desktops as a full-screen view, then click one to use it. There's also a handy little quick-switcher that sits near the clock, and fully customisable shortcut keys. In fact, just about every part of Dexpot is customisable. It'll end up saving you a lot of time. ■




# KEY FEATURES

**1. A BETTER START**
Customise the Start menu. You can even bring back the Windows 95 style.

**2. IN COMMAND**
Install a command prompt replacement to mimic the new version in Windows 10.

**3. WINDOW ON THE WORLD**
Run Modern apps in a normal window, and resize them just like any other program.

**4. VIRTUAL DESKTOPS**
Get multiple virtual desktops and switch between them quickly using Dexpot's powerful features – before Win10 arrives.

**5. MAKE THE SWITCH**
Get advanced task switching, tiled app previews and more with Switcher 2.0.

**6. RETURN OF THE START**
Bring the Start menu back to Windows 8 with Classic Shell – it looks and works like Windows 7, right down to the icon.

# Watch and Record TV

## YOU'LL NEED THIS

**TV TUNER**
You might have to update the drivers if prompted.

**NEXTPVR**
A free Personal Video Recorder and Media Centre application (www.nextpvr.com).

**THE DAYS OF WINDOWS MEDIA CENTER** being standard on PCs are long gone, but thankfully you'll find a more-than-capable replacement in the form of NextPVR. Not only does it give you access to your music, video and photo libraries, it enables you to plug in a TV tuner and both watch live TV and record programmes for playback later – it's even capable of recording more than one channel at the same time, even with a single-channel tuner, thanks to multiplexing.

The biggest drawback with NextPVR is getting it up and running, but fear not – in this tutorial we'll step you through the entire process of installing the application, configuring it to work with your TV tuner, and finally browsing the Electronic Programme Guide (EPG), watching live TV and recording shows for catching up later. After all, why pay for a separate personal video recorder when your PC can easily do the job? –NICK PEERS

### 1 SET UP YOUR TV TUNER

If it's not already installed, plug in your TV tuner and wait for Windows to set it up – if prompted, provide drivers from the CD that came with the tuner or visit its website to download the latest ones if they exist. If you're in the market for a new TV tuner, make sure it comes with Broadcast Driver Architecture (BDA) drivers – most do, but check with the manufacturer first.

### 2 INSTALL NEXTPVR

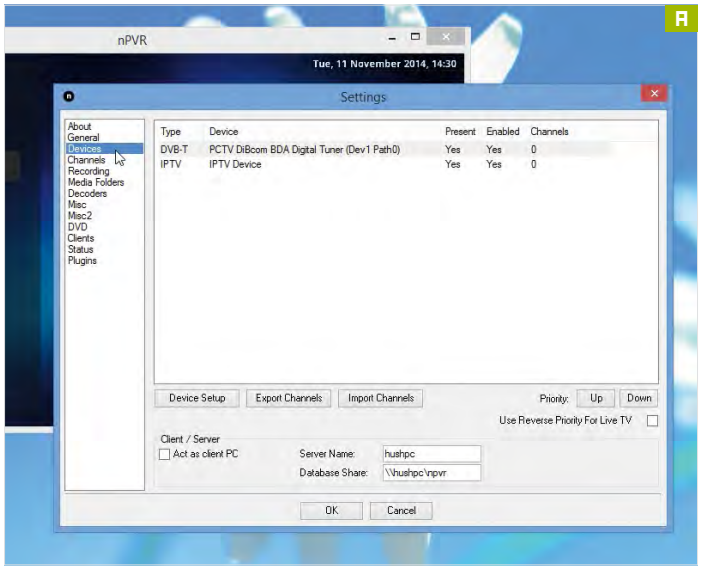
Make sure your TV tuner is plugged into an aerial with a strong signal – one of the household sockets is best. Now download and install NextPVR from www.nextpvr.com. During the install process a number of Command Prompt windows will open – simply leave them open and ignore any error message that might appear; the installation should still proceed smoothly.

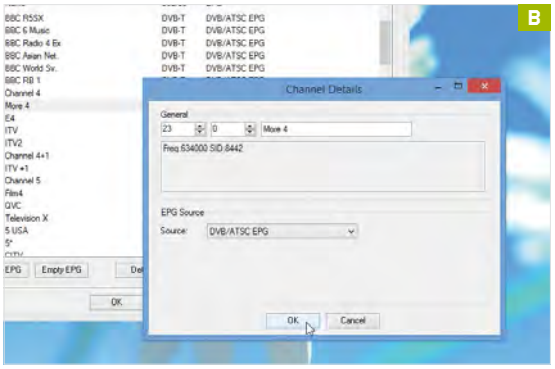
### 3 START TUNER SETUP

Once installed, click 'Start' and search for 'nextpvr'. Click the 'NextPVR' (not NextPVR Tray) entry to launch the program. The Settings window should appear automatically (**Image A**); if not, right-click inside the main program window and choose 'Settings'. Switch to the 'Devices' section in the left-hand panel and your card should be visible.

### 4 SCAN FOR CHANNELS

Click the 'Country' drop-down menu under 'Type Specific Settings' and select 'United Kingdom'. Next, click the 'Region' drop-down menu and choose 'All Regions – Frequencies'. Tick the 'Scan Offsets' option and finally click the 'Scan' button to search for available channels. The scan takes longer than choosing a transmitter, but is more likely to find your available channels.




### 5 SET CHANNEL ORDER

Switch to the 'Channels' section. Click 'Update EPG' to update the EPG. You'll notice the channel order isn't what you expect – sadly, the only way to change this is to manually double-click each channel, then type in the number you want under 'General' (**Image B**). You can also delete unwanted channels from this list.

### 6 SET DRIVE TO RECORD ON

Next, select 'Recording' to configure which drive or drives you want to store your recorded programmes on (**Image C**). Select the Default choice and click 'Edit' to move it to a drive with more space. Check the 'Default Padding' section – these settings start recordings earlier and stop them later than the scheduled times to offset the effects of overrunning programmes.

### 7 ADD MEDIA FOLDERS

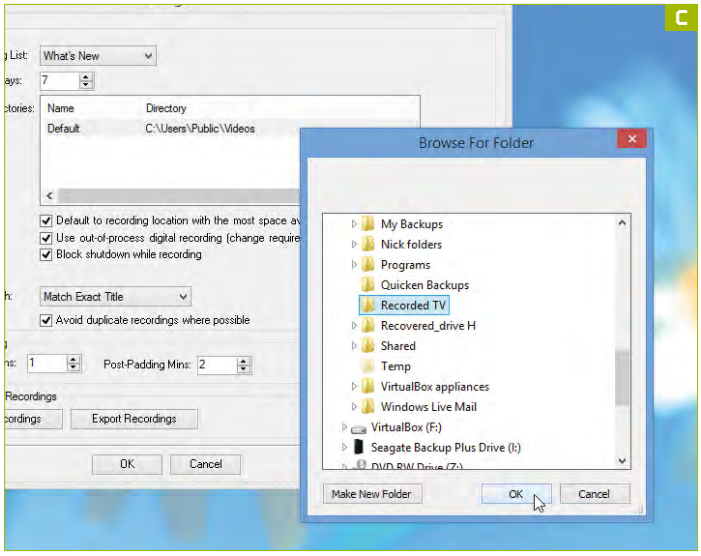
To access your own media through NextPVR, select 'Media Folders' on the left and then click 'Add' under Videos, Music and Picture Folders in turn to select the folder or folders your media is stored in (**Image D**). Next, check the 'Decoders' section to see which video renderers and decoders have been selected – you'll need to edit this section if you can't see a picture or hear any sound.

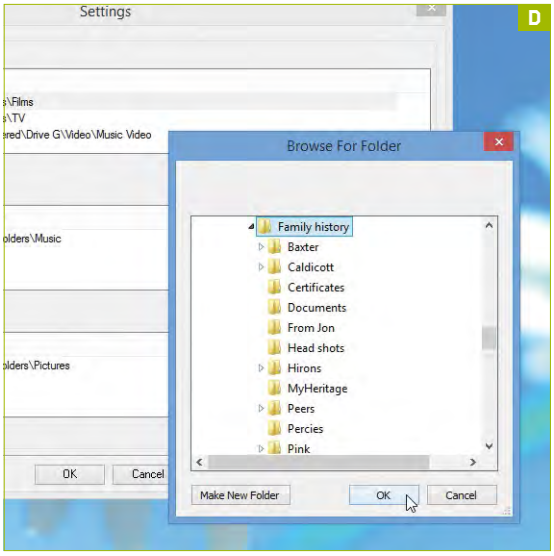
### 8 START USING NEXTPVR

With your settings configured, click 'OK'. From the main NextPVR window, click 'TV Guide' to see what programmes are currently on and coming up. Click on a programme for more details, 'Quick Record' to quickly schedule a recording, or 'Record' to tweak its preferences first. Click 'Watch' to view a live programme (**Image E**).

### 9 WATCHING LIVE TV

Use the annotation opposite to help you navigate NextPVR when watching live TV. When finished, right-click and choose 'Main Menu' to return to the program's main menu and navigate the other sections –

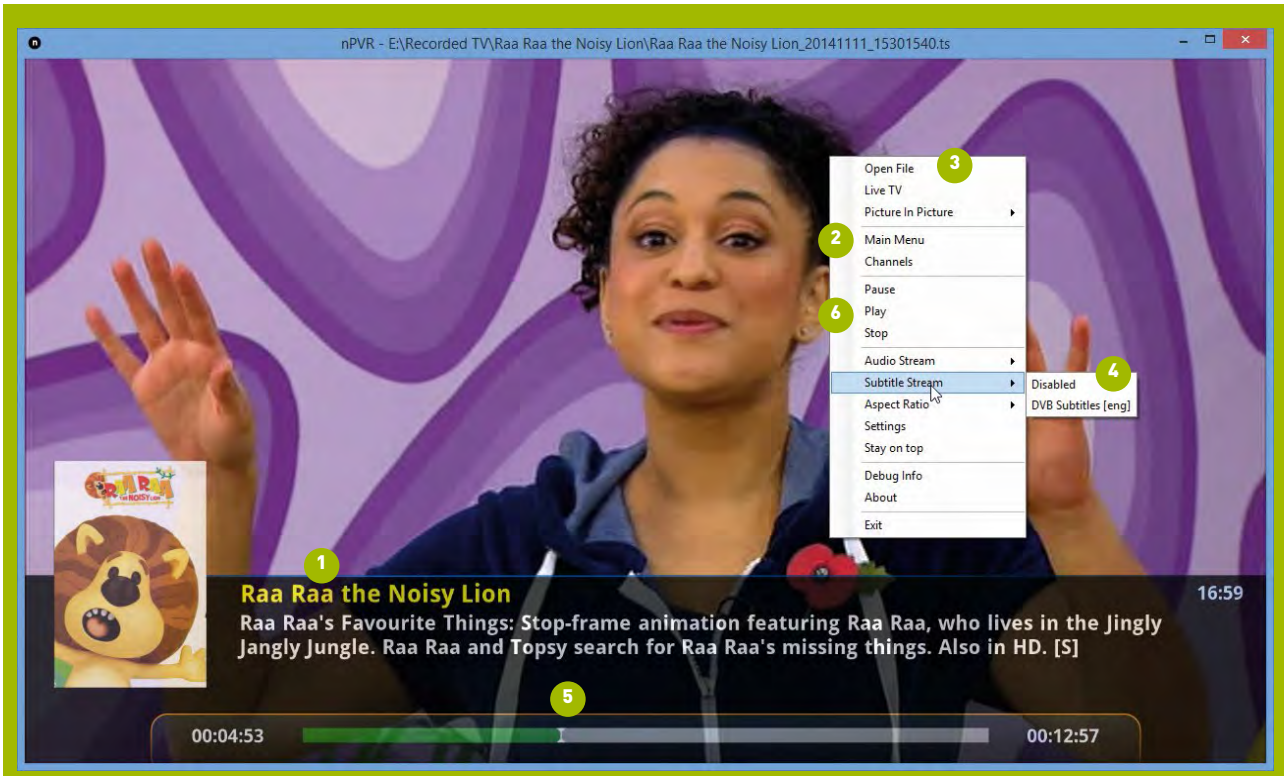



you can browse your existing media collection, plus access (and manage) recorded programmes via the Recordings section. Double-click a recording to watch or delete it.

## 10 READY FOR ACTION

NextPVR is now configured and set up ready to go. Take the time to explore the other Settings menus – for example, visit 'Misc' and set 'TimeShift Mode' to 'EPG Based' to be able to start watching a programme and then choose to record all of it at any point during the broadcast – including everything you've already watched. Visit gbpvr.com/nwiki for a rundown of other controls, such as how to use it to play DVDs, as well as user-created plug-in and skin downloads. ■


# SCREEN PLAY

**1. PROGRAMME INFORMATION**
This is where information about the show you're watching is displayed.

**2. LEAVE VIDEO**
Choose 'Main Menu' to jump back to the main NextPVR menu, or 'Channels' to return to the EPG listing screen.

**3. ACCESS TV MENU**
NextPVR excels in distraction-free viewing. You'll need to right-click on-screen to bring up this menu.

**4. ACCESS SUBTITLES**
If your broadcast or recorded programme has subtitles, select this track under Subtitles to view them.

**5. TIMELINE SLIDER**
Use this to quickly jump to different parts of the recording – after pausing live TV, you can then jump forwards from here.

**6. PLAYBACK CONTROLS**
Control playback from here, or use [Ctrl] + [Q] to pause, [Ctrl] + [P] to resume and [Ctrl] + [S] to stop playback completely.

# ASK LUIS

BY LUIS VILLAZON

# All The Stuff You Didn't Know About

Taking a red hot iron to the squealing rump of your tech problems

**REPRODUCIBLE CALAMITY**

## PANEL ACCESS

**I was very interested in your step-by-step guide to Windows File History last issue, because I have always been jealous of Mac users and their Time Machine backups. Unfortunately, I can't get it to work. I can start File History, but when I try to run the 'Restore your files', I get the error "Cannot access immersivecontrolpanel". I've tried making sure File History wasn't still running, as well as rebooting, and so on – still no joy. So, what's up with that?**
*Rich DiMarco*

Ah yes, this isn't actually a problem with File History; you can also run into it with Windows Update, Firewall and other things. It's Search that's borked. To fix it, you need to clear your search history. Open the charm bar and click Settings → Change PC Settings → Search and apps → Clear search history.

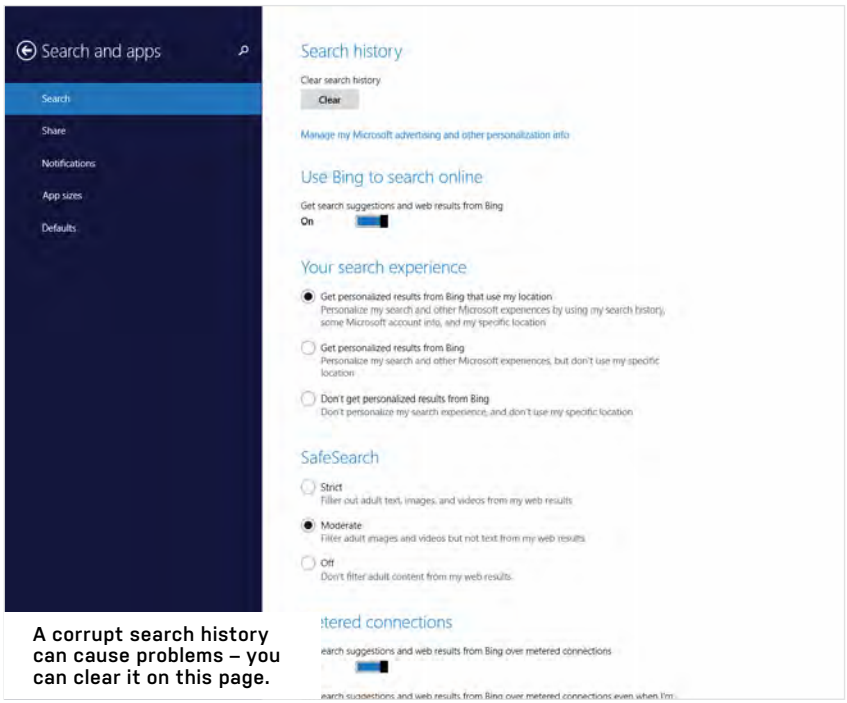
In the unlikely event this doesn't work, you'll have to rebuild the search index manually, via Indexing Options in Control Panel. "How the heckins do I get to Indexing Options?" you're asking. It's a good question, well done for asking. See *this* month's step-by-step on page 94 for instructions on that. Now click 'Advanced' to bring up the Advanced Options dialog and then 'Rebuild' on the Index Settings tab. This will fix Search, so you can access File History from the Windows search bar. Alternatively, you could just do it directly from Control Panel, now that you know how.

**CREEPING BADNESS**

## FILES THAT HIDE THEMSELVES

**I have a large collection of files across a 3TB NAS. However, I seem to have hit a file limit and can only see all the files on the NAS in Windows Explorer. Using DLNA on my TV, phone and tablet, I definitely hit a limit on what I can see: as I delete some files, others become visible to take up the slack, so to speak. I am guessing my Sagem Fast 2504n router is capping this, but I can find very little information about DLNA limits with different routers.**
*John Wright*

Digital Living Network Alliance, or DLNA, is a set of standards that provides a way for different devices to share audio and video over a network. It uses UPnP for the file handling part and there's nothing in UPnP or DLNA that specifies a limit to the number or size of the files it can handle. But there's nothing in either standard that says a particular media server *can't* impose a limit. In particular, the Twonky server, used by lots of Linksys and Cisco hardware, and doing the heavy lifting for many mobile apps, has a limit of 8,000 files. On a 3TB drive, that's an average of 0.375GB per file. You probably won't run out if you use your NAS for video, but you almost certainly will if you use it for music or photos. The only work-around I can think of is to partition your NAS into volumes of less than 8,000 files.




A corrupt search history can cause problems – you can clear it on this page.

## FREE TECHNICAL SUPPORT

Email Luis for guaranteed insults and possibly even some technical help as well.
pcfhelpline@futurenet.com
PCF Helpline, Quay House, The Ambury, Bath BA1 1UA

### The six categories of all human misery

**REPRODUCIBLE CALAMITY**
Things that break predictably.

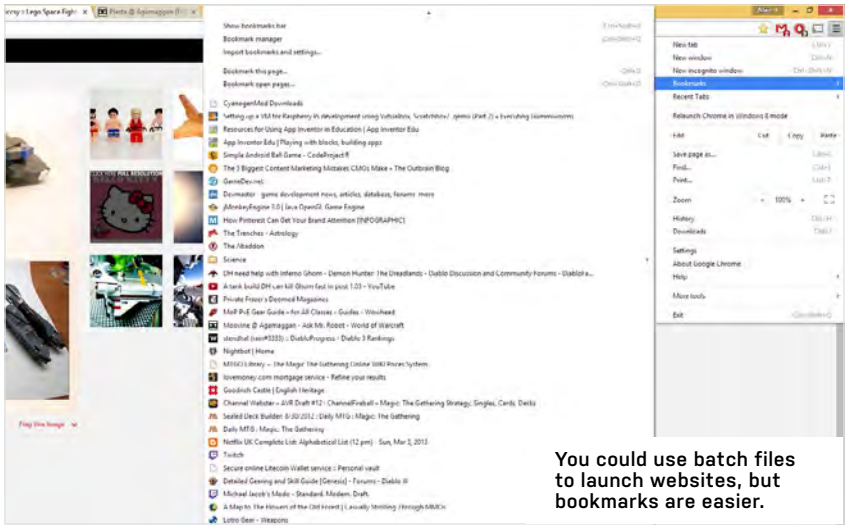
**RANDOM WEIRDNESS**
Things that break unpredictably.

**CREEPING BADNESS**
Things that just get worse.

**OMINOUS PORTENTS**
Things that might be a problem.

**SPONTANEOUS BREAKAGE**
Things that definitely are.

**RAINBOW CHASING**
Things that could be so much better.



You could use batch files to launch websites, but bookmarks are easier.

**RAINBOW CHASING**

## BATCH TO THE FUTURE

**I have recently discovered Windows batch files and have found they are a great way to bend Windows 8 to my will. I am busy assembling a library of shortcuts to all the things I need most often. One thing currently hindering me, though, is web pages. Is there a way to launch a web address directly from the command line? Or failing that, is there a third-party utility that will run them, so I can launch that?**
*Eric Campion*

Yes, it's called a browser. Use the 'start' command in a batch file like this:

start http://www.microsoft.com

The Windows command interpreter will automatically open your default browser to display the page you specify. This will break if the page's address contains special characters like '?' and '&', unless you use quotes like this:

start "" "http://support.microsoft.com/search?query=test"

You need the three quotes at the beginning (with a space between the second and third) because the quote marks themselves are a special character, so you need quote marks for your quote marks. (I hear that in Soviet Russia, Marx quotes you.)

I've humoured you this far, partly to show you that I did know the answer, and partly so I could do that Marx joke. But really, this whole batch file kick you're on is madness. Batch files are what we used back in the early 90s, when all we had was batch files and simple flint tools. The only reason they still work in the Windows command prompt is probably because it would be more effort to remove them at this point.

If you want shortcuts to things you do often, Windows has a feature called (drum roll) *shortcuts* that puts them on the desktop. Or the Start screen. Or the Start bar. If you want to jump straight to a web page, just right-click the desktop, choose New → Shortcut and type the page's address in the box. Done.

And even *this* is still a fairly pointless thing to do, because shortcuts to web pages you visit a lot are called *bookmarks* and you can create them right there in your browser, where you actually need them to be.

**OMINOUS PORTENTS**

## INTRUDER IN SECTOR 7!

**I ran into trouble with some malware recently and ended up having to reinstall Windows to get rid of it all. After everything was restored from backup I was doing some double-checking to make sure everything was gone. In the Wi-Fi logs for my router, I found dozens of messages warning of intrusions. These were spaced just a few seconds apart and began almost from the moment I had got Windows working again! Obviously I shut everything down again but I am unsure what to do to proceed. If the system is intruded as soon as I boot up, how can I install anything to protect myself? If I buy a whole new computer, would this even fix it?**
*Anthony Poel*

First, calm down. Second, nearly everything you have said is wrong. You should never need to reinstall Windows to get rid of malware. And if you did, restoring your backup would be a bad idea, because you could be restoring the malware too.

> "I'VE HUMOURED YOU SO FAR, BUT REALLY, BATCH FILES ARE WHAT WE USED IN THE 90s."

YOU ASKED!

# FAQ

## Project Loon

**What is it?**
An attempt to deliver internet access to remote areas using high altitude helium balloons carrying Wi-Fi hotspots.

**Isn't that madness?**
The punning name partly acknowledges this, but Project Loon is run by Google, and therefore has serious money and tech behind it.

**How big are these balloons?**
They're 15m across. Each balloon contains as much helium as 7,000 party balloons. The payload weighs 10kg and contains radio transmitters, antennas and batteries. Solar cells charge the batteries during the day so the equipment can operate continuously.

**Where do they fly?**
The project has been trialled over New Zealand and Brazil, but the balloons are designed to travel in the high altitude air currents that blow east or west around the globe. Each balloon can cover a 20km radius on the ground and they act as repeaters for ground stations positioned at 100km intervals. When a ground station isn't in range, signals can be bounced from one balloon to another. Each balloon can be steered to a limited degree by pumping air ballast in or out.

**How many balloons are there?**
They only last about 100 days before too much helium has leaked out but Google can launch up to 20 a day, which currently allows for up to 2,000 to be in the air at once. As each balloon reaches the end of its life, it is steered to a recovery area and the helium is vented.

**Isn't this a waste of helium?**
It's true that helium is a non-renewable resource, but this is arguably a much better use than balloons for hen nights.

**Read more at:**
http://bit.ly/16znzHw

Those messages in your router logs are warning about *attempted* intrusions that have been rejected. If the intrusion had been successful, the router would (by definition) never have noticed, and so there would be nothing in the log. Intrusion attempts like this are really common – I've got four in my router log for today already. They are generated by botnets – PCs infected with malware that are co-opted into a distributed network that scans huge blocks of IP addresses, rattling the door handles to see if anything has been left unlocked.

Most modern routers will just silently ignore these requests, so the bot can't even tell whether there's another computer at that address. It sounds as if your router is already doing everything it needs to (although do make sure you have changed the router's admin password from its default). If you're still uneasy, check your security by running the Shields Up! test at www.grc.com.

## "NOBODY ORDERS BISCUITS IN A RESTAURANT OR GOES OUT FOR BISCUITS WITH FRIENDS."

**CREEPING BADNESS**

### COMPRESSION MAKES THINGS BIGGER!

**I have a PC with a 1TB hard disk that is starting to run low on space. A lot of this is taken up with various VMware clients I don't use much any more, so to save space I figured I could use NTFS disk compression to compress each client. Instead of this saving me disk space, it actually takes up more space – in some cases several gigabytes! So why is it called compression? And is there a way to know in advance if something is worth compressing?**
*Jordan Hughes*

Here's the rhyme I use to help me remember what to do:

"Should I compress? I need to know. Oh, that's easy, the answer's 'no'."

In your specific case, your virtual machines are probably getting bigger because NTFS maintains a lot of metadata for files that aren't compressed, and also caches uncompressed copies of the files. These will get released after you reboot but modifying a file will create a new uncompressed temporary file. Disk compression is optimised for large data files, not the hundreds of relatively small ones that make up an OS.

But who cares? None of this matters because there is a much better way to free up some disk space: get a bigger disk! A 2TB disk only costs about £60, or you could just get another 1TB drive for £40 and put the VMware clients on that. And then in a year, when you still haven't used any of them, you can delete them.

**RAINBOW CHASING**

### THE FANCIEST SWITCH

**What (in the simplest possible terms) is the difference between a router and a switch? Is a router just a fancier kind of switch? Is it just a switch with a firewall built in? Or is it a completely different kind of thing that just happens to use the same size box?**
*Aiden Maconi*

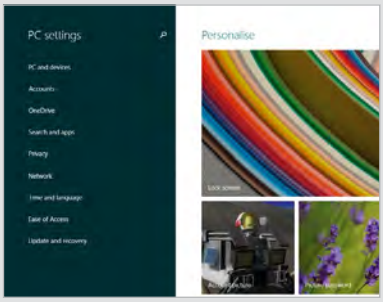
There are two ways to explain something simply. One is to start right at the beginning and the other is to jump straight to the end. If you want the second one, skip to the last sentence, otherwise keep reading.

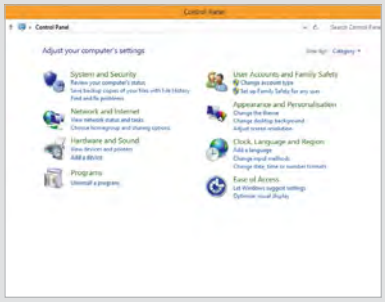
Suppose you have four PCs. The simplest way to network them together is to plug them all into a hub. This is little more than a multi-port adaptor for Ethernet sockets. All the data wires of each Ethernet port are connected together, as if they were on the same cable. This works fine until two PCs try to transmit at the same time. When that happens, the signals overlay each other and nothing is readable, so both PCs have to back off, wait a random number of milliseconds and try again. This slows down the total amount of data you transmit because the PCs waste a lot of time saying "After you. No after you. I insist" and so on.

A better system is to look at the unique Media Access Control (MAC) address on each network transmission to decide which PC it is intended for and only relay the packet to that port. This is called a switch. It cuts down on network collisions, which increases the effective

## Control Panel is the Worst!

### Those dialogs you probably shouldn't touch



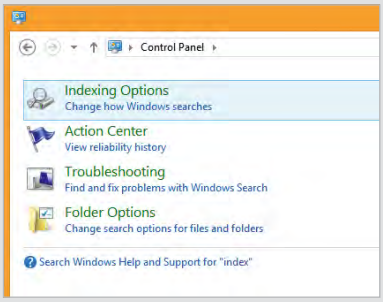



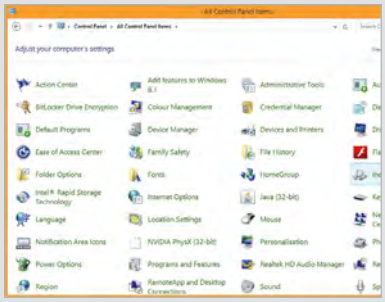
### 1 Layers

It doesn't matter which version of Windows you use, Control Panel always, *always* manages to be more confusing than the previous version. First you need to get to Control Panel, which, since Windows 8, has been hidden away behind the embedded interface that Start Search uses.

### 2 Categories

Once you've opened it, you've still got to bypass the category view that has been the default since Vista, because the thing you want is never visible on the top level view. Take Indexing options, for example. You can click on every link in category view and you will never find it.



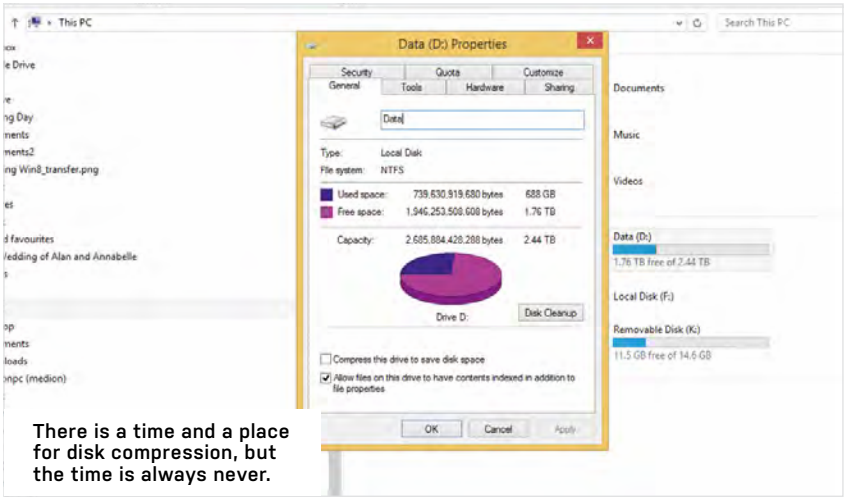



### 3 Mysteries

Yet if you type 'indexing' into the search box, it pops right up. How is this discoverable? You can only use features that you already know the name of? What is this – an operating system or a secret society? Even this ultra-secret dialog has an Advanced button for even more secret options!

### 4 One crumb

To make it easier to find things in Control Panel, click the 'View by' drop-down menu at the top right of the Control Panel dialog, and change it to either large or small icons. Congratulations, you now have access to all the Control Panel applets. Just like Windows Millennium!




**There is a time and a place for disk compression, but the time is always never.**

bandwidth. Switches are almost as cheap to make as hubs, so no one actually uses hubs any more. They are fine until you want to connect your network to the internet.

The internet uses IP addresses to identify computers, not MAC addresses, and you don't usually want the wider internet to know the IP address of your PC because that just makes things easy for hackers. So your broadband router creates a separate set of IP addresses for your PCs and presents just a single IP address to the outside world.

When network packets arrive from the internet, the router translates the external address to the internal one and forwards it to the right port (or just broadcasts it over your home Wi-Fi). This Network Address Translation mechanism is part of what allows your router to act as a gatekeeper between your PC and cybercrims. But routers can also look inside network packets and block the ones that look dodgy, which is how the firewall works.

If you would prefer a postal analogy, switches deliver data by looking at the house number and postcode, which uniquely identifies a physical location, whereas routers deliver based on the name on the envelope, which could be a pseudonym.

**RANDOM WEIRDNESS**

## I HAVE PLENTY OF SPACE, DAMMIT!

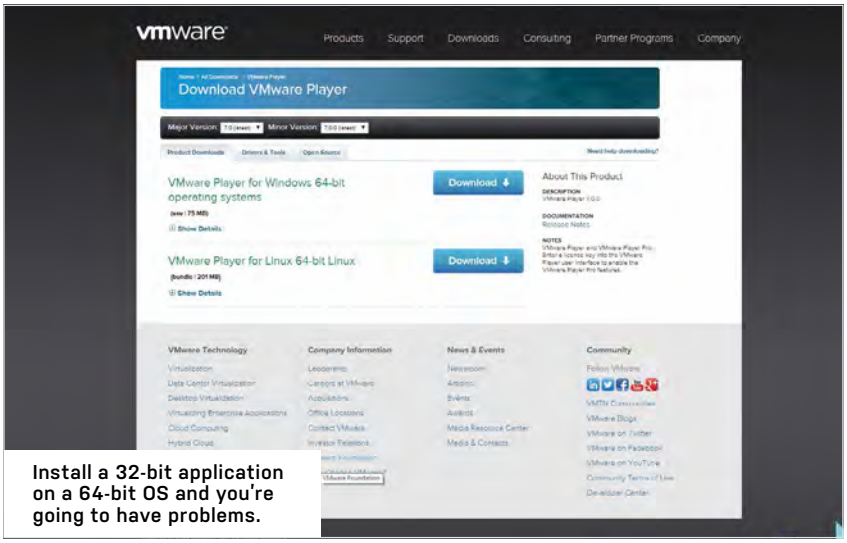
**I have Windows 7 64-bit. Recently I tried to install VMware and received the error: "Windows found driver software for your device but encountered an error while attempting to install it." Then it says: "Not enough storage space is available to process this command." How much do I need? I have almost 50GB free on Drive C and 1.2TB on Drive D. As if this isn't bad enough, installing other drivers seems to give the same error.**
*Jim Treace*

This is a busted Windows install. I've seen it happen when you force a 32-bit driver to install on a 64-bit version of Windows. If you have a System Restore point, you could try rolling back to that. Otherwise you'll need to do a repair install of Windows 7, or upgrade to Windows 8 if you were thinking about doing that anyway. That will work too.

**REPRODUCIBLE CALAMITY**

## THIS IS PROBABLY ILLEGAL

**Is there a way to deliberately trigger a BSOD on a Windows machine? I want to use it as part of my test suite for, ah,**




**Install a 32-bit application on a 64-bit OS and you're going to have problems.**

# FLASHBACK

## What Luis Said...


### 5 years ago *(PCF236)*

About leaving the monitor on

Enduring a sleepless night rather than get out of bed to turn off a monitor is beyond lazy. Why are you even getting *in* to bed with the PC still on? Don't you know the ice caps are melting? And even if you are downloading all eight seasons of *24*, you can still turn off the monitor. I don't see why you can't just add this to the bedtime list. Or do you lie in bed, clothed, teeth unbrushed and with the lights on, because you can't 'be bothered' with these either?

### 10 years ago *(PCF170)*

About Windows' BSOD

The error message is the puff of smoke the cheap stage magician uses to distract you from the fact he's stuffed a Bengal tiger in the pocket of his deceptively capacious jacket. We are so impressed Windows has warned us of this illegal memory access that we completely overlook the fact its sole remedy is to crash the program, taking all your unsaved data with it. Without the message we'd feel only the sudden jerk as the rug is pulled. And we'd blame Windows.

### 15 years ago *(PCF105)*

About complacency

Before you dislocate your shoulder from all that patting yourself on the back, have you considered the possibility you may simply have dangerously low levels of ambition? Anyone who thinks their computer is fine isn't using it properly.


The On-Screen keyboard is now available on page thanks to this great mag!

**security purposes. And definitely not to use it at work on the PC of the guy who keeps eating all the biscuits.**
*Harlan*

Well, obviously not. That would be completely petty and is a potentially dismissible offence if you were caught. Anyway, you should be thanking this guy. Biscuits are one of the least enjoyable ways to get fat. We eat them mostly because they are there in front of us. Nobody orders biscuits in a restaurant or goes out for biscuits with friends. They are just a thing that gets given away to take your mind off other things that are even worse, like meetings, cheap B&Bs and giving blood.

There is a Windows API routine that is specifically designed to BSOD Windows, called KeBugCheck(). It's there so that programmers can metaphorically yank the plug out if their code is in danger of permanently damaging the system – by overwriting the system32 folder, say. If you write a little C++ program that just calls KeBugCheck(0), it will immediately crash Windows when run. If you can't be bothered, the authors of Windows Internals have a version you can download at http://bit.ly/13J5oOx.

But seriously, don't eat biscuits.

**RAINBOW CHASING**
## KINDLEGRESS

**Can I play *Ingress* on my Kindle Fire? I can't find the app on the Amazon Appstore, but it's just Android, right? What's stopping me from downloading it from Google Play?**
*Sereena Kwouk*

Well Amazon only lets you download apps from the Amazon Appstore and Google won't let a Kindle Fire download apps from Google Play, so that's two industry gorillas stopping you right there. Kindles do run a version of Android, it's true, but it's a customised version and it's Amazon's intention to keep their apps ecosystem proprietary.

In principle, of course, Google could release a version of *Ingress* for the Kindle Fire (they did this for iOS, even though many people said they never would). But the Kindle Fire has a tiny market share compared to the iPhone and iPad, so there isn't nearly the same business case for this.

Even if you could, I'd argue you shouldn't. I have *Ingress* on my iPad mini and the only time I ever play it there, is for those rare portals that are in blackspots for EE coverage on my phone, but still get a signal for Vodafone on the iPad. Playing *Ingress* on a tablet is tiring and a bit too conspicuous for my liking. You never know when those blasted Resistance are spying on you.

**REPRODUCIBLE CALAMITY**
## THE KEYBOARD THAT WON'T DIE

**I have a custom-built desktop PC from Cyberpower, running Windows 8.1. I'm very pleased with it, except that I'm plagued by the on-screen keyboard and the magnifying glass. I think I may have turned them on once, just to see, but I don't want them now. I have searched online for the correct procedure to turn them off and it does indeed work – until I restart the PC. Then it comes back, like a bad penny. Is this setting not saving somehow?**
*Simon Cordrey*

The on-screen keyboard and the magnifier are part of the Ease of Access utilities, and Windows treats these slightly differently from other Control Panel settings. If you need any of these settings to use Windows effectively, the chances are you will also need them to negotiate the Windows login screen, so they need to start before you've typed your password in. This is a potential security loophole, so they need to be sandboxed off in their own little domain.

To change it, you need to open the Windows 7-style Control Panel and then click 'Ease of Access'. If you are in Category view, you will also need to click 'Ease of Access Center'. Now click 'Change sign-in settings' on the left. You'll see all the assistive technology utilities listed there, each with a checkbox to run it at the login screen, and another checkbox to run it after you have logged in. One or both of these boxes will be ticked for the On-Screen Keyboard and the Magnifier. All you need to do is clear both and click 'OK'.

And this right here is my biggest beef with Windows 8. The Control Panel options are completely undiscoverable. If you know they are there already, you can usually stumble your way onto them eventually. But if you don't know that a setting exists, there is no way to learn about it just by using Windows. This is really, really bad interface design.

I have no problem with the more advanced options being hidden away behind a button labelled 'Advanced'. I have a huge problem with them just being hidden altogether. Control Panel is flat-out broken in Windows at the moment and if Windows 10 'addresses' this problem by adding yet another layer of interface between me and the same old applets, I will not be responsible for my actions. ■

## STATS KNOW-IT-ALL?

# Quiz

1. When was HTML 4 standardised?
a) 1997
b) 1999
c) 2004
d) 2007

2. When did browsers begin supporting HTML5?
a) 2000
b) 2008
c) 2010
d) 2013

3. When was the specification actually finalised?
a) October 2010
b) January 2012
c) August 2013
d) October 2014

4. Which of these tags is new to HTML5?
a) <video>
b) <audio>
c) <canvas>
d) all of them

5. Which browsers fully support HTML5?
a) IE, Firefox and Chrome
b) Firefox, Chrome and Safari
c) just Chrome
d) none of them

Answers: 1a, 2b, 3d, 4d, 5d

graphics cards / monitors / motherboards / processors / CPU coolers / mice / keyboards / hard drives / soundcards / cases / SSDs / water coolers / power supplies / laptops

# THE 2015 HARDWARE PREVIEW

## ALL THE HARDWARE THAT WILL MAKE THIS YEAR THE BEST SO FAR FOR PCs

/ memory / blu-ray drives / cameras / joysticks / gamepads / RAID controllers / NAS / network cards / projectors / headsets / USB storage

## PLUS

- SSD supertest
- Games preview 2015
- Streaming 101
- Create your own social network

PCFormat PERFORMANCE GEAR & GAMING

**ISSUE 302**
**ON SALE**
12 February 2015

# Month in numbers...

## 500,000

The number of charging cables laptop manufacturer Lenovo has recalled, following reports of them overheating, sparking, burning and melting. Probably a bad thing, but it certainly makes the company's laptops a bit more interesting.

## $365,000

The amount a historic fully-functional Apple 1 computer sold for at auction. The figure is below the $400,000 to $600,000 guide price issued by auction house Christie's – and a rare example of an Apple product selling for what it's worth.

## 16.1bn

The total number of times players boost-jumped in the first two weeks of *Call of Duty: Advanced Warfare*. They've covered the same distance as 230 trips to the Moon from the Earth, or one bus ride on service 64 through Croydon.

## 20ft

The distance between an Airbus 380 and a drone in an incident last year. The small unmanned aircraft are predicted to take off in a big way in the next few years – we just hope new aeroplanes are equipped with awesome laser technology to take them out.

## £5,000

The value of *Counter-Strike: Global Offensive* player The Dahn's weapon collection, which has been cited as the most complete in the world. The enterprising hoarder plans to auction off his virtual museum of boomsticks and stabby prongs.

ILLUSTRATION: KEVIN FEBRUARY

## THE VOICE OF REASON

# A Cockney Creed

***PC Format*** **has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his troubled thoughts...**

**IN A COMPLETELY UNSHOCKING MOVE** from Ubisoft's *Assassin's Creed* team, it has transpired that the next title in the time-hopping franchise will be set in Victorian London. Despite usually taking place in more exotic locales, the new game will depict the United Kingdom's capital city in all its grimey, poverty-ridden glory. We've seen a little footage from the game, and these are our thoughts.

New additions to the secretive-slashing formula include horse carriage races through the streets of London, and the ability to gamble in authentic Cockney boozers. The former is a nice idea which recalls the chase in that *Pirates of the Caribbean* film, while the latter feels like something from a Sir Guy Ritchie movie. The *Assassin's Creed* team knows high quality cinema.

Big red buses also make an appearance in the game, with red phone boxes and pillar boxes also dotted throughout the urban landscape. There's also a British policeman who says, "All right guvnor, eeer, cockerney hat apples and pears jellied eels" on a loop, while waving a truncheon and looking at his pocket watch.

In keeping with previous *Assassin's Creed* games, in particular the most recent one, there are some more surreal moments. Faces have a habit of disappearing and reappearing, textures don't load, and some characters have a tendency to just float away, as if they're filled with helium. Occasionally Arthur Smog, the player character, will run suspended in mid-air.

In one mission Arthur is asked to protect Queen Victoria from a dangerous hitman. Once the task is complete, the country's monarch turns herself inside out and crab-walks out of Buckingham Palace, while her spleen waves around and knocks out some Beefeaters. Queen Victoria was famous for doing this from time to time according to the game's producer.

Later in the game Arthur's quest is to take out Lord Jacob Pennington-Dandy, a rich chap who's involved with the criminal underworld. At first Pennington-Dandy looks like a normal posh gent, complete with a wig and a servant, but later on he chooses to disguise himself as the Tower of London. Fortunately Arthur randomly transforms into the Palace of Westminster, and is able to destroy Pennington-Dandy by strangling him with a rat's lower intestine.

Finally, we caught a glimpse of the final level. The Thames itself has been replaced with an undulating mass of human organs. Arthur – who has become a giant disembodied brain which slinks around the game, snail-like – must take out Evilyn MacEvil, a woman whose entire body is made of human hands, and who floats in low Earth orbit, occasionally firing kneecaps at the unsuspecting citizens of London, who now exist only as frantically quivering entrails wandering through the cityscape.

It ends with the game world being enveloped in white light, a single set of teeth chattering in the middle of the screen. It concludes with the words: "Thank you for playing Assassin's 9 Lond game we hope you like." At this point our hands had merged with the controller and we'd lost all sense of purpose or identity, which, we guess, is kind of the point of any *Assassin's Creed* game.

DinoPC.com

## Griffin 15.6" 840M

- Intel® Core™ i3 4100M processor (2x2.5Ghz)
- Windows 8.1 (64-bit)
- 8GB DDR3 1600Mhz RAM
- NVIDIA GeForce 840M 2GB
- 8x DVDRW
- 500GB S-ATAIII HDD
- 15.6" HD 1366x768 LED
- 2.0M Webcam + Card Reader
- Wifi + Bluetooth

**£549** inc VAT

intel inside™ CORE™ i3

Elegant and slim laptop with superb all-round performance

# The Winning Species

Trust us to build you a champion's PC for less.

### Slayer 15.6" £1,099

- Intel® Core™ i7 4710MQ processor (4x2.5Ghz)
- Windows 8.1 (64-bit)
- Corsair 8GB Vengeance 1600Mhz RAM
- 256GB SSD
- NVIDIA GeForce GTX 870M 6GB
- Wifi + Bluetooth
- 15.6" Matte LED (1920x1080)
- 2.0M Webcam + Card Reader

"Bettery life is good...And there is plenty of horsepower under the hood"

### Infernodon £1,499

- Intel® Core™ i7 4790K processor (4x4.5Ghz)
- Corsair Hydro H100i Water Cooling
- Windows 8.1 (64-bit)
- Gigabyte Z97X-Gaming 3 Motherboard
- Corsair 16GB Vengeance Pro 2400Mhz RAM
- NVIDIA GeForce GTX 980 4GB
- Plextor 128GB M.2
- Seagate 1TB Hybrid SSHD
- NZXT H440 Chassis
- Corsair CS 650W Modular PSU


"This superb Devil's Canyon machine won't dissapoint"

### Microraptor £1,049

- Intel® Core™ i5 4690K processor (4x4.3Ghz)
- Windows 8.1 (64-bit)
- Gigabyte Z97N-Wifi Motherboard
- Corsair 16GB Vengeance 1600Mhz RAM
- 128GB SSD
- 1TB S-ATAIII 6.0Gb/s HDD
- NVIDIA GeForce GTX 970 4GB
- Coolermaster Elite 130 Chassis
- Corsair CX 600W PSU

GIGABYTE™

PC ADVISOR ★★★★★

"A gaming PC that delivers excellent performance for the price"

**Discount Code:**
**PCF32G3W**

Free 32GB drive +
3 working day priority

DinoPC.com

www.dinopc.com
0844 999 4123
Or visit our London office

# Chillblast

www.chillblast.com

**£15 OFF** ANY CHILLBLAST PC | WITH THE CODE: **PCFDISC1214**

9021

# THE POWER TO PLAY

## Fusion **Ares** X99

- NZXT H440 Black Case
- Intel® Core™ i7-5820K Processor
- Corsair H100i Water Cooler
- Gigabyte X99-Gaming 5 Motherboard
- 16GB 2133MHz DDR4 Memory
- Radeon R9 285 2GB Graphics Card
- 250GB Solid State Drive
- 2000GB SATA 7200RPM Hard Disk
- Corsair CX 750W PSU
- Microsoft Windows 8.1

From **£1399.99** inc VAT

Beating at the heart of the Fusion Ares is Intel's latest 5th generation Core i7 5820K, expertly overclocked by our engineers to up to 4.2GHz. This chip offers 50% more performance than even the 4790K thanks to two additional CPU cores, and supports quad channel DDR4 RAM for unparalleled memory bandwidth. 16GB of 2133MHz DDR4 is included as standard, provided as 4 x 4GB sticks for optimum performance. Gaming is capably handled by the AMD Radeon R9 285 2GB video card. This brand new card offers exceptional performance in the latest games and can be doubled up in a Crossfire configuration for true 4K capabilities without breaking the bank. Storage has not been forgotten either, with 250GB of dedicated SSD you'll have space for Windows as well as your favourite games, and a 2TB secondary drive gives you enough space for the rest of your Steam Library.

**5 Year Warranty** with **2 Years Collect and Return** with **ALL PURCHASES**

## Furion **Nebula** Z97

- Intel® Core™ i7-4790K Processor
- Asus Z97-K Motherboard
- 16GB 1600MHz DDR3 Memory
- GeForce GTX 970 4GB GPU
- 250GB Solid State Drive
- 1000GB SSHD Hybrid Hard Disk
- Microsoft Windows 8.1

From **£1199.98** inc VAT

## Fusion **Dragon** Z97

- Intel® Core™ i7-4790K Processor
- Sabertooth Z97 Mark 1
- 16GB 1600MHz DDR3 Memory
- GeForce GTX 780Ti 3GB GPU
- 120GB Solid State Drive
- 2000GB SATA 7200rpm Hard Disk
- Microsoft Windows 8.1

From **£1699.99** inc VAT

## Fusion **Probe** Z97

- Intel® Core™ i5-4690K Processor
- 16GB 1600MHz DDR3 Memory
- GeForce GTX 970 4GB GPU
- 120GB Solid State Drive
- 2000GB SATA 7200rpm Hard Disk
- Microsoft Windows 8.1
- Monitor • Mouse • Keyboard

From **£1299.00** inc VAT

## **Helix 17"** Gaming Laptop

- Intel® Core™ i7-4710MQ Processor
- 17" Full HD Display
- 8GB 1600MHz DDR3 Memory
- GeForce GTX 870M GPU
- 120GB mSATA Solid State Drive
- 1000GB Hybrid SSD/HDD
- Microsoft Windows 8.1

From **£1249.99** inc VAT

For full specifications and customisation options go to: **www.chillblast.com**

**Chillblast**
e-mail: sales@chillblast.com
tel: 0845 45678 31

**The UK's most awarded PC Builder***
But don't just take our word for it...
-Five time winner of PC Pro Excellence Award!
-Four time winner of PC Advisor Best Desktop Brand!
-Builder of the World's Fastest PC!**
-Computer Shopper & Expert Reviews Best PC Manufacturer 2012

* Chillblast won more awards in the leading IT press publications PC Pro, PC Advisor and Computer Shopper combined than any other retailer 2010-2013
** World's fastest PC as tested by PC Pro Magazine http://www.pcpro.co.uk/reviews/desktops/371152/chillblast-fusion-photo-oc-iv

Terms and conditions are on the website. All trademarks are acknowledged.
Pictures are for illustration only. Prices are correct at time of going to press (26-10-14) E&OE



9000