RASPBERRY PI SALES PASS FIVE MILLION

But does that make it the bestselling UK computer of all time? **The MagPi** delves into the past to find out...

When the Raspberry Pi was launched in February 2012, Foundation trustee Eben Upton's firm belief was that the tiny and inexpensive bare-bones computer would sell 10,000 units over the course of its lifetime. As it turned out, Mr Upton could hardly have been more wrong – albeit much to his delight.

For in the first year alone, the Pi hit sales of 1 million, as demand outstripped supply to such an extent that it proved very difficult for the manufacturer to keep up. But on 17 February this year, the sales figures reached a staggering 5 million – making the Raspberry Pi the fastest-selling UK computer of all time, as well as one of the most successful.

It's been a long time coming for a British-made home computer to come close to anything like the dominance of the machines of the 1980s and 1990s. Back then, multimillion-selling computers were far more common, as entrepreneurs and inventors ranging from Clive Sinclair to Alan Sugar lined up for a slice of the emerging market, making their fortunes and earning lordships and knighthoods in the process.

Yet there is still some way to go before the Pi can take the undisputed crown of the UK's biggest-selling computer. While the Pi has more than surpassed the 1.5 million BBC Micros sold and bettered the entire Amstrad CPC range (which, despite being especially popular in France, shifted just 3 million units), it still lags behind the Amstrad PCW's 8 million sales. Significantly, though, it has gone neck and neck with the most iconic British-made computer of all time: the ZX Spectrum.

The Speccy

The Speccy, as it was affectionately called, was launched by Sinclair Research in 1982 and it attracted the attention of 5 million punters – the exact same number as the

TAKING UP ARMS

When sales of the Raspberry Pi eventually exceed that of the ZX80, ZX81 and ZX Spectrum combined, the consensus is that the small-form computer will become Britain's most successful of all time. But will it?

According to Stephen Furber, one of the designers of the BBC Micro, a lot depends on how the terms are defined. "More than 60 billion ARM processors have been shipped in total, and the rate is now over 12 billion a year (a small subset of which are, of course, going into the Raspberry Pi), so ARM is clearly the most successful British computer of all time, and indeed the most successful computer in the world," he says. "But maybe ARM doesn't count as a 'computer' because it is a microchip – or a part of a microchip – that needs other components to operate?"

Raspberry Pi. There is some debate over whether or not the figures should include the sales of the ZX80 and ZX81 – that would add an extra 1.6 million – but when you look at the pattern of Pi sales, you get a sense that it's only a matter of 'when' and not 'if' it becomes top dog in terms of sales.

> "Should this trend continue, we could, in theory, see an extra 6 million sales in a year's time"

The Raspberry Pi took 20 months to achieve sales of 1.75 million, yet just 16 months more to add 3.25 million. Should this trend continue, we could (in theory) see an extra 6 million sales in a year's time, though Upton touted 3 million as a target for the year. Whatever the truth in that, far from waning, the Pi is becoming more popular. Even Sir Clive Sinclair, the brains behind the Spectrum, has been impressed by its impact.

"It's very exciting," he said. "I think it's dramatic and terribly clever." He has praised both its low cost and its accessibility which, like his Spectrum, allows users to quickly start coding. "Suddenly people can again get their hands on computing power and play with it, manipulate it and really understand it."

All of this is undoubtedly brilliant news for the Foundation, which created the computer as a tool to get children coding. Over the past three years, the Pi has become as ubiquitous in British schools as the BBC Micro was in the 1980s, and the irony of this situation is rather delicious.

After all, the BBC Micro was produced to complement the BBC Computer Literacy Project, which aimed to familiarise pupils with the ins and outs of these newfangled machines back in 1981. When affordable PCs became common in the home and consoles began to seize control of the gaming industry, it became more difficult for children to 'get under the hood' of computers, and so the number of youngsters growing up with programming skills nosedived. The Raspberry Pi was created as a response to this.

A touch of Micro magic

It was hoped that by invoking the spirit of the BBC Micro, coding skills would rise again. On the back of this, former education secretary Michael Gove proposed that Computing, with a firm emphasis on coding, would replace ICT as a subject in schools. As the new curriculum was introduced last September, so many more Raspberry Pis were purchased.

Teachers view the computer as the perfect way to introduce children to programming and so the Raspberry Pi has become the new BBC Micro, albeit with greater sales and better penetration. Best of all, instead of having one computer per class, the Pi is so inexpensive that some schools have enough for every pupil. It's a triumph in every sense.

"The success of the Raspberry Pi is to be highly welcomed," says Stephen Furber, one of the designers of the BBC Micro. "It has created a real buzz of excitement around learning to use computers, reminiscent of the early days of the BBC Micro."

FROM BEDROOM TO BOARDROOM

The Raspberry Pi's remarkable success has spawned a cottage industry of entrepreneurs, fuelled by crowdfunding platforms like Kickstarter. Here are some recent Raspberry Pi success stories...

› FLOTILLA

Build great ideas in minutes, not hours, with Flotilla for Raspberry Pi by the pirates of Pimoroni. Flotilla recently rocked Kickstarter, surpassing its goal by 447% to raise nearly £147,000.
flotil.la

› OPENPi

For inventors, makers and coders, OpenPi is designed to make it easier and cheaper to design, make and sell products based on the Compute module.
wirelessthings.net/openpi

› RASPiO DUINO

Learn to code Arduinos from the comfort of your Raspberry Pi with the latest Kickstarter project from the co-creator of HDMIPi and RasPi.TV blogger, Alex Eames.
kck.st/1zrHIFI

Image: Bill Bertram CC BY-SA 2.5

Above Playground debate raged over whether the UK's limited-colour Spectrum was better than the American-made Commodore 64

Image: Stuart Brady (public domain)

Above Very few pupils went through a British school in the 1980s without learning to program (or play *Chuckie Egg*) on a BBC Micro

Image: Bill Bertram CC BY-SA 2.5

Above Lord Alan Sugar's Amstrad made the CPC range, including the 464 (pictured). The disc-based 6128 sold well in France

RASPBERRY PI 2

Better, faster, stronger

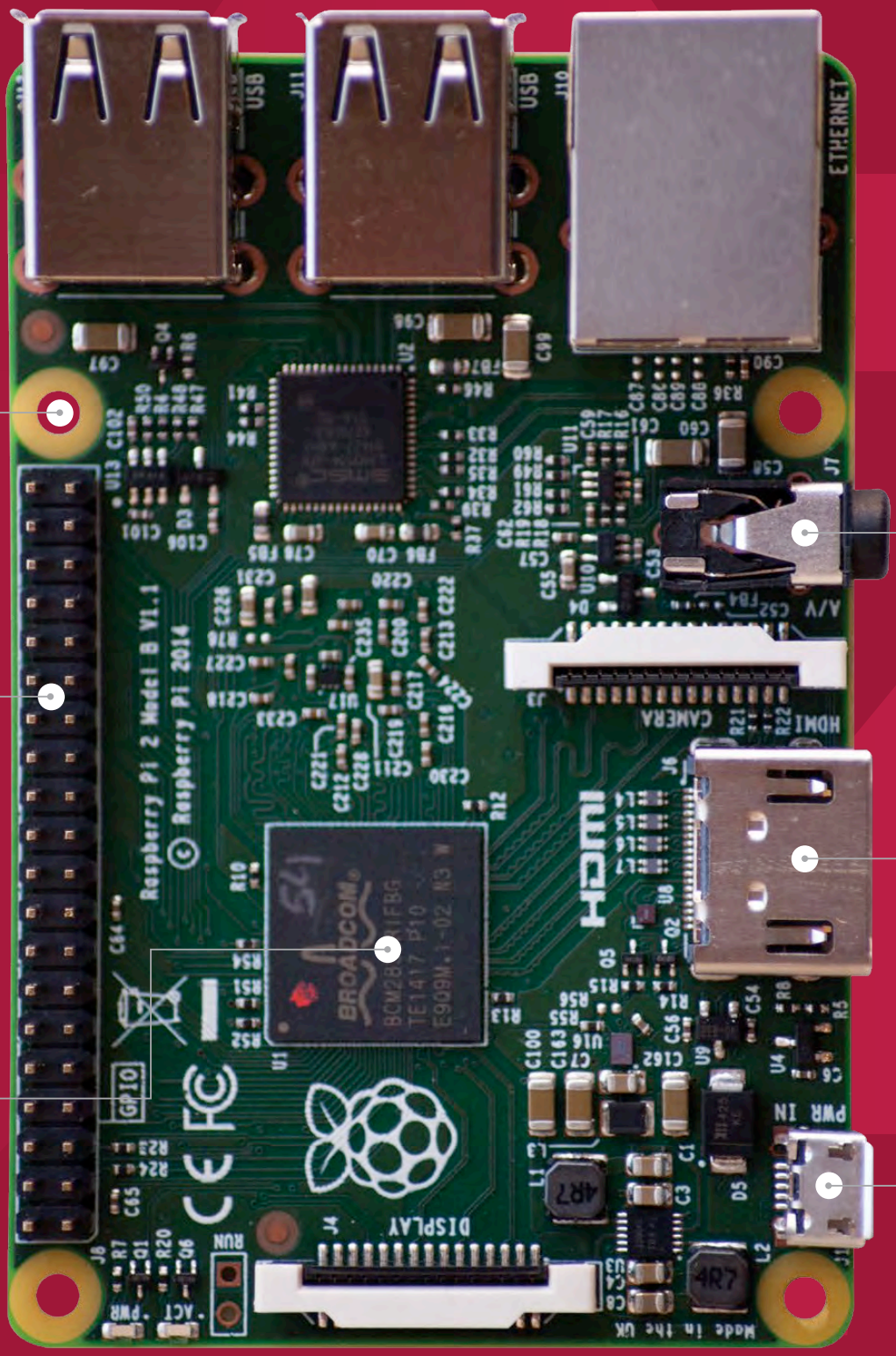
The Raspberry Pi is a really tiny, really cheap computer. So cheap, in fact, you could sacrifice your Starbucks coffee for a week to afford one. Because it's so small and affordable, it's an excellent tool to teach computer education in schools. As the Raspberry Pi Foundation learned, however, the 'bigger' kids among us quite enjoy playing with the Pi too.

Regardless of how old you are, you can hack, make, watch movies, and even play games with it. With the Raspberry Pi, though, it's just as easy to start making your own game or movie as it is to passively consume one. This is one of the key things that sets the Raspberry Pi apart from its growing competition.

With the Raspberry Pi 2, those goal posts have shifted. With its sixfold increase in power, whether you're making or playing games, movies or music, the experience is all the better for it.

On paper, the upgrade itself is pretty mundane stuff. The Pi 2 is essentially identical to a Model B+ in almost every respect. Other than its four 900MHz ARM Cortex-A7 cores and 1GB of RAM (as opposed to one 700MHz ARM Cortex-A6 core and 512MB of RAM), you could easily confuse the two.

The fact that there's no killer application exclusive to the Raspberry Pi 2 is, conversely, its biggest asset and a super-weapon primed to stave off even the stiffest competition in the burgeoning 'maker' marketplace. Best-of-British design and engineering is one thing, but a real commitment to powerful and flexible open source software, that offers near-total cross-compatibility between models, ensures this tiny, cheap computer is one of the most powerful in the world today, regardless of the model you're using...



The Pi 2 is compatible with almost every Model B+ case on the market

Add-ons designed for the Raspberry Pi Model B+, and any HAT add-on boards, will work on the Raspberry Pi 2 Model B

The 900MHz quad-core ARM Cortex-A7 CPU on the Broadcom BCM2836 SoC. The 1GB of RAM sits on the rear of the board

The combination analogue audio and video port is useful if you don't have an HDMI screen to connect to

Plug your Pi into any modern monitor or TV to turn it into a powerful quad-core Linux PC

Pi 2 uses the same amount of power as the Model B+ when idle, but can use as much as the original Model B under load

"We released the original Raspberry Pi on the 29th February 2012," says its creator Eben Upton. "It's been successful beyond our wildest dreams. Three years in, we've sold five million, and we think somewhere between one and two million Raspberry Pis are in the hands of children."

While the launch of the Raspberry Pi 2 on the 35th floor of the Shard, one of London's most impressive new landmarks, was quite grand, the humble aim of the Raspberry Pi Foundation was never far from view. The goal has always been to get more kids into computing; to give children of today the same kind of experience people growing up during the home computing boom of the '80s and early '90s had – people of Eben Upton's generation.

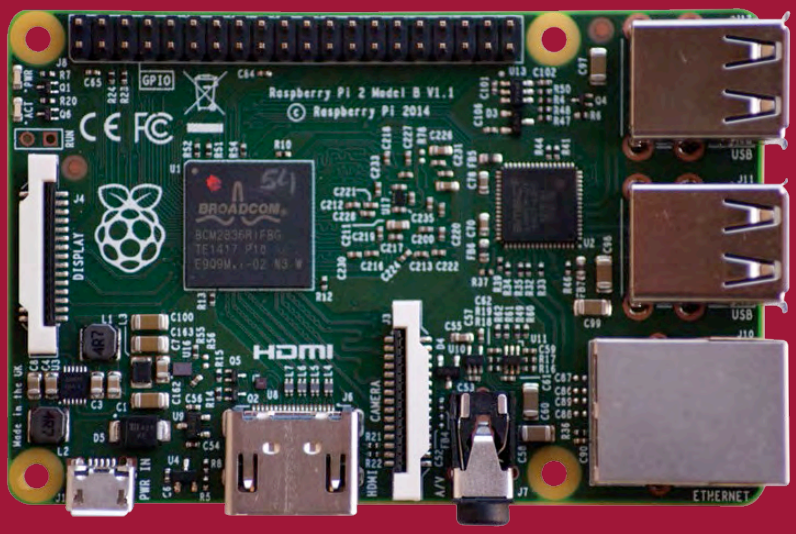
"It's the idea of having a computer in the bedroom that's hackable and fun," says Upton. "In the first few months we were concerned they were only going in the pocket of people like me, but over time it's become clear there is interest from children in learning computing with the Raspberry Pi. As much as anything, there's interest from children in learning something their parents don't understand."

Of course, even the Raspberry Pi Model B+ wasn't perfect. You can't build a $35 computer without making compromises. "The Raspberry Pi has a level of computing power of a PC from the turn of the century. Even when we doubled the RAM six months in, it still only had half a gigabyte." The Raspberry Pi 2 has been released to address these deficiencies, and more besides.

"The Raspberry Pi 2 takes us to a level of performance that makes it a genuine PC. We have power users in the office today that are using the Pi 2 as their PC at home," continues Upton. "While the Raspberry Pi was a great little PC, insofar as you had to be a little forgiving given the price, Pi 2 costs $35 and is now just a great PC – there is no caveat anymore."

> "The Raspberry Pi 2 takes us to a level of performance that makes it a genuine PC"

That's the money shot: the realisation that actually you can have your cake and eat it. It's also the moment you realise that the single-board computer revolution just got interesting. The Raspberry Pi was the hacking and making board with brains, but the Raspberry Pi 2 takes the formula much further: real-time physics calculations, complex computer vision projects with the Camera Module, and anything else – up to and including complex weather simulation – with minimal investment in hardware. The Raspberry Pi 2 represents the backbone of the perfect university computer cluster.



Below
Imagine what could be achieved with a cluster of 40 Pi 2s running side by side

2012

May 2011
BBC news goes viral online
Elite game developer David Braben reveals an early prototype of the Raspberry Pi to BBC correspondent Rory Cellan-Jones. The video goes viral.

Feb 2012
Raspberry Pi Model B released
The Raspberry Pi Model B breaks the internet as overwhelming demand crashes the websites of its makers, Premier Farnell and RS Components.

March 2012
Ethernet bork slows progress
Due to a manufacturing error in China, the wrong networking ports are soldered to the first Pis, holding up production while they are replaced.

April 2012
Short supply fuels fire
The Raspberry Pi becomes available, but only in very short supply. Demand for the Pi and pre-order waiting lists continue to grow unabated.

May 2012
A community magazine is born
The MagPi magazine comes into the world! The magazine was designed by enthusiasts for enthusiasts and it's still alive and kicking!

July 2012
Raspberry Pis on the edge of space
Dave Akerman puts a Pi where no Pi has gone before: 40km straight up, attached to a weather balloon. He's repeated the feat many times since.

September 2012
New jobs for Pi bakers in Wales
The Foundation announces a deal with Sony that sees Pi production start up in a plant in Wales, meaning UK jobs for a UK computer.

Above **Eben Upton eyes Element14's past success, but there's much more to come**

Software, software, software

The Raspberry Pi has popularised the format of the affordable development platform beyond all recognition, but it wasn't the first single-board computer and it won't be the last. The market has become saturated with competitors, many already as powerful as the Pi 2, others more powerful still. So what makes the Raspberry Pi special? The same thing that led to the iPad's runaway success in the tablet market – useful, targeted, easily accessible software.

In the three years that the Raspberry Pi has been with us, the Foundation has been working tirelessly on improving its software offering. Much like Ian Bell and David Braben dedicated themselves to crafting their BBC Micro assembly code to cram their most famous game, *Elite*, into a 22KB footprint, the Raspberry Pi Foundation has crafted Raspbian, its official Linux-based operating system, into an efficient, capable interface for its credit card-sized PC. Even before Pi 2 hardware, the Pi had become much faster and more usable because of Raspbian.

Adding a further three CPU cores and 512MB of RAM, while retaining complete compatibility with the same lean, polished software, is like stripping all the excess weight out of your car and fitting a roll cage. The Raspberry Pi 2 was born track-ready.

It was a must that all users of all Raspberry Pi models have the same experience. As Eben Upton so eloquently puts it, "We don't want to orphan 4.5 million Raspberry Pi users." Raspbian is Raspbian, whether you're running a Pi or a Pi 2, a Model B or an A+, the latest add-on HATs (Hardware Attached

RASPBERRY PI 2 IN NUMBERS

10
The version of Windows supported by the Pi 2

6
Average speed increase from the Pi Model B+

10,000
The number of Pis the Foundation thought it might sell

20
The number of full-time Raspberry Pi employees

3m
The number of Pis the team hope to sell during 2015

900
The speed, in MHz, of the new ARM Cortex-A7 processor

02/02/15
The date the Raspberry Pi 2 was officially released

2013

October 2012
Thanks for the memory
The Model B gets an upgrade from 256MB to 512MB RAM, in the hope it will become more useful as a home computer. It seems to do the trick.

November 2012
Three. Two. One. Say cheese!
The Camera Module is released. Its 5MP sensor and ability to record in HD ensure it's a resounding success and must-have Raspberry Pi accessory.

January 2013
Google puts Pis in schools
Google's Eric Schmidt donates 15,000 Raspberry Pis to be placed in schools all around the UK, alongside other educational material.

February 2013
The Model A is finally released
The Foundation announces the cheaper, lower-power Raspberry Pi Model A. It has 256MB RAM, no Ethernet, and only one USB port.

March 2013
One million (and counting)
After celebrating its first year on sale, the Raspberry Pi also breaks the one million sales barrier. Less than two years on and five million have been sold.

April 2013
Half a million Welsh Pis
In the six months since production of Raspberry Pis started in a Sony plant in Wales, 500,000 have already rolled off the production line.

May 2013
Can we have all the swag?
The Foundation launches the Swag store. Every purchase from the store helps fund the Foundation's educational activities in the UK and abroad.

SIX THINGS THAT ARE BETTER WITH RASPBERRY PI 2

Home office
You can now use the Raspberry Pi as a productivity machine. Now packages like LibreOffice (**Libreoffice.org**, the open source alternative to Microsoft Office) are responsive and usable.

Web browsing
Enjoy loading times four times faster than the old Model B – the Pi 2 hardware is much more adept at running modern websites. It's still not perfect, but it's nowhere near as frustrating as it used to be.

Minecraft: Pi
Minecraft is easily three times faster than before, and coders will be able to create much more elaborate and 'explodey' scripts. It's also now more realistic to create a *Minecraft* server with the Pi 2, as **stuffaboutcode.com**'s Martin O'Hanlon recently demonstrated (**bit.ly/1DzFJqx**).

Computer vision
With the addition of the affordable Raspberry Pi Camera Module, the Raspberry Pi 2's four faster cores make the evaluation and processing of images and video streams much easier.

Sonic Pi 2
Despite a cruel bug that initially meant the live coding music application couldn't use the full amount of RAM afforded to the Pi 2, the ability to create better beats and more complex compositions has drastically increased. Check out **sonic-pi.net** to get started today.

Retro gaming
The Pi is already a very popular solution for playing retro games, but the extra power from the Pi 2 opens up a whole world of new possibilities, including the emulation of fifth-generation consoles like the Nintendo 64.

on Top) are designed to 'just work'. The pin layout is the same for GPIO projects, and even 99% of the cases designed for the B+ fit the Pi 2. The Foundation has made a lot of its decisions based on the community and the cottage industry that surrounds the Pi, and it shows.

It wasn't a completely smooth getaway, though, with a small amount of wheelspin as the Pi 2 crossed the start line. There were some avoidable GPIO issues, an unforeseeable Sonic Pi 2 bug, and a rather amusing glitch that sees the Pi 2 proving rather camera-shy (crashing when a particular xenon flash is used in close proximity to a certain photosensitive component on the board). All these things were overshadowed, though, by the performance benchmarks the Raspberry Pi community were quick to supply.

Chief among them were **RasPi.TV**'s comparison videos. Alex Eames's short videos almost perfectly sum up the added user-friendliness that the extra power provides. According to the side-by-side comparisons (which you can see at **raspi.tv/?p=7589**) the Pi 2 boots in just 15 seconds, half the time it takes the Model B+.

2014

June 2013
Silver is better than gold
Eben Upton, creator of the Pi, receives the Royal Society of Engineering's Silver Medal for outstanding contributions to UK engineering.

August 2013
A weekly slice of Pi
Ben Nuttall and Ryan Walmsley start a weekly Pi newsletter, **piweekly.net**, which – as of Feb 2015 – has over 10,000 happy readers and counting.

October 2013
Infrared-y on set? Action!
The Pi NoIR version of the Camera Module is announced. The NoIR is designed to operate in the dark, so it's ideal for capturing nature shots and doing science.

November 2013
Wolfram: It all adds up
The Wolfram Language (as used for Mathematica) is launched. The Pi is the second computer ever to feature it installed free as standard.

December 2013
Adventures in Raspberry Pi
Carrie Anne Philbin's award-winning *Adventures in Raspberry Pi* is released. Find it on our top reads list in this issue's book reviews (page 62).

February 2014
A birthday gift from Broadcom
On its second birthday, the Foundation reveals that Broadcom has released the graphics stack of the Pi's VideoCore GPU under a BSD 3-Clause licence.

March 2014
The MagPi comes of age
The 21st issue of The MagPi magazine is released to the world, and includes articles on PIR motion detection and weather stations.

> This isn't the same Windows 10 we'll be seeing on most other devices

Perhaps an even more accurate reflection of the Pi 2's new capability as a productivity machine, or second home PC, is the massive boost in performance seen from Epiphany, Raspbian's relatively new HTML5- and JavaScript-capable web browser. Browsing has always been the Raspberry Pi's most frustrating Achilles heel. It struggles to reliably serve all but the simplest of webpages and keels over at the prospect of handling JavaScript-heavy content. But in his testing of the Pi 2, Alex Eames saw webpage loading times reduced by 75%. **RasPi.TV** demonstrated **raspberrypi.org**'s homepage loading in six-and-a-half seconds. It's still no spring chicken, but side by side with the B+ it's the Usain Bolt of Raspberry Pis, breaking the previous record by a whopping 16 seconds.

Microsoft joins the party

Probably the biggest story surrounding the release of the Raspberry Pi 2 was the news that the Foundation has been working with Microsoft for six months to bring Windows 10 support to the Pi 2. "This is a really exciting thing for us. Raspberry Pi 1 uses an ARM 11 processor, which implements the ARM v6 instruction set architecture. In moving to this new core we've moved to the ARM v7 instruction set architecture, which broadens out the range of operating systems we can run on the Raspberry Pi," explains Upton. "Windows 10 runs; I've seen it and it's pretty cool."

While much of the world saw the headlines about Windows 10 support and got excited, they went away misinformed. This isn't the same Windows 10 we'll be seeing on most other devices, despite Microsoft's forthcoming refresh being sold as a universal operating system that encompasses desktop PCs, smartphones, and tablets. "This is a version of Windows 10 primarily targeting Internet of Things (IoT) applications, so the intention here is to have a device you can use to build IoT devices that have screens attached, and it participates in the broad range of Windows 10 API support," explains Upton. You'll be able to take a Windows 10 application that runs on a PC or smartphone and run it on a Raspberry Pi 2. Ultimately, this implementation of Windows 10 support sees the Raspberry Pi 2 flourish in another area in which it excels – as a development platform.

So what's next for Raspberry Pi, now the Raspberry Pi 2 Model B has landed? When you apply its full title, it's clear the potential for a Model A is implied. While Eben Upton has confirmed the intention of making a smaller, lower-power version of the Pi 2, the Foundation is very much committed to the $20 price for the Model A and – as it stands – the maths simply doesn't stack up to produce a quad-core Raspberry Pi in that price range. That said, it's only a matter of time until it happens. Eben has also gone on record to confirm that a Compute Module version of the Raspberry Pi 2 is also in the works. Since there's no inherent price barrier at play, we'll certainly see this before the Pi 2 Model A, but likely no earlier than September.

2015 SALES PREDICTIONS

"We'd like to sell a total of 3 mill in 2015; that would be a good year," says Eben Upton. "The interesting thing about Pi 2 is that it does broaden out the addressable market, so I'm hoping that with this product we stand a chance of having people buy them as their second PC in their house. We've got to that level now where we can address these different market segments. We sold between 2 and 2.5 million in 2014; it would be great to hit 3 million this year."

Below ***Minecraft: Pi*** **becomes even more usable with the advent of Pi 2**

2015

April 2014
A new Pi? It does compute!
The Raspberry Pi Compute Module is announced, **raspberrypi.org** gets a redesign, and a £1 million education fund is also set up.

July 2014
The Model B+ launches
The new and improved Model B+ offers a new layout, lower power requirements, and lots more GPIO pins. It's the Pi the world has been waiting for.

August 2014
Ben goes to America
The Raspberry Pi undertakes a mammoth tour of America, courtesy of the Foundation's Ben Nuttall. He drives over 4,000 miles.

September 2014
An internet Epiphany
A new, improved, hardware video-decoding, ARMv6-optimised, HTML5-supporting web browser is released for the Pi: Epiphany.

November 2014
The Model A+ is released
The Raspberry Pi Model A+ arrives. It's smaller, cheaper and uses less power, making it ideal for battery-powered and small-form-factor applications.

January 2015
Astro Pi is announced
The Astro Pi competition is announced at BETT 2015. Read all about this amazing spacefaring mission elsewhere in this issue.

February 2015
Raspberry Pi 2 has arrived!
The Raspberry Pi 2 is launched. If your memory is so short you need reminding of this already, you require medical assistance, not a timeline.