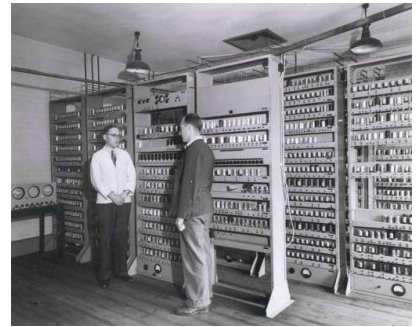


# Let's build another computer!

Back in 2006, 11 years ago, I gave a talk to this group called "Let's Build a Computer". I think there were two or three people here today who were in the group then. I'll remind them of what I did then - and then bring the story up to date. We'll see that the 2017 Raspberry Pi can largely match the 2006 PC at a fraction of the cost. And I'll use the Raspberry Pi to run my screen presentation as I talk.

But to start with let's go back not 11 years but 67. 1949 was the year I went up to Cambridge. And it was also the year when Edsac became the first useful computer. In 1952 I actually did a computer course, delivered by Maurice Wilkes, later Sir Maurice Wilkes, who had led the Edsac project. But then I left this behind with two years in the RAF, and 11 years on radar.



So I'd given computing a chance to move on! By 1966 computers were like this, and this Elliott 803 was the first computer that I learnt to use. And computers have been part of my life ever since. We came to Cheltenham in 1975, and it wasn't long after this that we had a first home computer, the Tandy TRS80.



At the same time, Microsoft had just been launched by Bill Gates.



The IBM PC arrived in 1981. At much the same time, the Xero company devised a windows-type system which actually started the Apple story.



Alan Sugar started Amstrad which had a few successful years using a Windows system called Gem. And of course Acorn had many years of success culminating in their development of the Acorn Risc Machine processors - A.R.M.



Herman Hauser of Acorn said

***"When we decided to do a microprocessor on our own, I gave Steve Furber and Sophie Wilson two things which National, Intel and Motorola had never given their design teams: the first was no money; the second was no people. The only way they could do it was to keep it really simple."***

And that was the foundation for success.

Acorn itself failed, but the ARM story has gone from strength to strength. Something like 80 billion Arm processors have been sold. Of course each Raspberry Pi uses one and that's over ten million..

By the late 1990s the PC and Microsoft Windows had swept most of the opposition away. That was still very much the situation in 2006, though this was the year when Macbook appeared.

PC technology was modular and you didn't actually need too much skill to plug together a dozen or so modules and achieve a working computer. Something like £400 would buy everything one needed including a monitor and a Windows licence.

Assembly began with the 'motherboard', a board with 20 or so plugs and sockets and some electronics - costing from £40. You then needed



- a processor ( the Intel or AMD contribution),
  - with a large heatsink and fan
  - memory modules,
  - power supply unit
  - keyboard,
  - mouse,
  - hard disk,
  - cd drive. - and a cd with the Windows software.
  - and finally a case

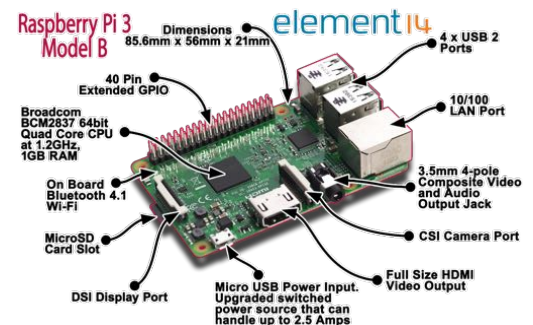


For an S&T meeting back in 2006 I brought in these bits and made an assembly which actually worked. But I'm not going to try that again! I want to move on.

You could still build a PC this way. Firms like Novatech are still in business selling suitable components which have not changed much in the last 10 years. But of course the market for desktop PCs has vastly reduced, replaced by laptops and tablets. These of course are not machines one can easily self-build from modules.

But what about Raspberry Pi and the like. All kinds of things can be done with such devices, so lets see what we can do with a £60 budget. That excludes the monitor, but then it has become so easy to use a TV as an excellent monitor. We'll see that in some respects the Raspberry Pi does more than the 2006 desktop machine, though in other respects it struggles

Half the budget goes on the Raspberry Pi. These days there are versions from only£4. But we'll need something a bit beefier than that. It has to be the Raspberry Pi 3 for £33. You get a lot for the money, including memory, wifi and bluetooth on the board. But in order to build a desktop computer there are a handful of things one can't do without.



Power supply - the only thing you have to ensure is that it is beefy enough to deliver the current - a cheap mobile phone charger is no good, but you can get a suitable one for a fiver.

wireless keyboard and mouse - or it can be wired USB ones if thats what you have lying about

microSD card - which is where the Raspberry Pi looks for its boot-up software. More to say on that.

the software - you can buy a pre-loaded micro SD card, but there's no need for that. All the available operating systems are free to download, and easy enough to transfer to the memory card.

cables

As I said, the software is free. Not Windows of course, or Apple Mac OS, but a choice of Linux based systems. I shall use Ubuntu Mate It comes with Open Office and other useful applications, and with easy access to a great deal more free software.

I said that you need a microSD card - just as in today's digital cameras and mobile phones. But there is a performance issue here. A microSD card holding the software is quite normal - but the speed of the card significantly affects the performance of the system whenever data has to be fetched. I believe that it is better to hold most of the software on a USB memory stick. Better still perhaps to use a hard drive, but that costs more. It's quite hard to find reliable information on speeds which vary quite a lot, but a Sandisk Ultra seems to work well, and is still cheap.

Let's now look at the Ubuntu Mate desk top.

At the bottom are some of the most useful applications in a Mac-style dock

Virtually everything one expects to find in a desk-top office system is there and works slickly. That includes sophisticated graphics-processing applications such as Scribus, the desk-top-publisher

There are some shortcomings of course. On-line videos do not usually play well. And of course there are utilities for which Linux versions are not provided

Another shortcoming of the set up I have on my budget system here is the small amount of storage provided by my 16gb memory stick. Not really a problem. 128gB sticks are now £30 or so. Alternatively one can go to a small hard drive - or a solid-state drive for more money..

