

# Not Your Mother's Raspberry PI

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# Boilerplate

The thoughts expressed within are mine based on what I have seen and read. My employer may or may not agree with the contents.

Also. . .

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# Agenda

- Introduction
- History
- Hardware
- Software
- Impact
- Using a Pi
- Demos

# Introduction

# Who Am I?

I have two Model B Raspberry Pis! (Sofar. . .)

I have been a Unix/Linux user since about 1998.

I have worked at Digital River, Inc since college. From 2000 - 2011 I worked on the "Unix Team" ending as a Senior Systems Engineer. In August of 2011 I joined the Digital River World Payments organization as a Software Engineer.

I graduated from The University of Wisconsin - River Falls with a degree in Computer Science - Information Systems and a minor in Philosophy.

I have two daughters ( 6 and 4 ).

# Executive Summary

The Raspberry Pi is a single-board ARM based computer designed with the intention of stimulating the teaching of basic computer science in schools. It was six years from when the original concept formed in 2006 by the Raspberry Pi Foundation to when it shipped in April 2012.

The Raspberry Pi is built through licensed manufacturing deals with element 14/Premier Farnell and RS Electronics. It is also available through many other online sites.

# History

# History

2006 - Eben Upton and colleagues at the University of Cambridge came up with the idea of a tiny and cheap computer for kids.

2006 to 2008 - Eben Upton designed several versions of what would become the Raspberry Pi.

2008 - Components were becoming more powerful and affordable. The idea of a project became realisable and the Raspberry Pi Foundation was formed.



August 2011 - Fifty Alpha boards were manufactured functionally identical to the planned model B. Demoed running Debian with LXDE playing Quake 3 at 1080p.

October 2011 - A version of RISC OS 5 was demonstrated.

December 2011 - Twenty-five model B Beta boards were built and tested.

January 2012 - The first 10 boards were put up for auction on eBay raising over £16,000.

29 February 2012 - Initial sales commenced.

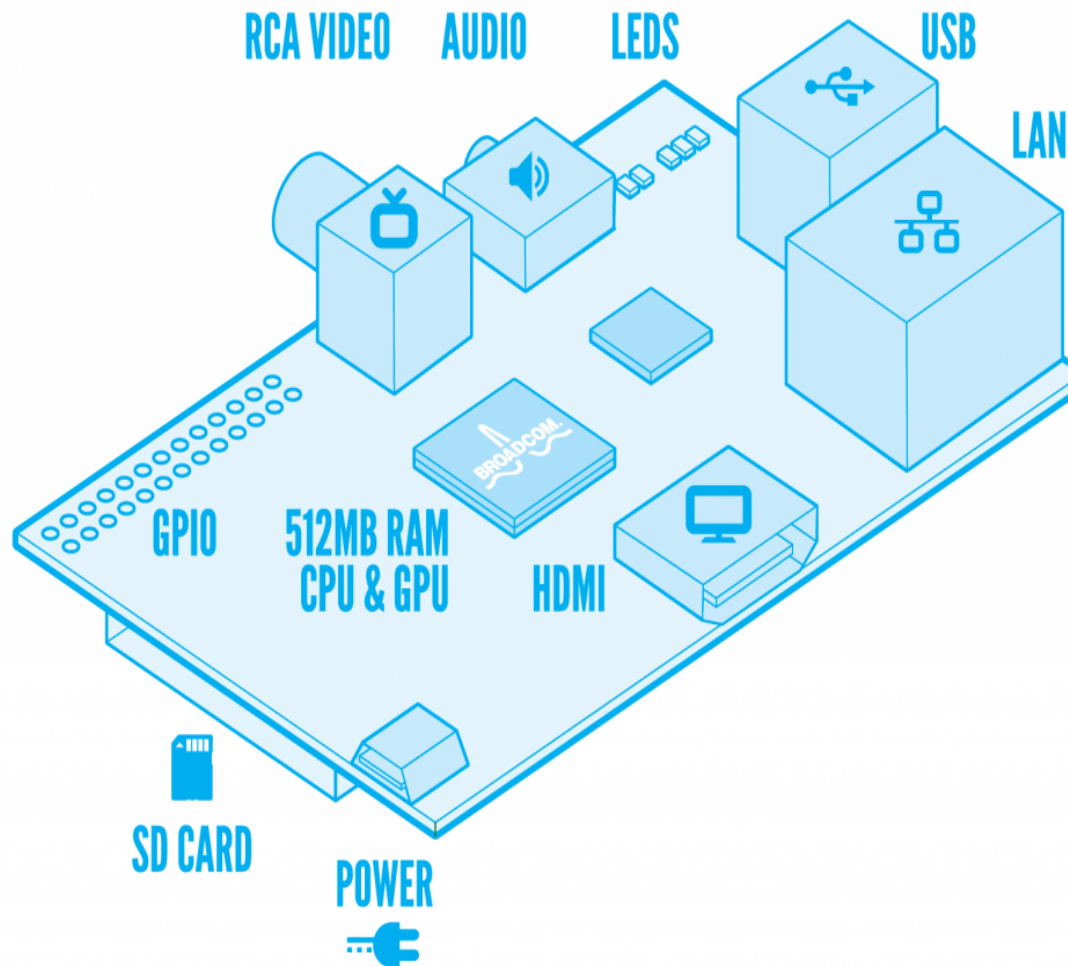
16 April 2012 - The first buyers started receiving their Raspberry Pi.

5 September 2012 - The Raspberry Pi Foundation announced the second revision of the Model B delivering 2X the original RAM.

# Hardware

	Model A (2013?)	Model B
Target Price:	US\$25 Ext tax (GBP £16 Exc VAT)	US\$35 Ext tax (GBP £22 Exc VAT)
System-on-a-chip (SoC):	Broadcom BCM2835 (CPU + GPU. SDRAM is a separate chip stacked on top)	
CPU:	700 MHz ARM11 ARM1176JZF-S core	
GPU:	Broadcom VideoCore IV,OpenGL ES 2.0,OpenVG 1080p30 H.264 high-profile encode/decode	
Memory (SDRAM):	256 MiB (planned with 128 MiB, upgraded to 256 MiB on 29 Feb 2012)	256 MiB (until 15 Oct 2012); 512 MiB (since 15 Oct 2012)
USB 2.0 ports:	1 (provided by the BCM2835)	2 (via integrated USB hub)
Video outputs:	Composite video   Composite RCA, HDMI (not at the same time)	
Audio outputs:	TRS connector   3.5 mm jack, HDMI	
Audio inputs:	none, but a USB mic or sound-card could be added	
Onboard Storage:	Secure Digital SD / MMC / SDIO card slot	
Onboard Network:	None	10/100 wired Ethernet RJ45
Low-level peripherals:	General Purpose Input/Output (GPIO) pins, Serial Peripheral Interface Bus (SPI), I <sup>2</sup> C, I <sup>2</sup> S <sup>[2]</sup> , Universal asynchronous receiver/transmitter (UART)	
Real-time clock:	None	
Power ratings (provisional, from alpha board):	500 mA, (2.5 W)	700 mA, (3.5 W)
Power source:	5 V (DC) via Micro USB type B or GPIO header	
Size:	85.0 x 56.0 mm (two different boards, measured with callipers)	

# RASPBERRY PI MODEL B



# Video

- **RCA video**
- **HDMI**
  - **1080p**
- **Licensed hardware encoding/decoding**
  - **MPEG-2 (pay)**
  - **VC-1 (pay)**
  - **H.264 encode (free)**

# Hardware Downside

- No RTC
  - You must sync your time from an external source
    - NTP
    - RTC containing board (GPS)
- Mentions that each board is different
  - Multiple boards might not perform the same

# **Software**

Operating Systems and Applications



# Operating Systems

## Full OS:

- AROS
- Linux
  - Android
  - Arch Linux ARM
  - Debian Squeeze
  - Firefox OS
  - Gentoo Linux
  - Google Chrome OS
  - Raspberry Pi Fedora Remix
  - Raspbian(Debian with hard float)
  - Slackware ARM
  - QtonPI(Qt framework based)
  - WebOS
- Plan 9 from Bell Labs
- RISC OS

- Unix
  - FreeBSD
  - NetBSD

## Multi-purpose Light distributions:

- Moebius
- Squeezed Arm Puppy

## Single-purpose light distributions:

- Instant Webkiosk
- IPFire
- OpenELEC
- Raspbmc
- XBMC
- Xbian

# Applications

Any application that can be recompiled to execute on the ARM processor should run on the Raspberry Pi.

The only real bounds are the limited amount of resources available to you.

CPU, RAM, and IO

# Languages

Scratch and Python are very popular in the community



Any language compiled to the ARM processor will run on the Raspberry Pi out of the box

More in the demos

<http://scratch.mit.edu>

<http://python.org>

# **Impact**

Education, Industry, and Individuals

# Education

Educators are shown to be very excited about the features of the Raspberry Pi.

Though while early adopters have been quick to move more widespread adoption will take time. A more polished package will be needed as well as teacher and student materials will need to be produced.

It is important for us to help our schools refine their "digital vision" as to support students exploring technology.

“we think that the lack of programmable hardware for children – the sort of hardware we used to have in the 1980s – is undermining the supply of eighteen year olds who know how to program, so that’s a problem for universities, and then it’s undermining the supply of 21 year olds who know how to program, and that’s causing problems for industry,”

-Eben Upton

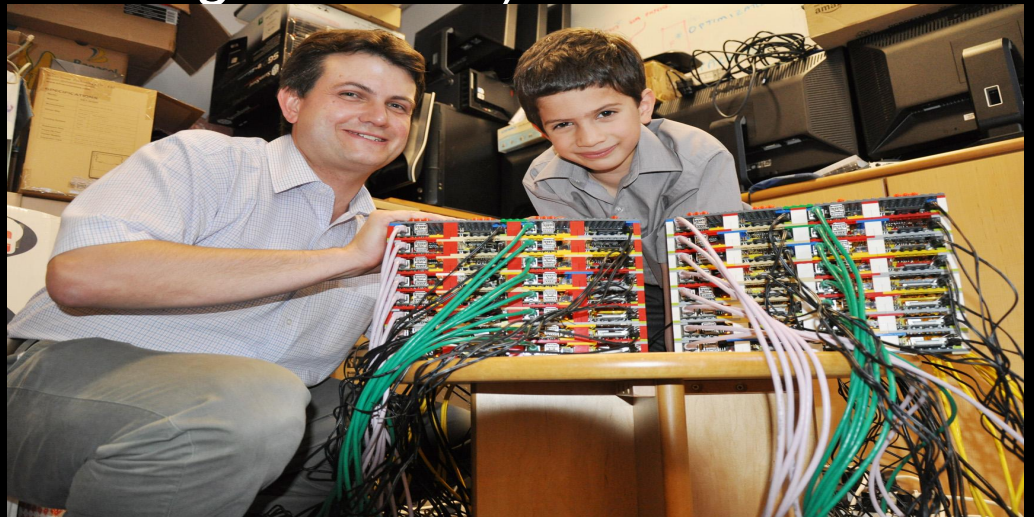
"The creators of the RPi are of a generation that played with, rather than on, computers. Their first consoles were BBC Micros, Commodore 64s, Spectrum ZXs: beige boxes with limited power that offered limited built-in entertainment. In order to really enjoy yourself, you had to tinker about with what your computer could do: change some of the coding and see what happened. If you could do that, you could bring that programming skill to any other computer. But once computers improved, became more powerful and better to play games on, they became harder to program. The tinkering aspect was lost, and this affected swaths of schoolchildren: they just didn't come into contact with programming, even though they had more access to computers, better games consoles, lessons in ICT."

-Miranda Sawyer in The Observer

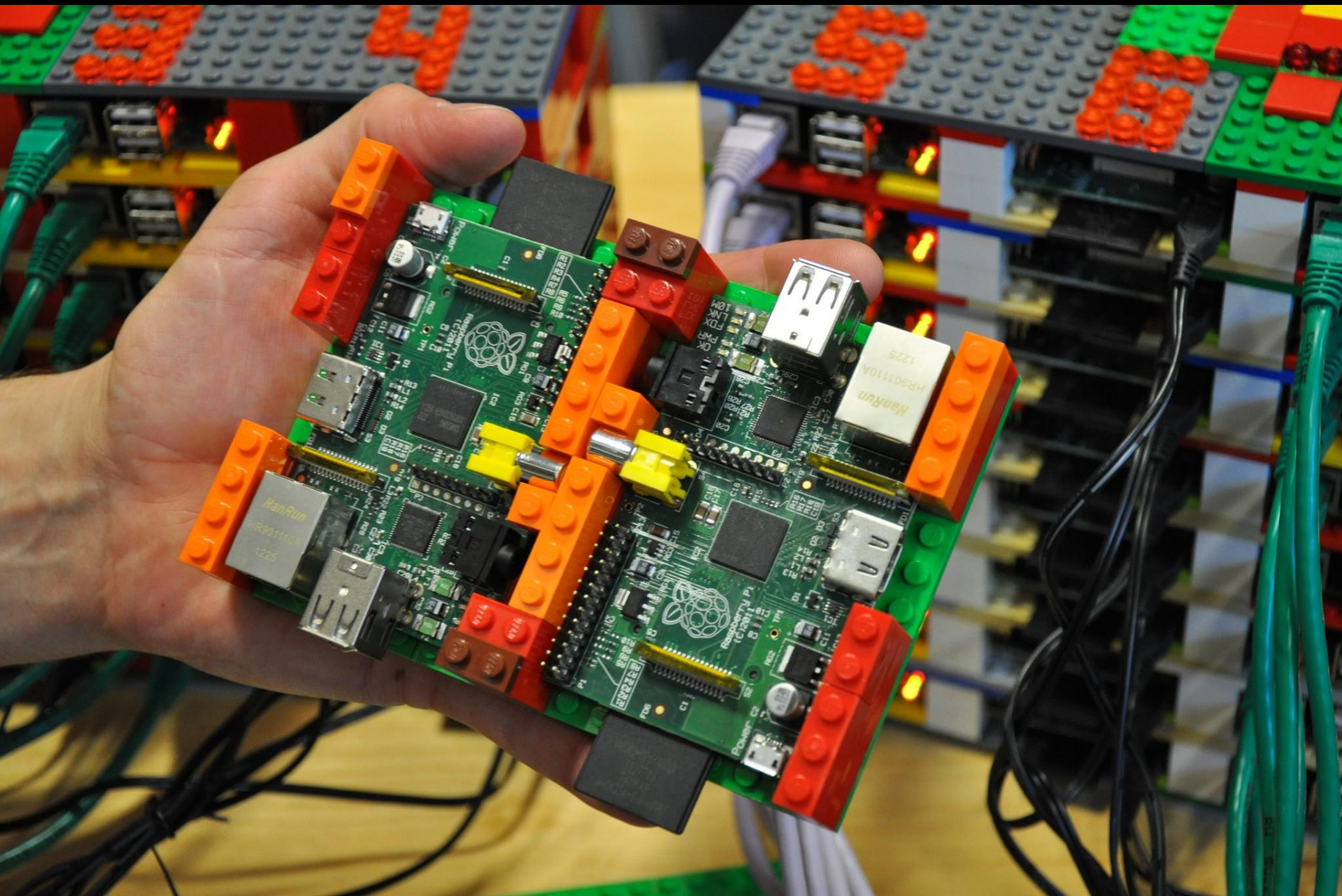
<http://www.guardian.co.uk/technology/2012/nov/04/raspberry-pi-programming-jam-cern>

# Raspberry Pi + Legos = Supercomputer?

- University of Southampton
- 64 Raspberry Pi computers in a Lego framework
- 8 person team and a James Cox(aged 6) for Lego Support
- Uses MPI (Message Passing Interface).
- £2,500 w/o switches







# Industry

The Raspberry Pi is still new but it is starting to affect the industry.

SMBs are springing up selling supporting devices and products.

The Raspberry Pi Foundation has expressed that it is very open to the industry making a profit and driving adoption.

# kickstarter.com

- EVE Alpha
  - A server to connect all your wireless devices to a single device.
- WiPi Wireless Bridge for Raspberry Pi
- Picade: The arcade cabinet kit for your mini computer
- pIO - micro SD Adapter for Raspberry Pi
- PiFlavors

# Individual / DIY

"Our initial expectation was that most of you would buy the Raspberry Pi for educational purposes, and that you wouldn't mind that MPEG-2 wasn't available. Our bad."

-Liz Upton

<http://www.raspberrypi.org/archive/1839>

# Media Center

- 1080p playback
- CEC Support
- Hardware Codecs
  - MPEG-2
  - VC-1
  - H.264
- XBMC
  - OpenELEC
  - Raspbmc
  - XBian





# Games!

MAME

MESS

gngeo

Elite

Quake 3 (and Arena)

Pub Quiz!



<http://www.raspberrypi.org/archive/2412>

<http://blog.seasilverman.com>

<http://myraspberrypiexperience.blogspot.co.uk>

<http://www.raspberrypi.org/archives/2431>

# Raspberry Pi vs. Arduino

- Raspberry Pi
  - Flexible OS and Software
  - Designed as a learning platform
- Arduino
  - Must be flashed to change operating software
  - Has great tools that are easy for beginners
  - Double the price for similar features

**Using a Pi**



# Getting Started

## Musts:

- Raspberry Pi Model B board
- SD Card
- USB power supply
- HDMI or RCA cable
- USB keyboard
- Screen



# Getting Started continued. . .

Optional:

- USB Hub (powered)
- Case
- Gertboard
- Adafruit Pi Cobbler Breakout Kit
- USB Storage (disk or stick)
- USB WiFi
- USB Bluetooth
- Camera (coming 2012?)
- Battery via USB

# Getting Booted

Download an image and use a PC to copy an OS to your SD card.

Most distributions instruct you to use `dd` to copy an image to your SD card.

Recent distributions have install scripts that automate copying your image and basic config tasks.

For your first boot try using Rasbian.

**Demos**

# Demos

- Rasbian firstboot
- RISC OS
- Raspbmc
- Languages!

<http://raspberrypi.org>

<http://www.themagpi.com>

<http://www.element14.com/community/groups/raspberry-pi>

<http://www.adafruit.com/category/105>

[http://www.makershed.com/Raspberry\\_Pi\\_Boards\\_and\\_Accessories\\_s/227.htm](http://www.makershed.com/Raspberry_Pi_Boards_and_Accessories_s/227.htm)

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