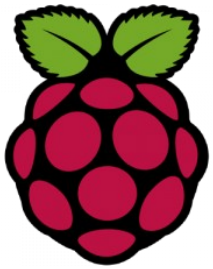


Qt on Raspberry Pi

Jeff Tranter

Integrated Computer Solutions (ICS)

Qt Developer Days 2012

Agenda

- What is the Raspberry Pi?
- Raspberry Pi Foundation
- Hardware
- Software
- QtonPi Distribution
- QtonPi Device Program
- Qt 4 on Raspberry Pi
- Qt 5 on Raspberry Pi

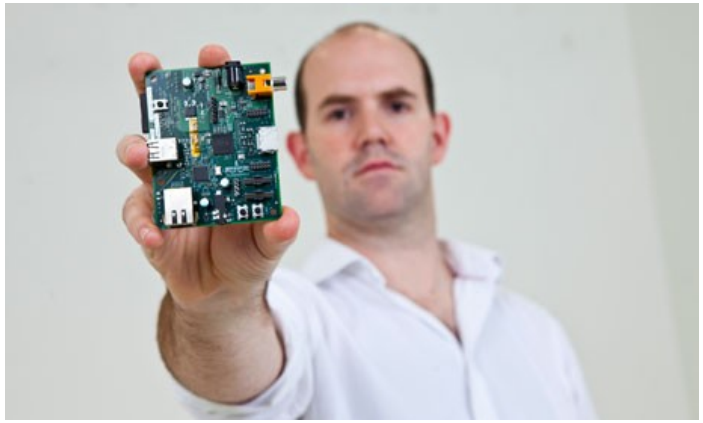
Agenda (continued)

- Input Devices - Mouse, Keyboard
- Output Devices and Touchscreen
- Major Competitors
- Misc. Issues
- Areas Of Future Development
- Demo
- References
- Summary

What is the Raspberry Pi?

"*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.*"

- Co-founder Eben Upton in 2012



Raspberry Pi Foundation

- Non profit British charity
- Promotes basic computer science in schools
- Small: day to day work done by one full-time paid employee and volunteers
- Manufacturing and sales licensed to distributors: Element 14 and RS

What is the Raspberry Pi?

- Project originally started in 2006
- Eventually decided on ARM architecture
- Alpha boards Aug 2011
- Beta boards Dec 2011
- Sales launched February 2012
- First batch of 10,000 boards in Mar 2012

What is the Raspberry Pi?

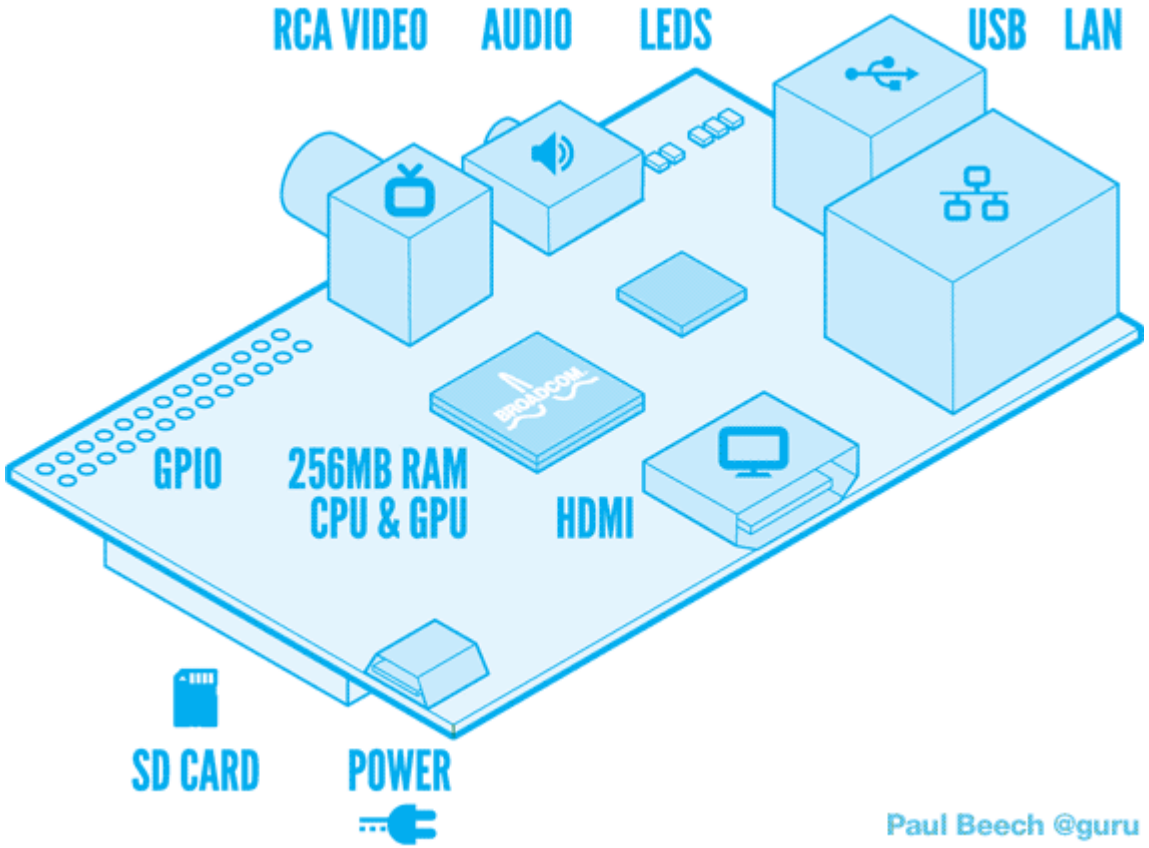
- Two licensed manufacturers/distributors
- Initially unable to keep up with orders
- Two million people registered interest in pre-orders
- As of early July 2012: production 4,000 per day, approx 200K shipped
- Backlog now down to a few weeks
- Most manufacturing now done in the UK

What is the Raspberry Pi?

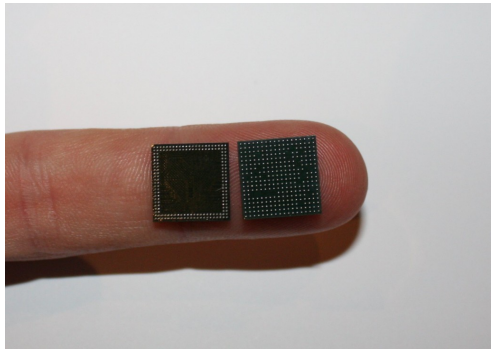
What's With the Name?

- Nostalgia: a number of early home computers had "fruit" names, e.g. Apple, Apricot, Tangerine
- PI is from "Python Interpreter", the official programming language for the Raspberry Pi

Hardware



Hardware



- Credit card sized computer
- CPU: Broadcom BCM2835 SOC
- 700MHz ARM11 with floating point
- Videocore 4 GPU capable of BluRay quality 1080p30 video using H.264 at 40MBits/s
- OpenGL ES2.0 and OpenVG
- SD card for mass storage (can also use USB after booting)
- Model A: 256MB RAM, 1 USB port (not yet shipping)
- Model B: 512MB* RAM, 2 USB ports, Ethernet

Hardware

- Composite and HDMI video out
- Sound output over HDMI and 3.5mm audio jack; can use USB microphone for input
- Header with GPIO ports
- Powered by 5V over micro USB (2.5W/3.5W. Could use battery, i.e. 4 AA cells. Power by USB port not recommended.)
- No RTC (gets time from network)
- Memory not expandable

Hardware

- Retail price US$25 (Model A) / US$35 (Model B)
- Board only: typically add HDMI monitor, SD card, USB keyboard and mouse, power supply
- Some users may use television and second hand keyboard/mouse to save on cost
- Hardware schematics available

Input Devices - Mouse, Keyboard

- USB mouse and keyboard supported
- Can use (powered) hub if more than two USB devices needed

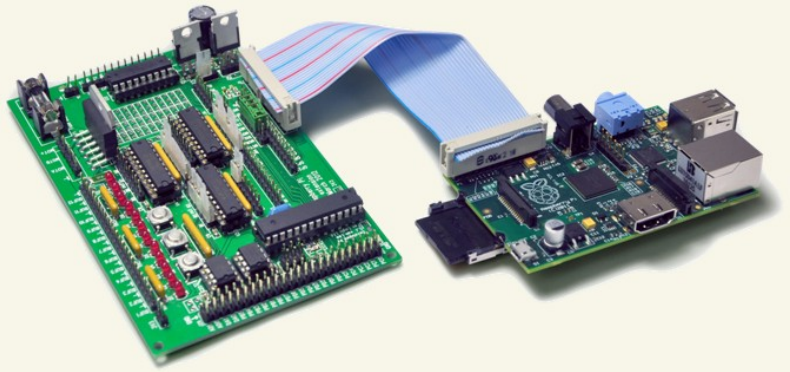
Output Devices and Touchscreen

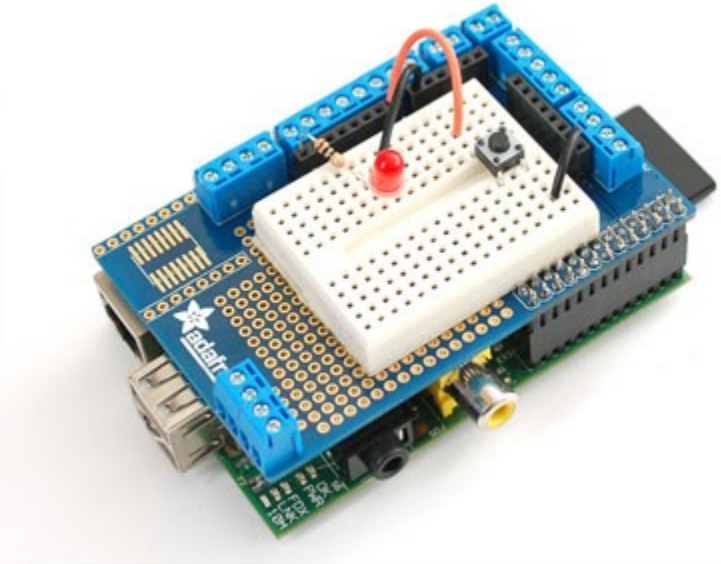
- HDMI and composite video out
- Can use DVI or VGA monitor with adaptor
- Standard touch screen monitors with HDMI should work out of box if they emulate a USB mouse
- Chalkboard Electronics has compatible 10 inch touchscreen with HDMI to LVDS interface board
- Dell 2220 touch screen monitor (needs modified kernel)

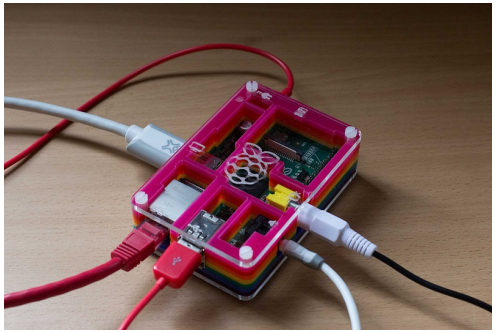
Other Hardware

- GPIO, serial, SPI, I^2C, JTAG ports
- brought out on 26-pin connector P1
- use caution if used directly as no protection from overvoltage, etc.
- MIPI CSI-2 (Camera Serial Interface) on connector S5
- DSI (Display Serial Interface) on connector S2 for driving LCD (no drivers currently)
- Rev 2 board makes some small changes

Other Hardware

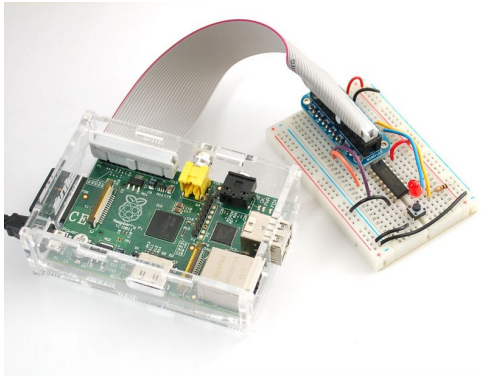






Other Hardware

- Official camera module:
  - Approx. $25
  - 5 MP images and video
  - Attaches to CSI port via ribbon cable
- GPIO expansion boards: AdaFruit Pi Cobbler, AdaFruit Pi Plate, GertBoard
- LCD displays
- Third party cases
- Many more to come



Software

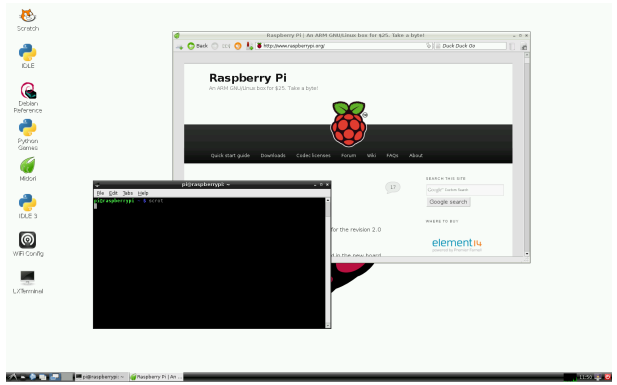
- Linux-based
- recommended distro is Debian-based Raspbian "Wheezy" (uses hardware FP)
- Several other Linux distros supported
- GPU code was proprietary but open sourced in Oct
- Other operating systems: RISC OS (Acorn), Android, BSD, Plan 9, AROS, Open WebOS, etc.

Software

- Currently aimed mostly at developers
- Preferred language for educational apps is Python
- Will eventually include applications like games and development tools for kids including BASIC, Python
- Unlikely to Run Windows 8 (needs newer ARM CPU)
- Can't run Windows apps using WINE since not x86

Raspbian Distribution

- Currently the preferred distribution
- Based on upcoming Debian 7.0 “Wheezy” release
- Optimized for Raspberry Pi hardware
- LXDE - Lightweight X11 Desktop Environment
- Uses hardware floating point in ARM chip
- Over 35,000 software packages
- http://www.raspbian.org/

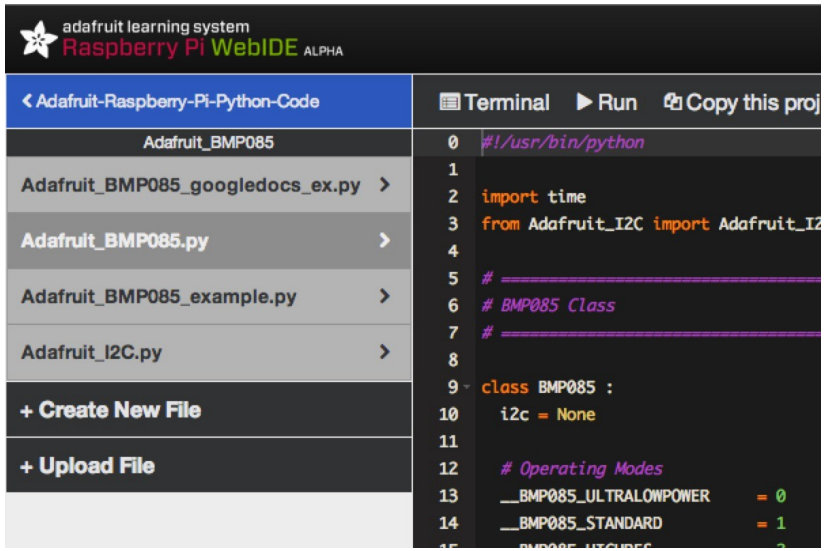


QtonPi Distribution

- Qt 5-focused distribution
- SDK (Qt Creator) with development tools
- SD card image
- Fedora based
- No longer maintained, Qt 5 packages are now in Debian Wheezy beta and soon in Raspbian

Other Distributions

- AdaFruit Occidentalis distribution for teaching electronics
- AdaFruit WebIDE: browser based IDE that runs on desktops
- ARCH Linux ARM
- Soft-float Debian Wheezy



QtonPi Device program

- 400 boards ordered by Nokia and partners like ICS in late 2011
- Allocated to Qt developers who were qualified with project ideas
- Delivery was delayed by move to using licensed hardware distributors
- Shipped to developers and partners in August 2012

Qt 4 on Raspberry Pi

- Packages available on Debian Wheezy beta and Raspbian
- Doesn't make use of graphics hardware acceleration (no OpenGL)
- Runs okay in my experience
- Focus of development is on Qt 5 where Scene Graph pushes more work to GPU

Qt Mobility (Qt 4)

- Qt add-on used by some applications
- Not available as a package
- Was not ported to Raspberry Pi per se
- Builds from source without changes
- Some modules are not applicable (e.g. phone-specific)
- Use latest source from git as the 1.2 release is getting old and has some compile issues
- In Qt 5 Mobility becomes optional Qt 5 modules

Qt 5 on Raspberry Pi

- Nokia sponsored work (QtonPi) since late 2011
- Can use Wayland and hardware accelerated cursor
- Uses GStreamer for multimedia
- H.264 only free HD video format supported on Pi due to licensing issues
- Hardware similar to some Nokia phones?
- Packages currently in Debian Wheezy beta, moving to Raspbian
- Packaging of QtMultimedia and QtWebKit being worked on

Qt 5 on Raspberry Pi

- See qt-project.org Wiki
- Bakeqtpi script to cross-compile Qt 5 on desktop
- Qt Creator can be used to build (cross-compile) and deploy

EGLFS

- Qt 5 on Raspberry Pi normally uses EGLFS back end
- Uses OpenGL/ES for rendering
- Runs full screen, no window manager, one application instance, does not use X11
- Wayland compositor backend can play nicely with X11 and window managers while still using OpenGL/ES
- xcb backend for X11 currently has no OpenGL support (needed for Qt Quick 2)

Raspberry Pi Competitors

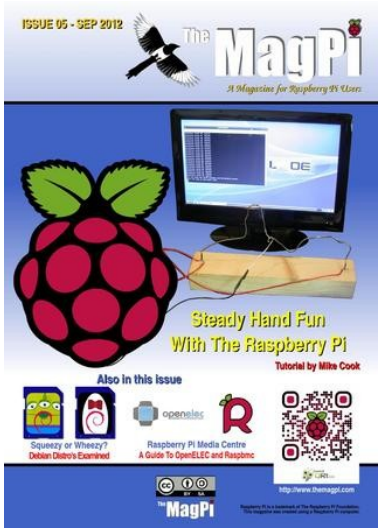
- For embedded development
- BeagleBoard (more expensive)
- Arduino (simpler OS)
- VIA APC (Android)
- Many others coming...

Misc Issues

- Wheezy includes "omxplayer" video player application
- Foundation sells licenses for commercial codecs: VC-1 (Microsoft) and MPEG-2
- RAM is shared between CPU and GPU. Can adjust how it is split (See Wiki and raspi-config program)
- Compiling on the Pi is slow. Can cross-compile on a Linux desktop. See Wiki for details.
- QEMU emulator to emulate Raspberry Pi on Windows or Linux desktop
- Hardware compatibility issues with some SD cards (should be mostly resolved now)

Misc Issues

- Overclocking/overvoltage possible (up to 1 GHz)
- For more filesystem storage you can connect USB flash or hard drive
- Can use USB dongle for Wi-Fi if it has a suitable driver
- Official book: *Raspberry Pi User Guide*
- Free monthly magazine: *The MagPi*
- Summer 2012 coding contest



Areas Of Future Development

- Port of Android 4.0 (already demoed)
- Model A
- Educational/consumer version with case, power supply, keyboard, etc.
- Third party add-ons like cases, touch screens, expansion boards

Demo

References

- http://www.raspberrypi.org/
- http://qt-project.org/wiki/Qt-RaspberryPi
- http://qt-project.org/wiki/RaspberryPi
- http://qt-project.org/wiki/RaspberryPi_Beginners_guide
- https://gitorious.org/bakeqtpi
- http://www.raspbian.org

Summary

- Raspberry Pi is an extremely low cost computer that can be used for embedded Qt 5 development.
- Good reference platform for Qt 5 with Qt Quick 2 (QML scene graph)
- Needs volunteers to help develop the platform and applications.

The End

Thank you very much for attending!

Q&A

- Questions?