An Introduction to Raspberry Pi
March 9, 2013
TechShop/RDU

Presented by:

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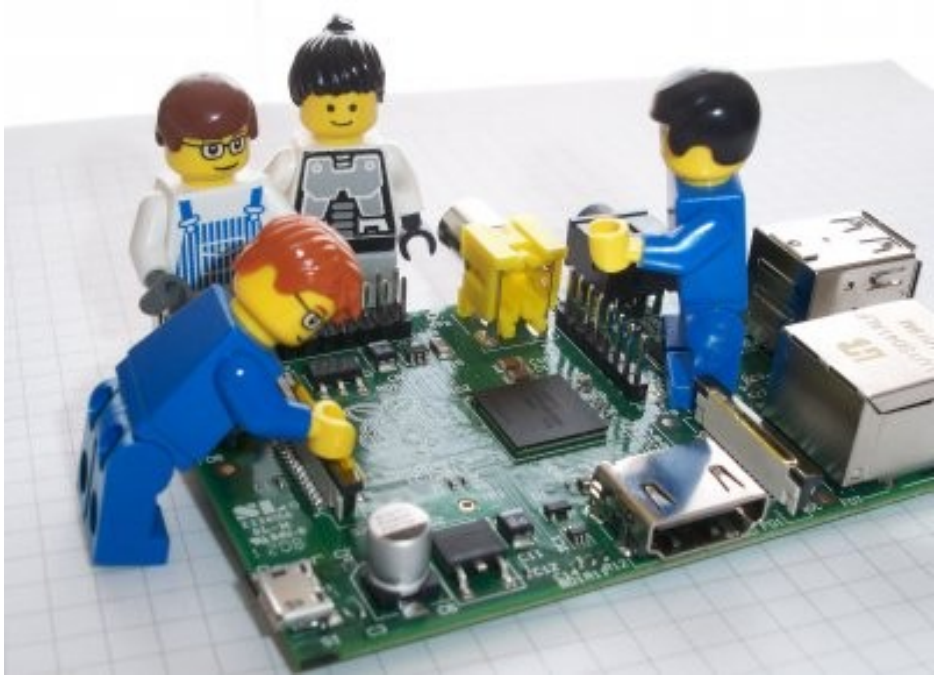
SPLATSPACE

Board Member at Large

Outline

- What is a Raspberry Pi?
  - History and charter
  - Description
  - Resources
- Demos
  - A Raspberry Pi Workstation
  - Standalone webcam
  - Blink
- Q&A

Today vs Monday



- Today:
  - Presentation/demos
- Monday 7pm (here):
  - Expanding charter of "2nd Monday Arduino Interest" meeting to include RPI
  - Help with Raspberry Pi installs, customization
  - EVERY 2nd Monday @ TechShop. Details here:

http://groups.google.com/group/triangleardu ino?hl=en

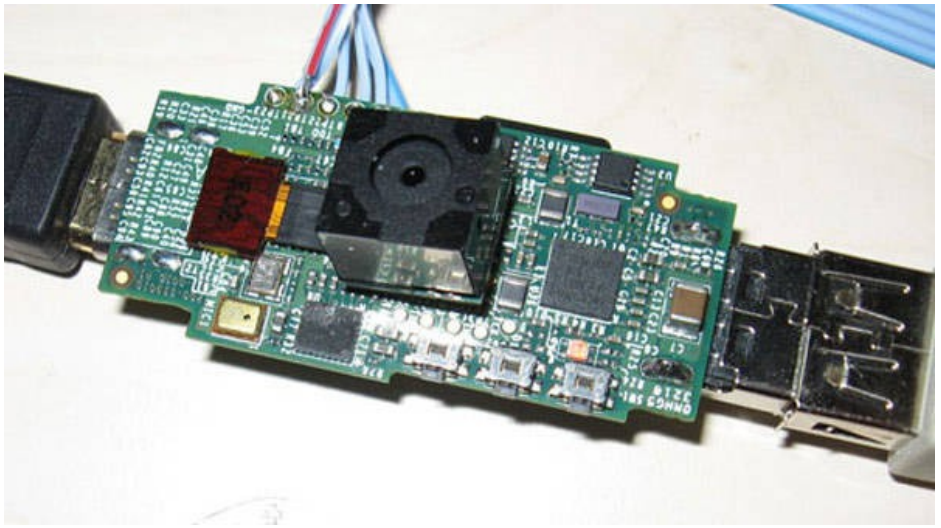
What is Raspberry Pi?

- A single board, very flexible, four watt computer in $35 (model B) and $25 (model A) flavors designed and made in the UK
- A mostly-open educational platform. (Some chip firmware not open)
- A standalone Linux, BSD, RISC OS, or Plan 9 system with a lot of I/O
- A powerful programming environment

The Short History

- Around 2005 Eben Upton was Director of Studies in Computer Science at Cambridge.
- Incoming students had relatively few programming and/or hardware skills vs “the old days”, creating vision of “something like the BBC Computer, but running a modern language like Python.” The name “Raspberry Pi” is a combination of “a fruit name” and a play on “Python”.
- Between 2006-2011 the vision turned into a highly capable single board computer design.

Raspberry Pi Proto



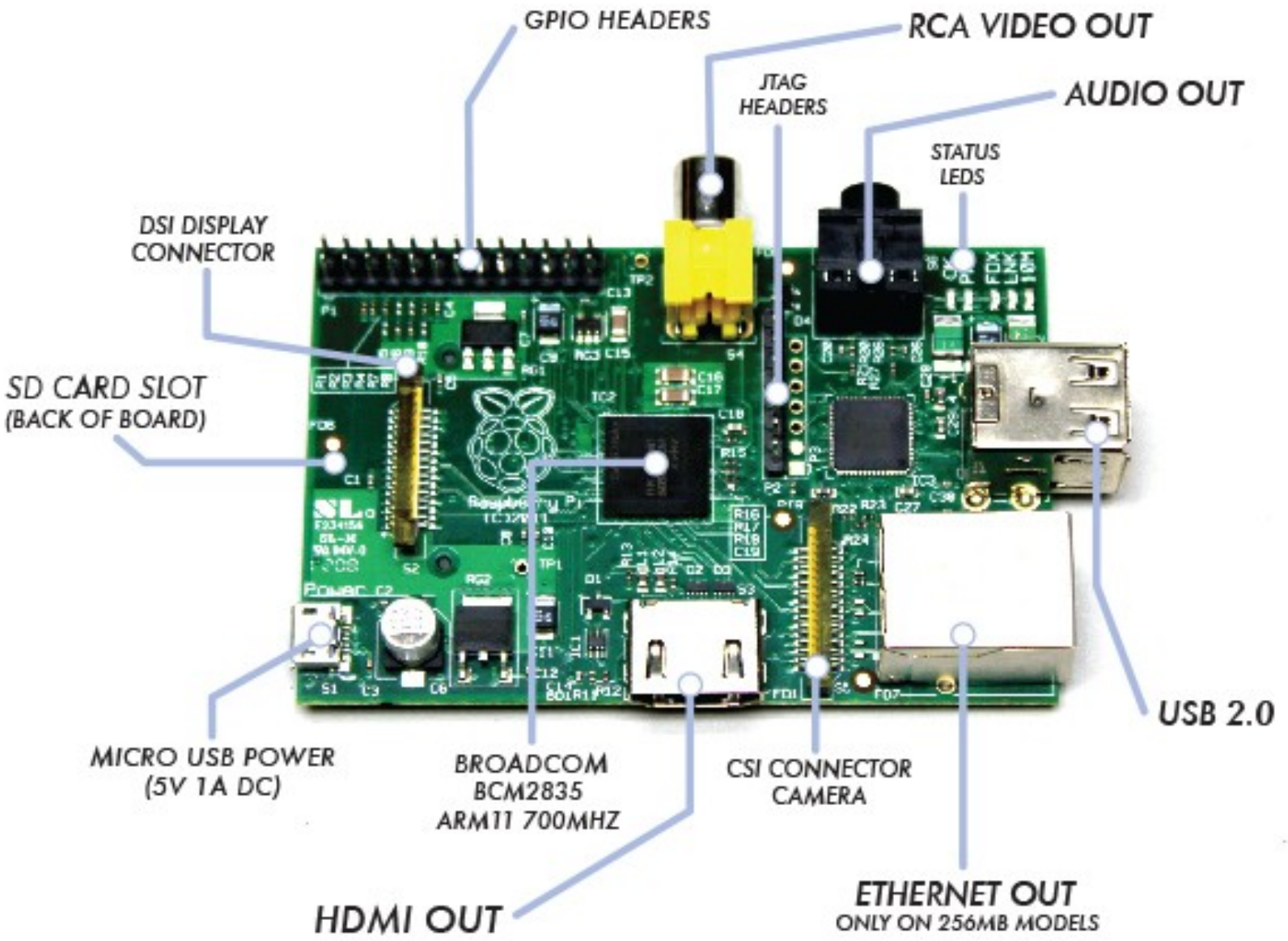
- Getting past the idea that “Python is enough”

History (2)

- Interest in RPi exploded as production plans became more and more enthusiastic, reaching the initial run of 10k boards by a partnership with Element14 and RS Components in the UK.
- The day sales began 100k orders were chasing the first 10k boards.
- Support hardware and software development have been proportionate to the estimated 1M boards shipped.
- But this is all really just STEP ONE.

Why was Raspberry Pi Made?

- Education!
- Original measure of success: more CS students
- But education-related efforts are rapidly spreading downward, aiming toward young children.



Raspberry Pi Details (revision 1 model B)

Two Models, Two HW Versions

- Model B, version 1
  - Original $35 board (almost everybody's is this one)
  - 1/4gb RAM, all peripheral support
- Model B, version 2 (starting Sept, 2012)
  - 1/2gb RAM, other tweaks mentioned later
- Model A (started shipping early 2013)
  - $25
  - No ethernet jack: networking via USB add-on
  - 1/4gb RAM

Processor and Memory

- Broadcom 2835 System On Chip
  - 32 bit ARM RISC CPU core (not x86 compatible)
  - Videocore IV GPU
  - Gadzooks of additional I/O
- Arm11 hardware, Arm6 architecture (-1 from current “hot” cellphone chips)
- Default clock speed is 700mhz
- Second and third chips for ½ (model B) or ¼ (model A) gb RAM and ethernet controller

The RPi Mass Storage: SD Card

- Any SD card, not MMC
- Kernel boots from SD card, period.
- Easy to have root FS on other device

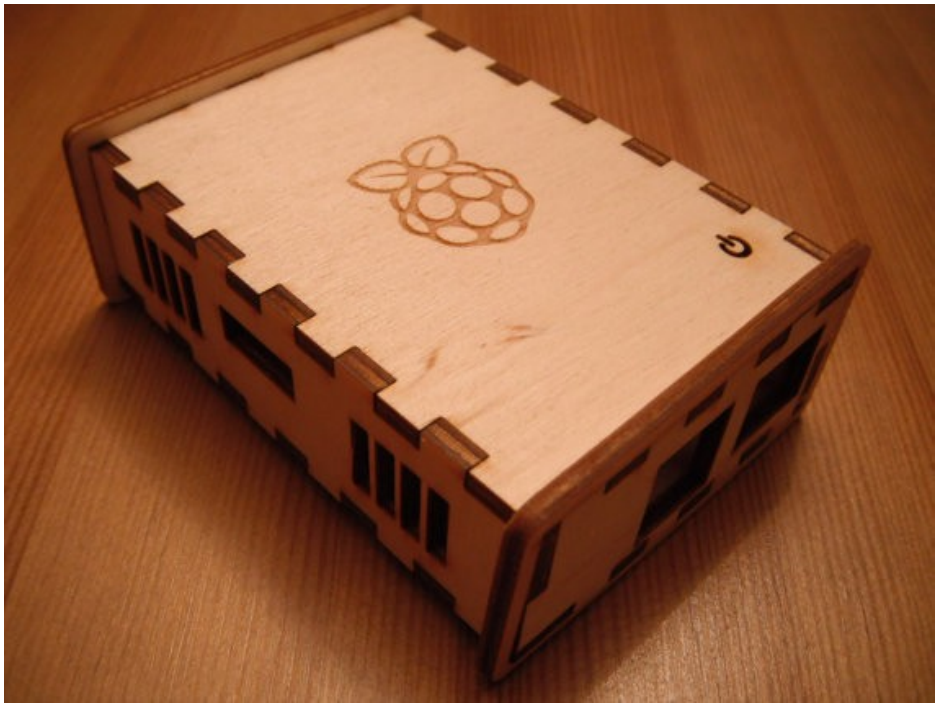
Video

- HDMI or (digital) DVI via cheap adaptor/cable
- Composite NTSC/PAL via RCA
- Wide range of resolutions
- NO VGA without an add-on, nontrivial converter (Adafruit)

Audio

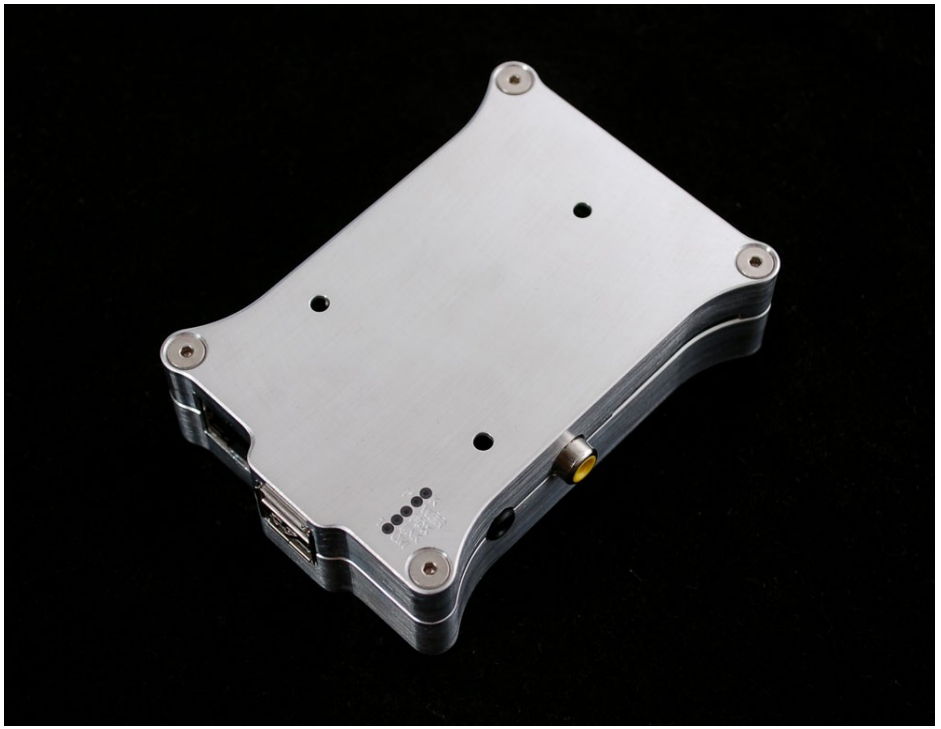
- Via HDMI **or** from stereo jack
- Output only
- Audio via jack not as mature as the rest of the system

Networking



- 10/100mbps via RJ45 on model B
- Via USB add-on
- Good support for USB wireless adapters based on many popular chipsets

USB



- Dual USB sockets on RPi model B, single on model A
- Expandable via regular or powered hubs

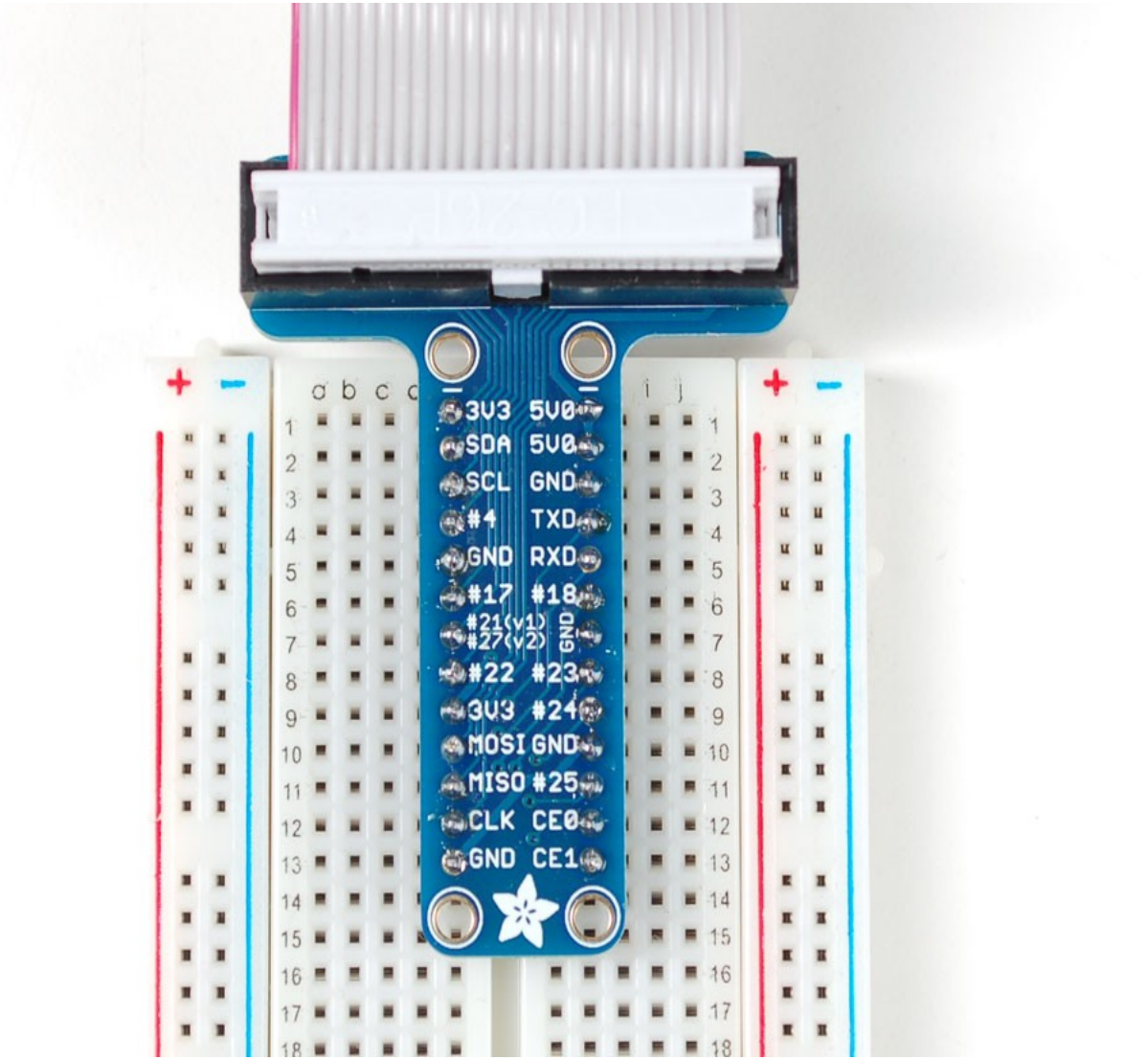
Speaking of Power

- Primary power via microUSB plug: a one amp cell charger works well with mouse and keyboard
- Model A about a quarter amp less
- PC USB port does **not** provide enough power

More on Power

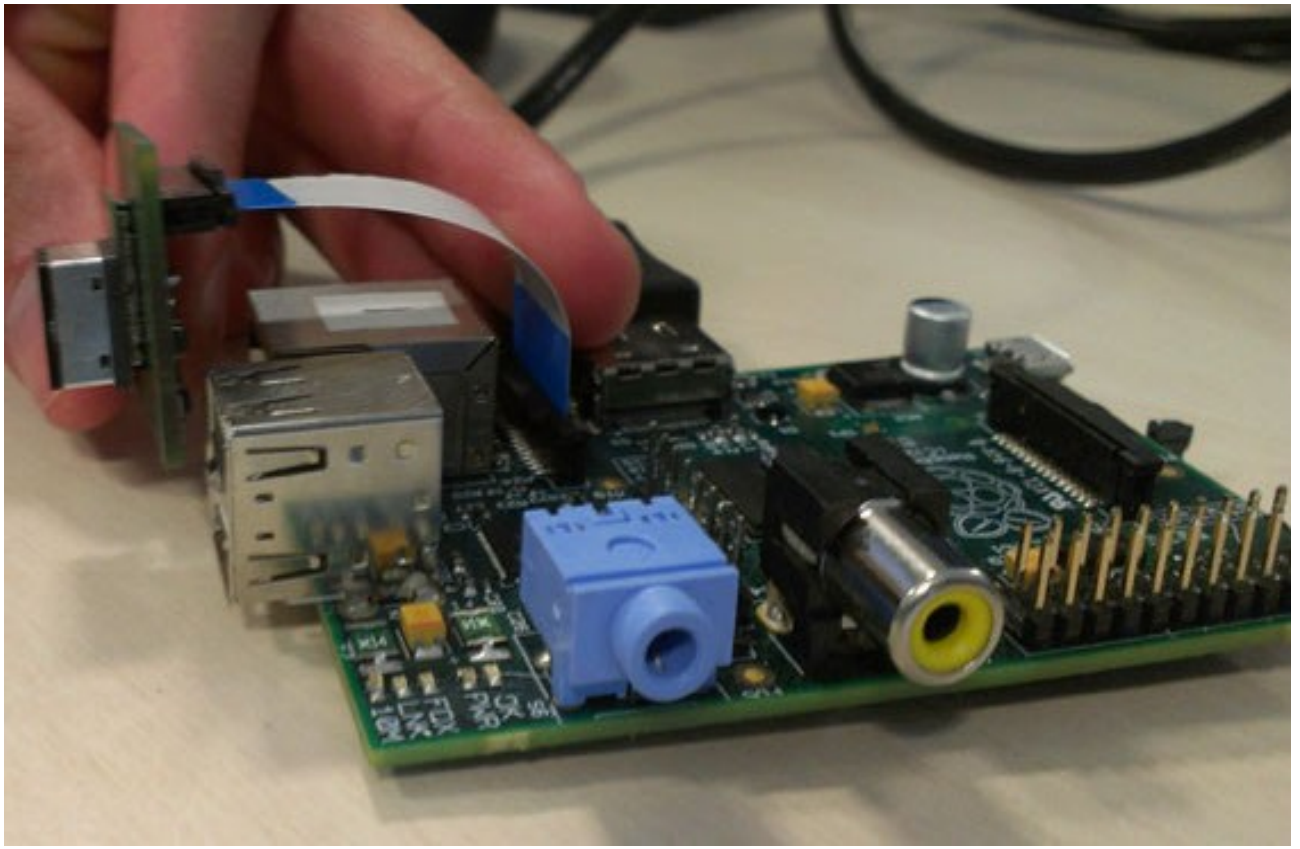
- Rev 1 boards have a current limiting fuse in the USB socket path.
- Having lots of USB peripherals requires a hub anyway: Strongly recommend a **powered** hub w 2 or more amps.

General Purpose I/O



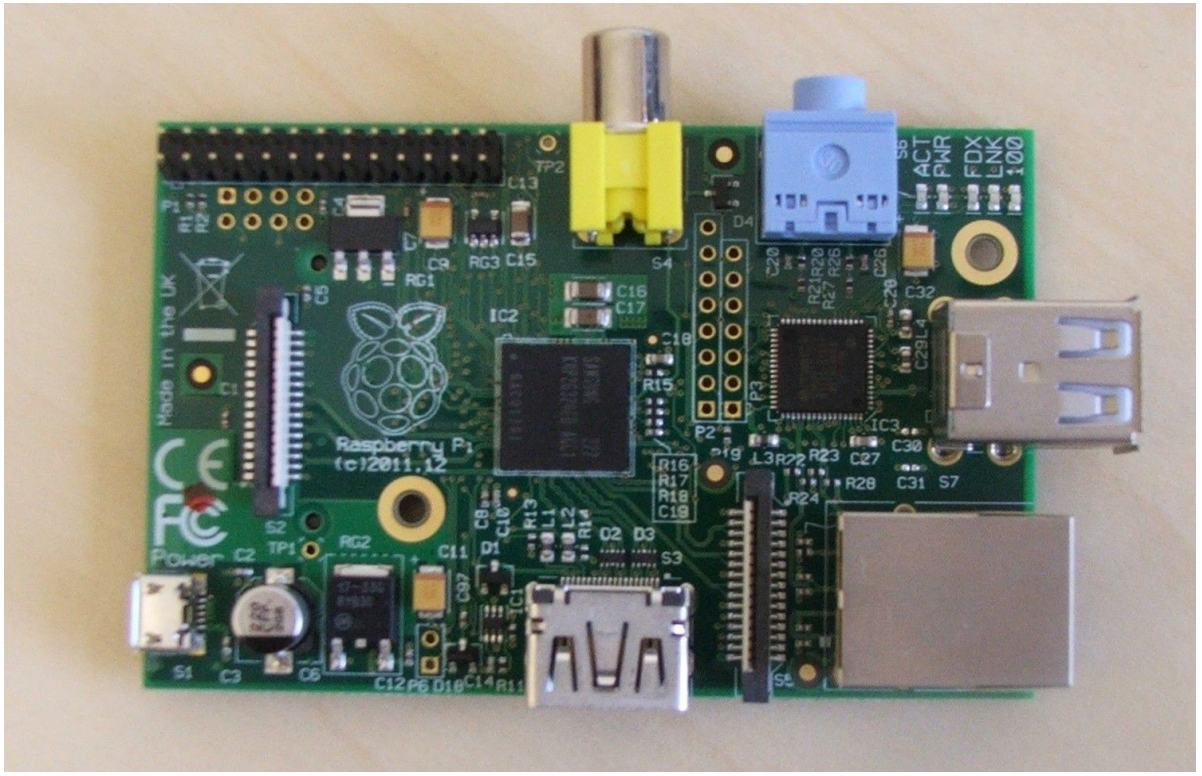
- 3.3 volt logic via 26 pin header (**NOT** 5 volt or short tolerant)
- Parallel I/O pins
- UART (Linux console support)
- I2C, SPI for peripherals

Even more I/O



- DSI LCD panel support
- CSI camera support
- Additional GPIO via other headers

More Version 2 Hardware Details



- Doubled RAM
- Removed current limiting fuse from USB socket path
- Rearranged, added GPIO, including reset
- Added two mounting holes

Software

- Many OS ports in progress
- Debian Linux best supported with two flavors of Wheezy (rev 7):
  - Current (2/9/2013), “raspbian” w hardware FP, **includes** open source Java
  - Earlier, software FP version required by Oracle Java
- Initial install by pre-installed SD card or copied disk image
- Beginner's starting point:

  http://raspberrypi.org/downloads

Resources: Web sites

- http://raspberrypi.org
  - Foundation web site
  - Most folks should start here, but plan on going to:
- http://elinux.org/RPi_Hub
  - Primary reference repository. Your first 99 questions are answered here.
  - Where to buy list is http://elinux.org/Buying_RPi

Resources: Pubs and Communities

- Magpi magazine

  http://www.themagpi.com/
- Raspberry Pi Educational Manual
  - http://tinyurl.com/RPi-edu
  - This manual is being updated: revisit periodically
- Communities and Forums
  - Via http://elinux.org/RPi_Hub#Community
  - Via http://raspberrypi.org

Resources: Books

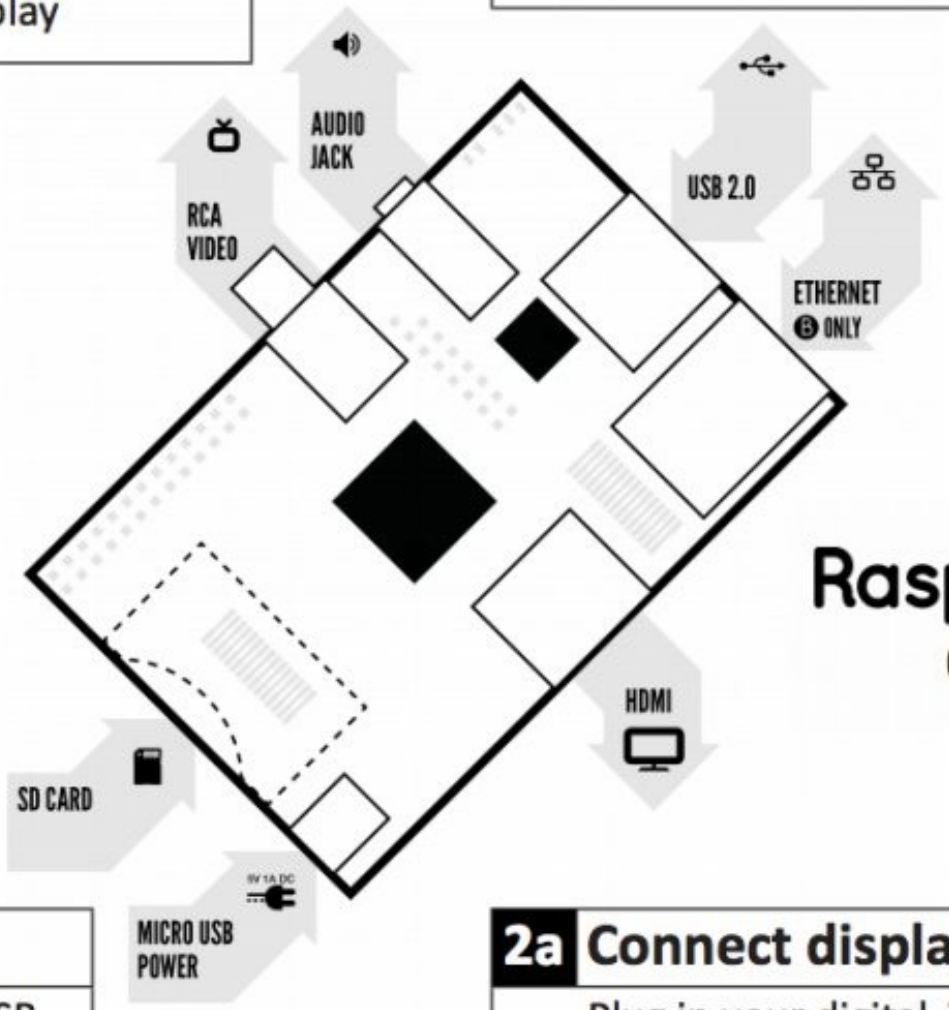
- **Raspberry Pi: A Quick Start Guide** by Schmidt
- **Raspberry Pi User Guide**, Upton and Halfacre
- Search Amazon, Barnes and Noble: bags of bunches of RPi books.
- Local B&N is stocking multiple titles

2b Connect display

If *not* using HDMI, plug in your analogue TV or display

3 Connect input

Plug in a USB keyboard and mouse



4 Connect network

Connect to your wired network [optional]

Raspberry Pi
Quick start

nsert SD card

ee page 3 for how to repare the SD card

5 Power up

Plug in the micro USB power supply

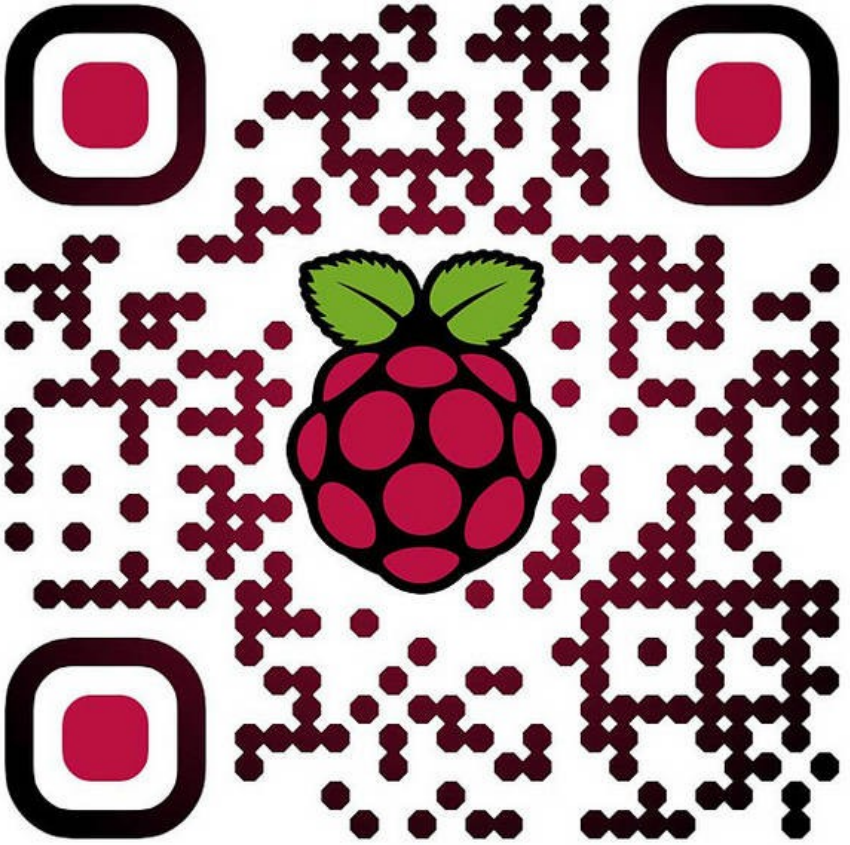
2a Connect display

Plug in your digital TV or monitor

The Raspberry Pi Workstation

- Cheap used 17” monitor
- Acrylic plastic sheet + 4x4mm bolts from Home Depot clamp RPI and hard drive to back of monitor
- Seagate USB harddrive, mouse, keyboard 5 volt/2 amp wall wart from junk box
- Radio Shack 273-463 microUSB plug for power
- USB hub and TP-Link TL-WN722N wireless

Q & A



Slides:http://bitser.net/talks/techshop-20130309.pdf

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