Introduction to the Raspberry Pi
What is it???

- 700Mhz ARM v6 Broadcomm CPU+GPU
- 512 MB RAM (256MB on Model A)
- Boots off SD card for filesystem
- USB, Audio out, LAN (Model B only)
- HDMI + Composite video out
- GPIO pins
- Powered off 5V, ~700ma (500ma on Model A)
What was the point?

- Meant to be a very inexpensive, open computer to help give kids access to computers that they could experiment with, like many of us did in the 1980’s.
- Hooks up to TV’s, USB KB+mouse, powered off cell phone power adaptors – things many of us have already!
- SD storage so easy to reflash if you screw it up
- Linux based OS, so easy to get in and see how it works.
- Also has GPIO so possible to use for robotics!
- HUGE community following! (Not true of many of these types of devices…) Think Arduino popular... (>1M units sold in the first year...)
What sort of performance?

- Default is 700Mhz, but most will overclock to ~1Ghz.
- Stock is roughly as powerful as a 400Mhz Pentium 2.
- GPU is basically as powerful as what was on the original Xbox.
- The SD interface is a bit slow, BUT you can hook up a normal mechanical HD or SSD or USB thumb drive and get a bit better performance. SD is great though because no moving parts and small.
- 100Mbit Ethernet, but it is attached through the USB interface and rarely gets full speed.
### GPIO

- 3.3V (NON PROTECTED!)
- I2C, Serial, SPI, etc.
- No A/D, so no analog input
- Can do software-based PWM
- Libraries exist for interacting with the GPIO through your favorite language

http://elinux.org/RPi_Low-level_peripherals#GPIO_hardware_hacking

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Comparison to XYZ uC?
Apples and Oranges..

- Way more RAM + Storage – can do more advanced algorithms, or perform data logging.
- Can debug in place!
- Easy/quick to change program – no “reprogramming/uploading”
- Interfacing to LOTS of other hardware (webcams, etc.
- INSANE amounts of software out there for Linux, and a lot of it works on the Pi!
- Can do projects that require a GUI
- Can run and chain together multiple programs
- Network connectivity and remote access

- Not real time!
- Can be daunting if you don’t know Linux
  - BIG learning curve, but really depends on what you’re trying to do.
  - And remember the whole point of this thing is computer EDUCATION! GREAT platform to learn Linux on!
- X still isn’t accelerated
- No A/D, no analog inputs, not protected GPIO
- Nowhere near as many pins as say, Arduino Uno to work with
- MUCH pickier about power (very narrow input voltage tolerance (4.8-5.2V)
Some other cool things...

- Can run XMBC Home Theater PC software
- Turn your TV into a Smart TV!
- Emulators for tons of old platforms (C64, Atari, NES, etc.)
- Games – OpenTTD, OpenArena, more...
- Has it’s own app store...
- Several OS options – Raspbian (Debian optimized for Rpi), Debian (non-optimized), Arch Linux, RISC-OS, NetBSD – NO UBUNTU (but not a big deal)
Getting started...(with Raspbian)

- First boot will run a config program...
  - Can config settings such as the RAM mix between CPU/GPU based on your needs, overclocking, locale info, clock, etc.
- HIGHLY recommend installing “Rpi-update” (google for it) – updates software and Linux Kernel
- If you want to install more software:
  - `sudo apt-get update`
  - `sudo apt-cache search “something in the name”`
  - `sudo apt-get install packagename`
- Doing the above will update the software available list, show you any packages that have a match for the search text, install the named package(s) and any dependencies.
- If you plan to use the desktop, install synaptic package manager for a graphical way to manage software...
Graphical Desktop

- **Type: “startx”**  This will launch the LXDE graphical desktop. A more “windows-ish” environment.

- You’ll notice this seems slow – X (the graphical desktop foundation) hasn’t been optimized (YET) to use the GPU for rendering, so has to do it with the slower CPU. Still useable though, just don’t expect miracles!

- Requires you to allocate RAM to the GPU – so take with grain of salt. Takes away from system RAM.
So what else do you want to know about???

- ROS – the non-graphics (read core, important stuff) can be run, but it’s a headache to get it built and working. (I have a SD card image with Fuerte on Raspbian if you want it.)

- Time for discussion!!!
Good Sources for Info

- Raspberry Pi Manual
- Raspberrypi.org + associated forums (LOTS of traffic here!)
- [www.elinux.org](http://www.elinux.org) - entire areas on this wiki for the Rpi.
- Adafruit.com/category/105 – products, tutorials, and an educational distro of Linux for the Pi.
- Youtube – TONS of Rpi related videos