

Build Your Own PiDoorbell

Rupa Dachere
Akkana Peck
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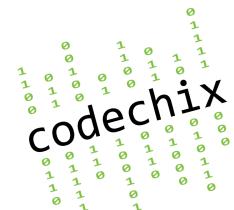
CodeChix @ PyCon 2014

CodeChix Confidential Proprietary

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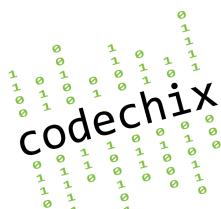
Our Awesome TA's

- Serpil Bayraktar – Principal Engineer, Cisco
- Deepa Dhurka – Technical Lead, Ericsson
- Lyz Krumbach – Automation/Tools Engineer, HP
- Stuart Easson – Sr. Staff Engineer, VMware



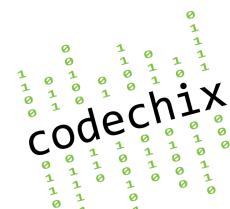
About CodeChix

- Increase number of women engineers on technical track
- Groundbreaking programs for industry (incl. male eng.)
- Dedicated mentorship program for academia (incl. male eng.)
- Refresher programs for returning women engineers
- Increase number of chapters in USA



Agenda

- Introduction & History of PiDoorbell
- Section 1
 - Introduction to RaspberryPi
 - Run through of Networking – SSH setup
 - Blinking LED + Install of necessary packages
- BREAK – eat, drink, be merry etc.
- Section 2
 - Introduction to the HC-SR04 Sonar Sensor
 - Download/Install PiDoorbell code (USB or GitHUB)
 - Build your circuit with sensor for detection. Test it.
- Section 3
 - Dropbox & Twilio setup



History of PiDoorbell

- Rupa needed to track who was at her front door (2012)
- Low cost, omnipresent (worldwide notification)
- Photo/Video, Date & timestamp
- PiDoorbell was born – Dec. 2012 – March 2013
- 2013 PyCon US, PyCon Australia, USENIX, OSCON, SVCC, Twitter
- PyCon US 2014 – Tutorial to spread the knowledge

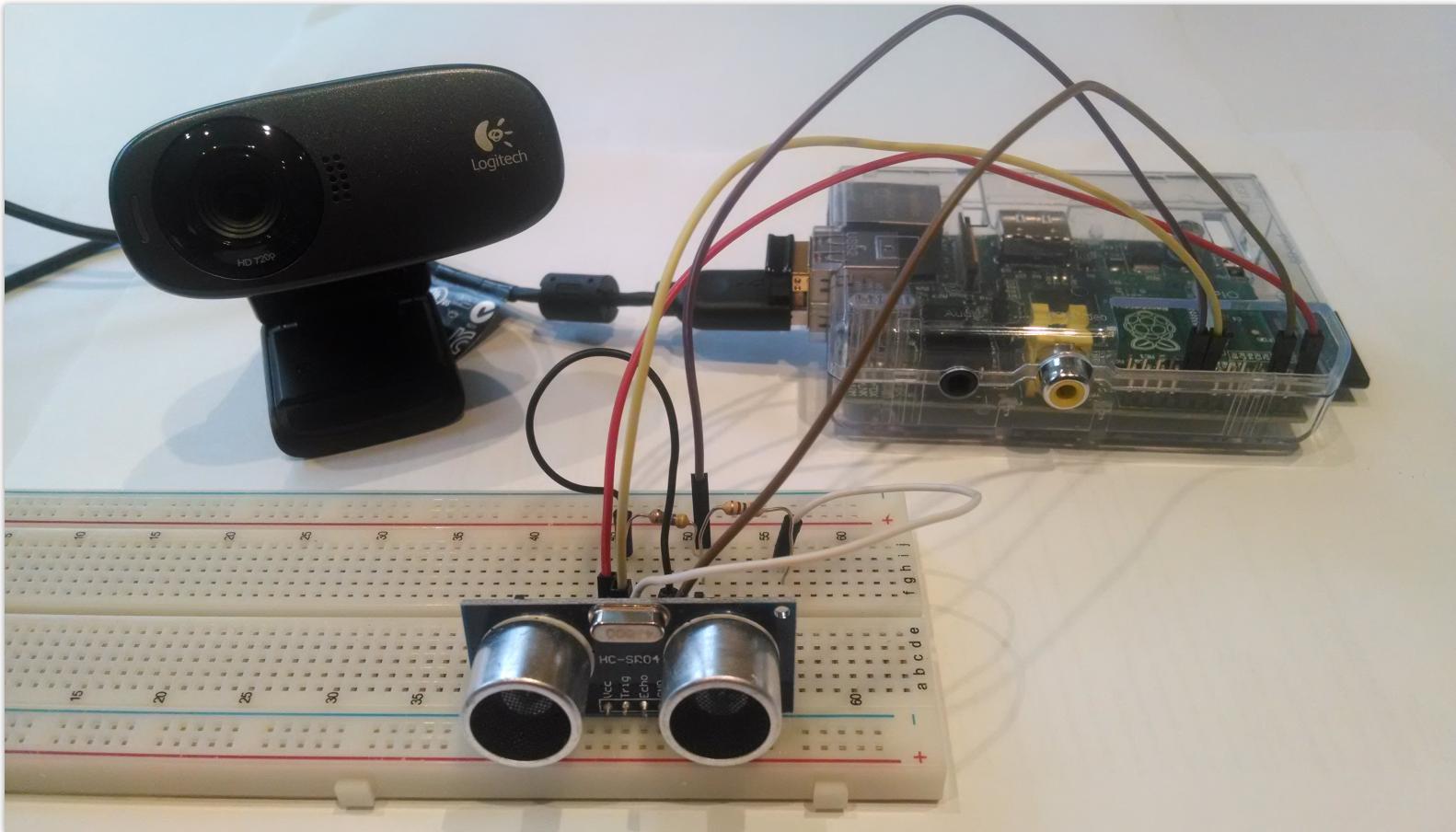


First cut of PiDoorbell w/ Arduino



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Latest PiDoorbell w/ GPIO – Mar. 2014



PyCon 2014

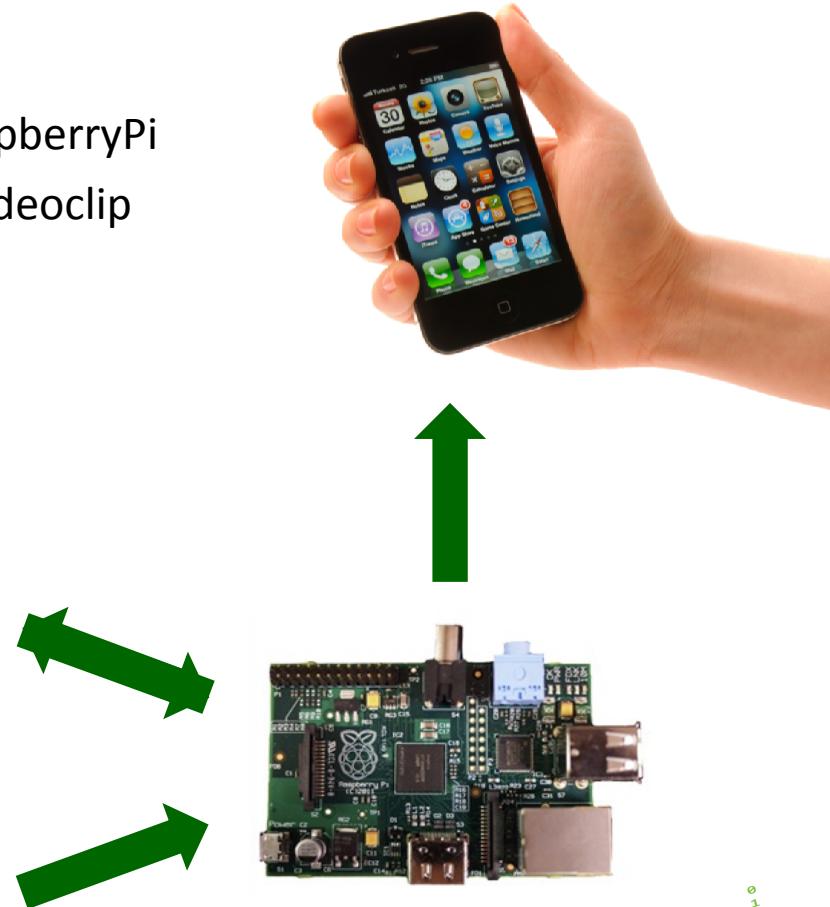
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PiDoorbell Flow

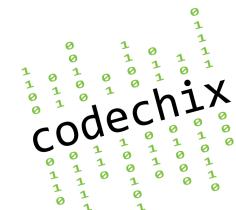
- 1) Here comes a caller
- 2) Proximity sensor outputs changed signal to RaspberryPi
- 3) RaspberryPi instructs webcam to take photo/videoclip
- 4) Webcam sends photo/videoclip to RaspberryPi
- 5) RaspberryPi uploads photo/video & sends SMS



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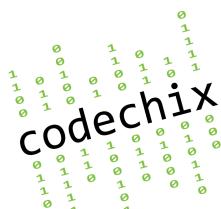
Why this solution?

- Reasonably inexpensive
 - Around \$65
 - Nothing commercial that does this
- Learn about hardware and build my own solution
- Get to speak at conferences
- Role model - Inspire kids, women engrs.



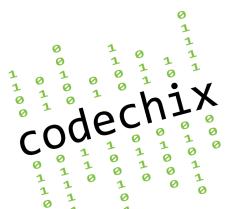
Hardware cost

- Proximity Sensor = \$5
- RaspberryPi = \$35
- Webcam = \$5
- Nano wifi USB adapter = \$10
- Jumper wires, resistors, breadboard = \$10
- Total = \$65
- Add extra for power adapters, etc. <= \$75 (approx.)
- Not counting smartphone/mac, time spent etc.
- Software is free – Apache or GPL

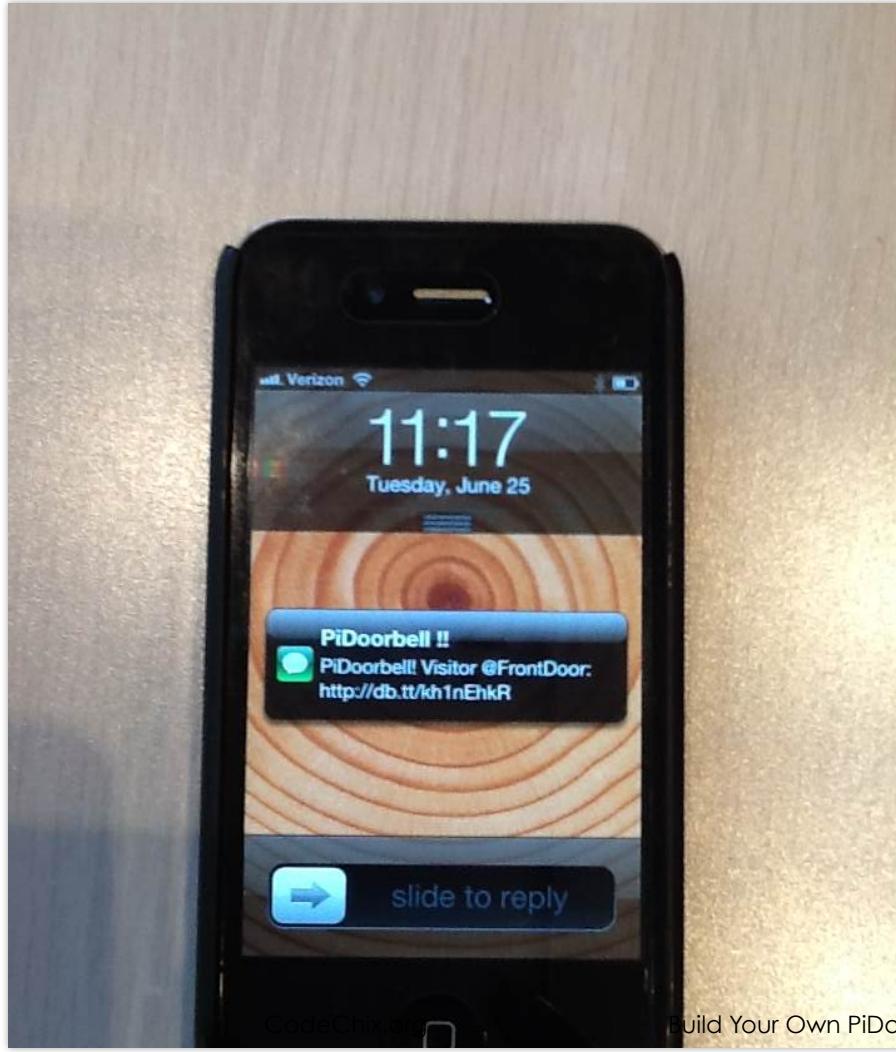


Breakdown of steps

- Walk in front of the proximity sensor
- See detection of foreign object
- Trigger camera to take a photo or start capturing video
- Save in file with date/timestamp
- Upload file to Dropbox and get URL to file
- Send SMS/Tweet to smartphone w/ URL of photo/video



Notification on Mobile Device



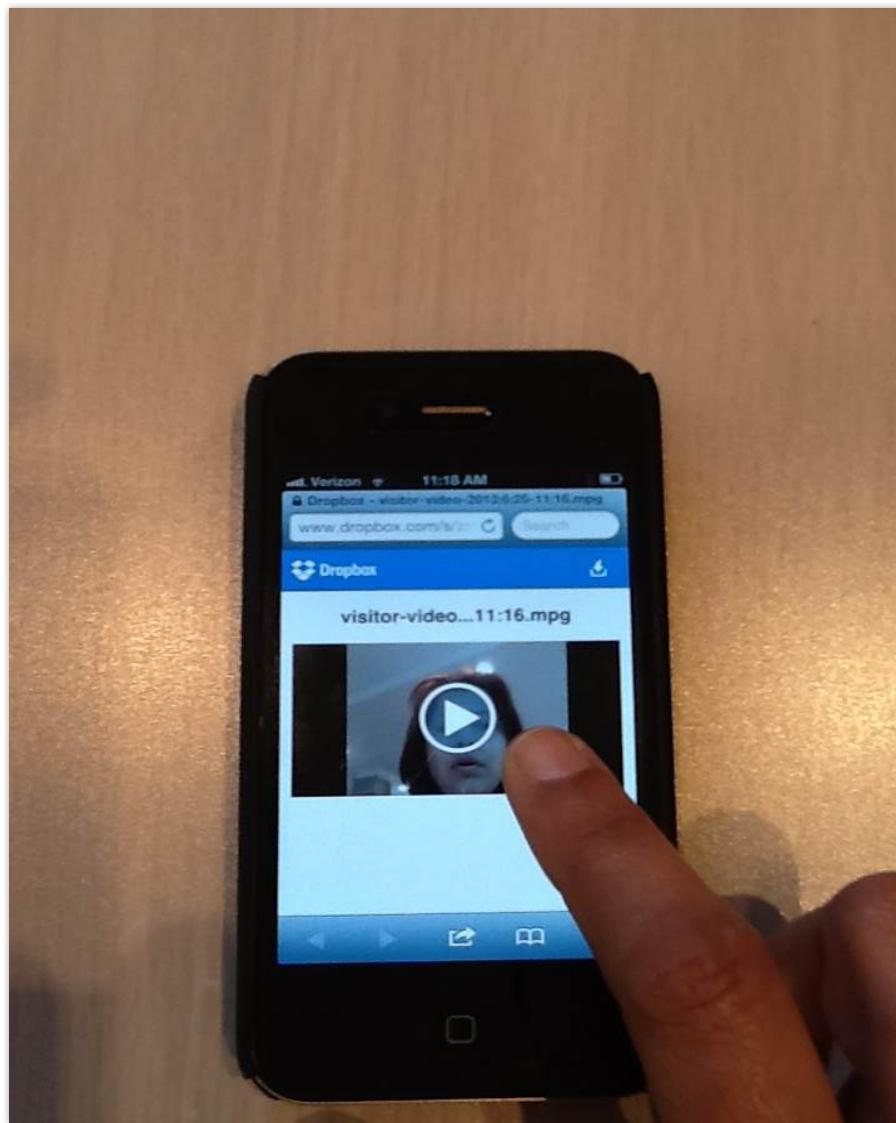
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Photo/Video on Phone



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Front Door



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Mounting Area – 8"x8"x6"



RaspberryPi Model B

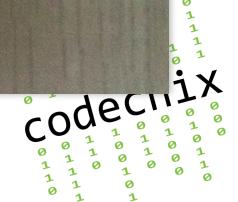


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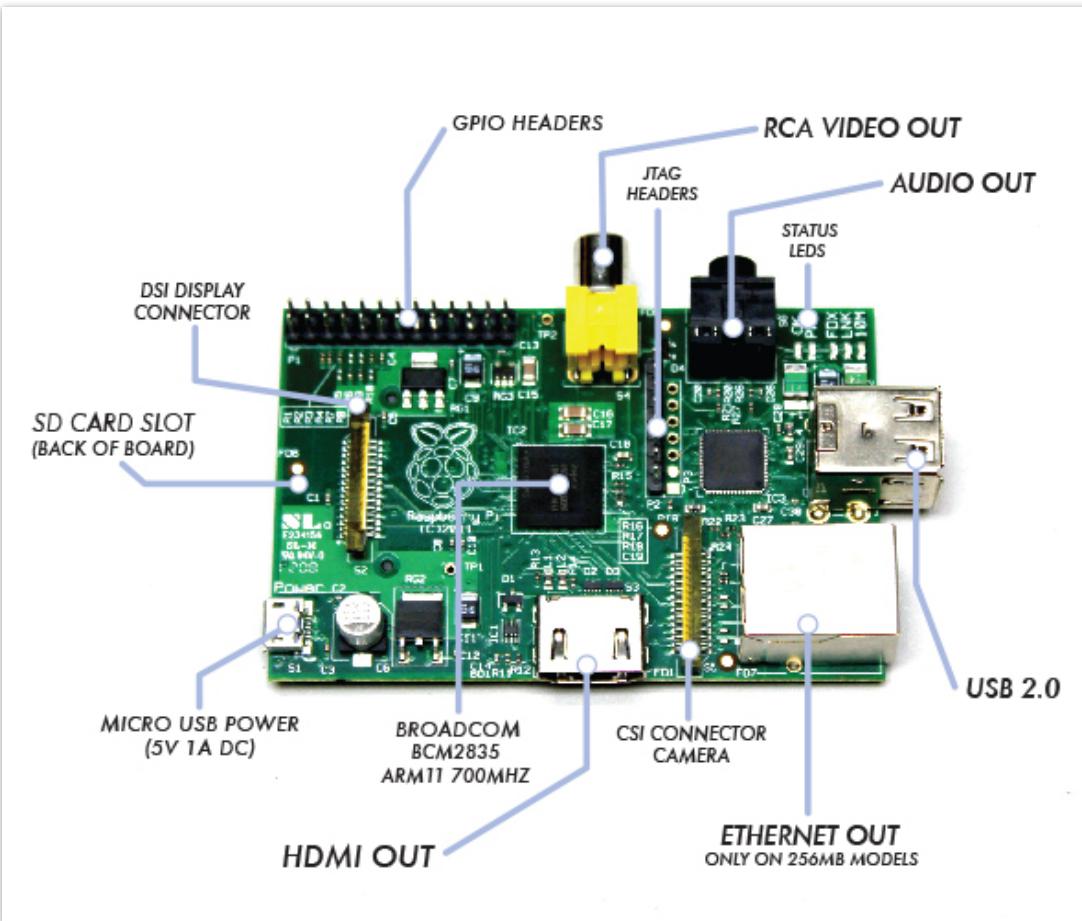
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A watermark consisting of binary code (0s and 1s) arranged in a grid pattern, with the word "codeChix" written diagonally across it.

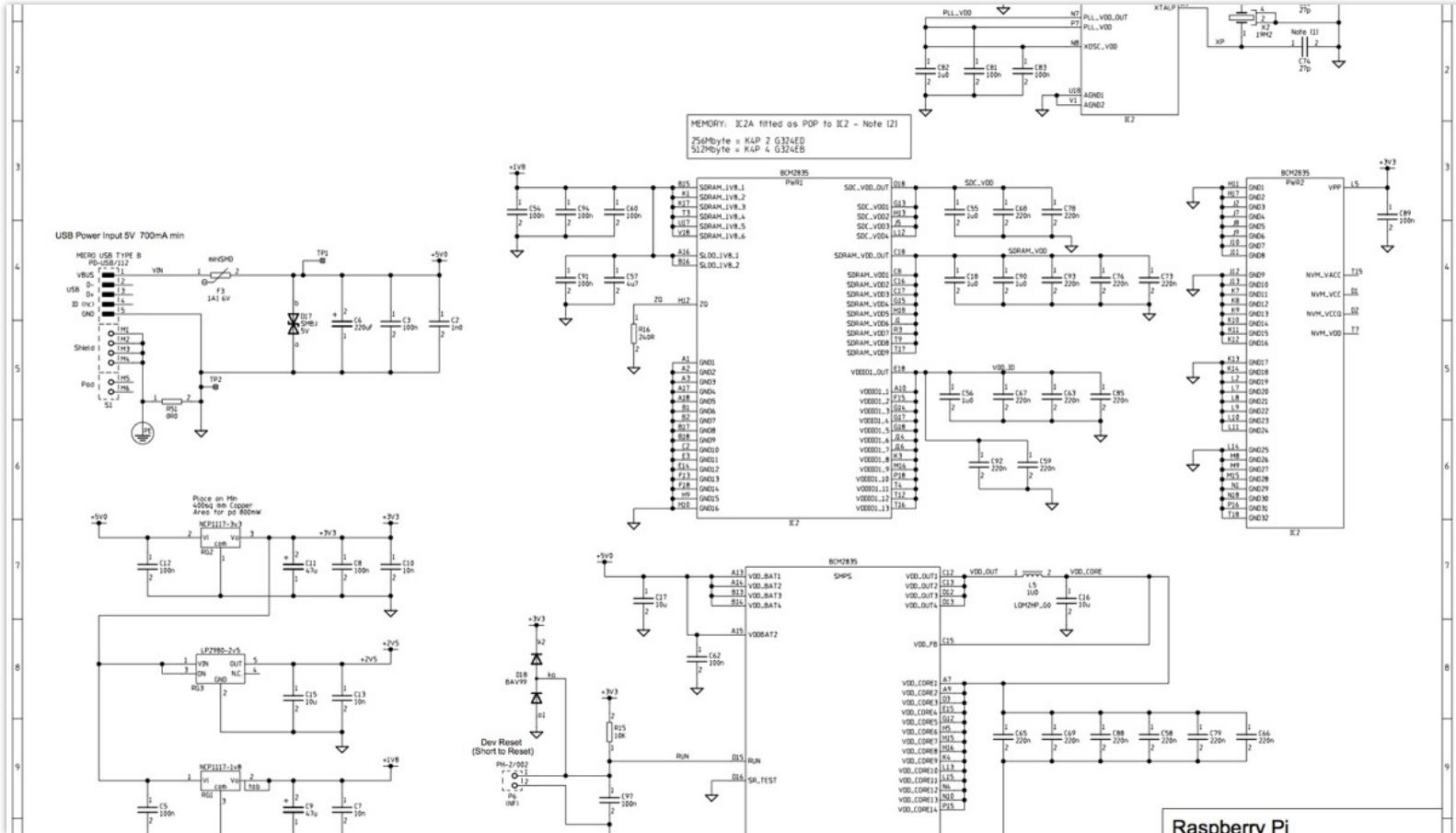
RaspberryPi



Arduino vs Rpi vs BeagleBone Black

Component	Arduino Uno	RaspberryPi	Beaglebone Black
Model	R3	Model B	Rev A5A
Processor	ATMega 328	ARM11	ARM Cortex-A8
Clock Speed	16MHz	700MHz	700MHz
RAM	2KB	512MB	512MB
Flash	32KB	External SD Card	2GB Onboard/ optional external
EEPROM	1KB		
Input Voltage	7-12V	5V	5V
Min Power	42mA	700mA	170mA
Digital GPIO	14	8	66
Analog Input	6 10-bit	N/A	7 12-bit
PWM	6	1	8
TWI/I2C	2	1	2
SPI	1	1	1
UART	1	1	5
USB Master	N/A	2	1
Ethernet	N/A	10/100	10/100
Video Out	N/A	HDMI, Composite	microHDMI
Audio Out	N/A	HDMI, Analog	Analog

RaspberryPi Model B Schematic



RaspberryPi Networking

- Time to setup networking so you can SSH to your Rpi's.....
- Uname: pi
- Password: raspberry
- Don't forget the “p” in raspberry...

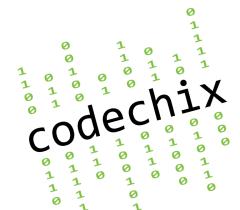


Network Setup

Deepa Karnad Dhurka

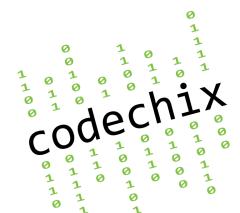
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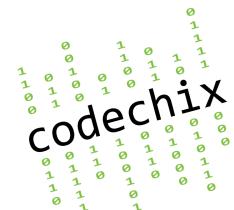
Goal

- Connect the Raspberry Pi to local LAN
 - Wireless or ethernet
- Connect the Raspberry Pi to the internet via local LAN
 - DNS servers, Gateways
- ssh pi@<ip address> to the Raspberry Pi
- Ping an external www URL from the Raspberry Pi



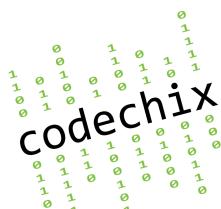
Configuration

- Edit `/etc/network/interfaces`
 - Setup Ethernet and WiFi
- Edit `/etc/wpa_supplicant/wpa_supplicant.conf`
 - Setup WiFi Roaming
- `sudo /etc/init.d/networking restart`
 - Apply network configuration changes



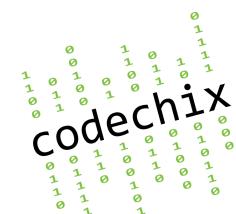
eth0

- Pre-configured with 192.168.2.2/24
 - `#iface eth0 inet dhcp`
 - `iface eth0 inet static`
 - `address 192.168.2.2`
 - `netmask 255.255.255.0`
 - `gateway 192.168.2.1`
- Configure laptop ethernet port with 192.168.2.1/24
- Enable internet sharing on ethernet port of laptop
- Connect with crossover ethernet cable
- IMPORTANT: Note the wlan0 HWaddr from 'ifconfig -a' output



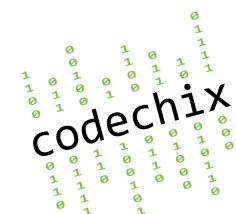
wlan0

- Step 1
 - #gateway 192.168.2.1
 - #iface wlan0 inet manual
 - #wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
- Open WiFi
 - iface wlan0 inet dhcp
 - wireless-essid "network name"
 - wireless-mode managed
- Secure WiFi
 - iface wlan0 inet dhcp
 - λ wpa-ssid "network name"
 - λ wpa-psk "passphrase"



wlan0

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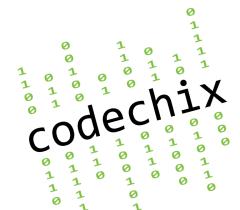
wlan0 with roaming

- wpa_supplicant.conf
 - ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
 - update_config=1
 - network={
 - λ ssid="Deepa CC"
 - λ psk="codechix"
 - λ priority=20
 - λ #scan_ssid=1
 - λ #key_mgmt=NONE
 - }



wlan0 With Roaming (contd.)

- interfaces
 - iface wlan0 inet manual
 - wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
 - iface wlan0 inet dhcp



Connection up and running

Connect Away...

