

# Build Your Own PiDoorbell

Rupa Dachere  
Akkana Peck  
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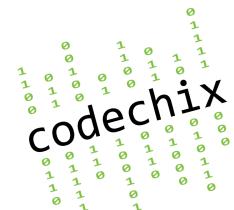
CodeChix @ PyCon 2014

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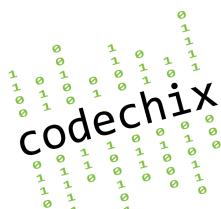
# Our Awesome TA's

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



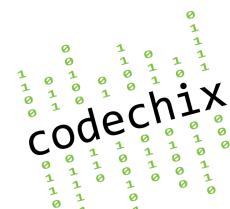
# About CodeChix

- 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

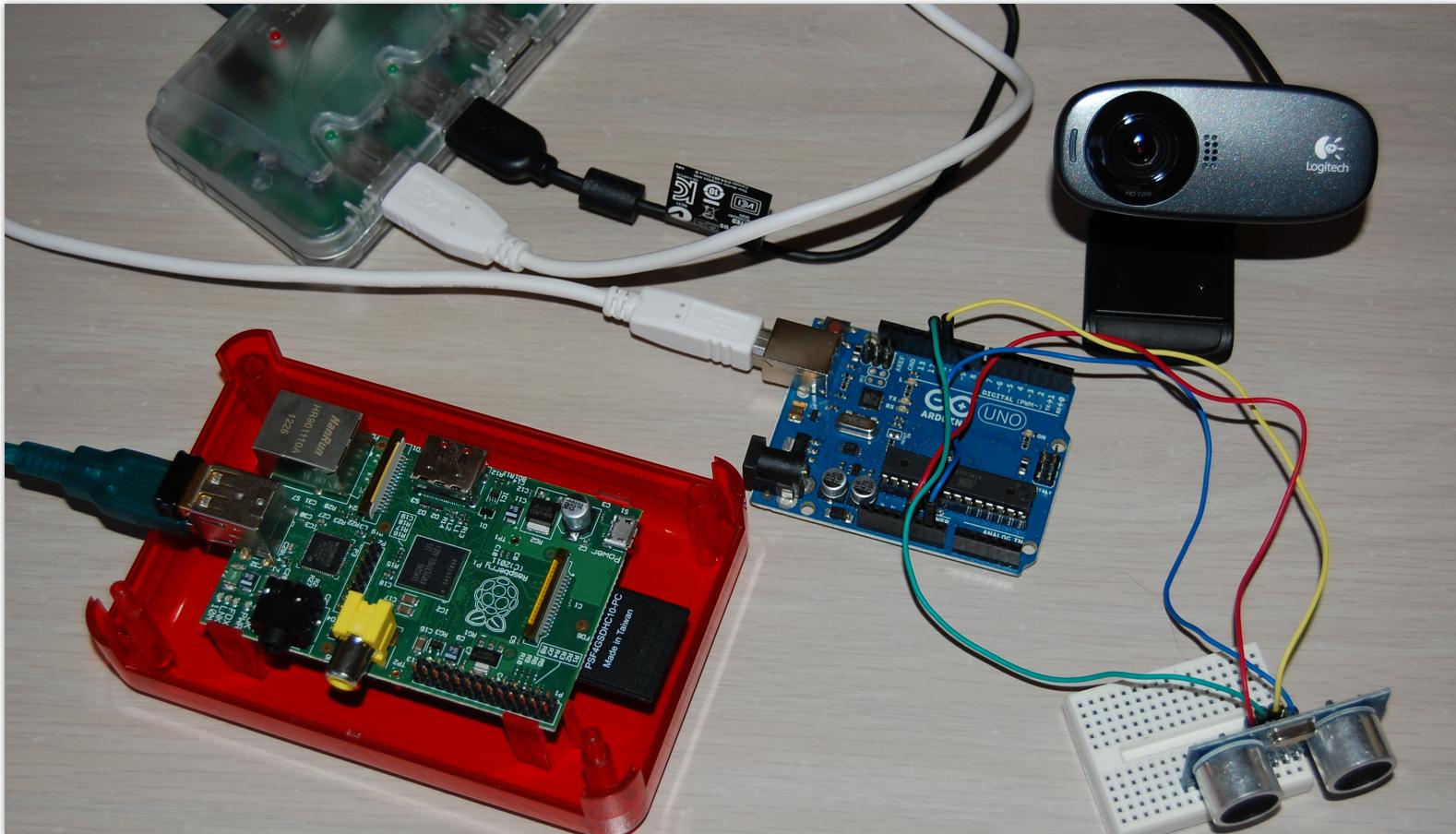


# History of PiDoorbell

- 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

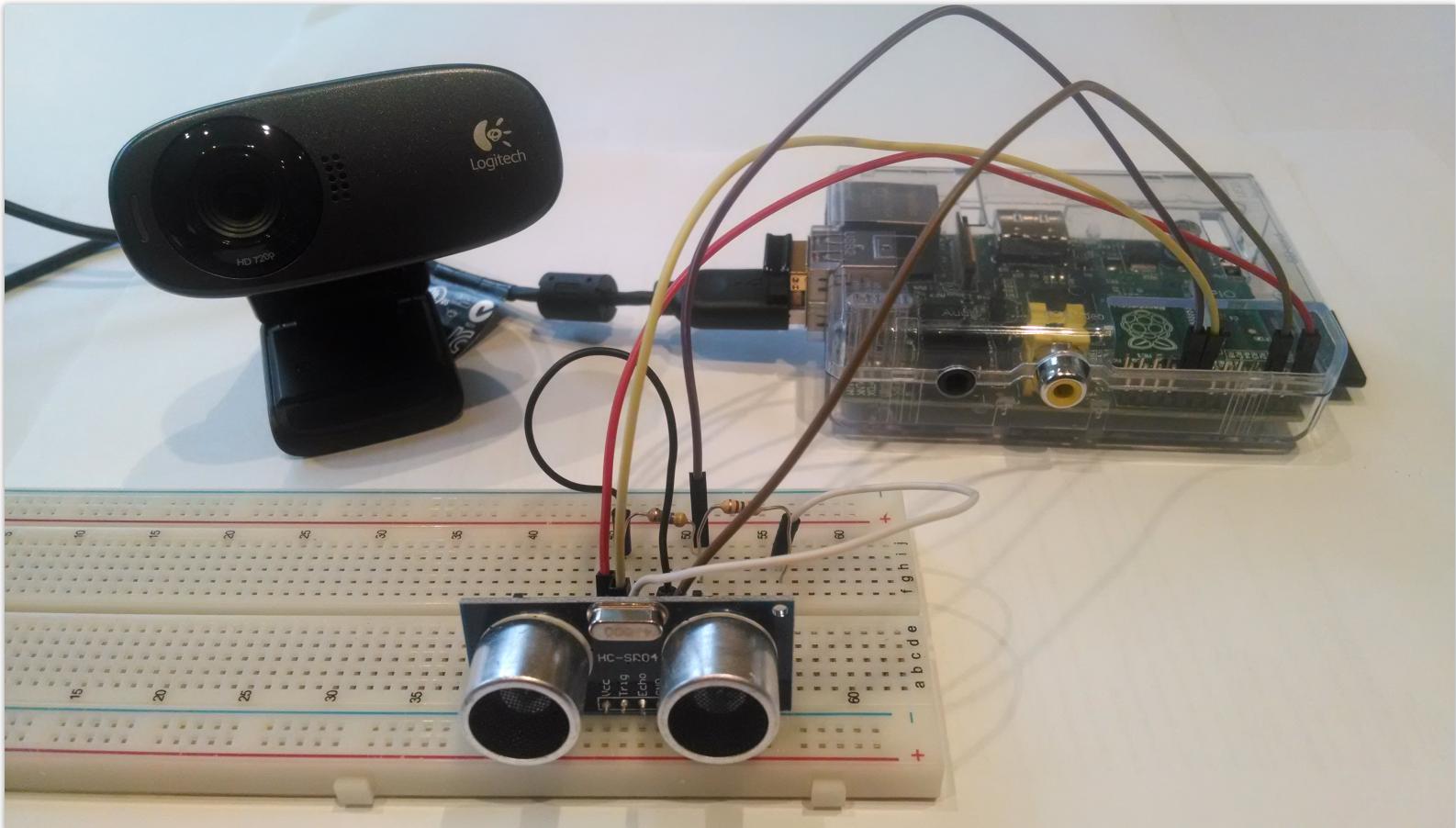


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## Build Your Own PiDoorbe

# Latest PiDoorbell w/ GPIO – Mar. 2014



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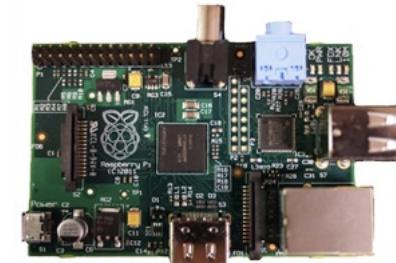
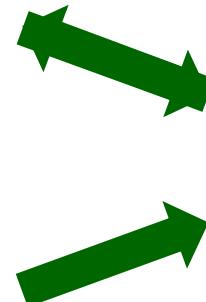
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# PiDoorbell Flow

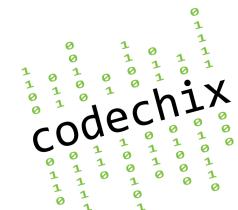
- 1) Here comes a caller
- 2) Proximity sensor outputs changed signal to RaspberryPi
- 3) RaspberryPi instructs webcam to take photo/videoclip
- 4) Webcam sends photo/videoclip to RaspberryPi
- 5) RaspberryPi uploads photo/video & sends SMS



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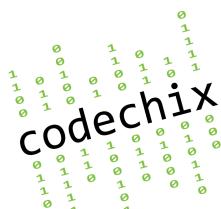
# Why this solution?

- 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.



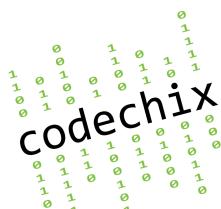
# Hardware cost

- 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

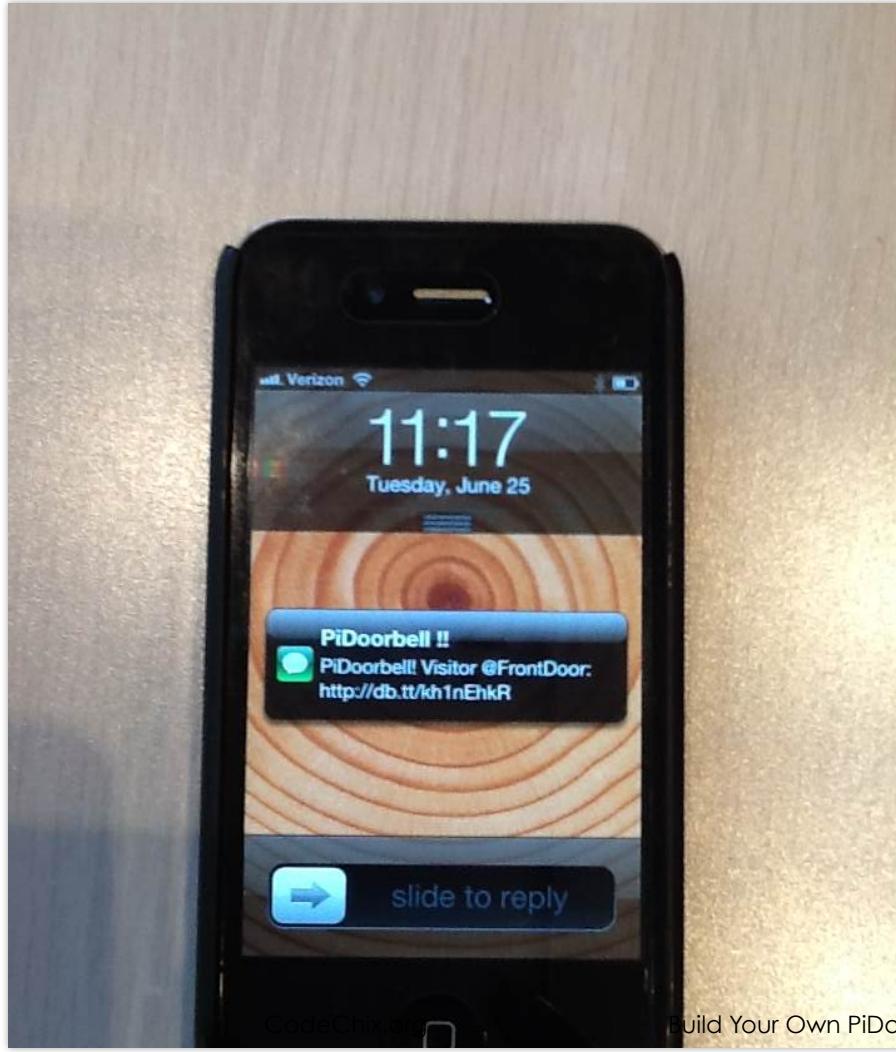


# Breakdown of steps

- 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



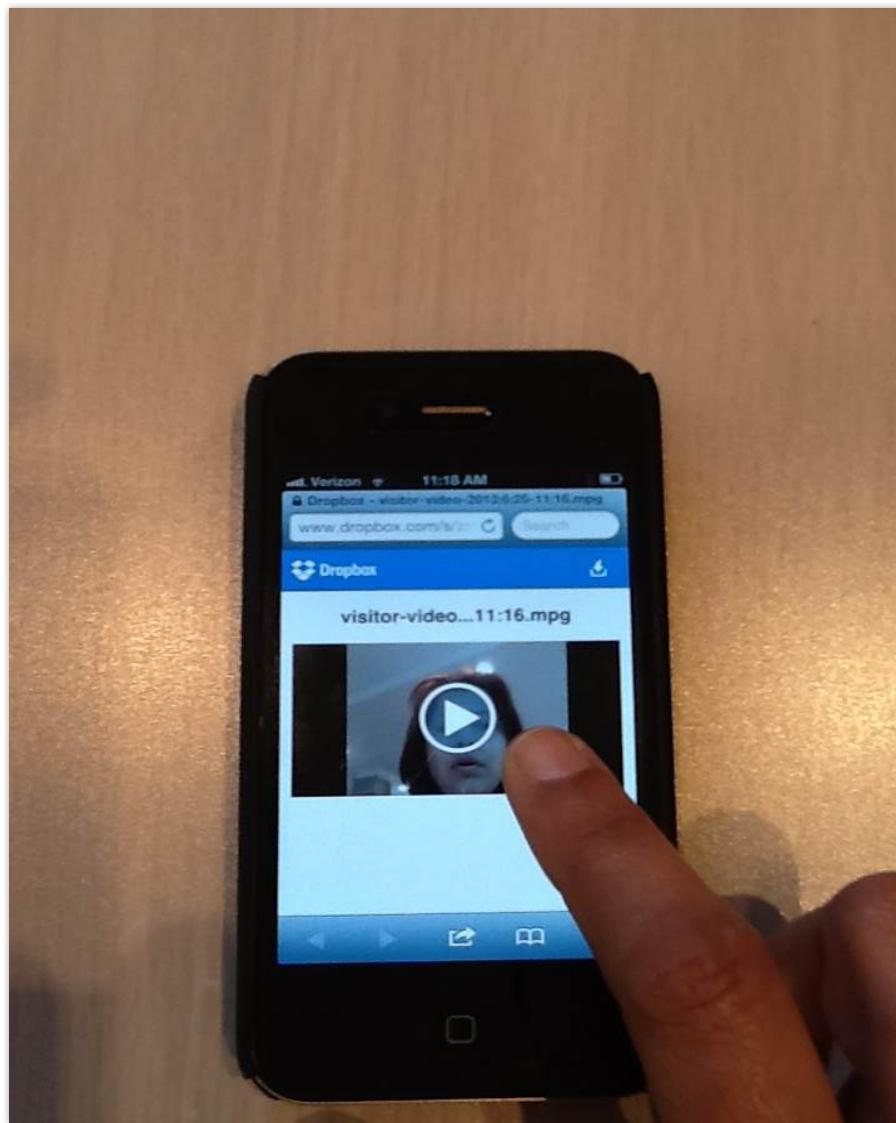
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# Photo/Video on Phone



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# Front Door



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# Mounting Area – 8"x8"x6"



# RaspberryPi Model B

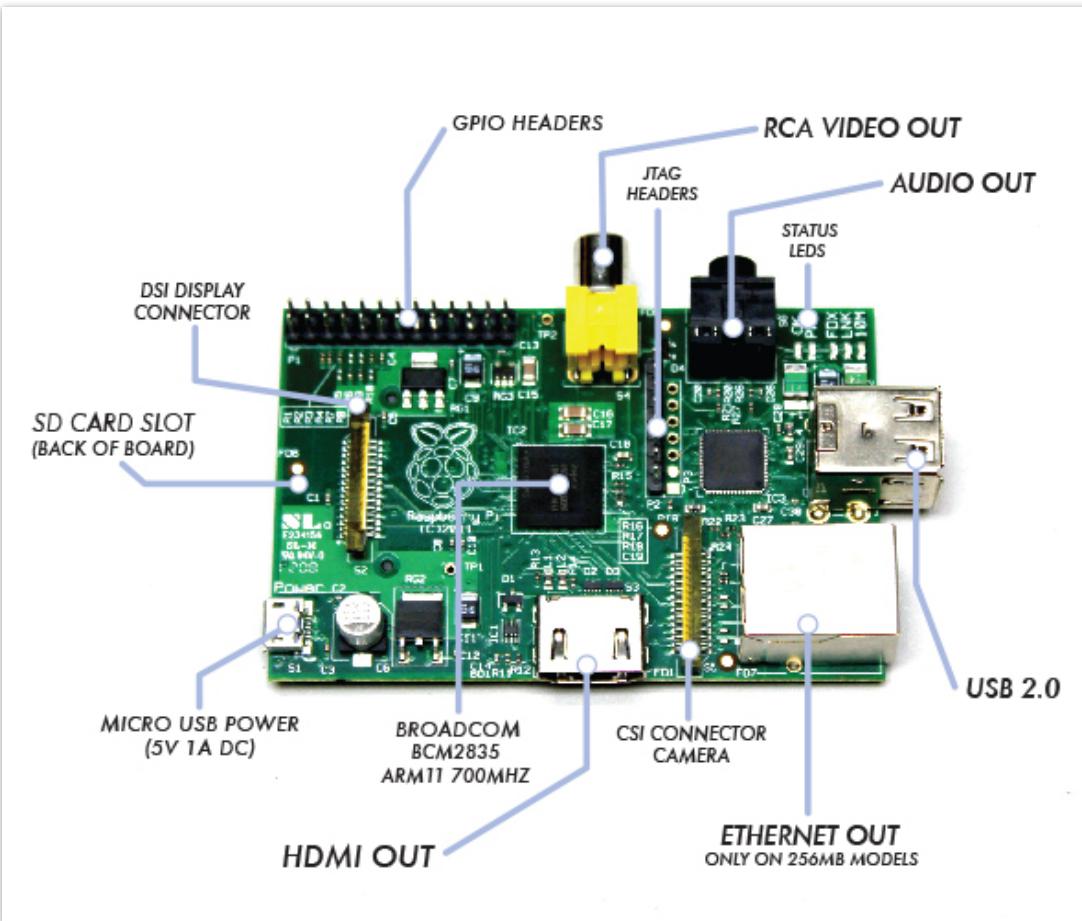


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## Build Your Own PiDoorbel

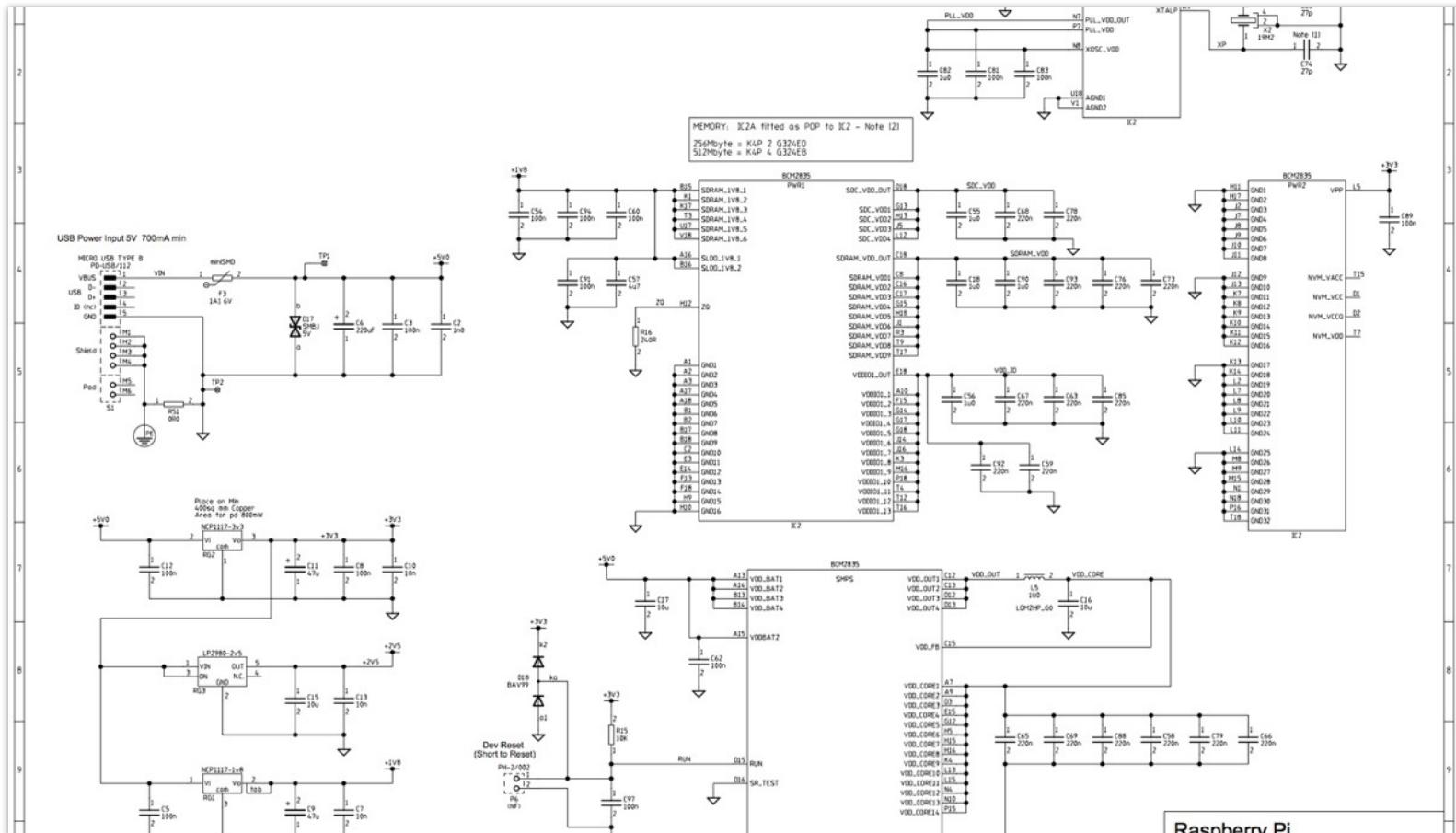
# RaspberryPi



# 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           | <b>2KB</b>  | <b>512MB</b>            | <b>512MB</b>                              |
| Flash         | <b>32KB</b> | <b>External SD Card</b> | <b>2GB Onboard/<br/>optional external</b> |
| EEPROM        | 1KB         |                         |   |
| Input Voltage | 7-12V       | 5V                      | 5V  |
| Min Power     | 42mA        | 700mA                   | 170mA                                     |
| Digital GPIO  | <b>14</b>   | <b>8</b>                | <b>66</b>                                 |
| 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    | <b>N/A</b>  | <b>2</b>                | <b>1</b>                                  |
| Ethernet      | N/A         | 10/100                  | 10/100                                    |
| Video Out     | <b>N/A</b>  | <b>HDMI, Composite</b>  | <b>microHDMI</b>                          |
| Audio Out     | <b>N/A</b>  | <b>HDMI, Analog</b>     | <b>Analog</b>                             |

# RaspberryPi Model B Schematic



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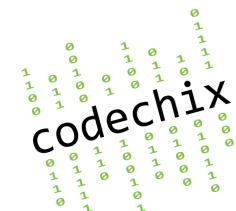
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Build Your Own PiDoorbell

The logo for codechix, featuring the word "codechix" in a bold, black, sans-serif font. The letters are arranged in a staggered, overlapping pattern. Behind the text, there is a background of green diagonal lines forming a grid-like texture.

# Copy/Install PiDoorbell code

- Copy two files from USB thumbdrives to your laptop
  - **codechix-pidoorbell-gpio-rpi.tar**
    - Contains code which you need to copy to the RPI
  - **codechix-pidoorbell-gpio-pycon2014.tar**
    - Contains code and Documentation that you store on your laptop for reference after the workshop.



# 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...

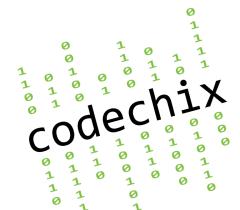


# Network Setup

Deepa Karnad Dhurka

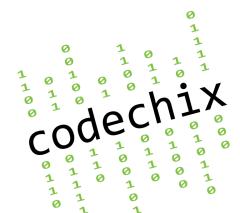
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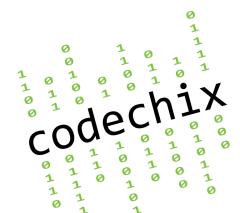
# Goal

- 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



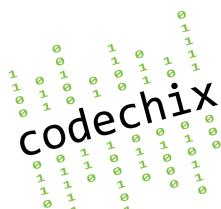
# Configuration

- 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



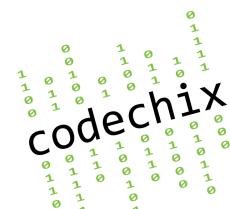
# eth0

1. 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
  2. Configure laptop ethernet port with 192.168.2.1/24
  3. Enable internet sharing on ethernet port of laptop
  4. Connect with straight-through ethernet cable
  5. Test with 'ping 192.168.2.2' from laptop
  6. Ssh pi@192.168.2.2 from laptop
- **IMPORTANT:** Note the wlan0 HWaddr from 'ifconfig -a' output



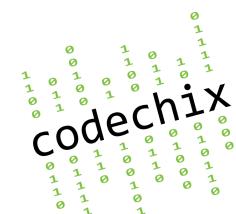
# wlan0

- 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"



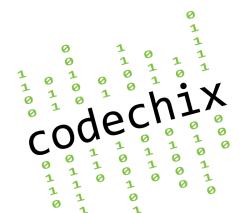
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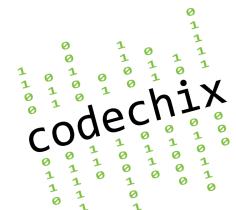
# wlan0 with roaming

- 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...

