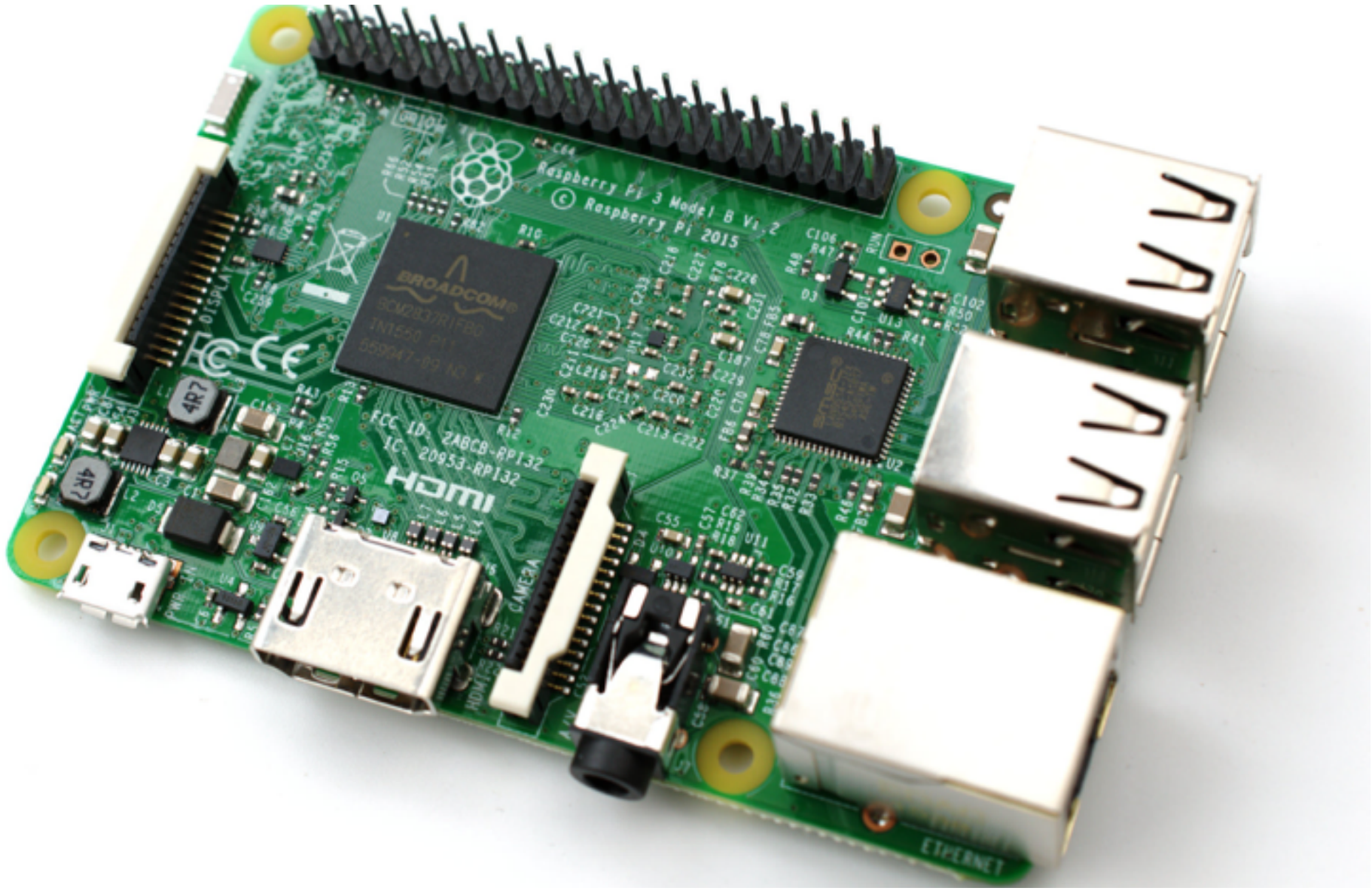
WyPi Project: Lessons Learned



Topics:

- What (and why) is the WyPi project?
- Lessons Learned in
  - The Classroom
  - The Build (hardware and software)
- Future plans

WyPi Mission

An outreach effort to expose students and educators to HPC concepts and promote skill development by providing small, inexpensive clusters AND training to high schools and community colleges around the state.

Executing the Mission

- Built a list of interested people
- Schedule classes in likely areas of the state
- Hold a session where we had a critical mass of attendees
- Provide follow up modules

The Classroom


TP-LINK

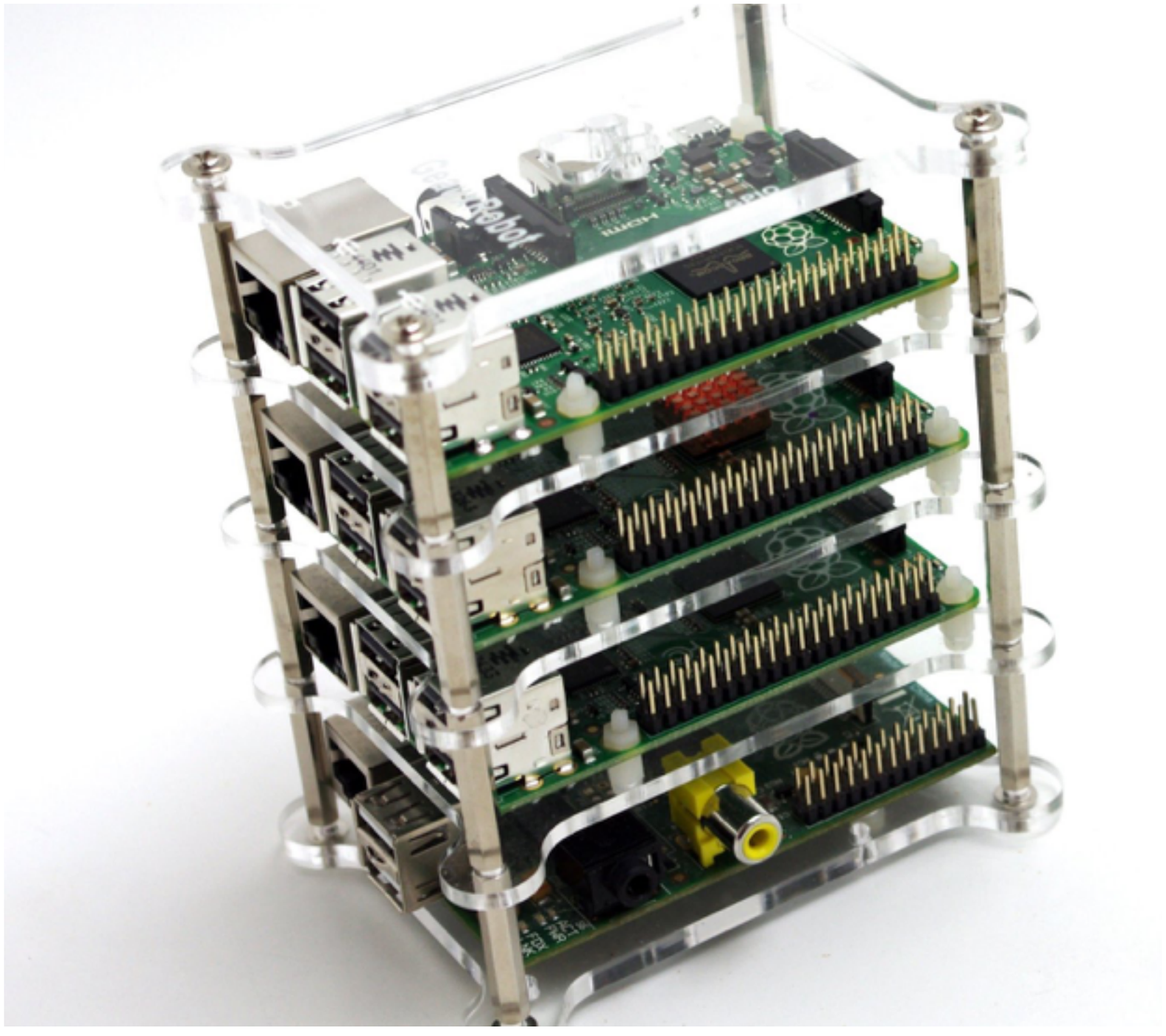
Agenda

- 8:00-8:15 Logistics and Setup
- 8:15-8:30 Welcome/WYPi Overview
- 8:30-8:45 Introductions
- 8:45-9:25 Computing/Parallel Computing Thoughts and Concepts
- 9:25-10:00 Cluster Components
- 10:00-10:15 Break
- 10:15-10:30 Begin Cluster hands on
- 10:30-12:00 Cluster assembly and configuration
- 12:00-13:00 Lunch
- 13:00-14:00 Cluster configuration (continued)
- 14:00-14:15 Break
- 14:15-15:15 Simple Program (serial and parallel)
- 15:15-16:30 Open session, Discussion, Advanced topics

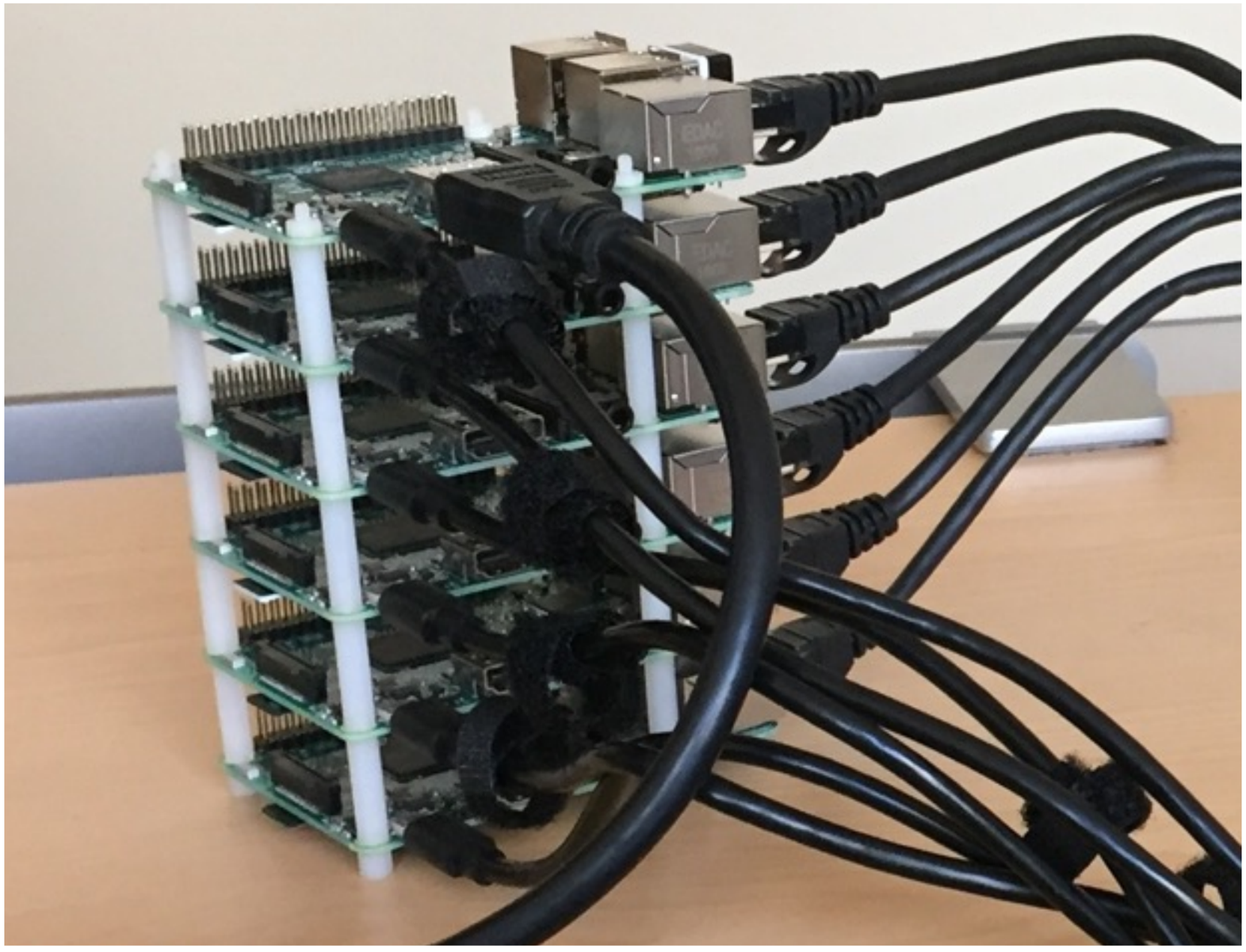
The Build

Structure

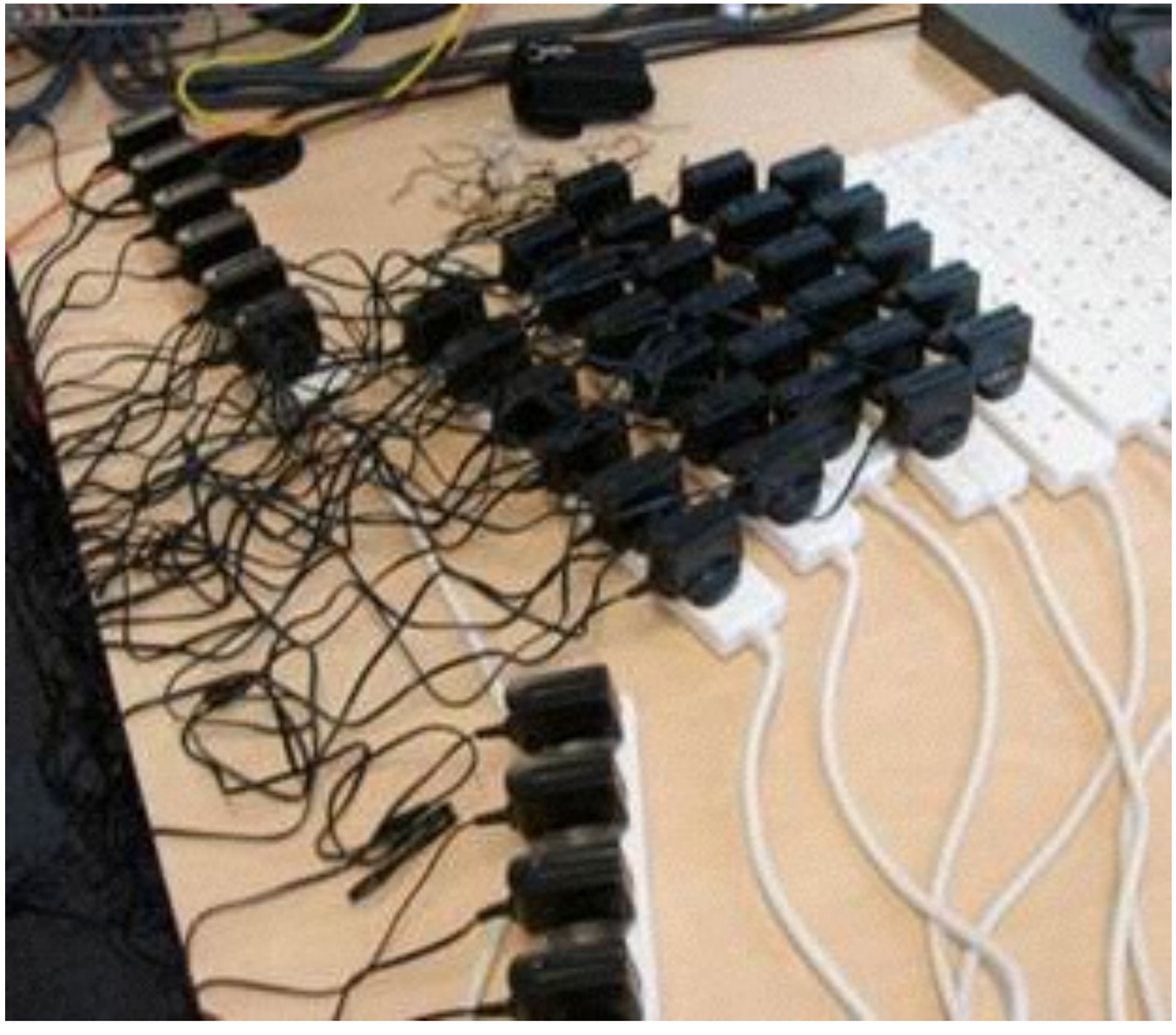
Structure



Structure



Power



Power

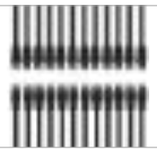
Power

Product	Recommended PSU current capacity	Maximum total USB peripheral current draw	Typical bare-board active current consumption
Raspberry Pi Model A	700mA	500mA	200mA
Raspberry Pi Model B	1.2A	500mA	500mA
Raspberry Pi Model A+	700mA	500mA	180mA
Raspberry Pi Model B+	1.8A	600mA/1.2A (switchable)	330mA
Raspberry Pi 2 Model B	1.8A	600mA/1.2A (switchable)	
Raspberry Pi 3 Model B	2.5A	1.2A	~400mA

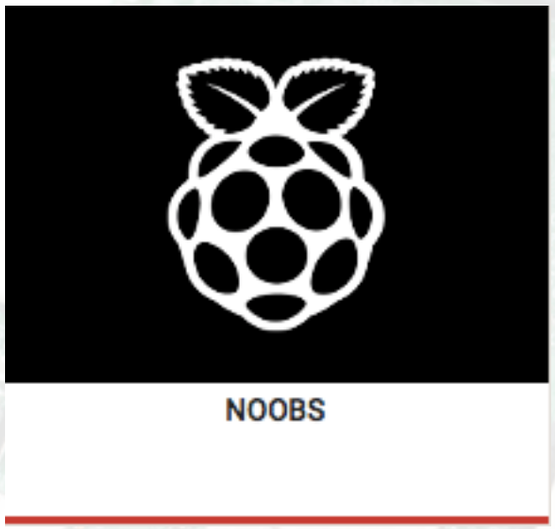
Video

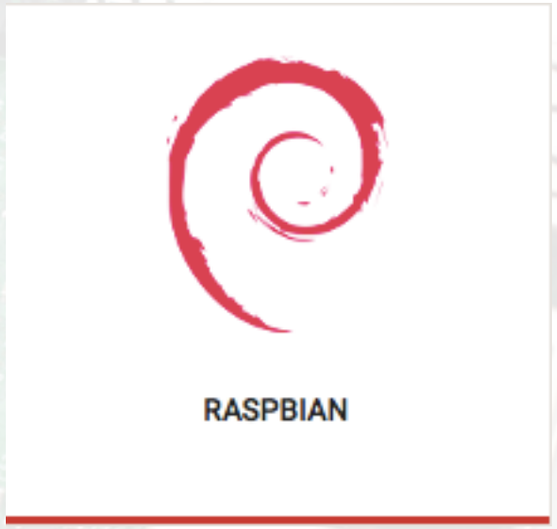

Raspberry Pi 2 Model B V1.1
© Raspberry Pi 2014
BROADCOM
HDMI
DISPLAY
CAMERA
PWR IN

Parts List

Quan.	Category		Description	per unit cost	per cluster cost	Total
1	Network		TP-LINK 8-Port Gigabit Ethernet Desktop Switch (TL-SG1008D) by TP-Link	$24.95	$24.95	$24.95
1	Network		GearIt 24-Pack, Cat 6 Ethernet Cable Cat6 Snagless Patch 2 Feet - Snagless RJ45 Computer LAN Network Cord, Black - Compatible with 24 48 Port Switch POE Rackmount 24port Gigabit	$26.98	$4.50	$4.50
1	Power		Sabrent [6-Pack] 22AWG Premium 1ft Micro USB Cables High Speed USB 2.0 A Male to Micro B Sync and Charge Cables [Black] (CB-UM61)	$7.99	$7.99	$7.99
1	Power		AmazonBasics 60W 6-Port USB Charger - Black	$24.99	$24.99	$24.99
1	Interface		Logitech Wireless Keyboard with Mouse Combo - Black (MK270)	$19.99	$19.99	$19.99
1	Display		StarTech.com 8in HDMI to DVI-D Video Cable Adapter - HDMI Male to DVI Female - HDMI to DVI Dongle Adapter Cable	$9.11	$9.11	$9.11
1	Display		24” Monitor, used	$10.00	$10.00	$10.00
6	Memory		SanDisk Ultra 16GB Ultra Micro SDHC UHS-I/Class 10 Card with Adapter (SDSQUNC-016G-GN6MA)	$8.45	$50.70	$50.70
6	Pi		Raspberry Pi 3 Model B Motherboard	$36.00	$216.00	$216.00
1	structure		50 Pcs Nylon Hex Hexagonal Standoff Spacer Female to Male M2.5x20+6mm	$11.55	$4.62	$4.62
1	structure		100 Pcs Nylon Hex Standoff Spacer M2.5x5 Female to M2.5x6 Male	$12.33	$0.49	$0.49
1	structure		50 Pcs M2.5 Thread Nylon Hex Nut Threaded Spacer Support for PCB Board	$6.86	$0.27	$0.27
			Grand total per cluster			$373.61

Software: Choosing the OS





- NOOBS vs Raspbian Jesse
- https://www.raspberrypi.org

Software: Setting up the Cluster

- Copy image onto an SD card
- Setup and test a Pi
- Configure and Explore Raspbian
  - setup OS (timezone, keyboard)
  - configured Wifi for first node only
  - change hostname
  - setup hosts file with static IP’s (optional)

Software: Setting up the Cluster

- Setup SSH Keys:
  - Generate public/private rsa key pair on Master Node: Ssh-keygen -t rsa
  - Copy public key over to Slave Nodes: cat ~/.ssh/id_rsa.pub l ssh pi@<ip address of slave> “mkdir .ssh; cat >> .ssh/authorized_keys”

Lessons Learned: Coulda, Woulda, Shoulda

- One day really isn't enough
- WyPi is a valuable outreach tool (cool and fun)
- Building a cluster for less than $500 is doable
- Our setup isn't expandable

Lessons Learned: Smell the Roses

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Future Plans

- Combine our efforts with other similar efforts at UW and other research entities.
- Advance collaborations with researchers at UW
- Where possible extend into two or more days

Ideas We're Exploring

- hosting a Pi cluster at UW that UW maintains/ updates that schools can remote into?
- can ARCC host a small data area in support of high school research?
- fostering collaborations between schools to research topics of common interest?
- Pi cluster competitions at RMACC?

Questions/Discussion

Contact Us

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