

SINGLE BOARD COMPUTERS

Raspberry Pi, Linux, Alternatives

October 10, 2019

LAB REVIEW

Lab 4:

Meera Nanda - <https://www.youtube.com/watch?v=jio6CZYOgA8&feature=youtu.be>

Anaya - <https://www.youtube.com/watch?v=5jhqTsDqOSM&feature=youtu.be>

Jeremy Walker (arrow) - https://www.youtube.com/watch?v=qfM_7DACA_4&feature=youtu.be

LAB REVIEW

Lab 5:

Recubery Box <https://www.youtube.com/watch?v=N-BVdGN9zDM>

johnway in the box <https://www.youtube.com/watch?v=3nWsDvjpMv0>

Jesse Mo - <https://www.youtube.com/watch?v=3nWsDvjpMv0&feature=youtu.be>

Beer - https://drive.google.com/file/d/1kTD_T9HDqPgiBdOhB2KOYKmVjTOqXbKF/view

Eduardo Castillo <https://www.youtube.com/watch?v=N-BVdGN9zDM&feature=youtu.be>

WHAT IS IN A COMPUTER?

CPU

Memory

I/O controllers

External storage

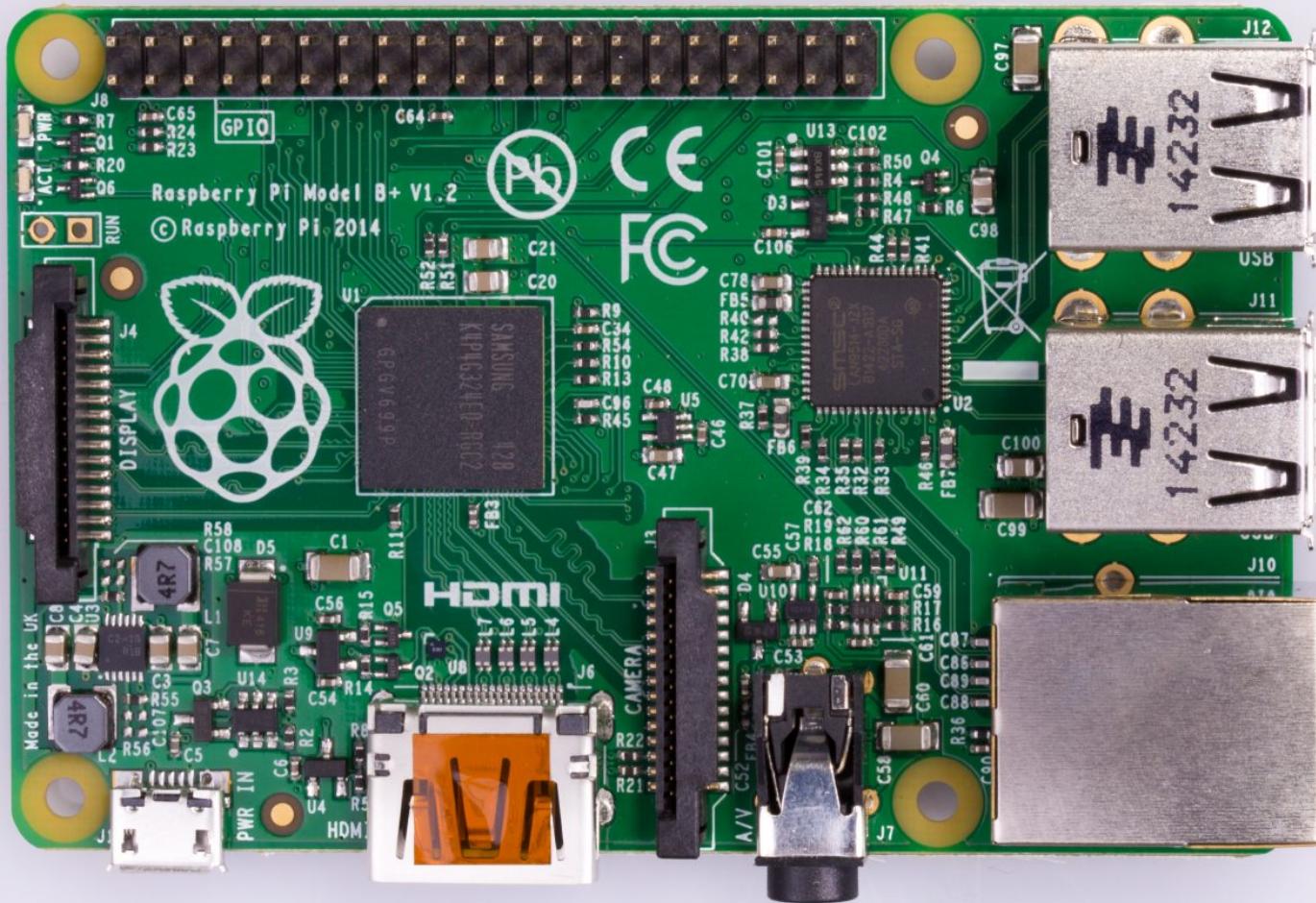


photo from WikiMedia, user Herbfargus

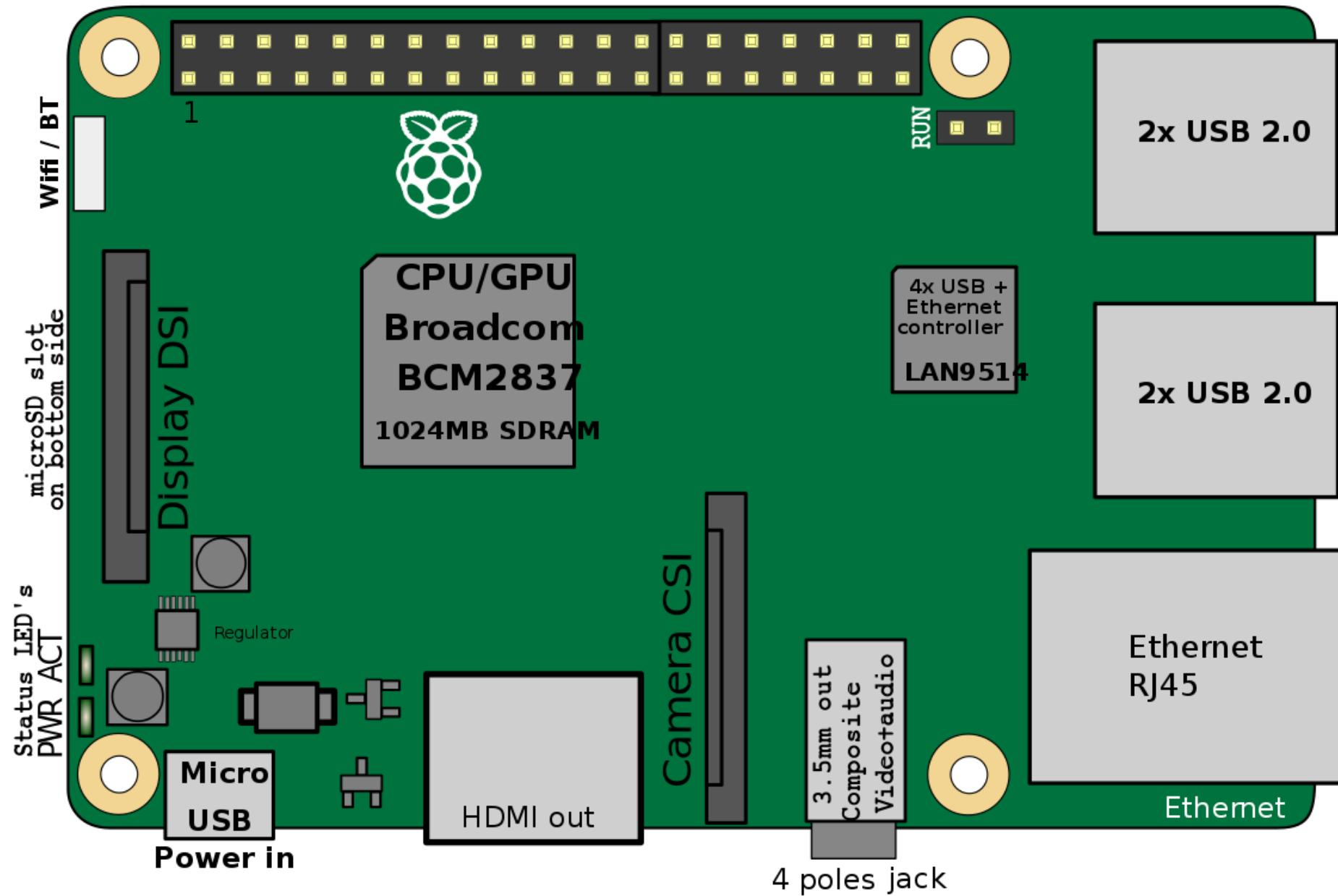


diagram from Wikimedia, user Era

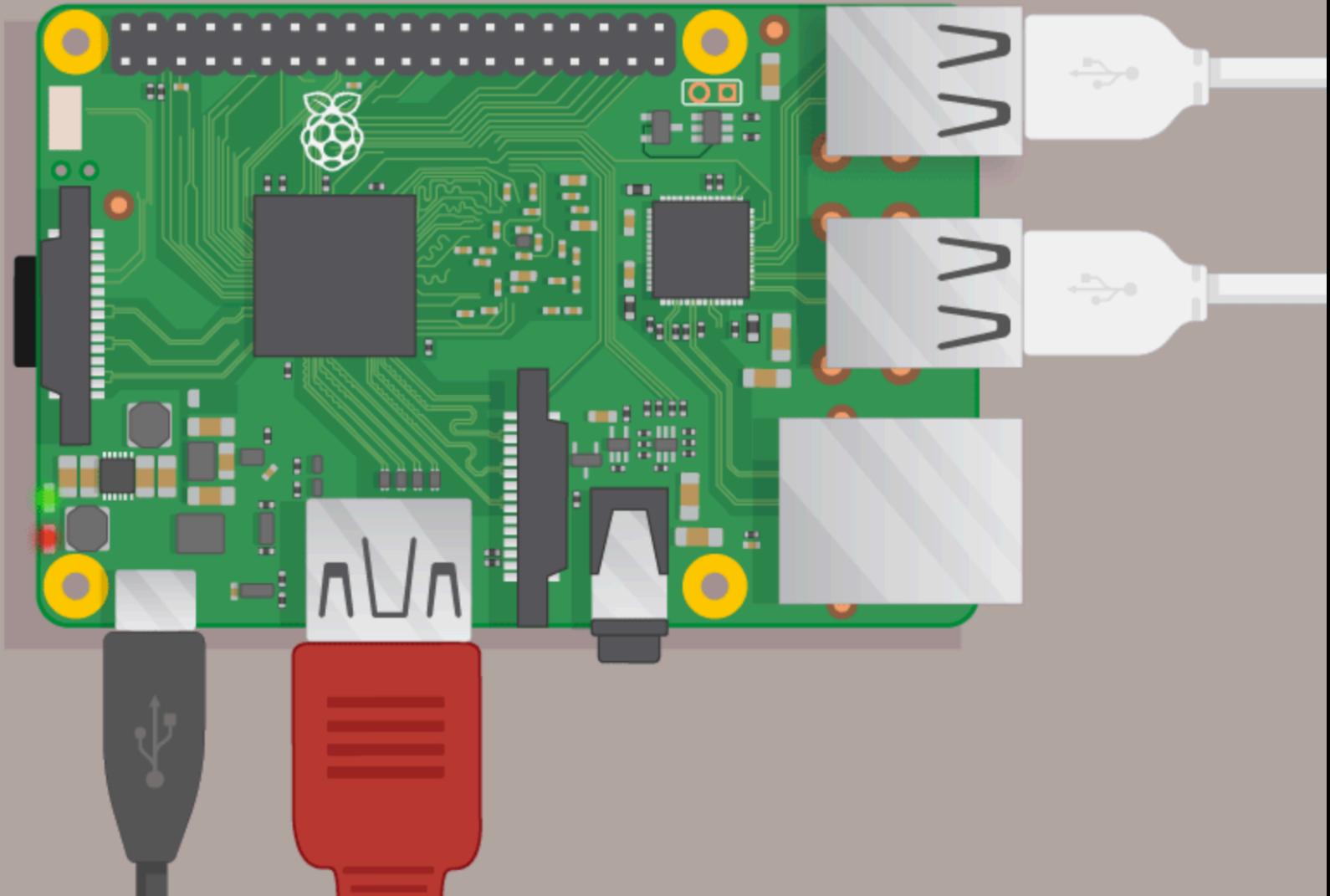


diagram from [RaspberryPi.org](https://www.raspberrypi.org)

RASPBERRY PI

From the UK, specifically for education

15 million sold (as of July 2017) * Raspberry Pi Foundation,
3rd best-selling general purpose computer

RASPBERRY PI B+

Microprocessor: ARM-based CPU, on-chip GPU

Storage: microSD card

Uses normal computer connectors, peripherals

Audio, Video output: 3.5mm headphone, HDMI

Peripheral IO: 4 USB

Networking: 802.11n, Ethernet, Bluetooth

Target price: \$35

Community

LINUX



Based on UNIX command set
Began in 1991 as personal project of Finnish student Linus Torvalds to make a free OS kernel based on the x86
Free
Open source

image: December 2002 issue of Linux Magazine, retrieved from Wikipedia

BEFORE THE DAWN OF GUI

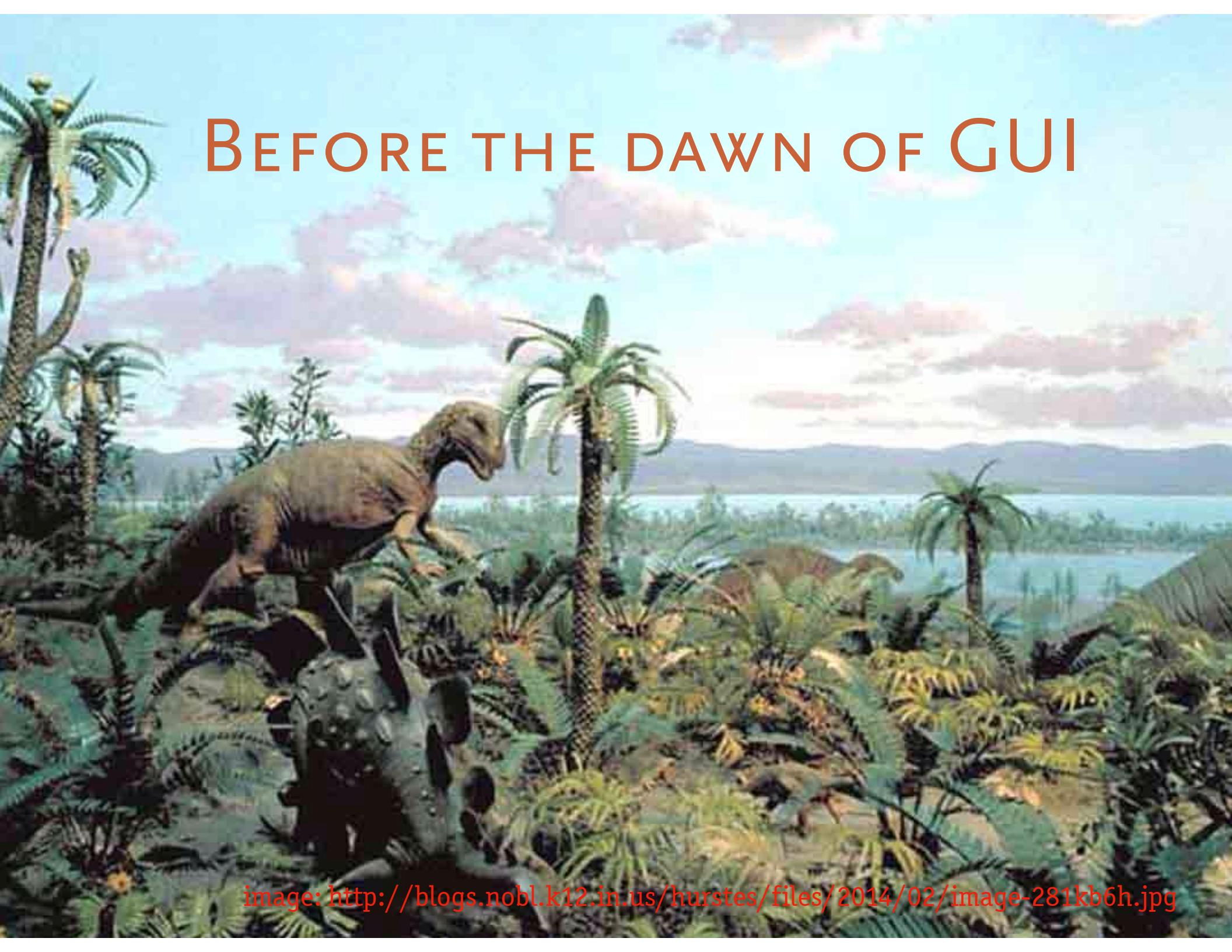
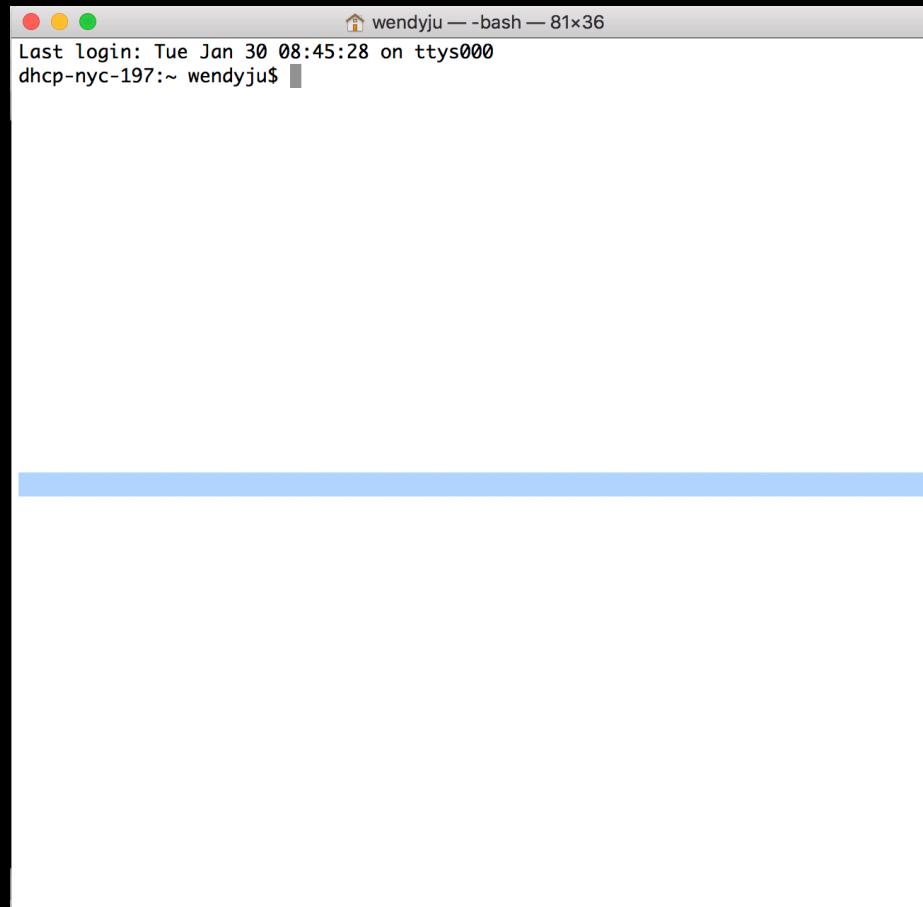


image: <http://blogs.nobl.k12.in.us/hurstes/files/2014/02/image-281kb6h.jpg>

UNIX/LINUX



Demo in Terminal (Window users can use PuTTY)

UNIX COMMANDS

ls
cd
mkdir
cp
mv
rm
cat

Tab complete
History
Background jobs

UNIX COMMANDS

ssh - secure shell

scp - secure copy

OPERATING SYSTEMS

Wikipedia:An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs.

User Interface

3rd party software availability

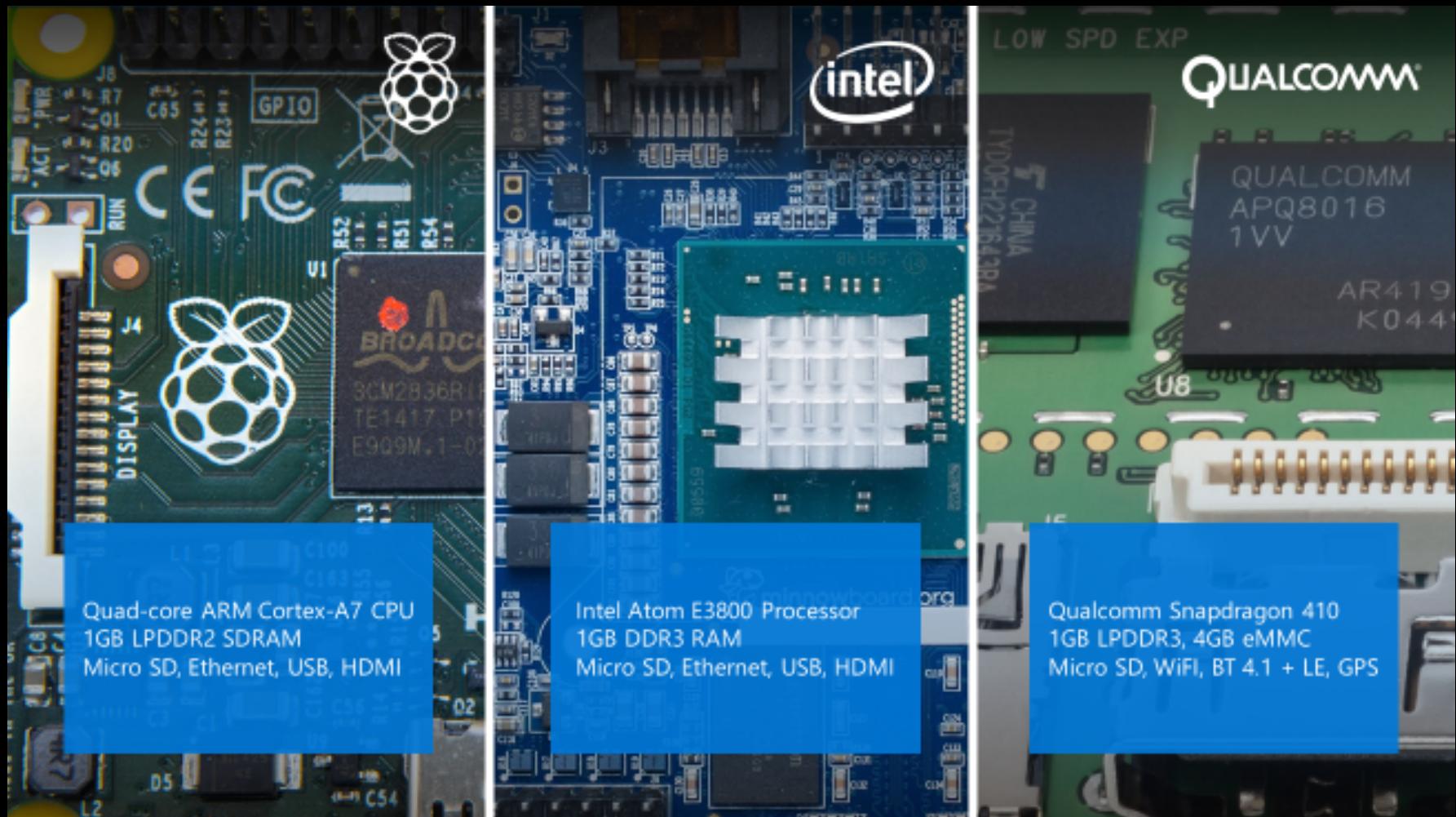
Ability to integrate peripherals

ANDROID



“Linux makes up the core part of Android, but Google hasn’t added all the typical software and libraries you’d find on a Linux distribution like Ubuntu. This makes all the difference.”
Android allows central vetting of applications.

Windows 10 IoT



<https://blogs.windows.com/windowsexperience/2015/03/18/windows-10-iot-powering-the-internet-of-things/>

WINDOWS 10 IoT

Not open source

More peripherals likely to work

Allows you to program in Visual Studio and run code on Pi

Not a lot of community support

PI ALTERNATIVES

BEAGLEBONE BLACK

Based on ARM Cortex A8

\$75 MSRP

Less connectivity, more GPIO

Low power consumption

Intended to be integrated into
products

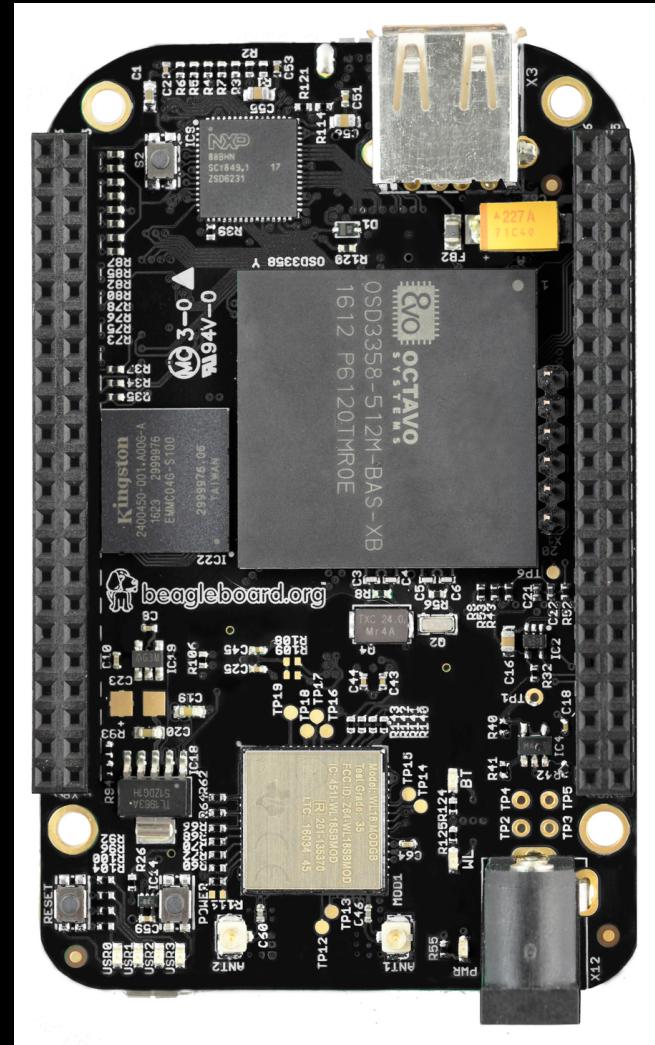


image: <https://beagleboard.org/black-wireless>

ODROID-XU4

Based on ARM Cortex
~\$60 MSRP
More powerful than Pi
Open hardware
Less community support
Supports Linux, Android
2 USB, no Wifi or BT built in
Intended to promote Samsung IoT

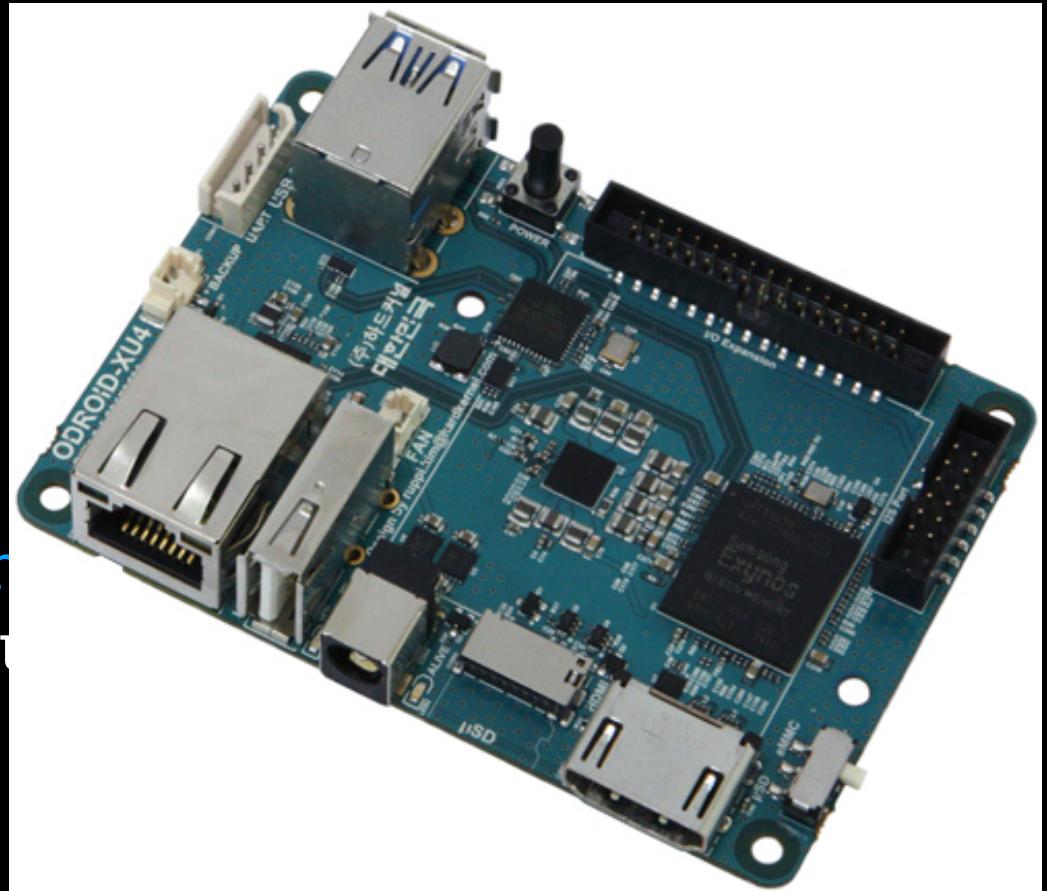


image: <http://www.hardkernel.com/main>

LATTEPANDA

Runs Windows 10, Linux

~\$89 MSRP

Has an Arduino
integrated

Normal PC peripheral
drivers will work

Intended to promote
Windows Infrastructure



image: <https://www.lattepanda.com>

JETSON NANO

Runs Ubuntu Linux
~\$99 MSRP
Quad-core ARM A57

Intended to promote
NVIDIA as deep-
learning platform

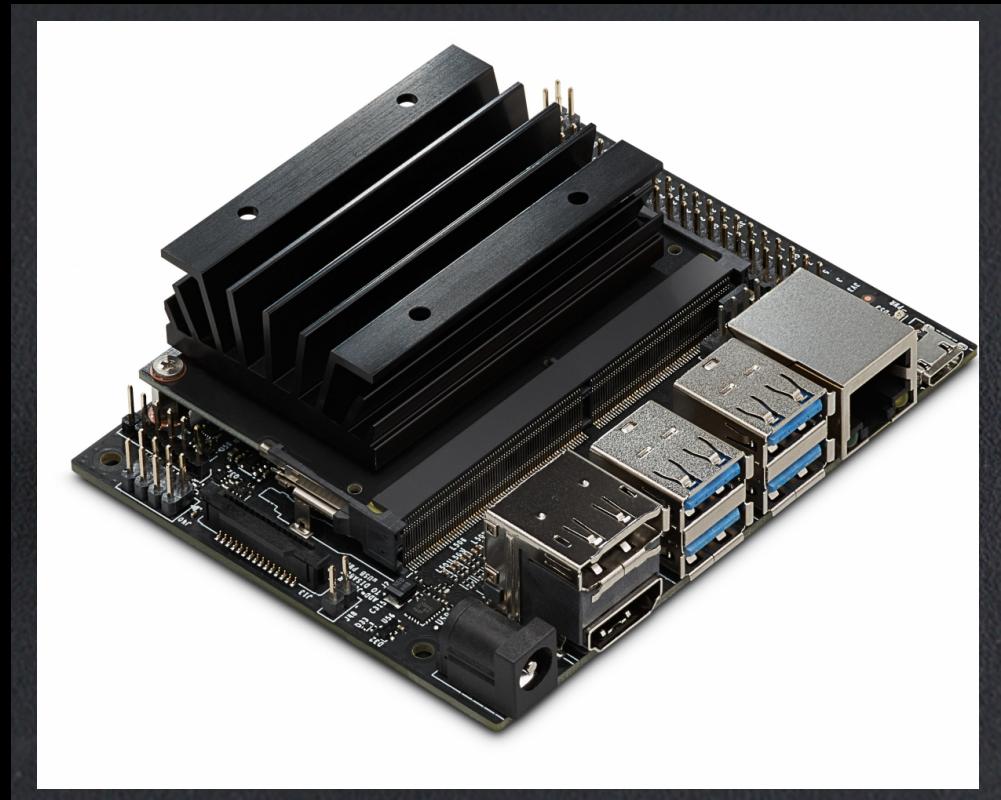


image: <https://www.lattepanda.com>

RASPBERRY PI (RPI) ZERO

Smaller
MicroSD card slot
MiniHDMI
2 micro USB ports
\$5

Also: Pi Zero W has Wifi - \$10

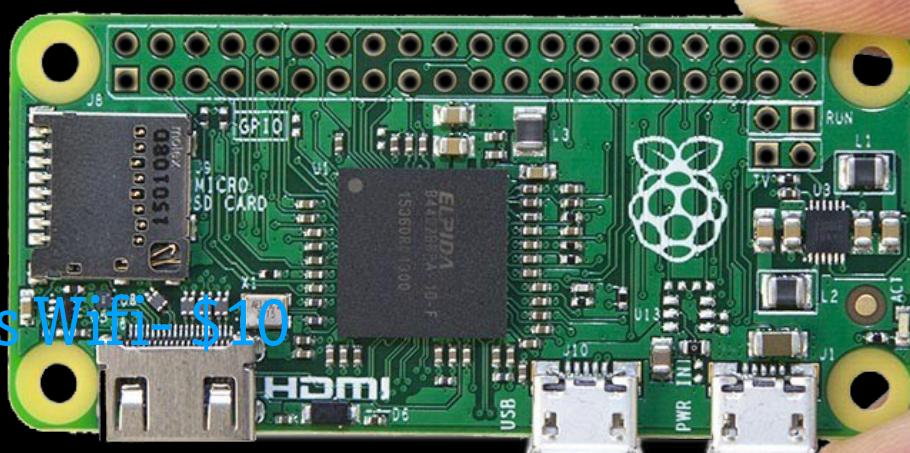


image: [Pi Supply](#)



Raspberry PI alternatives

Products > High-Tech

Last update 2018 Aug 2 02:25:54

 Favorite

 2

Compare boards which could replace a Raspberry Pi

Compatible Raspberry PI HAT (Hardware Attached on Top): Have the same GPIO layout

You might also be interested by: <http://socialcompare.com/en/comparison/arm-boards> or <http://socialcompare.com/en/comparison/raspberrypi-models-comparison>

- Livres
- Livres en anglais
- Musique
- DVD
- Vidéo
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- Jeux vidéo

Achetez en toute sécurité



Cliquez ici !

A propos de cet espace

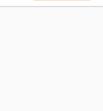
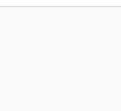
[Raspberry Pi 3 B+](#)[Raspberry Pi Zero](#)[CHIP](#)[Banana Pi](#)[BeagleBONE BLACK](#)[BeagleBone](#)[A20-OLinuXino-LIME](#)

Image	Raspberry Pi 3 B+	Raspberry Pi Zero	CHIP	Banana Pi	BeagleBONE BLACK	BeagleBone	A20-OLinuXino-LIME
Image							
HAT compatible							
Height	3.37 in (85.6 mm)	1.18 in (30 mm)	1.57 in (40 mm)	2.36 in (60 mm)	2.15 in	2.15 in	84 mn
Width	2.22 in (56.5 mm)	2.55 in (65 mm)	2.36 in (60 mm)	3.62 in (92 mm)	3.4 in	3.4 in	60 mn
Weight	1.58 oz (45 g)	0.31746 oz (9 g)		1.69 oz (48 g)	1.4 oz	1.4 oz	
Price	US\$35.00	US\$5.00	US\$9.00		US\$45.00	US\$89.00 (Digikey)	€33.00

Technical details

CPU	1.4GHz 64-bit quad-core ARMv8	1 GHz Low Power ARM1176JZ-F	1 GHz Allwinner A13 Compatible SoC	1 GHz ARM Cortex-A7 dual-core			Allwinner A20 dual core Cortex-A7 processor (1 GHz)
GPU	VideoCore IV	Dual Core VideoCore IV® Multimedia Co-Processor	ARM Mali-400	ARM Mali-400 MP2 GPU dual-core			dual-core Mali 400 GPU
RAM	1 GB	512 MB	512 MB (DDR3)	1 GB	512 MB	256 MB	512 MB (DDR3)
4K compatible							
Onboard storage			4 GB EMMC				
Flash storage types							
Ethernet (LAN, RJ45)		10/100/1000		via USB			
USB		4x USB2.0		micro + micro OTG		1x USB2.0 + micro OTG	
SATA Ports						2x USB2.0 + micro OTG	
HDMI port		1		mini		via adapter	
Wi-Fi		2.4GHz and 5GHz 802.11 b/g/n/ac		802.11 b/g/n			
Bluetooth®		4.2. BLE		4.0			

OTHER CONSIDERATIONS

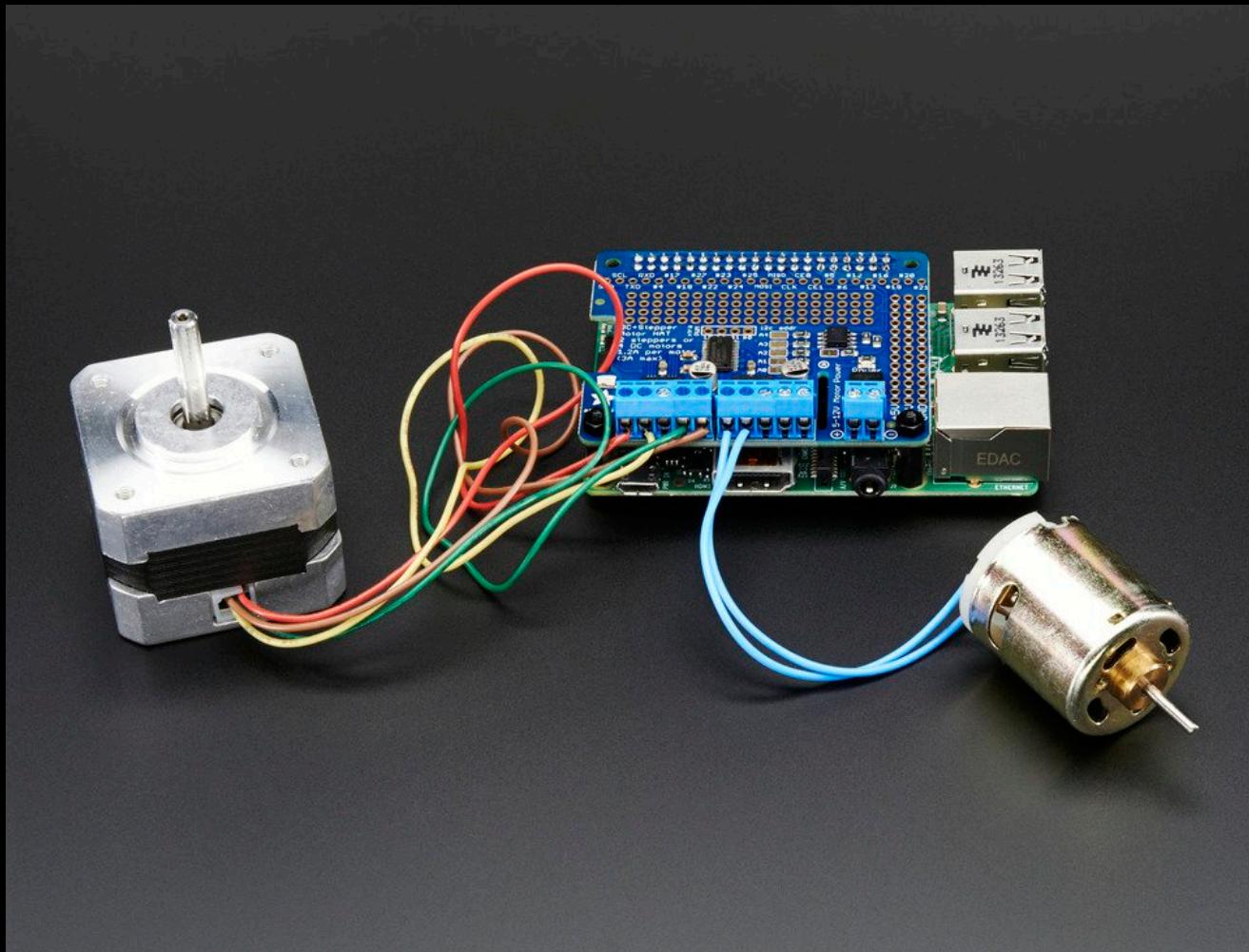


image: [Pi Supply](#)

OTHER CONSIDERATIONS

BeagleBoard.org® Capes



BeagleBoard.org Comms Cape

For industrial communication applications. Provides an array of communication protocols including one RS485, one CAN, two analog 4–20 mA current loops, and two 3A 50V interfaces allowing the control of high current loads.

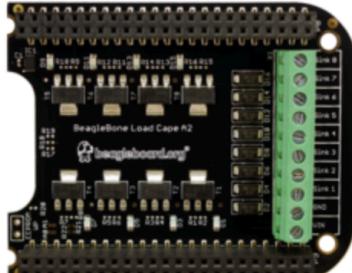
[Additional details](#)

- RS485
- CAN
- 2x 4–20mA current loop inputs
- 2x 3A 50V sinks for high-current loads
- I²C EEPROM

[Purchase](#)



Select a distributor to buy



BeagleBoard.org Load Cape

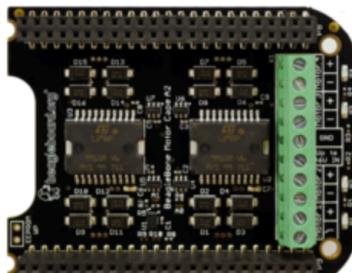
Drive high-current loads like relays, motors, solenoids, and high current LEDs.

- 8x 3A 50V sinks for high-current loads
- I²C EEPROM

[Additional details](#)

[Purchase](#)

Select a distributor to buy



BeagleBoard.org Motor Cape

Drive DC motors with direction and PWM control.

- 4x 3A motor outputs up to 46V
- I²C EEPROM

[Additional details](#)

[Purchase](#)

Select a distributor to buy

BeagleBoard.org Power Cape

[Beagleboard Capes](#)

ALTERNATIVES

Criteria for selection:

Price

Power consumption

Availability

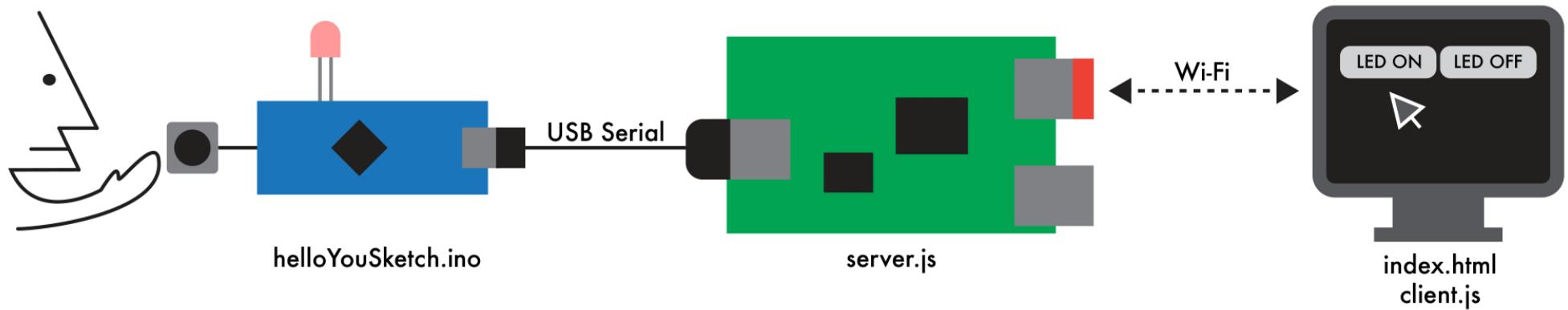
Product roadmap

Community

Software support

Operating System

INTERACTION ENGINE



The Interaction Engine is a framework for prototyping web-connected hardware. We use a set of widely supported tools to create a system to help interaction designers quickly realize new, multimodal interactive experiences.

NODE.JS

Node.js is a JavaScript run-time environment which can make interactive websites through server-side scripting. It uses an event-driven, non-blocking I/O model that makes it lightweight and efficient.

NPM

Packages people 'npm install' a lot



browserify

browser-side require() the node way

16.1.0 published 3 weeks ago by [goto-bus-stop](#)



gulp

The streaming build system

3.9.1 published 2 years ago by [phated](#)



npm

a package manager for JavaScript

5.7.1 published a week ago by [zkat](#)



grunt-cli

The grunt command line interface

1.2.0 published 2 years ago by [vladikoff](#)



grunt

The JavaScript Task Runner

1.0.2 published 4 weeks ago by [vladikoff](#)



cordova

Cordova command line interface tool

8.0.0 published 2 months ago by [stevegill](#)



bower

The browser package manager

1.8.2 published 6 months ago by [sheerun](#)

express

express

Fast, unopinionated, minimalist web framework

4.16.2 published 5 months ago by [dougwilson](#)



forever

A simple CLI tool for ensuring that a given node script runs continuously (i.e. forever)

0.15.3 published a year ago by [indexzero](#)

Node.js' package ecosystem, [npm](#), is the largest ecosystem of open source libraries in the world. (<https://www.npmjs.com>)

SOFTWARE BEST PRACTICES

Start early

- bugs are best resolved with time rather than intensity
- time enables collaboration

Make a plan, keep the plan updated

- a plan will help you when you get lost
- a plan will help you remember what you did
- a plan helps others see where you went wrong

SOFTWARE BEST PRACTICES

Don't code alone

- do not beat your head on problem for more than 1 hour
- see if anyone else has had your problem
- use Discord to get help

Documentation

- write down your sources
- when you hit an error and resolve it, write it down YOU WILL SEE IT AGAIN

Commit & Push often