Introduction to Raspberry Pi

ROCHESTER MAKERSPACE

2019

History

▶ The Raspberry Pi was created in February 2012 by the Raspberry Pi Foundation to promote and teach basic computer science in schools and colleges around the UK.

▶ The Raspberry Pi Foundation is a UK-based charity that works to put the power of computing and digital making into the hands of people all over the world. We do this so that more people are able to harness the power of computing and digital technologies for work, to solve problems that matter to them, and to express themselves creatively.

▶ More than 1M units sold in the first year, more than 4.5M by 2014

▶ Raspberry Pi 4 B went on sale in June 2019, offering faster processor and ports, as well as options for more RAM.

Raspberry Pi 3 B+

- Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz

- 1GB LPDDR2 SDRAM

- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE

- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)

- Extended 40-pin GPIO header

- Full-size HDMI

- 4 USB 2.0 ports

- CSI camera port for connecting a Raspberry Pi camera

- DSI display port for connecting a Raspberry Pi touchscreen display

- 4-pole stereo output and composite video port

- Micro SD port for loading your operating system and storing data

- 5V/2.5A DC power input
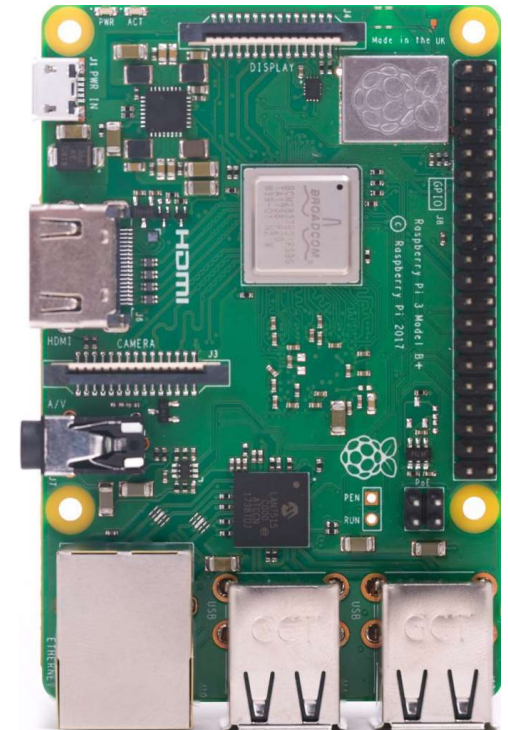
Raspberry Pi 4 B

- Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz

- 1GB, 2GB or 4GB LPDDR4-2400 SDRAM (depending on model)

- 2.4 GHz and 5.0 GHz IEEE 802.11ac wireless, Bluetooth 5.0, BLE, Gigabit Ethernet

- 2 USB 3.0 ports; 2 USB 2.0 ports

- Raspberry Pi standard 40 pin GPIO header (fully backwards compatible with previous boards)

- 2 × micro-HDMI ports (up to 4kp60 supported), 2-lane MIPI DSI display port

- 2-lane MIPI CSI camera port

- 4-pole stereo audio and composite video port

- H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode), OpenGL ES 3.0 graphics

- Micro-SD card slot for loading operating system and data storage

- 5V DC via USB-C connector (minimum 3A*)

- 5V DC via GPIO header (minimum 3A*)

Linux with GPIO!

GPIO Pinout Diagram
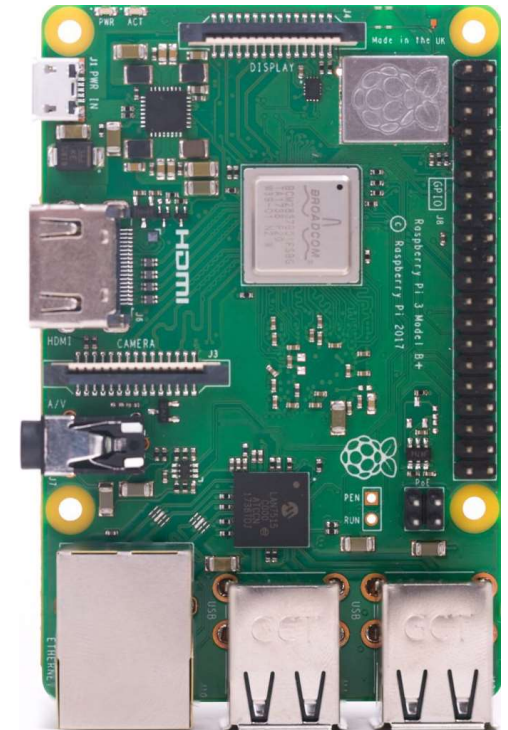
- At 1.4MHz, quad-core and 1GB of RAM, RPi 3 B+ is a capable small Linux system

- Raspberry Pi 4 offers a faster processor, two USB 3.0 ports, two (micro) HDMI ports, options of 1GB, 2GB, or 4GB of RAM

- Both offer GPIO enabling the creation of different projects e.g., robots
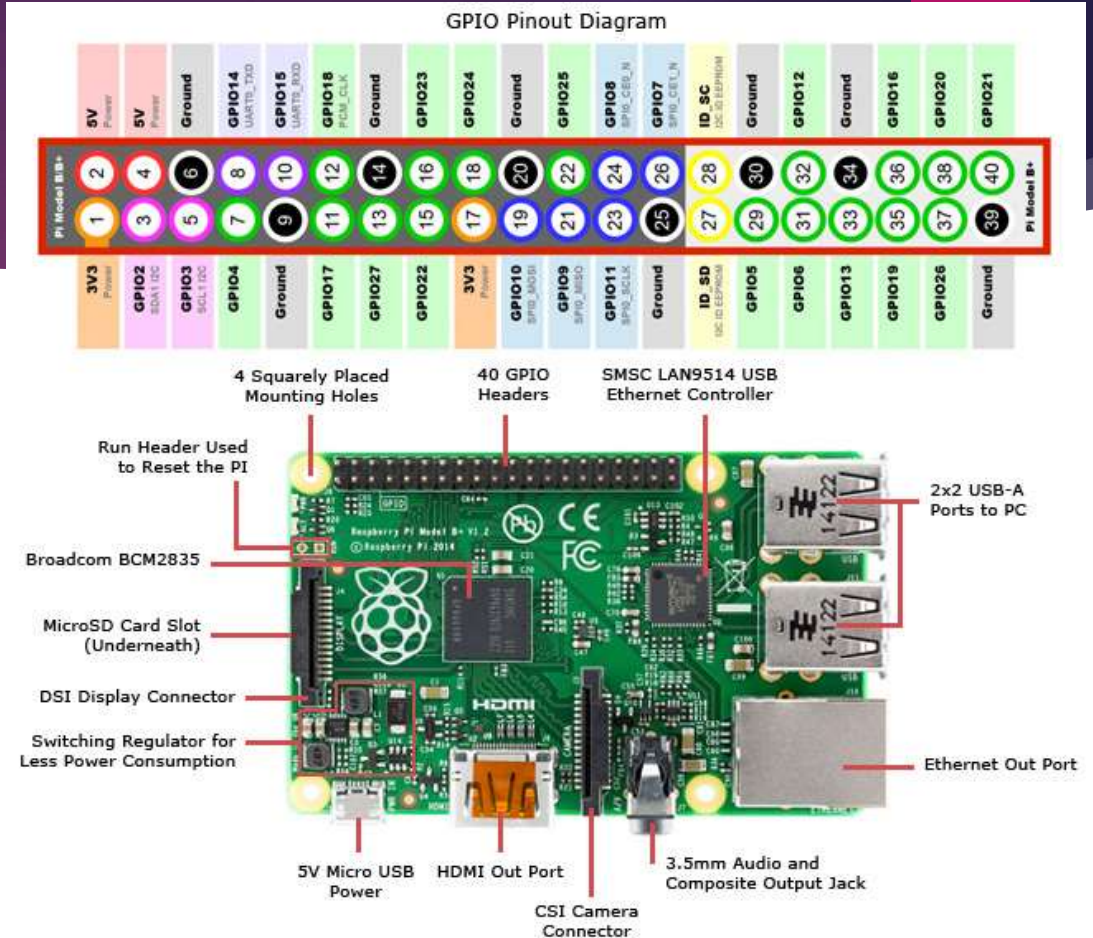
Comparison vs. Arduino

Pros

- More RAM + Storage
- More processing power
- Debug in place
- Multiple, concurrent programs
- Built-in HDMI and camera interfaces
- Built-in WiFi and Bluetooth comms
- Built-in Ethernet and 4 USB ports
- Pluggable SD card to expand memory

Cons

- Non-real-time OS makes real-time programming impractical
- Requires some understanding of Linux
- Much more configuration required
- More electrical power required
- No A/D inputs
- Narrow input voltage tolerance

Bottom Line: Choose the right tool for the job

Next Steps

- Check out these sources of information
    - Raspberry Pi Manual
    - Raspberrypi.org
    - www.elinux.org
    - Adafruit.com/category/105 – Raspberry Pi products and accessories
    - Youtube.com
- Design a project or program and get started!
    - Lots of examples online if you are looking for inspiration