

■ Pi in the Shack

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■ Introduction

- Designed to promote computer science
- Increase applications for University level computer science courses.
- Strong maker community interest
- Over 12.5 million sold in 5 years – more than Commodore 64!
- 3rd most popular computer after the PC and Mac ...

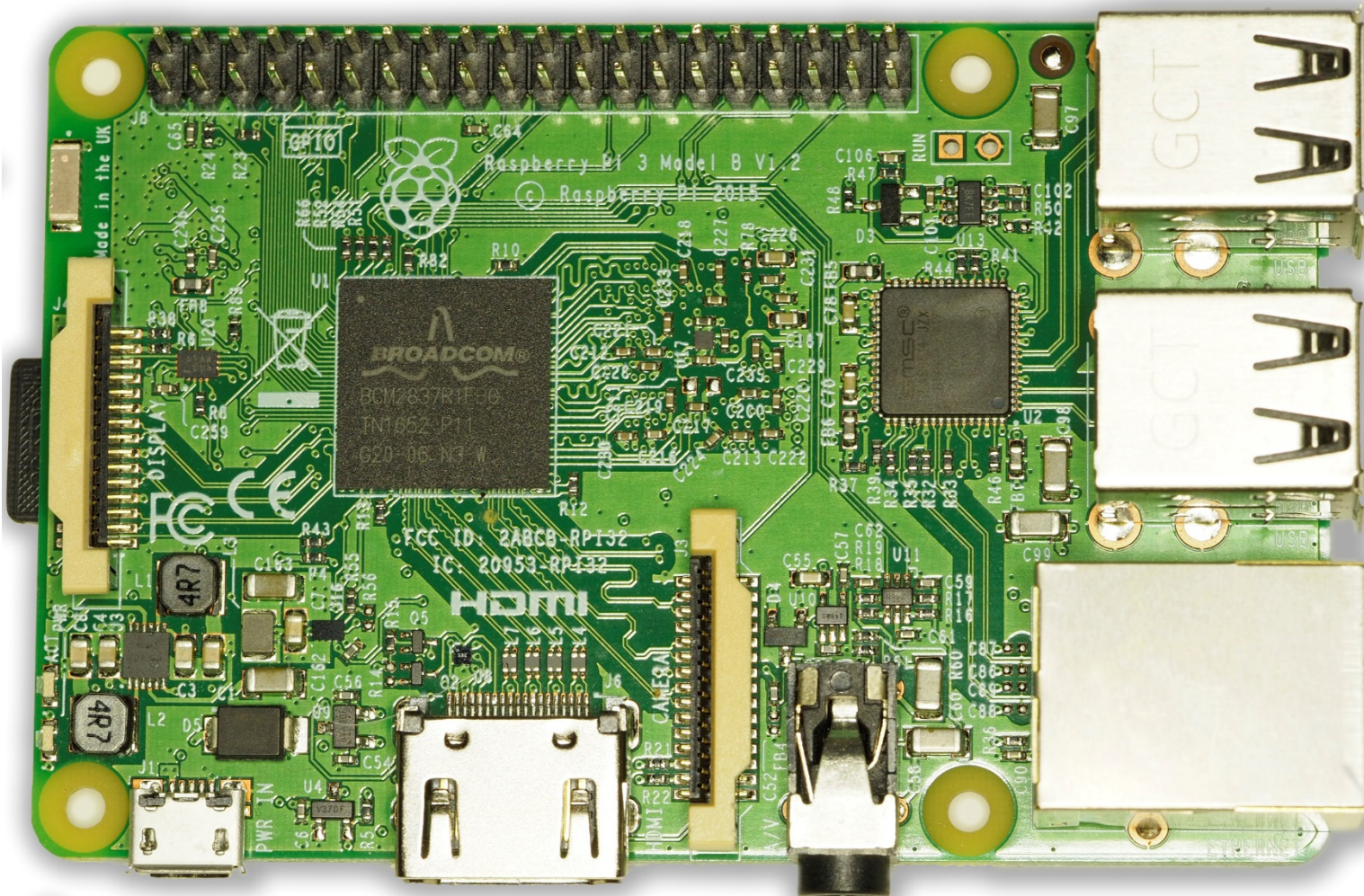
■ What is it?

- Pi-3 - Single board computer
 - Quad core 64-bit processor
 - Runs at 1.2GHz
 - 1GB RAM
 - Dedicated full HD graphics processor
 - Micro SD card as hard drive
 - 40 GPIO pins
 - Dedicated camera and display serial connectors ...

■ There's More ...

- Pi-3 - Single board computer ...
 - On-board Wi-Fi and Bluetooth
 - Dedicated Linux OS
 - Libre Office Suite
 - Suite of programming tools
 - Comprehensive support
 - Costs just £32!
 - ...

Pi-3

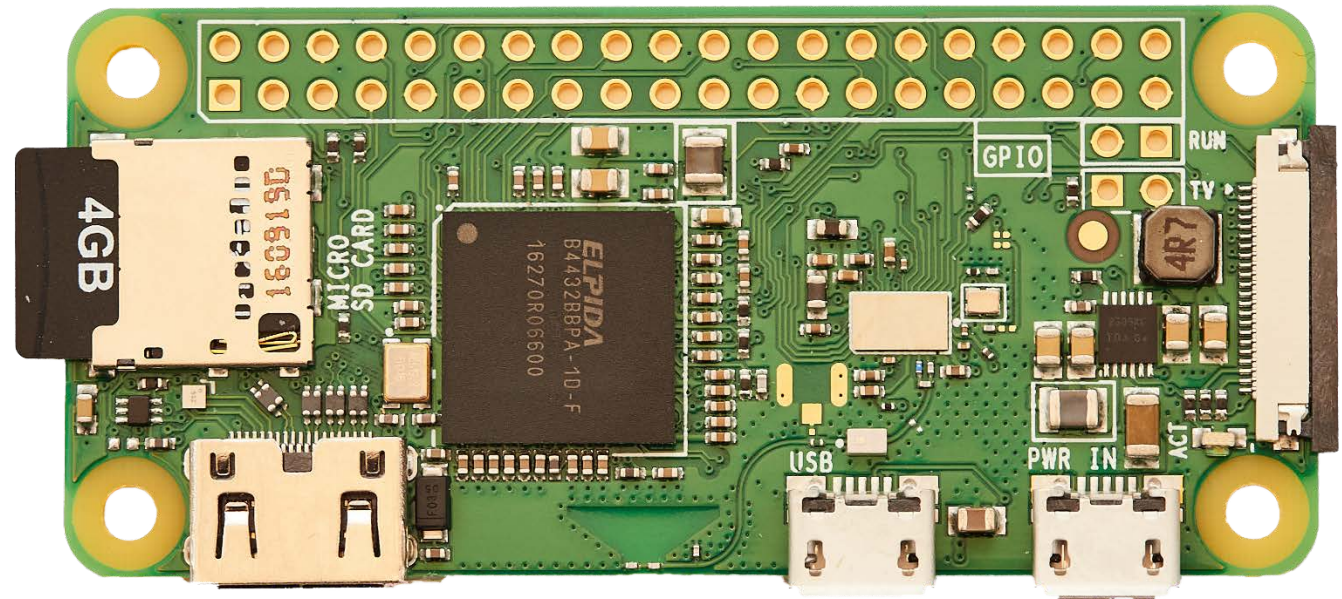


■ There's More ...

- Pi-Zero
 - 1GHz ARM11 processor – 40% faster than original Pi-1
 - 512MB RAM
 - Full HD graphics processor
 - Unpopulated 40-pin GPIO
 - Tiny – 65mm x 30mm x 5mm
 - Serial camera socket
 - Costs just £4.80!
 - ...

Variants ...

- Pi-Zero-W
 - Same as Pi-Zero but ...
 - On-board Wi-Fi and Bluetooth
 - Costs just £9.60!
 - ...

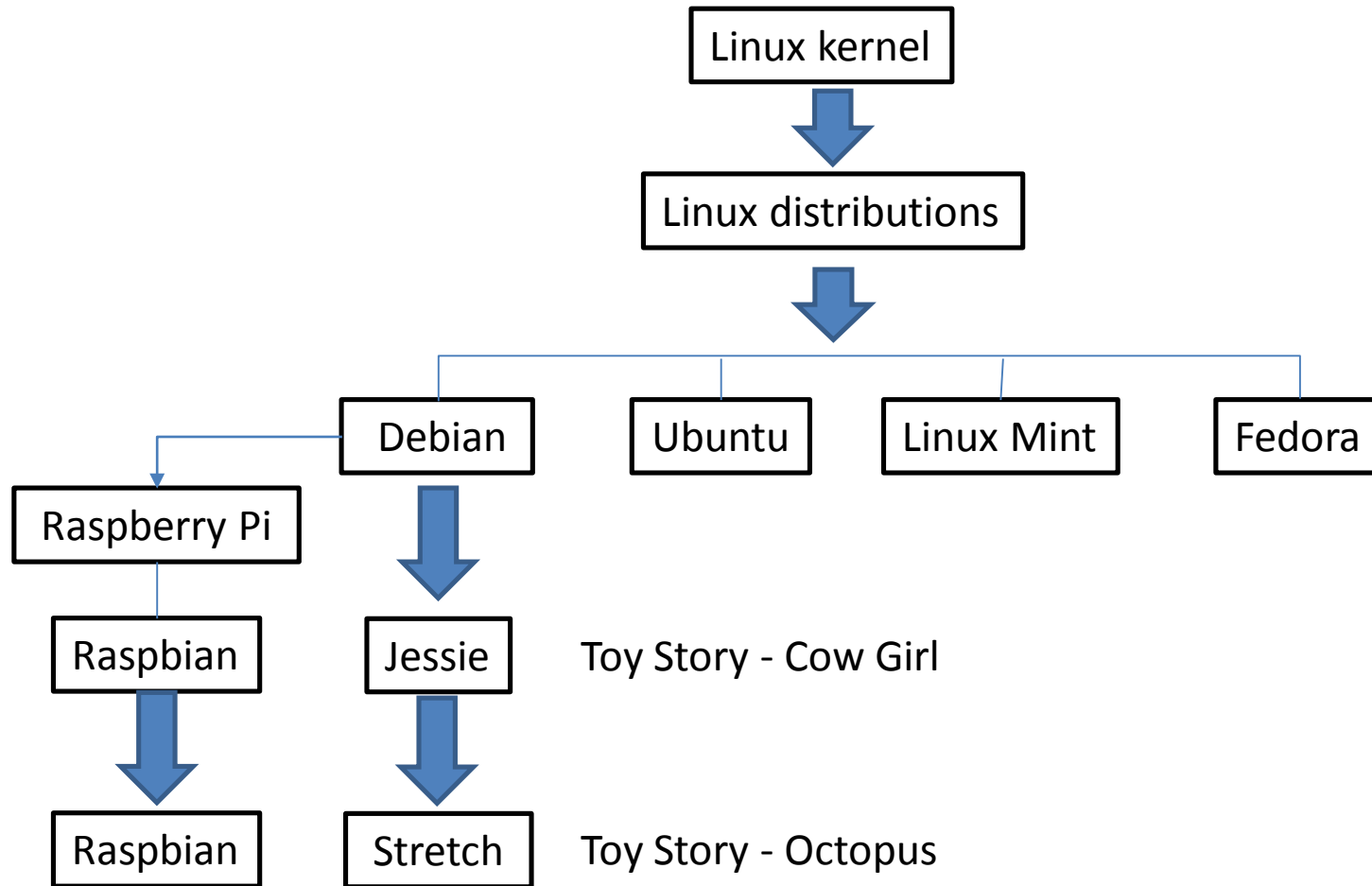


■ Variants ...

- Pi-Zero
 - Great Pi cases - £6
 - ...



Operating System



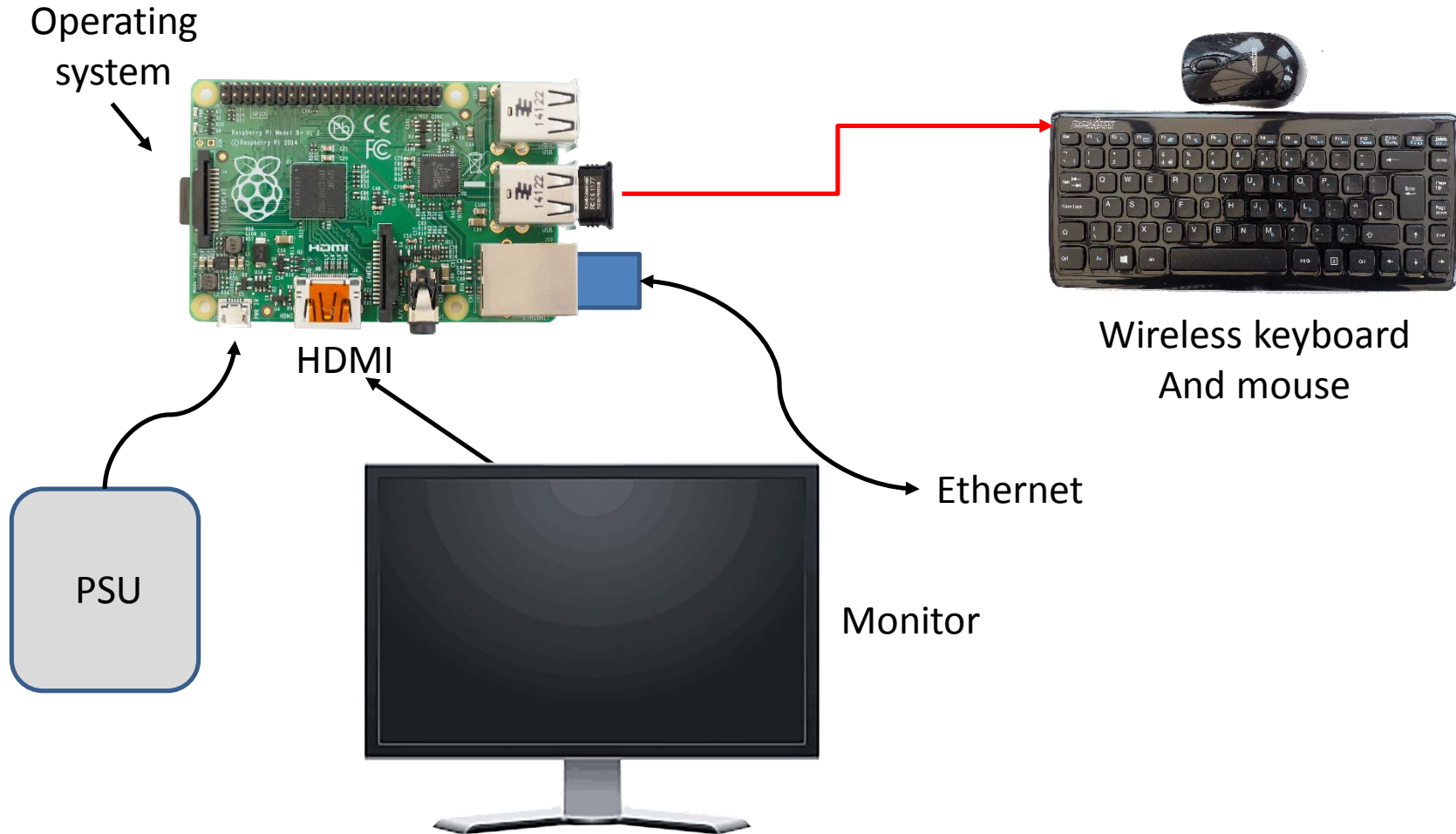
■ Peripherals

- Keyboard/Mouse
 - Wireless combos, i.e. Perixx Periduo-712
- Network
 - Ethernet is fastest and has no setup
 - Wi-Fi good and easy to configure
 - ...

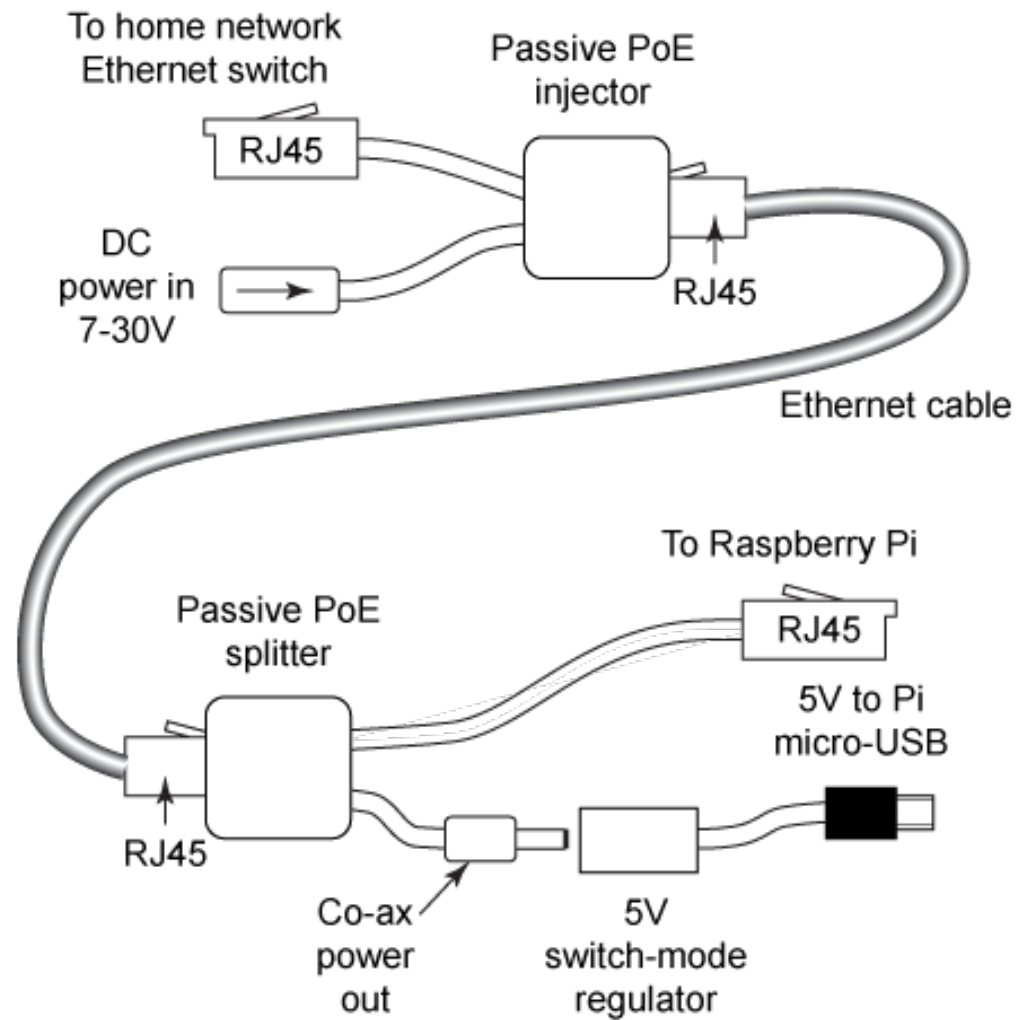
■ Peripherals

- Display
 - Use any HDMI monitor or Pi 7" TFT
 - Pi outputs 1080p HD
- Power
 - 5V DC 2-3A plug-top units
 - Mobile phone power packs
 - LiPos – 3.7V with boost converter
 - PoE – Power over Ethernet
 - ...

Connecting-up – Stand-Alone



Passive PoE



■ Passive PoE ...

- 100Mb/s Ethernet uses 2 pairs
- Cat 5 cable has 4 pairs – two available for other use
- Bunch the wires of each pair – doubles current capacity
- Standard Cat5E can handle 600mA, bunched = 1.2A
- Passive PoE injector/splitter cables about £5-£10
- ...

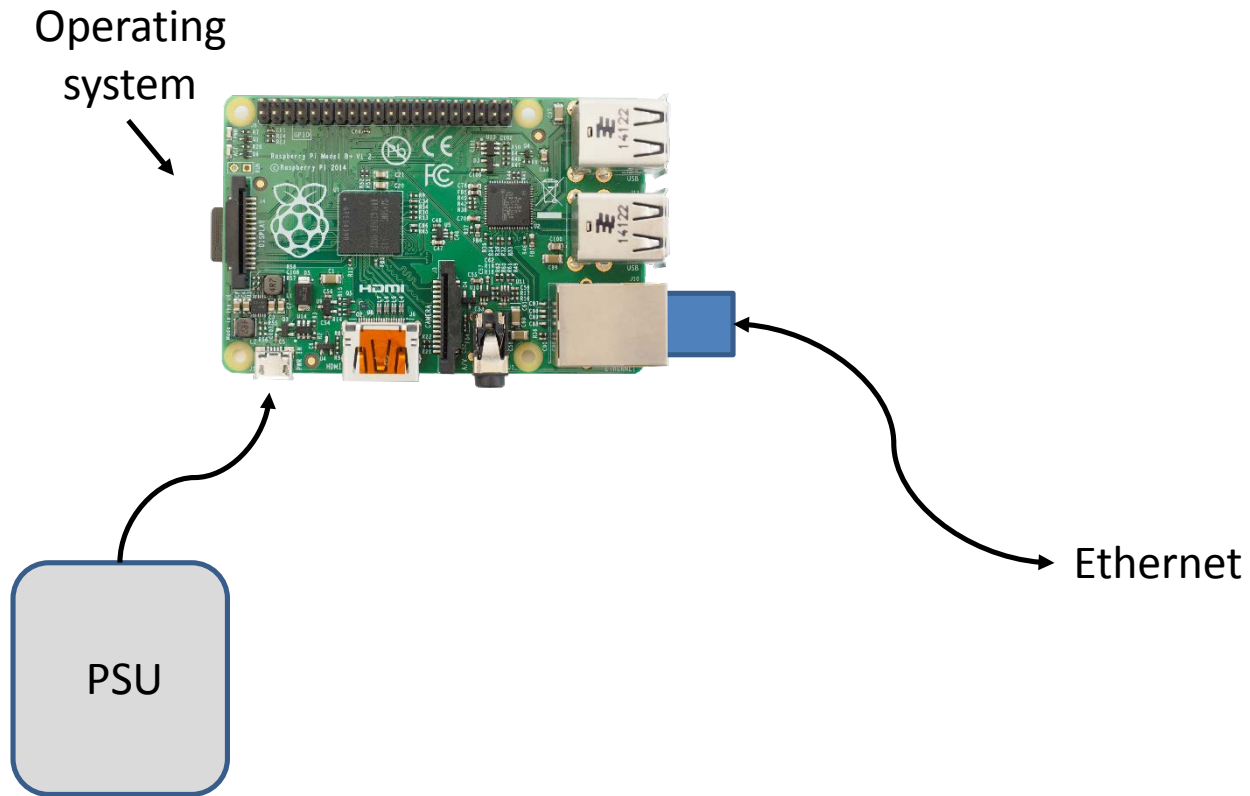
■ DiY Passive PoE

- CAT5E – Passive PoE wiring
 - Orange & green pairs = data
 - Blue pair = +ve
 - Brown pair = -ve
- Minimise current by applying 12V DC and using efficient switching regulators to derive 5V for Pi
- Murata OKI-78SR regulator 90% efficiency at 12V in and 5V out at 1.5A
- Use over-current protection on the PoE feed (PTC, etc)

■ Headless Operation

- Connect keyboard/display on first boot.
 - Remote connectivity disabled by default
- RealVNC
 - Included in Raspbian
 - Provides full remote access to desktop
- SSH
 - Provides command line access
 - Both enabled via Preferences menu
 - ...

Connecting-up – Headless



Raspberry Pi – IP Address

- Many apps require the Pi IP address
- How to find IP address
 - Hover network icon on desktop (Two arrows)
 - Open a terminal and enter: `hostname -I`
 - Modern routers can link IP address to MAC code.
 - Better than static IP
 - ...

Pi Shack Projects

Data Modes Terminal

Data Modes Terminal

- Standard setup plus a USB soundcard
- Choosing a Soundcard
- USB, ideally with short tail
 - Use Pi suppliers or U-Green USB Audio Adapter from Amazon
 - Signalink USB
- Tx/Rx switching
 - Use Vox or add serial USB adapter
- Add a level adjustment in Tx audio

Data Modes Terminal

- FLDIGI
 - Wide range of data modes
 - Integrated logging
 - All modes work with a Pi-3
 - Pi repository has very old version
 - Install latest version using script from:
www.indyham.com
 - Includes Hamlib for rig control
 - ...

Data Modes Terminal

- QSSTV
 - Versatile SSTV software
 - Uses the USB soundcard
 - Needs to be compiled on the Pi
 - Simple installation instructions on web at:
users.telnet.be/on4qz/
 - ...

Data Modes Terminal

- WSJT-X
 - Includes all the weak signal modes
 - Pi binary of latest rc2 release available from: <https://physics.princeton.edu/pulsar/k1jt/wsidx.html>
 - Or Google WSJT-X
 - Fully functional on Pi-3 only
- Ready programmed microSD card with printed instructions available from my shop www.g4wnc.com/shop
- ...

Pi Shack Projects

Packet & APRS Station

Packet & APRS Station

- No need for traditional hardware TNC
 - Dire Wolf software handles the packet protocol
- Uses a standard USB soundcard
- Can use VOX for Tx/Rx
 - Needs to be compiled on the Pi
 - Installation instructions on web at:
<https://github.com/wb2osz/direwolf>
- ...

Packet & APRS Station

- Provides open ports for APRS or other clients to connect
- YAAC runs well on the Pi-3
- Get it here:
<http://www.ka2ddo.org/ka2ddo/YAAC.html>
- Self contained Java application
- Will also run on a PC on the local network
- I've also published instructions here:
<http://photobyte.org/packet-radio-raspberry-pi/>

■ Packet & APRS Station

- Add USB GPS or GPS HAT
- Run the Pi as an APRS Tracker
- ...

Pi Shack Projects

Security/Trail Cam

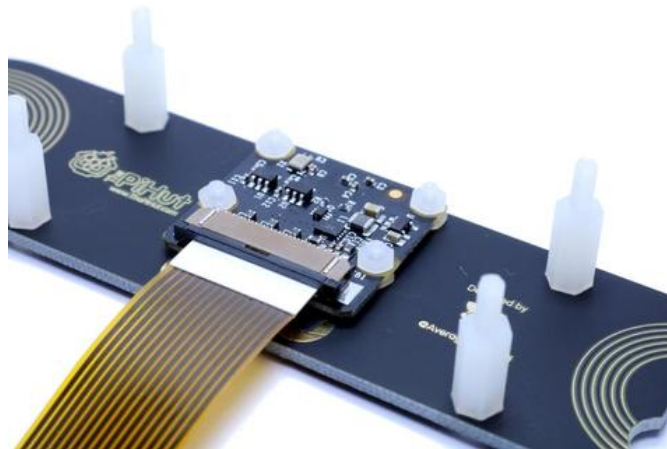
Security/Trail Cam

- Based on motioneyeOS
 - Self-contained OS and motion monitor
- Senses motion by analysing image – no PIR
- Simple browser interface
- Raspberry Pi Camera module or webcam
- Captures movement at typ. 2 frames/second
- Store images on SD or network attached storage.
- Can preview from phone/tablet/laptop

ZeroView - PiHut



ZeroView PCB - £7



Pi Hut Zero Cam



£25 complete with camera and IR lights

Pi Shack Projects

SDR Server

SDR Server

- RTL-SDR
 - Mount Pi and RTL Dongle close to antenna
 - Use standard Cat-5 ethernet for IQ data
 - Power over Ethernet
 - Can handle up to 4 instances with reduced bandwidth
 - Full instructions here:
 - <http://photobyte.org/using-the-raspberry-pi-as-an-rtl-sdr-dongle-server/>

RTL Dongle Server

Antenna



Ethernet + Power
Passive PoE

Streamed IQ Data

PC with SDR Sharp
or SDR Console
software

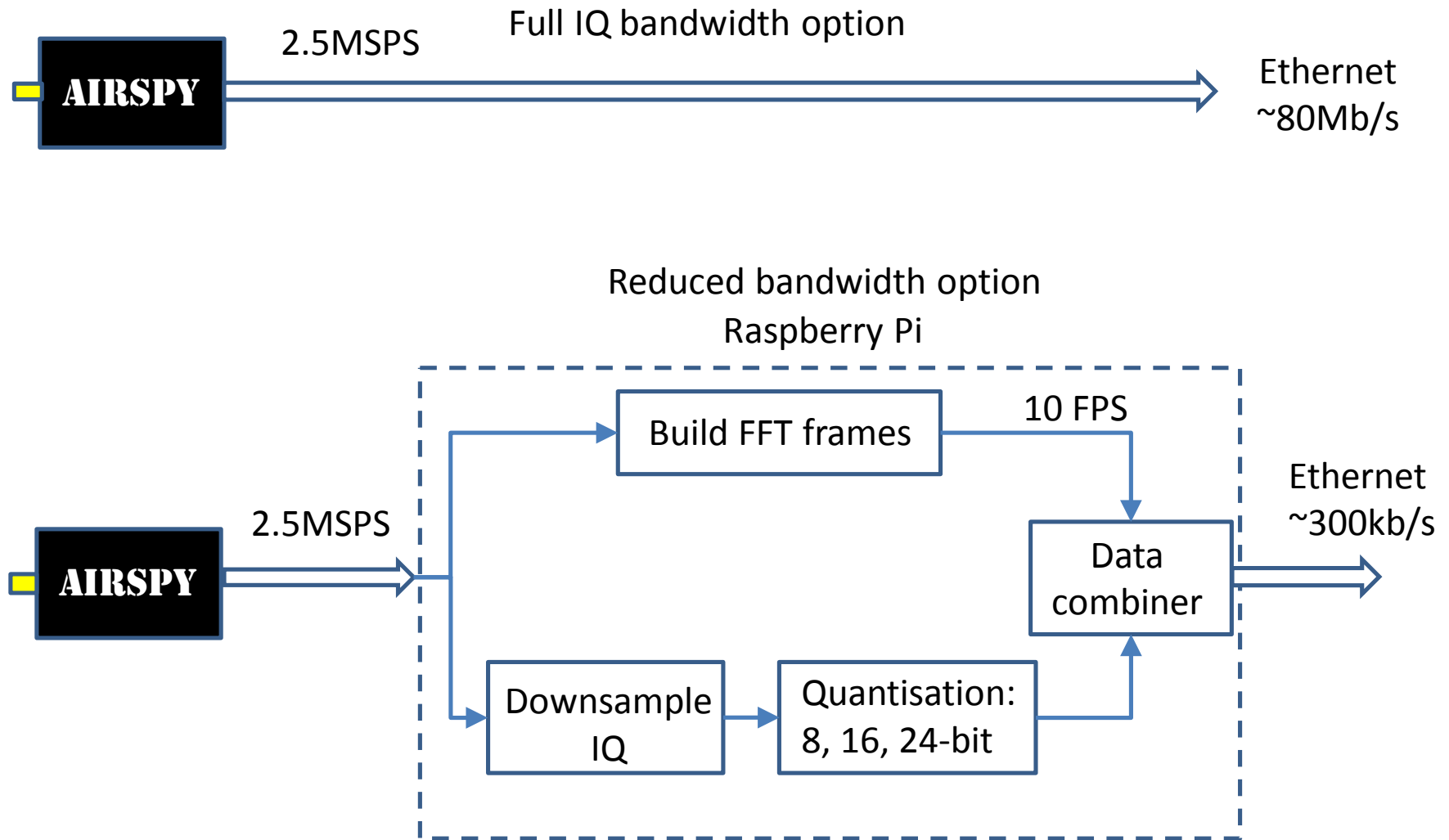


Power
supply

SDR Server

- Spy Server
 - New software designed for Airspy
 - Can also handle DVB-T dongles
 - Provides a low bandwidth mode for Internet sharing
 - Handles multiple connections
 - Locks tuning with multiple connections

SDR Server



SDR Server

- Spy Server Summary
 - Enables Internet sharing with 2MHz bandwidth.
 - ASUS Tinkerboard or PC does 10MHz!
 - Quantisation adjustment lets you adapt to link quality
 - Will work with the new AirSpy HF+
 - ...

Pi Shack Projects

SDR Receiver

SDR Receiver

- GQRX – Alex Cset
- Still experimental
- Supports multiple SDR receivers
 - RTL-SDR, AirSpy and AirSpy mini, FunCube Pro, RF Space
 - See GQRX website for software & limitations:
 - <http://gqrx.dk/download/gqrx-sdr-for-the-raspberry-pi>
- Best with a Pi-3

Pi in the Shack - Summary

- A Quick run through a few applications
- An excellent platform to learn programming
- Makes a great home media centre
- I have pre-loaded microSD cards with printed instructions for most of these projects
- Spy Server and Packet Radio cards will be ready this month

■ **Find out more...**

g4wnc.com

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www.rsgb.org

