

**Tehachapi Amateur Radio Association** 

# **Do I need a Raspberry Pi** ...No, but ....

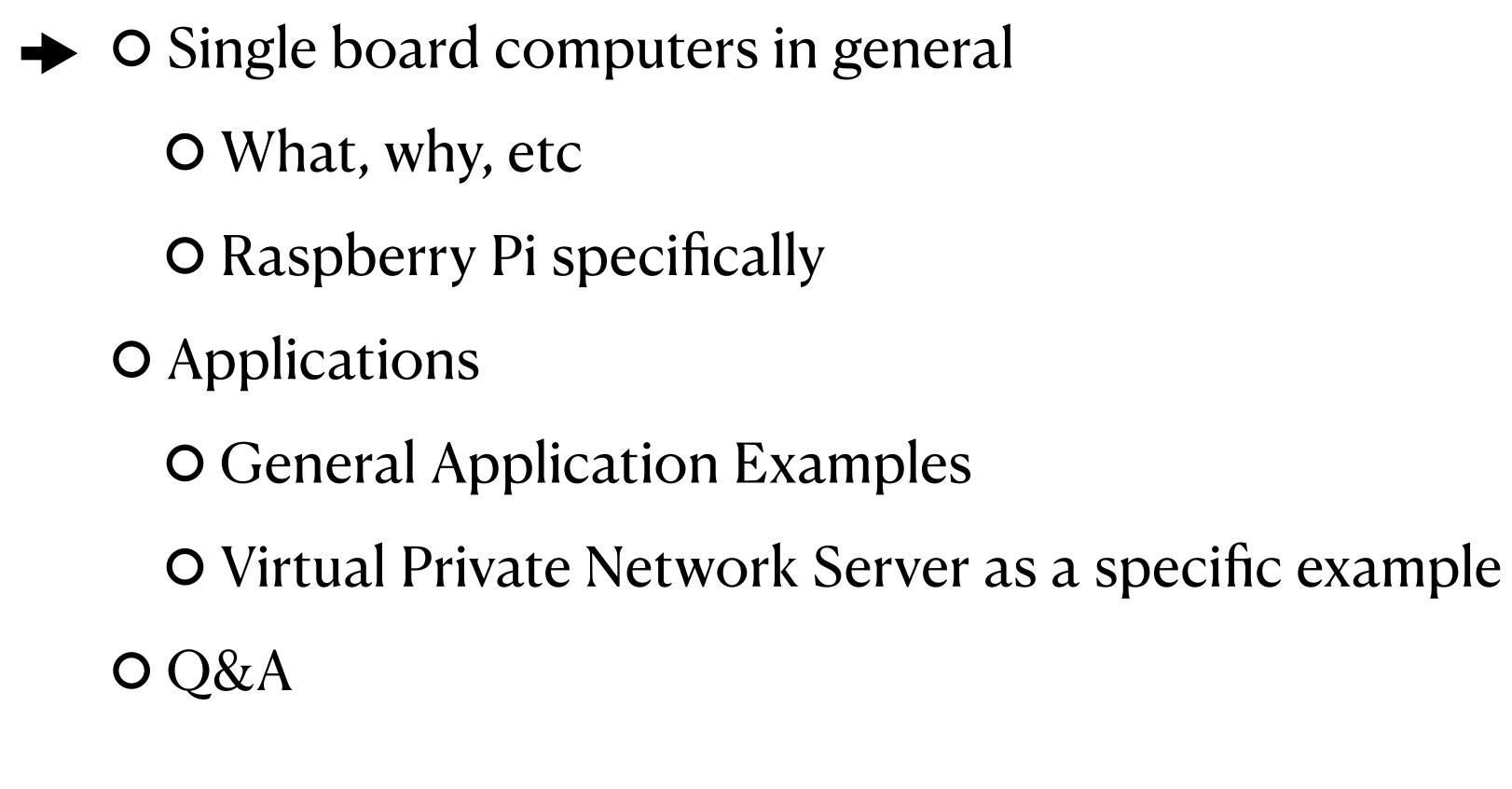
Ray, W6QPA — 14 April 2022



#### Do I need a Raspberry Pi? Probably not ... but maybe ...

- Frequently asked question
- Almost everything can be done on existing PC's, Tablets, & Laptops
  - I'm running a SurfacePro for N1MM+ Logging, WSJTX, FLDIGI, JS8Call
- RPi maybe useful if:
  - You don't want to tie-up a PC for a dedicated application
  - You have a limited power budget
  - You enjoy tinkering





## Outline



#### Single Board Computers General Characteristics

- One board with:
  - Processor
  - System memory
  - I/O subsystems
    - Networks Wifi, Wired Ethernet, Bluetooth, USB
    - Video HDMI
    - Console port
    - Audio In/Out
    - GPIO Binary I/
  - Connect power, load an Operating system and you have a useable computer
  - Small size, low power

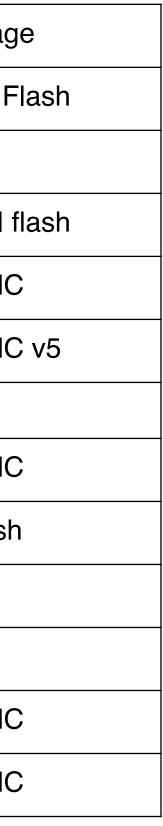
- Used in:
  - General Purpose Computers, appliances, radios, cameras, Internet connected (IoT) devices
  - Many vendors offering wide range of capabilities



SBC	Architecture	Memory	Inbuilt Storage	SBC	Architecture	Memory	Inbuilt Storage
Rock Pi X Model B	x86, 64-bit	2/4 GB LPDDR3	16/32/64/128 GB	Raspberry Pi Pico	ARM, 32-bit	264 KB SDRAM	2 MB QSPI FI
Lideo Rolt \/9	vec c4 bit	4-32 GB DDR4	32 GB eMMC 5.0	PocketBeagle	ARM, 32-bit	512 MB DDR3	None
Udoo Bolt V8	x86, 64-bit			Pine A64-LTS	ARM, 64-bit	2 GB LPDDR3	128 MB SPI fl
Raspberry Pi 4 Model B	ARM, 64-bit	2, 4, 8 GB DDR4	None	Udoo x86 II Ultra	x86, 64-bit	8 GB DDR3L	32 GB eMMC
<u>Seeed Odyssey</u> (X86J4125800)	x86, 64-bit	8 GB LPDDR4	None	LattePanda Delta 432	x86, 64-bit	4 GB LPDDR4	32 GB eMMC
Rock Pi N10 Model A	ARM, 64-bit	4 GB LPDDR3	16 GB eMMC	MiSTer DE-10 Nano	ARM, 32-bit	1GB DDR3 for CPU	None
Nvidia Jetson Nano Developer Kit	ARM, 64-bit	4 GB LPDDR4	None	OSMC Vero 4K+	ARM, 64-bit	2 GB DDR3	16 GB eMMC
Odroid-N2+	ARM, 64-bit	2/4 GB DDR4	8 MiB SPI flash	BBC Micro:Bit V2	ARM, 32-bit	128 KB RAM	512 KB Flash
				Raspberry Pi Zero 2 W	ARM, 32-bit	512 MB LPDDR2	None
Pine64 ROCKPro 64	ARM, 64-bit	2/4 GB LPDDR4	128 MB SPI flash memory	LattePanda V1	x86, 64-bit	2/4 GB DDR3L	32/64 GB
Rock Pi 4 Model C	ARM, 64-bit	4 GB	None	Asus Tinker Board 2S	ARM, 64-bit	2 GB LPDDR4	16 GB eMMC
Odroid-C4	ARM, 64-bit	4 GB DDR4	None	Orange Pi 4B	ARM, 64-bit	4 GB LPDDR4	16 GB eMMC
Arduino Mega 2560	RISC, 8-bit	8 KB SRAM, 4 KB EEPROM	256 KB flash ROM		<u> </u>		

This is not an exhaustive list.

#### Single Board Computers Summary from <u>All3DP.com</u>





#### **Raspberry Pi Specific Instance of a SBC**

- RPi is "famous" due to efforts of the <u>Raspberry Pi Foundation</u>
  - UK based, educational group
  - Cheap 15 45 (at least use to be), Easily available (before pandemic supply-chain issues) • Widely supported Software eco-system - O/S include Unix variants and Windows (lite
  - version)
- Variety of capacities
  - $Pi_4 most powerful; Pi_3 powerful mid range; Pi Zero small; Pi Pico microcontroller$
- Currently availability (April 2022)

  - Nearly Unobtanium "Scalpers" getting \$\$\$ (hundreds) for what can be found • Optimistic estimates point to July 2022 returning to in-stock



# Raspberry Pi

#### Variant Summary From <u>Raspberry Pi Expert site</u>

<b>Raspberry Pi Platform</b>	CPU	RAM	I/O Ports	Price
Raspberry Pi 400	1.8 Hz, Quad-core Broadcom BCM2711 (Cortex-A72)	4GB (LPDDR4)	2 × USB 3.0, 1 x USB 2.0 ports, 2 x micro HDMI, 1 x Gigabit Ethernet	\$70
Raspberry Pi 4B	1.8 Hz, Quad-core Broadcom BCM2711 (Cortex-A72)	8G (LPDDR4)	2x USB 3.0, 2x USB 2.0, 1x Gigabit Ethernet, 2x micro HDMI	\$75
Raspberry Pi 4B	1.8 Hz, Quad-core Broadcom BCM2711 (Cortex-A72)	4GB (LPDDR4)	2x USB 3.0, 2x USB 2.0, 1x Gigabit Ethernet, 2x micro HDMI	\$55
Raspberry Pi 4B	1.8 Hz, Quad-core Broadcom BCM2711 (Cortex-A72)	2GB (LPDDR4)	2x USB 3.0, 2x USB 2.0, 1x Gigabit Ethernet, 2x micro HDMI	\$35
Raspberry Pi 3B+	1.4-GHz, 4-core Broadcom BCM2837B0 (Cortex-A53)	1GB	4 x USB 2.0, HDMI, 3.5mm audio	\$35
Raspberry Pi Zero WH	1-GHz, 1-core Broadcom BCM2835 (ARM1176JZF-S)	512MB	1x micro USB, 1x mini HDMI	\$17
Raspberry Pi Zero W	1-GHz, 1-core Broadcom BCM2835 (ARM1176JZF-S)	512MB	1x micro USB, 1x mini HDMI	\$10
Raspberry Pi Zero	1-GHz, 1-core Broadcom BCM2835 (ARM1176JZF-S)	512MB	1x micro USB, 1x mini HDMI	\$5

Another comparison site – <u>RaspberryPi Comparison on SocialCompare.com</u>

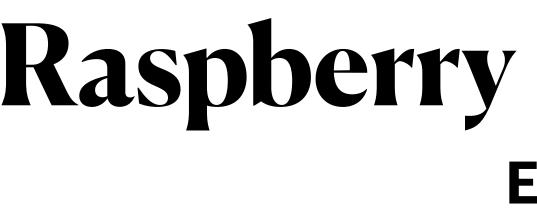




- Single board computers in general
  - What, why, etc
  - Raspberry Pi specifically
- ➡ O Applications
  - **O** General Application Examples
  - O Virtual Private Network Server as a specific example
  - O&A Ο

## Outline





- Digital Media server Manage audio, photo, video HAM Specific: for a home entertainment system
- Print server
- Web servers
- Networked attached Storage (NAS) Server
- Robotics embedded controller
- Household automation security camera, lock controllers, irrigation systems
- Network Security Network intrusion detection, Virtual Private Network (VPN)
- Home Brew (Beer) System Controller *BrewPi*

#### **Raspberry Pi Application Examples**

- DMR Hotspot  $\bullet$
- Software Defined Radio
- Shack Clock
- Satellite Antenna tracking controller
- Digital Mode station
- Logging Server
- **APRS** Tracker  $\bullet$
- etc.



#### **Raspberry Pi Application** Specific Example — Virtual Private Network (VPN) Server

- Why a VPN?
  - Some HAM radios offer capability to connect to them via the internet.
    - This can create a security vulnerability when configuring a router/firewall to open "holes" (IP ports) into your home's local area network (LAN) to connect to your radio from outside your home LAN
    - VPN provides secure access (no unencrypted holes)



#### Raspberry Pi Application Virtual Private Network (VPN) Server

- What's a VPN server?
  - Provides a secure "tunnel" from your device (phone, tablet, PC) to a local area network using the internet.
  - Without a VPN the connection is like sending a "Post Card" through the postal service, it can be read in transit without difficulty.
  - With a VPN your "Post Card" is sealed in an opaque envelope can't be read in transit (without extraordinary effort)



#### **Raspberry Pi Application** Virtual Private Network (VPN) Server

- Building a VPN server Summary
  - Acquire RPi hardware (<u>www.adafruit.com</u>; <u>www.canakit.com</u>)
  - install PiOS Lite (<u>https://youtu.be/ntaXWS8Lk34</u>)
  - Establish DDNS host entry for each PiVPN server (<u>https://www.noip.com/members/dns/</u>)
  - Log into the Pi-VPN server hardware
  - Install DDNS DUC <u>https://www.noip.com/download?page=linux</u> <u>https://www.noip.com/support/knowledgebase/install-ip-duc-onto-raspberry-pi/</u>
  - Install OpenVPN (<u>https://www.pivpn.io</u>)
  - On LAN router establish reservation for the PiVPN Server or assign it a static address
  - On LAN Router set port forwarding for 1194 to the PiVPN server
  - On PiVPN server create user device profiles (no password option e.g. "pivpn add nopass") and export to MicroSD or USB Thumb drive
  - On each accessing device install OpenVPN Client and import devices profile from thumb drive as exported from the PiVPN server



#### **Raspberry Pi Application** Virtual Private Network (VPN) Server

- I've exclude the details of, and reasons for, the steps in the previous slide due to time constraints of this presentation.
- The references on each step lead to information to accomplish the installation.
- If interested we could conduct a "build" party to create VPN servers as a group project. • Has to wait until RPi's are again In-stock.
- There are commercial VPN service providers ...
  - They can provide a VPN service for a fee
  - However they are managed and controlled by someone you don't know



## Questions



- Single board computers in general
  - What, why, etc
  - Raspberry Pi specifically
- Applications
  - General Application Examples
  - Virtual Private Network Server as a specific example
- J&A

## Outline



**Tehachapi Amateur Radio Association** 

# Backup Detail

#### **W6QPA Home LAN Configuration**

