



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



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



Single Board Computers

Summary from [All3DP.com](https://www.all3dp.com)

SBC	Architecture	Memory	Inbuilt Storage
Rock Pi X Model B	x86, 64-bit	2/4 GB LPDDR3	16/32/64/128 GB
Udoo Bolt V8	x86, 64-bit	4-32 GB DDR4	32 GB eMMC 5.0
Raspberry Pi 4 Model B	ARM, 64-bit	2, 4, 8 GB DDR4	None
Seeed Odyssey (X86J4125800)	x86, 64-bit	8 GB LPDDR4	None
Rock Pi N10 Model A	ARM, 64-bit	4 GB LPDDR3	16 GB eMMC
Nvidia Jetson Nano Developer Kit	ARM, 64-bit	4 GB LPDDR4	None
Odroid-N2+	ARM, 64-bit	2/4 GB DDR4	8 MiB SPI flash memory
Pine64 ROCKPro 64	ARM, 64-bit	2/4 GB LPDDR4	128 MB SPI flash memory
Rock Pi 4 Model C	ARM, 64-bit	4 GB	None
Odroid-C4	ARM, 64-bit	4 GB DDR4	None
Arduino Mega 2560	RISC, 8-bit	8 KB SRAM, 4 KB EEPROM	256 KB flash ROM

SBC	Architecture	Memory	Inbuilt Storage
Raspberry Pi Pico	ARM, 32-bit	264 KB SDRAM	2 MB QSPI Flash
PocketBeagle	ARM, 32-bit	512 MB DDR3	None
Pine A64-LTS	ARM, 64-bit	2 GB LPDDR3	128 MB SPI flash
Udoo x86 II Ultra	x86, 64-bit	8 GB DDR3L	32 GB eMMC
LattePanda Delta 432	x86, 64-bit	4 GB LPDDR4	32 GB eMMC v5
MiSTer DE-10 Nano	ARM, 32-bit	1GB DDR3 for CPU	None
OSMC Vero 4K+	ARM, 64-bit	2 GB DDR3	16 GB eMMC
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
LattePanda V1	x86, 64-bit	2/4 GB DDR3L	32/64 GB
Asus Tinker Board 2S	ARM, 64-bit	2 GB LPDDR4	16 GB eMMC
Orange Pi 4B	ARM, 64-bit	4 GB LPDDR4	16 GB eMMC

This is not an exhaustive list.



Raspberry Pi

Specific Instance of a SBC

- RPi is “famous” due to efforts of the Raspberry Pi Foundation
 - 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
 - Pi4 — most powerful; Pi3 — powerful mid range; Pi Zero — small; Pi Pico — microcontroller
- Currently availability (April 2022)
 - Nearly Unobtainium — “Scalpers” getting \$\$\$ (hundreds) for what can be found
 - Optimistic estimates point to July 2022 returning to in-stock



Raspberry Pi

Variant Summary From Raspberry Pi Expert site

Raspberry Pi Platform	CPU	RAM	I/O Ports	Price
Raspberry Pi 400	1.8 Hz, Quad-core Broadcom BCM2711 (Cortex-A72)	4GB (LPDDR4)	2 x 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 — [RaspberryPi Comparison on SocialCompare.com](https://socialcompare.com/raspberry-pi-comparison)



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Raspberry Pi Application

Examples

- Digital Media server — Manage audio, photo, video 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*
- HAM Specific:
 - DMR Hotspot
 - Software Defined Radio
 - Shack Clock
 - Satellite Antenna tracking controller
 - Digital Mode station
 - Logging Server
 - APRS Tracker
 - 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 (www.adafruit.com ; www.canakit.com)
 - install PiOS Lite (<https://youtu.be/ntaXWS8Lk34>)
 - Establish DDNS host entry for each PiVPN server (<https://www.noip.com/members/dns/>)
 - Log into the Pi-VPN server hardware
 - Install DDNS DUC <https://www.noip.com/download?page=linux>
<https://www.noip.com/support/knowledgebase/install-ip-duc-onto-raspberry-pi/>
 - Install OpenVPN (<https://www.pivpn.io>)
 - 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



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Backup Detail

W6QPA Home LAN Configuration

