# So You Can't find a Raspberry Pi 6 Alternatives to Consider

December 6, 2022

By Aaron Grothe

# Introduction

If anybody has any questions or comments at any time please let me know.

If I start to mumble please let me know as well :-)

There are a lot of other options to consider. These are just a couple of them. Some of them are just representative of other options.

Software like userland and debroot that can make an android device like a phone more linux like aren't included in this talk.

I might be wrong on the specs of various boards.

# You CAN get a Raspberry Pi

Raspberry Pis are out there with several caveats:

- You'll be paying more than list
- You might have to get it from "over the pond", so it'll be a while before it gets to you
- You might have trouble finding the models you want. 8gb RAM systems are pretty hard to find
- One resource to consider is rpilocator - https://rpilocator.com/

# 6 Options We're going to Talk about

- Mango Pi
- Risc-V boards
- USB 4GLTE/Modem Stick
- Android TV Boxes
- Router
- Raspberry Pi Picos

I own all of the above except for the other RISC-V boards

# Mango Pi

# Mango Pi - Specs

- SoC – Allwinner D1 C906 RISC-V processor @ up to 1GHz with G2D 2D graphics accelerator
- System Memory –1GB(1) DDR3(L) (varies)
- Storage – MicroSD card socket
- Display – mini HDMI 1.4 port up to 1080p60 or 4Kp30
- Networking - 2.4Ghz 802.11b/g/n WiFi 4 and Bluetooth 4.2 Ethernet via expansion board connected to 24-pin DVP/RGMII
- USB – 1x USB OTG Type-C port, 1x USB host Type-C port
- Expansion – 40-pins Raspberry Pi compatible GPIO header
- Power Supply – 5V via USB Type-C port or 40-pins GPIO header

# Mango Pi - Pros

- Same form factor as Raspberry Pi-Zero
  - Pinouts for ports aren't 100% so you might need to break out the dremel if you already have a case
- GPIO Pins :-)
- Is readily available from overseas
- Costs about $40 from Aliexpress with Shipping

# Mango Pi - Cons

- 3D is not hardware accelerated
  - Hello Mesa and 3/4fps
- Is rapidly evolving
  - if you order 2 they might be a bit different
- Doesn't have Raspberry Pi OS/Raspbian - Options include
  - Armbian
  - Tina OS
  - Ubuntu is coming to it as well

# Mango Pi - Summary

- Mango Pi is probably the closest drop in replacement for the Raspberry Pi Zero
- It is an exciting thing to try and I think it might take off the next couple of years, the Pi shortage is helping to get people to consider them

# Other RISC-V boards

Ubuntu is supporting their OS on some RISC-V SBCs

# Other RISC-V boards

Example show is the Sipeed Lichee RV D1

As Ubuntu add more boards the specs/will vary quite a bit.

The Sipeed Lichee RV D1 is similar to a Raspberry Pi 4 Compute Module as it looks more like  a stick of ram and is usually designed to be used with an optional dock

# Sipeed Lichee RV D1 - Specs

- SoC – Allwinner D1 C906 RISC-V processor @ up to 1GHz with G2D 2D graphics accelerator
- System Memory –512MB(1) DDR3(L)
- Storage – MicroSD card socket
- Onboard OTG USB Debugging Port
- Power Supply – 5V via USB Type-C port or 40-pins GPIO header
- Dimensions – 46.2 x 25.0mm
- Video Output/Networking are provided by optional dock

# Sipeed Lichee RV D1 - Pros

- Lot of different types of boards available and coming out
- Ubuntu is supporting a lot of different board types and adding more all the time
- Can be pretty cheap

# Sipeed Lichee RV D1 - Cons

- Some of the boards are already selling out so you might end up picking another choice
- 3D is not hardware accelerated
  - Hello Mesa and 3/4fps
- Is rapidly evolving
  - if you order 2 they might be a bit different
  - Might not be able to get the same spec'd version in the future
- The Specs vary alot from board to board
- You're a pioneer :-)

# Sipeed Lichee RV D1 - Summary

- If you're a bit more a hardore developer this might be more up your alley
- Ubuntu is supporting boards from
  - StarFive VisionFive, Allwinner Nezha, and SiFive Unmatched, and Sipeed and will be adding more in the future
- You might be able to find a board that better fits your need than just a mango or RPI for that matter

# 4G LTE WiFi Modems

Buy hardware, Own hardware, Run Linux on it

# 4G LTE WiFi Modems

These are “4G LTE WiFi Modems” made in China
They are basically small computers that people have figured out how to Own and load regular linux on

# 4G LTE WiFi Modems - Specs (Vary)

- 4-core 1GHz A53-based Qualcomm 8916
- System Memory –512MB(1) DDR3(L) or 1GB
- Storage – 4gb / some have MicroSD Slots
- Networking 4G LTE Modem (Chinese Bands), Wifi
- USB-A, Power and programming
- Dimensions – 94 x 33mm
- No Video output

# 4G LTE WiFi Modems - Pros

- Is readily available from overseas
- Cheap - I bought 2 for ~$20.00 with shipping
- Support OpenWRT and Debian Linux
- Can run with a USB battery pack for quite a while
- Many models to consider, some have sd cards, some have gpio pins etc.

# 4G LTE WiFi Modems - Cons

- No Video output
- You can brick these - I did
- Make sure you get the right model 8916 not 9600
- Depending on which one you get you might not be able to flash it
- Who knows how long the bootloaders will be unlocked

# 4G LTE WiFi Modems - Summary

- This is the classic way of doing things
  - Find a device that comes with Linux that is designed to do a specific task and then loading a more general purpose linux on it
  - Your mileage can vary quite a bit on these
- Can be quite a bit of fun
- Full Debian is kind of cool

# Android TV Boxes

TV Box runs Android - Android is Linux - put Regular Linux on it

# Android TV Boxes

There are a bunch of options here

You can buy your own Android TV box if it is one of a couple of options

- H96
- T95

Or you can buy a box with Linux already on it from Inovato

# Android TV Boxes - Specs (Vary)

- Allwinner H6 - quad core ARM Cortex-A53 processor
- System Memory – 1, 2 or 4 gb of Ram
- Storage – 16/32/64gb of Storage
- Mightt have SD card slot
- Wifi 4 or Wifi 5, might have wired ethernet
- Dimensions – Varies usually 100mm x 100mm
- HDMI Video output

# Android TV Boxes - Pros

- If you buy an Inovato you can get it for $30 + $10 shipping
  - Preinstalled Debian with XFCE
- You can buy other boxes from $20-$60
- Probably no GPIO pins
- You do get a case, heatsink, power supply, etc.
- If you bring your own you can also brick these, usually you can recover most of the time if you put the right micro-sd card in the box
- H96 Max v58, RK3588 processor up to 8gb Ram and 64gb storage (not supported yet, but will be soon) - 6 TOPs of AI performance

# Android TV Boxes - Cons

- If you get an Inovato base you're getting some limited specs
  - 2Gb ram, 16gb Storage
  - 2.4ghz 802.11n
- Specs vary from manufacturer to manufacturer
- Some might have locked bootloaders - be careful of model numbers
- You can brick these - I did
- Depending on which one you get you might not be able to flash it
- Who knows how long the bootloaders will be unlocked
- Probably no bluetooth - can add an adapter

# Android TV Boxes - Summary

- If you've got a project with Video requirements these can be a good solution
- Inovato offering them ready to go makes them into little desktop boxes
- Readily available from Amazon you can have one in TWO days

# Flash A Router

# Flash A Router - Specs

- All over the place
  - Mips/Arm/Intel, etc…
  - Ram can range from 256mb to 4gb
  - Network options vary a lot, might have multiple ethernet ports, 1gb ports, Wifi 4, 5, 6 etc
  - Costs range from free to hundreds of dollars

# Flash A Router - Pros

- Can get them for pretty cheap new
  - Some of the tplink routers that are supported are can be bought for less than $25.00 new at Amazon
  - Bought one at Goodwill bytes for $5.00 a couple of weeks ago
- Choice of distributions
  - DD-WRT - classic for routers
  - OpenWRT - more general purpose OS
    - Has a package manager
  - Debian, Tina and some others are available as well
- Usually a lot of ethernet ports/networking options

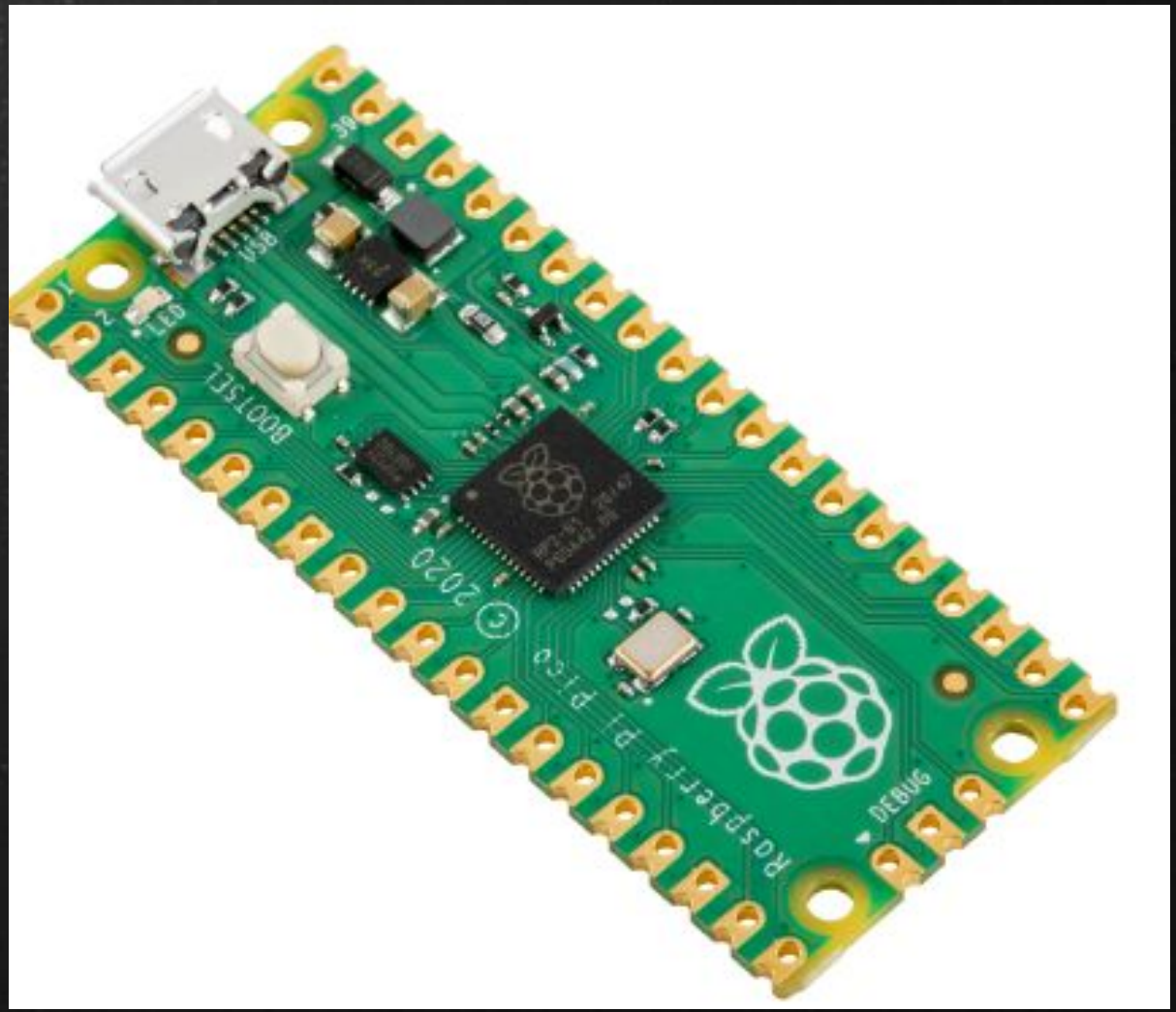
# Flash A Router - Cons

- No Display
- You can brick these as well
  - Make sure you know the unbrick options if there are any
- Usually a lot bigger than a Raspberry PI with a case
- Need to be careful about what version of a router you get a lot of times some versions work pretty well and others don't at all
- No GPIO pins
- Specs can vary a lot

# Flash A Router - Summary

- Routers are a good cheap option to consider if you need a special purpose computer
- You'll learn a lot and hopefully, you'll be able to apply that on your home network as well
- Ideal for projects that are primarily network focus  like Wireguard endpoints, Pi-holes, etc…

# Raspberry Pi Pico



# Raspberry Pi Pico - Specs

- Dual Core Arm Cortex-M0+
- System Memory – 264KB
- Storage - 2Mb
- GPIO Pins
- Pico W - adds 2.4ghz 802.11n
- USB-A, Power and programming
- Dimensions – 51mm x 26mm
- No Video output (can be done via gpio ports)

# Raspberry Pi Pico - Pros

- Readily Available from Amazon/Aliexpress and many other places
- Are cheap $6 for a Pico or $8-$10 for a Pico W is not unusual
- Are pretty much the RPI equivalent of an arduino
- Good introduction to Microcontrollers
- There are other systems that have multiple Pico cores available

# Raspberry Pi Pico - Cons

- No Display - can hack the pins to do VGA
- Don't run Linux, run a limited O/S - Micropython, Circut Python, etc.
- Not expandable
- Memory is in the Kb range, Storage is in the Mb range
- Is a different kind of beast
- There are a couple of RTOS options available as well

# Raspberry Pi Pico - Summary

- If your project can run with a Pico it is an option to consider
- Everybody should know a little Micropython, etc

# Resources

Resources to Hit

- Liliputing - https://www.liliputing.com - great resource about oddball hardware, I hit it almost every day
- hackaday - https://www.hackaday.com - another great resource lot of information about people hacking devices
- Linux Gizmos - https://www.linuxgizmos.com - an older site that talks a lot about running Linux on SBCs and other odd things

# Summary

So those are 6 Options to consider until the PIs are freely flowing.

Each of them keep teach you something different and are worth considering.

# Summary

So here are the 6 Options we've talked about today

- Mango Pi
- Risc-V boards
- USB 4GLTE/Modem Stick
- Android TV Boxes
- Router
- Raspberry Pi Picos

Each of them has their own/niche and can teach you something new about systems.

# Thanks for Listening

Any Questions???

# Links - Mango Pi

Mango Pi

Mango Pi - on Aliexpress
https://www.aliexpress.us/item/3256804547451361.html?spm=a2g0o.productlist.0.0.19377600GOuUY1&algo_pvid=83f73865-08bc-46f3-8109-b51f1e892f6b&algo_exp_id=83f73865-08bc-46f3-8109-b51f1e892f6b-0&pdp_ext_f=%7B%22sku_id%22%3A%2212000030277200050%22%7D&pdp_npi=2%40dis%21USD%2139.99%2131.99%21%21%21%21%21%40210318c916671531279545445e3cea%2112000030277200050%21sea&curPageLogUid=hf8RcjT5Wp6v

# Links - Ubuntu on Risc-V

Register Article
https://www.theregister.com/2022/10/28/ubuntu_riscv_sbc/

Liliputing article on Risc-V ubuntu
https://liliputing.com/now-you-can-run-ubuntu-on-a-risc-v-computer-that-costs-less-than-20/

Aliexpress - Risc-V
https://www.aliexpress.us/item/3256803408560538.html

# Links - Linux on 4GLTE Modem

Liliputing article about the modems
https://liliputing.com/this-dirt-cheap-4g-lte-modem-on-a-usb-stick-can-be-hacked-to-run-mainline-linux/

Hackaday article about them
https://hackaday.com/2022/08/03/hackable-20-modem-combines-lte-and-pi-zero-w2-power/#comment-6500125

Aliexpress posting
https://www.aliexpress.us/item/3256803964280481.html?spm=a2g0o.order_list.0.0.21ef1802Z1QlCC&gatewayAdapt=glo2usa&_randl_shipto=US

# Links - Android TV Boxes

Inovato - place to buy preinstalled Linux tv Boxes
https://www.inovato.com/

Liliputing article about new H96 Max system
https://liliputing.com/h96-max-v58-android-tv-box-has-an-rk3588-processor-and-up-to-8gb-ram-and-64gb-storage/

Article about Inovato and other android tv boxes
https://liliputing.com/inovato-quadra-is-a-compact-linux-pc-with-an-arm-processor-and-29-starting-price/

# Links - Flash a Router

DD-WRT - great resource for flashing your router. Wiki has a lot of great information in it
https://dd-wrt.com/

OpenWRT - alternative firmware for routers, closer to a typical distribution. Has package management, etc. Supports some routers that DD-WRT don't
https://openwrt.org/

# Links - Raspberry Pi Pico

Info about Raspberry Pi Pico W
https://www.raspberrypi.com/news/raspberry-pi-pico-w-your-6-iot-platform/

Aliexpress page for Raspberry Pi Pico
https://www.aliexpress.us/item/3256804360324658.html?spm=a2g0o.productlist.0.0.630f77b7FEhAo5&algo_pvid=3767aa1c-97db-44f3-b1c0-666f60304c31&algo_exp_id=3767aa1c-97db-44f3-b1c0-666f60304c31-2&pdp_ext_f=%7B%22sku_id%22%3A%2212000029562074385%22%7D&pdp_npi=2%40dis%21USD%214.23%214.23%21%21%21%21%21%40210318b816671736329652718e9817%2112000029562074385%21sea&curPageLogUid=yi3k564Dcr68