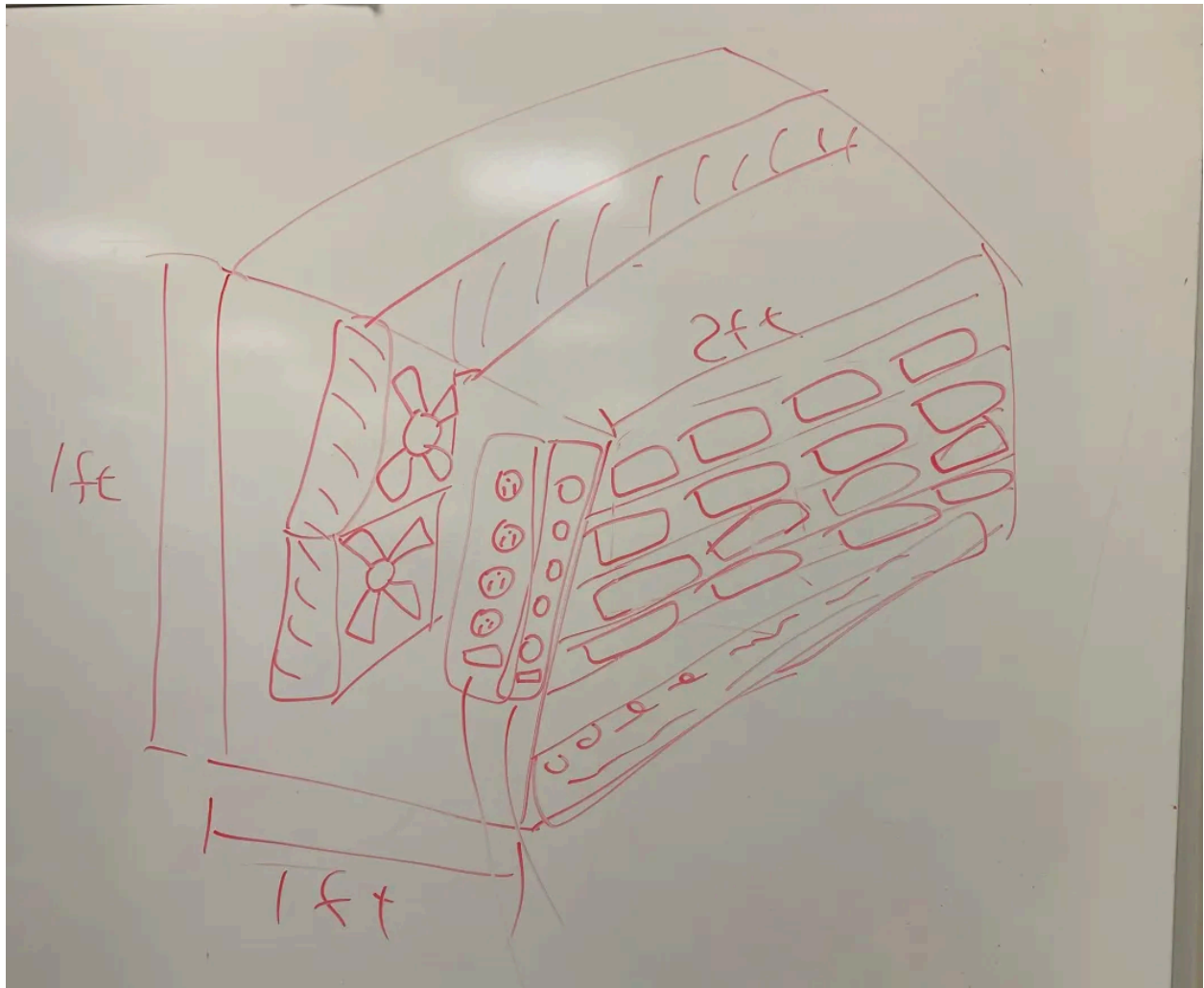


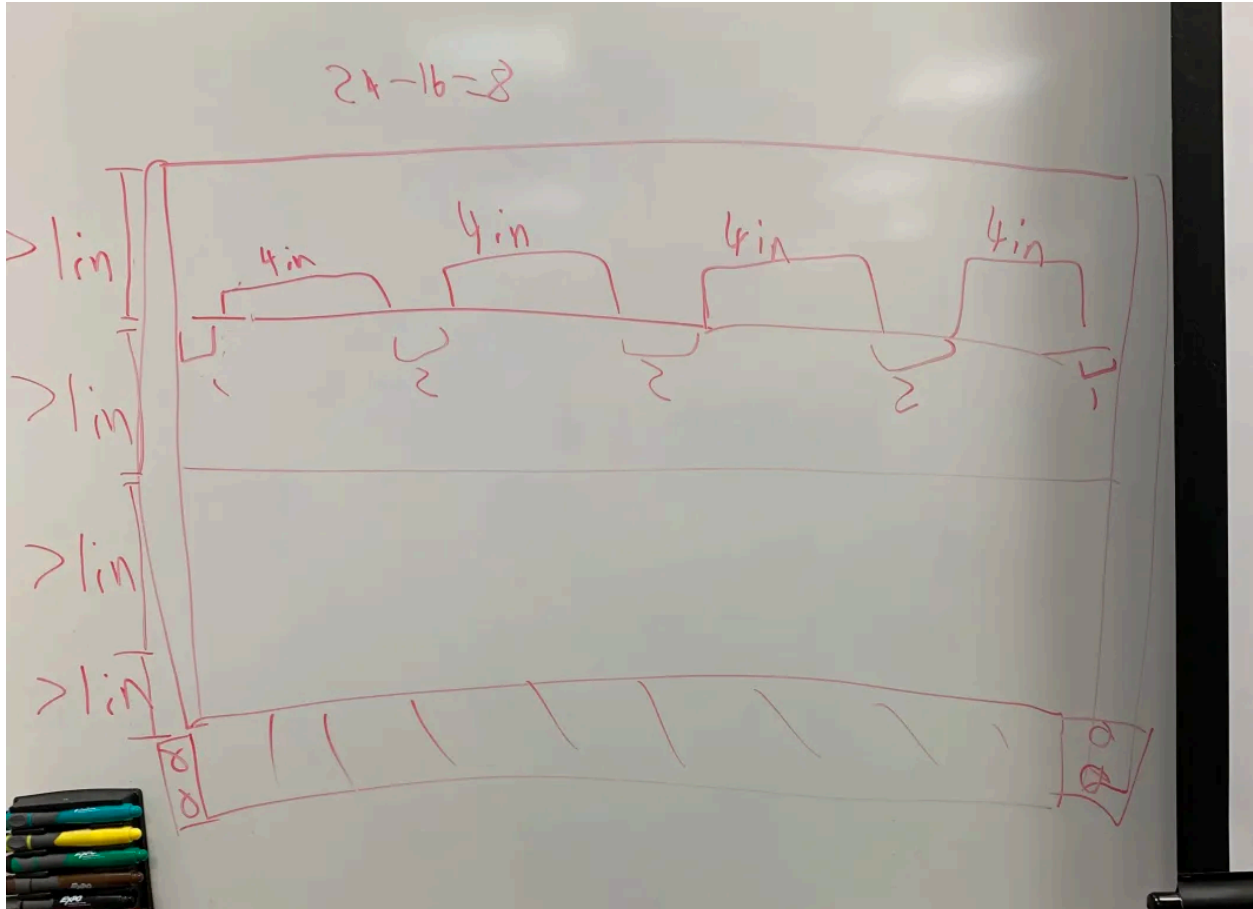
Dear future RockPi cluster hardware maintainer,

I have compiled the documentation for the hardware used in the RockPi cluster. I hope this guide serves whoever inherits the cluster well. Please update it according to what changes have been made.

The case:

The case is made using wood. The side panels are 1 x 1 feet, with 11/32 inch thickness. The top, bottom, and shelf panels are 1 x 2 feet with 11/32 inch thickness.



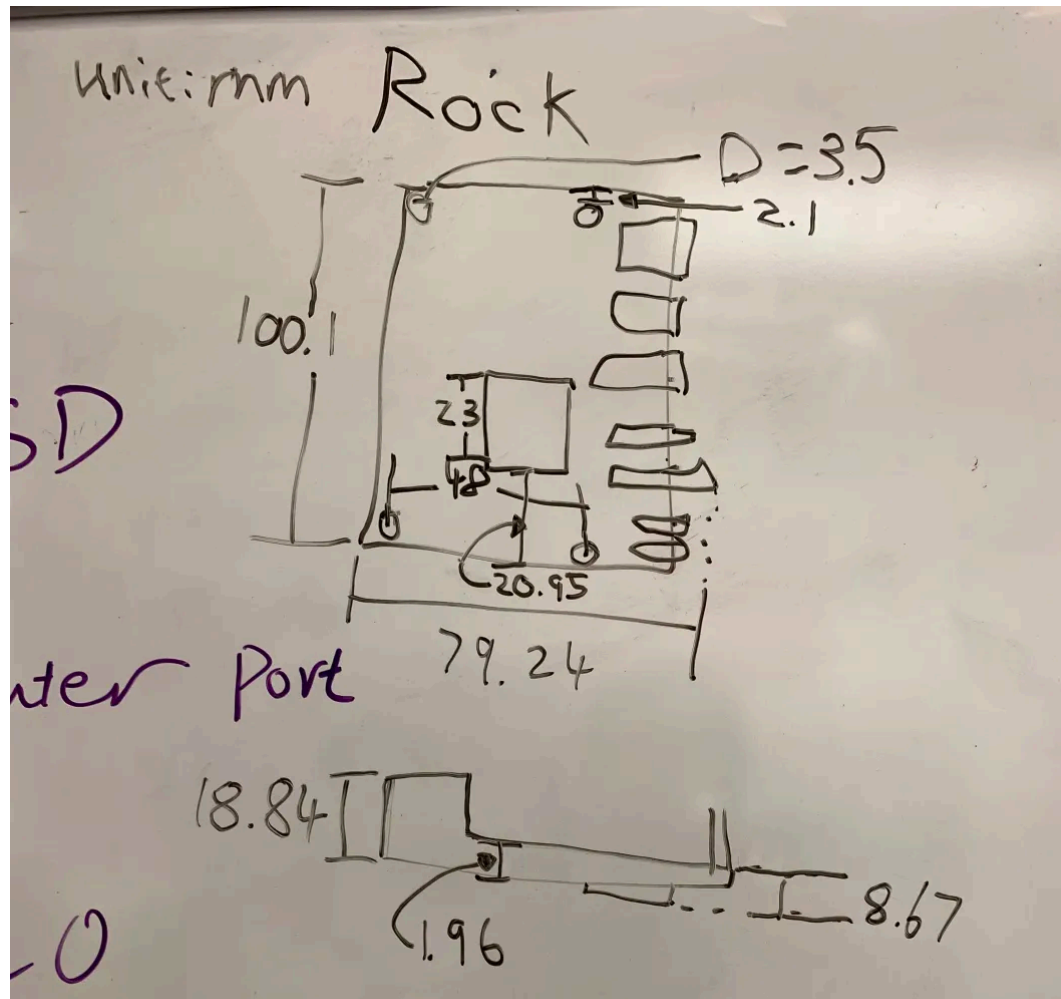


The case is screwed together with #10 machine screws (3/4 inch length) and [0.28 kg 90-degree stainless steel brackets](#) of size 1.57 x 1.57 x 0.63 inch. Each shelf is 1 x 2 feet with a height of about 1.5 inches. Some of the screws and the corresponding nuts went missing. The bottom shelf houses the switch and is at a height of about 4.5 inches. The shelves are bolted on for rigidity, but a sliding shelf would offer better serviceability. The picture of the current state of the case is shown below.



The Rockpi

The RockPi is a [RockPi 5B](#). The RockPi dimensions are shown in the image below.



The RockPis currently have 20mm x 20mm x 10mm aluminum heatsinks attached with Noctua NT-H1 thermal paste. The direction of the heatsinks should be parallel to the HDMI ports for efficient cooling from the fans. The RockPis are mounted with 5-40-5/8 inch screws and 5-40 nuts. I miscalculated the thickness of the shelf panel, so the screws are a little bit too short to hold the RockPis in place effectively.

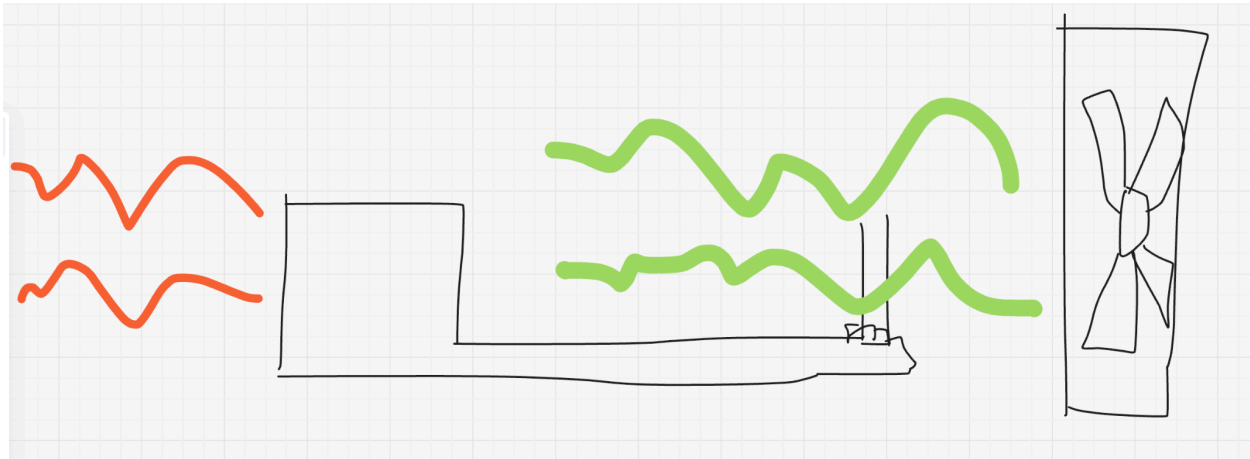
The fans

The fans are [Thermalright TL-C14CW](#) fans. These fans were chosen due to Gauri Renjith's power constraints. The following are the specifications:

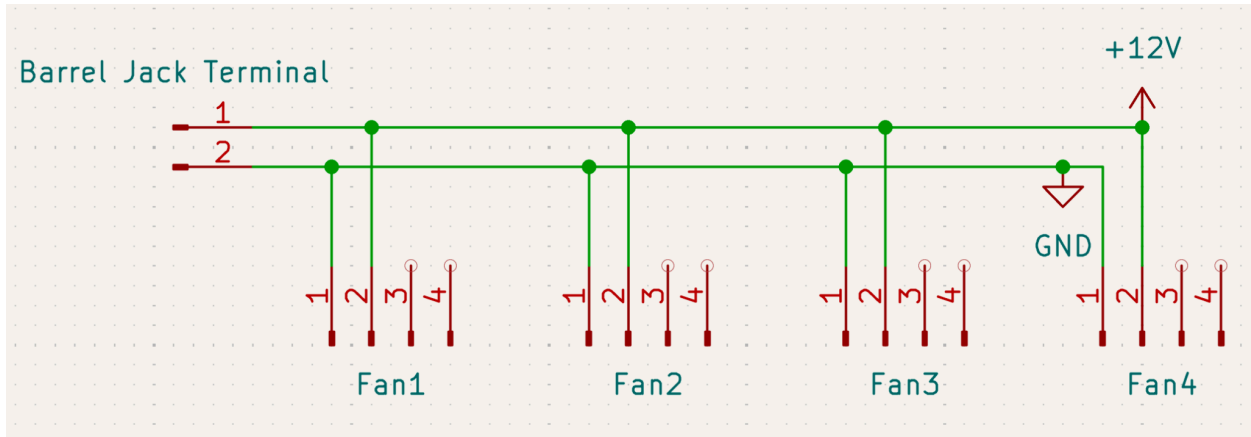
- Dimension: L140 mm x W140 mm x H25 mm
- Weight: 170 g
- Rated Speed: 1500 RPM \pm 10% (MAX)
- Noise Level: 26.4 dBA (MAX)
- Air Flow: 75.8 CFM (MAX)

- Air Pressure: 1.93 mm H₂O (MAX)
- Ampere: 0.13 A
- Connector: 4 PIN PWM
- Bearing Type: S-FDB Bearing

The fans should have screen meshes to prevent dust buildup on the RockPis. The meshes are currently taped on with Scotch Cellophane tape. The meshes should be properly mounted using #14 machine screws (3/8 inch length) screws. The RockPis should be oriented with the GPIO pin side facing the fans for optimal chip cooling. Also, the RockPis should be oriented with the long side facing the fan for more cooling surface area.



When viewed with the fans facing towards you, the fans should be mounted such that the left side fans are 4 inches from the left side wall and the right side fans are 3 inches from the right side wall. There is an offset in the fan placement because the RockPi chips are not centered on the board. Vertically, the fans should not have any spacing. The fan cables should be routed such that they can be grouped together in the center for easier cable management. The centerpiece is currently missing since I did not have enough time to finish it before the competition back in 2025. The fans used a PCB Spider to supply power. The PCB Spider connected the fans in parallel to each other. The PCB Spider consisted of a barrel jack AC to DC converter, a barrel jack terminal block connected to two power rails, and eight wires (4 wires on each power rail). The AC to DC converter is rated for 12 volts and 1 amp. The circuit diagram is shown below.



To Do!

Buy proper screws!

Here are the suggested screw sizes. There are also some missing screws.

- 5-40-1 inch screws for mounting the RockPis (you can go slightly longer than 1 inch, just in case).
- Get #14 machine screws (3/8 inch length) for the fans to properly mount the meshes.
- Get #10 machine screws (3/4 inch length) and the corresponding nuts to fasten the case.

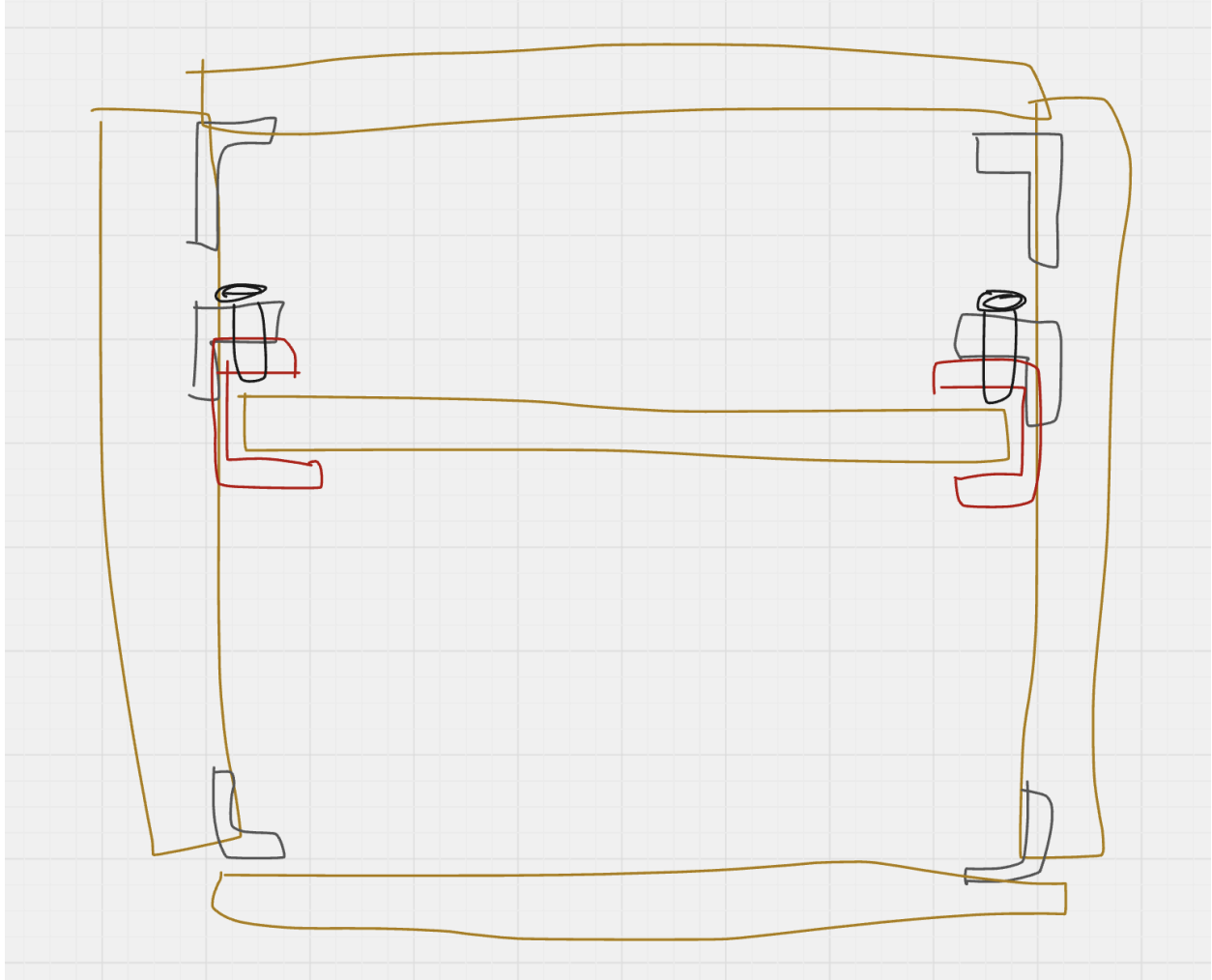
Fix the fan mount!

Measure out the size of the center cavity and put a piece of wood or plastic there to enhance airflow direction.

Make sliding trays!

Make the trays slide for easier access and maintenance. Here is the preliminary design.

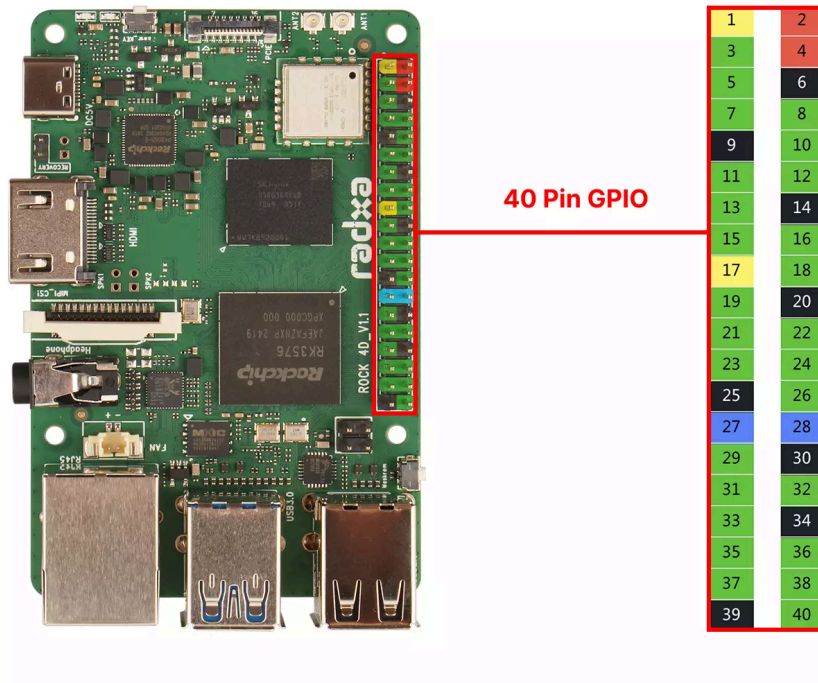
- Make a C-shaped jacket that hangs and screws onto the 90-degree brackets.
- This jacket can be 3D printed for ease of construction (I do not expect anyone to CNC mill it. It is too expensive)
- Make a latching mechanism to hold the shelf in place like a server tray.
- A diagram for visual reference is shown below.



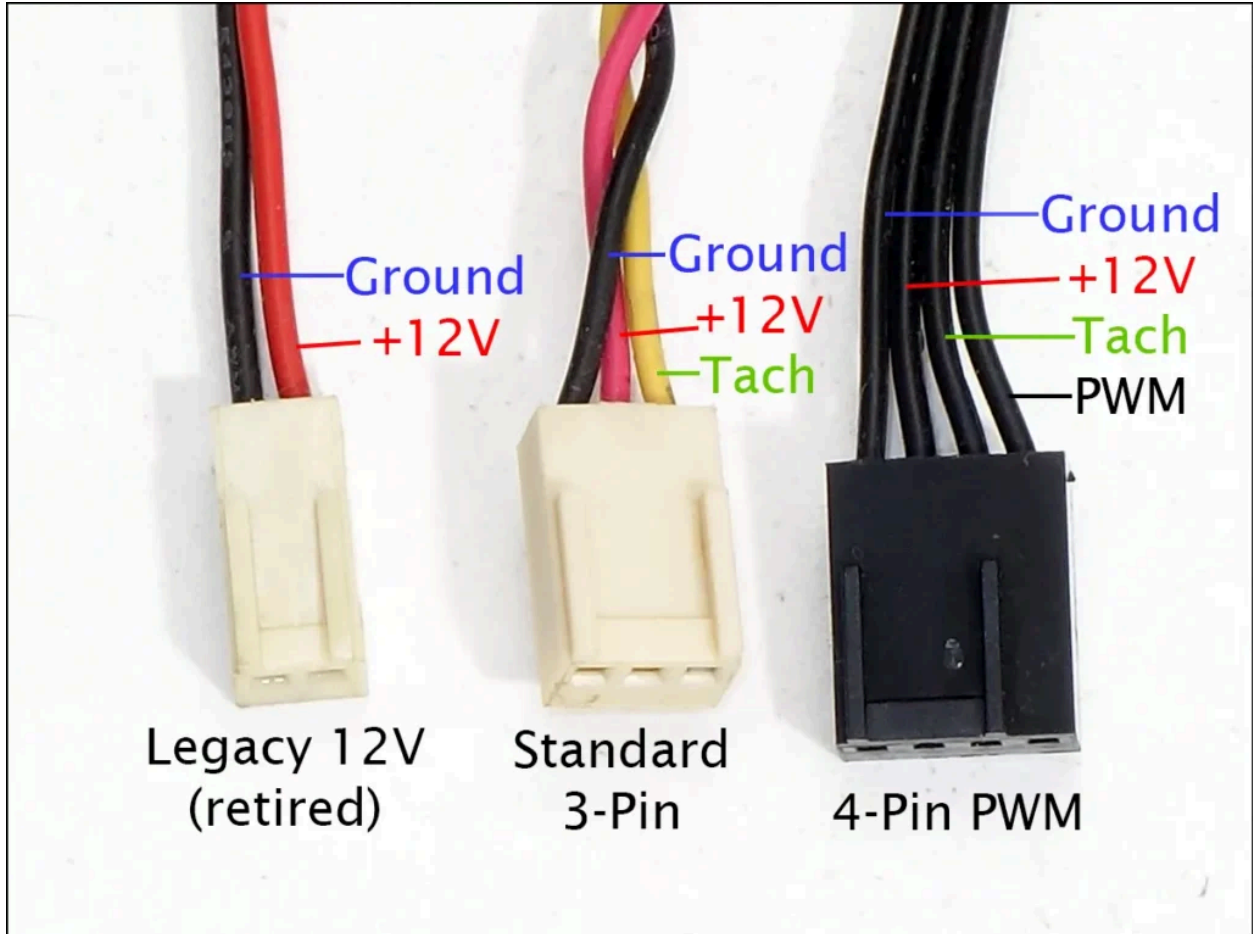
Make a proper fan controller!

Here is the preliminary design.

- Use the lead RockPi as the fan controller node (or you can alternatively put a custom connector hat onto each of the RockPis)
- Users can directly control the output of the GPIO pins through the terminal.
- Use PWM to control the fan speeds based on the temperature or workload of the RockPis.
- This lets the users have more efficient and fine-grained control over the fan usage. For example, if only the top left RockPis are being stressed, then only the top left fan should spin up while the other fans remain at idle.
- When the RockPis are at idle, the fans should not be on.
- The GPIO pin layout of a RockPi (not the same model) is shown below.



- A pinout diagram of the fan headers is shown below.



- In this case, you should be looking at the 4-pin version with support for PWM because the fans support it.

Sincerely,

Ferrari Guan

Original Designer of the *UCSD IEEE Supercomputing RockPi Cluster™*

P.S. Nut on the RockPis when you can!

