

RoPieee

A Beginner's Guide



What is RoPieee?

RoPieee (<https://ropieeee.org>) is a custom appliance that acts as a dedicated Roon endpoint and/or Roon display (<https://roonlabs.com>) running on modern Raspberry Pi hardware, with audio output over USB or a HAT. The project has three aims:

1. Easy to create appliance, with no linux knowledge required.
2. No ongoing maintenance required (self-updating).
3. Full integration with the Raspberry Pi official 7" display (to view artwork and track information from Roon in real time via the API).

Why not RoPieee?

RoPieee aims to offer an appliance-like endpoint experience for the Roon user. If you desire other non-supported functionality, specific custom settings, or extensive personalization options, it may not be a good fit for you: use a generic OS implementation such as DietPi or Raspbian instead.

Since RoPieee is volunteer-led and free of license cost, there are no commercial support mechanisms other than what is available through the Roon forum. If you desire traditional support, similarly a commercial product may be a better option for you.

Other preliminary notes

RoPieee does not support HDMI (neither for display nor audio), and disables the HDMI port after booting. This means that for Roon or other supported applications HDMI is not a valid output, and will not work.

RoPieee runs on a linux kernel, so any USB DAC must have reasonable, standard, existing linux support to work properly.

Roon Server does not run on ARM architecture, and therefore must be run elsewhere, often on a NUC running ROCK, a normal PC or Mac, or perhaps a Roon Nucleus. See

<https://help.roonlabs.com/portal/en/kb/articles/architecture>.

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RoPieeee

Hardware



RoPieee Hardware Prerequisites

- Raspberry Pi 2, 3, or 4 (preferred)
 - Appropriate, safe power supply (2.5 or 3 amp, depending on Pi model and installed hardware).
 - Raspberry Pi 3 B+ supported as of v91.
 - Raspberry Pi 4 supported as of v332.
 - Compute Module 4 IO Board as of v3.107
 - RoPieee only requires several hundred MB of memory to run well, so any supported Pi model is sufficient.
 - MicroSD card of at least 4g size.
- Audio HAT (if using as an audio endpoint and not using USB to connect to your DAC).
 - Check http://www.ropieee.org/audio_hardware/ for currently supported hardware.
 - “HAT” means “hardware attached on top”, eg an add-on board such as DAC for analog output (RCA or XLR), a DIGI board for digital output (S/PDIF, Toslink, AES/EBU), or an amplifier (speaker terminals).
- Appropriate case for Pi model and whether using a HAT or display.
 - Flirc case for Pi 4 highly recommended (<https://flirc.tv/more/raspberry-pi-4-case>) if using USB.
- Official Raspberry 7” display (if using a display).
 - Case for display and Raspberry Pi (check case shape carefully if also using a HAT).

RoPieee Networking Prerequisites

- Working network connection
 - Working DNS access
 - Unfiltered outgoing connections to internet
- Ethernet (eg wired) for install and initial configuration
 - Wi-fi can be configured later after initial setup, though Ethernet is more reliable for audio streaming.

Possible hardware configurations

Example 1: Roon endpoint on a Raspberry Pi 2, 3, or 4 running RoPieee using USB to connect to a DAC. Pi 4 preferred.



Any RoPieee-supported audio HAT, including DIGI, DAC, and amplifier boards.

Example 2: Roon endpoint on a Raspberry Pi 2, 3, or 4 running RoPieee with a supported audio HAT to output a digital signal (S/PDIF) connected to an external DAC. (“DIGI boards”).



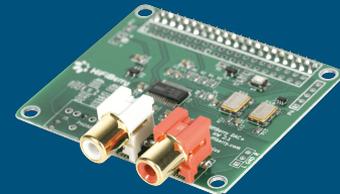
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Example 3: Roon endpoint on a Raspberry Pi 2, 3, or 4 running RoPieee with an audio HAT that outputs an analogue signal connected to an external amplifier. (“DAC boards”).



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Which Raspberry Pi?

Although RoPieee runs on most modern Raspberry Pi hardware, many Roon forum members inquire about which model “sounds the best” or has the “best performance”. RoPieee is neutral to the audio chain, as it delivers bit-perfect data to the USB port or onboard HAT. However, there are some advantages of the different models depending on your use case, notably improvements of USB in the Pi 4.

Raspberry Model	HAT (DAC, DIGI)	USB	Bluetooth	Official 7” Display
Pi 3	✓			Case dependant
Pi 3+ (Wifi)	✓			Case dependant
Pi 4 ⁽¹⁾	✓	✓	✓ ⁽²⁾	Case dependant

⁽¹⁾ 1g ram model sufficient for RoPieee.

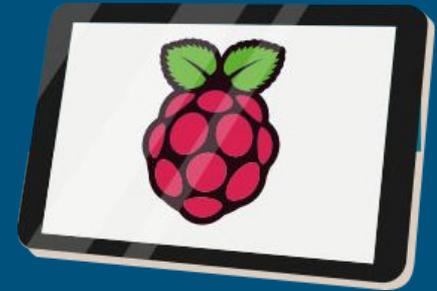
⁽²⁾ Requires RoPieeeXL.

RoPieee + Official Raspberry Pi 7" Display

RoPieee supports the official Pi 7" display to view Roon track information + artwork, as well as offer basic play controls, either display only configuration or display + audio. NB: only the official Raspberry Pi 7" display is supported.



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The display is only detected at the time of initial installation and the software installed then. Re-flash if adding the display to an existing RoPieee endpoint.

Highly recommended.

Also, HDMI output is turned off once RoPieee boots, so attaching an external monitor is almost never beneficial.

RoPieee + Remote Control

RoPieee supports the use of a hardware remote control:

- <https://osmc.tv/store/product/osmc-remote-control/> (OSMC)
- <https://flirc.tv/> (Flirc)



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Other hardware may be supported in the future: check the Roon forum for updates.

Hardware assembly tips

- The microSD card is installed in the Raspberry Pi “upside down”, eg pins facing up. Some people find using a pair of tweezers helpful, especially with the video cable installed when using the Raspberry Pi official 7” display.
- Brass spacers often are easier to use than the plastic ones often included with audio HATs. Ebay has many brass M2.5 spacers of various lengths, along with screws and nuts. 12mm is a good length.
- Be sure to use a decent, safe, sufficient power supply.

Raspberry 7" Official Display Tips

- When attaching the cable from the display to the Raspberry Pi (see the right side), you may have to open the black tabs to slide the cable in (“out to the side” on the display board; “up” on the Pi board). This may take more force than expected. Be sure to install the correct side of the cable, as shown.
- If you want to attach an audio HAT as well, you will have to power the display and PI separately (eg you can’t jumper the power, as shown in this picture). A dual microUSB cable is ideal for this if using a Pi 3. (See <https://www.buyapi.ca/product/dual-microb-usb-power-cable/> for example.)
- Depending on display placement, microUSB right-angle adapters may be useful (see Ebay).



Software



II

RoPieee or RoPieeeXL

RoPieee has two versions: a standard version (**RoPieee**), and an extended version (**RoPieeeXL**) which offers support for some streaming protocols (like AirPlay®). For normal Roon usage, stick with **RoPieee**, as there is no performance or feature difference between the versions from a Roon perspective.

RoPieeeXL is installed from RoPieee via the **Advanced** tab of the web interface after the initial install is complete.



RoPieee

Functionality Matrix

	RoPieee	RoPieeeXL
Raspberry Pi 2, 3, or 4	✓	✓
Raspberry Official 7" Display	✓	Roon only
Hardware Remote	✓	Roon only
Roon Endpoint (running RoonBridge)	✓	✓
Bluetooth		✓ (Pi4 only)
DLNA		✓
AirPlay®		✓
Spotify®		✓
Squeezeelite®		✓
HQPlayer NAA		✓

Installation



III

Install RoPieee overview

1. Download RoPieee from <https://ropieee.org/software/>.
2. Copy image to microSD card using a utility such as Etcher (<https://www.balena.io/etcher/>) or Rufus (<https://rufus.ie/>).
3. Install RoPieee.
4. Enjoy well-made latté.

1) Download RoPieee

- Download the latest RoPieee image from <https://ropieee.org/software/>.



Software

Download the latest RoPieee image.

Only using Roon's RAAT? Then there's no need for going XL. Just pick 'regular' RoPieee and you're set.

RoPieee

The latest RoPieee (2021/05/08) can be downloaded from [here](#)

XZ compressed version of the image (about 1/3th of the original size) [here](#)

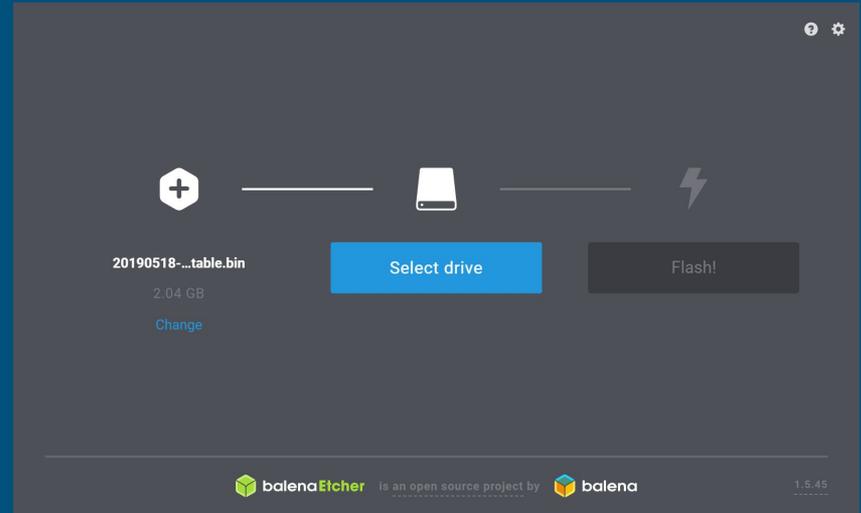
RoPieeeXL

You can get XL by simply starting with 'Regular'. After installing it, go to the 'advanced' tab in the web interface and choose 'Upgrade to XL'. Simple as that!

2) Copy RoPieee image to microSD card

- Using an imaging tool such as Etcher (<https://www.balena.io/etcher/>) or Rufus (<https://rufus.ie>), copy the downloaded RoPieee image to an empty microSD card (4g or larger).
 - Etcher is available for Windows, MacOS, and linux.
 - Make sure the image is stored locally, not on a network share.
 - NB: if using Etcher, you can use the compressed image directly.

→ **Make sure the target destination (eg the blank microSD card) is the correct storage device being written to!**



3) Install RoPieee

1. Physically install microSD card with RoPieee image into a supported Raspberry Pi.
2. Attach official Raspberry Pi 7" display (if using).
3. Attach HAT (if using)
4. Assemble everything in case.
5. Attach Ethernet cable (with known working internet including DNS).
6. Attach USB cable for power.
7. Wait until green status LED⁽¹⁾ flashes at ½ Hz (there will be several reboots).
8. Attach the USB DAC (if using) and ensure that it is powered on
9. Launch web administration interface for final configuration via a browser.

RoPieee is designed to be installed without the need for a computer screen or keyboard (i.e. headless), but must be connected via Ethernet to the Internet during setup. WiFi and other configuration options can be accessed via a web browser after installation is complete.

⁽¹⁾ Not to be confused with the Ethernet activity LED.

Advice from **@spockfish**

Wait for all of the installs to complete, ensuring that all of the reboots are finished. This may take up to 20 minutes if on a lower speed internet connection or located far away from RoPieee HQ.

@spockfish suggests that preparing and enjoying a well-made latté during this installation phase yields optimal RoPieee results; **@wizardofoz** reminds us that alternative beverages work well too.



Configuration

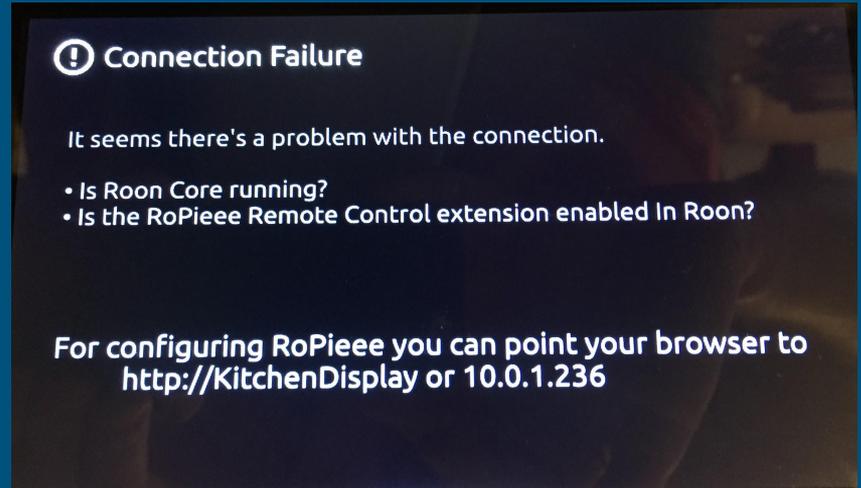


IV

RoPieee is ready for configuration

If all goes well, your new RoPieee device will now have finished installation and is ready for configuration. This is done in three steps:

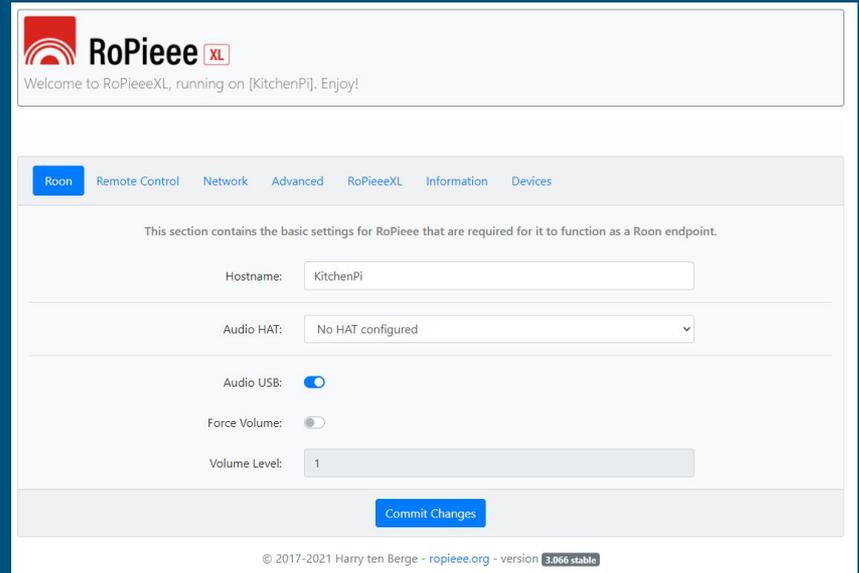
1. Adjust RoPieee settings via a browser.
2. Enable in Roon settings.
3. Adjust on-screen display settings (if applicable).



1) RoPieee web interface

Open the web interface of the new RoPieee device by going to <http://ropieee.local> or directly via the IP address (example: <http://10.0.1.238>). You can determine the IP using a port scan application or via your router interface, often in a DHCP tab. If using the official 7" Pi display, the opening error message will indicate the IP assigned by DHCP.

Port scan applications, such as Fing (<https://www.fing.io>) for iOS or Android, can be used to determine the IP address. The default machine name is "ropieee" or "ropieeexl".



The screenshot displays the RoPieeeXL web interface. At the top, there is a logo for RoPieeeXL and a welcome message: "Welcome to RoPieeeXL, running on [KitchenPi]. Enjoy!". Below this is a navigation menu with tabs for "Roon", "Remote Control", "Network", "Advanced", "RoPieeeXL", "Information", and "Devices". The "Roon" tab is currently selected. The main content area is titled "This section contains the basic settings for RoPieee that are required for it to function as a Roon endpoint." and includes the following settings:

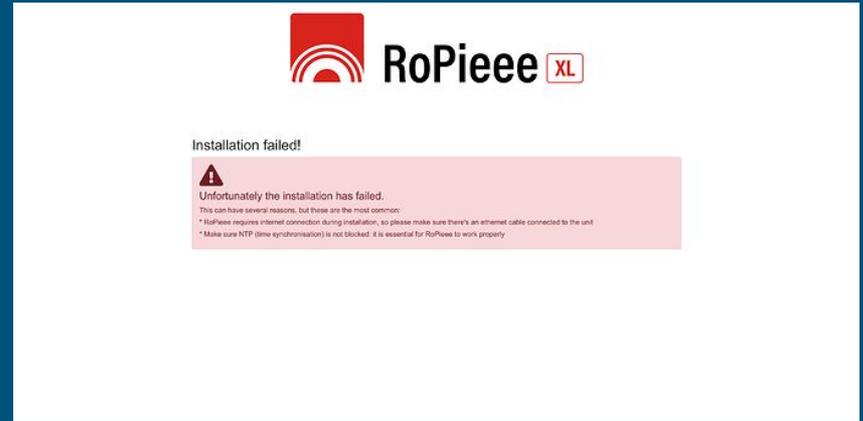
- Hostname: KitchenPi
- Audio HAT: No HAT configured
- Audio USB:
- Force Volume:
- Volume Level: 1

A "Commit Changes" button is located at the bottom right of the settings section. At the very bottom of the page, there is a footer: "© 2017-2021 Harry ten Berge - ropieee.org - version 3.066.stable".

1a) RoPieee installation error

If the installation failed for some reason, you may see an error message instead of the normal RoPieee configuration screen.

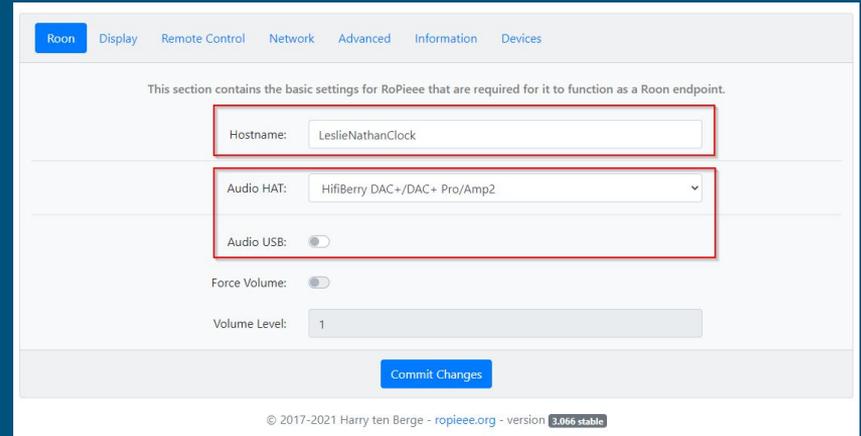
You may need to re-flash or check your network carefully. RoPieee needs to access the internet in order to complete the installation process, so ensure you are using a known good ethernet cable and known good network / DNS without any filtering or other general impediments.



1b) Adjust the general settings

- Change the hostname.
- Select the supported audio HAT from the dropdown or adjust the “Audio USB” tick box if using a USB DAC

Once you commit the changes, you may be asked to reboot the device; do so whenever requested.



The screenshot displays the RoonPiEEE web interface. At the top, there is a navigation bar with tabs: Roon (selected), Display, Remote Control, Network, Advanced, Information, and Devices. Below the navigation bar, a message states: "This section contains the basic settings for RoonPiEEE that are required for it to function as a Roon endpoint." The settings are as follows:

- Hostname: LeslieNathanClock
- Audio HAT: HifiBerry DAC+ / DAC+ Pro / Amp2 (dropdown menu)
- Audio USB: (toggle switch)
- Force Volume: (toggle switch)
- Volume Level: 1 (slider)

At the bottom right of the settings area, there is a blue button labeled "Commit Changes". At the very bottom of the page, there is a footer: "© 2017-2021 Harry ten Berge - roopieee.org - version 3.066 stable".

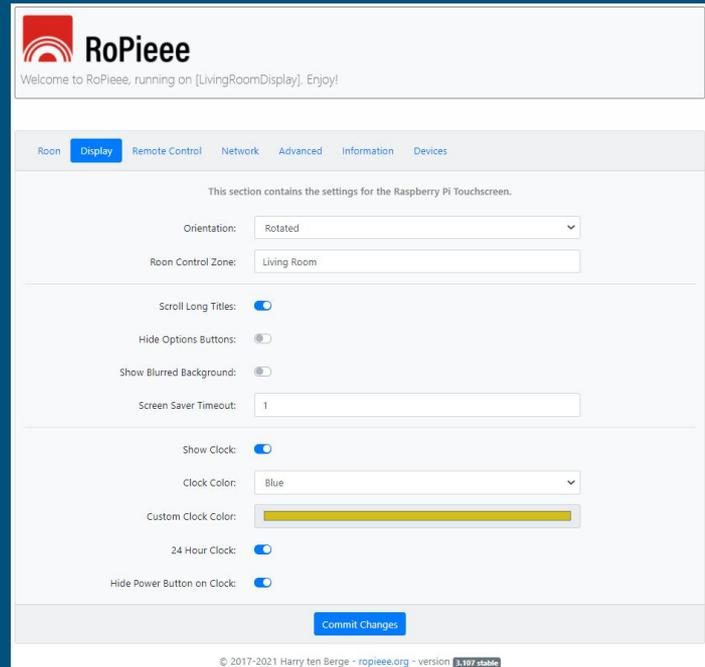
Your device requires a reboot for the latest changes to take effect.

REBOOT

1c) Adjust the display settings (if using)

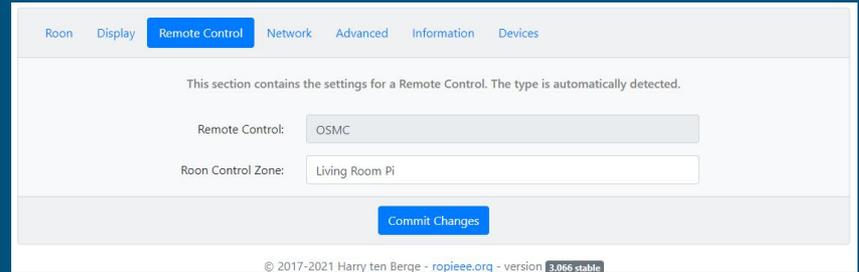
- If the display is upside down, change the the display orientation setting to “Rotated” (this is case dependant).
- Type the Roon control zone that the display should be associated with (e.g. what content should display): this must be exactly as is specified in Roon settings. (Please copy and paste if there is any doubt.)
- Remember to enable in **Roon Settings** → **Extensions**, if necessary.

NB: The display can connect to any Roon Control Zone, not just the same device.



1d) Adjust the remote control settings (if using)

- The OSMC remote and Flirc USB dongle are currently supported (detected automatically).
- Type the Room control zone that the remote control should be associated with: this must be exactly as is specified in Room settings. (Copy and paste if there is any doubt.)
- Remember to enable in **Room Settings** → **Extensions**, if necessary.



OSMC control notes

- As at RoPieee v. 282, on the OSMC remote, the play/pause button, forward, back, and volume (if applicable) buttons are active.

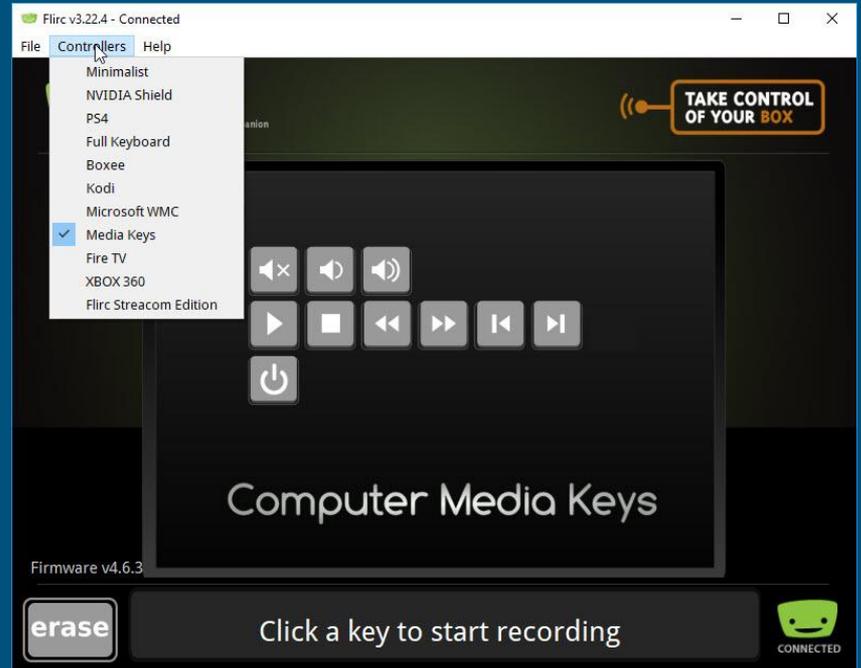


Flirc USB notes

- As at RoPieee v. 337, use the 'Media Keys' profile when setting up the Flirc USB dongle.

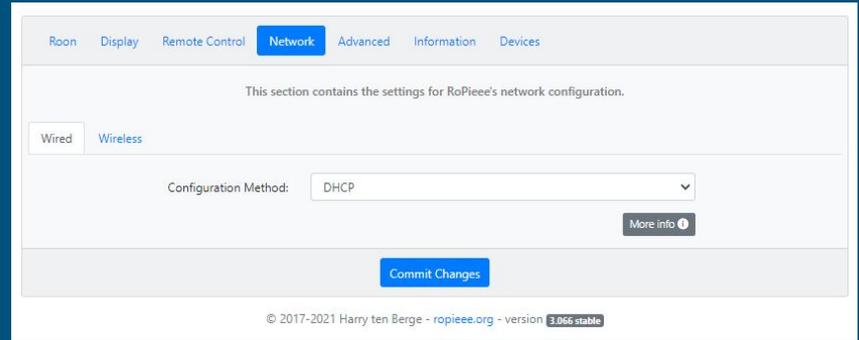


See <https://flirc.tv/support/flirc-usb> for Flirc support.



1e) Network settings

- If using WiFi or static IP, this can be configured once all of the other setup parameters are complete.
- Wireless must be enabled before it can be configured, usually requiring a reboot in between.

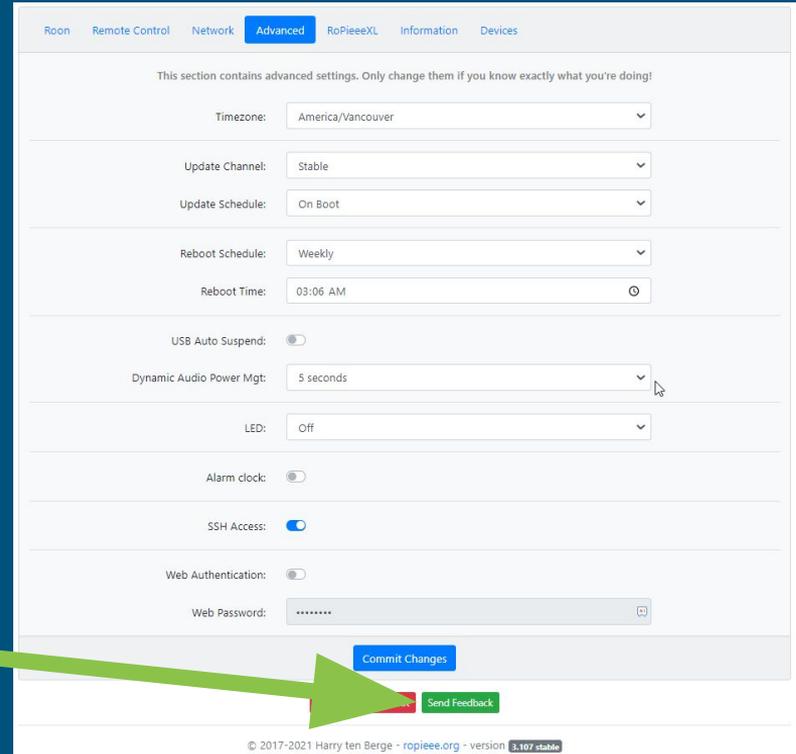


→ **TIP: use DHCP reservations in your router rather than using a fixed IP.**

1f) Advanced settings

- The **Advanced** tab contains optional settings regarding the update or reboot schedule, and other additional functionality.
- The blinking LED on the PI can be turned off, if desired.
- The great Alarm Clock extension (@Jan_Koudijs) can be enabled and run directly from a RoPieee endpoint.
- The RoPieeeXL OS upgrade option adds other streaming functionality.

Use the “Send Feedback” button to send diagnostic logs if requested; report the unique number identifier to the Roon forum.



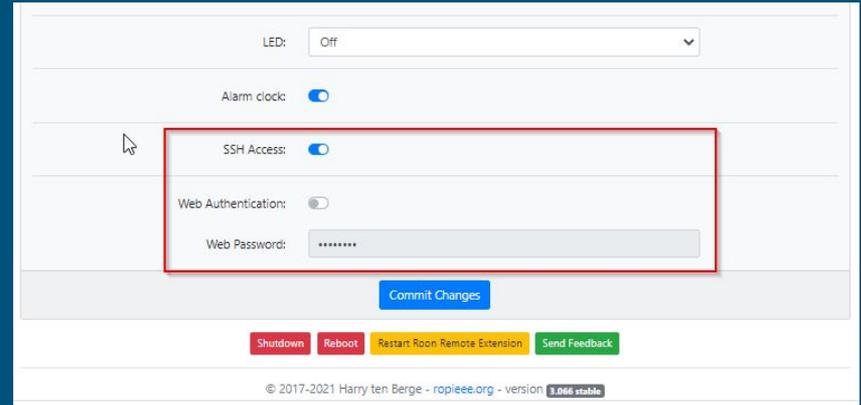
The screenshot displays the 'Advanced' settings page for RoPieeeXL. The page is organized into a grid of settings. At the top, there are navigation tabs: 'Roon', 'Remote Control', 'Network', 'Advanced' (selected), 'RoPieeeXL', 'Information', and 'Devices'. Below the tabs, a warning message states: 'This section contains advanced settings. Only change them if you know exactly what you're doing!'. The settings include:

- Timezone: America/Vancouver
- Update Channel: Stable
- Update Schedule: On Boot
- Reboot Schedule: Weekly
- Reboot Time: 03:06 AM
- USB Auto Suspend: Off
- Dynamic Audio Power Mgt: 5 seconds
- LED: Off
- Alarm clock: Off
- SSH Access: On
- Web Authentication: Off
- Web Password: [Redacted]

At the bottom of the settings area, there are two buttons: 'Commit Changes' (blue) and 'Send Feedback' (green). A large green arrow points from the left side of the slide to the 'Send Feedback' button. The footer of the page reads: '© 2017-2021 Harry ten Berge · ropieee.org · version 3.107 stable'.

1g) Security settings

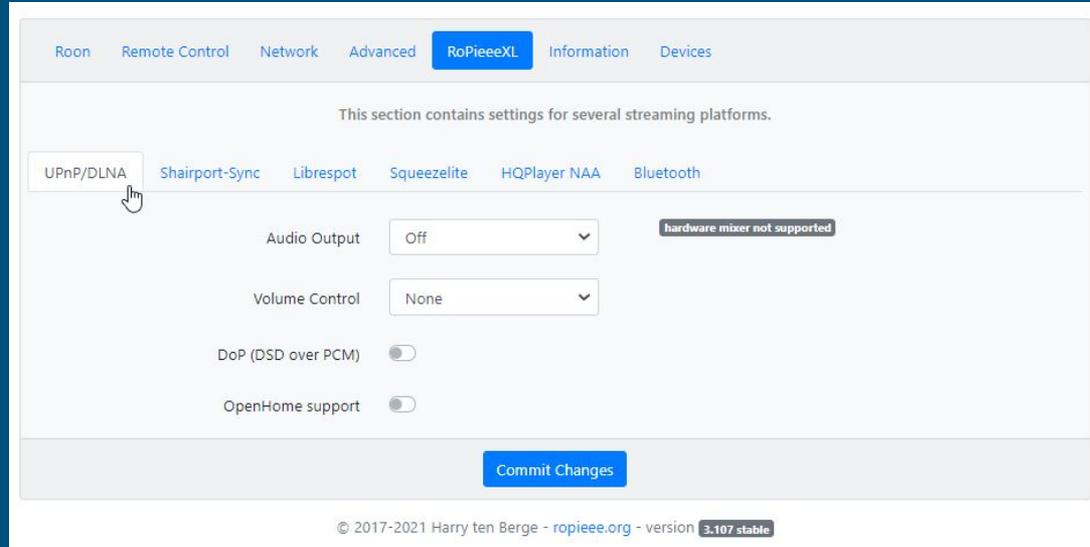
- The **Advanced** tab also contains some security settings that can be adjusted.
 - SSH access can be turned off to the Pi.
 - Web GUI authentication can be turned on and a password set.



1h) RoPieeeeXL tab

If you have upgraded to the RoPieeeeXL version of RoPieeee, the **RoPieeeeXL** configuration tab is displayed next. Configuration options of RoPieeeeXL are not included in the scope of this beginner's guide.

Please note that the application names listed refer to copyrighted services that cannot be displayed directly in RoPieeeeXL.



The screenshot displays the RoPieeeeXL configuration page. At the top, there is a navigation bar with tabs: Roon, Remote Control, Network, Advanced, **RoPieeeeXL** (highlighted), Information, and Devices. Below the navigation bar, a message states: "This section contains settings for several streaming platforms." A horizontal menu below this message lists several streaming services: UPnP/DLNA (highlighted with a mouse cursor), Shairport-Sync, Librespot, Squeezeelite, HQPlayer NAA, and Bluetooth. The main settings area contains the following options:

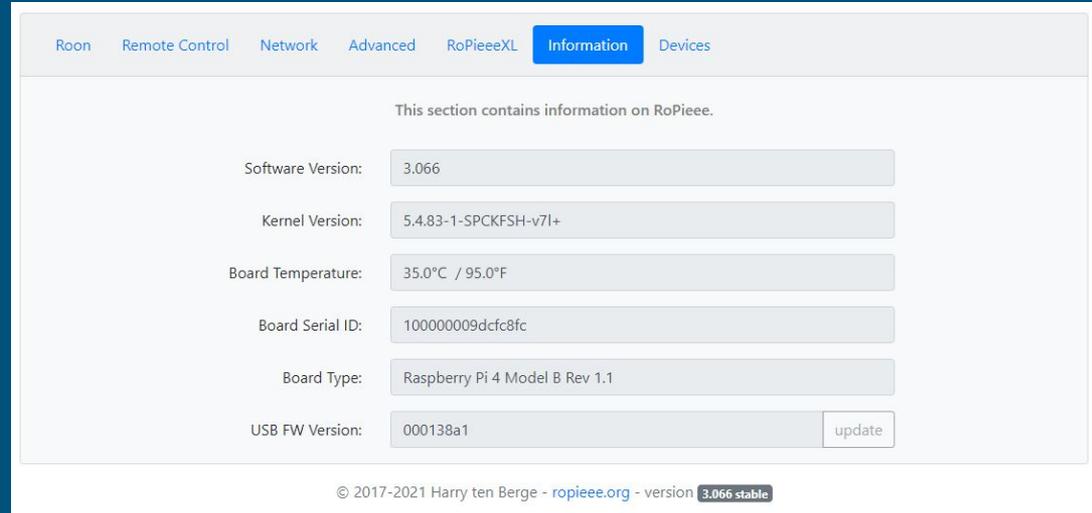
- Audio Output: Off (dropdown menu)
- Volume Control: None (dropdown menu)
- DoP (DSD over PCM):
- OpenHome support:

A "Commit Changes" button is located at the bottom right of the settings area. A "hardware mixer not supported" warning is visible next to the Audio Output dropdown.

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1i) Information tab

Information about the Raspberry Pi may be found in the **Information** tab. Please note that if there is a USB firmware upgrade available, it will be found here.



The screenshot displays the 'Information' tab of the RoPieeeXL interface. The navigation bar at the top includes 'Room', 'Remote Control', 'Network', 'Advanced', 'RoPieeeXL', 'Information' (highlighted), and 'Devices'. The main content area is titled 'This section contains information on RoPieee.' and lists the following system details:

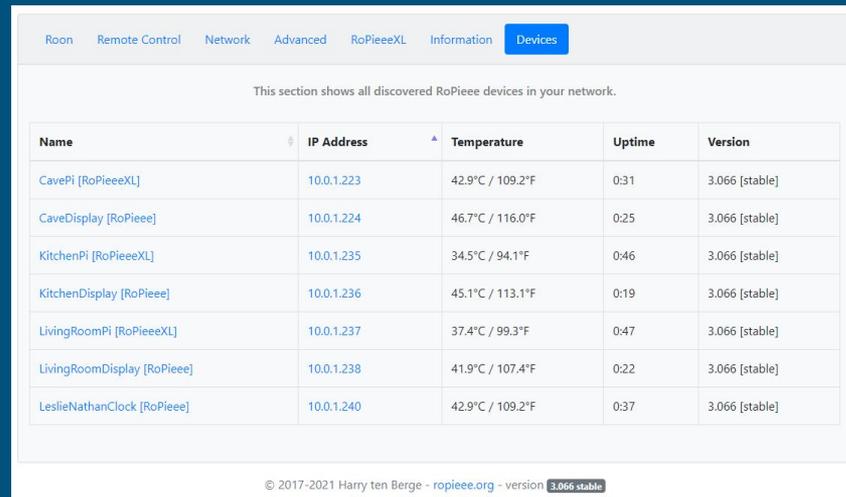
Software Version:	3.066
Kernel Version:	5.4.83-1-SPCKFSH-v71+
Board Temperature:	35.0°C / 95.0°F
Board Serial ID:	100000009dcfc8fc
Board Type:	Raspberry Pi 4 Model B Rev 1.1
USB FW Version:	000138a1 <input type="button" value="update"/>

At the bottom of the page, the footer reads: © 2017-2021 Harry ten Berge - ropieee.org - version **3.066 stable**

1j) Devices tab

If you have more than one RoPieee device in your network, the **Devices** tab will present information about each one, along with links to the respective configuration pages.

If you only have one RoPieee device, the tab will not appear.



This section shows all discovered RoPieee devices in your network.

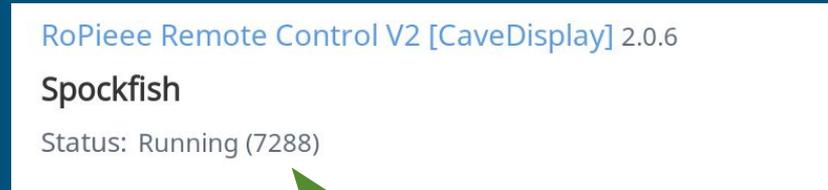
Name	IP Address	Temperature	Uptime	Version
CavePi [RoPieeeXL]	10.0.1.223	42.9°C / 109.2°F	0:31	3.066 [stable]
CaveDisplay [RoPieee]	10.0.1.224	46.7°C / 116.0°F	0:25	3.066 [stable]
KitchenPi [RoPieeeXL]	10.0.1.235	34.5°C / 94.1°F	0:46	3.066 [stable]
KitchenDisplay [RoPieee]	10.0.1.236	45.1°C / 113.1°F	0:19	3.066 [stable]
LivingRoomPi [RoPieeeXL]	10.0.1.237	37.4°C / 99.3°F	0:47	3.066 [stable]
LivingRoomDisplay [RoPieee]	10.0.1.238	41.9°C / 107.4°F	0:22	3.066 [stable]
LeslieNathanClock [RoPieee]	10.0.1.240	42.9°C / 109.2°F	0:37	3.066 [stable]

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2) Enable in Roon settings

- If using as an audio endpoint, eg using a HAT (audio add-on board) or USB DAC, enable in **Roon Settings** → **Audio**.
 - If using an USB DAC, it must be connected to your Pi and powered on to appear in Roon settings.
 - Any installed HAT must be supported by RoPieee and specified correctly in RoPieee to appear in Roon settings.
- If using as a display, enable the RoPieee extension in **Roon Settings** → **Extensions**. You may need to use a PC or tablet to make this change, as some mobile devices don't display this settings area.
- If using the remote control, this may need to be enabled in **Roon Settings** → **Extensions** if it hasn't been already (eg as a display too).

What is typed in RoPieee settings must match exactly what is defined in Roon Settings → Audio.



Number of seconds since last extension start.

3) Display settings

- The following display settings are accessed by tapping the lower right corner of the physical display:
 - Screen brightness (turn down to reduce power requirements).
 - Clock brightness.

→ To adjust most other display settings, use the Display tab.

Troubleshooting



Potential installation problems

- Using a display and it doesn't seem to work?
 - Make sure you are using the official Raspberry Pi 7" Display, and make sure that it is connected during the initial software install (if not, simply re-flash).
 - Make sure the Roon Control Zone is spelled exactly the same: copy and paste the value if there is any doubt.
- Is the Raspberry Pi not seeming to boot? Maybe the LED is blinking 7 times on and off?
 - Ensure that the Raspberry Pi is a supported model, eg a 2, 3, or 4 (not an earlier model).
- Is the install process seeming to fail?
 - Check your DNS settings, and check for basic networking connectivity, including being connected via Ethernet. RoPieee needs to download critical components during the initial install.
- Is the RoPieee endpoint not showing up in Roon?
 - Check that your USB DAC is attached and powered on, if using, or that your HAT is supported by RoPieee.
 - Verify that the RoPieee settings for USB/HAT are set correctly.

Potential installation problems (2)

- Do you have a recently manufactured Pi4 and an expected feature isn't available (like bluetooth support in RoPieeeXL)?
 - It may be that RoPieee needs to be updated with the new hardware CPU revision codes in order to identify the device correctly. Send feedback via the Roon forum and this will get fixed.
- Did you remember to enable the RoPieee extension, if applicable?

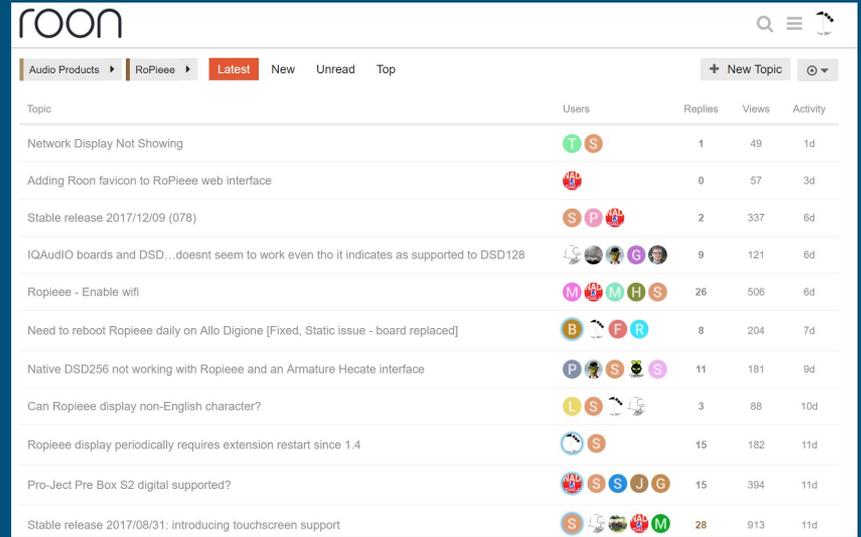
Other diagnostic steps

- Re-flashing your microSD card is always a good first step, in case of file or card corruption, after first trying a few reboots (both the Pi itself and the Roon Core).
- Also, take note of the status LED: is it flashing at ½ Hz (good) or faster (install still in progress)?
- Sometimes rebooting your Roon Core on its own is beneficial, especially for display update issues.
- If networking seems to be the issue, rebooting your network infrastructure, from the core router outwards, is occasionally helpful.

Getting Help

For technical support or RoPieee questions, see the RoPieee section in the Roon forum:

<https://community.roonlabs.com/c/audio-products/ropieee>



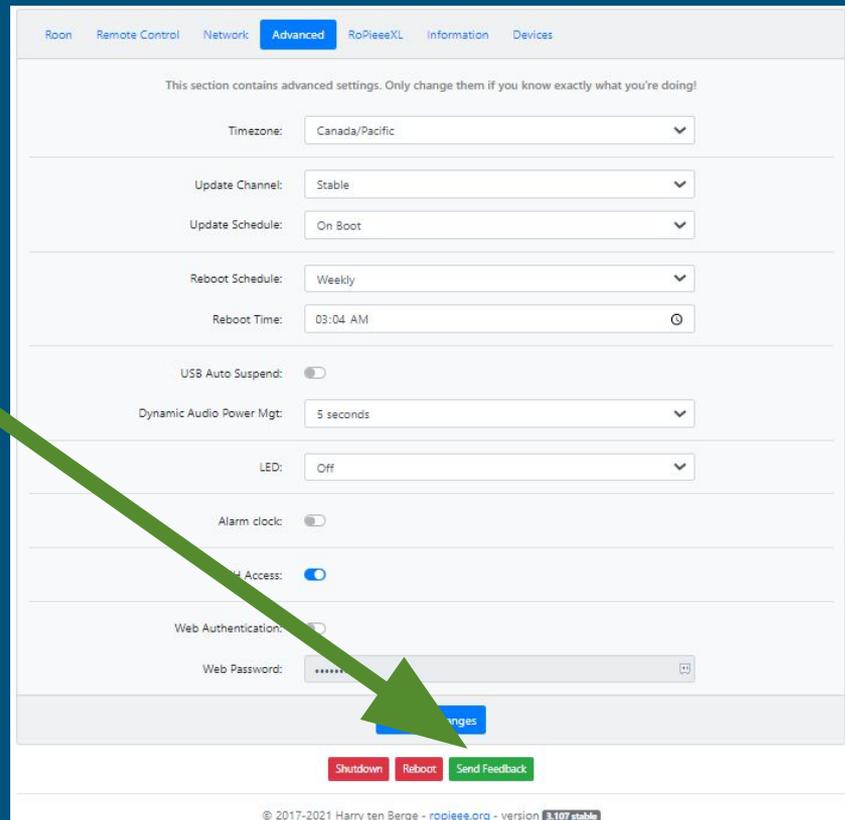
The screenshot shows the Roon forum interface. At the top, the 'roon' logo is on the left, and search, menu, and refresh icons are on the right. Below the logo, there are navigation tabs: 'Audio Products', 'RoPieee', 'Latest', 'New', 'Unread', and 'Top'. A '+ New Topic' button and a filter icon are also visible. The main content is a table of forum topics with columns for 'Topic', 'Users', 'Replies', 'Views', and 'Activity'.

Topic	Users	Replies	Views	Activity
Network Display Not Showing		1	49	1d
Adding Roon favicon to RoPieee web interface		0	57	3d
Stable release 2017/12/09 (078)		2	337	6d
IQAudI/O boards and DSD... doesnt seem to work even tho it indicates as supported to DSD128		9	121	6d
RoPieee - Enable wifi		26	506	6d
Need to reboot RoPieee daily on Allo Digione [Fixed, Static issue - board replaced]		8	204	7d
Native DSD256 not working with RoPieee and an Armature Hecate interface		11	181	9d
Can RoPieee display non-English character?		3	88	10d
RoPieee display periodically requires extension restart since 1.4		15	182	11d
Pro-Ject Pre Box S2 digital supported?		15	394	11d
Stable release 2017/08/31: introducing touchscreen support		28	913	11d

Submitting feedback

In some cases, you may be asked to submit technical feedback (logs and such). This can be done via the **Advanced** tab.

Be sure to capture the **unique identifier** when posting back to the Roon forum.



Donate

RoPieee is a volunteer-led project (thank you @spockfish), with hosting and other direct costs. If you use RoPieee, please consider contributing on an annual basis:

<https://ropieee.org/donate/>

RoPieee

Enjoy the music!

