

Raspberry Pi Projects for Ham Radio by WB5YYQ

In February 2012, the Raspberry Pi Foundation in the United Kingdom released the first credit card sized computer which was targeted as an educational tool to teach children basic computer science in schools and in developing countries. The Raspberry Pi model B had a single processor, with HDMI, USB, and Ethernet ports; it ran Linux, which is an open source operating system, and retailed for about \$30. It was a tremendous hit and became very popular with electronics hobbyists, for robotics, weather stations, and especially with hams.

Over the years, there have been about a dozen variations in Raspberry Pi models. As newer models have been introduced, they have become more powerful with faster processors, more memory, built-in Wi-Fi & Bluetooth. The Raspberry Pi 4 model B has a quad core ARM processor with 8 GB of ram and retails for \$75. However, the demand for Raspberry Pi products far exceed the supply, and they appear to be back-ordered everywhere. You can probably find some on eBay, but at dramatically inflated prices. In February 2022, ten years after its introduction, over 46 million Raspberry Pi units have been sold. The popularity and success of Raspberry Pi has launched a cottage industry to support this technology explosion, with 3D printed cases, LCD panels, and other specialized add-on modules.

If you can get your hands on a Raspberry Pi, there are many internet resources and YouTube videos to assist you in learning how to use this powerful tool. Here are four ham radio projects that I have personally tried over the past few years. Each of these projects use a Raspberry Pi, some external components, and a customized Linux based operating system which is easily available for download. I have had varying degrees of success and I'll give my impressions of each project.

1. PiStar (hotspot for digital modes) developed by Andy Taylor, MW0MWZ.

In many parts of the country, repeaters that cover DStar, DRM, or other digital modes are too far away to be accessed. A Raspberry Pi and a small add-on RF module (about the size of a stick of chewing gum) can provide access to worldwide digital repeaters and talk groups using a Wi-Fi connection (either thru your home network, or a cellular hotspot). This is a highly portable setup and works well in a mobile unit. Imagine linking to a digital repeater and driving coast to coast without having to change channels. That's entirely possible as long as you have internet access. I have two of these RF modules, a ZumSpot with a 1 inch white LCD display, and MMDVM with a 1 inch blue LCD display. Except for some minor layout differences, these are identical units. I use one on VHF and the other on UHF. To work properly with the PiStar, these have to be set to either plus or minus duplex with a zero offset; setting to simplex doesn't work. Both are plugged into Raspberry Pi Zero's and they both work very well with the PiStar software, which is available as a free download. I give PiStar 5 stars. www.pistar.uk

2. PiGate Emergency Email Gateway developed by Mark Griffith, KD0QYN.

This uses a Raspberry Pi and an add-on TNC module which are used as a Winlink email client/server for EMCOMM applications. Suppose you're deployed to a storm shelter after a disaster in an area that does not have cellular or internet service. A remote email server can be part of your EMCOMM equipment to provide a WiFi access point for outgoing email from storm refugees, using their cell phones or tablets to connect to a Raspberry Pi. A simple one-way message can be sent, such as "Hi Mom, we're all safe. We're coming to your house, in a couple of days, after the roads are cleared." These messages are put in an outbox for bulk upload to either a VHF or HF RMS station later by the EMCOMM personnel either manually or at a scheduled interval. All messages can be reviewed for appropriateness prior to uploading. That's a judgement call, and refugees should be made aware of that prior to using the system.

Suppose a RMS station is not reachable. Setup a mobile RMS station and go find the nearest open WiFi hotspot. Maybe the McDonald's a couple of towns over has power and internet service. Send a mobile unit over there and relay the bulk messages from the shelter to the mobile RMS station which is logged in to the McDonald's free WiFi (just make sure to get approval from the store manager).

I love the concept of PiGate, but it uses Packet technology with a hard to find TNC. The original TNC model is no longer manufactured and the replacement at the time I was experimenting with this, had limited availability. You need two Raspberry Pi's and two TNC's to make this work, and I had only one TNC, so I couldn't properly test this. There are separate versions of the operating system software for the PiGate and the RMS PiGate, both available for free download. I would like this much better if they were using VARA FM. I give PiGate 3 stars. www.pigate.net

3. DigiPi developed by Craig Lamparter, KM6LYW.

Use a Raspberry Pi and a Pi sound card with the appropriate cables to interface with your radio to work ALL amateur radio data modes. Radios that have built-in sound cards only need a USB cable and just the Pi (no Pi sound card is required). The operating system is 'sponsor-ware' and not free; but its very inexpensive. The developer offers the software free to patrons that sponsor their website, for as little as \$1 a month. The website has a lot of good info.

"The DigiPi is the ultimate hot-spot for all amateur radio data modes, including APRS, ax.25, Winlink email, FT8, Slow Scan TV, PSK31, Packet and even CW. The implementation is an elegant, inexpensive, low-power, open-source Raspberry-Pi--based amateur radio data transceiver, managed exclusively by web browsers or smart-phone apps, with no bulky keyboards, monitors or complicated wiring." (quote from webpage).

I haven't used this for very long and I'm still in the process of getting everything working correctly with my Icom 7100. So far, I've got APRS working. My 7100 is connected to a Raspberry Pi model 3 via a USB cable. My Android tablet is connected via Bluetooth to the Raspberry Pi. Stations received are displayed on the tablet in the APRSDroid program, and I can control the rig with my tablet. I love this concept, and I think it has great potential, and I give DigiPi 4 stars.

<https://www.youtube.com/watch?v=io-YnPOQ-ow&t=0s>
<https://youtu.be/cR2n-dmrP24>
<https://youtu.be/ggOhqdsvtr4>
<https://craiger.org/digipi/>

4. Build-a-Pi, developed by Jason Oleham, KM4ACK.

This is a customized operating system designed for hams to use a Raspberry Pi as your primary ham shack computer. The operating system is a free download. Connect a monitor, keyboard, and mouse, and plug into your home network (either with WiFi or Ethernet) and your ready to go. It comes with numerous ham related programs preinstalled to operate digital modes, SSTV, Winlink, logging, DX spots, etc. Basically anything you would use a computer for in your shack, can be done with a Raspberry Pi. I've used this for quite some time, and it's pretty solid. I give Build-a-Pi 5 stars.

<https://github.com/km4ack/pi-build>

These are just a few ideas for ham related projects with the Raspberry Pi.

For more information on these projects, consult the links attached to this document which is posted on the LeeCARES website.

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