Winlink and APRS on Raspberry Pi

Session 10 – Running Pat Winlink and YAAC APRS on the Pi

This session continues on the base we started last month to add Pat as a Winlink client and YAAC as an APRS client.

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BILL OF MATERIALS

- Computer: Windows, Mac, or Linux
- For VNC, you can also use a tablet or smartphone.
- Raspberry Pi 4 Model B starter kit including
  - Raspberry Pi 4 Model B 2GB 4GB or 8GB
  - Power supply, 5v, 3 amps

  - MicroHDMI to HDMI adapter cable
  - MicroSD card, at least 16 GB. Choose one size and type of card and stick to it, such as Sandisk Ultra 32GB, which is what I use.
  - Optional: case, fan, heatsinks
  - You can either buy a starter kit or the individual components.
  - To find a vendor with Raspberry Pi in stock, visit https://rpilocator.com/
- Either [HDMI Monitor, keyboard, mouse] or computer. I will have a monitor, keyboard, mouse available at the workshop.
- USB to MicroSD card reader
- A second MicroSD card for backup
- Optional: USB GPS. This is useful for applications such as HamClock and APRS.
  - For example, VK-162 USB GPS Dongle - Remote Mount USB - External GPS Navigation Dongle ($16-18 on Amazon).
  - There are GPS devices available as "dongles" that plug right into a USB port such as the HiLetgo VK172 G-Mouse USB GPS/GLONASS USB GPS Receiver ($12 on Amazon) For a Pi4, this causes interference with the GPS mounted right at the USB port and your GPS will not work reliably.
  - I purchased a GlobalSat BU-353S4 USB GPS Receiver several years ago when it was inexpensive ($30 on Amazon). It has gotten more expensive ($80 on Amazon but less expensive elsewhere such as Newegg, around $50) but it is the best GPS unit I have found.
  - The VK-162 is less expensive and will work although it might not find a fix as fast or as reliably. I could get a good signal inside the window on the GlobalSat but I had to put the VK-162 outside the window.
- A TNC (Terminal Node Controller) or audio interface for your radio, or a radio with a built in sound card interface.

UPDATES

I have experimented with my Raspberry Pi 5. It has been updated and I can now say it is usable for these applications. And it is a lot faster than the Pi 4.

For a free RealVNC account, use their Lite account.

GETTING STARTED

This workshop is based on the prior Raspberry Pi Basics workshop and assumes that you have installed Raspberry Pi OS and 73Linux on your Raspberry Pi. You can see that prior workshop's documentation at https://github.com/hwdornbush/9-RaspberryPiBasics

WINLINK

We will explore installing and running Winlink on the Pi. In case you are not familiar, Winlink is an application that allows you to send and receive email using RF. It was originally developed for sailors so

they could stay in touch while out on the seas. It now has widespread use in the ham community especially for emergency communications. Winlink is run and maintained by hams for hams.

To send or receive, you connect your station to a Winlink Gateway, which is another amateur radio operator's station that is connected to the Internet. The Gateway forwards your email to the Winlink servers. The servers store and forward your email to its recipient, and if that recipient is not a radio amateur, then it forwards it to the public email system.

An email can attach files, such as spreadsheets or photos, although since transport is via RF and relatively slow, we limit the size of attached files. It also includes forms which allow you to send just the data in the form and not the form itself.

For emergency communications, Pat and Winlink support Peer-to-Peer messaging where you use RF to connect directly to another Winlink user to send and receive messages.

You can see more about Winlink at https://winlink.org/

If you don't already have a Winlink account, you will need one. In https://winlink.org/user see "How to get an account." You can use this installation of Pat to get your account.

The Winlink client supported on the Pi is "Pat." Actually, Pat is a cross-platform Winlink client so you could also use it on Windows or Mac.

To install the software needed for Winlink, select Start > Hamradio > 73Linux > 73Linux.

Select "Select Apps for Build"

We will start with setting up 2 Meter connections.

Select
DIREWOLF
AX25
PAT
PAT-MENU

Click "Build It."

Enter your Six Character Grid Square and Winlink Password.

If you don't already have a Winlink account, leave the Winlink Password blank.

Enter your Pi password if requested.

Click "OK."

73Linux will download and install your selected applications. Select "Reboot" when requested.

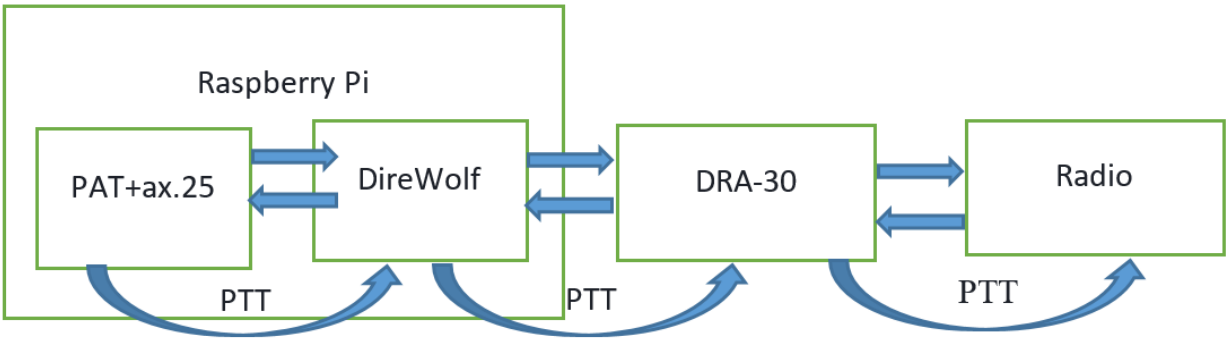
You will now see in Conky that "PAT is ACTIVE" meaning that the PAT program has been started. Now we can proceed to send and receive emails.

First, we must deal with the hardware requirements. On the Pi, PAT can format the messages to and from Winlink, but the Pi can only send a digital signal that must be converted to an analog signal that

can be sent by a radio. There are many ways to address this. Traditionally, there is a device called a "Terminal Node Controller" or TNC that connects the Pi to your radio. The term TNC is not quite accurate as it used to refer to a computer-like device that connected a keyboard to a radio, but the term is often used more broadly. A TNC can be as simple as an audio interface between the Pi and radio. Today, most TNCs are called KISS TNCs as they leave the processing to the Pi and convert the signals to audio that can be transmitted or received on the radio. A TNC can be hardware or software based with an audio sound card to be the connector. Some radios today have a sound card built in so you can connect your computer to your radio with nothing else required.

For this example, we will use the following: The Pi will run PAT to format the email messages, and pass them to a software TNC called Direwolf. Direwolf will create the needed packets and pass the signals to an audio interface, a Masters Communications DRA-30 which will be connected to the data connector on a radio, an IC-7100. This approach works for any 2M radio, not just the IC-7100. You will need a cable that will connect the DRA-30 to your radio's data port, or to its microphone, speaker, and PTT connections. The other connector on the DRA-30 is a standard USB-A to USB-B cable which connects to the Pi.

The protocol used is AX.25 which is a packet protocol also used for Winlink, APRS, and other packet applications.



Other TNCs are Signalink sound card modem, Mobilinkd, Digirig, PACTOR, Rigblaster, TNC-Pi, TNC-Pi9k6, and home-built interfaces such as the one demonstrated by Dale N5EIA.

For VHF, software modems include Direwolf, AX.25, and VARA FM.

For HF, software modems include ARDOP and VARA HF.

VARA can be installed on a Pi but it is a little finicky.

Direwolf must be configured for your soundcard.

a) You will need to configure Direwolf for your sound card. In my case, here is what is needed for DRA-30 support:

   i) Determine where your soundcard is listed on the Pi:
   `$ arecord -l` (that is a "lima" not a "one")
   Note the Card number and device number. For example,

```
Card 3: Device [USB PnP Sound Device]. Device 0: USB Audio [USB
Audio]
```
My card is at 3,0

ii) Edit direwolf.conf to support the soundcard. For example,
```
$ mousepad direwolf.conf
```
(Mousepad is a text editor that is easy to use, as it is a WYSIWIG editor similar to Notepad on Windows.)

Build-a-Pi will set this:
```
ADEVICE plughw:3,0
```

Uncomment: (remove the leading #)
```
PTT CM108
```
This provides Push To Talk (PTT) via the DRA-30 soundcard GPIO line which the DRA cards support.

If you are using a Signalink, then no PTT line is needed, as the Signalink generates the PTT.

If you have a different soundcard, you will need a different PTT command.

Read documents at https://github.com/wb2osz/direwolf for Direwolf instructions and the many capabilities of Direwolf.

Save and close the editor:
```
Ctrl-s
Ctrl-q
```

To send an email via PAT Winlink:

1. Select Start > Hamradio > Pat Menu
2. Click Start/Stop Modem
3. Click Start Packet Modem
4. You will see “DIREWOLF ACTIVE” and “KISSATTACH ACTIVE” go green in Conky.
5. You will see a window “The PACKET modem has started.” Click OK.
6. A browser window will open. If asked to allow notifications, select “ALLOW.”
7. PAT is running in this browser window. You will see menu items at the top, messages in the middle, and in the black area at the bottom, system status messages.
8. If this is your first time using Winlink and you don’t yet have an account, see below “I WANT TO USE WINLINK…” and then come back here to complete the connect by radio.
9. To compose and send a message:
    i. Select “Action” > “Compose”
    ii. Compose your message
    iii. Click “Post”
10. To connect via 2M FM radio to send and receive messages:
    i. Select “Action” > “Connect”

ii. Select transport “AX.25”
iii. Enter the callsign of the gateway as the target, for example, AK4ZX-12
iv. Tune your radio to the gateway frequency, for example, 145.050
v. Click “Connect”
vi. You will see status in the bottom black part of the window and any messages in your inbox

11. To connect to Winlink via telnet, using just the Internet,
    a. Select Action > Connect
    b. In the dropdown (select alias), select “telnet”
12. You can create aliases to make it easier to connect to different gateways. For example, to create an alias for AA6BD-10 and AK4ZX-12, run
    `$ pat configure`
    and change the connect_aliases section to

```
"connect_aliases": {
 "telnet": "telnet://{mycall}:CMSTelnet@cms.winlink.org:8772/wl2k",
“AA6BD-10”: “ax25:///AA6BD-10?freq=144950”,
 "AK4ZX-12": "ax25:///AK4ZX-12?freq=145050",
 “W4EDP-10”: “ax25:///W4EDP-10?freq=145750”
```

    Using “pat configure” invokes the Nano editor so you will need to learn how it works. Basically, use the arrow keys to position the cursor where you want to make changes, make your changes, and type “Ctrl-x”, “y”, and hit “return”.

    After you make any changes using “pat configure”, you must restart your Pi for the changes to take effect.
    While you are in the Pat Configure file, look around to see what else is there.

WINLINK USING A BUILT-IN SOUND CARD

I have an IC-7100 radio that has a built-in sound card and rig control interface, as do many recent radios.

You can use this built-in interface rather than the DRA-30 to connect the Pi directly to the radio. This requires implementing rig control in your Pi.

1. Start > Hamradio > 73-Linux > 73 Linux
2. Click “Select Apps for Build”
3. Select HAMLIB
4. Click “Build it”
5. Enter your password if requested
6. Get a cup of coffee as this installation takes a while.
7. Reboot when requested.
8. Reinstall Direwolf to include support for hamlib
   a. `$ sudo ldconfig`

b. Start > Hamradio > 73 Linux > 73 Linux
c. Click Select Apps for Build
d. Click the box in front of DIREWOLF to select it, and it will be reinstalled
e. Click Build It
f. Enter password if requested
g. Reboot Now when requested
h. To confirm: Start > Hamradio > Dire Wolf
i. At the top of the window, you should see
"Includes optional support for: gpsd hamlib cm108-ptt"

9. Edit "direwolf.conf" to enable rig control of your transceiver
   a. Open a Terminal window and go to your home directory:
      `$ cd`
   b. In order to save my working DRA-30 configuration file, I used
      `$ cp direwolf.conf direwolf-DRA.conf`
      I can then restore it as needed.
   c. `$ mousepad direwolf.conf`
   d. Find these lines in direwolf.conf
      `#Uncomment line below for PTT with CAT through FLRIG`
      `#PTT RIG 2 localhost:4532`
   e. Replace the second line with:
      `PTT RIG 3070 /dev/ttyUSB0`
      In this line, 3070 is the model number in hamlib for the IC-7100. Model numbers are available at https://github.com/Hamlib/Hamlib/wiki/Supported-Radios
      /dev/ttyUSB0 is the port where the rig control of the IC-7100 is connected to the Pi. You can list the ports on your Pi using the command
      `$ ls /dev/ttyUSB*`
   f. This line may vary depending on your transceiver and how it appears to the Pi. I found it by Googling "direwolf rig control using flrig and ic-7100"
   g. Type `Ctrl-s`
   h. Type `Ctrl-q`
10. Setup HAMLIB in Pat
    a. Pat documents how to use rig control at https://github.com/la5nta/pat/wiki/Rig-control
    b. Use Pat Menu to set up rig control
       i. `Start > Hamradio > Pat Menu`
       ii. `Settings > Config > Current Config Setttings`
       iii. Change config to support rig control
       iv. Rig Control: "Yes"
       v. Rig Control Command: "/usr/local/bin/rigctl –m 3070 –r /dev/ttyUSB0 – s 19200"
       vi. 2M Mode for Radio: "FM-D"
       vii. Press "Update"
11. Each time you want to use Pat and rig control:
    a. `Start > Hamradio > Pat Menu`
    b. `Start/Stop Modems > Start Packet Modem`
    c. You can now use Pat Winlink to connect to a Winlink Gateway using your transceiver directly wired to your Pi.

d. Action > Connect
e. Set up connect as needed
f. You will see the rig change frequency and there will be a QSY message at the bottom of the Pat Mailbox window.
g. You may need to change the mode to “FM-D”

WAYS TO USE WINLINK

1. Use Winlink to send and receive emails to and from other Winlink ham radio users by sending the email To: (callsign)
   For example: To: AA6BD
2. Send email to any email account.
   For example: To: billdornbush@w4am.net
   Once you have sent an email to a non-ham account, that account will be “white listed” for 400 days and will be able to send an email to you. The whitelist removes spam and unwanted emails from reaching you via RF as we must follow FCC rules.
   You can manage your whitelist using Winlink.
3. Use the Winlink Catalog to obtain many different types of information such as weather and propagation:
   Start > Hamradio > Pat Menu > Pat Catalog
   For example, Weather Reports > GPS Weather will provide a weather report based on your GPS location.
4. Send a txt message to a cell phone.
   a. In Pat, you can find this information at
      Start > Hamradio > Pat Menu > Pat Catalog > Send SMS
   b. You must know the service for a cell phone you want to reach
   c. https://help.inteliquent.com/sending-emails-to-sms-or-mms provides a listing of services
   d. For example, to send a txt message to a Verizon cell phone, use
      To: (number)@vtext.com
5. So far, we have discussed Winlink using a VHF Gateway to reach other stations. You can also use HF Gateways and the ARDOP modem.
6. If the Internet is not available, Gateways can be configured into a Winlink Hybrid Network where they use RF to exchange messages among each other.
7. If a Gateway is not available, you can communicate directly with another Winlink station. This mode is called P2P, or Peer-to-Peer. Messages must be sent to the callsign of the other station.
8. SHARES is a government network using RF and different HF frequencies along with the Winlink backbone to exchange messages.
9. For more information on Winlink, see https://winlink.org/
10. For many details, see https://winlink.org/content/winlink_faq_march_11_2023

I WANT TO USE WINLINK. HOW DO I GET AN ACCOUNT?

From the https://winlink.org/user website:

Winlink accounts are created with a client program such as PAT.

If you use a different program from Winlink Express: (such as PAT)

a) Follow the program's help or instructions to configure it for your callsign and use. In PAT, we already did this above.
b) Connect with the Winlink system (send a message via Telnet [the Internet]) to create your account:
c) In the PAT Mailbox window, select Action > Connect
d) In the "Connect to remote node" window, select alias "Telnet" and click "Connect"
e) *Do not use a password on your first connection.* Your radio email address is *YOURCALL*@winlink.org. A message containing your password will be sent to your account. Retrieve it with a second connection. After retrieving your password, secure login will now be enforced by the CMS, so *be sure to set your password in your client program.*
f) For PAT, open a Terminal session and type

```
$ pat configure
```

This uses the Nano editor, so be sure to see how to use it.
Edit the second line, "secure login password": ""
and put your password between the ""
then type

```
Ctrl-X
y
enter
```

To recover your password and log into your account on Winlink.org:

i) At any time, use the recovery form at Winlink.org [My Account] to have a password re-sent to your account or password recovery address. Retrieve it using the appropriate program.
ii) *Use your callsign as your username*, and password to log in at Winlink.org. You can change your password once you're logged in.
iii) *Be sure to edit your account settings at Winlink.org and* ***set a password recovery address!***

BACK TO HAMCLOCK

Sometimes, when you install a program, you "break" another one. In this case, I have found that when I installed Pat, then Hamclock ran into an address conflict. This was due to both programs wanting to use the same "port" to display using a browser.

To fix this, change the port that Pat uses:

1. Start > Hamradio > Pat Menu
2. Click Settings/Config
3. Click Current Config Settings
4. Change Pat Port from 8080 to 5000.
5. Click Update.
6. Click Main Menu.

7. Open a Terminal window.
8. `$ pat configure`
9. In the line
   "http addr": "127.0.0.1:8080"
   Change "8080" to "5000"
10. Type Ctrl-s, and Ctrl-x
11. Reboot

You can now run both Hamclock and Pat at the same time.

How did I learn this? By searching messages in https://groups.io/g/KM4ACK-Pi

APRS

APRS is Automatic Packet Reporting System. It is often used by hams to share their locations. I have used it to track my progress while driving around town, or on a vacation and then to print a map showing where I have been.

See also https://www.youtube.com/watch?v=seD0bYsoRZc for Randy K7AGE APRS Train Trip video.

I have also used it to share my location during a public service event. I have three radios where I can make position reports: a Yaesu FT1XDR handheld and a Yaesu FTM-300D mobile that can both transmit and receive APRS beacons and messages, and on my mobile rig, I use a smartphone app, APRSdroid, to connect to a Mobilinkd TNC which connects to my mobile rig which transmits and receives APRS beacons and messages. Both have a GPS to provide my location for my beacon.

APRS reports are transmitted to other APRS stations using RF (Usually 2M) or through the Internet. APRS stations include:

- Trackers – sending positions (beacons) to APRS via RF or the Internet
  Trackers have been launched on weather balloons for long distance tracking.
- Digipeaters – receiving RF position reports and repeating them so other distant stations can hear them
- I-Gates – receiving RF position reports and sending (gating) them to the Internet APRS database.
- Weather stations who provide local weather using telemetry
- A station can send and receive messages like txt and email messages

- And more

We could spend a session on APRS and its many features and uses, but I will restrict this session to how to run APRS on a Raspberry Pi under 73Linux.

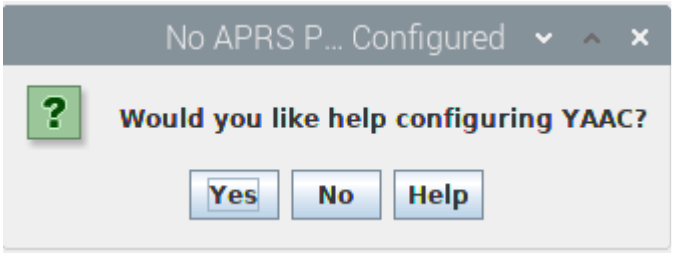
In the US, the standard APRS frequency is 144.390 MHz.

You can view APRS traffic at https://aprs.fi

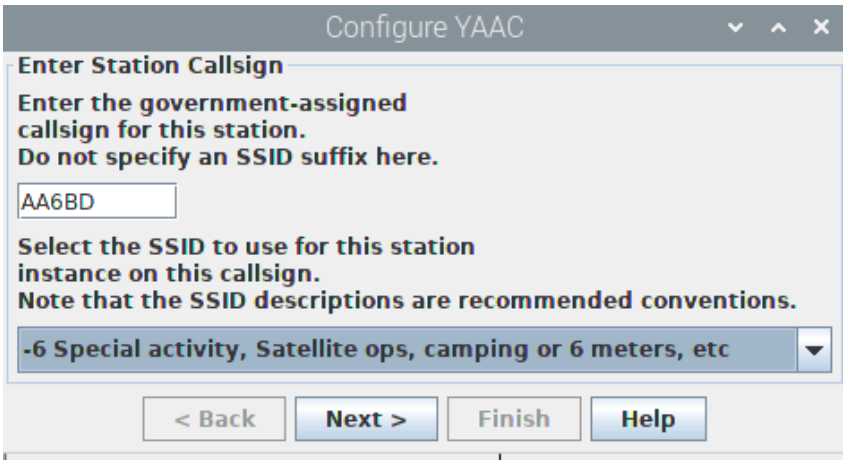
There are several programs available in 73Linux to provide APRS. We will explore one of them: YAAC, which stands for Yet Another APRS Client. It provides a full range of APRS services including sending and receiving beacons and messages using either RF or the Internet, and functioning as a digipeater and/or I-gate. It displays other beacons on a detailed map.

To install APRS:

1. Start > Hamradio > 73Linux > 73 Linux
2. In the 73Linux window, click on “Select Apps for Build”
3. Select YAAC
4. Click “Build it”
5. Enter your password if requested.
6. Reboot when requested
7. Start Direwolf
   Start > Hamradio > Dire wolf
8. Start YAAC
   Start > Hamradio > YAAC
9. You will see this window:

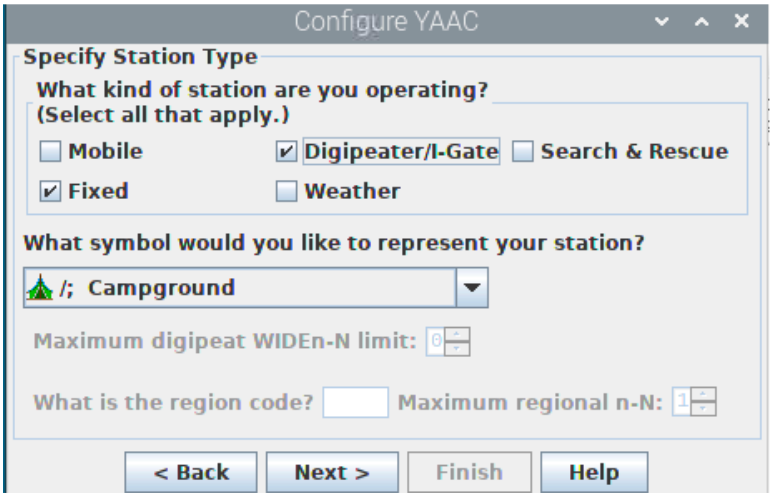


10. Click Yes
11. NOTE that you can change any of this configuration later.
12. Enter your call sign and select an SSID (Secondary Station Identifier). I suggest using -6 for this demo.
    a. CAUTION: Use a different SSID (like -6) for each device as you should not have more than one device with the same SSID in use at the same time. For example, I use -7 for my handheld and -0 for my stationary Pi based station. SSIDs can be from 0 to 15. The suggested use for SSIDs is defined in the APRS specification and repeated in the Appendix below.



Click Next >

b. Specify your station type



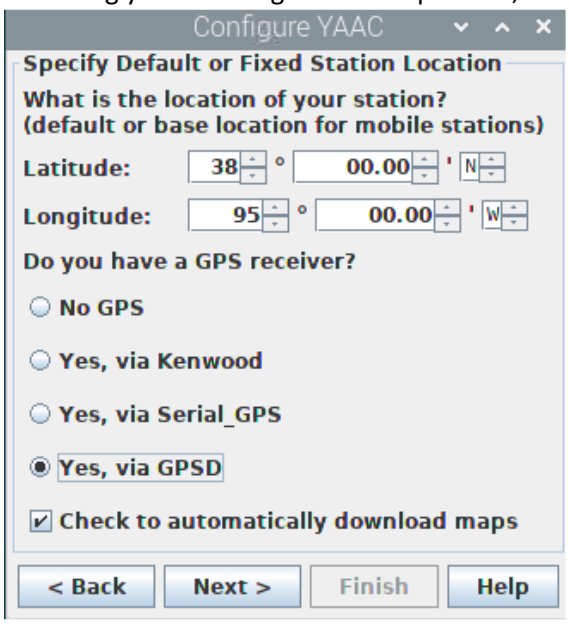
You are probably Fixed, that is, stationary at home.

If you want to also Digipeat and/or I-Gate, select this also.

Click Next >

c. Configure your station location.

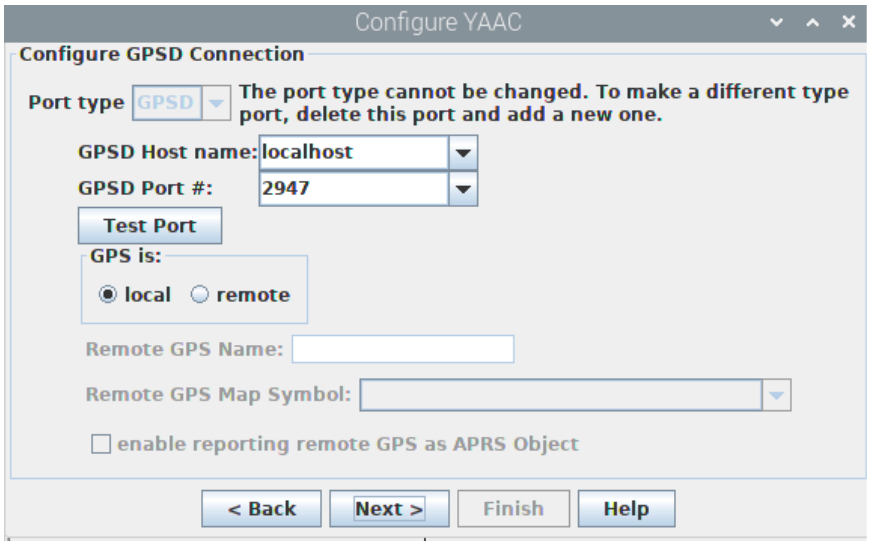
i. Assuming you are using the GPS I specified, check “Yes, via GPSD.”



ii. If you do not have a GPS, then you can enter your Latitude and Longitude and select “No GPS” You should enter your home location in case your GPS does not provide your coordinates to YAAC.
    1. Use this web site: https://www.gps-coordinates.net/gps-coordinates-converter to get the GPS coordinates for your address.
    2. Use this web site: https://www.sunearthtools.com/dp/tools/conversion.php and convert your coordinates to DM format
    3. Enter your coordinates in DM format and select “No GPS”
    4. APRS uses a standardized format called DDMM.MM (or degrees and fractional minutes). It specifically does _not_ use degrees/minutes/seconds (typical GPS device display format) or fractional degrees (such as whatsmygps.com reports). Although you can change preferences in YAAC to display and enter coordinates in those formats/units, they will be translated to DDMM.MM format before transmission in APRS packets. But for this initial setup, you need DM format.

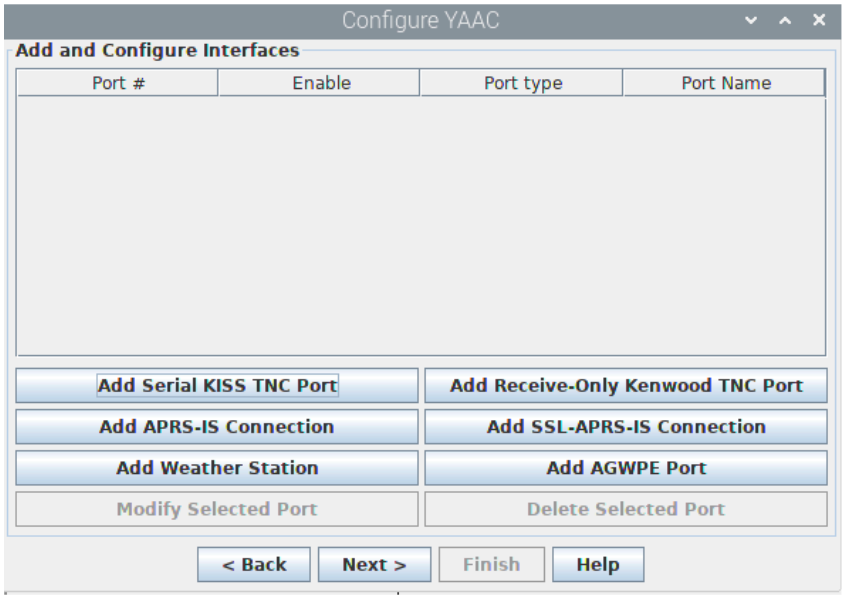
iii. Click Next >

iv. If you indicated that you have a GPS, you can select defaults in the Configure GPSD Connection window.

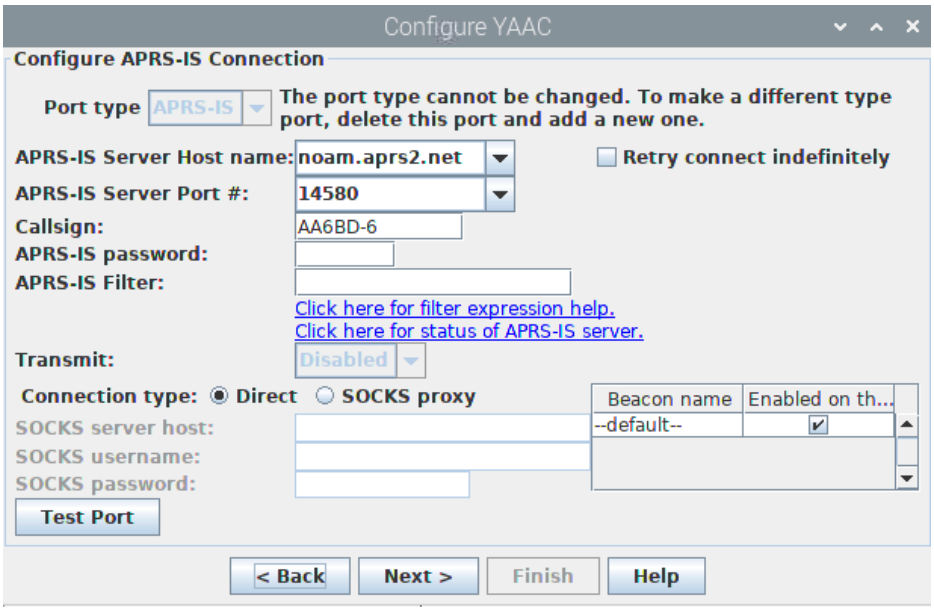


Click Next >

d. Configure any additional ports that you want to use.

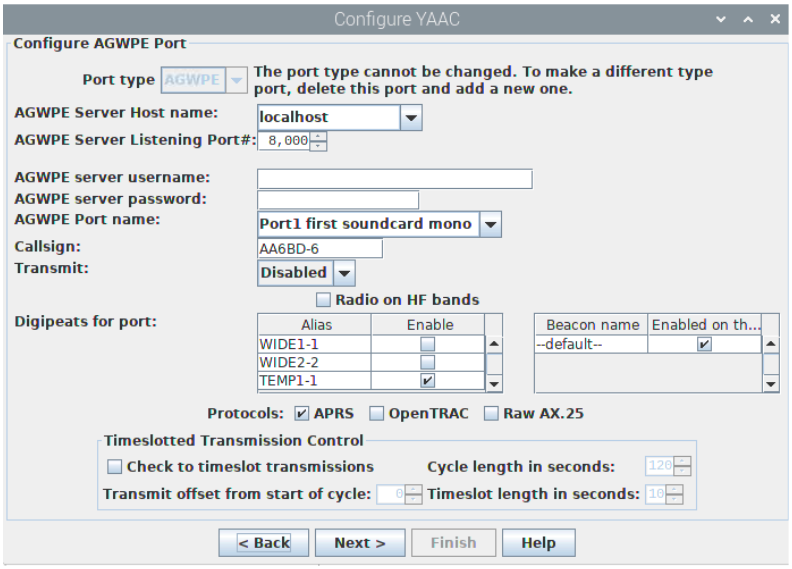


a. I suggest you add an APRS-IS Connection (connects you to the Internet database of APRS messages in your area). Click “Add APRS-IS Connection.



To get your APRS-IS password, browse to https://apps.magicbug.co.uk/passcode/
Enter your callsign and click Get Passcode
Enter your passcode into the APRS-IS password field.
If you want to transmit your location to the APRS-IS database using the Internet, change Transmit to Enabled.
Click Next >

b. To add a radio connection using Direwolf and your DRA-30:
   i. Click Add AGWPE Port
   ii. AGWPE is the packet protocol used by Direwolf.

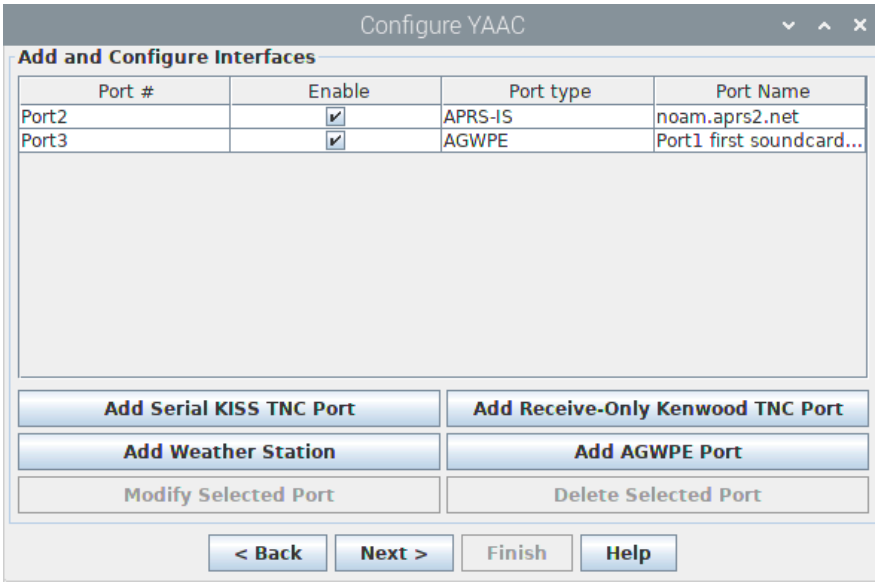


   iii. If you want to Transmit through your radio as well as receive, Change Transmit: to Enabled.
   iv. Accept the other defaults and click Next >to
   v. Tune your radio to 144.390 MHz.

vi. Since we want to transmit through the DRA-30, change your radio to digital mode. I change mine to "FM-D"

vii. This port can be used for either a DRA-30 connection or an IC-7100 connection. You must configure Direwolf PTT for the device and make sure your radio is in Data mode. If properly configured, you could connect any radio to the DRA-30 with cabling to support microphone, speaker, and PTT.

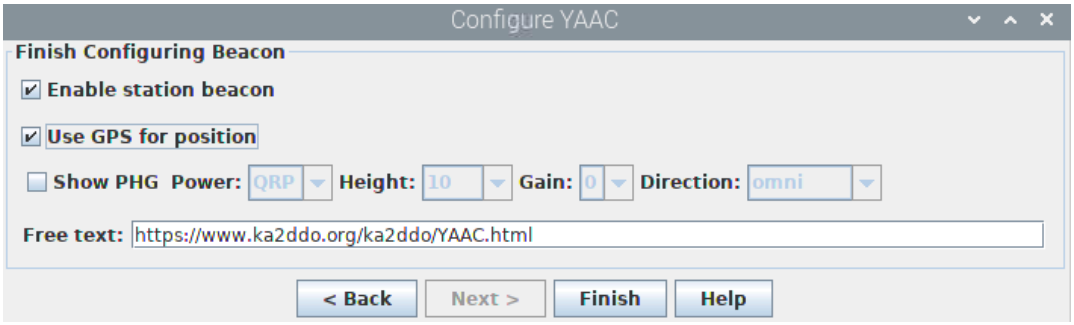
c. You have configured ports for Internet and radio.



Click Next >

2. Almost done!

If you want to transmit your position using your radio, click "Enable station beacon" and "Use GPS for Position" if you have a GPS configured. You can also choose to transmit Power / Height / gain. You might also want to change the "Free text" which is transmitted with your beacon and appears on the APRS.fi map.



Click Finish.

YAY! YAAC is now operating as an APRS client.

Click  House symbol to center the map on your current location.

Load your maps. It will take a while to load maps. Use the YAAC menu:

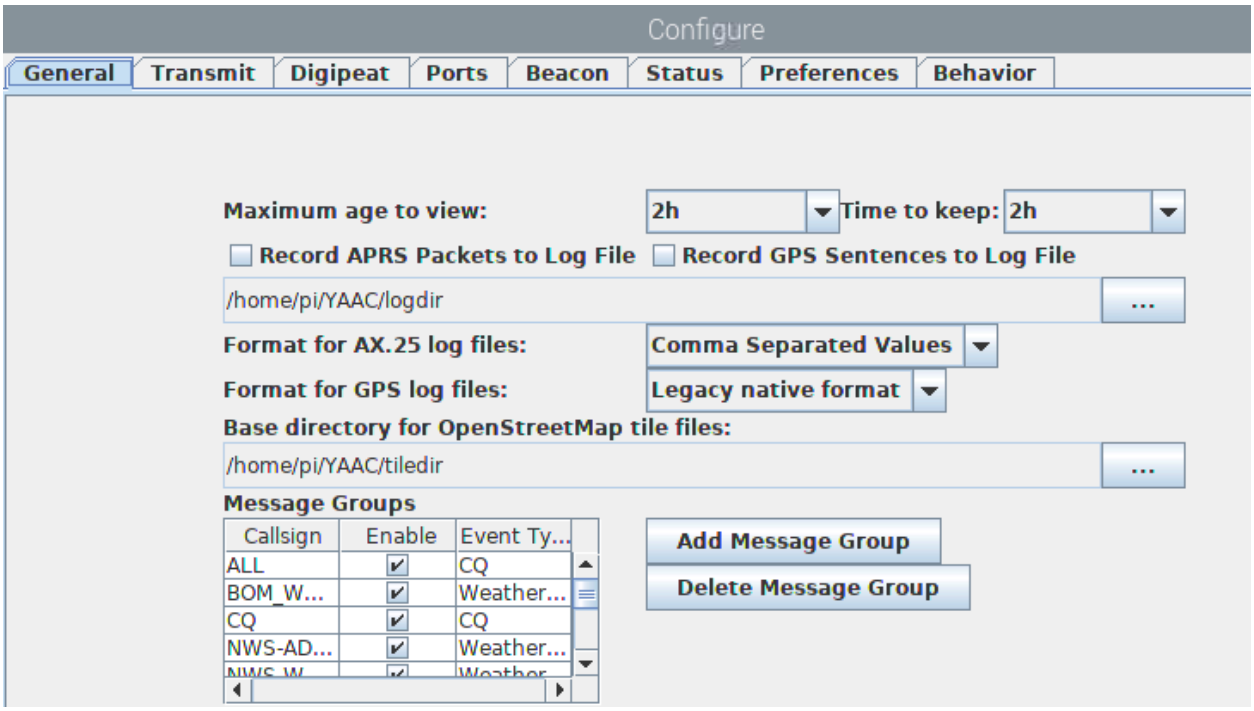
```
File > OpenStreetMap > Download preimported tiles
```

Accept the defaults.

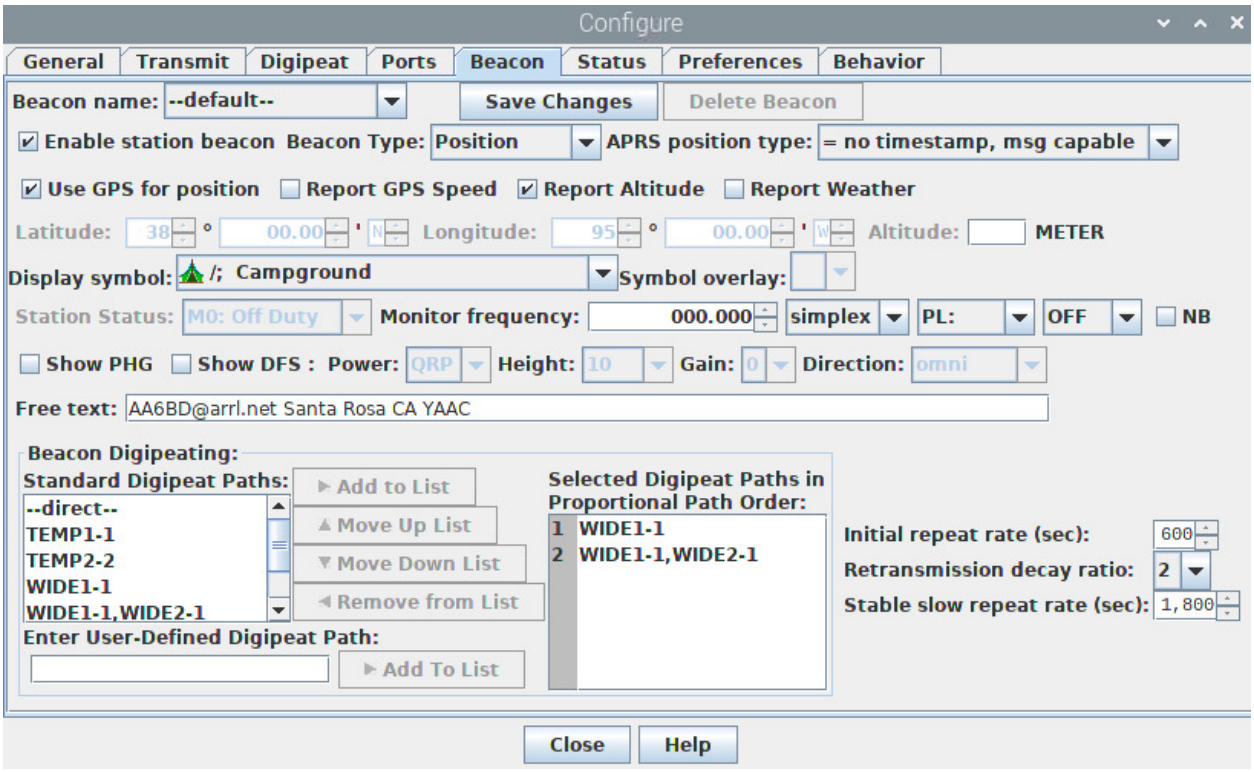
Click 

Beacon to send a beacon via RF. You can edit the Beacon setup to set an interval where it will automatically send a beacon. For fixed operation, I suggest once every 10 minutes.

To edit the configuration, select File > Configure > Expert Mode



Click the tab at the top for the section you want to change. For example, to change the beacon interval, click Beacon.



This is my Beacon configuration. You can see that I am sending my position every 600 seconds, or 10 minutes. You can see my display symbol and my free text.

(Some APRS software supports Smart Beaconing. This sends a beacon more often while you are in motion, and less often when you are stationary. For example, my Yaesu FT-1 HT provides this as does YAAC.)

After making any changes, click "Save Changes." Then click Close.

You might want to explore other tabs to see where the configuration is saved and to perhaps make other changes.

For example, if you want to see only markers that you received by radio, or by Internet, you can use Filter to make those selections.

Note that if you are actually traveling, you may need to load other map tiles for where you expect to be.

DISPLAYING APRS INFORMATION

The APRS-IS database is available for you to use. The best interface that I have found is

https://aprs.fi/

It will try to determine your location and display a map centered on it. You can select many views of APRS data. This website will show not only APRS beacons but also a track of where the beacon was heard, enabling you to see the path a vehicle took.

DIGIPEATERS

The use of digipeater paths is not obvious. Your "path" controls how your beacon signal is repeated by digipeaters. See the Powerpoint presentation or YouTube video listed in the Appendix below for details.

Digipeaters are used to repeat your over-the-air transmission so that other RF devices can hear it. You don't need to repeat beyond what is needed to reach an I-gate, or Internet Gateway which will send the transmission to the Internet database.

Recommended for mobile or home use: WIDE2-2 or WIDE1-1, WIDE2-1

- WIDE2-2 means repeat twice, and still two to go. Each repeat reduces the second digit by 1. Repeating stops when the second digit goes to 0.
- We don't want to repeat too much as it overwhelms the system, no more than 60 stations in your area.

THE ALOHA CIRCLE

- This shows the maximum distance your station can safely transmit directly over RF without saturating the RF channel (i.e., reaching too many digipeaters). You should be able to communicate effectively if your packets don't go beyond this circle. It indicates how many hops may be necessary for your message to reach an I-Gate. It is a yellow circle shown on the YAAC display. It will appear after a while and change as the stations come and go.
- APRS is meant to be a short distance transmission so it is important to NOT repeat more than needed.

MESSAGES

You can use APRS to send a message to another APRS station. Even though the message is transmitted over RF, other stations will ignore it if it is not directed to them. Use the menu Message > Station.

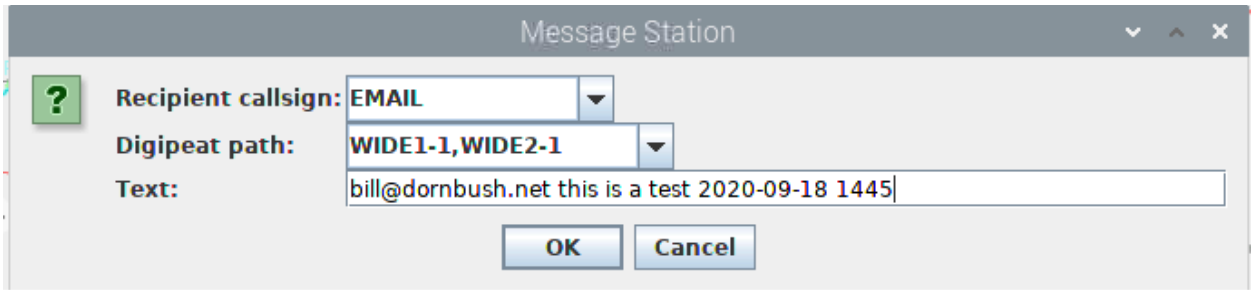
APRS message system is extensive.

As an example, there is an APRS Thursday Weekly Net where stations send a message and then receive messages from other stations. They use the "HOTG" group on the Announcements Server "ANSRVR" See https://aprsph.net/aprsthursday/ for more details.

Another example is APRSPH Net. (https://aprsph.net/) APRSPH is a network of licensed amateur radio operators who share messages and position packets through radio and internet. It can be used for daily routine messages, and it can also be used for off-grid text-based communications during emergencies.

EMAIL

This provides an APRS – Email gateway that allows sending SHORT emails via radio. Use the menu Message > Station. Select the recipient call sign of EMAIL. Type the text starting with the email address then a SHORT message. Click OK.



WHAT CAN WE DO WITH APRS

- Share position (can be set with "ambiguity" if you prefer location privacy);
- Share telemetry (device health, battery status, etc.);
- Share weather information using telemetry;
- Create APRS Objects to show location information on an aprs.fi map;
- Short one-to-one messages;
- Bulletins sent to everyone within range and also posted on aprs.fi;
- Group messages (CQ, ALL) shared to those within simplex and local digipeater range (can also be i-gated);
- Group messages and APRS net via APRSPH — it supports local RF group messaging supported by internet connectivity when available.
- Group messages via ANSRVR (announcement server on the internet);
- Cellular SMS via SMS gateway;
- Email via Winlink link WLNK-1

OTHER USES

Here is something unusual you can do with your Raspberry Pi and APRS: Use APRS to send a message from one radio to another and use that message to control another radio, such as turn it on and off. Check this out:
https://www.youtube.com/watch?v=F8EmZNcbKT0

WHAT'S NEXT

After reviewing this information, decide what capabilities you want to implement in a Raspberry Pi. For example, I use them for:

- My LED Christmas Tree (not ham radio, but fun)
- Winlink through DRA-30 and (IC-7100 or FTM-300)
- WSPR transmitter to test where my antenna reaches through TAPR WWOT on 40M and 20M
- MMDVM hotspot for YSF
- LinBPQ/PiGate RMS for 2M Winlink Gateway
- In progress: Allstar node

- In progress: packet nodes using NanoTNC

Other possibilities:

- fldigi and NBEMS
- exploring data digital modes, using Pi as a platform but not limiting it to Pi
- Winlink on Windows
- APRS on APRS-capable radios such as Yaesu FTM-300D.
- Building an APRS Tracker
- Building an APRS digipeater
- Building an MMDVM hotspot using a Pi Zero
- Exploring digital voice modes and gateways

APPENDIX

RESOURCES FOR APRS
http://www.aprs.org/ provides extensive information about APRS and its many uses.

Introduction to APRS - https://www.youtube.com/watch?v=xQFSmINZqCY
APRS: SSIDs, Paths, and Beacons - https://www.youtube.com/watch?v=xQFSmINZqCY
Another introduction: https://n2rac.com/introduction-to-aprs-ddd4097a0dba

KM4ACK has recorded videos on many features of APRS. He provides one on how to build a portable APRS Digipeater using a Pi Zero 2 that he often uses at events and camping where the extra reach of his digipeater is needed. This would be a good use of a Raspberry Pi dedicated to this purpose.

There are many videos on different aspects of APRS.

APRS SSID Specification

-0 Your primary station usually fixed and message capable
-1 generic additional station, digi, mobile, wx, etc
-2 generic additional station, digi, mobile, wx, etc
-3 generic additional station, digi, mobile, wx, etc
-4 generic additional station, digi, mobile, wx, etc
-5 Other networks (Dstar, Iphones, Androids, Blackberry's etc)
-6 Special activity, Satellite ops, camping or 6 meters, etc
-7 walkie talkies, HT's or other human portable
-8 boats, sailboats, RV's or second main mobile
-9 Primary Mobile (usually message capable)
-10 internet, Igates, echolink, winlink, AVRS, APRN, etc
-11 balloons, aircraft, spacecraft, etc
-12 APRStt, DTMF, RFID, devices, one-way trackers*, etc
-13 Weather stations
-14 Truckers or generally full time drivers

-15 generic additional station, digi, mobile, wx, etc

WHAT IS A TNC AND PACKET RADIO

Brief Description of Amateur Packet Radio – from TAPR's TNC Manual

> "Communication via Amateur packet radio involves the transmission of digital data by means of radio, making use of typical ham transceivers . Unlike ordinary RTTY or ASCII, the data does not pass directly from the source to the radio or vice—versa. Instead, it is routed through a terminal node controller, where the special characteristics of this mode are implemented. TAPR t s terminal node controller is a microprocessor based device which is connected to a source of digital data via its RS—232C serial data port, and to an ordinary Amateur radio transceiver via its radio port. Thus, it stands between the digital device and the radio.
>
> Usually the TNC will be connected to a data terminal or computer via the data port, and all commands to the TNC as well as data to be transmitted will come from this device. The TNC handles all the chores involved in actually sending and receiving the data, including packaging the data into bursts called packets or frames, keying and modulating the transmitter, and listening for and demodulating packets from the receiver.
>
> In fact, the TNC does many tasks associated with maintaining the data channel, such as checking the integrity of packets received, and acting as a relay station when so requested by other users of the channel. All of these functions are handled completely automatically by the software and hardware of the TNC. The user need only be concerned with producing and making use of the digital data, leaving the multitude of communications tasks to the TNC."

Today, we implement all of the TNC functionality in software, in the Direwolf program.