Where's Andy?

RaspberryPi Mobile APRS Project
(RMAP)

A Pragmatic Mobile Radio Positioning Solution

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This is Andy!

The Goal

Overlanding is a great way to experience the outdoors and to brush up on self reliance skills. One often overlooked aspect of these adventures is having the ability to share position data once the convenience of the last cell tower has faded into the past. This is the driving force behind the RMAP project, to create a practical and highly portable radio-based positioning solution that renders station information to an interactive map.

Everything we'll need is pictured here...
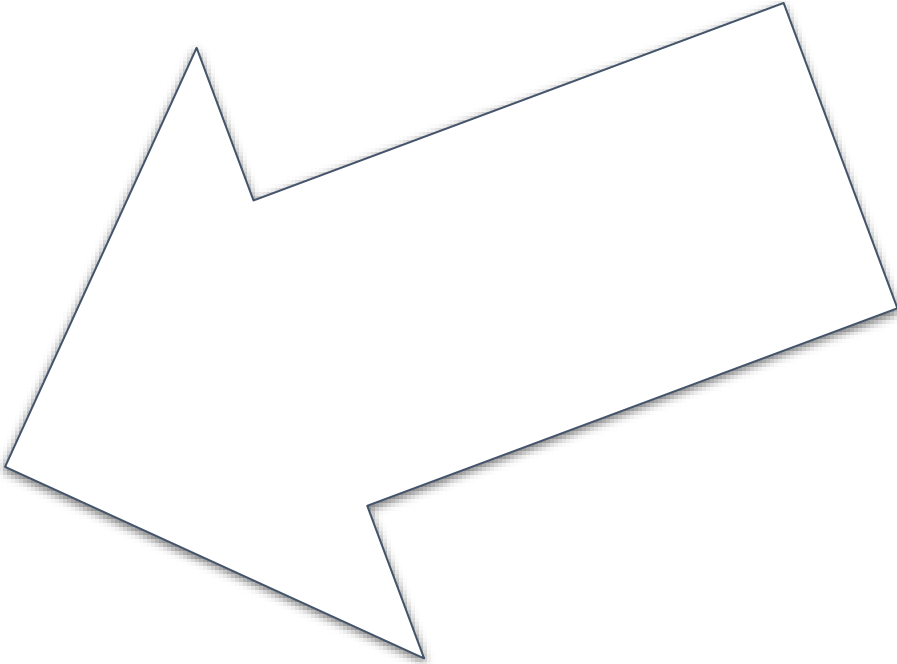
Credit goes to the great work KM4ACK and DL1GKK (and many other Hams) have done providing the source material for this project.

This presentation demonstrates how to configure a Raspberry Pi 4 as a terminal node connector controlling an IC-705 transceiver, but any of the hundreds of radios supported in the HamLib application's library will work - just pay attention to the state of a rig's testing status - for example stable vs. beta.
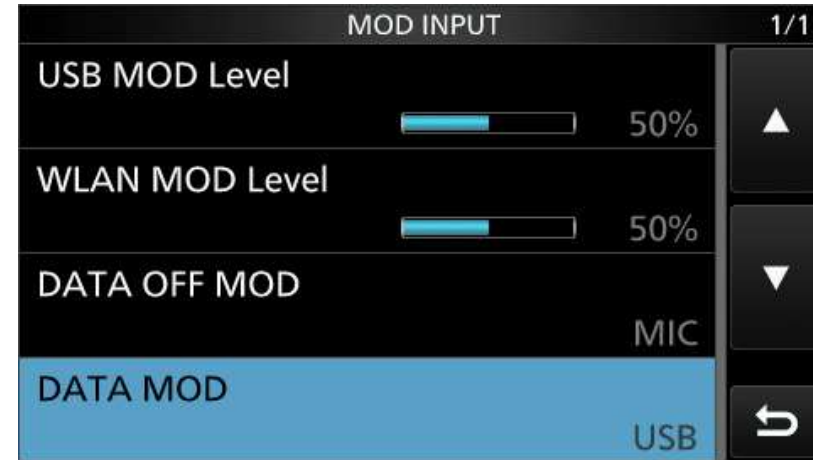
RMAP System Components
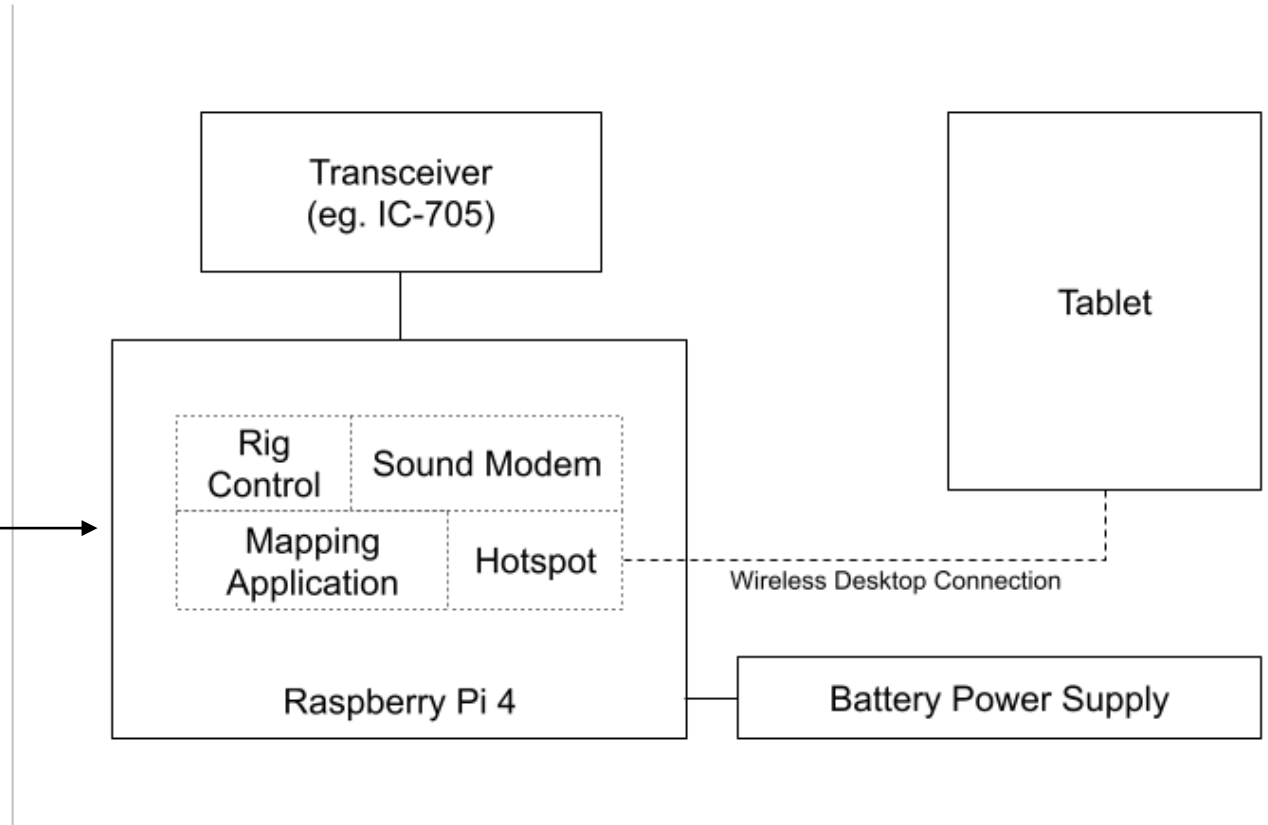
Preparation

```
sudo apt-get update
sudo apt-get upgrade
```
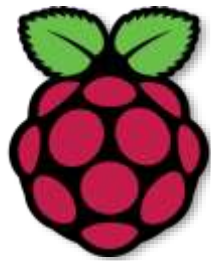

[Step by Step Guide](#)


What Serial Port Should We Use?

```
ls -l /dev/serial/by-id
```

ttyACM0 in this case is an IC-705 serial A port and what we'll configure in the terminal node connector (TNC) software later on.

ttyACM1 is the serial B port, and on the 705 is used to send GPS coordinate data. If you're using a GPS dongle or some other device, you just need to use its identifier.

```
lrwxrwxrwx 1 root root 13 Jan 20 16:03 usb-Icom_Inc._IC-705_IC-705_12006024-if00 -> ../../ttyACM0
lrwxrwxrwx 1 root root 13 Jan 20 16:03 usb-Icom_Inc._IC-705_IC-705_12006024-if02 -> ../../ttyACM1
```

Setup GPS on ttyACM1...
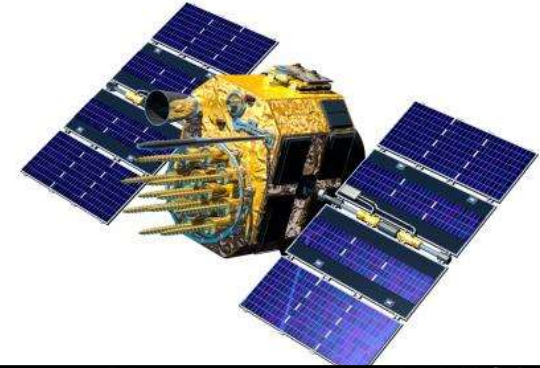
```
GNU nano 5.4                                          /etc/default/gpsd
# Devices gpsd should collect to at boot time.
# They need to be read/writeable, either by user gpsd or the group dialout.
DEVICES="/dev/ttyACM1"

# Other options you want to pass to gpsd
GPSD_OPTIONS="-n"

# Automatically hot add/remove USB GPS devices via gpsdctl
USBAUTO="true"

START_DAEMON="true"
```

To confirm things are working you can use the following commands...

```
# check that gpsd and chronyd are active
systemctl is-active gpsd
# if not try: sudo systemctl restart gpsd
systemctl is-active chronyd
# if not try: sudo systemctl restart chronyd

# you can check the status
sudo systemctl status gpsd

# show raw gps data
gpsmon -n
cgps
Xgps
```

```
                                                    ─Seen 12/Used  5─
Time:           2023-01-27T23:44:56.000Z (0)  GNSS  PRN  Elev   Azim   SNR Use
Latitude:                                     GP  6    6  28.0  151.0  14.0  Y
Longitude:                                    GP 14   14  29.0   93.0  22.0  Y
Alt (HAE, MSL):      -62.664,      -5.577 ft  GP 17   17  58.0   60.0  10.0  Y
Speed:               0.99 mph                 GP 19   19  79.0  171.0  26.0  Y
Track (true, var):    37.2,   15.5     deg    GP 24   24  48.0  292.0  26.0  Y
Climb:               0.00 ft/min              GP  1    1  15.0   34.0  12.0  N
Status:              3D FIX (23 secs)         GP  3    3   0.0   67.0   0.0  N
Long Err  (XDOP, EPX):  1.02, +/- 50.0 ft     GP 11   11   1.0  177.0   0.0  N
Lat Err   (YDOP, EPY):  1.36, +/- 67.0 ft     GP 12   12  15.0  279.0   0.0  N
Alt Err   (VDOP, EPV):  2.90, +/-  218 ft     GP 13   13  12.0  208.0  22.0  N
2D Err    (HDOP, CEP):  1.70, +/-  105 ft     GP 15   15  12.0  237.0   0.0  N
3D Err    (PDOP, SEP):  3.30, +/-  205 ft     GP 30   30   2.0  146.0   0.0  N
Time Err  (TDOP):       2.17
Geo Err   (GDOP):       3.91
Speed Err (EPS):      +/- 91.3 mph
Track Err (EPD):        n/a
Time offset:          0.117425051 s
Grid Square:
```

Controlling Your Rig (Install HamLib)

`rigctl -l`


```
3060  Icom        IC-7600      20210507.1
3061  Icom        IC-7200      20210507.0
3062  Icom        IC-7700      20210507.0
3063  Icom        IC-7600      20210507.0
3064  Ten-Tec     Delta II     20210507.0
3065  Icom        IC-92D       20210507.0
3066  Icom        IC-R9500     20210507.0
3067  Icom        IC-7410      20210507.0
3068  Icom        IC-9100      20210507.0
3069  Icom        IC-RX7       20210507.0
3070  Icom        IC-7100      20210507.1
3071  Icom        ID-5100      20210507.0
3072  Icom        IC-2730      20210507.0
3073  Icom        IC-7300      20210507.4
3074  Microtelecom Perseus     20210507.0
3075  Icom        IC-785x      20210507.1
3076  Xeigu       X108G        20210507.0
3077  Icom        IC-R6        20210507.0
3078  Icom        IC-7610      20210507.2
3079  Icom        IC-R8600     20210507.0
3080  Icom        IC-R30       20210507.0
3081  Icom        IC-9700      20210507.3
3082  Icom        ID-4100      20210507.0
3083  Icom        ID-31        20210507.0
3084  Icom        ID-51        20210507.0
3085  Icom        IC-705       20210507.2
4001  Icom        IC-PCR1000   20200323.0
4002  Icom        IC-PCR100    20200323.0
```
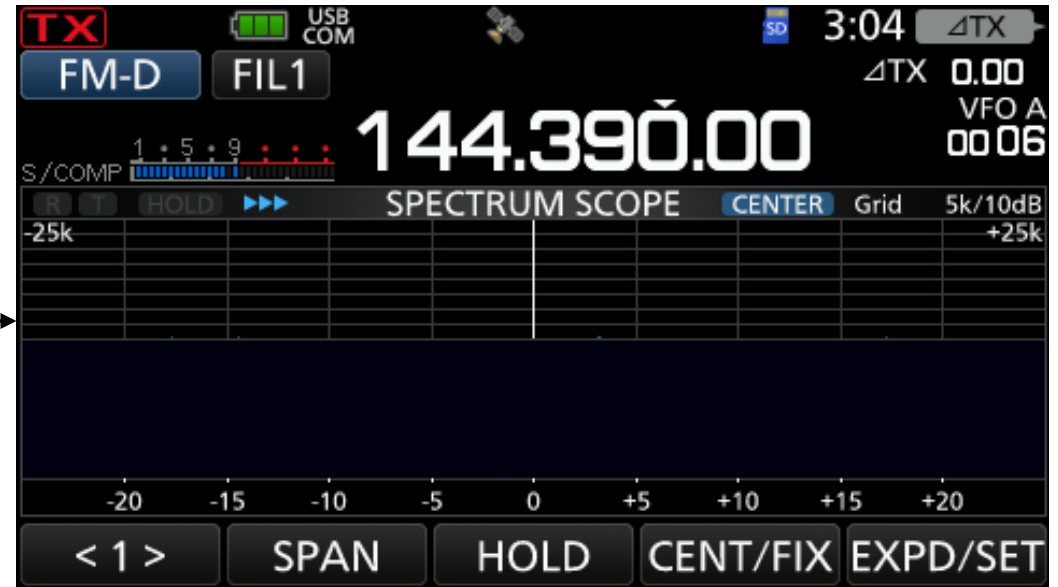
```
root@raspberrypi:~# rigctl -m 3073 -r /dev/ttyACM0 -s 115200 f
144390000
```

Setting Up DireWolf

Dire Wolf is a software "soundcard" AX.25 packet modem/TNC and APRS encoder/decoder...

ADEVICE plughw:Card,Device

ADEVICE plughw:3,0

# Choose an approach that best suits your needs...
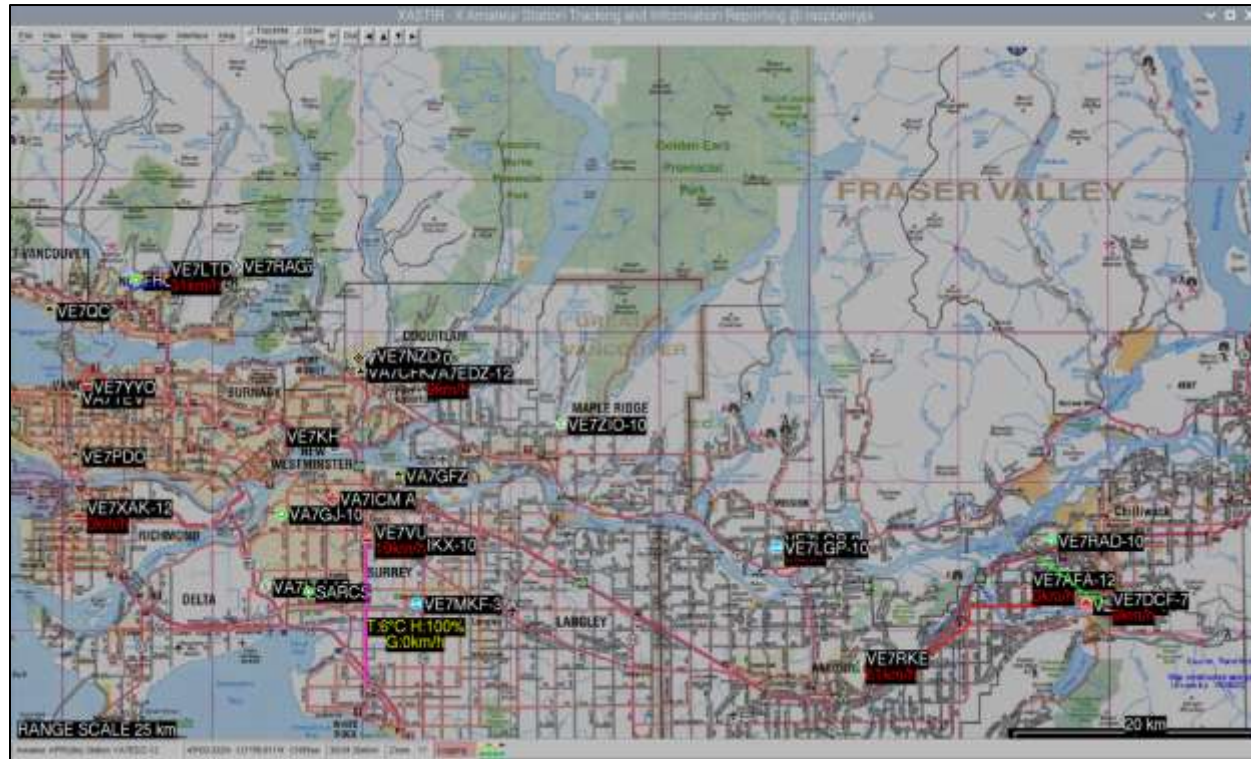
APRS Mapping Software

https://xastir.org

There are two approaches to installing the Xastir (*X Amateur Station Tracking and Information Reporting*) application. The first is the easiest but doesn't let you customize the station font size, which can be challenging on smaller tablets; the other requires building the application directly from the source code but allows you to increase the size of station call signs that appear on the map.

Xastir Setup…
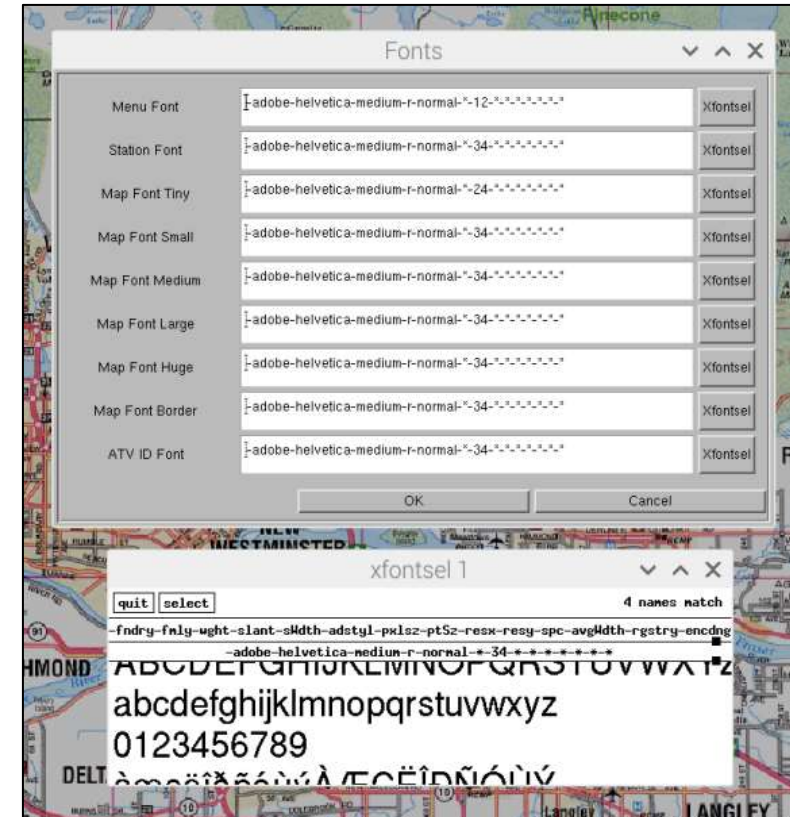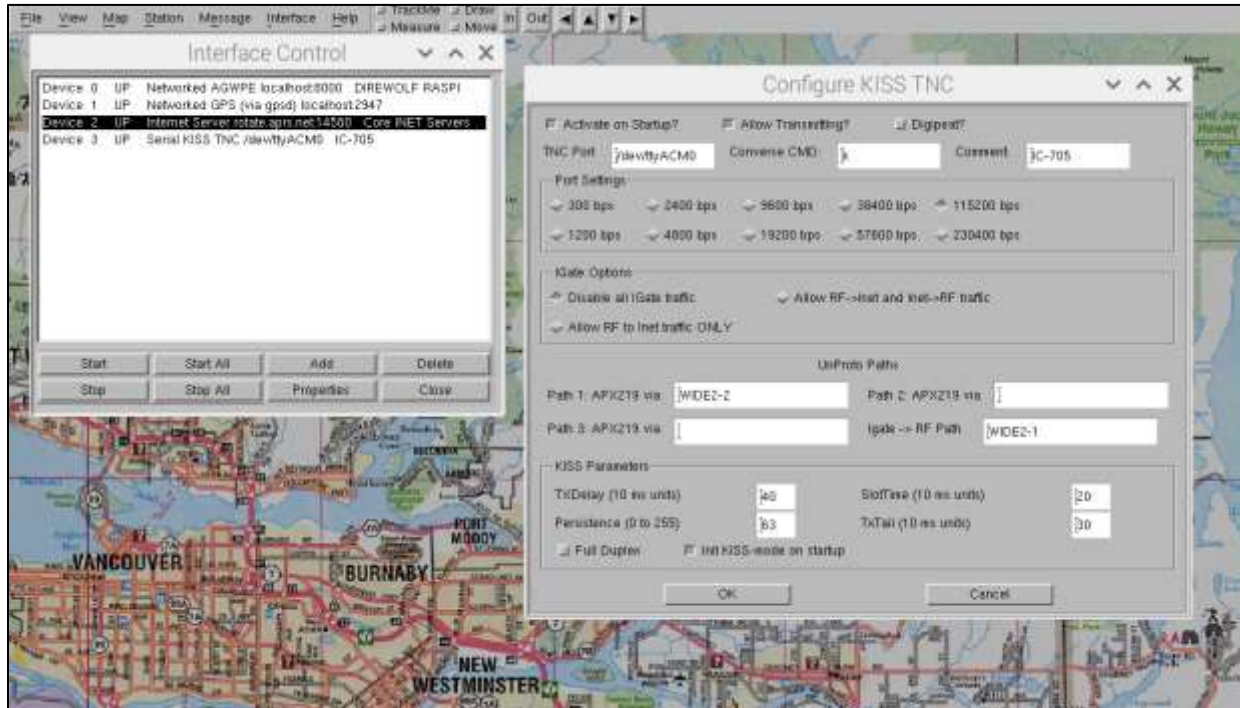
Greater Vancouver - Fraser Valley (VE7BZC), 2005

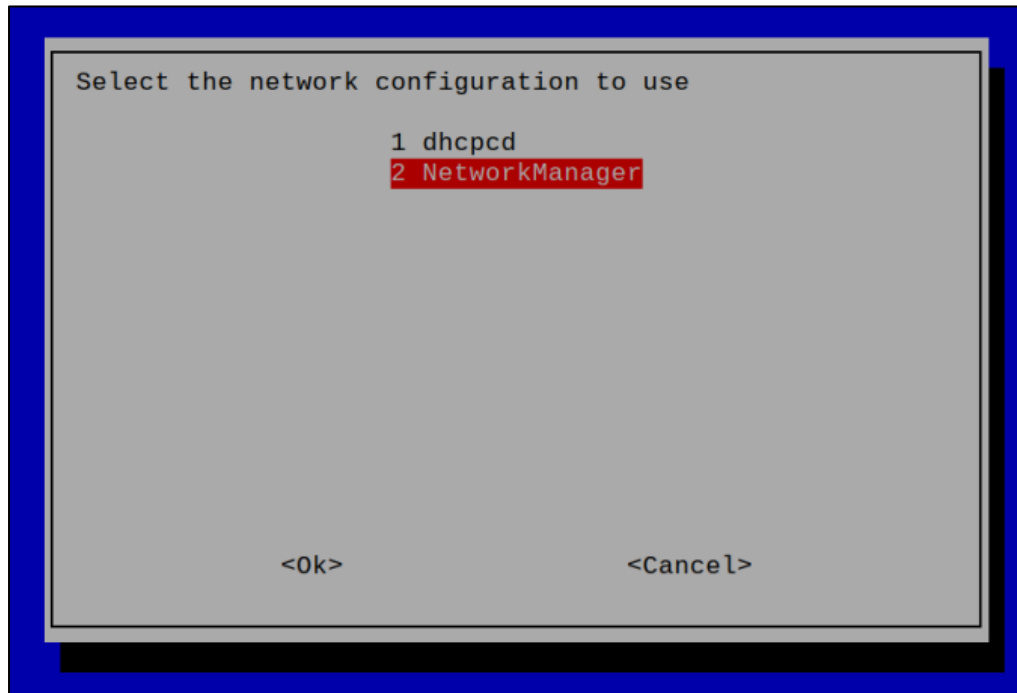**BC-GVRD-FraserValley_U.zip**, 2.79MB, (.png, .inf)
BC-GVRD-FraserValley_W.zip, 920KB, (.gif, .geo)
BC-GVRD-FraserValley_X.zip, 920KB, (.gif, .geo)

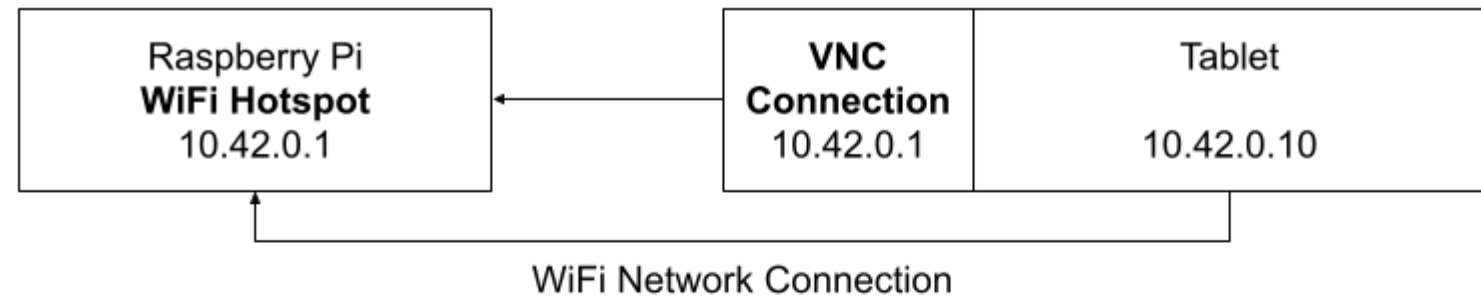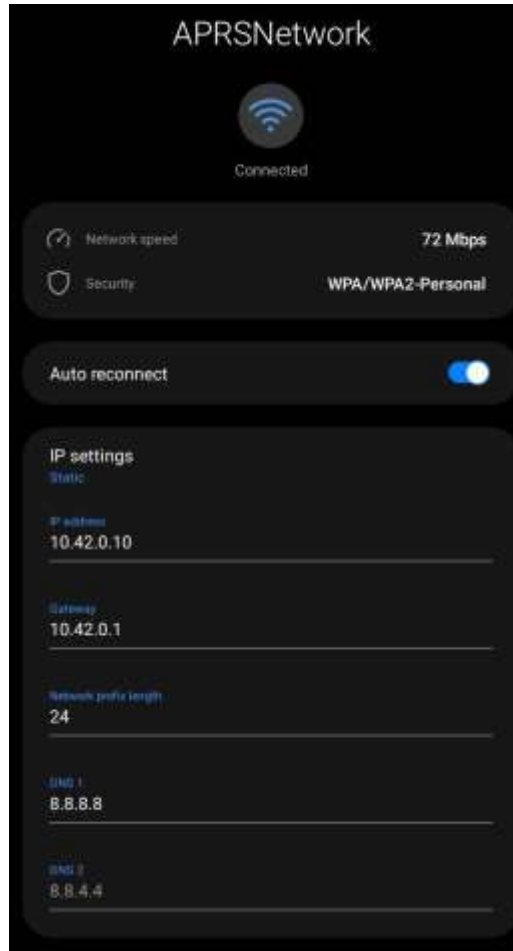**Kingston Radio Club** (Good offline BC maps)

http://www.ve3kbr.com/aprs/aprs_maps_bc.htm#province

Raspberry Pi Wi-Fi Hotspot!


```
sudo apt install network-manager
```

Configuring the Tablet…

APRSNetwork

Connected

Network speed		72 Mbps
Security		WPA/WPA2-Personal

Auto reconnect

IP settings
Static

IP address
10.42.0.10

Gateway
10.42.0.1

Network prefix length
24

DNS 1
8.8.8.8

DNS 2
8.8.4.4

Raspberry Pi **WiFi Hotspot** 10.42.0.1	**VNC Connection** 10.42.0.1	Tablet 10.42.0.10

WiFi Network Connection

Questions & Docs...

RMAP Step by step instructions (RMAP Step by step instructions.pdf)

ToDo's

- Would love to get this setup working with the ID-52A once it's supported in HamLib. The whole setup would fit in your pocket!
- The key Pi applications should auto start on boot.
- Email VA7EDZ@gmail.com if you have any other ideas!

Field Testing

1. Tablets are sensitive to the cold and below a certain temperature will stubbornly refuse to boot. Keep this in mind and plan accordingly if you need a screen to work immediately.
2. Xastir can take a few minutes to start transmitting from a cold boot. It's a good idea to enable Smart Beaconing as this will help things along. The default trigger speeds are 3 km/h (low) and 97 km/h (high). Additionally, any turn over 20 degrees will also trigger a broadcast.
3. Powering all devices over a longer period is challenging. A 12V socket splitter will solve this problem nicely.

Find your Andy!