

GQRX as a Frontend for Digital Receivers

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 <http://www.bastibl.net/>

About Me

- PhD Student @ University of Paderborn
- Distributed Embedded Systems Group
- Work on GNU Radio OOT Modules
 - WiFi, ZigBee, RDS, WeatherSonde

DF1BBL



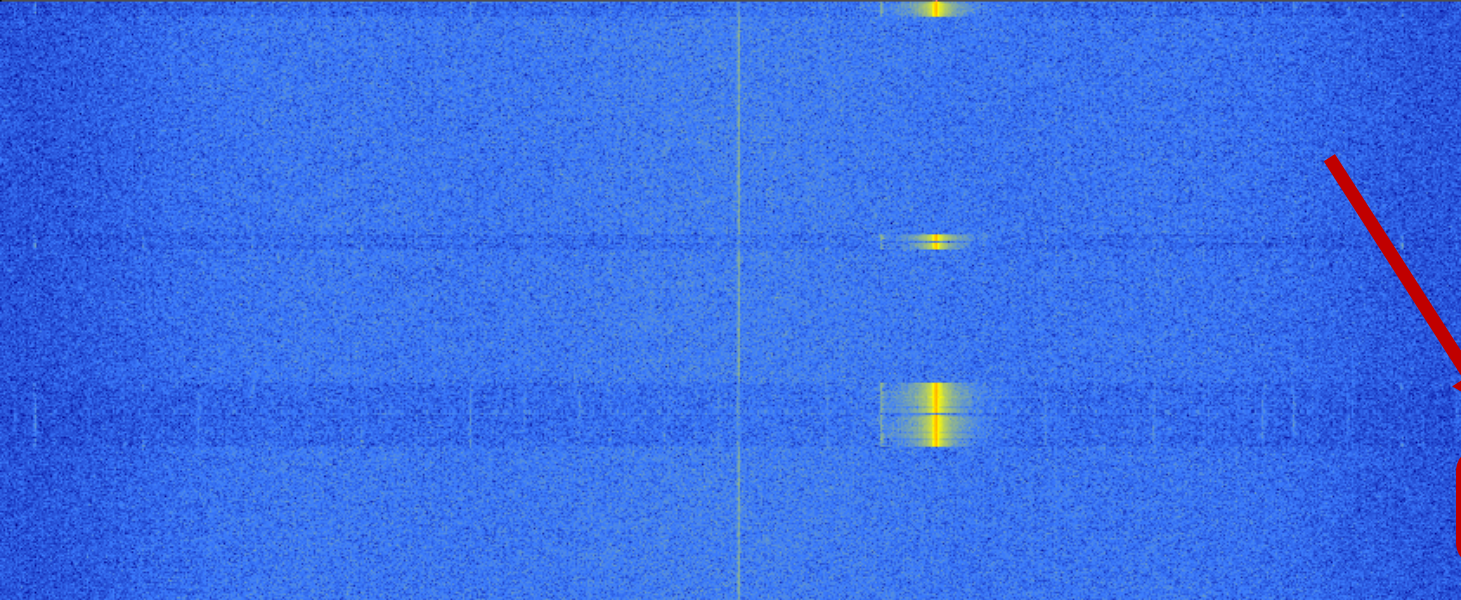
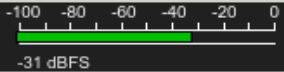


GQRX

File Tools View Help



434.401 000 MHz



Receiver Options

428.200 kHz

Hardware freq: 433.972800 MHz

Filter width Normal

Filter shape Normal

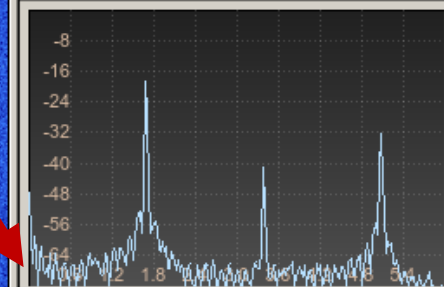
Mode AM

AGC Fast

Squelch -150.0 dBFS

NR1 NR2
Input controls Receiver Options

Audio

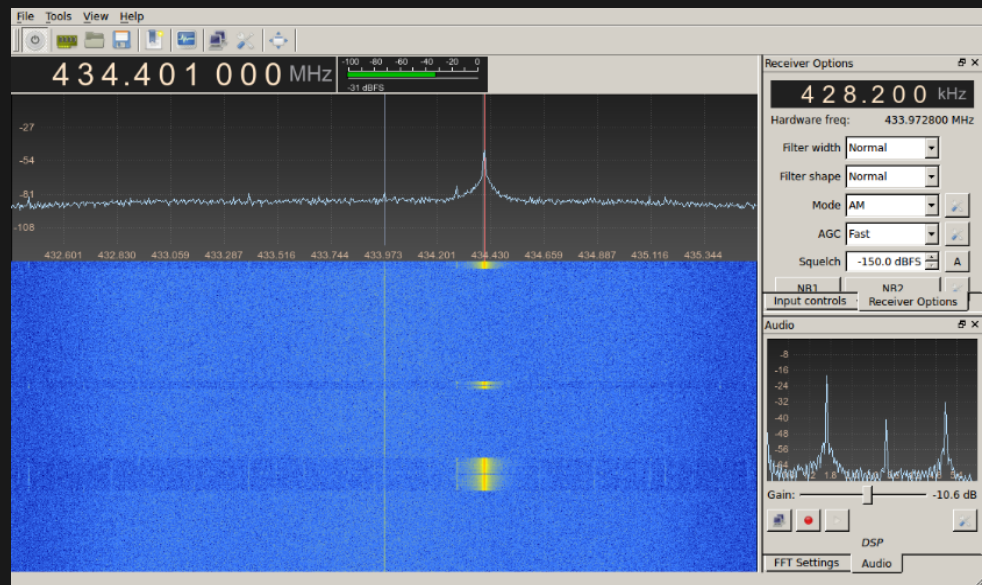


FFT Settings Audio



GQRX

- Developed by Alexandru Csete (OZ9AEC)
- Visualization
- Demodulation
- Audio-out
 - WAV files
 - Streaming



Audio-Out is Great!

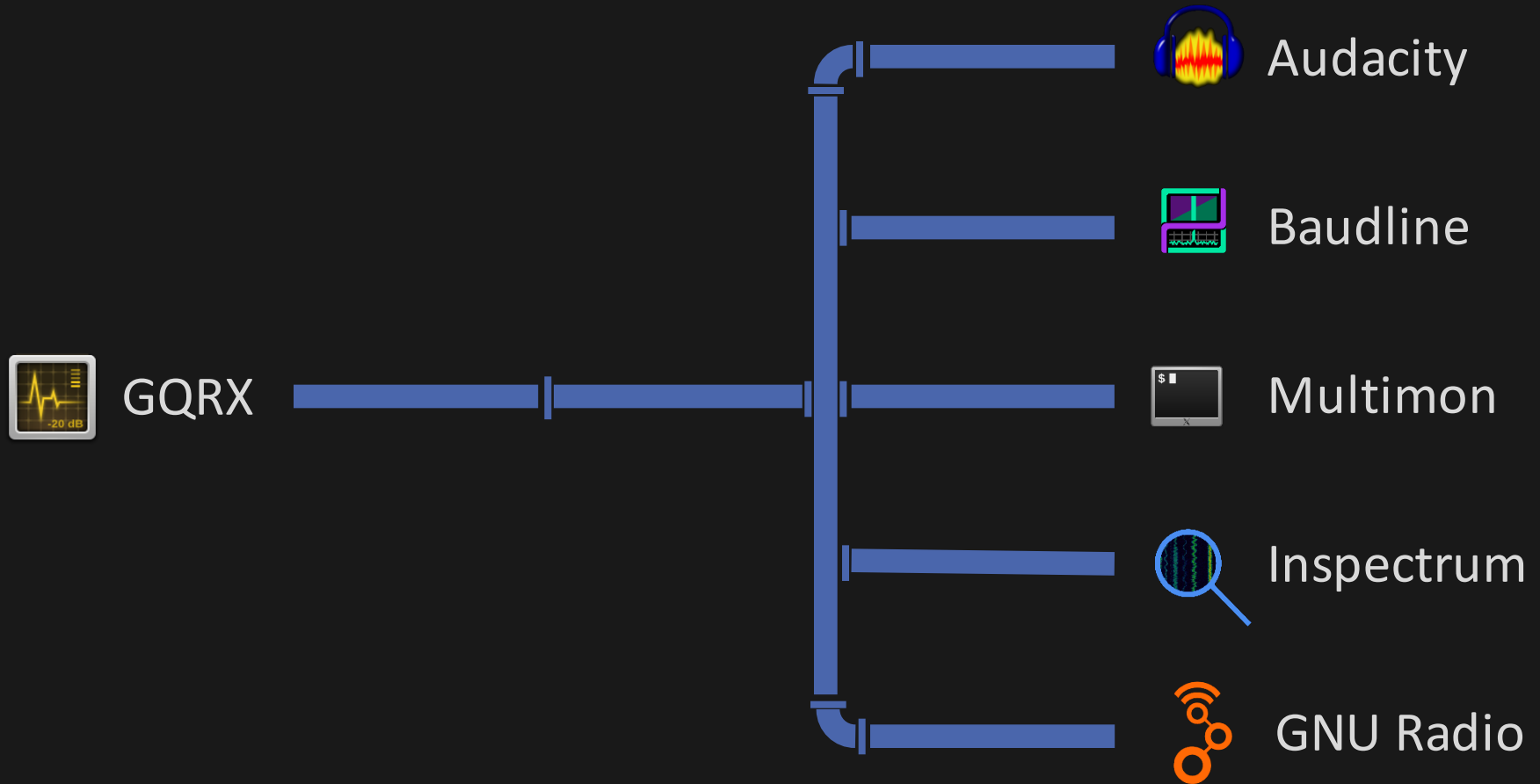
- Like a normal radio
- Unix philosophy:
 - “Do one thing and do it well”
 - “Write programs to work together.”
- No need for GQRX-digital?

Ken Thompson

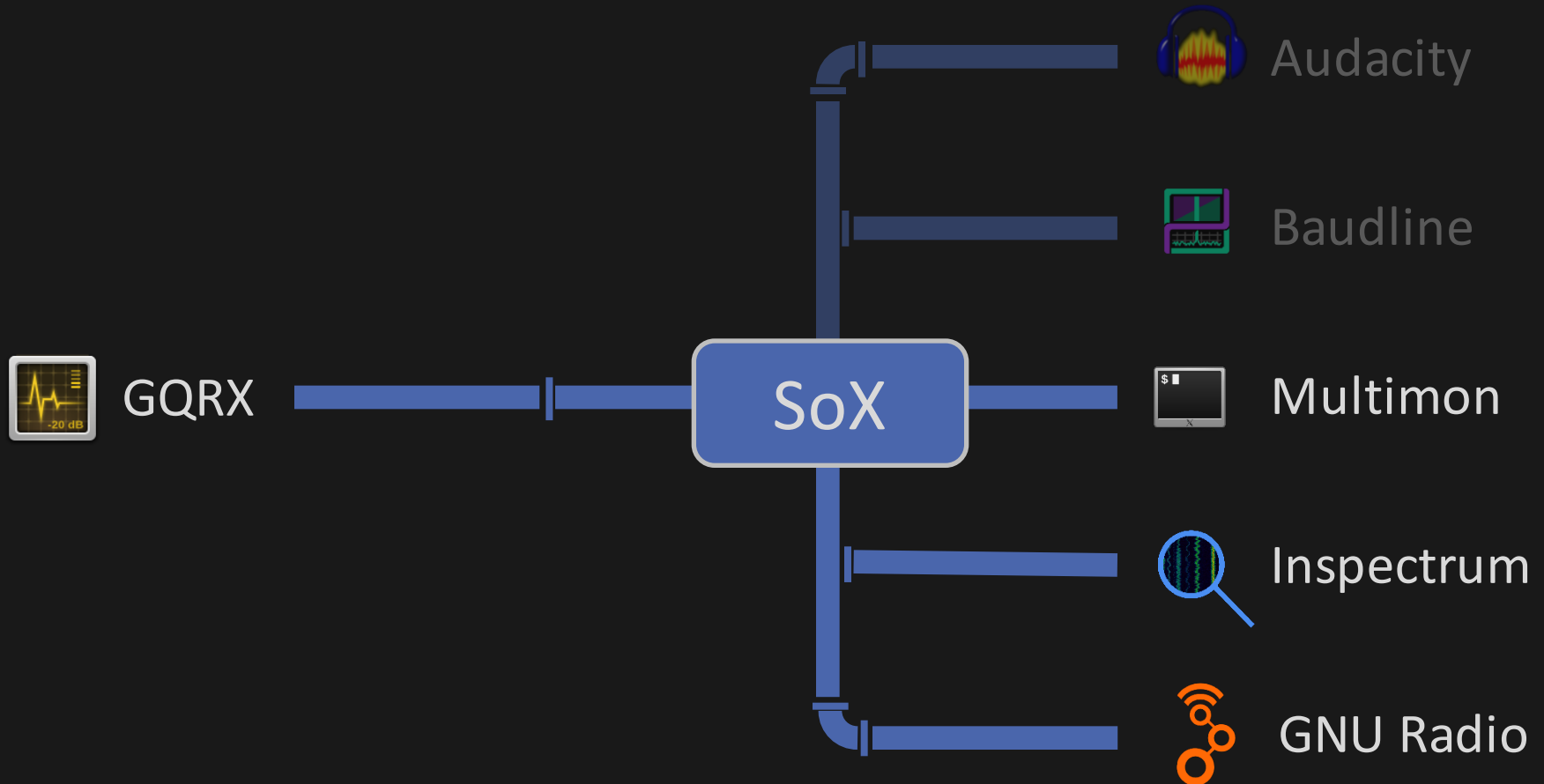


Public Domain

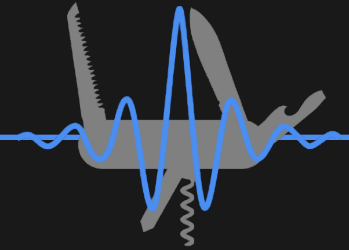
Some Plumbing



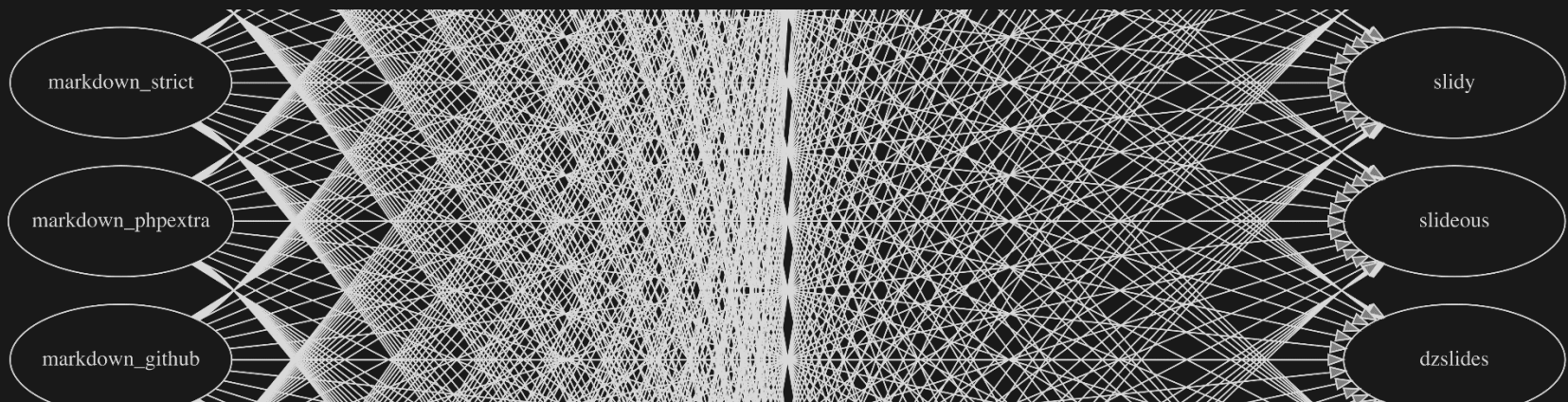
Some Plumbing



SoX



- Sound eXchange
- Command line tool for audio conversion
- Swiss Army Knife of sound processing
- Pandoc of audio



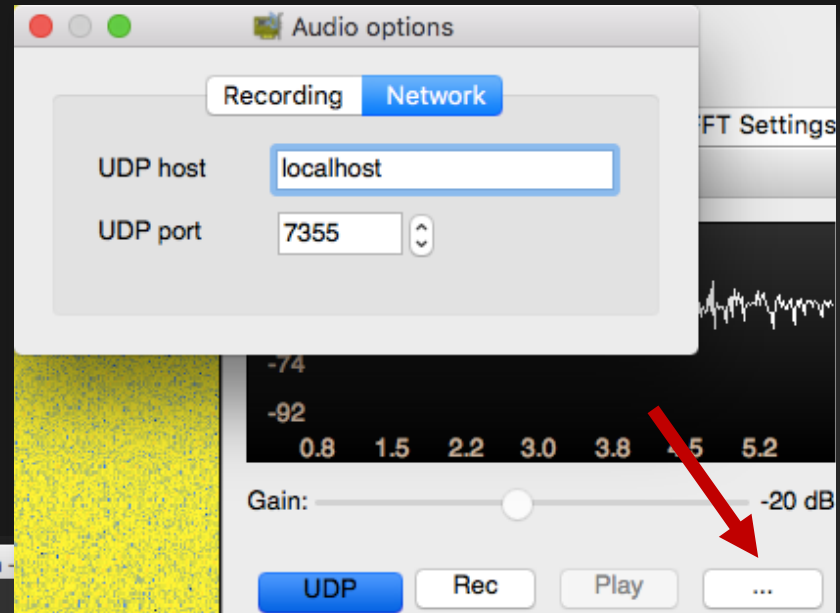
Multimon

- Command line utility
- Decoder for: POCSAG, AFSK, DTFM, ...

```
basti — basti@tronn — ~ — zsh — 113x40
$ nc -lup 7355 |
  sox -t raw -e signed-integer -b 16 -r 48000 -
    -t raw -e signed-integer -b 16 -r 22050 - |
  multimon-ng -t raw -a POCSAG2400 -f alpha -
```

Multimon

- Command line utility
- Decoder for: POCSAG, ...



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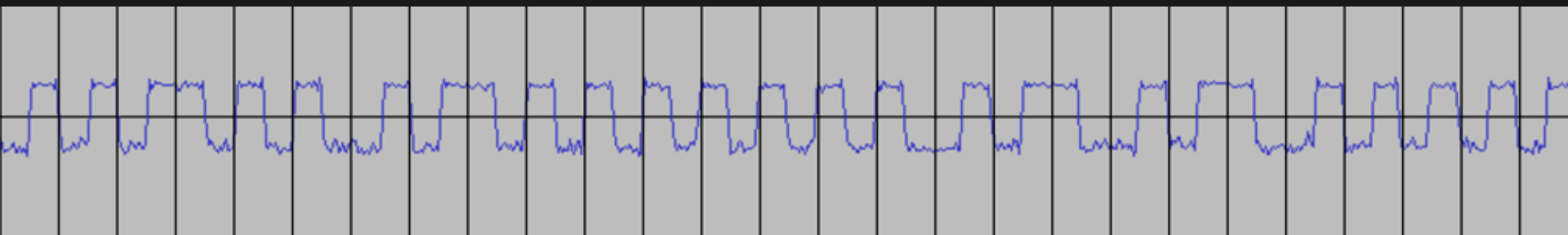
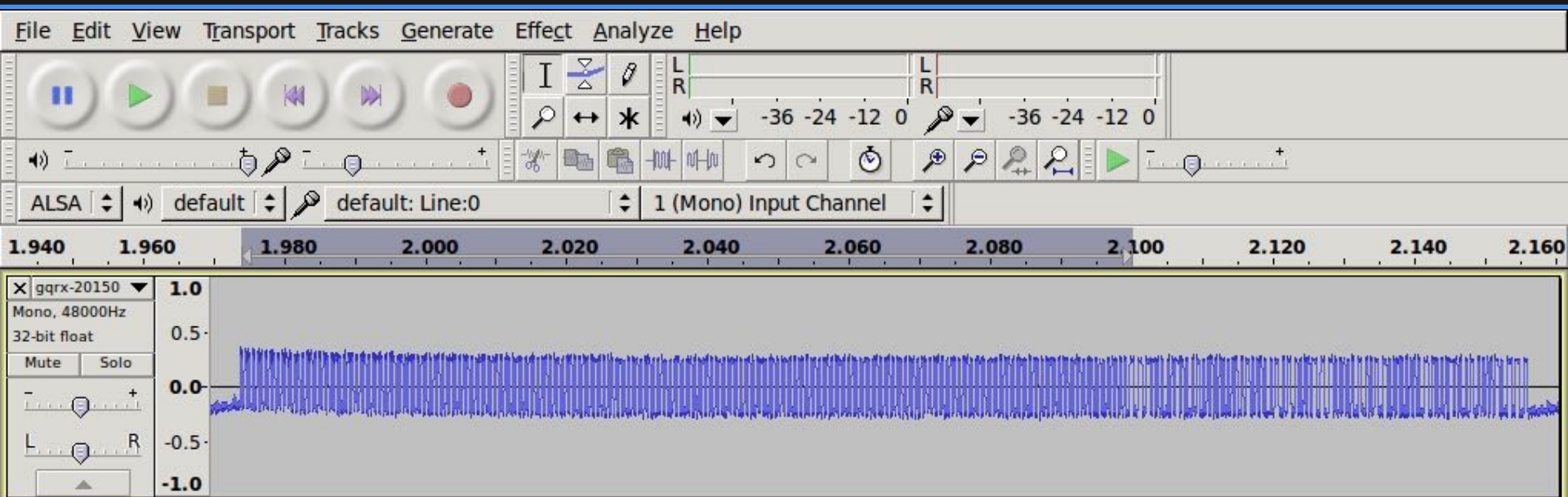
Multimon

The screenshot displays the Multimon software interface. At the top, the frequency is set to 144.792500 MHz. The main window shows a spectrum plot with a prominent peak at approximately 144.625 MHz. Below the spectrum plot is a waterfall plot showing signal activity over time. A terminal window is overlaid on the waterfall plot, displaying AFSK1200 data. The terminal output includes the following text:

```
build -- ncat -l -u -p 7355 | sox -t raw -e signed-integer -b 16 -r 48000 - -b 16 -r -- ncat
AFSK1200: fm S56LW-9 to TW4PU9-0 via OE5XTM-11,DB0FIG-0 UI pid=F0
` :w\#U>/
AFSK1200: fm DK0FN-0 to TW4PU7-0 via DB0FIG-0,WIDE2-1 UIv pid=F0
` :D\HeY\"8u}144.625MHzClubstation auf der Ham Radi=
AFSK1200: fm DK0FN-0 to TW4PU5-0 via DB0FIG-0,WIDE2-1 UIv pid=F0
` :Cl@4Y\"8L}144.625MHzClubstation auf der Ham Radi=
AFSK1200: fm DB0ZKN-0 to APNU19-0 via DB0FIG-0,WIDE2-2 UI^ pid=F0
!4739.34N100910.40E# FILL-IN Digi Konstanz JN47op, Sysop Bernd DL5BF
AFSK1200: fm DJ1SP-9 to TW3UX6-0 via DB0LC-0,WIDE1-0,DB0FIG-0 UIv pid=F0
` ?om]R>/]"8I}=
```

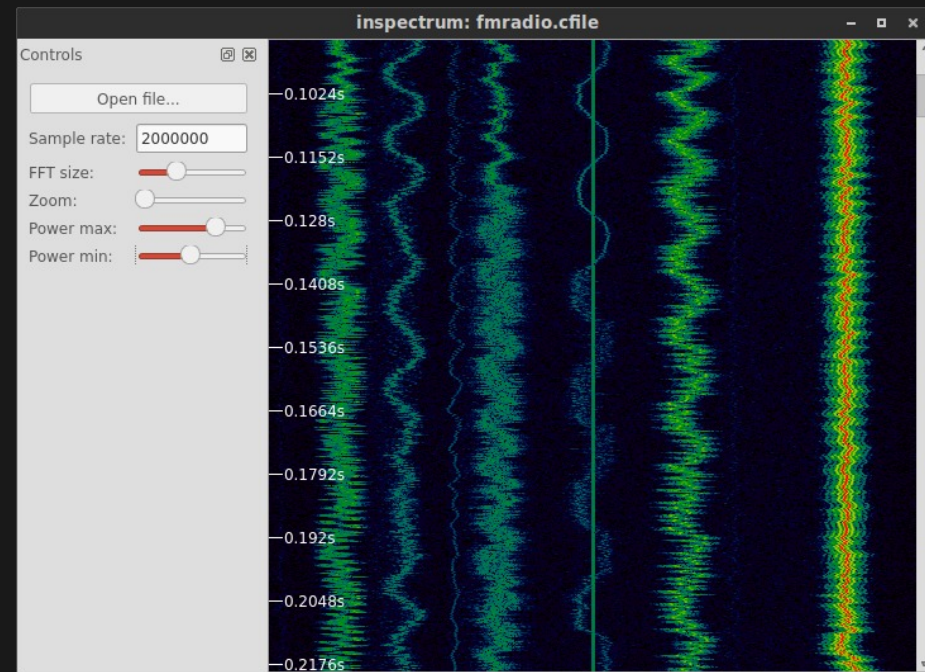
On the right side, the Receiver Options panel is visible, showing a frequency of -736.800 kHz and a hardware frequency of 145.529300 MHz. The panel includes settings for Filter width (Normal), Filter shape (Normal), Mode (Narrow FM), AGC (Fast), and Squelch (-150.0 dBFS). At the bottom right, there is a Gain control set to -20 dB and buttons for UDP, Rec, Play, and other functions.

Audacity

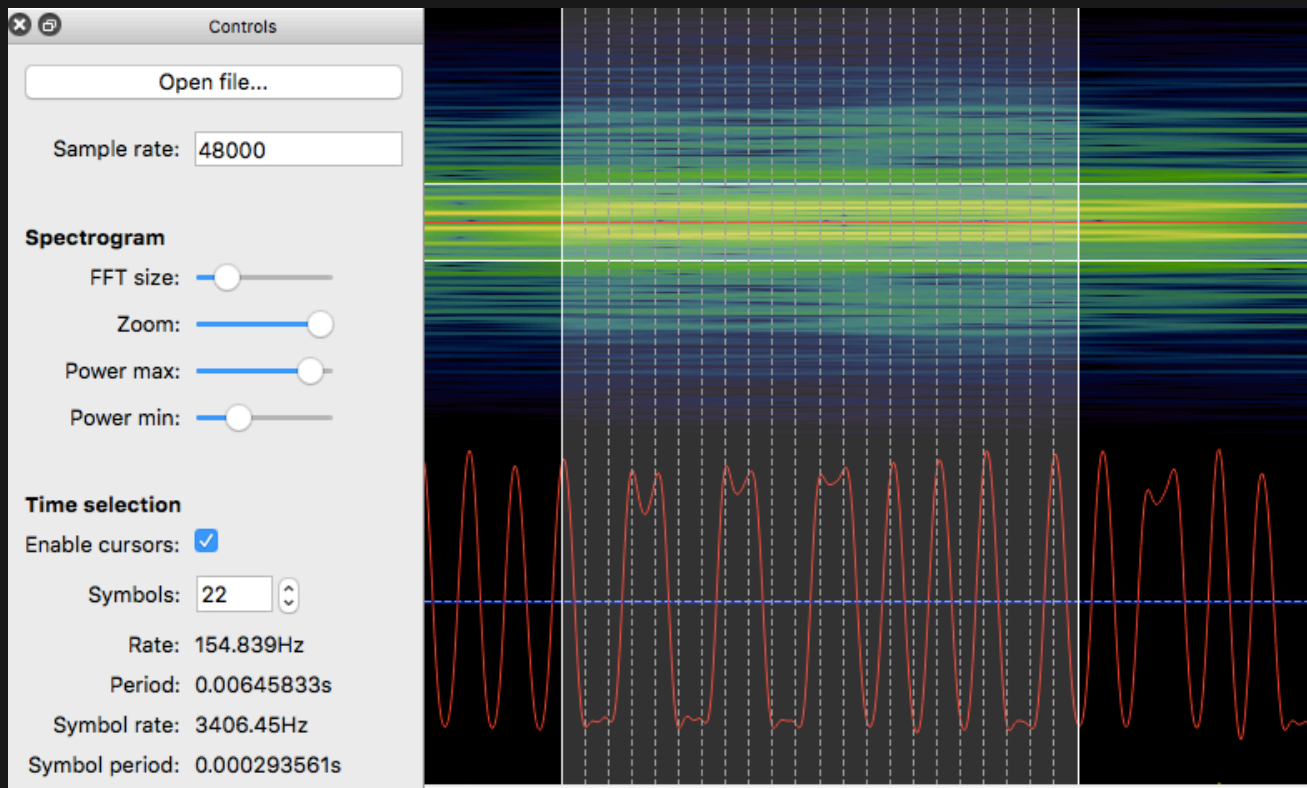
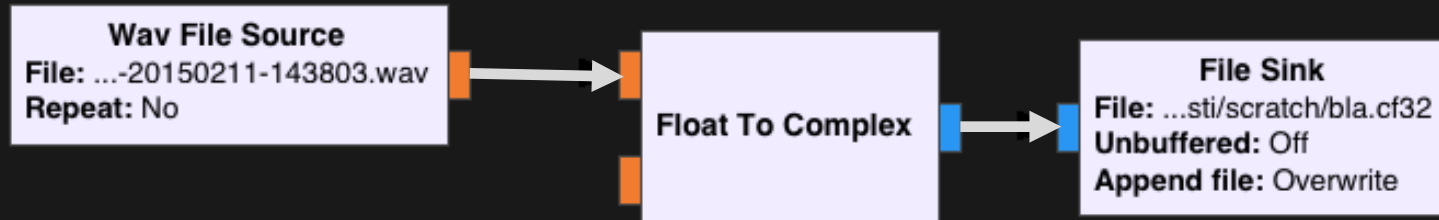


Inspectrum

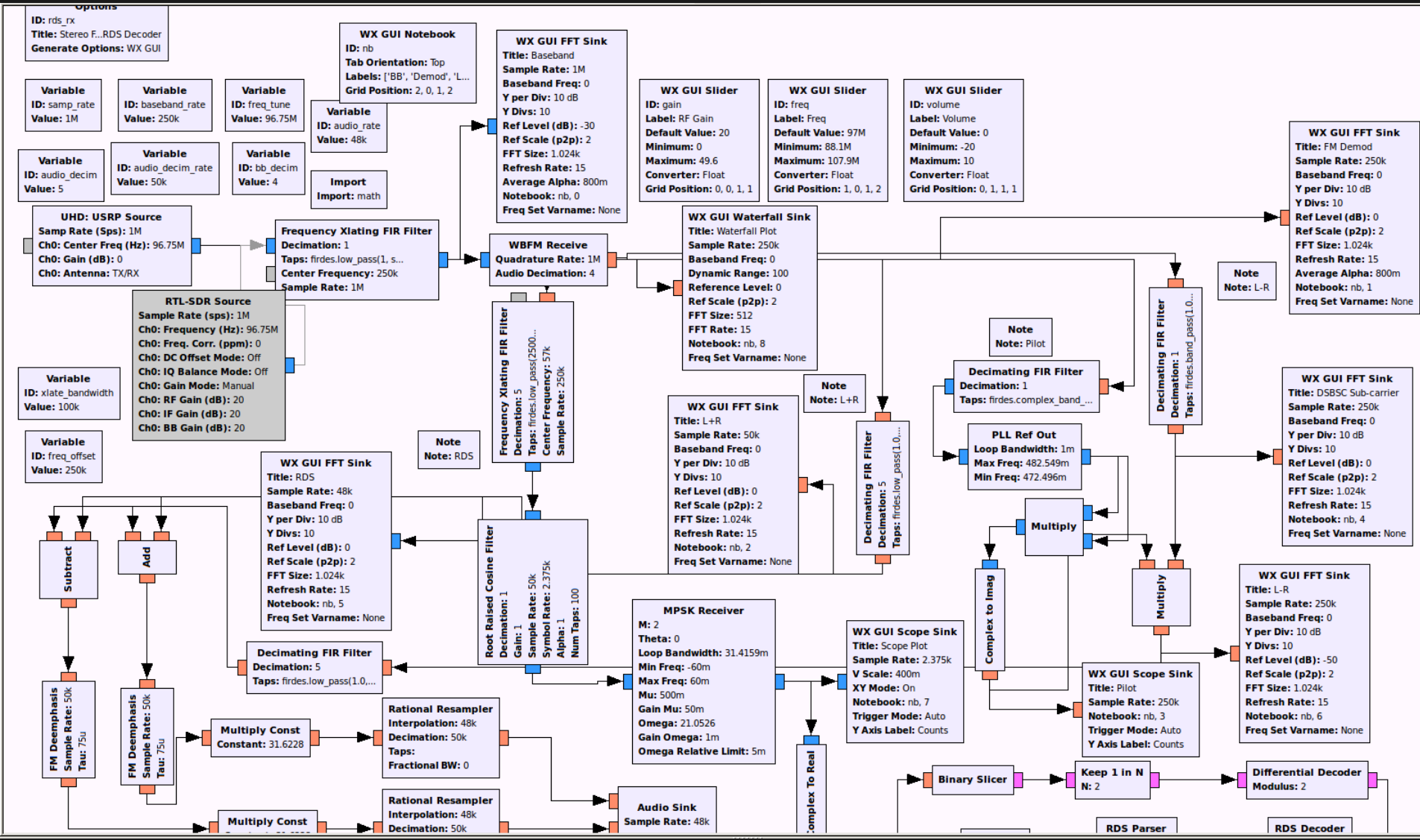
- Offline Signal Analysis
- Overlay to determine symbol rate
- See later talk



Inspectrum



GNU Radio

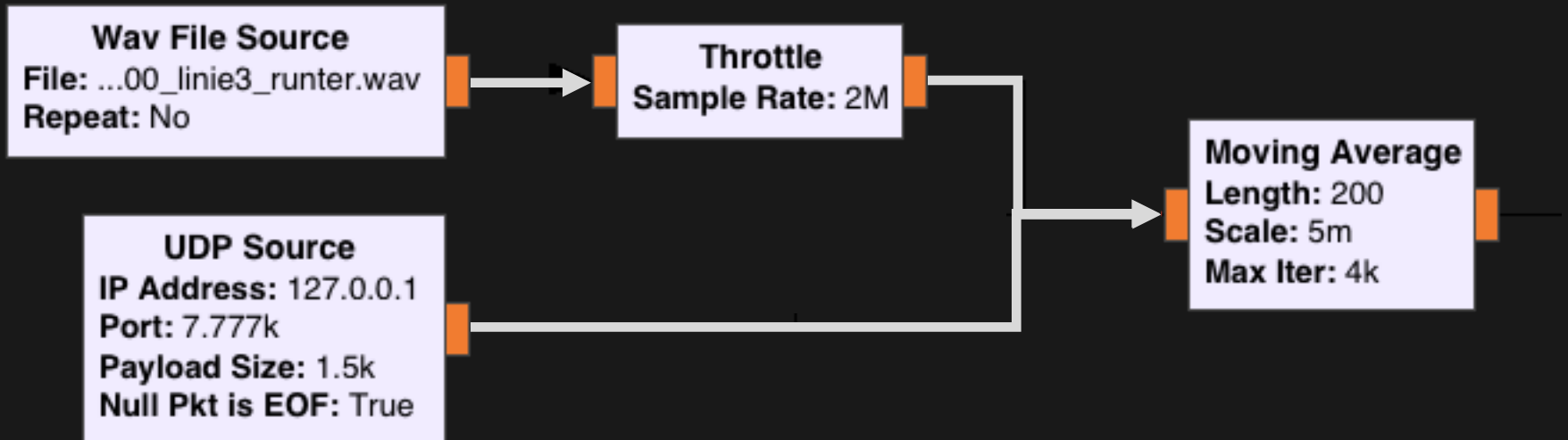


Example: Traffic Lights

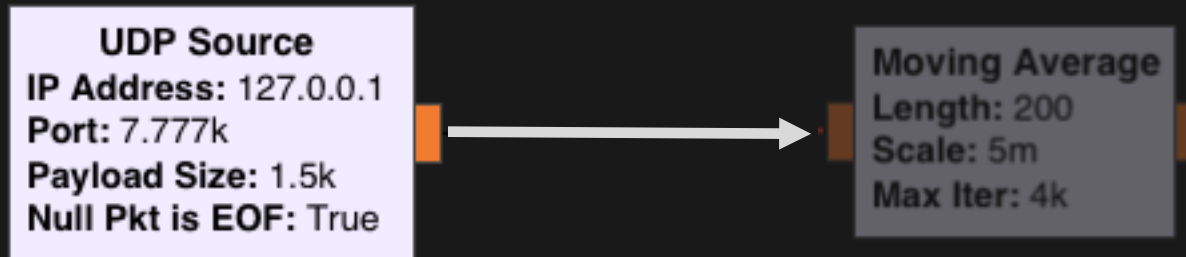


GNU Radio Receiver

- Seamless switch from offline to online



GNU Radio Receiver



```
basti — basti@tronn — ~ — zsh — 113x40  
$ ncat -l -u -p 7355 |  
  sox -t raw -esigned-integer -b 16 -r 48000 -  
    -t raw -efloat -b 32 -r 48000 - |  
  ncat -u 127.0.0.1 7777
```

Example: Traffic Lights

- Video:

<https://www.youtube.com/watch?v=1hb10T3aP4g>

Conclusion


- GQRX is a great SDR
- ...that shines even more in combination with other tools
- Open Source



<https://github.com/csete/gqrx/>

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