



**SegDSP
Future of RF Monitor**

**Cyberspectrum #23
DEF CON**

RF Monitor

Listen / Record RF Traffic

The problem

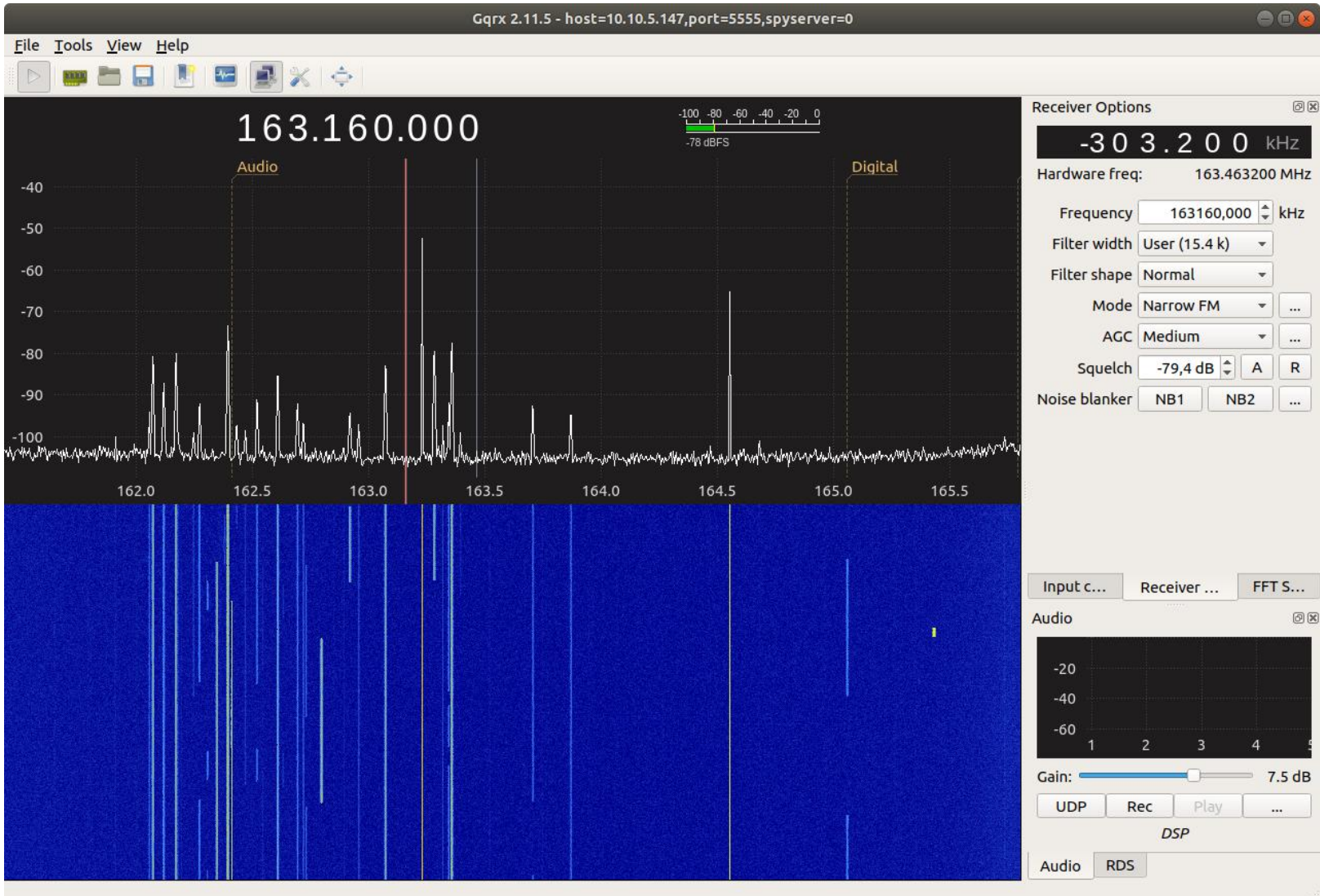
Most common problems for monitoring

- SDR Spectrum (Bandwidth)
- CPU Usage (might have too much channels)
- Disk Space / Organization
- Network Usage

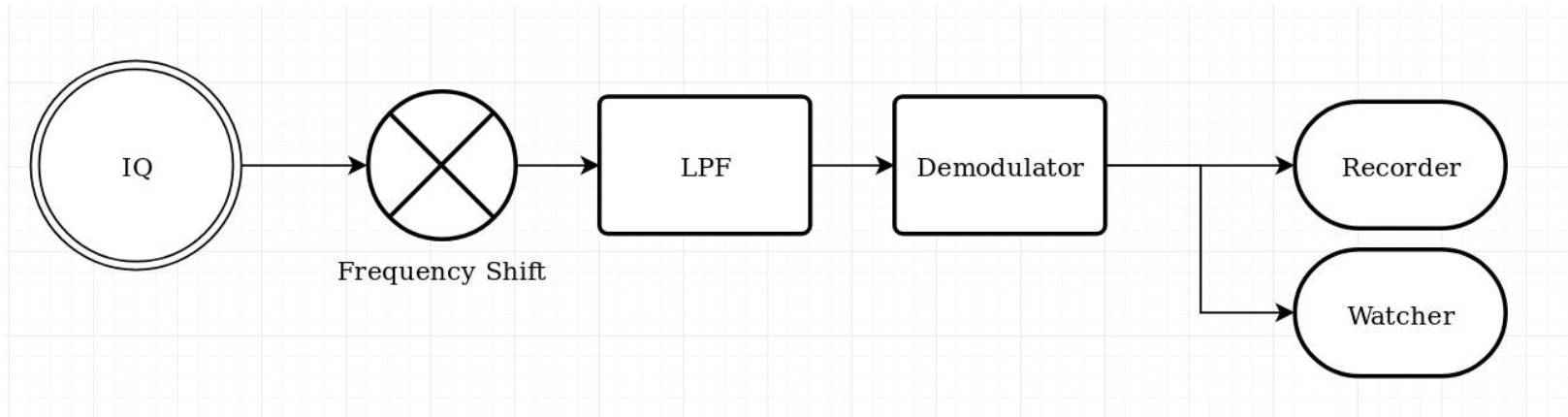
CPU Usage

When you have too much
channels

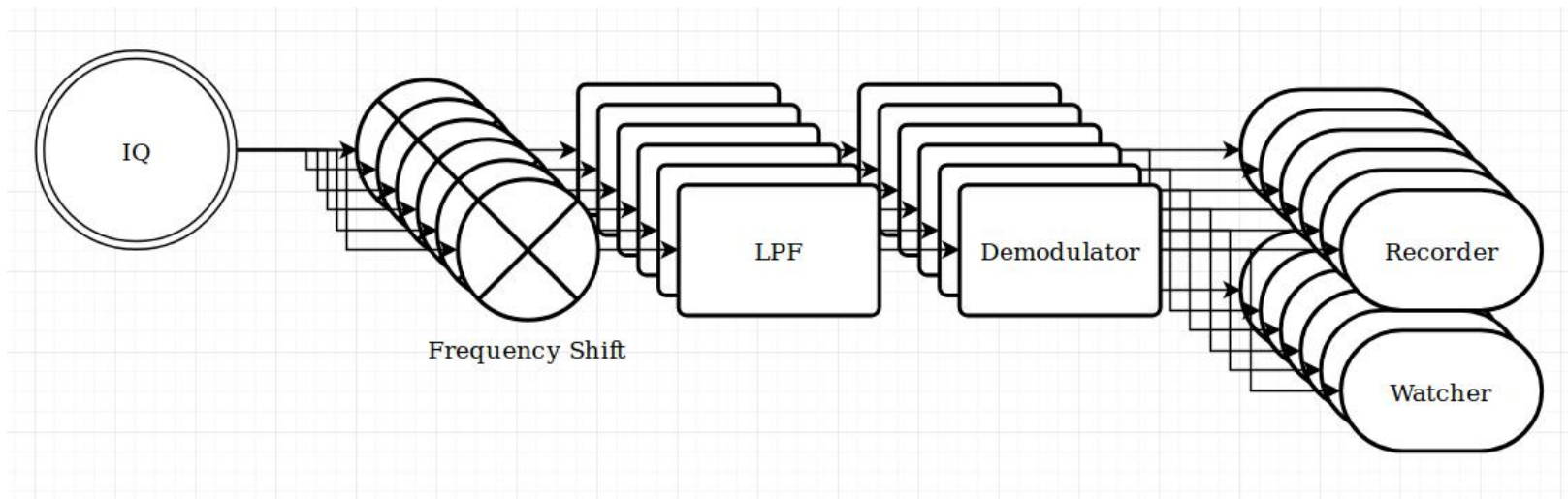
14 Individual Transmissions



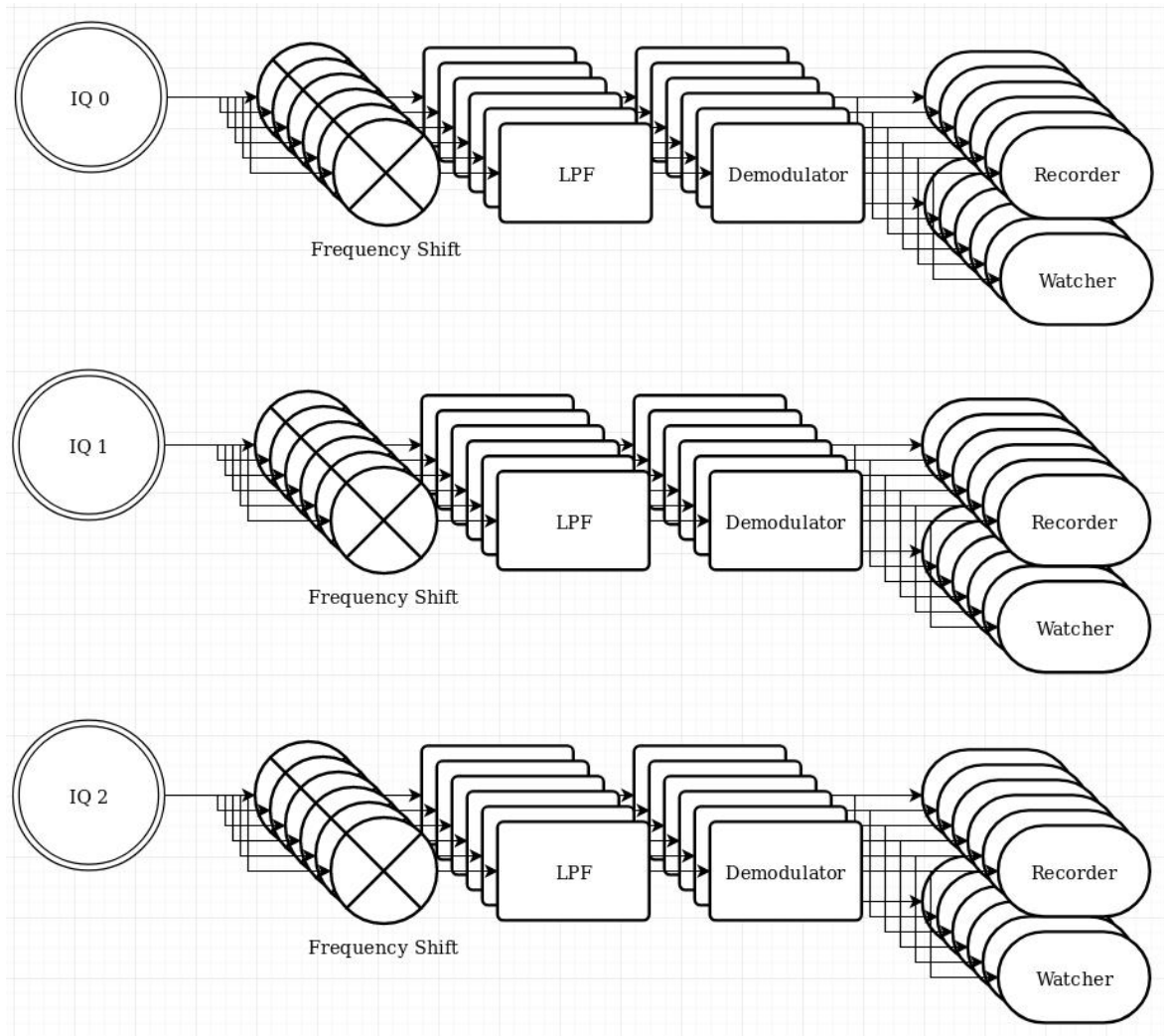
Demod Flow



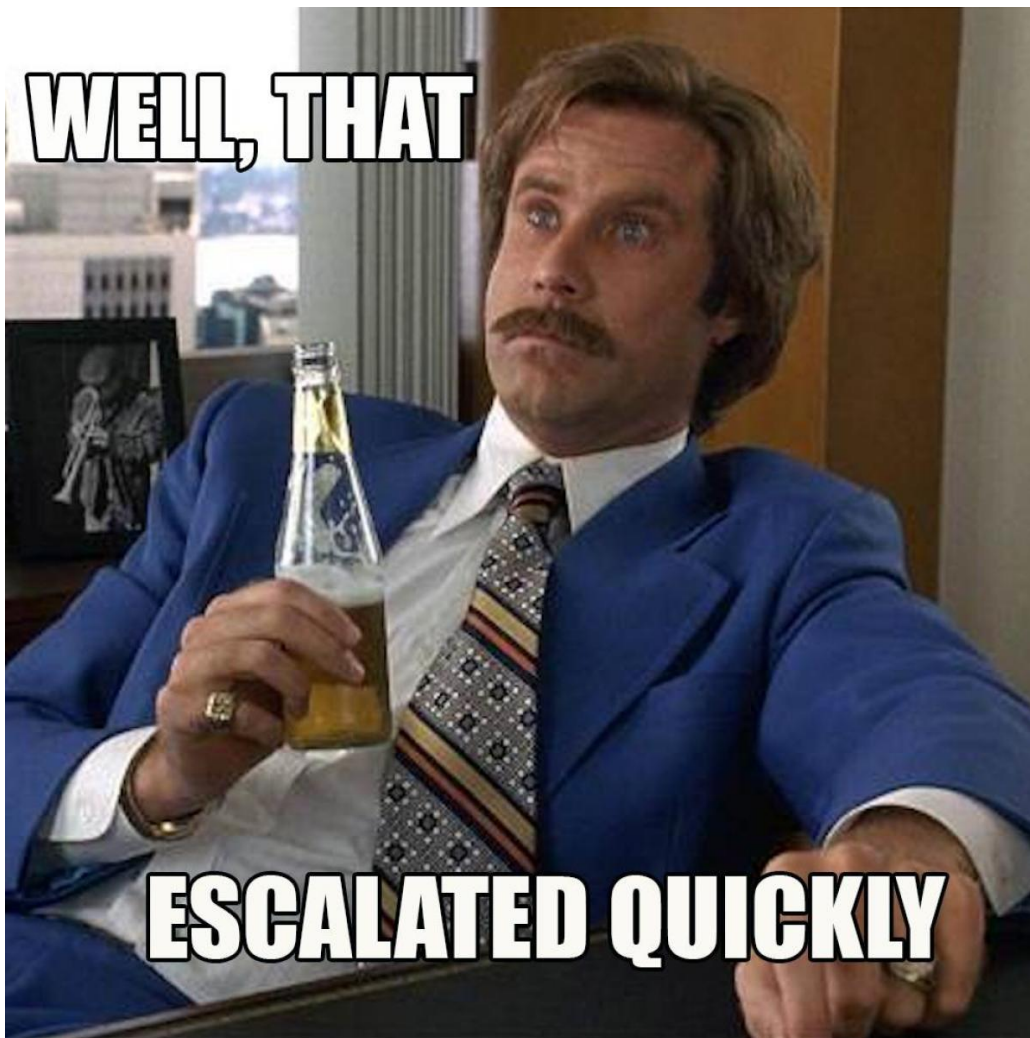
Simple Demodulator Flow



Multi-channel Demodulator Flow

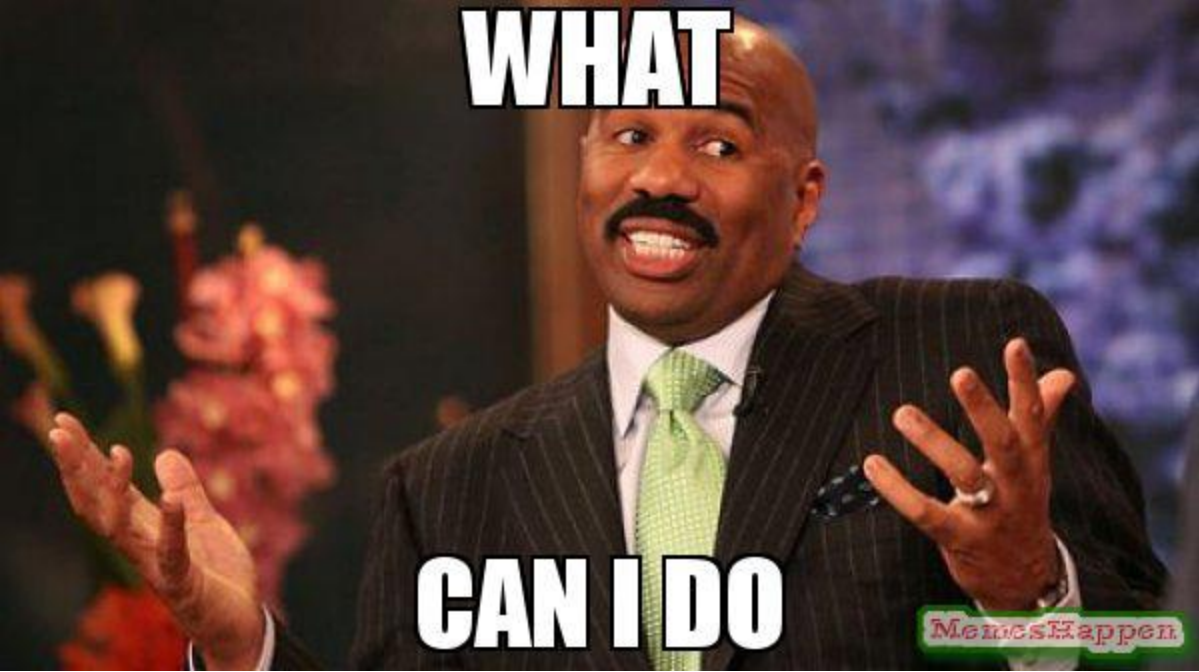


Multi-Channel Multi-SDR Flow



WELL, THAT

ESCALATED QUICKLY



WHAT

CAN I DO

MemesHappen



D₂

I₁

V₄

C₃

O₁

N₁

Q₁₀

I₁

D₂

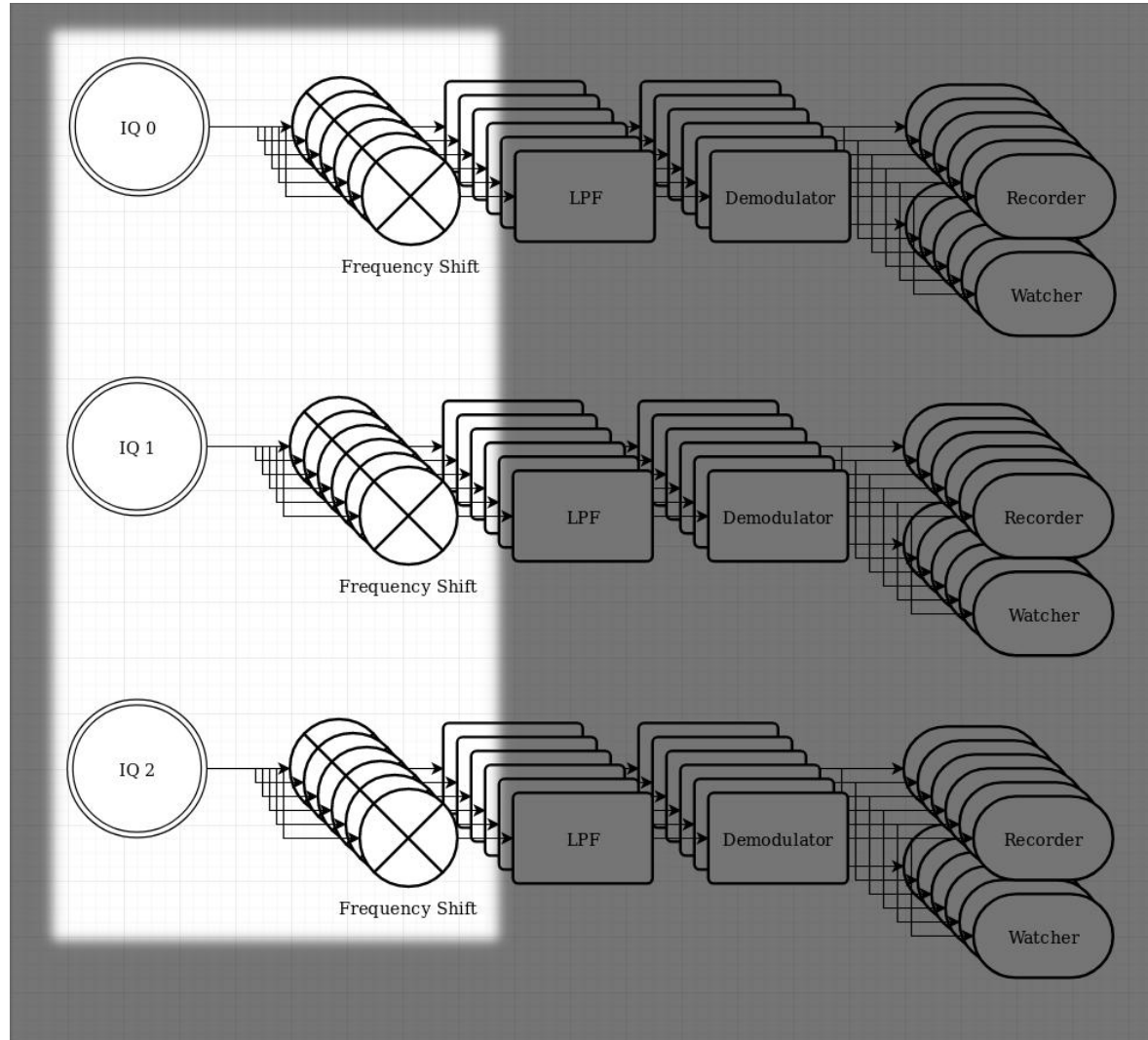
E₁

U₁

E₁

R₁

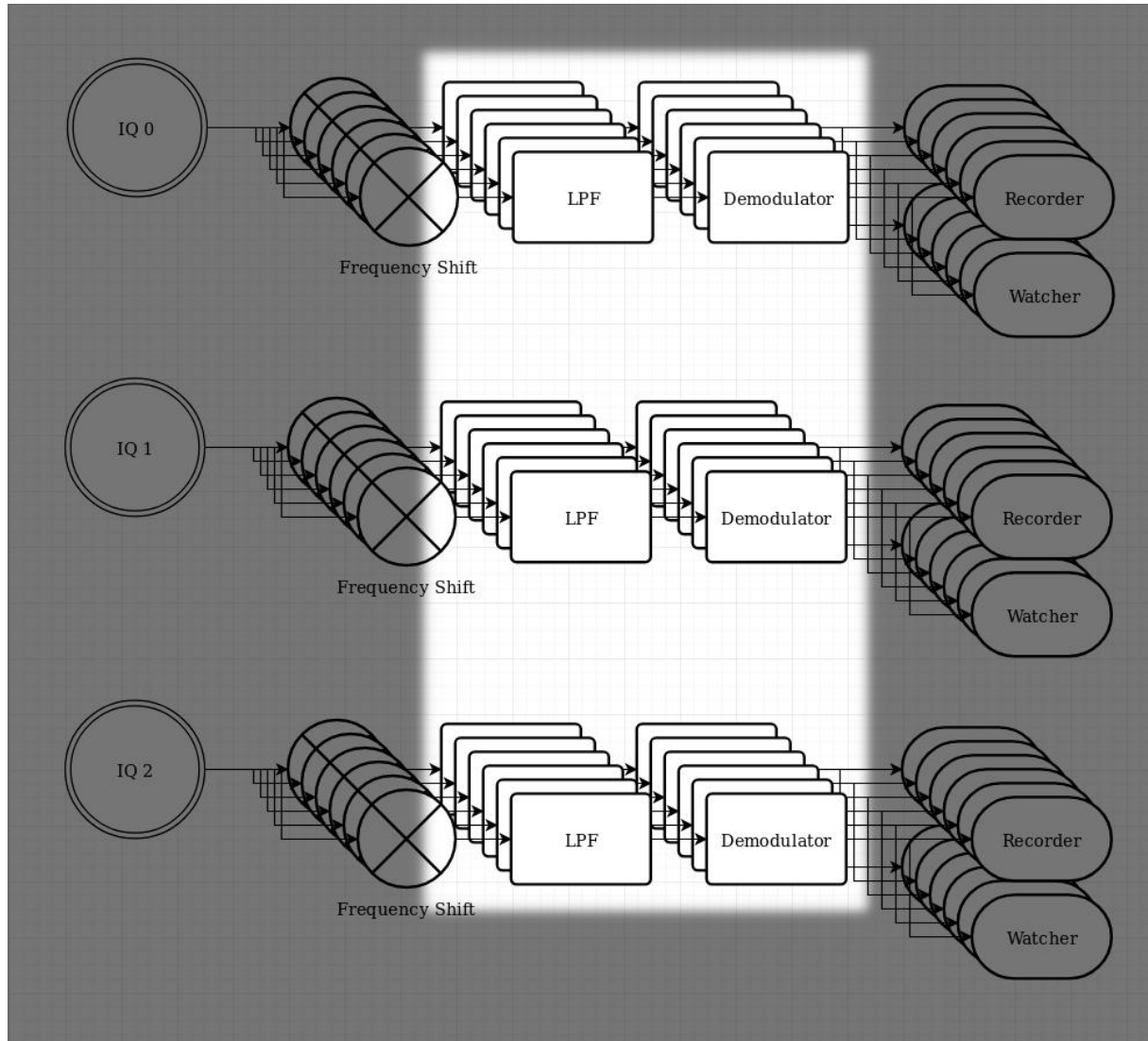
MultiSDR + Frequency Shift



SpyServer

- Supports RTL-SDR, Airspy Mini, Airspy R2, Airspy HF+
- Has independent FFT and IQ Stream
- Can do frequency shifting to select just a portion of IQ

Filter + Demodulator



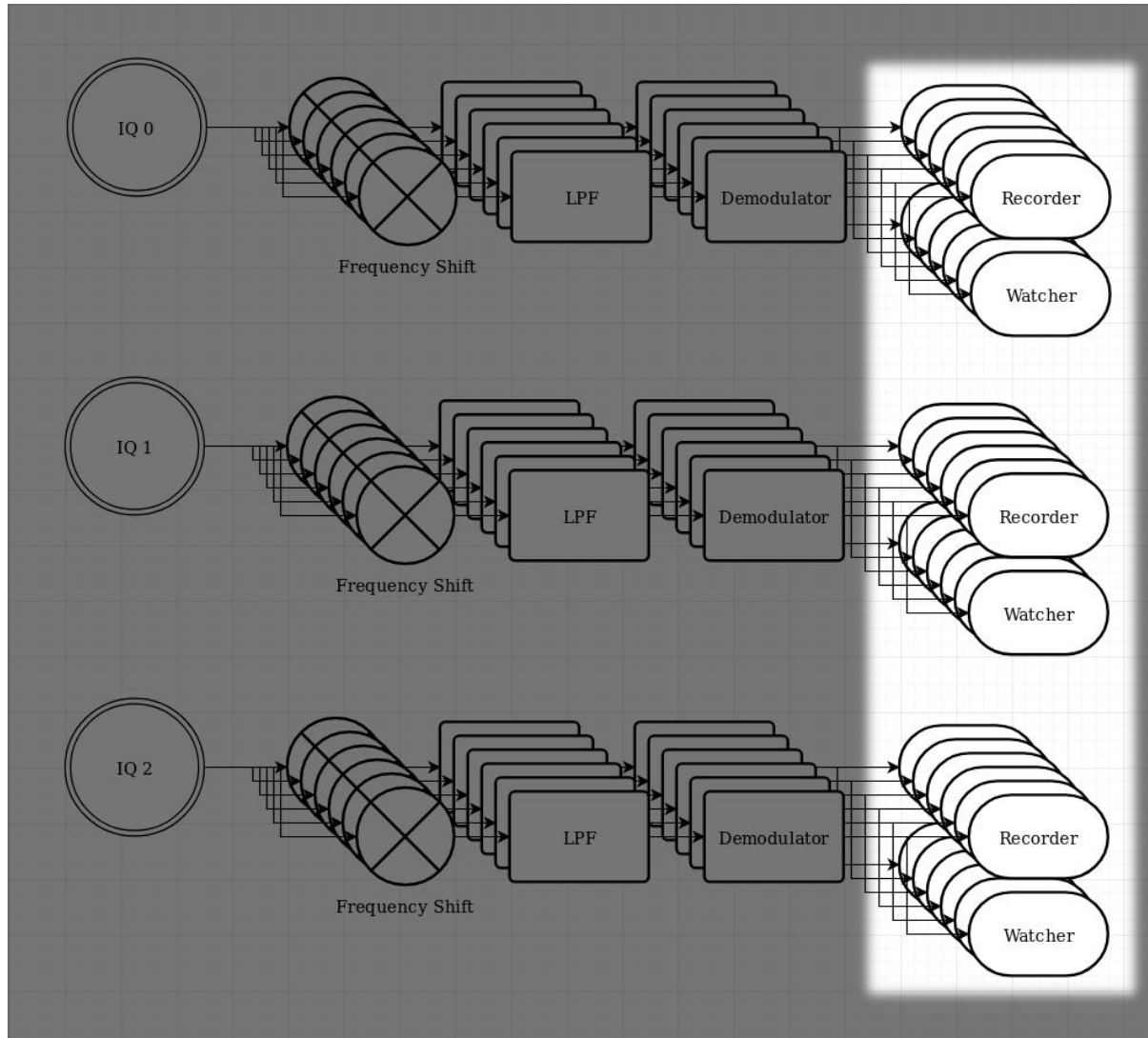


SegDSP!

SegDSP

- Means: Segment Digital Signal Processor
- Connects to SpyServer
- Event Driven Actions
- Self-Contained
- Outputs through WebSocket, TCP

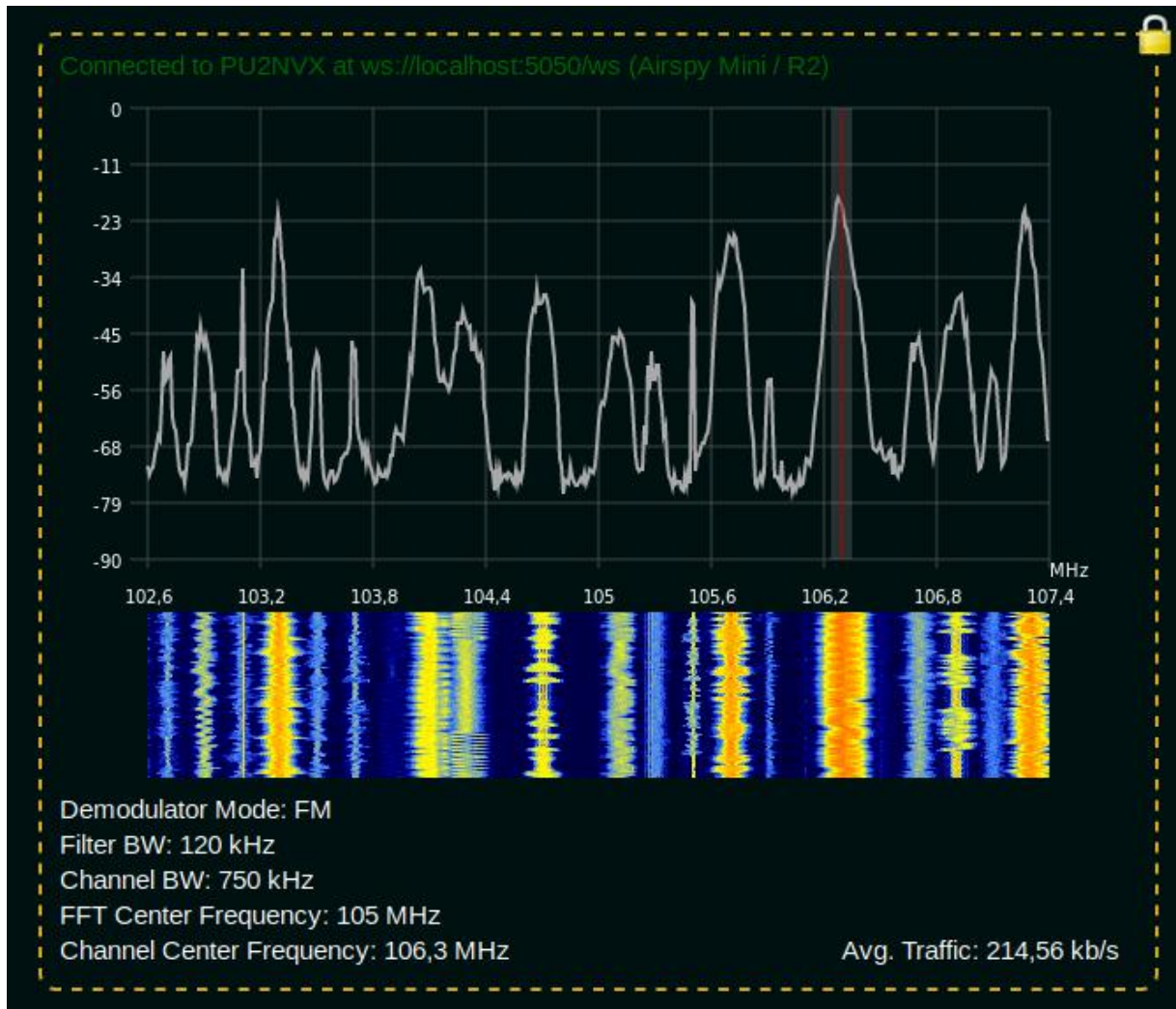
Recording / Watching



SegDSP Features for Watch / Record

- Record to Disk (IQ / Demod Out)
- WebUI with WebSockets to check status / listen
- Record on Squelch Off Feature
- *(Future)* Integration with RADOS block storage
- *(Future)* Event Driven Script Execute

SegDSP WebUI



Ok so far we got

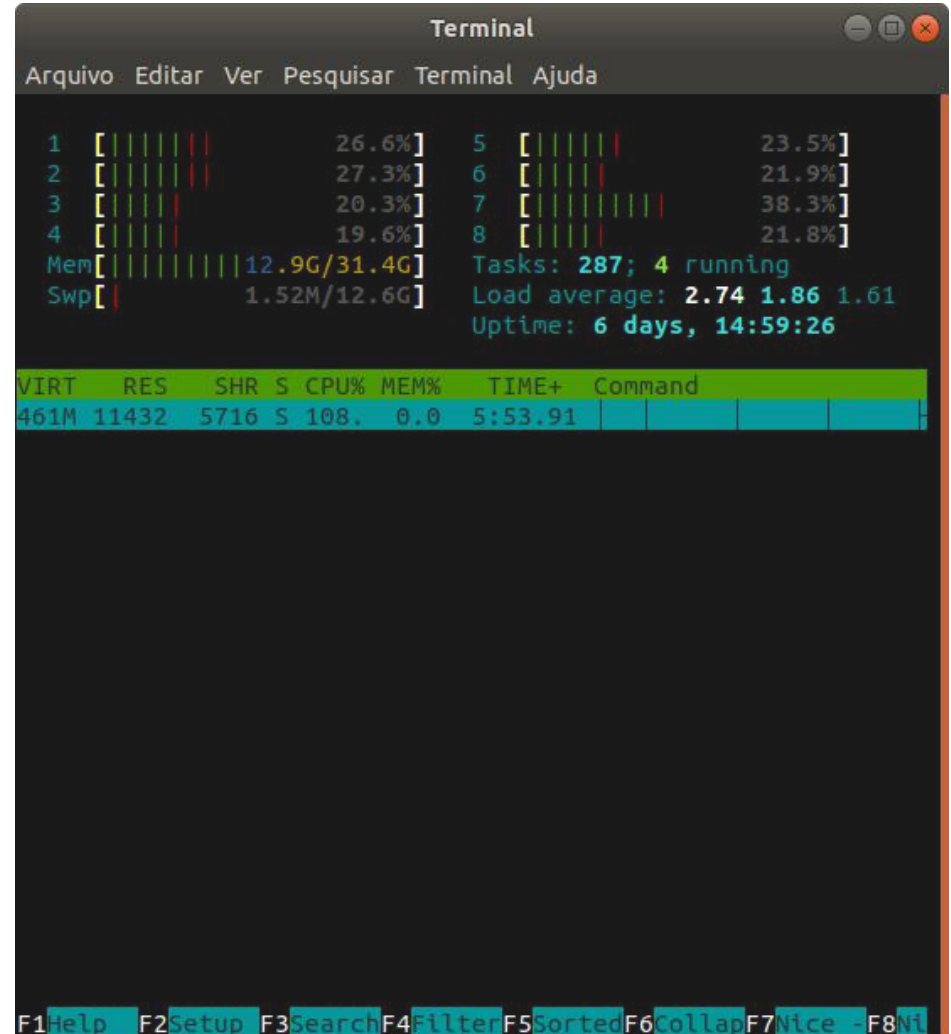
- Multi-SDR / Multi-IQ => Many Spyserver
- Multi-Filter-Demod => SegDSP
- Record / Watch => SegDSP

So, what's missing?

CPU Usage

SegDSP

Single Core Usage for WBFM
demodulation / webui /
record



```
Terminal
Arquivo Editar Ver Pesquisar Terminal Ajuda

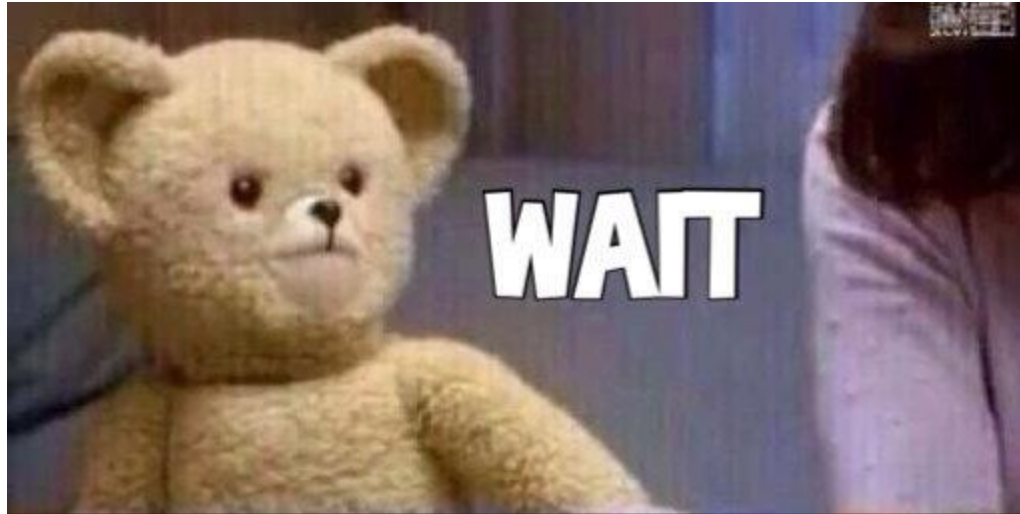
 1 [|||||  26.6%]  5 [|||||  23.5%]
 2 [|||||  27.3%]  6 [|||||  21.9%]
 3 [|||||  20.3%]  7 [|||||  38.3%]
 4 [|||||  19.6%]  8 [|||||  21.8%]
Mem[||||| 12.9G/31.4G] Tasks: 287; 4 running
Swp[| 1.52M/12.6G]   Load average: 2.74 1.86 1.61
                    Uptime: 6 days, 14:59:26

VIRT  RES   SHR S CPU% MEM%  TIME+  Command
461M 11432 5716 S 108.  0.0 5:53.91 | | | | |
```

F1 Help F2 Setup F3 Search F4 Filter F5 Sorted F6 Collap F7 Nice F8 Ni

Solution?

Multi-Machine!

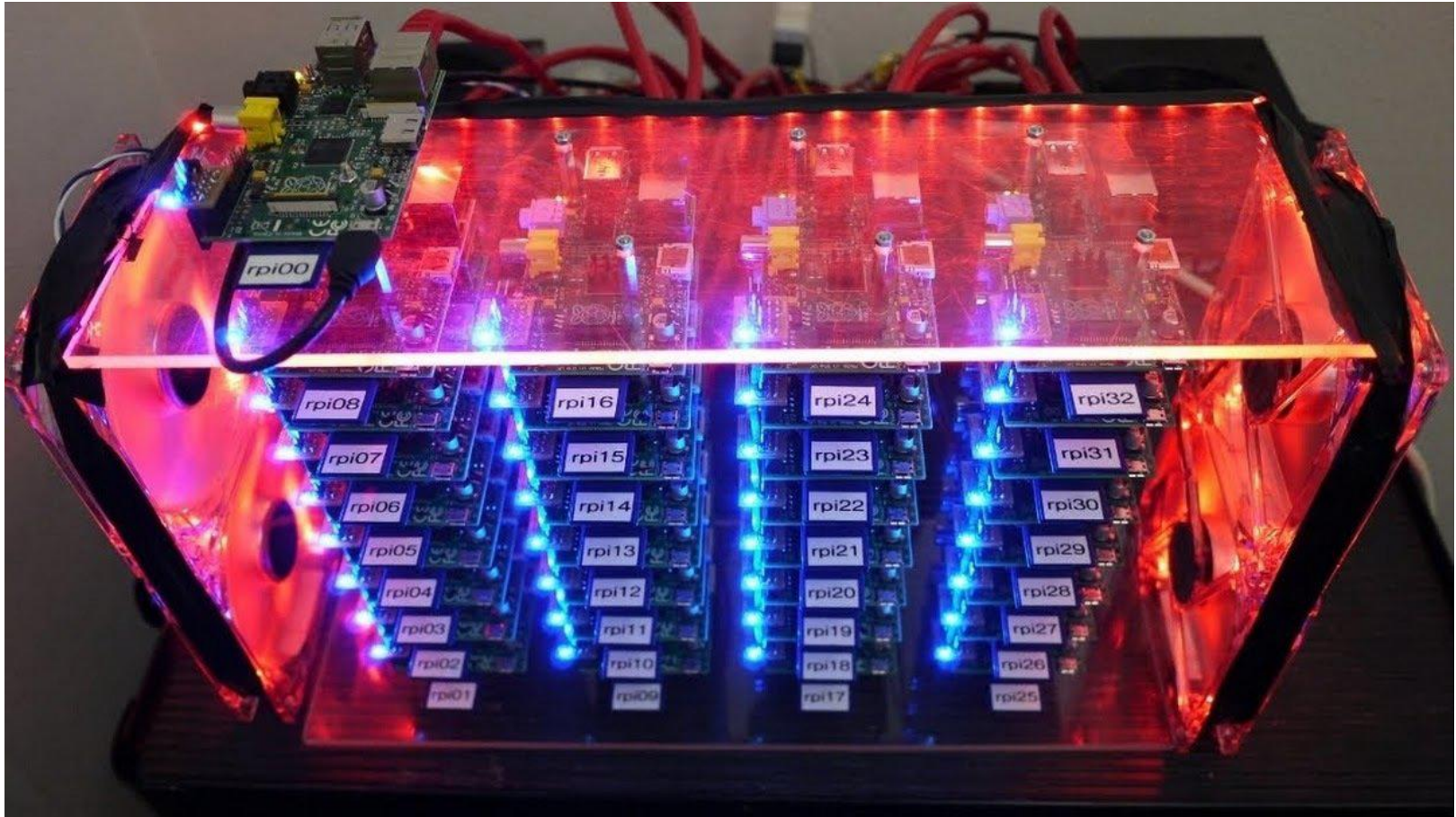


Cheap SBC with Docker

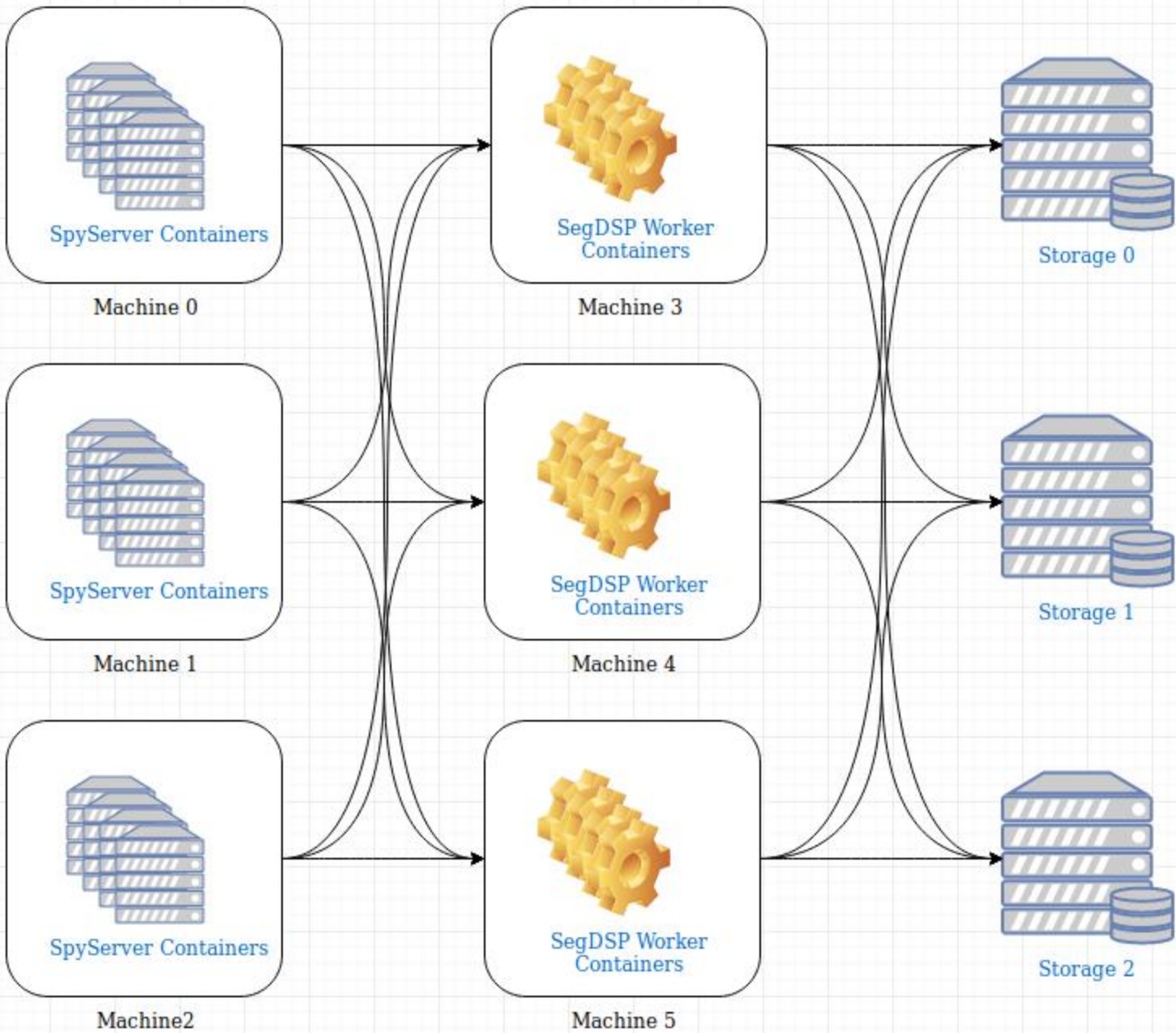
Odroid Cluster



Raspberry Pi Cluster



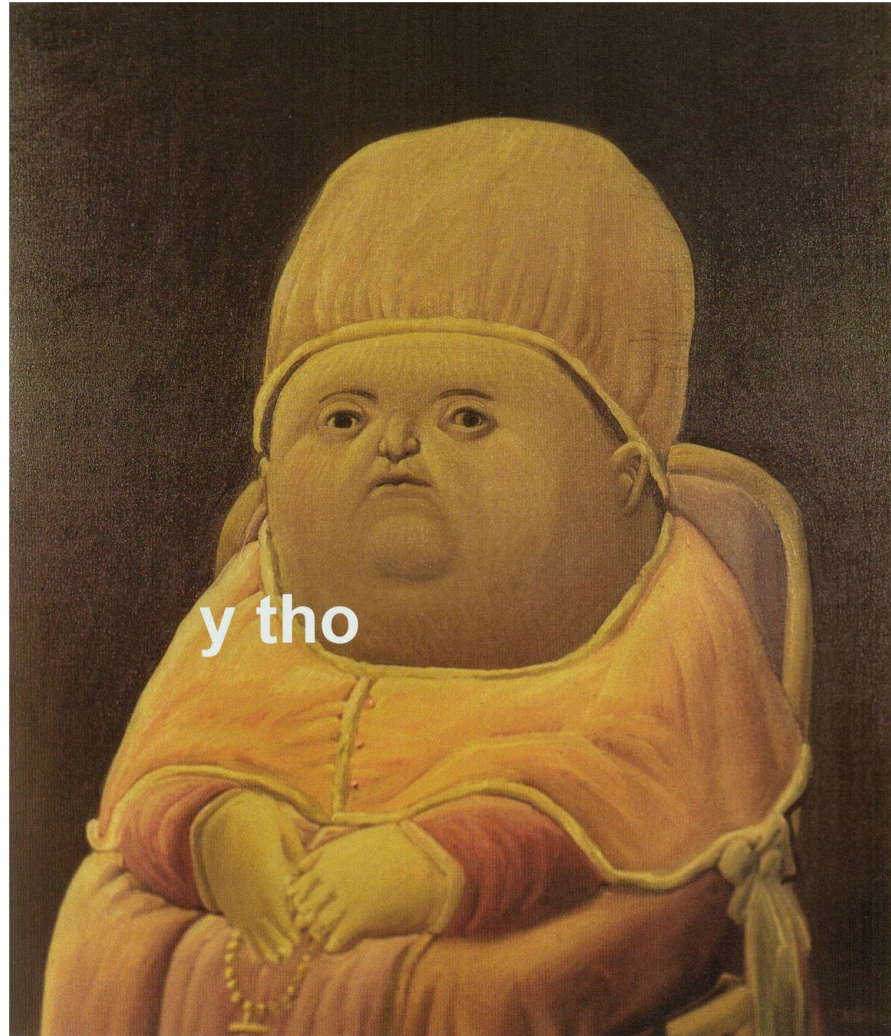
Boise University PhD candidate Joshua Kiepert Pi Cluster



Advantages

- Scale how-ever you want - Single Machine or one machine per process
- Have specific machine roles: SDR Machine, Processing and Storage
- Use of low cost machines like Pi Zero for processing Narrow Band signals.
- Use of cloud computing for processing signals
- Dynamically spawn / despawn DSP Workers when needed (LEO Satellites)

Then...



Usages

- Never miss that Satellite Pass again
- Dynamically spawn recorder
- Monitor for jammers and unauthorized TX and (maybe) warn authorities automagically
- Learn how a distributed system work (at home)

SegDSP

- Dockerized
- Event Driven
- File Recorder
- FM Demodulator
- WebUI
- Made in Go

Future

- RADOS Block Storage Recording
- Event Folder Script (`events.d/squelch_on/myscript.sh`)
- AM, SSB, LSB, PSK, FSK, etc... demodulators
- Dynamic Signal Detection and Recorder Spawner
- Remote Control

Any Questions?

Project: <https://github.com/racerxdl/segdsp/>

My contact:

- KeyBase: <https://keybase.io/racerxdl>
- Telegram: @lucasteske
- Twitter: @lucasteske
- Website: <https://www.teske.net.br/lucas/>

Thanks for watching!