

Homebrew APRS WX

Connecting Your Weather Station to APRS
the Hard Way



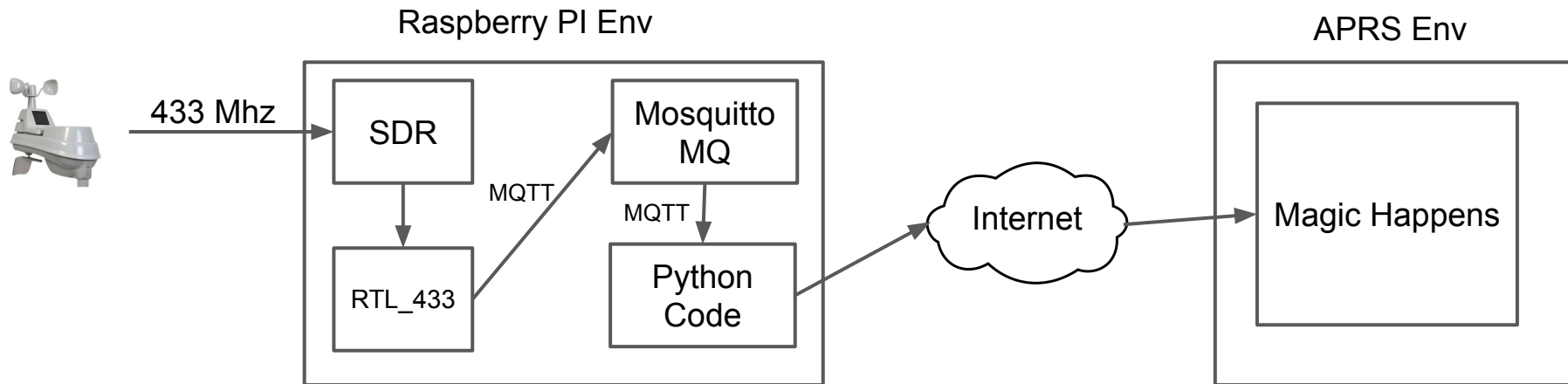
Presented by:
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Date: January 26, 2023

Agenda

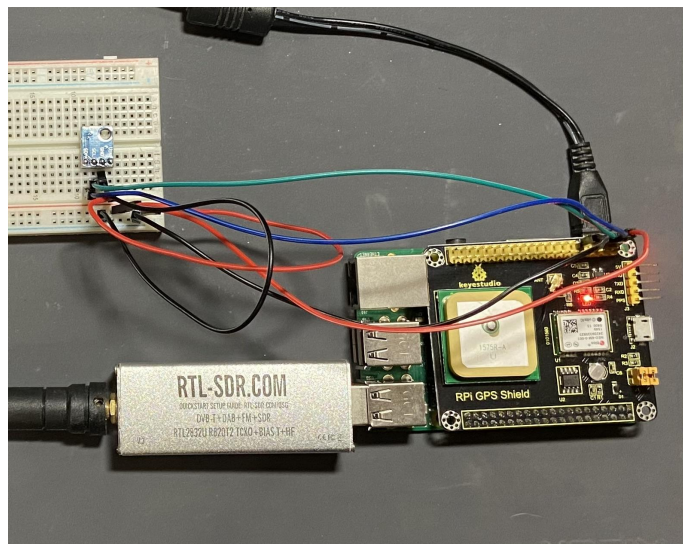
- Overview
- Rig Rundown
- Acurite 5-in-1
- SDR - RTL-433
- The Magic Packet
- It's Just Telnet
- What I got from the project?
- What's Next?

Overview



Rig Rundown

- Acurite 5-in-1 Pro Weather Station
- Raspberry Pi Model 3B
- HiLetgo BMP180 Digital Barometric Pressure Sensor
- Keystudio KS0216 GPS Shield
- RTL-SDR V3
- Software
 - RTL_433
 - Mosquitto MQTT
 - Python 3



Acurite 5-in-1

- AcuRite Pro 5-in-1 Color Weather Station 01528 / 01533
- Sensors:
 - Temperature
 - Humidity
 - Wind
 - Rain
- 433 Mhz Wireless



SDR - RTL_433

- RTL-SDR
 - 433 Mhz
- Rubber Ducky Antenna
- RTL_433 Software
 - Reads signal from SDR
 - Decodes data
 - Presents data in multiple formats
 - MQTT, JSON, CSV



It's Just Telnet

- Connect
 - `telnet noam.aprs2.net 14580`
- Authenticate
 - Callsign and Passcode
 - `user CALL pass PASS vers send-weather 0.99`
- Send Data Packet
- That's it!



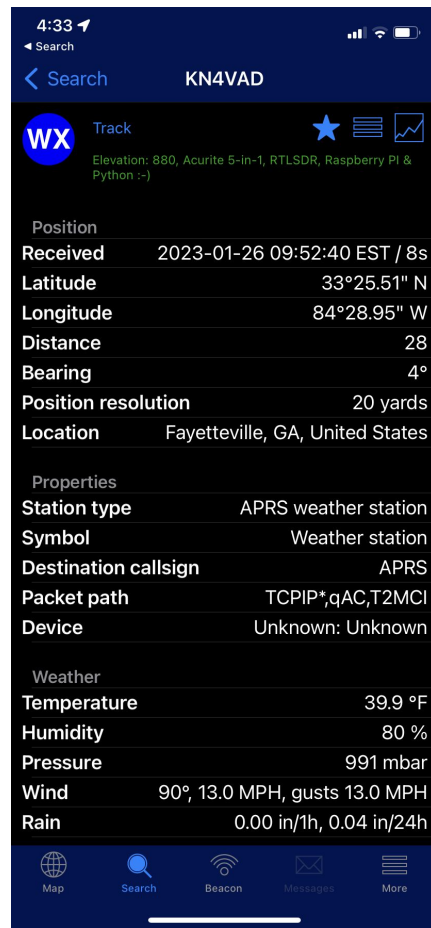
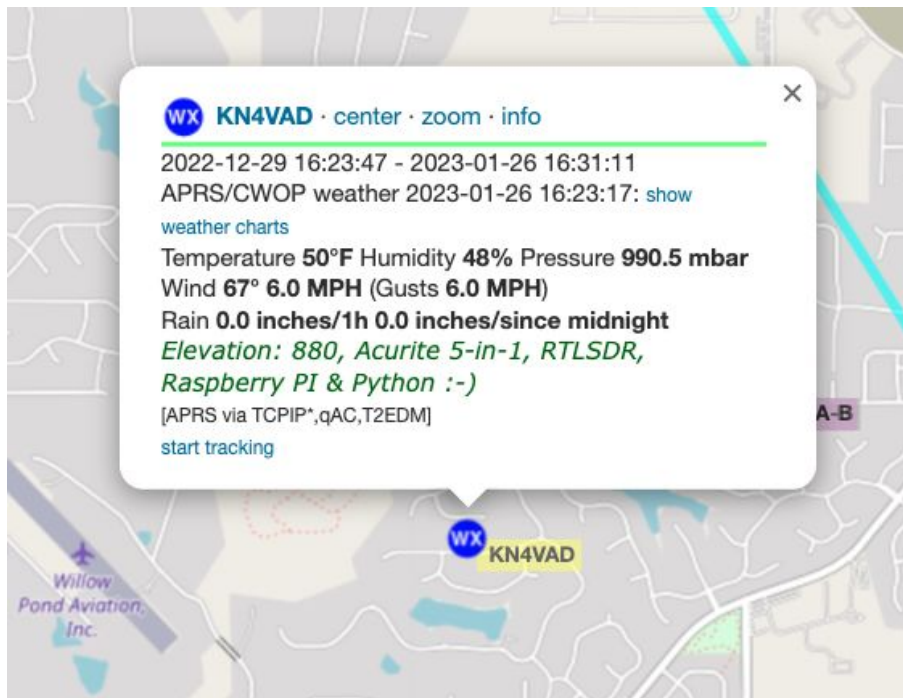
The Magic Packet

```
KN4VAD>APRS,TCPIP*:@231042z3325.51N/08428.95W_270/00  
0g000t039r000P010h099b09862Elevation: 880, Acurite  
5-in-1, RTLSDR, Raspberry PI & Python
```

Question: What makes a APRS WX packet a “weather” packet?

The “@” denotes Complete Weather Report Format — with Lat/Long position and Timestamp

The Pay Off



The Pay Off

APRS weather station **KN4VAD**  - [show graphs](#)

Comment: *Elevation: 880, Acurite 5-in-1, RTLSDR, Raspberry PI & Python :-)*

Location: 33°25.51' N 84°28.95' W - locator [EM73SK22CA](#) - [show map](#) - [static map](#)
2.3 miles Southwest bearing 224° from [Fayetteville, Fayette County, Georgia, United States](#) [?]
8.1 miles Southwest bearing 242° from [Irondale, Clayton County, Georgia, United States](#)
23.0 miles South bearing 194° from [Atlanta, Fulton County, Georgia, United States](#)
72.7 miles Northeast bearing 24° from [Columbus, Muscogee County, Georgia, United States](#)

Last position: 2023-01-26 16:37:16 EST (3s ago)
2023-01-26 16:37:16 EST local time at Fayetteville, United States [?]

Last WX report: 2023-01-26 16:32:24 EST (4m55s ago) - [show weather charts](#)
50 °F 48% 990.7 mbar 2.9 MPH South

Device: Unknown: Unknown

Last path: KN4VAD>APRS via TCP/IP*,qAC,T2MCI

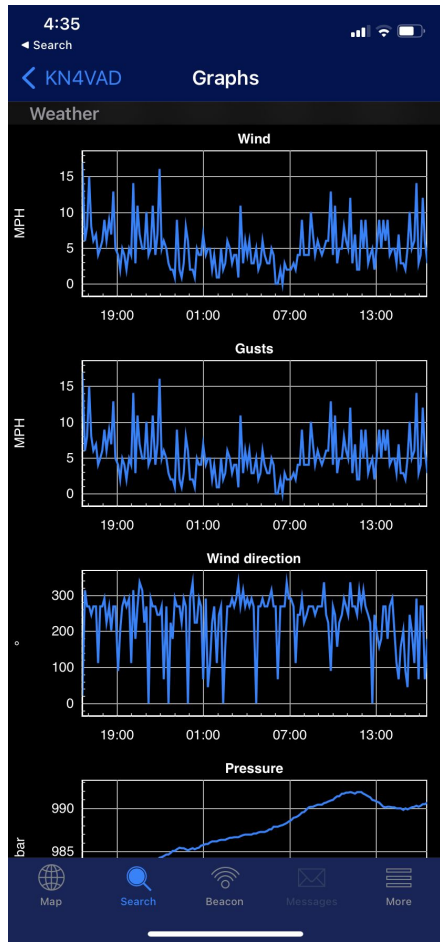
Positions stored: 1

Packet rate: 36 seconds between packets on average during 1788 seconds.

Other SSIDs: [KN4VAD-15](#)  [KN4VAD-1](#)  [KN4VAD-3](#) 

Stations near current position of **KN4VAD** - [show more](#)

callsign	distance	last heard - EST	callsign	distance	last heard - EST
KN4VAD-1 	0.0 yards 0°	2022-12-29 16:21:10	N4FGA-B 	0.7 miles 62°	2023-01-26 16:20:19
N4FGA-B 	0.7 miles 62°	2023-01-26 16:20:29	N4FGA-7 	0.8 miles 64°	2023-01-23 20:37:27
N4FGA-9 	1.3 miles 76°	2023-01-26 15:37:59	W8BYH-7 	1.4 miles 16°	2023-01-12 16:26:42
W8BYH 	1.5 miles 11°	2023-01-26 16:30:35	K1EOD-9 	1.5 miles 77°	2023-01-22 11:50:02
FFCSVRMqA 	1.6 miles 257°	2023-01-03 18:16:30	K1ASK-15 	1.7 miles 31°	2023-01-26 12:24:33
W4VBD-N 	2.0 miles 37°	2023-01-26 16:20:17	W4VBD-D 	2.0 miles 37°	2023-01-26 16:20:07
KD4YDC 	3.0 miles 115°	2023-01-24 09:55:55	KD4YDC-9 	3.0 miles 115°	2023-01-25 19:21:48
AJ4P-15 	3.1 miles 183°	2023-01-24 20:15:51	EW9467 	3.3 miles 161°	2023-01-26 16:33:09
KN4YZ-10 	3.6 miles 288°	2023-01-26 15:55:30	KA8MKX-9 	3.6 miles 99°	2023-01-26 12:05:31



What I got from the project?

- Deeper knowledge of APRS
 - How paths work
 - Data packet format
 - Propagation speeds
- Broader knowledge of the radio spectrum
 - 433 Mhz
- Fun with programming
 - More Python
 - Reading sensors on the RPi

What's Next?

- Integrate RF
 - Digipeter
- Explore Sending AND Receiving
 - Messaging
- LoraWAN Sensor Integration

References

- [AcuRite Pro 5-in-1 Color Weather Station](#)
- [Raspberry Pi Model 3B](#)
- [RTL SDR V3](#)
- [Keystudio KS0216 RPI GPS Shield](#)
- [HiLetgo BMP180 GY-68 Digital Barometric Pressure Sensor](#)
- [RTL_433 Software](#)
- [APRS.org](#)
- [APRS Protocol Reference](#)
- [APRS in Weather and Skywarn Applications](#)
- [APRS Passcode Generator](#)
- [Andreas Spiess - YouTube - Sensor and Microprocessor](#)
- [Andreas Spiess - YouTube - H9BLA Wireless](#)
- [KM6LYW Radio- YouTube - Put your weather station on the air](#)