Fun & Useful Things You Can Do With APRS

Automatic Packet Reporting System = Ham Radio texting & more

FAYETTE COUNTY

KK4GQ W4JB

Amateur Radio Club

GEORGIA

APRS

Presented by:
Joe Domaleski, KI4ASK

Date: March 31, 2022

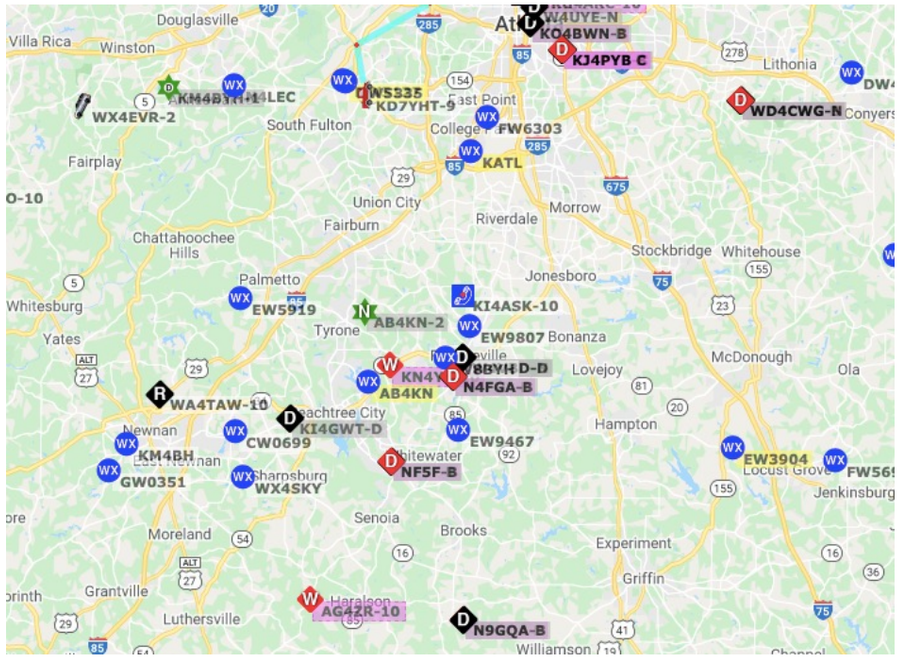
Agenda

- APRS – what is it?
- Father of APRS – Bob Bruninga
- APRS - advantages
- APRS - real-time information in the local area
- APRS – what can it be used for?
- Single national frequency
- How does APRS work?
- Using APRS with a radio
- Using APRS with a mobile phone
- Using APRS with a computer
- How I use APRS
- Cool things to do with APRS

This is NOT a technical presentation. It's designed to show you some fun and cool things you can do with APRS!

APRS – what is it?
Ham Radio Text Messaging

The Automatic Packet Reporting System is an amateur radio-based system for real time tactical digital communications of information of immediate value in the local area.



APRS data is typically broadcast on a single shared frequency to be repeated locally by area relay stations and digipeaters for widespread local consumption.

In addition, all such data is typically ingested into the APRS Internet System (APRS-IS) via an internet connected receiver (igate) and distributed globally. Shared information contains global coordinates, altitude, speed, heading, text messages, alerts, announcements, and bulletins.

Source: aprs.org website, Bob Bruninga (WB4APR)

Father of APRS
CDR Bob Bruninga, WB4APR, SK

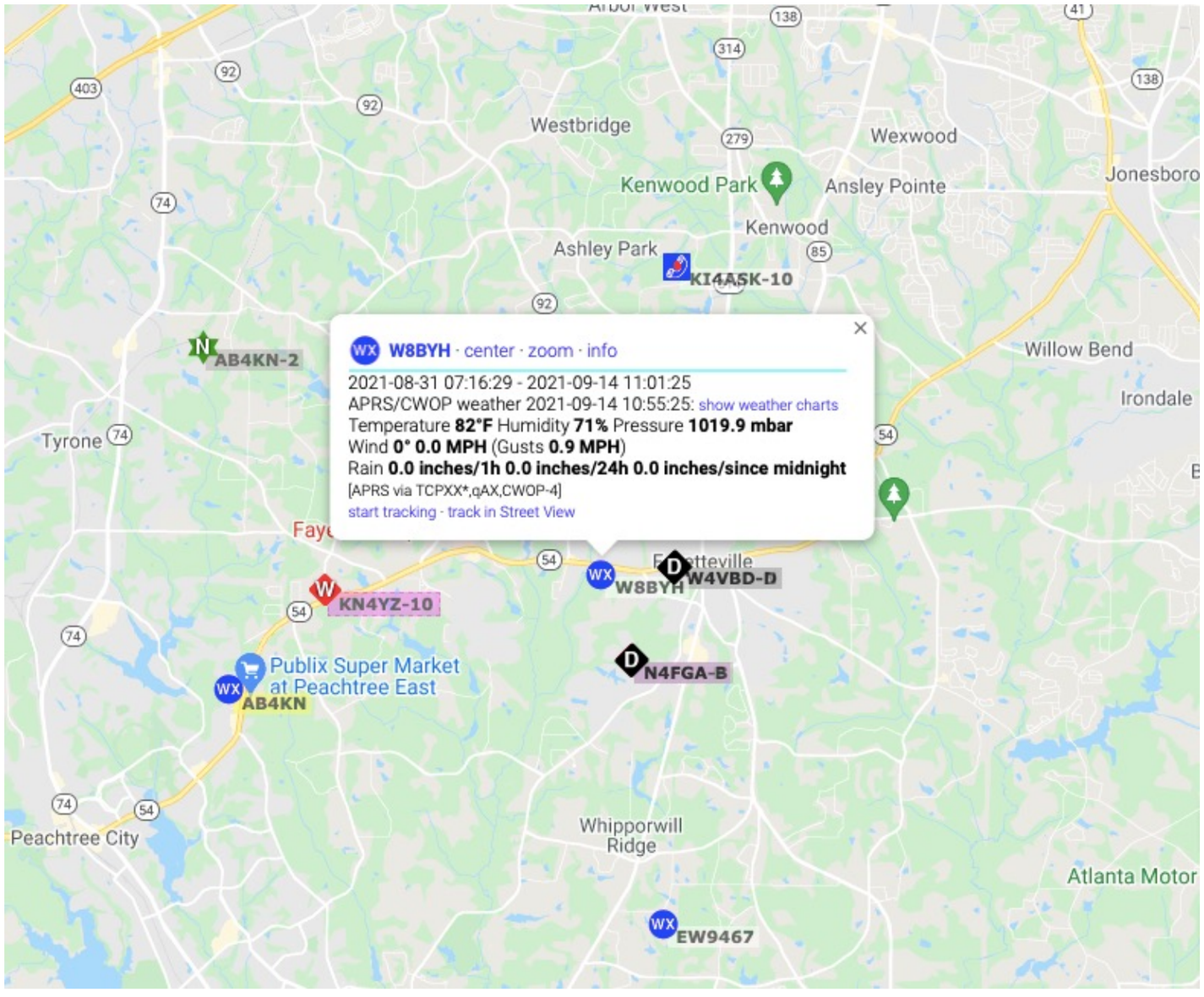
- Commander Robert Bruninga, P.E. (US Navy, 1970-1990) invented what became APRS in 1982 on an Apple II computer
- Georgia Tech, 1970, BS EE
- Naval Postgraduate School, 1971, MS EE
- Originally used to map Navy position reports
- Later ported to VIC-20 computer and then IBM PC
- Originally called Connectionless Emergency Traffic System (CETS)
- FEMA used the technology in the 1990's and it became Automatic Position Reporting System
- With the prevalence of civilian GPS technology, additional uses were found for APRS and it became known as Automatic Packet Reporting System
- APRS began to decline in popularity in the early 2000's, but became popular again over the last 10 years as it has become integrated with the Internet (although it works without the Internet)
- Bob Bruninga became a SK last month on 2/7/2022

APRS – advantages

Unlike other amateur radio digital technologies, APRS has the following advantages:

- Digital packets are small and move quickly on the network. Compare APRS messaging to Winlink for speed.
- APRS can be used with a very simple setup
- APRS has an extensive world-wide footprint
- APRS seamlessly integrates to other communication systems (SMS, email)
- APRS is easy to use with a radio or mobile phone app
- APRS is resilient and doesn't require the internet, but is made more useful with it
- APRS is handy, you can do a lot with it
- You can get started on APRS today just using a web browser

APRS - Real-time information in the local area



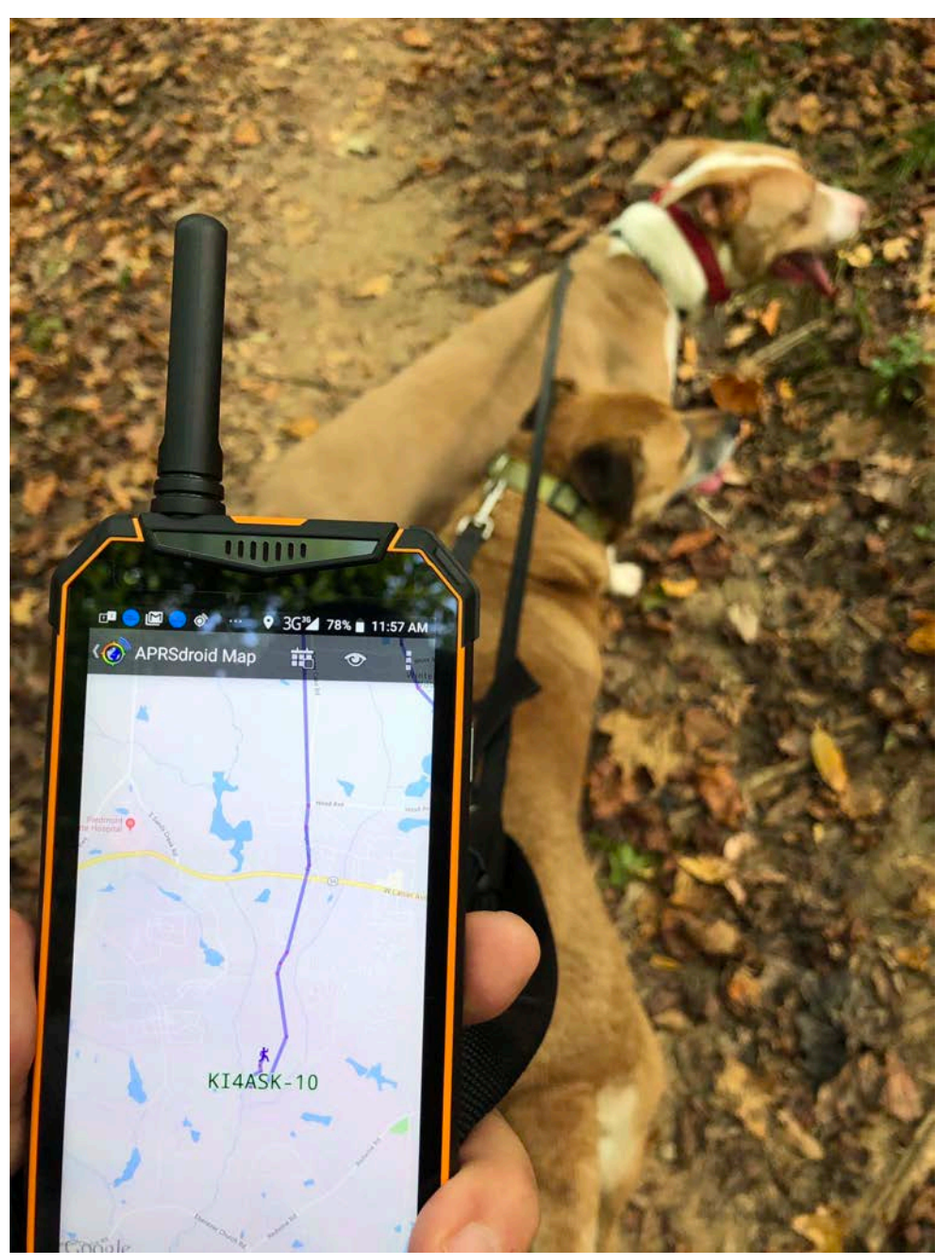
- AB4KN-2 digipeater
- W8BYH WX station
- KI4ASK-10 position
- N4FGA / W4VBD hotspot
- KN4YZ-10 Winlink gateway

HINT: Next time you travel to a new area, monitor the local APRS map for 10-30 minutes to give you a good tactical overview of what's going on

Source: aprs.fi website of Fayette County, 1100 9/14/21

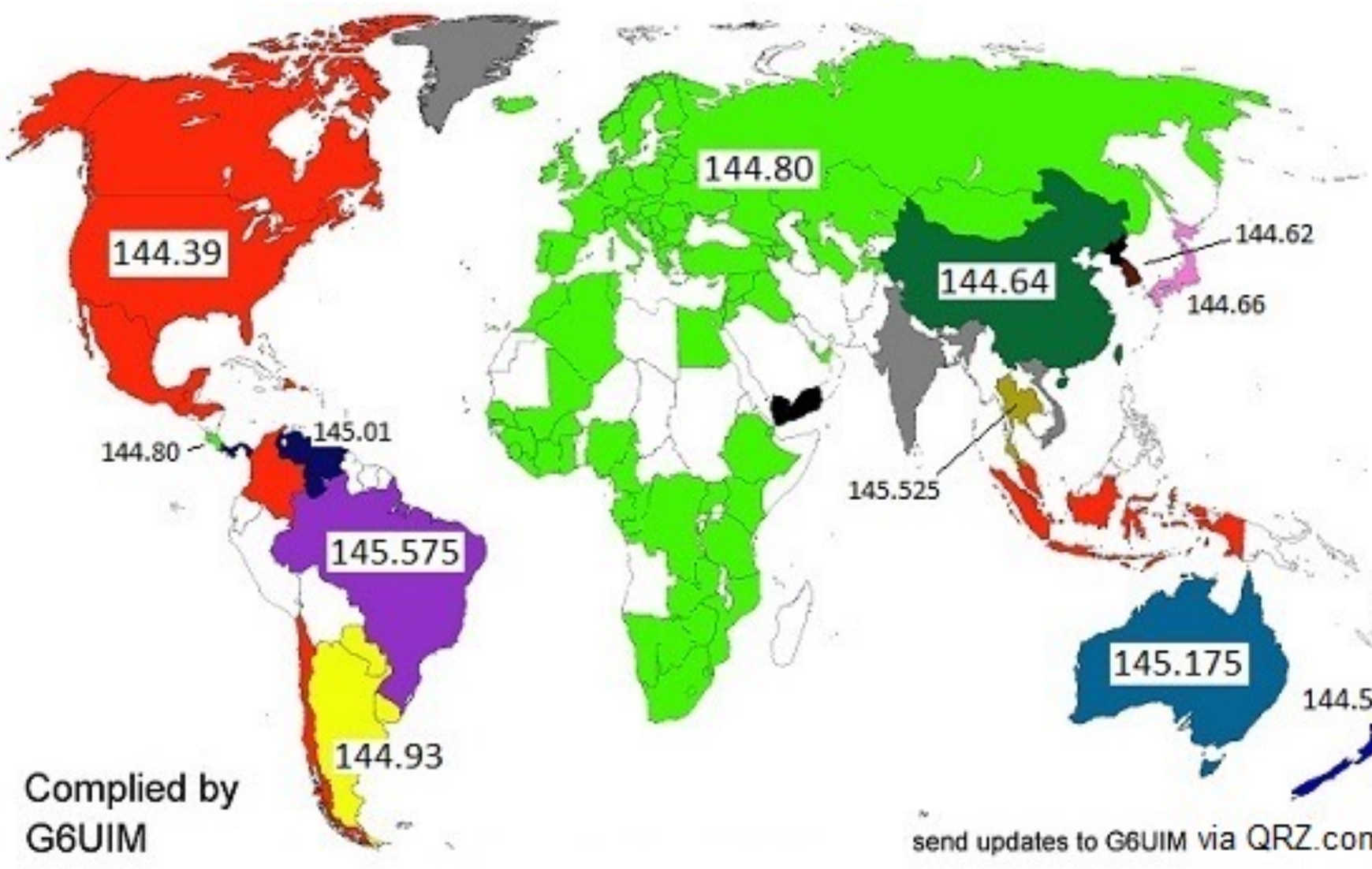
APRS – what can it be used for?

- Short text messages
- Situational awareness
- Location of repeaters / hotspots
- Group bulletins
- Position reports
- Tracking
- Current weather
- SMS gateway
- Winlink gateway
- SOTA / POTA spotting
- Much more!



Single National Frequency

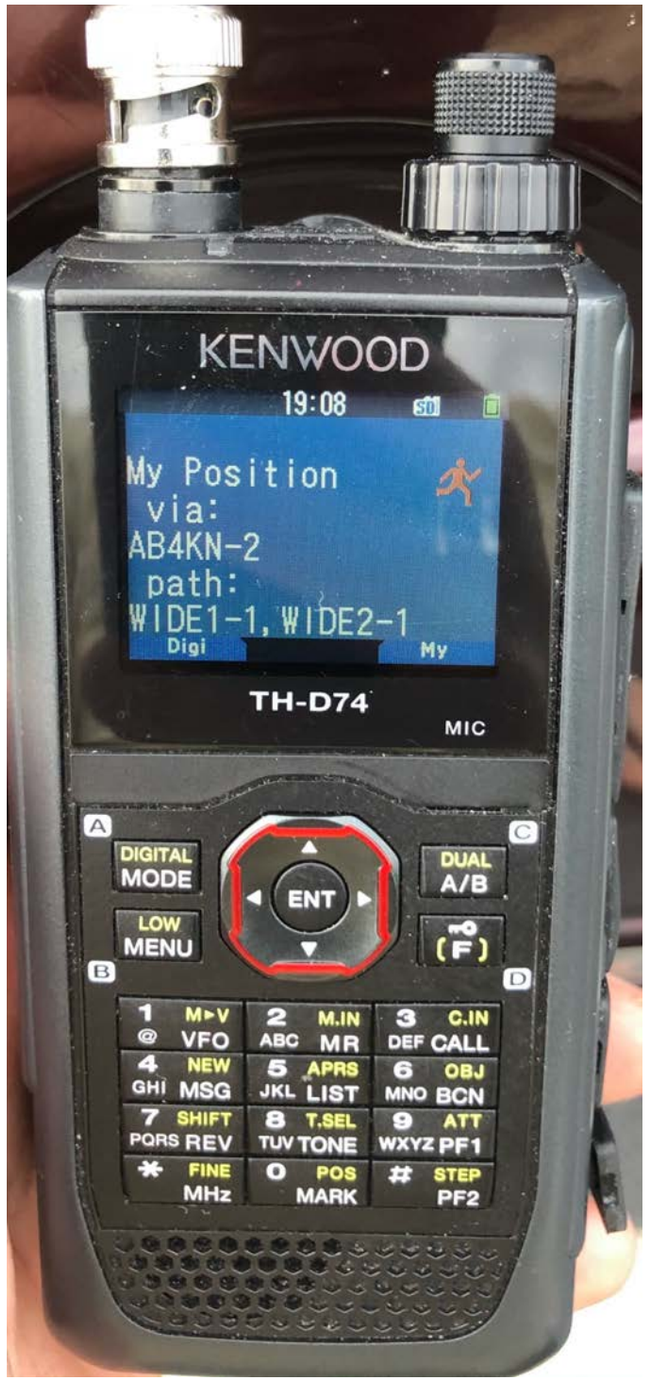
North America – 144.390 MHz



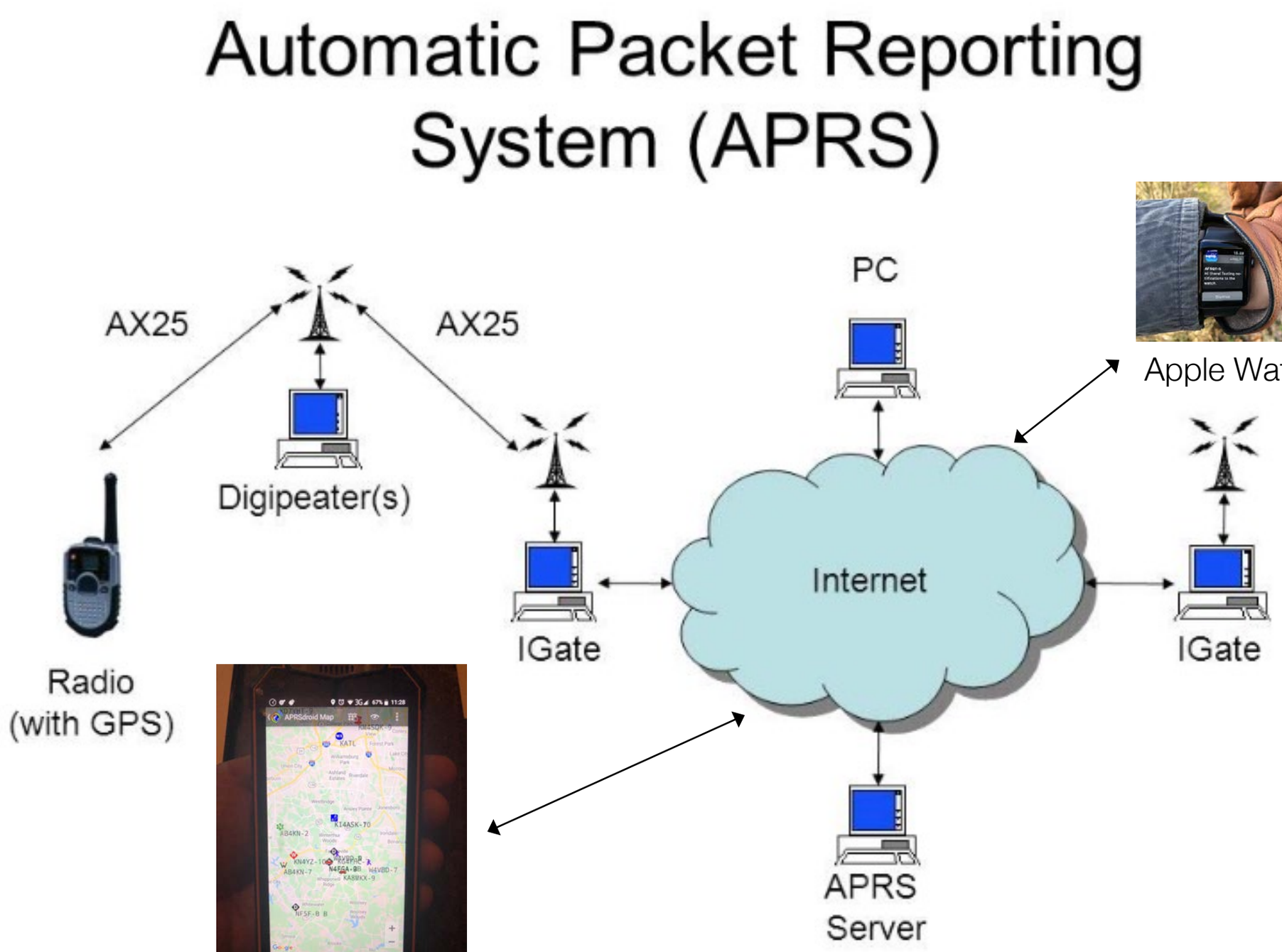
ARISS
145.825 MHz

How does APRS work?

- APRS - is a hybrid local RF and internet-connected system for exchanging messages, data, status updates, and positions.
- APRS works by transmitting unconnected digital packets containing a callsign, path, location, and other information.
- APRS is not true packet radio, but does use the AX.25 protocol typically at 1200 baud (although 9600 baud is supported in some cases)
- APRS uses a TNC (terminal node controller) to encode and decode digital data via audio tones over FM radio.
- APRS is very robust because any number of stations can receive and re-transmit packets.
- APRS packet traveling distance and re-transmit rate is controlled by a decay algorithm and instructions in the packet. Typically, stations use 2-hops as the default.
- APRS packet collision does occur, but over all the system is very reliable and robust.
- APRS digipeaters can receive and re-broadcast packets for greater range.
- APRS-IS is a gateway system to route APRS packets to/from the internet for greater range and capability



How does APRS work?



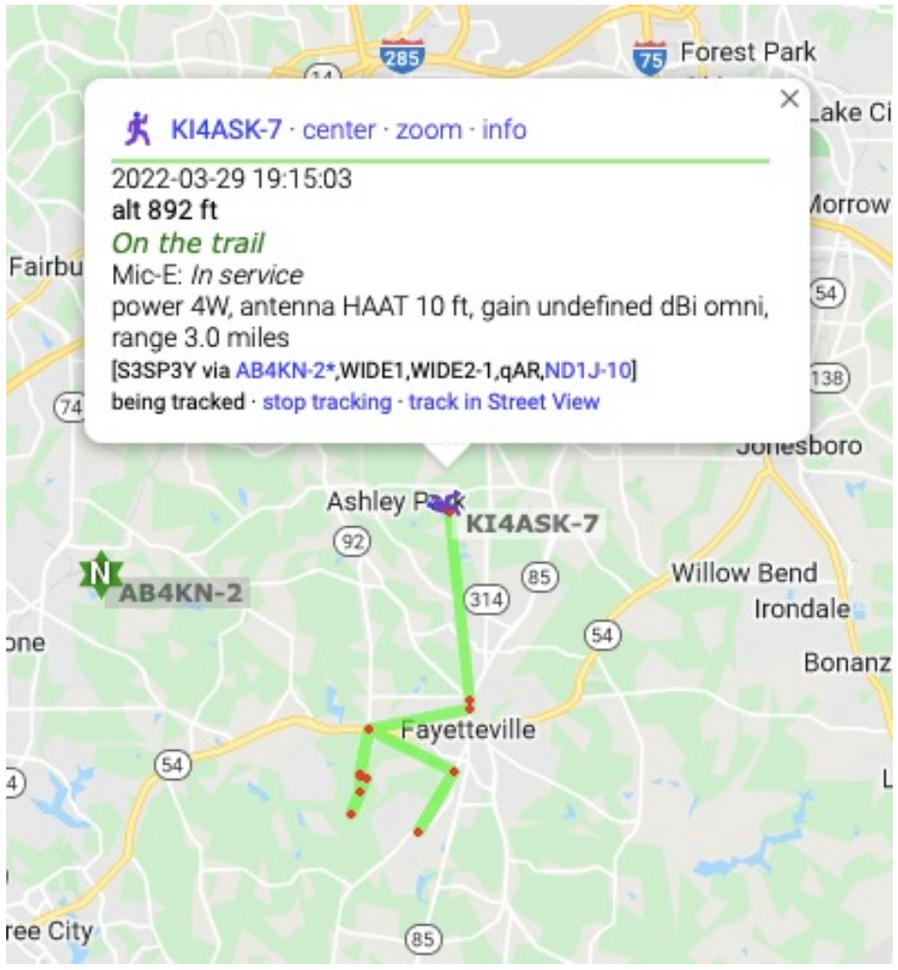
Source: Rick Fletcher, W7YP & Joe Domaleski, KI4ASK

How does APRS work?

- The APRS network is a very large land-based network
- It consists of nodes (stations) that are 2-20 miles apart
- Nodes relay messages through digipeaters to cover a wide area
- Many digipeaters are connected to Internet gateways to further extend the reach of APRS
- Satellite based digipeaters further extend the reach and capability of APRS
- Nodes connect to APRS in one of two primary methods
    - RF via VHF amateur radio
    - APRS-IS via Internet service

How does APRS work? SSID suffixes

- -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



- KI4ASK-7 via RF using Kenwood TH-D74 or Yaesu FT-3DR
- KI4ASK-10 via APRSDroid, phone using APRS-IS
- KI4ASK-15 via APRS.FI, iPhone

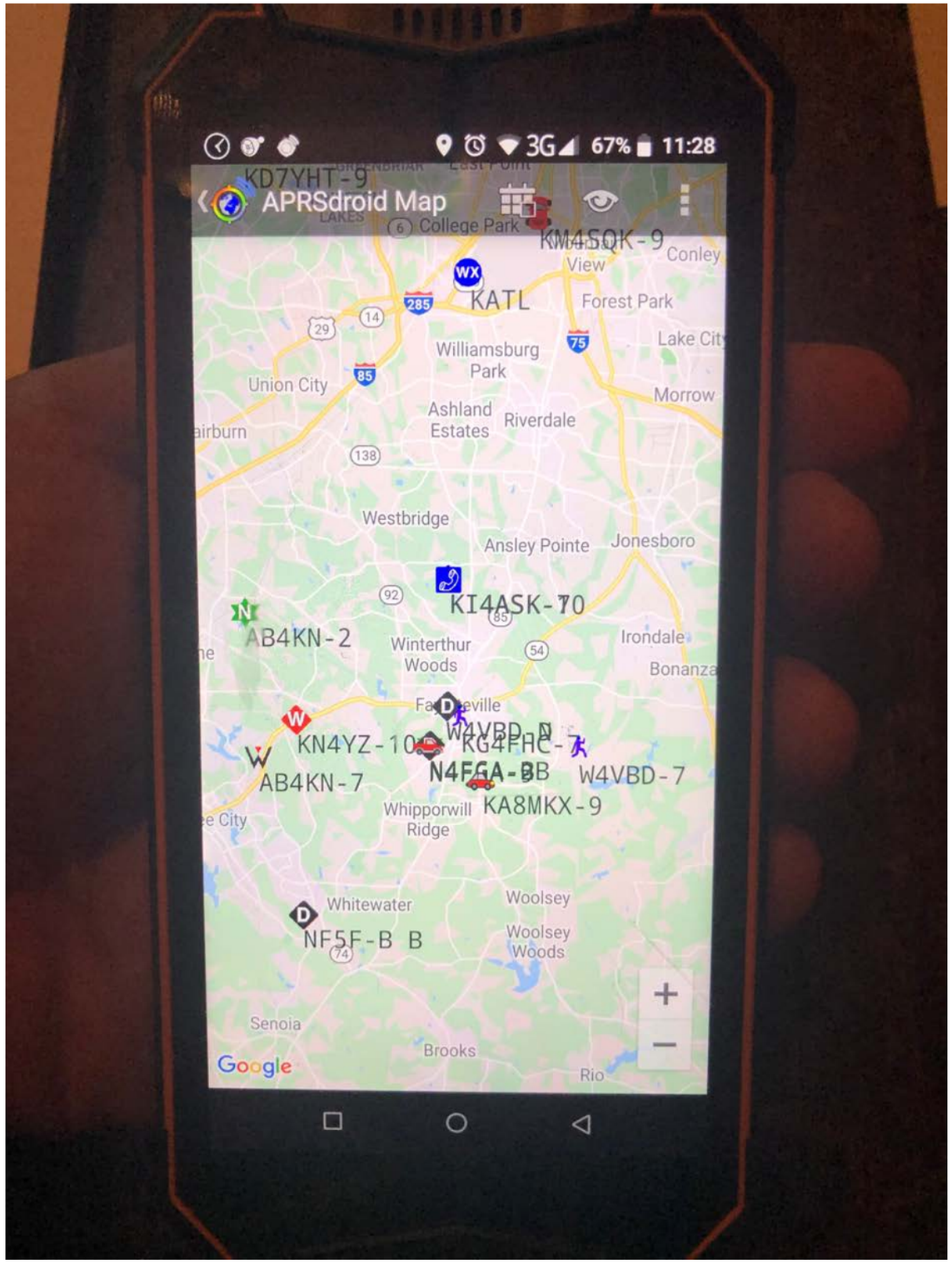
Using APRS with a radio

- Easiest way is to use a radio with built-in APRS capability
  - Yaesu FT-3D / FT-5D
  - Kenwood TH-D72 / TH-D74

- Almost any VHF radio can be used with APRS with the use of a TNC device
  - Mobilinkd – one of the easiest, most portable solutions.

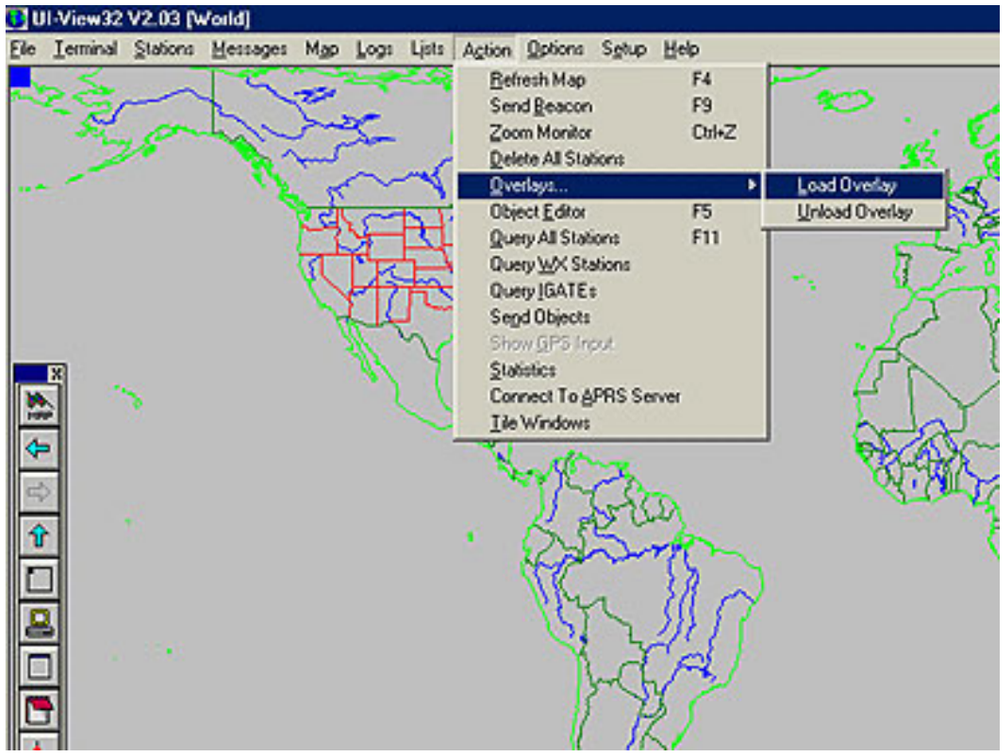
Using APRS with a mobile phone

- Android
    - APRSDroid – simply the best APRS application for any mobile device. Can be used with APRS-IS or connected to a radio via Bluetooth (or cable).
- iPhone
    - APRS.fi app
    - Pocket Packet
    - APRS Pro
    - Others



Using APRS with a computer

- Easiest way is to use a browser-based system like https://aprs.fi
- Various programs are available on different platforms
- Most of the development energy on apps have shifted to mobile operating systems (iOS and Android)
- If you want to explore APRS with a native PC app (MacOS, Windows, Linux), be prepared to sift through some old websites.



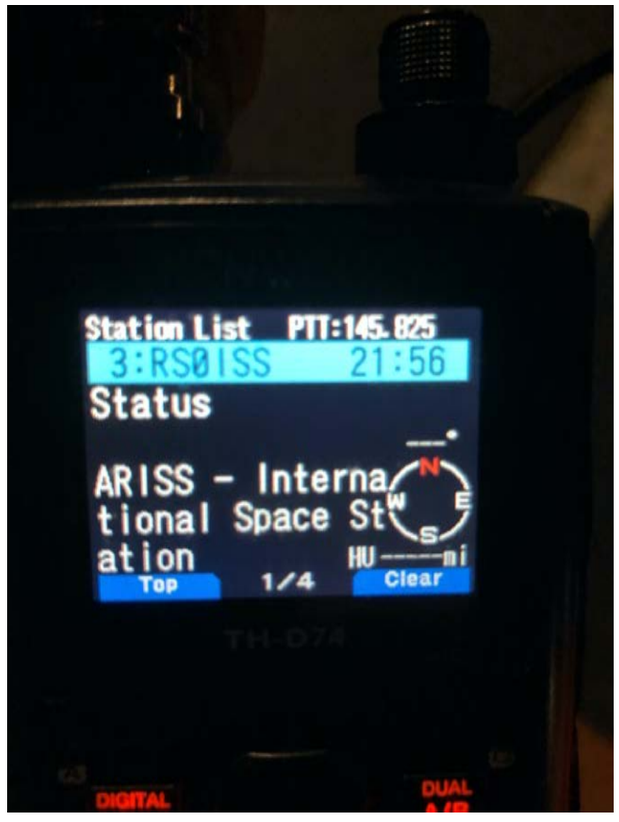
Original UI-View app used by many over the years on a PC. Current status is unknown since the author G4IDE is now a SK.

How I use APRS

- During field operations, I beacon using two methods
    - KI4ASK-10 via APRSDroid, phone using APRS-IS
    - KI4ASK-15 via APRS.FI, iPhone
    - KI4ASK-7 via RF using Kenwood TH-D74 or Yaesu FT-3DR
- My family knows how to lookup my position in case my cell phone has no coverage
- When I'm in a new area, I gain situational awareness by studying the local APRS map
- Many SOTA peaks and repeaters are on the APRS map, some include net information
- WX stations provide great hyper-local, pinpoint rain and temperature information
- APRS gateways are useful when I don't have cell phone coverage to get information
- I also use it for fun – making contacts via ISS or sending messages to friends like many of you

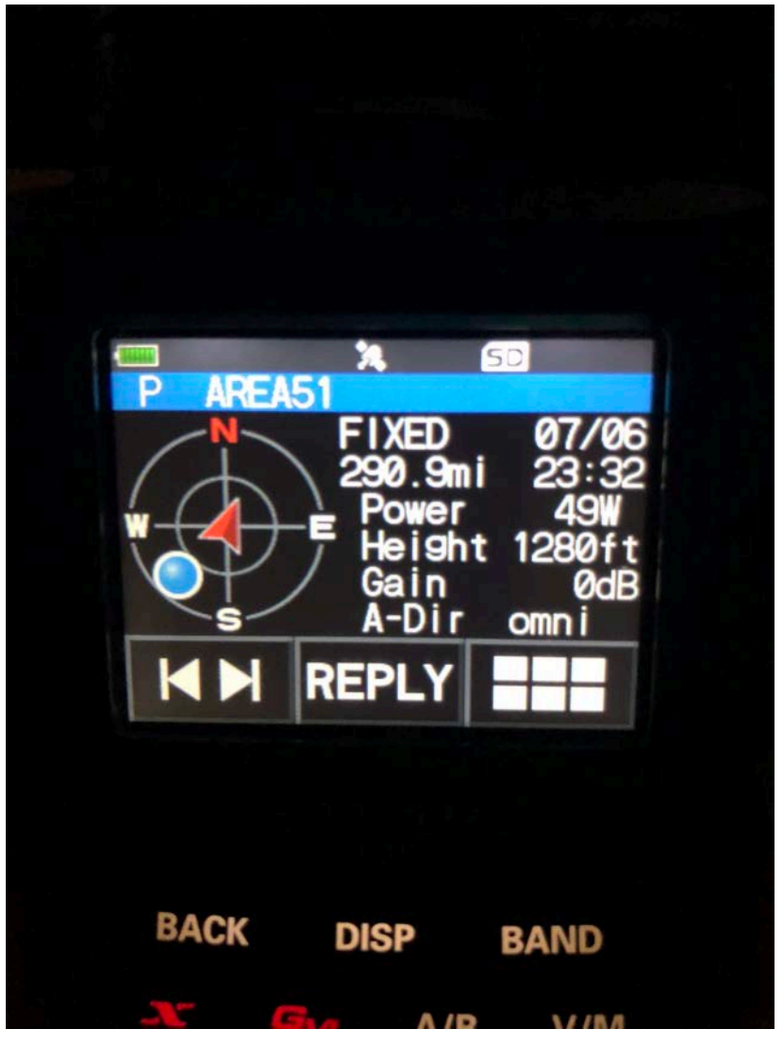
APRS via ISS / Satellites

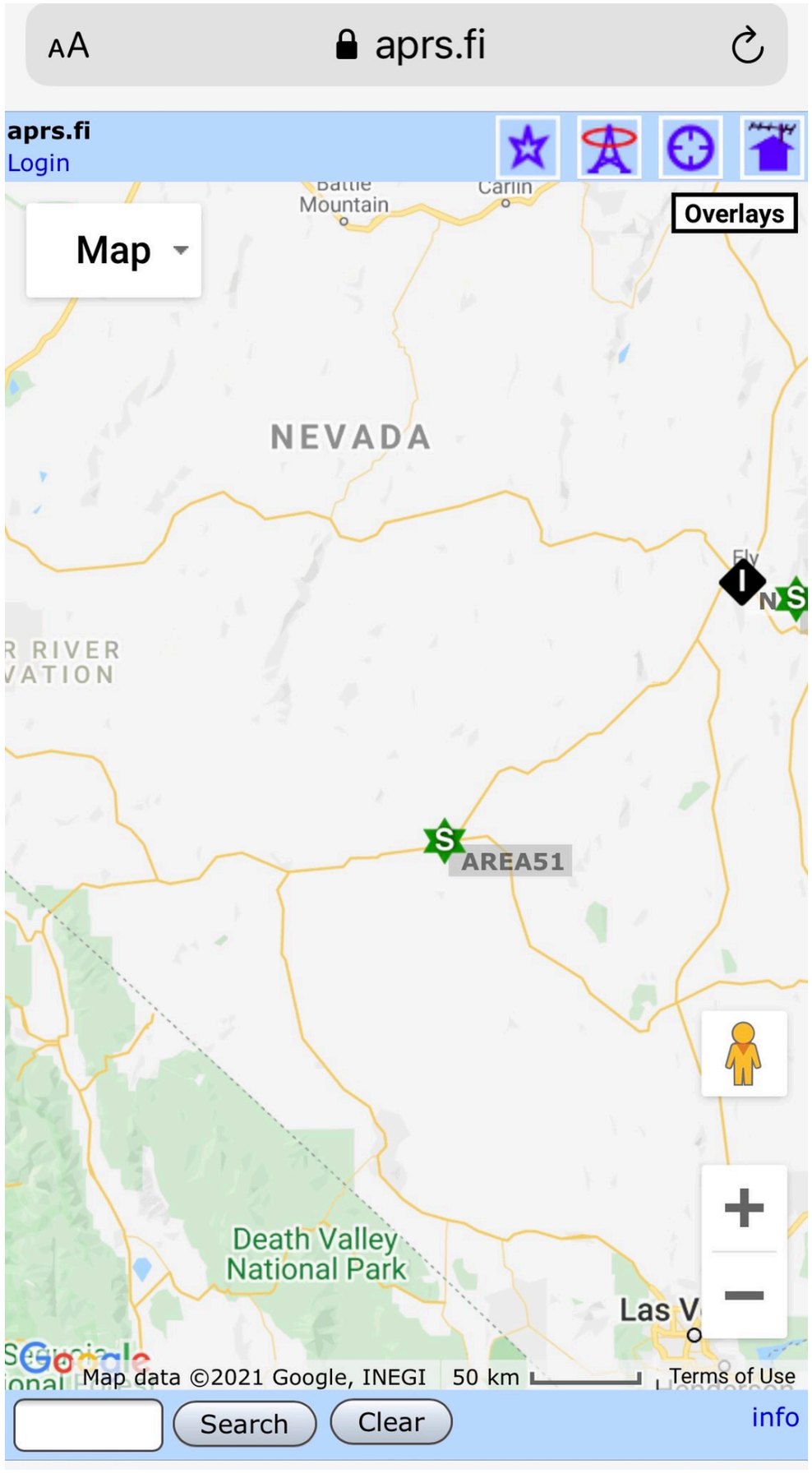
- APRS on the ISS is 145.825 MHz
- APRS digipath is ARISS
- ISS callsign is NA1SS / RS0ISS
- Other APRS satellites PSAT / PSAT2 / FalconSat
- Yagi helps, but you can just use the vertical whip antenna!



Area 51 is on APRS!

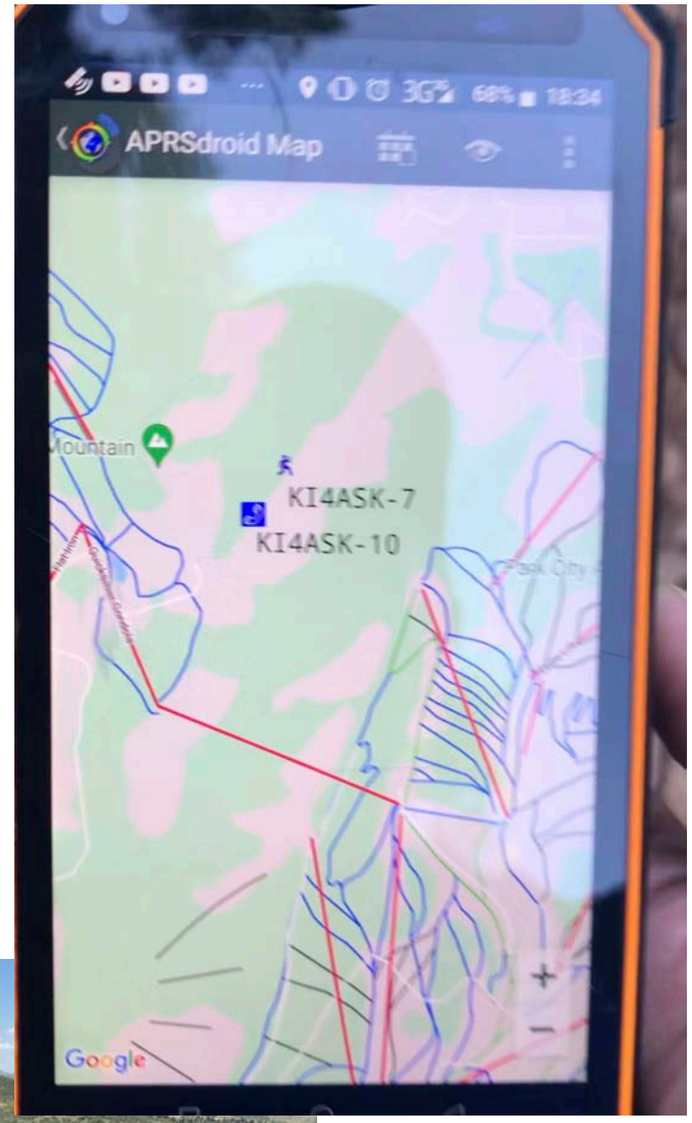
- Last summer, KI4HHI and I were visiting our daughter Tori in Salt Lake City.
- Of course, I brought my radios including my Yaesu FT-3 to work APRS.
- One evening, I received an APRS packet from Area 51 via RF and APRS-IS
- Here's a screen shot of each!

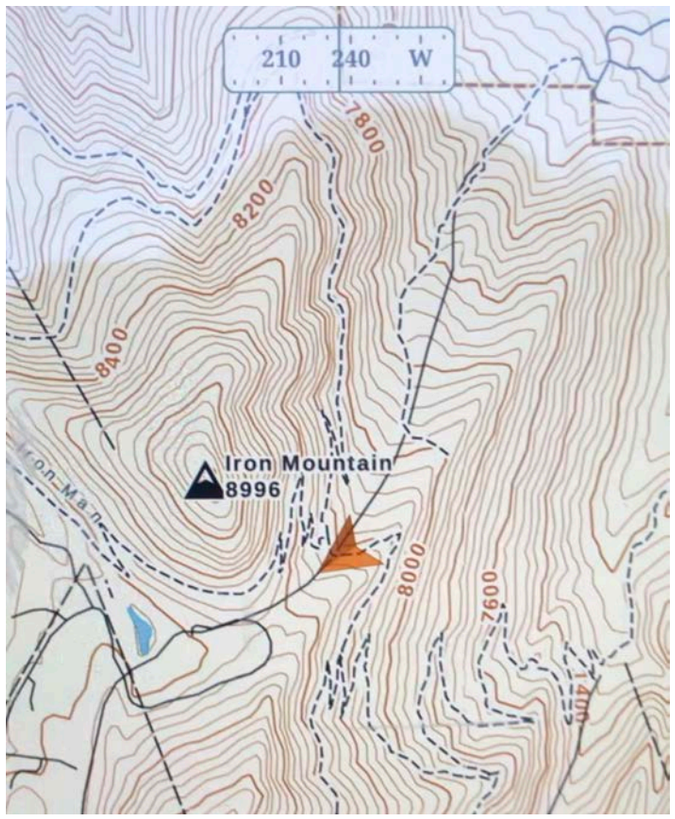


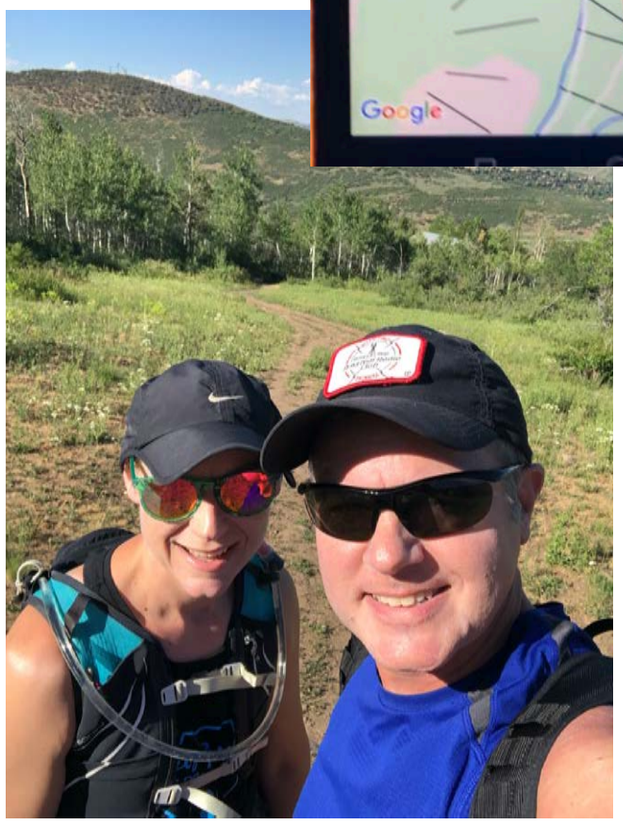


APRS helped us get home!

- During that same trip to SLC, we decided to do a SOTA activation of Iron Mountain, Utah – W7U/NU-057
- Click here for a YouTube video of the activation
- Our daughter Tori dropped us off and we were going to text her when to be picked up, but my phone died. We only had ham radio – but were beaconing APRS.
- We showed her how to use APRS.FI ahead of time and she used that to track our progress and descent from the summit.







SOTA auto-spot via SOTA2APRS

- any moving stations that use the 🚶 symbol will be shown with the SOTA summits nearby.
- in particular, **activators carrying an APRS tracker** (or an APRS enabled transceiver, or a mobile phone running an application like APRSdroid) will be shown on the map **with the location of the summit they are going to as ✕.**

SOTA auto-spot via SOTA2APRS

SOTA2APRS is an experimental service that posts the SOTA activations (spots and alerts) and some summit locations to APRS-IS. Web based clients showing the positions on maps include APRSDirect, APRS.fi or agwtracker.

SOTA2APRS reports

1. every activator "spotted" on SOTAwatch to APRS-IS with his current frequency as  (or  on some clients).
    - example: `ON6ZQ 007.032MHz SOTA activation ON/ON-001`
    - SOTA spots that contain the words "test" or "ignore" in their comment are not reported to APRS-IS.

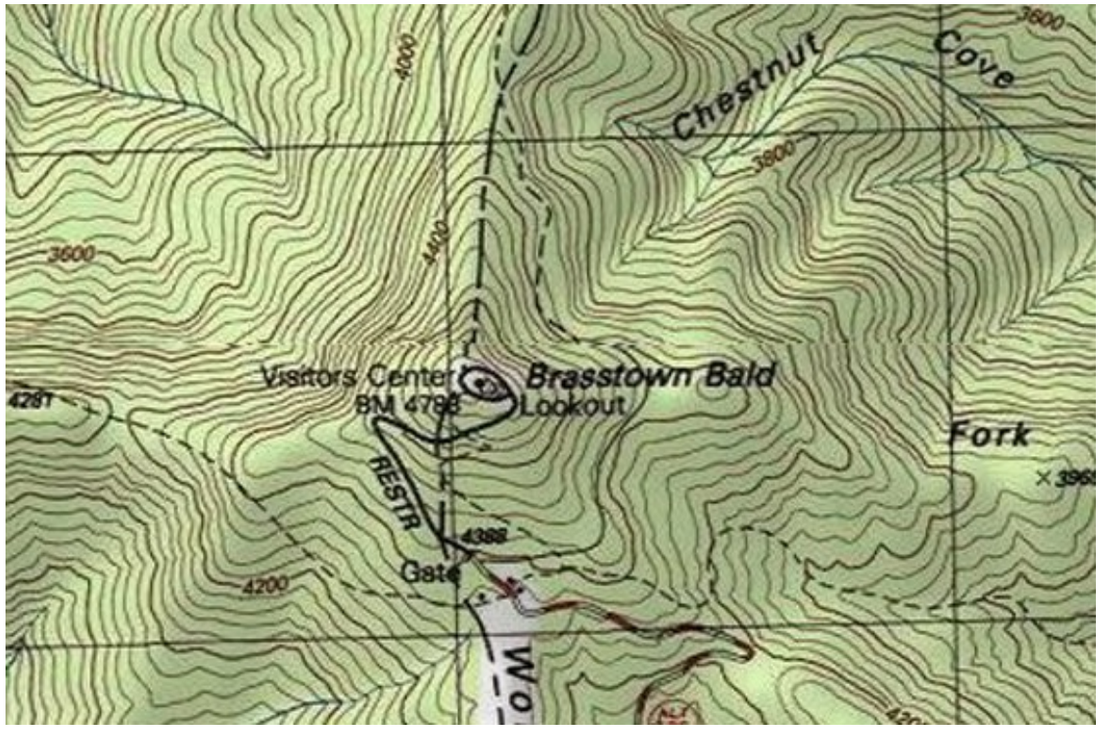
    Activators who would prefer NOT to be listed on APRS when their activations are spotted on SOTAwatch are welcome to let me know, and I'll make sure their callsign is added to the black-list.

2. every announced activation ("alert") with the date and time of planned activation as  (or  on some clients)
    - example: `ON/ON-001 SOTA activ. planned on YYYYMMDD HHMMz`

Click here for more information about SOTA2APRS

SOTA spot via APRS2SOTA

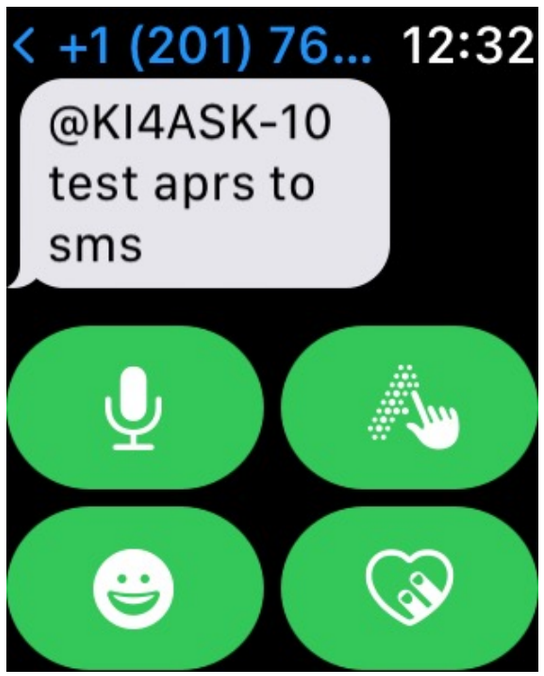
- Sending from APRS to SOTA
    - Address message to SOTA or APRS2SOTA
    - Message body
      <Assn/Ref> <Freq> <Mode> [callsign] [comment]
    - Example
      W4G/NG-001 146.520 FM KI4ASK CQ SOTA
- More information and registration (free)
  https://www.sotaspots.co.uk/Aprs2Sota_Info.php



How to send an SMS message via APRS

- Sending from APRS to SMS
  - Address message to SMSGTE
  - Message body
    @<number> <message>
  - Example
    @4048675309 No cell here, use radio
- Sending from SMS to APRS
  - Send SMS to SMS Gateway number
  - Message body
    @<callsign> <message>
  - Example
    @KI4ASK-7 Will contact u on 146.535
- More information and registration (free)
  https://smsgte.org

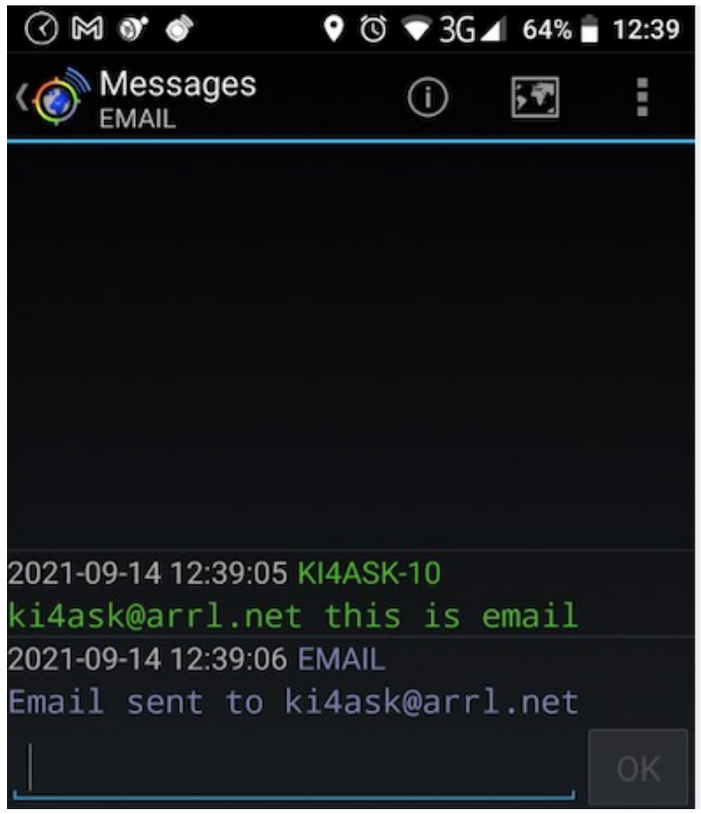
2021-09-14 12:31:51
EDT: **KI4ASK-10**>**SMSGTE**:
@6784649016 test aprs to sms



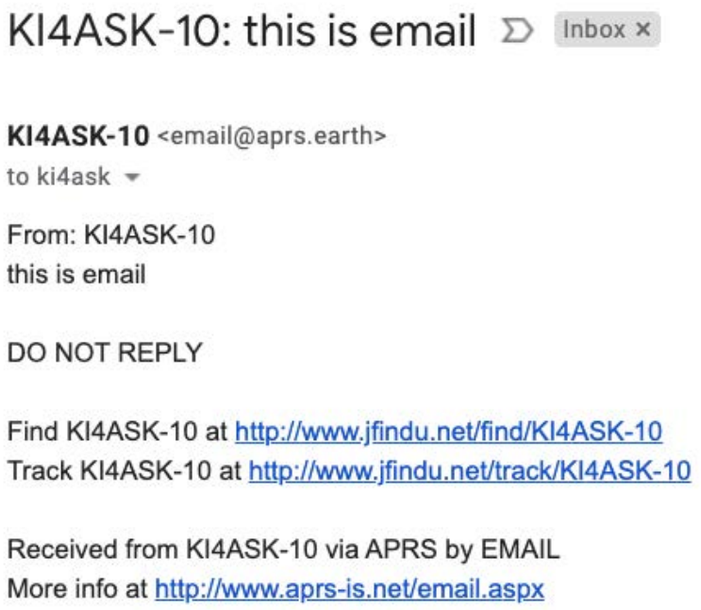
SMS on my
Apple Watch from APRS

How to send an email via APRS

- Sending from APRS to Email
  - Address message to EMAIL
  - Message body
    <email address> <message>
  - Example
    ki4ask@arrl.net this is email



- Sending Email to APRS
  - Bit more complicated
  - Requires registration to mitigate spam



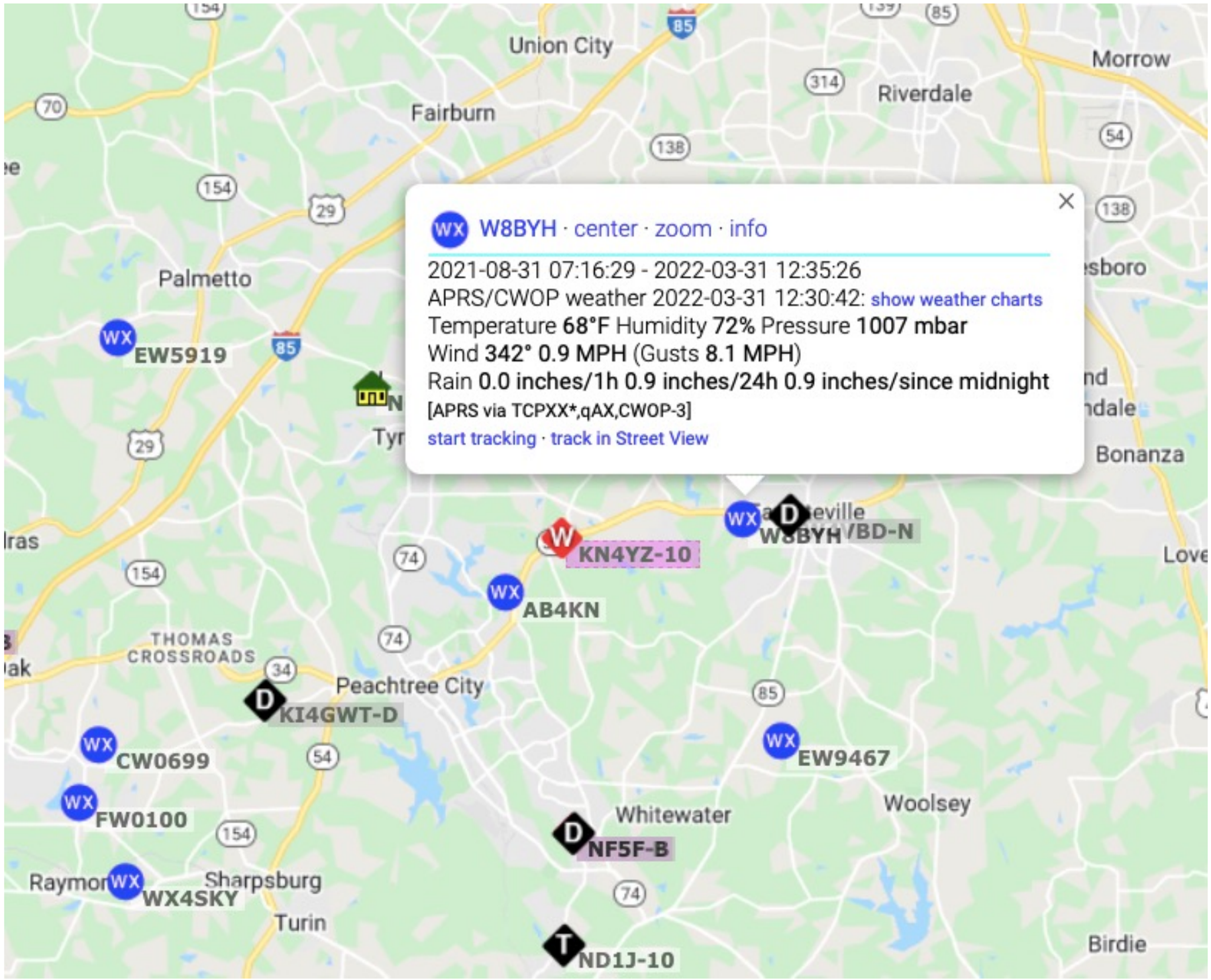
- More information and registration (free)
  http://www.aprs-is.net/email.aspx

Getting WX forecast via APRS

- WXBOT
    - Address message to WXBOT
    - Message body
      today
    - Replies with simple WX forecast
- WXYO
    - Address message to WXYO
    - Message body
      <callsign-SSID> or <grid locator>
    - Replies with more WX details

2021-09-14 13:15:40 EDT: KI4ASK-10>WXYO: KI4ASK-10
2021-09-14 13:15:46 EDT: WXYO>KI4ASK-10: Fayetteville in h light rain
T:29.63C,W159@1.71,H58,P1019hPa,rain 0
2021-09-14 13:15:51 EDT: WXYO>KI4ASK-10: .66mm,clouds 75 %

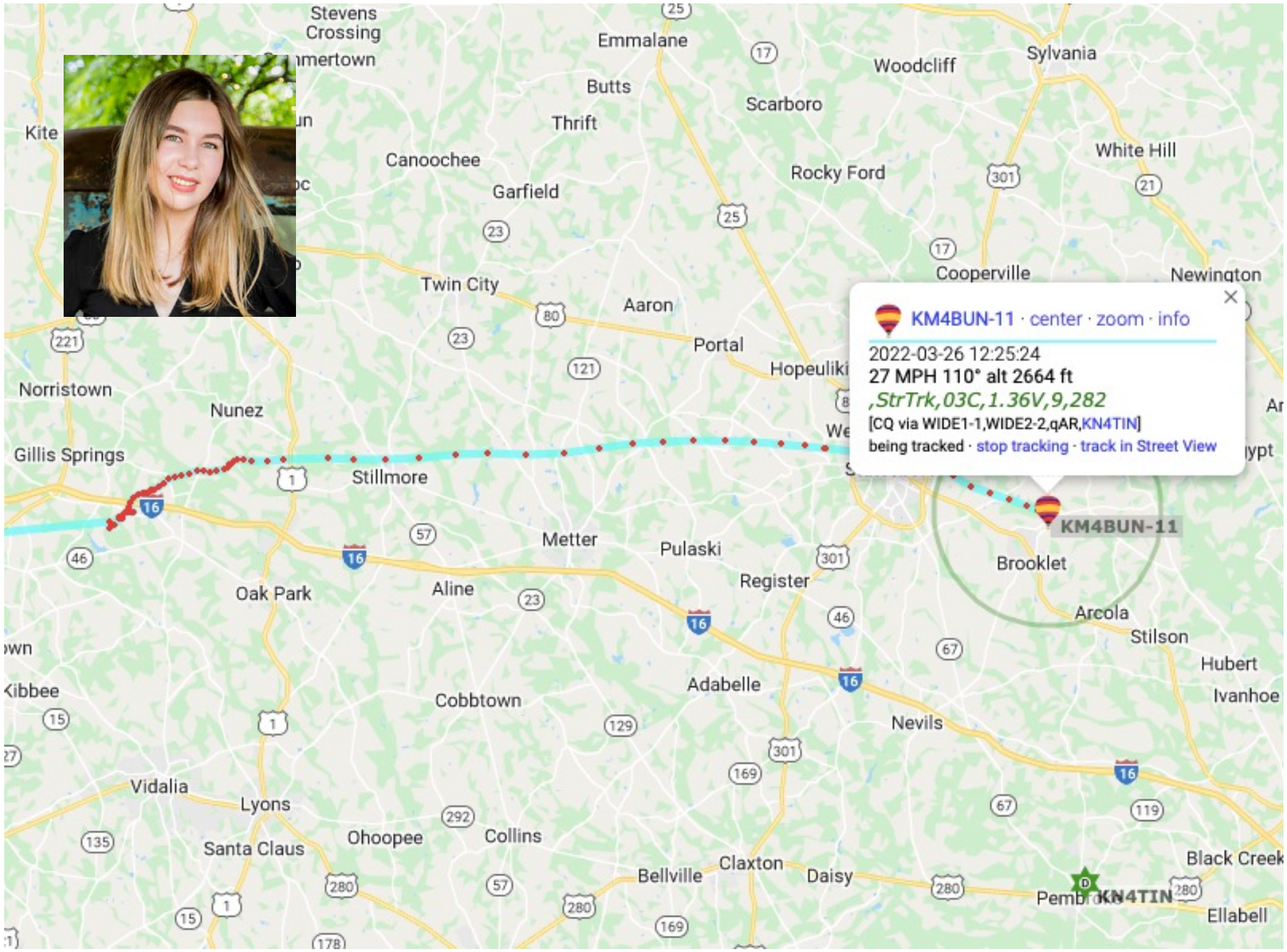
Getting WX forecast via APRS



Use interactive APRS app or website (APRS.FI) and view WX stations

Tracking balloons via APRS

- KM4BUN-11, Audrey McElroy 18yo YL in Cumming, GA launched a balloon with an APRS tracker last weekend. Balloon went east near Statesboro, GA.



Seeing who or what is nearby on APRS

APRS weather station **W8BYH** - show graphs

Location:	33°26.77' N 84°28.65' W - locator EM73SK27QB - **show map** - **static map** 1.3 miles West bearing 262° from Fayetteville, Fayette County, Georgia, United States [?] 2.9 miles North bearing 350° from Shannon, Fayette County, Georgia, United States 21.5 miles South bearing 194° from Atlanta, Fulton County, Georgia, United States 74.2 miles Northeast bearing 23° from Columbus, Muscogee County, Georgia, United States
Last position:	2022-03-31 12:40:26 EDT (2m20s ago) 2022-03-31 12:40:26 EDT local time at Fayetteville, United States [?]
Last WX report:	2022-03-31 12:40:26 EDT (2m20s ago) – show weather charts 67 °F 66% 1007.0 mbar 2.0 MPH Northwest
Device:	Unknown: Unknown
Last path:	W8BYH>APRS via TCPXX*,qAX,CWOP-5
Positions stored:	2
Packet rate:	300 seconds between packets on average during 14700 seconds.
Other SSIDs:	W8BYH-1 W8BYH-7

Last heard a station directly: 2022-01-11 20:57:50 EST (78d 14h44m ago)

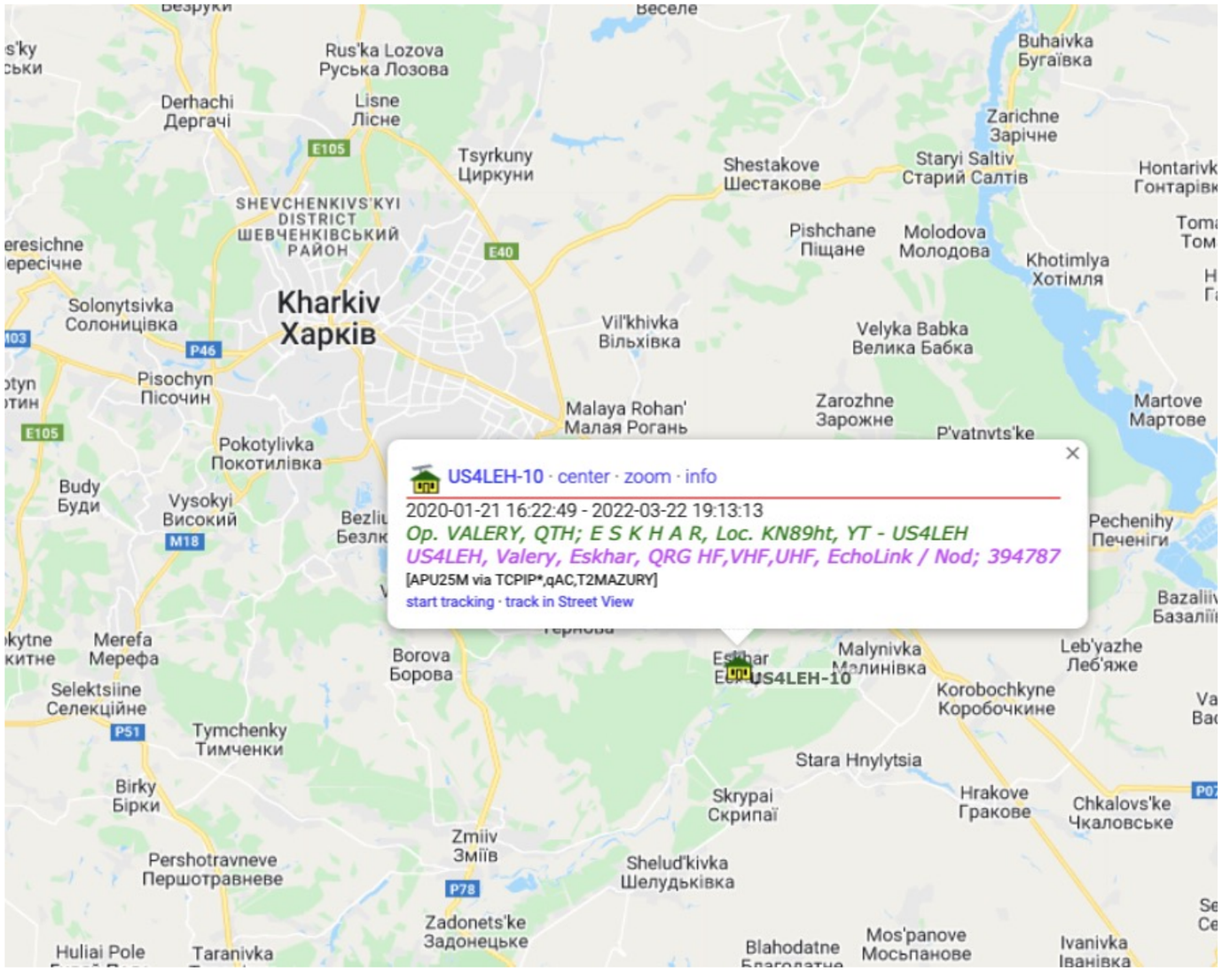
Stations near current position of **W8BYH** - show more

callsign	distance	last heard - EDT	callsign	distance	last heard - EDT
W4VBD-N	0.9 miles 83°	2022-03-31 12:29:15	N4FGA B	1.2 miles 161°	2022-03-18 12:38:03
N4FGA-B	1.2 miles 161°	2022-03-18 12:38:13	KG4FHC-9	1.4 miles 90°	2022-03-31 07:36:43
WL7GV-10	1.8 miles 154°	2022-03-27 22:19:35	W9NLU	2.3 miles 315°	2022-03-26 22:18:43
EW9807	2.5 miles 36°	2022-03-31 12:40:52	**KN4YZ-10**	3.7 miles 265°	2022-03-31 12:19:56
KI4ASK-15	4.1 miles 14°	2022-03-29 21:57:41	KI4ASK-11	4.1 miles 14°	2022-03-29 15:14:51
KI4ASK-7	4.1 miles 14°	2022-03-31 10:56:54	**EW9467**	4.6 miles 170°	2022-03-31 12:42:12
AB4KN	5.1 miles 253°	2022-03-31 12:38:47	AB4KN-7	5.1 miles 253°	2022-03-07 12:06:49
AB4KN-2	6.0 miles 300°	2022-03-31 12:41:45	KN4LQA	6.8 miles 295°	2022-03-26 08:05:55
KY4RJP-14	7.1 miles 241°	2022-03-17 19:29:17	**NF5F B**	7.3 miles 209°	2022-03-31 12:37:30
NF5F-B	7.3 miles 209°	2022-03-31 12:37:40	K6BET-7	7.9 miles 246°	2022-03-15 03:47:06

Use interactive APRS app or website (APRS.FI) and view WX stations

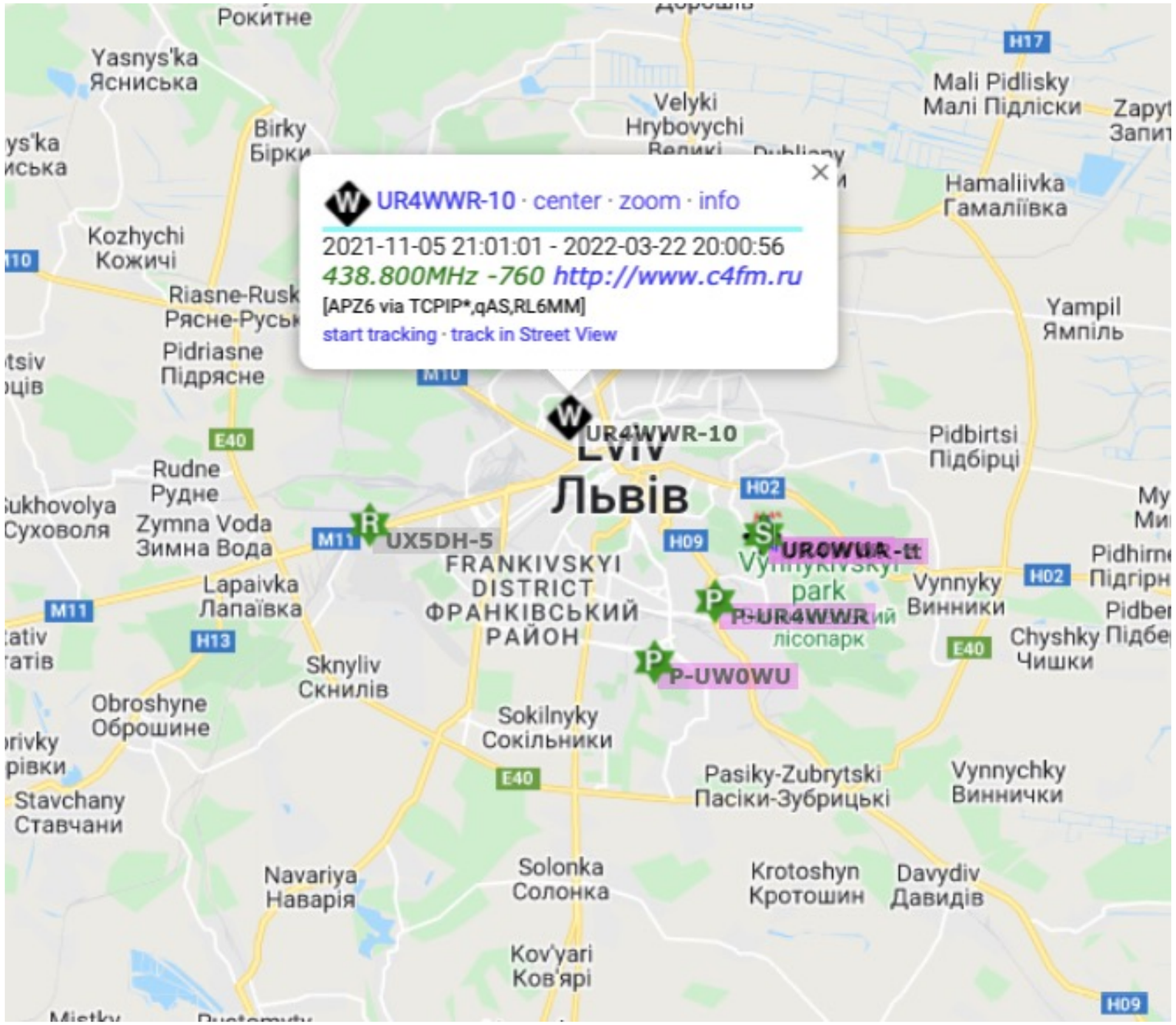
Monitoring Ukraine via APRS

- I use APRS.FI to monitor APRS world-wide
- Right now, Amateur Radio has been suspended in Ukraine, but…
- Here's a hotspot in Kharkiv



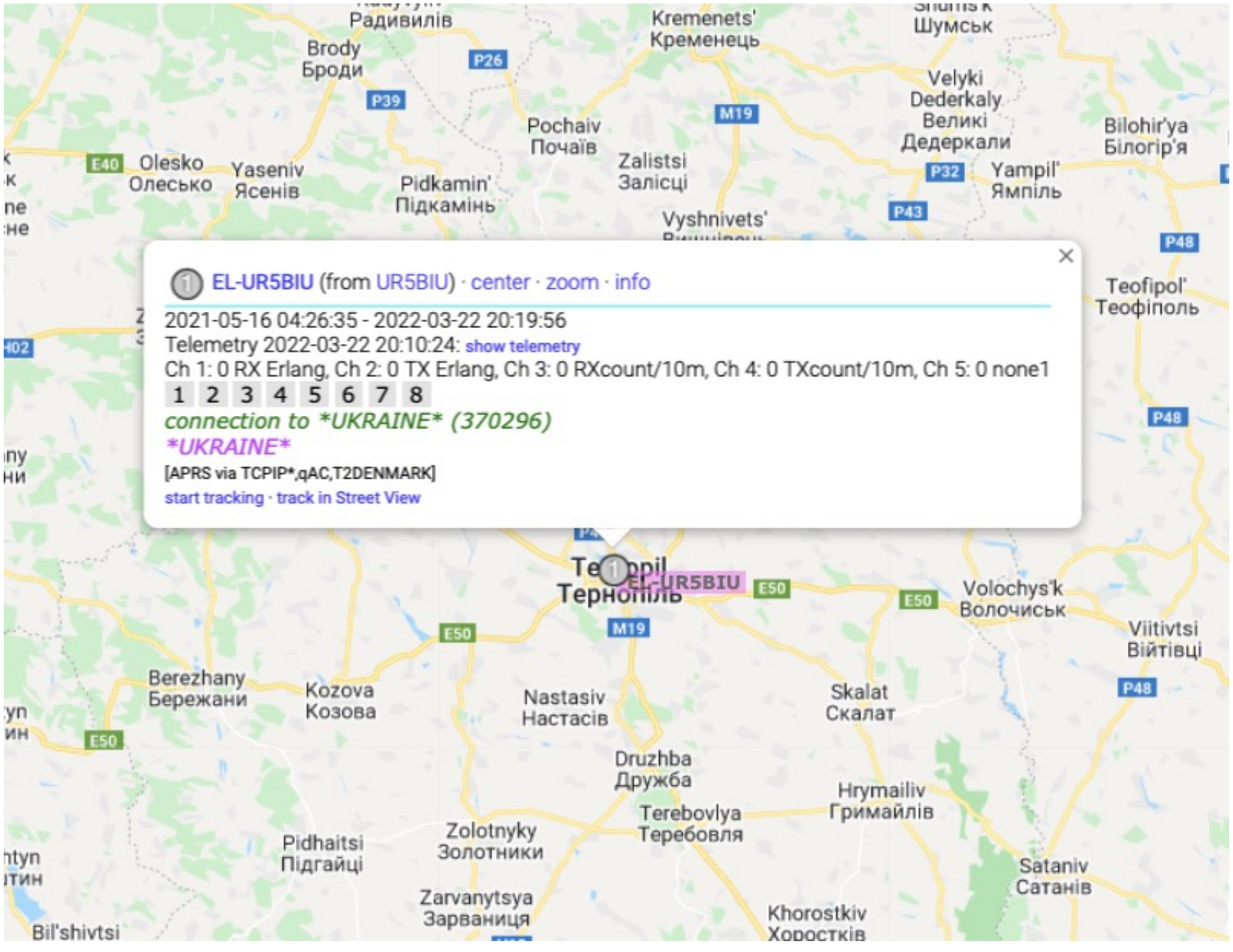
Monitoring Ukraine via APRS

- Here’s some repeaters in Lviv, western Ukraine



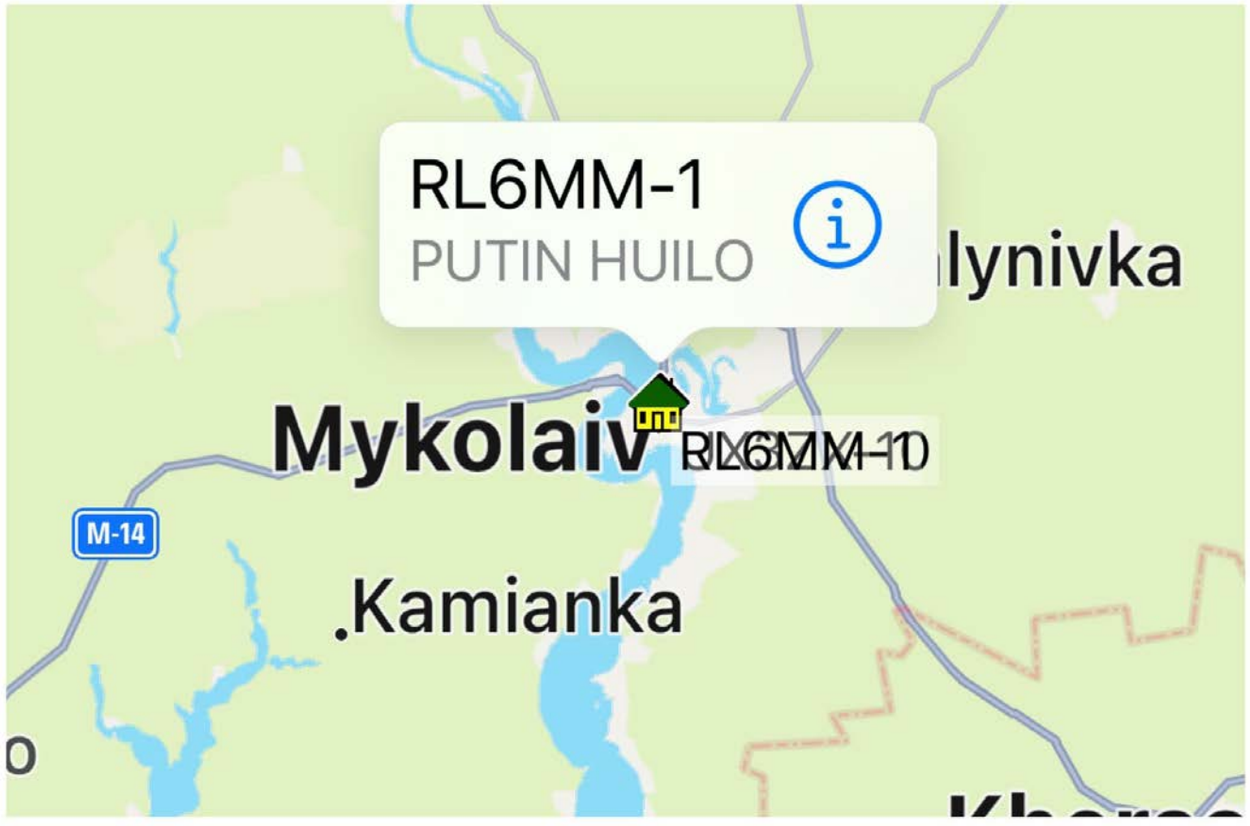
Monitoring Ukraine via APRS

- Here's an active Echolink node in Ternopil, Ukraine



Monitoring Ukraine via APRS

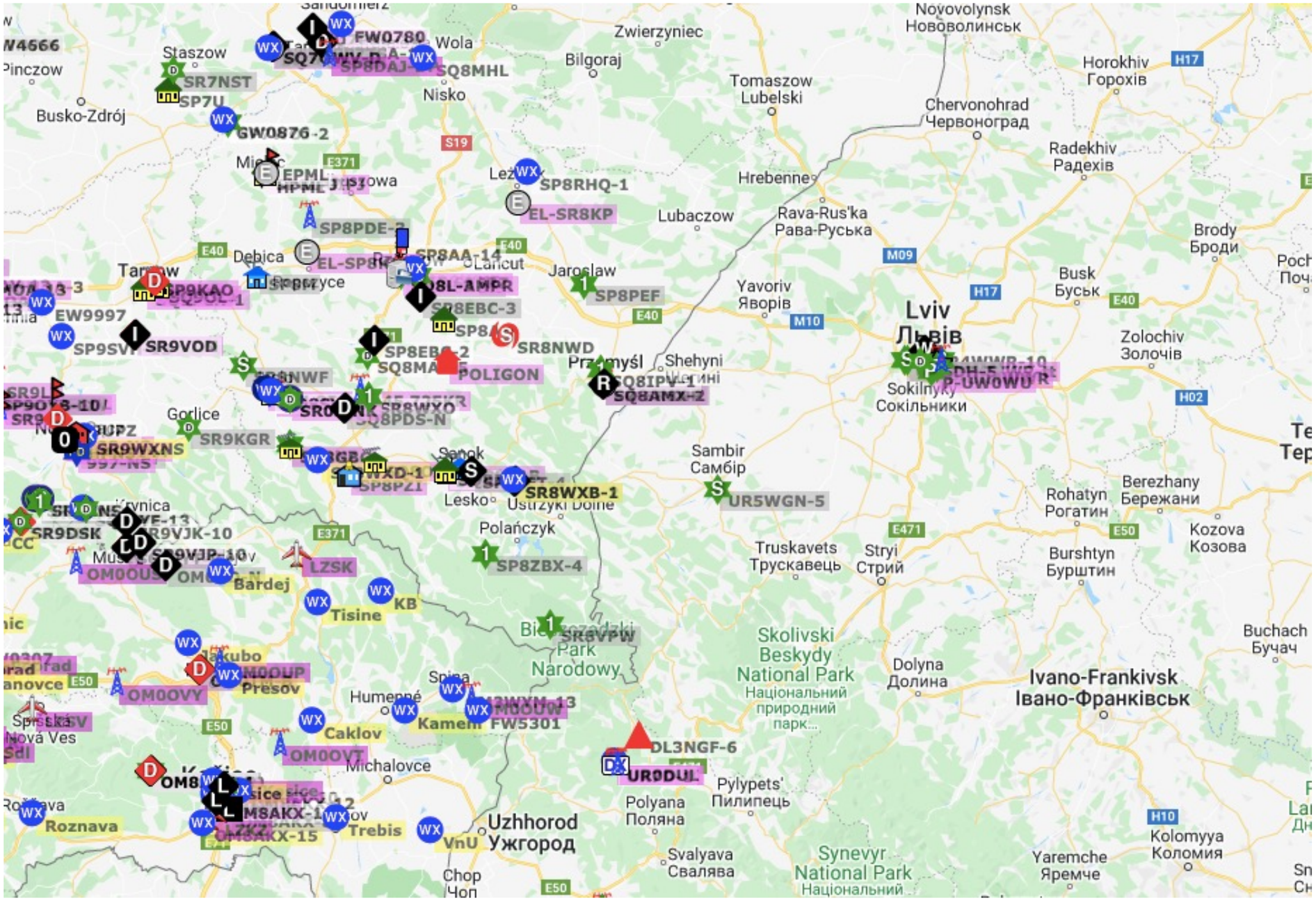
- This APRS station in Mykolaiv along the Black Sea coast has a message for Putin



Distance	5635 miles
Bearing	38°
Position resolution	20 yards
Location	Mykolayiv, Mykolaiv Oblast, Ukraine

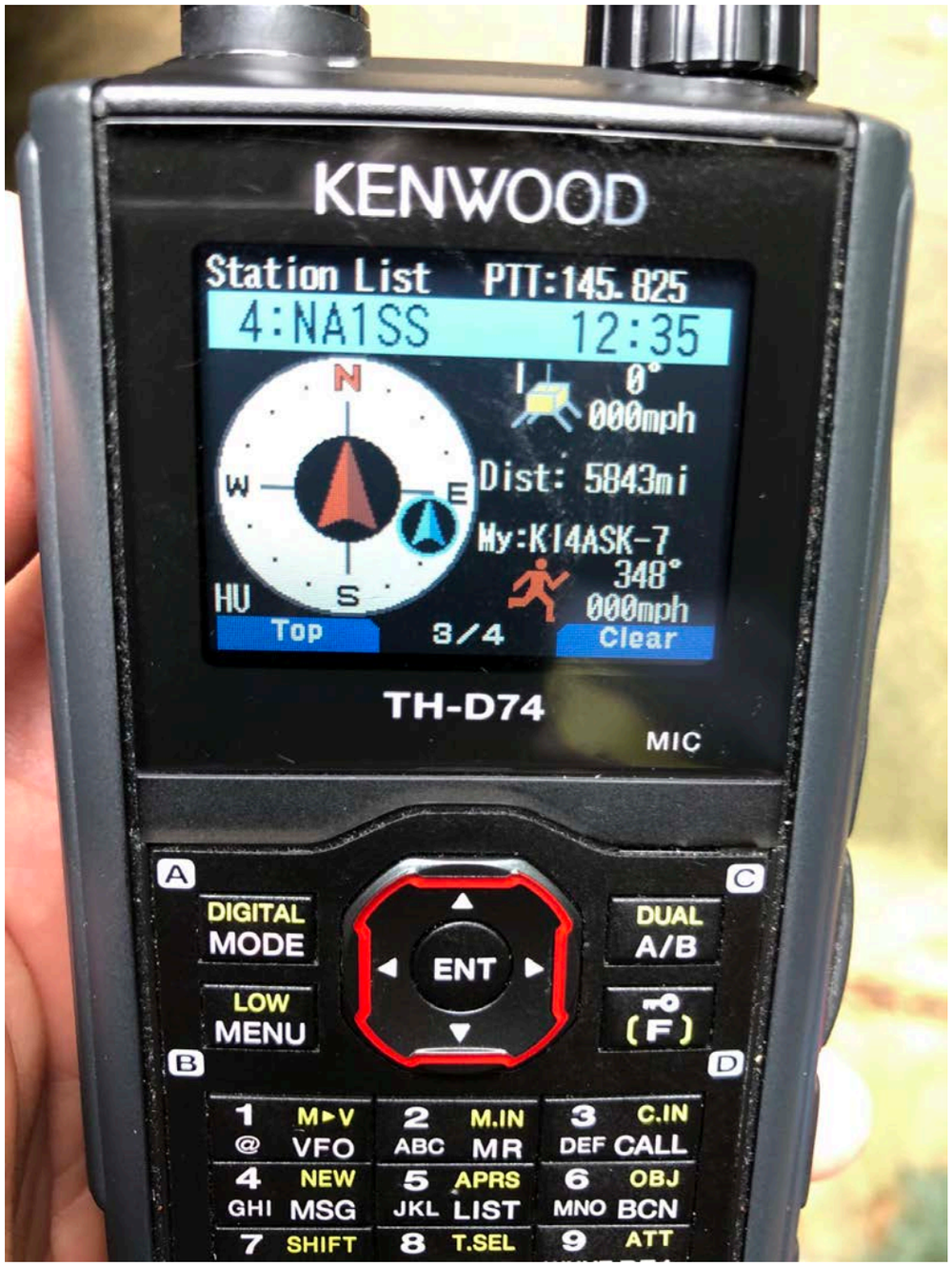
Monitoring Ukraine via APRS

- Poland (left) vs. Ukraine (right) APRS traffic along the border



Other APRS Gateways

- SOTA Watch spots
- Amateur radio satellite passes
- Winlink gateway
- Twitter gateway
- QRZ.com query
- Position lookup of a callsign
- For more information: http://www.t08.net/aprs-en/



About the presenter

- Joe has been using APRS for almost 20 years and currently beacons via APRS-IS (KI4ASK-15) and via RF (KI4ASK-7).

- Joe is active within ARRL, currently serving as an appointed Assistant Section Manager in the Georgia Section and as a member of Fayette County ARES. He has completed all three levels of the ARRL Emergency Communications courses and is an ARECC training mentor. He also serves as a volunteer examiner within the ARRL, W5YI, W4VEC, GLAARG, and Laurel VEC programs. He is a past President of the Fayette County Amateur Radio Club.

- Joe Domaleski, currently serves as the Public Information Officer (PIO) for Georgia AUXCOMM and is a board member. He has attended FEMA COML, COMT, and AUXC training.

- Joe is a licensed amateur extra class operator as KI4ASK and holds a GMRS license as WRCL957. His wife Mary Catherine is licensed as KI4HHI. They enjoy POTA, SOTA, fox hunting, and working amateur radio satellites. They were on the cover of CQ Amateur Radio magazine in February 2020. They enjoy sharing the hobby with others and have been interviewed on YouTube and spoken at hamfests.

- Joe has a BS in Mathematics/Computer Science from UNG and an MBA from GSU. He is a proud Army veteran. He currently owns and operates Country Fried Creative, a digital marketing agency, that was the 2021 Small Business of the Year for Fayette County. He is the past Board Chair of the Fayette County Chamber of Commerce.

- Joe and Mary Catherine Domaleski have three grown children and reside in Fayetteville, GA where they are active with the Fayette County Amateur Radio Club and Fayette County ARES.