HAM RADIO & DIGITAL EMERGENCY COMMUNICATIONS

APRS: MORE THAN JUST BEACONING

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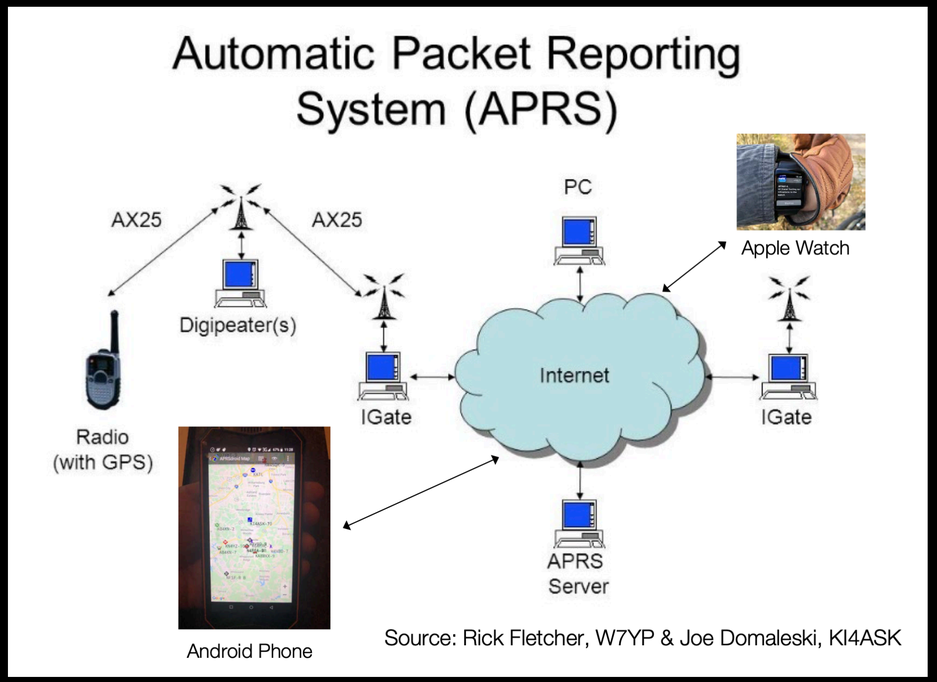
WHAT IS APRS?

- Automatic Packet (Position) Reporting System
- Developed by Bob Bruninga, WB4APR, in the late 1980s
- Sends real-time data: positions, messages, telemetry



- 1982: Early packet experiments
- 1990s: APRS protocol standardized
- 2000s+: APRS integrated into ham radios (Kenwood, Yaesu, etc.)
- Now: Global coverage via internet & satellites

APRS began life as a US Navy project to plot Navy position reports.
It currently uses unnumbered AX.25 frames transmitted for anyone to receive and use.
Each frame or packet is complete or self-contained. Each frame is also limited in the data it can contain.

CURRENT USES

- **Asset Tracking:**
  Monitor the real-time location of vehicles, boats, weather balloons, and even hikers in remote areas using GPS-equipped APRS trackers.

- **Emergency Communications:**
  Relay critical information, coordinate rescue operations, and track emergency vehicles in the field during disasters.

- **Weather Reporting:**
  Collect and share weather data (temperature, humidity, pressure) from individual stations and relay alerts from the National Weather Service.

- **Event Management:**
  Track participants in public events like marathons or air shows, monitor checkpoints, and mark points of interest such as aid stations or bathrooms.

- **Situational Awareness:**
  Provide real-time information on local events, traffic, direction finding, and the status of other amateur radio stations and repeaters.

- **Social Networking & Messaging:**
  Connect with other ham radio operators to exchange short text messages, bulletins, or participate in events and contests.

COMMON FREQUENCY

144.390 - simplex
North America

144.800 Europe
145.175 Australia

You can use your own frequency
to keep your transmissions more local

EQUIPMENT

- Hand Helds, Mobiles & HF with APRS capabilities
  Kenwood, Anytone, Yaesu, iCOM (DPRS)
  Other Devices can use a device such as MobilinkD, DigiRig, Signalink etc.

- Digipeaters
  rebroadcast messages WIDE1-1, WIDE2-2

- iGate
  receive and transmit messages to the internet

How does APRS work?

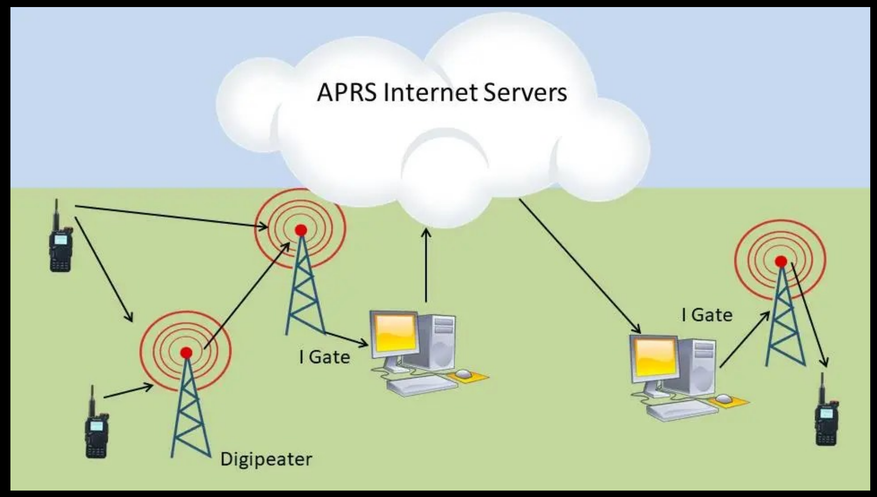
- The APRS network is a very large land-based network
- It consists of nodes (stations) that are 2-20 miles apart
- Nodes relay messages through digipeaters to cover a wide area
- Many digipeaters are connected to Internet gateways to further extend the reach of APRS
- Satellite based digipeaters further 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

https://kk4gq.org/pdf/FCARC-March-2022-Fun-an
webcopy.pdf

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

APRS - PATHS - WIDE?



Extends the range of your transmission
Wide1-1 or Wide 2-2.
The first digit is the number of times you want your packet retransmitted by the digipeater network. The second number indicates the number of hops your message has already gone.

That means with a Wide2-2 path, after the first hop the second digipeater will see that the message has hopped once and will retransmit the packet. The third digipeater that receives the message will see the message has hopped twice and will not retransmit the packet.

Reduce network traffic.

In many cases, the Wide2-2 will result in a packet being picked up by an iGate enabled digipeater. The iGate inserts the package into the internet data stream. The system removes duplicate packets in the internet data stream..

In APRS dense areas, Wide1-1 will get your message out just fine. In more remote areas, a Wide3-3 setting might be necessary. Since Wide 3-3 allows for many more duplicate packet broadcasts, **it's not a normally recommended** path designator. Wide 2-2 will likely be enough.

BEACON WITH GPS + BAND INFO

NORMAL BEACON: POSITION ONLY.

EXTENDED BEACON EXAMPLE:
VE3XBI>APRS,WIDE1-1:!4403.50N/07927.80W-LISTENING ON BAND A: 146.520 MHZ
LETS OTHERS KNOW YOUR POSITION AND OPERATING FREQUENCY.

Radios equipped with a QSY feature can copy this info into the other band of their radio (Freq, Tone, Shift)

APRS - QSY FUNCTION

The **QSY feature** in APRS-enabled ham radios lets you instantly switch to another operator's **voice frequency** that's broadcast in their APRS beacon. When you see their station on your display, you can press "QSY," and your radio automatically tunes to their listed voice channel so you can talk directly.

Great feature for Emergency Situations

Note: on Kenwood 710D you press the TUNE button

QSY AND EMCOMM

1. Trained communicators (TC) can add ***ACS*** to their beacon message
2. EOC can see if there are local trained communicators (***ACS***)
3. If there is an emergency the TC will get an APRS message and can QSY
4. Bulletin messages can also go out
5. Position information is sent from both EOC and TC

APRS MESSAGE FORMATTING

STANDARD MESSAGE: CALLSIGN>DEST,PATH:MESSAGE

WEATHER EXAMPLE:

VE3XBI>APRS,WIDE1-1,WIDE2-1:@092345Z4403.50N/
07927.80W_180/007G015T073R000P000P000H50B10150

INCLUDES: POSITION, WIND, GUST, TEMP, RAIN, HUMIDITY, PRESSURE.

CHARACTER SET GUIDELINES

General Use:
Stick to upper-case letters (A-Z), numbers (0-9), and a few basic symbols like hyphen (-), underscore (_), plus (+), and tilde (\~) for broad compatibility.
SSIDs & Callsigns: Use only 1 or 2 upper-case alphanumeric characters for your SSID and ensure callsigns are in upper-case.

Unicode/Emoji:
Standard APRS packets generally do not support Unicode or graphic emoji, as the packet size is too small to accommodate them.
Message Length & Truncation

Packet Overhead:
APRS packets have a total size limit of around 255 bytes, but the path information (like digipeater hops) consumes a significant portion of this.
Practical Limit: For third-party sending, the effective message length is often much shorter, typically around 47 characters to prevent your message from being cut off.

Specific Applications:
Email/SMS: For messages sent via gateways, you might be restricted to one-line messages, with a total length of approximately 67 characters including the recipient's address.
MeshCom Nodes: MeshCom nodes may accept longer messages, potentially up to 180 characters, though this depends on the server's limits.

APRS IN EMERGENCY COMMUNICATIONS

Share live locations of operators & vehicles.

Send text/status messages when cell towers fail.

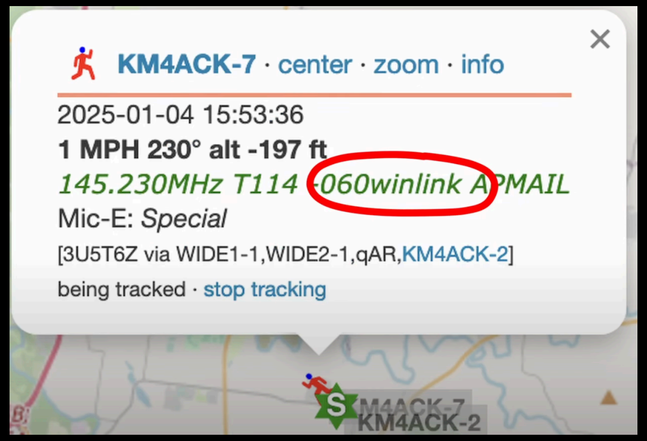
Transmit weather, alerts, and disaster info.

Coordinate volunteers and first responders.

AutoTune feature can aid in Emergency Situations

APRS AND WINLINK

Integration between APRS and Winlink allows amateur radio operators to send and receive text messages and emails over the air, primarily in emergency or off-grid situations. This capability is available using standard APRS-capable radios by sending specific commands to a Winlink gateway station (WLNK-1).



https://youtu.be/47OGdmm-jEY

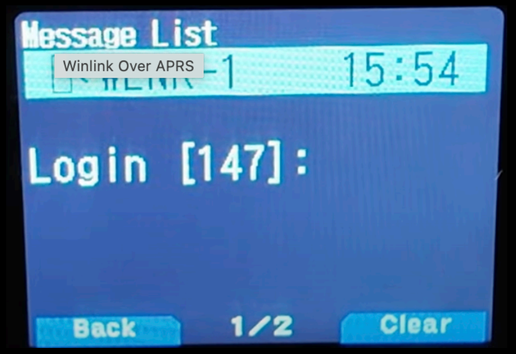
APRS - WINLINK COMMANDS

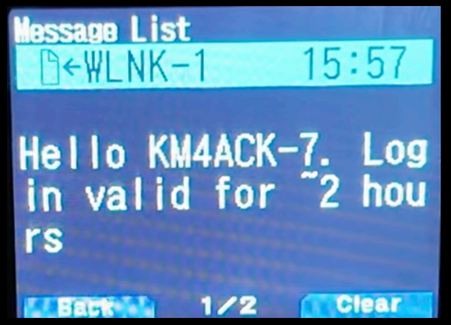
H or ?. Help
L - Return List
R# - Read Message #
Y# - Reply to Message #
SP - SP <email or call sign> Subject

https://privat.bahnhof.se/wb758759/documents/APRSlink-commands.pdf

APRS - WINLINK RETRIEVE

Step 1.
Send aprs message to wlnk-1 with random text
It will respond with a number for you to decode your password
Eg. You get 147 as a response





Step 2.
Use your Winlink password
8AWCFJH
12345678
147=8CJ
Then add any 3 characters
8CJABC

https://youtu.be/47OGdmm-jEY

Step 3.
Send message with letter L to get a List of messages

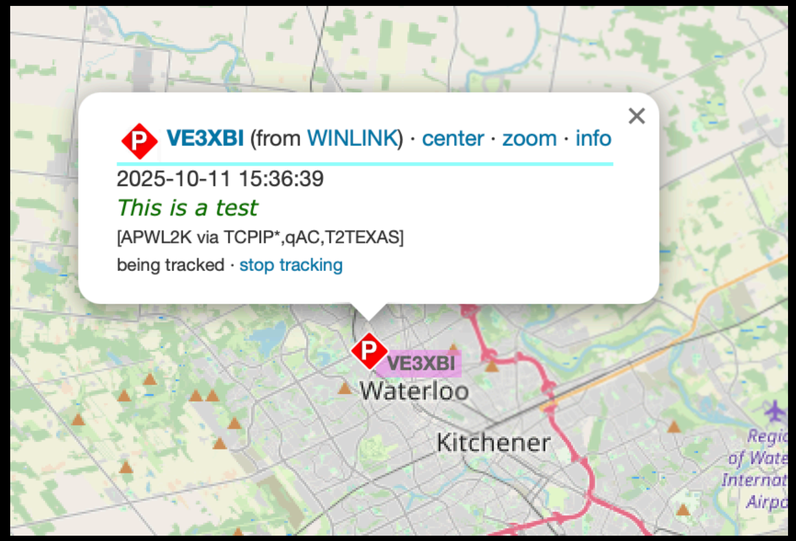
APRS - WINLINK - POSITION

Using RadioMail app on iOS

Send a position report by press+HOLD compose button

Option to add comment

Radiomail is a Winlink compatible app for iOS
Allows for SEND/RECEIVE of Winlink Message
Option for IMS/ICS forms via subscription



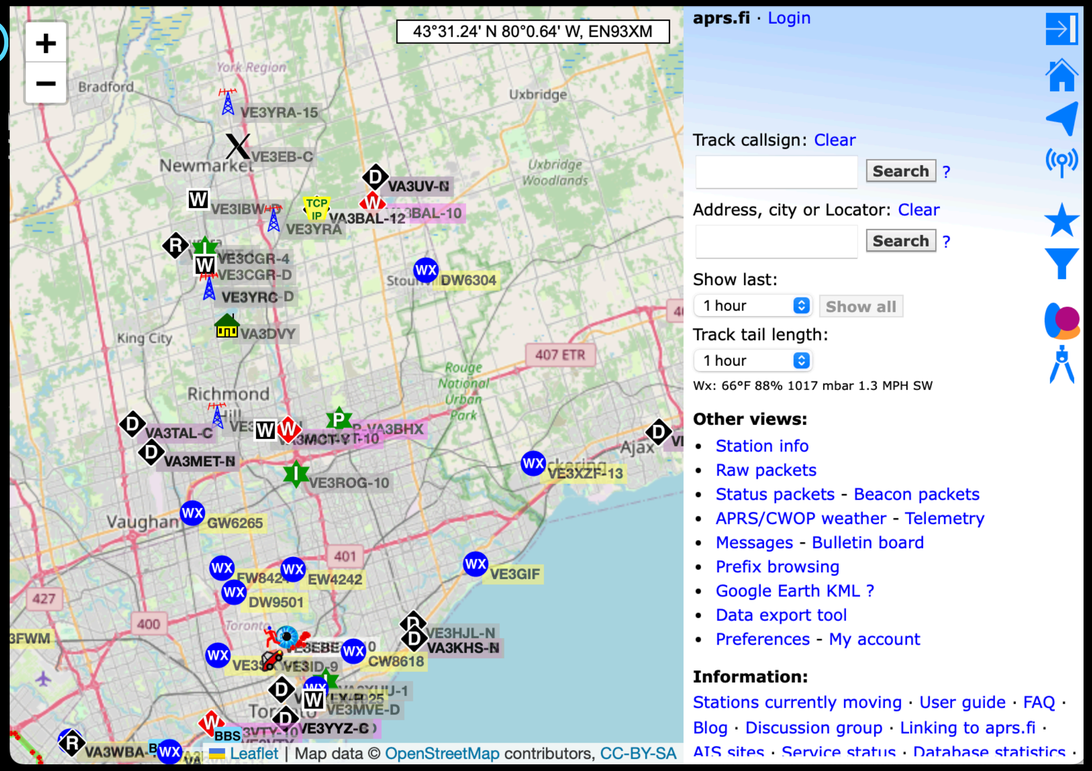
APPS SOFTWARE / APP

APRS.fi - Available for both web and iOS

Note: this app can also work with MobilinkD as a TNC

APRSDroid - for Android devices

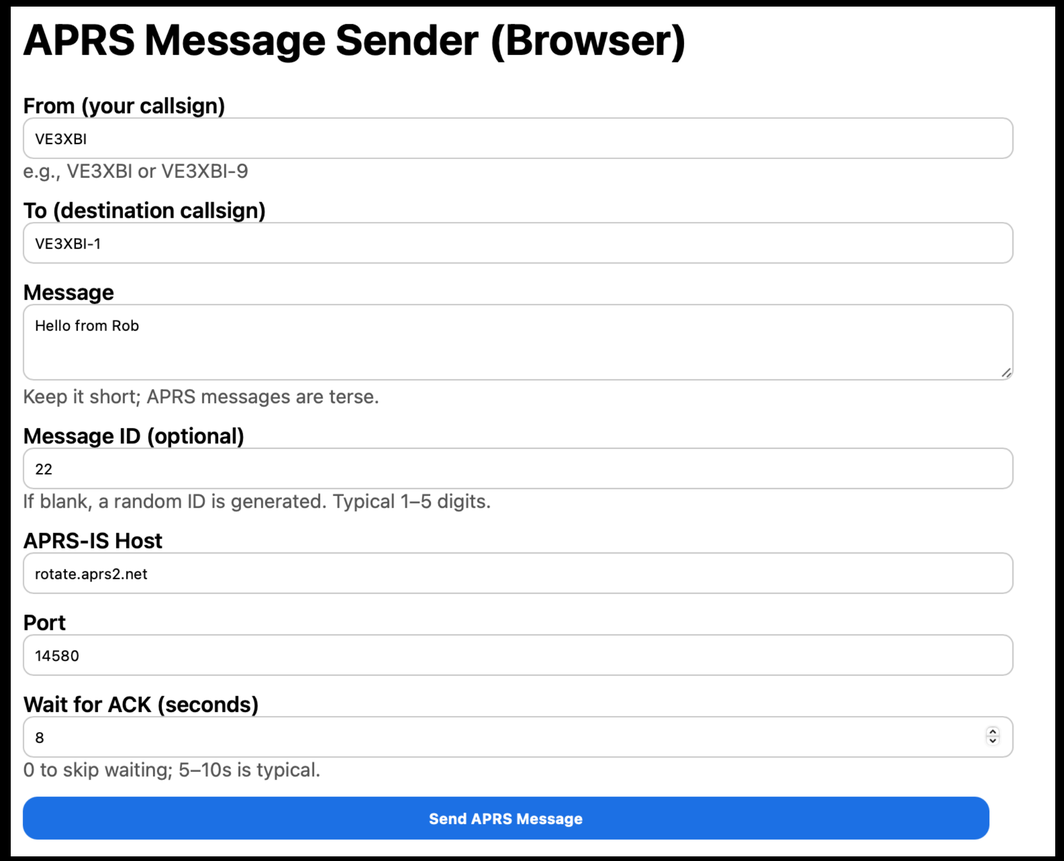
PinPoint - Web application

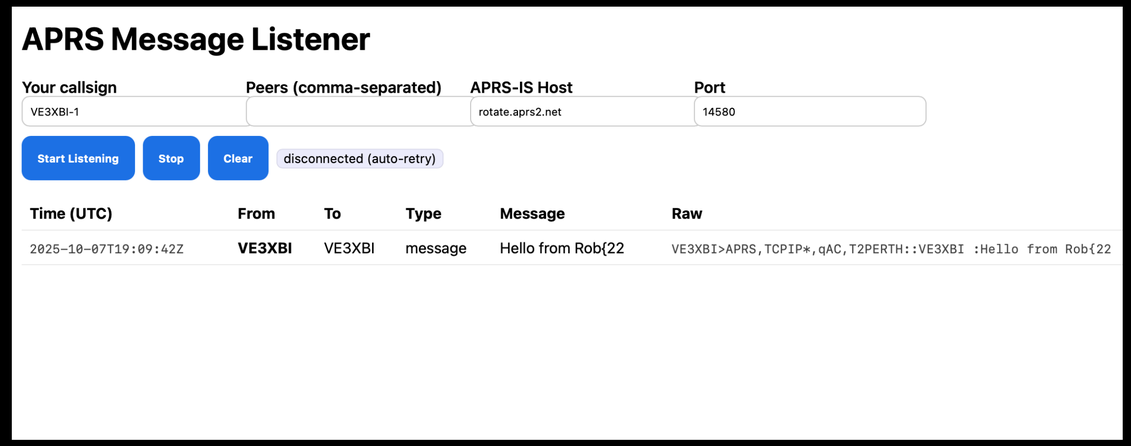


aprs.fi

APRS AND CHATGPT

https://auroraonline.com/sendaprs.php





https://auroraonline.com/aprsindex.php

FUN STUFF

Send message to internet users:
Address you message to EMAIL-2,
put the email address at the beginning
in the text body

Get the current weather:
Send a message to WXCAN with the word
NOW, tomorrow etc

APRS WXCAN WEATHER REQUEST

Newmarket

APRS TO SMS

Compose message to SMS

In the body @<phonenumber> <message>

Eg: @6473939883 Hello

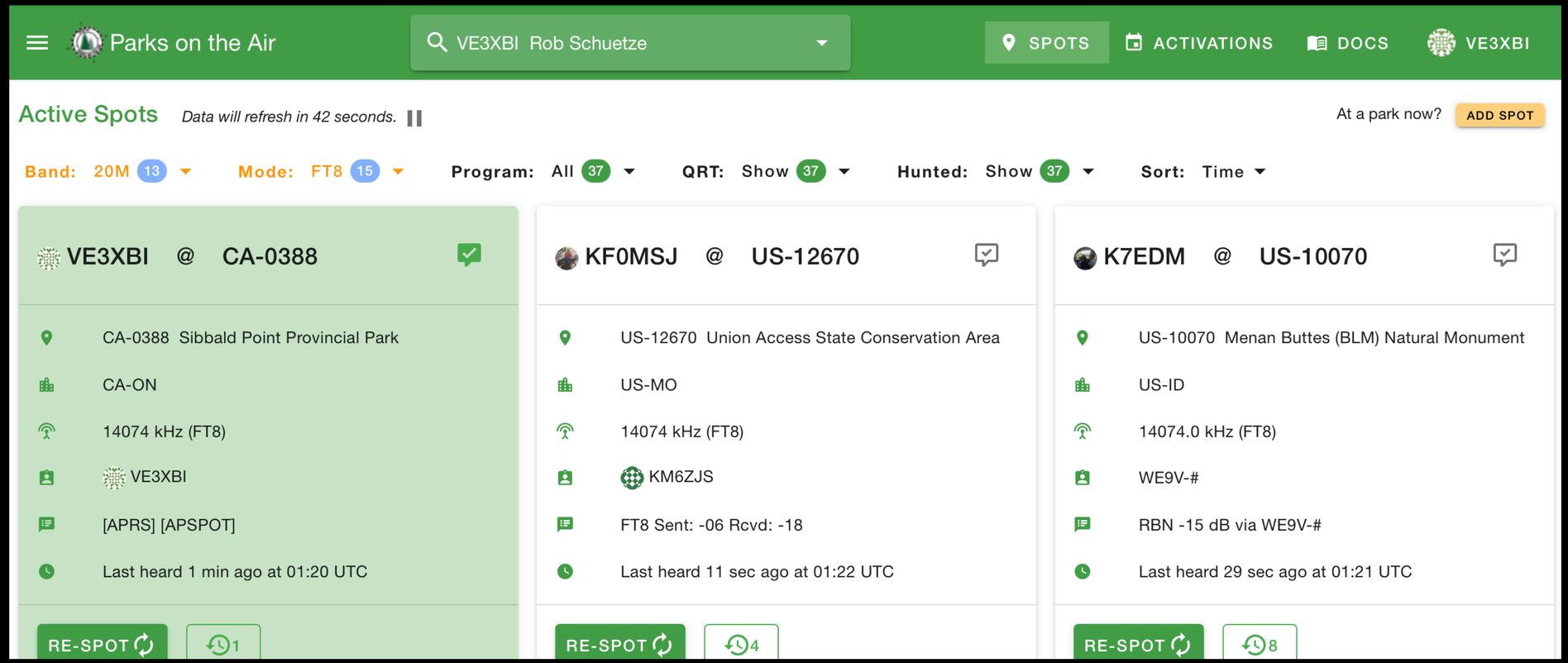
The person will receive a message from 1 (866) 352-4096 with a message @VE3XBI-4 Hello

They can now reply eg. How are things
You will receive @6473939883 How are things along with a time

SPOTTING - POTA

Sent to APSPOT

Message: ! POTA CA-0388 14074 FT8



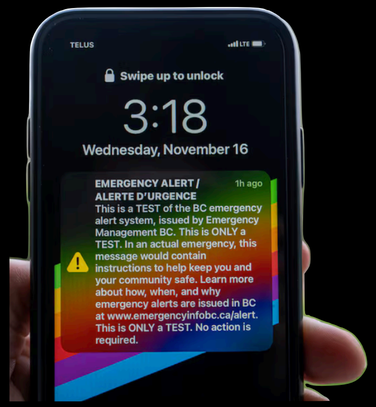
NEXT STEPS

If traditional communications fail - Rogers, Bell and the Internet, how can we get notified to take action and ***not miss*** *the message?*

Could APRS play an important role
in EmComm?

APRS PAGING

- Can alert everyone ON CALL
- Easy to Carry Around
- Keeps history of incoming messages
- Similar to Canada's Alert Ready System



- Phase 1
  Develop a low cost Rx APRS Pager that will last one month on a single charge, two line display
  - under $50 CDN
- Phase 2
  Develop a low cost Rx/Tx APRS Pager, touch screen, bluetooth, last one month on a single charge, smart beaconing
  - Under $75 CDN
- Mobile app for iOS and Android

IS THERE SOMETHING ALREADY ?

PICO APRS - $480 CDN

Developed by Taner Shenker DB1NTO

- APRS
- FM 2M
- 1 Watt
- Bluetooth

WRAP-UP & WHY IT MATTERS

APRS IS MORE THAN JUST LOCATION SHARING.
CRITICAL FOR DISASTER RESPONSE AND COORDINATION.
BRIDGES HAM RADIO, INTERNET, AND EMERGENCY NETWORKS.

How Can You Use APRS

Open Discussion

Presenter: Rob Schuetze, VE3XBI

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