OVERVIEW OF ANALOG AND DMR APRS

WITH BRANDMEISTER NETWORK INTEGRATION

BY

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WHAT IS APRS?

- Automatic Packet Reporting System
    - Developed by Bob Bruninga (WB4APR) in the early 1980s
    - Originally called "Automatic Position Reporting System" on early X.25* packet switched networks (TCP/IP and was still in its infancy in those days)
    - Global adoption of TCP/IP and network enabled GPS during the late 1980s made packet switching the norm for most data traffic – hence the name change from "Position" to "Packet"
- Transmits GPS, messaging, weather, and telemetry
- Used for real-time tracking and situational awareness
    - *NOTE: Legacy X.25 still used today for some Credit Card validation and ATM transactions across the world.

ANALOG APRS OVERVIEW

- Uses 1200 bps at 1200 baud Audio Frequency Shift Keying (AFSK) aka (Amateur X.25) on FM
    - Baud: Number of signal changes (symbols) per second.
    - Bits per second (bps): Number of bits transmitted per second.
- Standard frequency: 144.390 MHz (North America)
- Relayed by digipeaters and gateways (IGates)
    - Digipeater forwards RF-based APRS packets
    - Gateway transitions an RF-based APRS packet to another network (i.e., the Internet for sending traditional e-mail and SMS messages)
- This forwarding of packets though Gateways is handled by the APRS-IS. --- aka – APRS-Internet Service. Gateways are part of the APRS-IS

DMR APRS OVERVIEW

- Encapsulates APRS data into DMR packets

- Uses BrandMeister network for APRS-IS forwarding

- Common talk group: 310999 (Worldwide APRS)
    - In Analog APRS the national calling frequency is 144.390 MHz)
    - In Digital APRS the national TG on Brandmeister is 310999

HARDWARE NEEDED

- Analog: FM radio + TNC (or purpose built-in APRS radio like Yaesu FT-3/5)

NOTE: Most budget HT and mobile radios can only BEACON Digital and/or Analog APRS "messages"

To send/receive APRS messages you need a **TNC and "Messaging"** software

- Full Analog: GPS-enabled HT radio (e.g., FT5DR, FT2/3DR, KenwoodTH-D75A, AnyTone 878UVII, *ICOM HTs never offered true Analog APRS

- DMR radios are very limited in their APRS messaging capability due to DMR network restrictions and configurations. Short local message bursts are possible though.

- DMR Hotspot (WPSD, Pi-Star, OpenSpot), or access to a Digital DMR repeater within the Brandmeister network, or Analog APRS digipeater
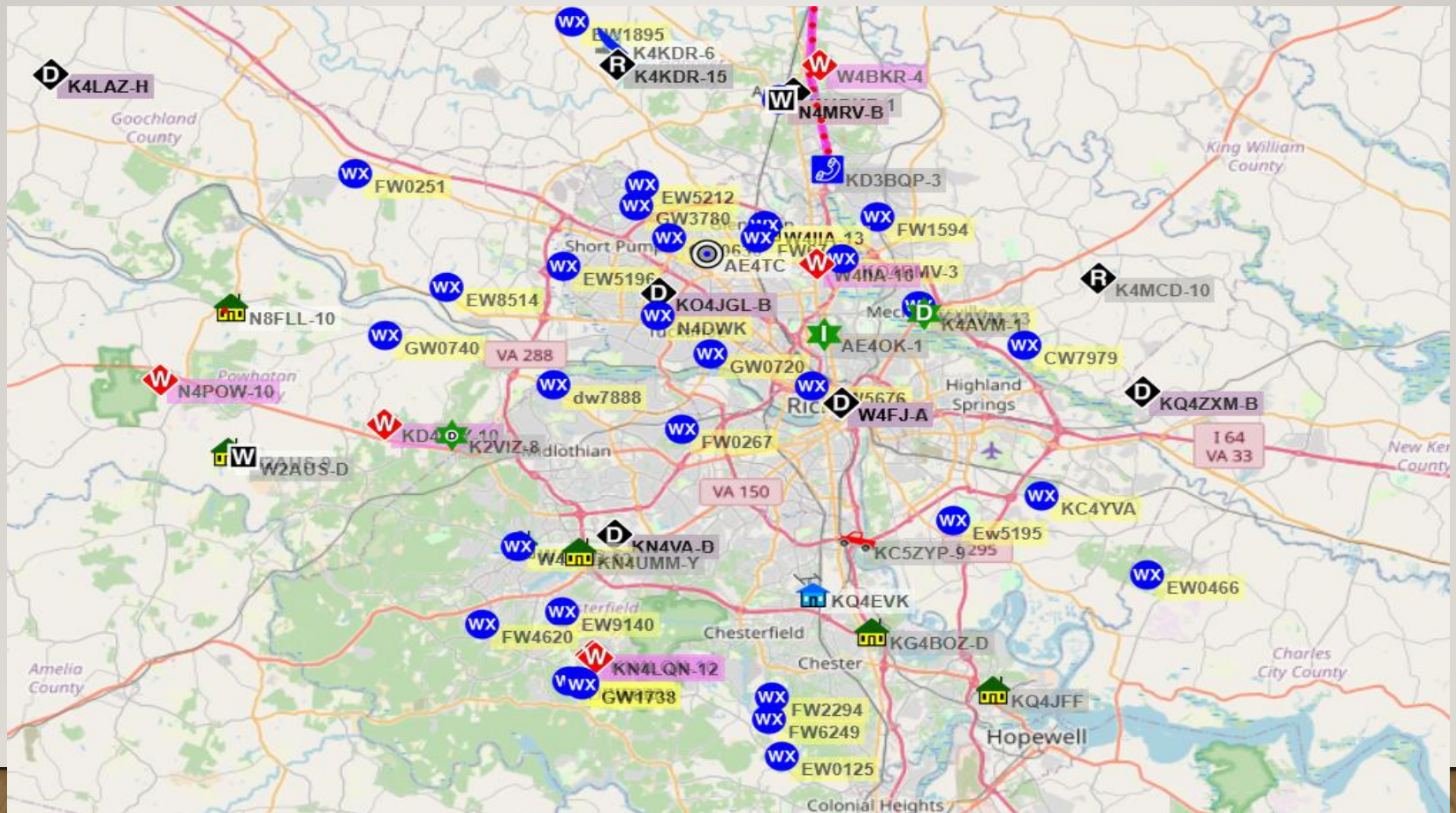
- GPS module (often built-in)

SOFTWARE & NETWORKS

- APRS-IS servers aggregate global APRS data

- Pi-Star / OpenSpot firmware for hotspots

- BrandMeister dashboard (self-care settings)

- aprs.fi for map visualization

DMR Base Station
DMR Hotspot
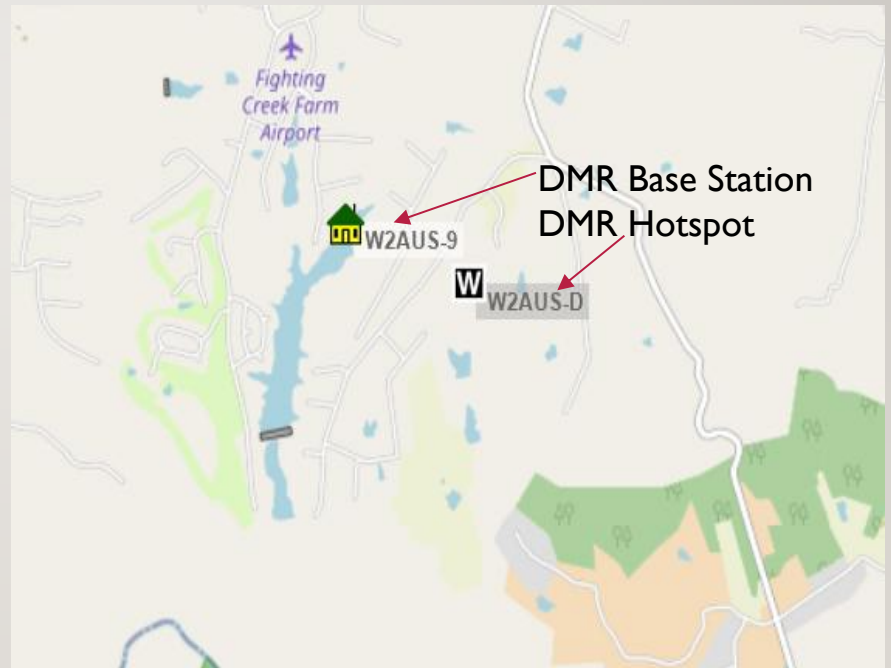
APRS.FI – THE APRS MAPPING SITE HTTPS://APRS.FI

CONFIGURING ANALOG APRS

- Set APRS frequency (144.390 MHz in North America)

- Enable GPS input to TNC

- Configure SSID (e.g., CALL-7 for handheld)

- Set BEACON rate (1-3 min for mobile use)

CONFIGURING DMR APRS

- Enable GPS on the radio

- Configure APRS destination in codeplug (TG 310999)

- Set BrandMeister Self-Care to 'APRS' with your callsign

- Configure hotspot to pass DMR GPS data

BRANDMEISTER "SELFCARE"

BRANDMEISTER APRS FLOW

- 1. GPS lock from radio

- 2. Radio sends GPS data via DMR Talkgroup 310999

- 3. Hotspot/repeater forwards to BrandMeister server

- 4. BrandMeister injects data into APRS-IS

- 5. Position visible on APRS.FI (aprs.fi)

MAPPING APRS ACTIVITY ON THE APRS.FI WEBSITE

- Use aprs.fi to view live positions

- aprs.fi website publishes APRS locations if:
    - Analog BEACON is picked up by a digipeater/I-Gate*
    - DMR BEACON is picked up by Brandmeister (through hotspot/repeater)

- Search by callsign and SSID (i.e., W2AUS-7)

- Can display stations, tracks, weather, and objects

- BrandMeister APRS shows up identically to analog APRS

(* not all digipeaters are connected to an I-Gate)

PRACTICAL ARES APPLICATIONS

- Event support & public service comms
  - Track people, vehicles, weather, etc on an APRS channel. Thereby keeping a voice channel open for general use.

- Search and rescue operations
  - Team tracking, messaging, and live mapping reporting capability
  - EC can coordinate Zone searches to avoid gaps and/or overlaps
  - Send e-mail and SMS to EC and Teams directly, or through portable digipeaters and/or I-Gates

- Road trip and convoy tracking
  - Track yourself on long road trips

- Weather telemetry & remote sensors

# ARES EXAMPLE: FT5DR APRS MENU #20 "MESSAGE GROUP" SETTING

- Enables sending and receiving APRS messages to predefined group callsigns instead of individual stations.

- Usage Notes:

- Set Menu #20 to ON to receive group messages.

- To send, enter the group callsign in the "To" field of your APRS message.

- Ideal for EMCOMM, club coordination, and APRS outreach.

- Can add "PARC" or Powhatan ARES "PARES" Group

Common Group Callsigns:

Group	Purpose
CQ	General call to all APRS users
ALL	Broadcast to all listening units
QST	Bulletin-style announcements
EMERGENCY	Alerts for emergency coordination

BEST PRACTICES

- Use correct SSID for device type (-7 HT, -9 mobile, -10 APRS-IS gateways)

- Choose meaningful APRS symbols
  - Most Common: "Walking Man = HT, CAR = Mobile, HOUSE = Basestation

- Set transmit intervals responsibly

- Always identify properly per regulations
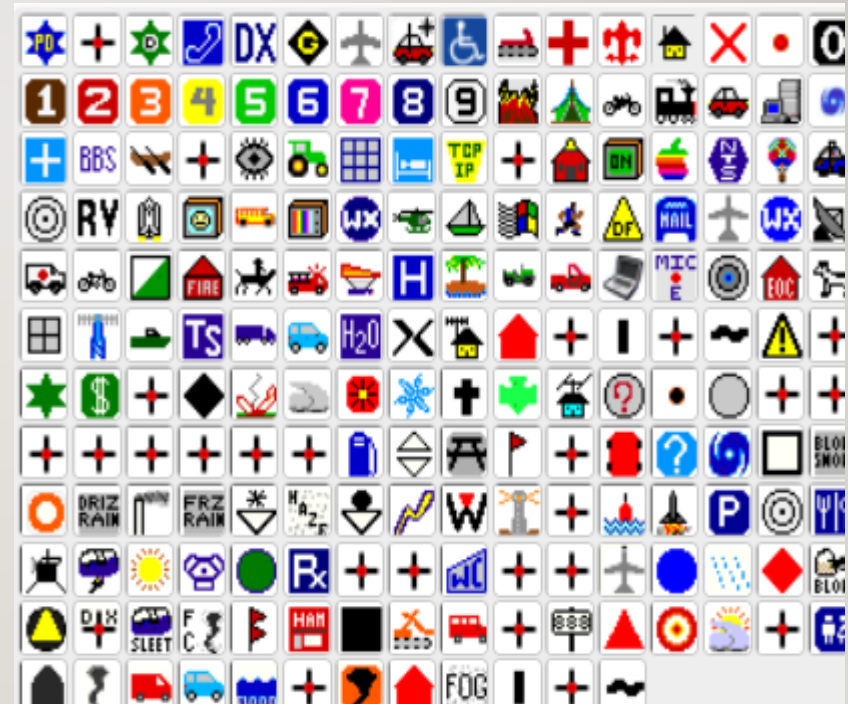
FUTURE OF APRS

- Cross-mode APRS (DMR ↔ Analog ↔ Fusion ↔ D-STAR)

- Satellite APRS (ISS digipeater)

- Expanded Internet of Things (IoT) telemetry applications
  - Independently monitored devices reporting data back to a centralized location.
    - i.e., remote floating current, tides, weather, earthquake stations
  - Hazardous/toxic site inspection

QUESTIONS?

Also: Would there be interest in a practical workshop/exercise on Radio APRS configuration and usage?