

Introduction to APRS

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July 15, 2010

What does APRS stand for?

- Automatic
- Position or Packet
- Reporting
- System

Bob Bruninga, WB4APR created APRS back in the late 80's. And the acronym APRS was derived from his callsign.

Bob is still a senior research engineer at the U.S. Naval Academy.

What does APRS do?

- Allows us to display the location and track the ham stations via GPS coordinates.
- Monitor weather conditions at remote sites.
- Receive and send digital messages to other ham stations.
- Provides extremely accurate Time reference

How does APRS work?

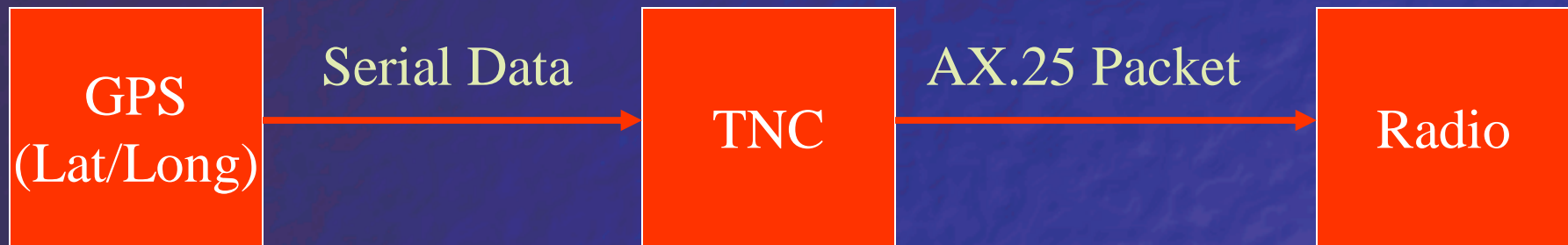
- Magic starts with GPS
 - Time as experienced at the desired location
 - Triangulation based on delay
 - Which is then calculated and translated into
 - Latitude
 - Longitude
 - Elevation

GPS and Time

- GPS measures time in nanoseconds
- Nanosecond = 1 / Billionth of a second
- A nanosecond is to one second as one second is to 31.7 years!
- Question: Why does GPS need to measure time at the nanosecond level ?

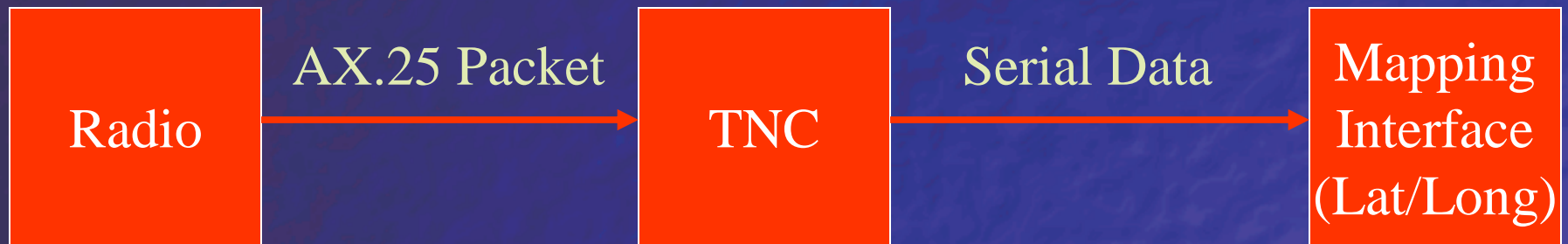
How does APRS work?

Basic Flow Chart to **Send** Your Position

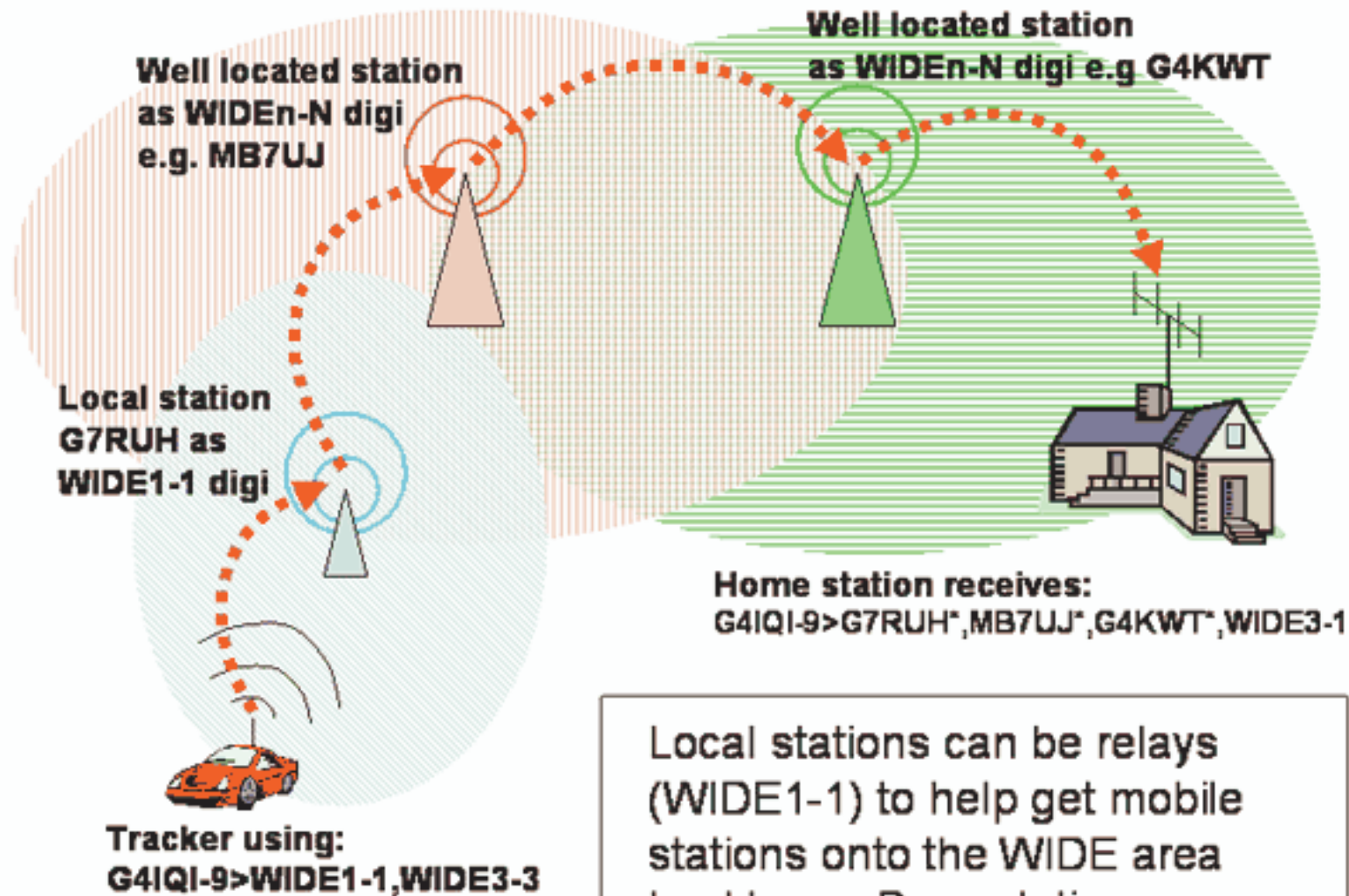


How does APRS work?

Basic Flow Chart to **Receive** Your Position



APRS Hops



Local stations can be relays (WIDE1-1) to help get mobile stations onto the WIDE area backbone. Base stations normally only use WIDEn-N

Digi-Peater Hop Demo

<http://wa8lmf.net/DigiPaths/NNNN-Digi-Demo.htm>

Ways to implement APRS Receive

■ Computer and the Internet

- No radio required !!! (Demo <http://aprs.fi>)

■ Out in the field:

- 2 meter FM Amateur Radio (144.390 mHz)
- TNC (decode digital packets)
- Audio cable between Radio and TNC
- Computer
 - Mapping Software
 - Software to superimpose decoded GPS coordinates on top of map
- **Question: Why isn't a GPS required?**

Receive Solution #1

- 2 meter FM radio (144.390mhz)
- Audio cable connected from radio to TNC
- Software TNC (AGWPE or AGWPE Pro)
- Laptop:
 - Internet Access Required
 - AGWTracker software to download maps dynamically
 - Software will plot APRS stations as they're received.

Receive Solution #2

- 2 meter FM radio (144.390mhz)
- Audio cable connected from radio to TNC
- Software TNC (AGWPE or AGWPE Pro)
- Laptop:
 - UI-View 32 (registration required)
 - Software will plot APRS stations as they're received
 - Maps need to be configured ahead of time

Receive Solution #3

- 2 meter FM radio (144.390mhz)
- Audio cable connected from radio to TNC
- Mini-TNC
 - ArgentData OT2m
 - TinyTrak 3 or TinyTrak 4 (some report RFI from these devices)
- Laptop:
 - UI-View 32 (registration required)
 - Software will plot APRS stations as they're received
 - Maps need to be configured ahead of time

Mobile Send & Receive Solution

- 2 meter FM radio (144.390mhz)
- Garmin Nuvi 350 (discontinued)
 - Special FMI (Fleet Management Cable) required
- ArgentData OT2m Tracker2 (TNC)
- Cables & Power to each unit

Using Garmin Nuvi's

Model	Displays Waypoints?	Displays Comment Text?	Makes duplicates? (Not Good)	Connector	Garmin Cable P/N	Notes
nuvi 2x5 series	No	N/A	N/A	Mini-B	010-11232-00	
nuvi 350	Yes	Yes	No	Mini-B	010-10813-00	Must have power through cradle, FMI connection on side of unit
nuvi 360	Yes	?	Yes	Mini-B	010-10813-00	Must have power through cradle, FMI connection on side of unit
nuvi 465T	No	N/A	N/A	Mini-B	010-11232-00	
nuvi 5xx series	No	N/A	N/A	Mini-B	010-11232-00	
nuvi 600 series	Yes	No	Yes	18-pin	010-10865-00	FMI connection on cradle
nuvi 7x0 series	No	N/A	N/A	18-pin	010-10865-00	
nuvi 7x5 series	No	N/A	N/A	18-pin	010-10865-00	
nuvi 12xx series	No	N/A	N/A	Mini-B	010-11232-00	Minimum Software 3.60
nuvi 13xx/14xx series	No	N/A	N/A	Mini-B	010-11232-00	Minimum Software 3.60
StreetPilot 2720	Yes	?	Yes	Mini-B	010-10813-00	
StreetPilot 7200	Yes	?	Yes	Mini-B	010-10813-00	

* Nuvi 350 only one to track moving POI's

GPS Language

- **APRS** needs **NMEA 0183** GPS Format
 - Serial Text Stream
- Other GPS Languages (**requiring translation**):
 - Garmin
 - Trimble TSIP and TAIP
 - DelBin
 - SIRF Binary
 - U Blox Binary

TNC Options

■ External Hardware

- ArdentData Tracker2
- Byonics TinyTrak
- Kantronics KPC3+

■ Embedded Hardware

■ Software!

Embedded TNC's in your Radio



Embedded TNC's



Software TNC's

- **AGWPE / AGWPE Pro** was written by George Rossopoulos, **SV2AGW**
- Acronym for **SV2AGW's Packet Engine**
- Ability to **encode and decode packet tones** using your computer's **sound card**

Advantages of Software TNC

■ Lower Cost

- Chances are you're already using a laptop for showing the APRS stations on a map. Why spend more money?
- Advanced options allows multiple software TNC's to run on both the LEFT and RIGHT soundcard channels.

■ No additional power requirement

■ Software TNC supposedly more efficient in generating AX.25 protocol packets.

- Many hardware TNC tell you to configure with KISS

AGWPE Requirements

- Windows 95, 98, ME, 98SE, 2000, XP
- Windows Vista and 7 (tweaking required)
 - Change default installation path to “C:\Ham”
 - Windows protects against changes in the “C:\Program Files\...” directory structure.
 - Sound drivers may require additional tweaking
- Windows 95, 98, ME
 - Requires Winsock 2 update

AGWPE Compatible Software

APRS	AGWTracker	see Info: http://www.agwtracker.com/
	APRSPoint	see http://www.aprspoint.com
	APRSPlus	AGWPE configuration help
	OziAPRS; netAPRS	see http://www.radio-active.net.au/web/gpsaprs/oziaprs.html
	UI-View32	AGWPE configuration help
	WinAPRS	AGWPE configuration help
	XASTIR	AGWPE configuration help

Some users have reported compatibility issues in Vista / Windows 7

Configuring AGWPE

Properties for Port1 [?] [X]

Tnc Setup | Tnc Commands

Select Port: COM4

Be carefull for Modems like Baycom etc need also the Baudrate.

SerialPort/modem BaudRate: 9600

Tnc Type: Select Your Tnc Model. SoundCard

Tnc Sub Type: Select The special KISS Mode. KISS Simple [Options]

Tnc Control Commands

IniKiss1: []
IniKiss2: []
IniKiss3: []

ExitKiss On Exit:

SinglePort
 DualPort
 Quadraple Port

Tnc RadioPort

Port	Port Description (Frequency,BaudRate etc)	Ports Kiss Id
Port1	APRS 1200baud	0
Port2	[]	0
Port3	[]	0
Port4	[]	0

OK Cancel

AGWPE vs. AGWPE Pro

More efficient CPU usage	no	√
Embedded monitoring of received packets	no (must use AGWMonitor)	√
TNC/sound card configuration wizard	no	√
Share your packet station with others (Radio Port Sharing)	no	√
Improved visual interface and navigation	no	√
Optional Windows XP/Vista visual theme	no	√
More comprehensive 'Help' files	no	√
Program may be updated from time to time	not likely	√
Automatic update feature	no	√
TCP/IP over radio feature (for sending and receiving email by packet)	\$28 option	included
300 baud: PK-232 (2110/2310) pair tones	no	√
Improved digital signal processing algorithm	no	√

2nd Soundcard

- Recent versions of AGWPE can support multiple sound cards.
 - Allows default sound for O/S
 - Dedicate 2nd soundcard to AGWPE
- Usually best, if subsequent sound card is a different brand, to avoid driver DLL overlap.
 - Lockups have been reported with identical hardware

APRS User Interface

- <http://aprs.fi>
- AGWTracker
- APRSPoint
- UI-View
 - 16 bit
 - 32 bit (requires registration)

UI-View Config

<http://www.apritch.myby.co.uk/uiv32.htm>

Registering UI-View32 - APRS

To obtain a registration code (may take a few hours to be processed):

1. Read the section 'About UI-View32/Winpack Author' at the top of this page.
2. If you do not hold a valid Amateur Radio License do not bother to apply.
3. Fill in your details in the form below and then click on Register UI-View32
4. Wait a few hours...
5. Fill in your details in the form below and then click on Previously Registered

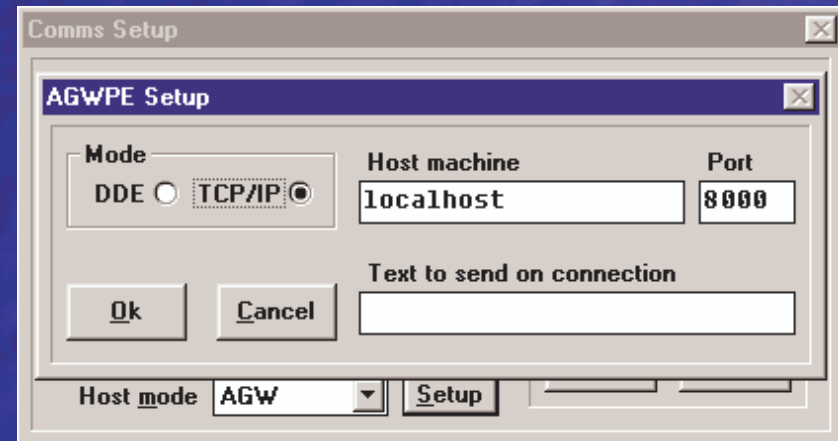
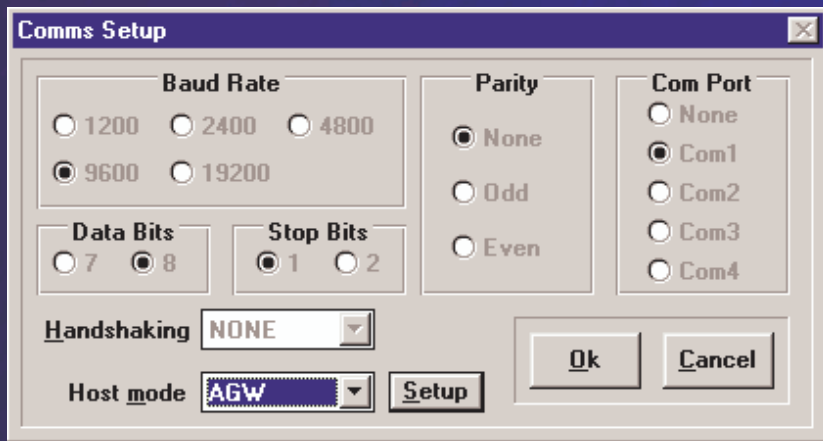
Callsign

First & Last Name

Submit

UI-View Config

- If only 1 soundcard installed
 - Disable sounds in UI-View
 - select "Options", then uncheck "Sounds Enabled"
- Select "Setup->Comms Setup"



UI-View32: use **127.0.0.1** instead of localhost

UI-View32 Example

The screenshot shows the UI-View32 V1.99 [Reading (2)] window. The background is a map of the Reading area. Three data windows are overlaid:

- Car: G62TZ-9**
 - Lat: 51.24.26N Long: 1.17.84W
 - Time: 18:55
 - Course: 269 degrees
 - Height: 259 feet
 - Speed: 22.0 knots, 25.3 mph, 40.7 kmh
 - Compass: Shows a heading of approximately 270 degrees (West).
 - Beacon comment: TM-D700, Garmin GPS 35 Module
 - Status text: OK Duty
 - Name: Simon
 - Effective-dig-path: M0BSI-2MB7UJ
 - Frame: 1955:04R G62TZ-9-UGRTRY;M0BSI-2*MB7UJ,TRACE7-6-UJR
 - Len=43:
- Home (HF) G4IQI**
 - Lat: 51.25.11N Long: 0.46.93W
 - Time: 19:16
 - Beacon comment: Map using TM-D700, Datum=OSGB36-BFV32
 - Status text: 0081932DX;G4PMG-6-5146.75N0-28.40W/25.7 miles N-19:06
- WX Station: M5LMY**
 - Lat: 51.21.39N Long: 0.46.95W
 - Speed S: 2.2 m/sec, 5.0 mph
 - Gust: 9.4 m/sec, 21.0 mph
 - W'chill: 1.2 C, 34 F
 - Time: 19:13
 - Humidity: 100 %
 - Pressure: 1029.0 hPa, 30.39 in
 - Temperature: 2.8 C, 37 F
 - Dew-point: 2.8 C, 37 F
 - Rain Today: 0.5 mm, 0.02 in
 - Compass: Shows a heading of approximately 280 degrees (West).
 - Direction: 280 degrees

At the bottom of the window, there is a status bar showing the current location coordinates: 51.26.94N, 0.44.42W. The Windows taskbar at the bottom shows the Start button and several open applications including UI-View32, Adobe Photo, UVV grabs, and Microsoft P...

APRS Suffix Standards

- -0 Home Station
 - Home Station running IGate.
- -1 Digipeater
 - Home Station running a Fill-In Digi, Wx Digipeater
- -2 Digipeater #2 or on 70CM
- -3 Digipeater #3
- -4 HF to VHF Gateway
- -5 IGate (Not home station)
- -6 SatGates & Special function Station
- -7 Kenwood D7 HH
- -8 Secondary Mobile station
- **-9 Primary Mobile station**
- -12 Portable Units such as Laptops etc.
- -14 Trucks
- -15 Mobile HF station.

APRS SSID = Your Callsign + Suffix

APRS in the Field

- How would APRS help us in a FoxHunt?
 - Keeping track of resources
 - Exact position right now
 - Station trail of where he/she has been
 - Who's nearby to assist?
 - Coordinating information at known locations
 - Send specific messages to designated party without bothering everyone else.

Introduction to APRS

Q & A

HF Packet – Where to listen?

HF Packet - LSB

Band	Suggested Frequencies* (channel centers = RF between the 2 tones)
80	3580-3635, priority at 3620-3635
40	7035-7050, priority at 7040-7050 and 7100-7120 with Americas
30	10.130-10.150, priority at 10.140-10.150
20	14.070-14.112, except 14.100 (beacons); priority at 14.095-14.0995
17	18.100-18.110, priority 18.104-18.110
15	21.070-21.125, priority 21.090-21.125
12	24.920-24.930, priority 24.925-24.930
10	28.070-28.189, priority 28.120-28.189

* AGWPE tones have a center frequency of 2210 Hz, so for LSB you would set your radio dial + 2210 Hz higher than the frequencies listed above. (For LSB, remember that the higher the frequency shift, the **lower** the resulting LSB frequency.)

- ✚ Look for APRS beacons at:
 - 7.035.5
 - 10.151.51 MHz LSB (North America)
 - 14.105.51 MHz LSB (Regions 1 & 2 only)
 - 18.102.5
 - 21.103.5 (Africa)
 - 29.250.5