Introduction to APRS

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What does APRS stand for?

- **A**utomatic
- **P**osition or **P**acket
- **R**eporting
- **S**ystem

Bob Bruninga, WB4APR created APRS back in the late 80's. And the acroynym 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?

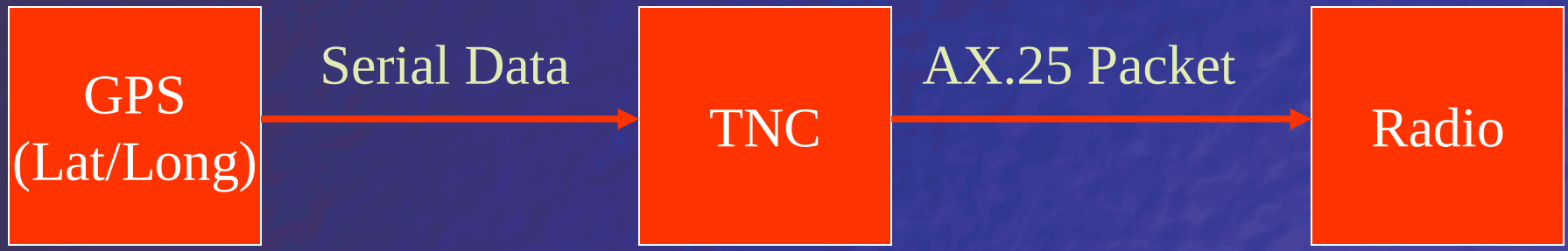
- Magic starts with GPS
  - Time as experienced at the desired location
  - Triangulation based on delay
  - Which is then calculated and translated into
    - Latitude
    - Longitude
    - Elevation

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 ?

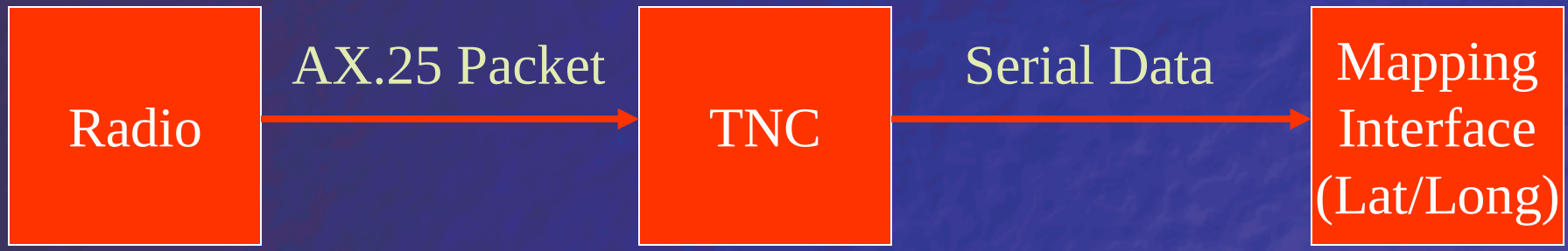
How does APRS work?

Basic Flow Chart to **Send** Your Position

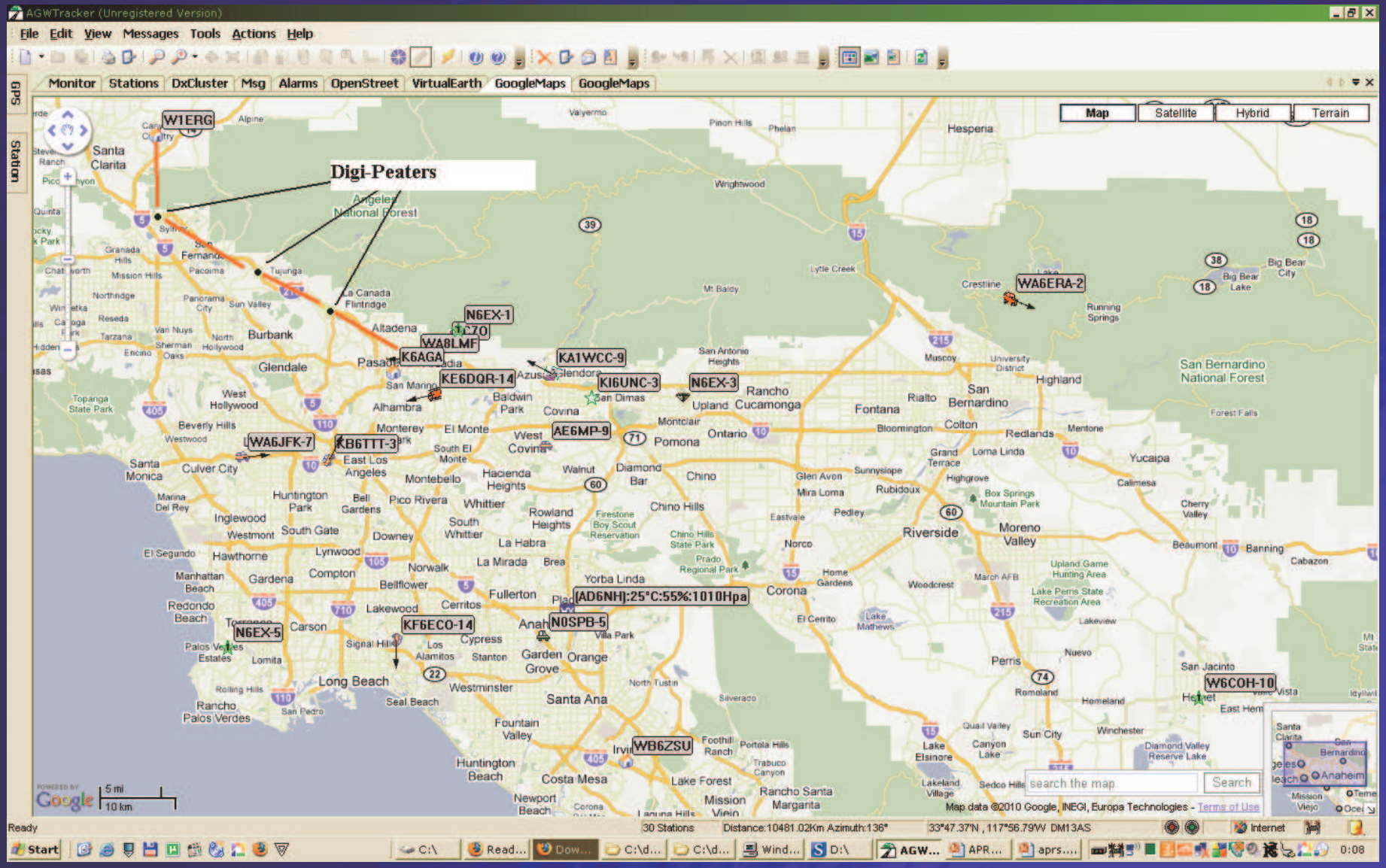


How does APRS work?

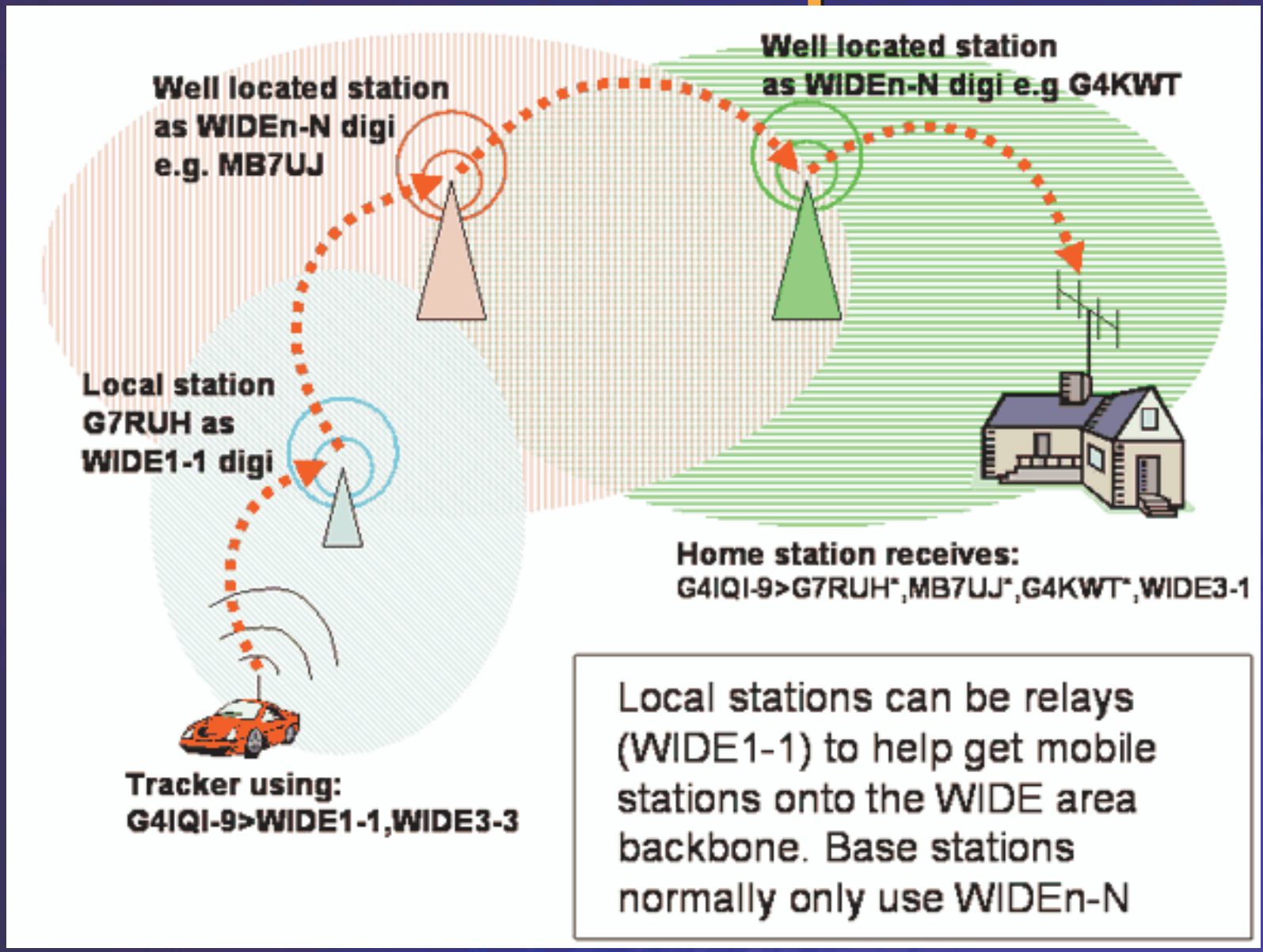
Basic Flow Chart to **Receive** Your Position



DigiPath Repeaters



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

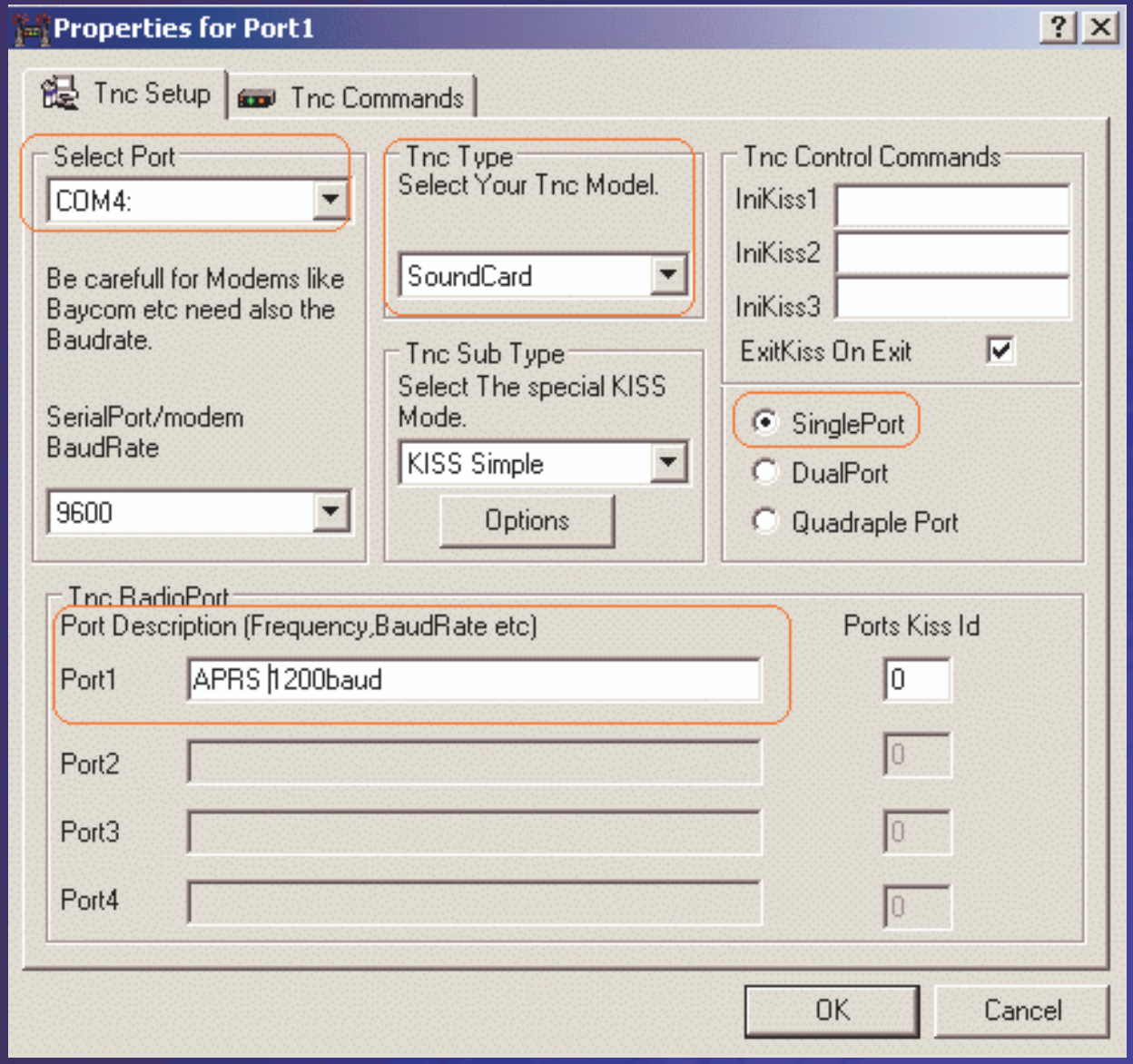
- **Windows 95, 98, ME, 98SE, 2000, XP**
- Windows Vista and 7 (tweaking required)
  - Change default installation path to "C:\Ham"
  - Windows protects against changes in the "C:\Program Files\..." directory structure.
  - Sound drivers may require additional tweaking
- Windows 95, 98, ME
  - Requires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



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

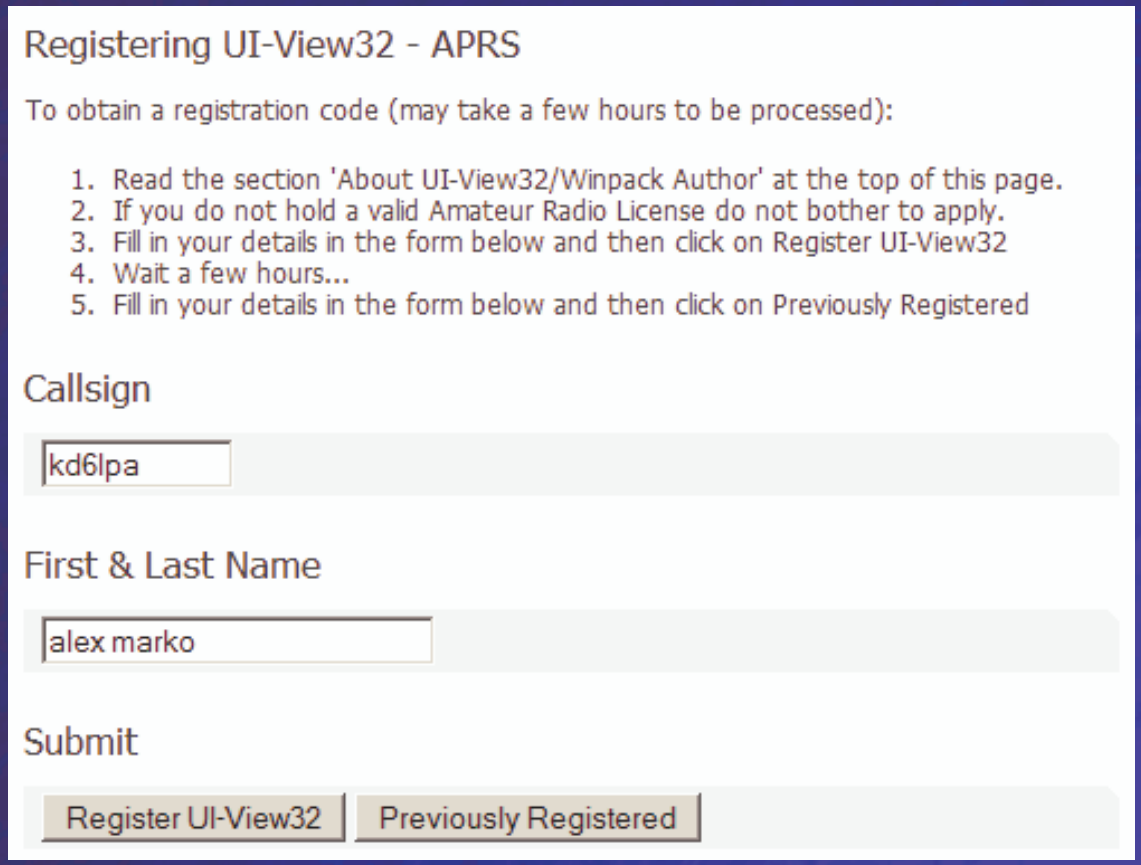
- Recent versions of AGWPE can support multiple sound cards.
  - Allows default sound for O/S
  - Dedicate 2nd soundcard to AGWPE
- Usually best, if subsequent sound card is a different brand, to avoid driver DLL overlap.
  - Lockups have been reported with identical hardware

APRS User Interface

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

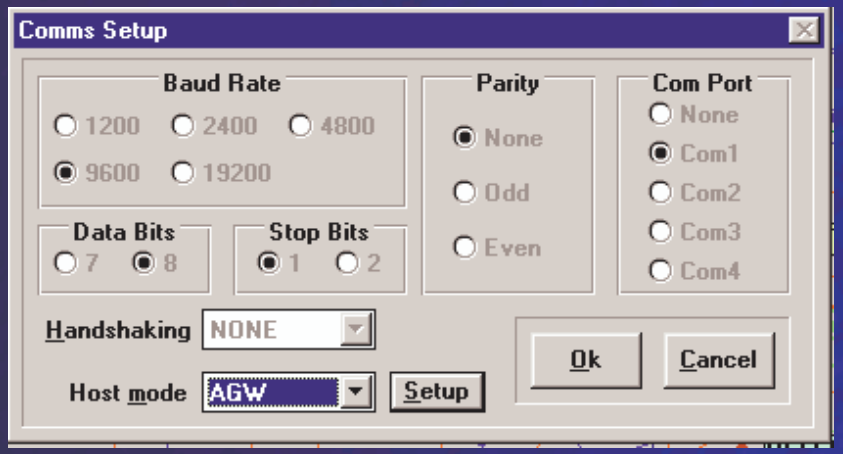
UI-View Config

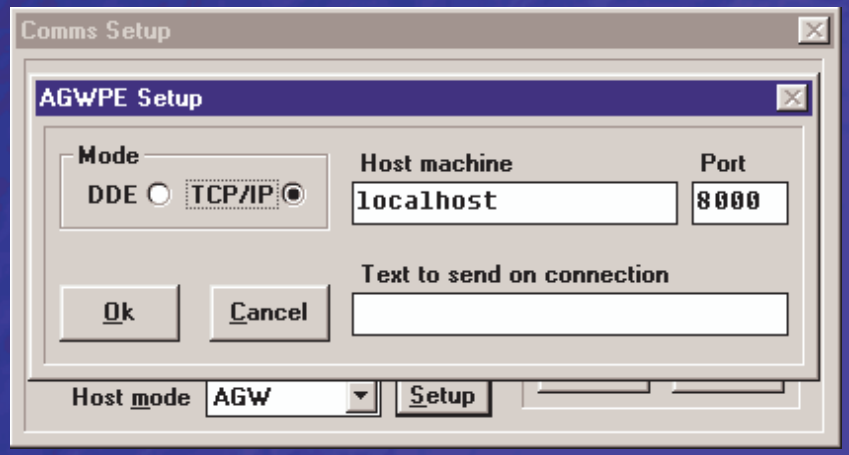
http://www.apritch.myby.co.uk/uiv32.htm



UI-View Config

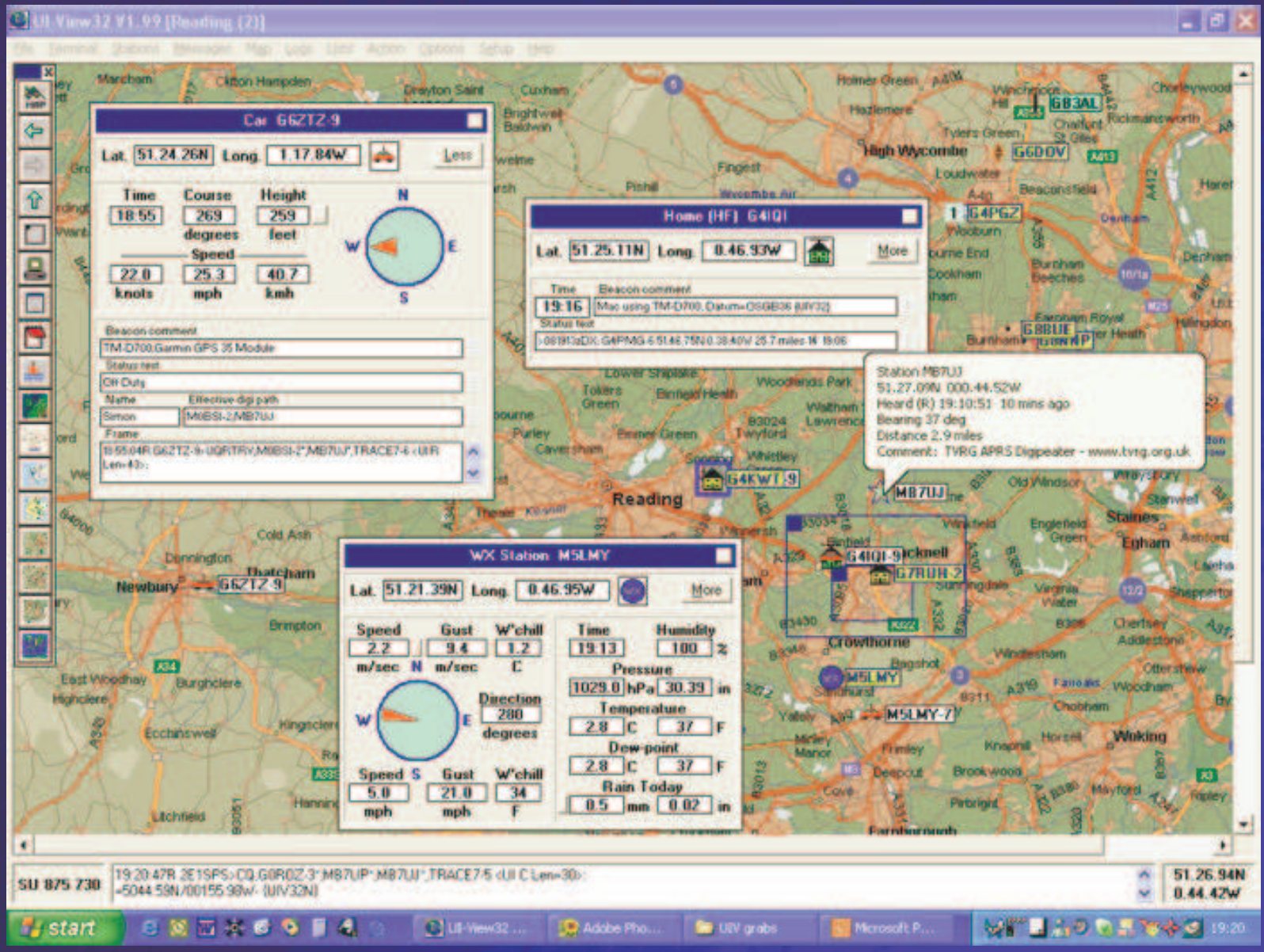
- If only 1 soundcard installed
  - Disable sounds in UI-View
    - select "Options", then uncheck "Sounds Enabled"
- Select “Setup->Comms Setup”





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

UI-View32 Example



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