



Maps – Mobiles - Users

Introduction to APRS! [Feb 2009]



[Adapted from "APRS-by-Bob" at <http://aprs.org/> for TMRA Program]

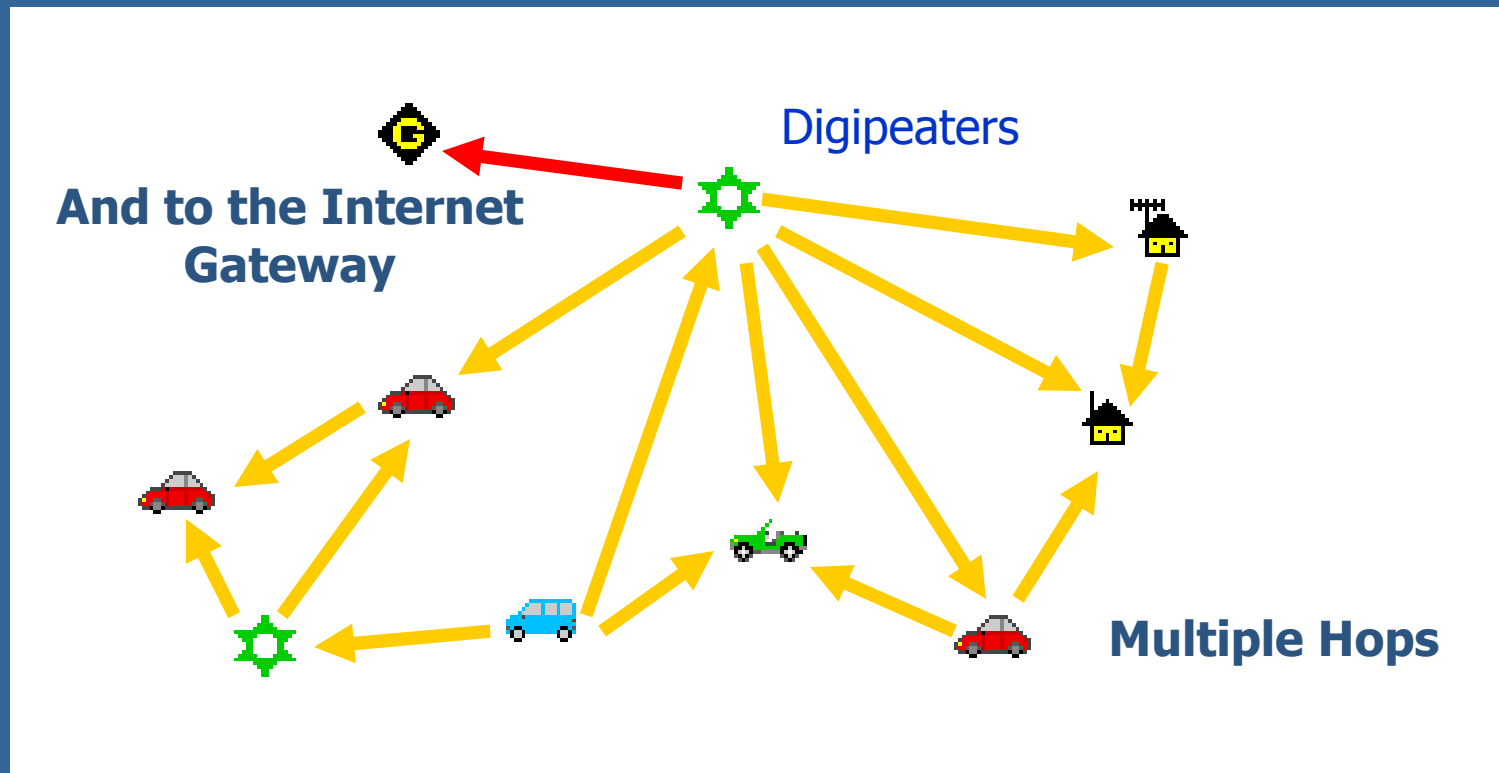
What is APRS?

- **APRS** = Automatic **Packet** Reporting System
- **APRS** was developed in the late 1980's for local **tactical digital communications**, situational awareness and **TWO-WAY** information exchange
- Messages + maps for OBJECTS – everyone sees the same situation
- **Not just GPS Vehicle Tracking!**



The APRS Network

Information exchange between everyone



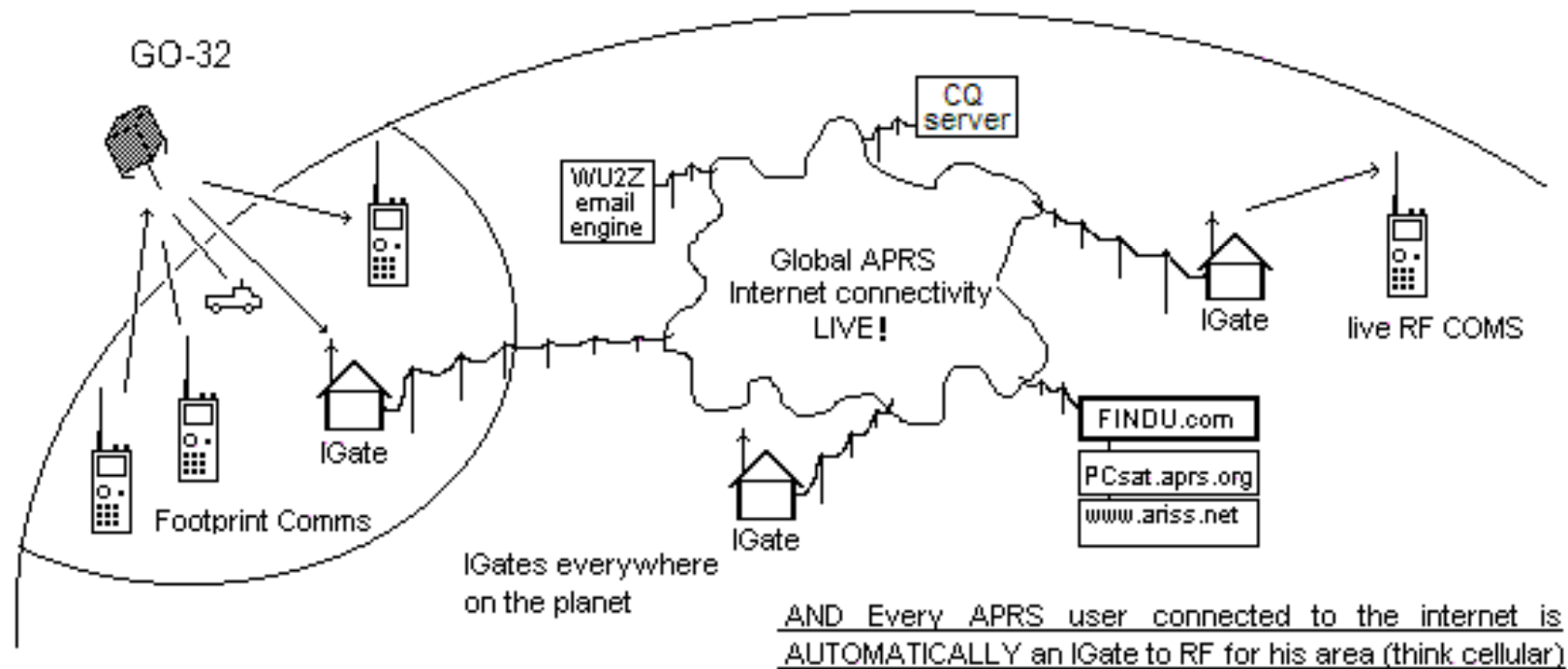
[2 Meter 1200 baud AX.25 Packets - North America: 144.3900 MHz]



Global Mobile and Portable Connectivity

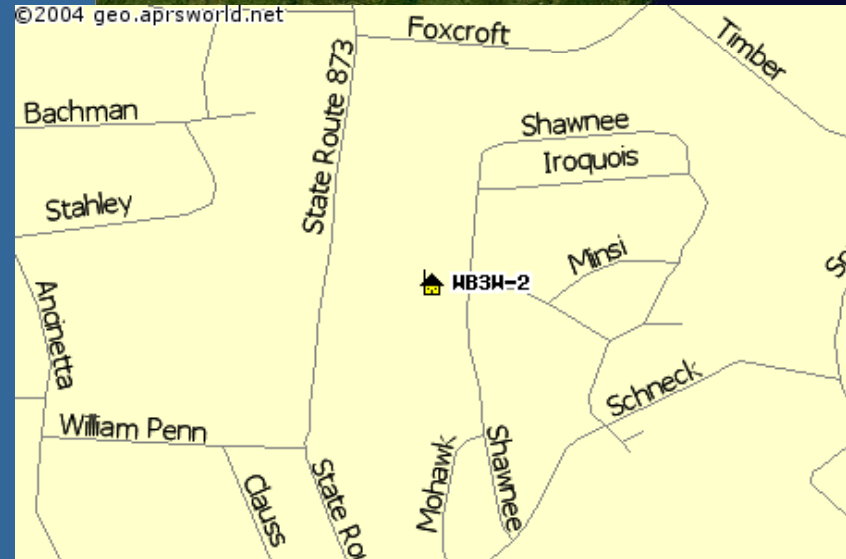
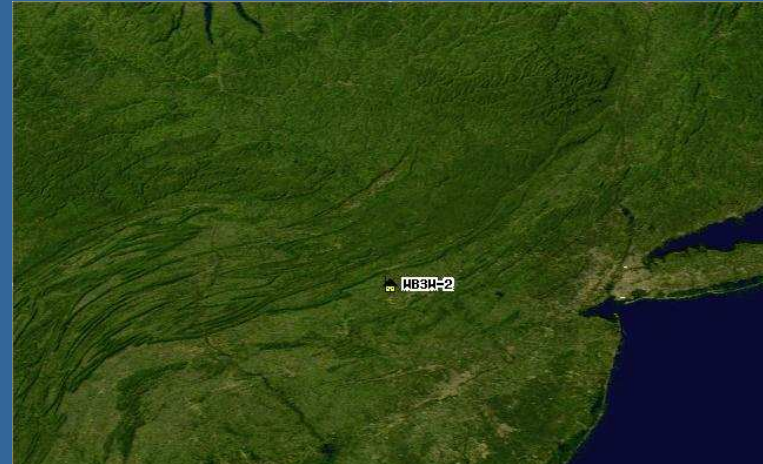
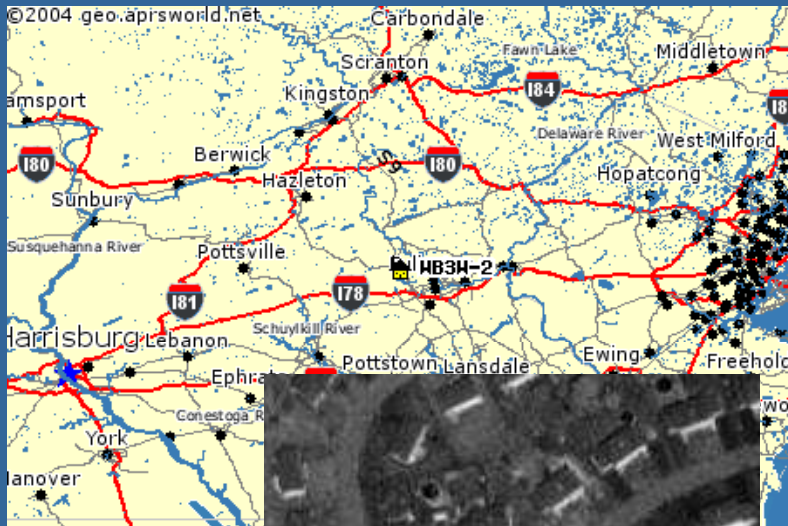
APRS Global Network

(End-to-End Everywhere)

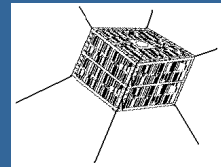
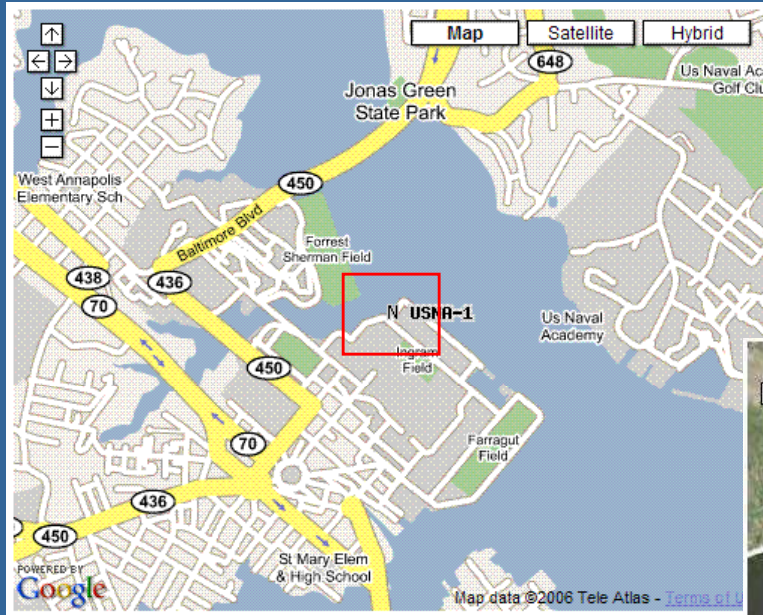


Findu.com Internet Interface

Internet tracking developed by
Steve Demise – K4HG



APRS-Internet (APRS-IS)



& situational awareness



This data is LIVE

[http:// Pcsat.aprs.org](http://Pcsat.aprs.org)

APRS is a registered trademark Bob Bruninga, WB4APR



APRS-IS (FINDU – Near Range)

APRS Stations Near WB4APR-9 (last 240 hours)

















Google™

findU links for WB4APR-9

- [Nearby APRS activity](#)
- [Raw APRS data](#)
- [Messages](#)
- [Nearest tide stations](#)
- [Metric units](#)
- [Nautical units](#)
- [Display track](#)
- [APRS Map Manager coverage](#)
- [NexRAD Radar](#)
- [Topographic map](#)
- [Aerial Photo](#)
- [APRSWorld map](#)
- [hide Google Maps](#)

External links for WB4APR-9

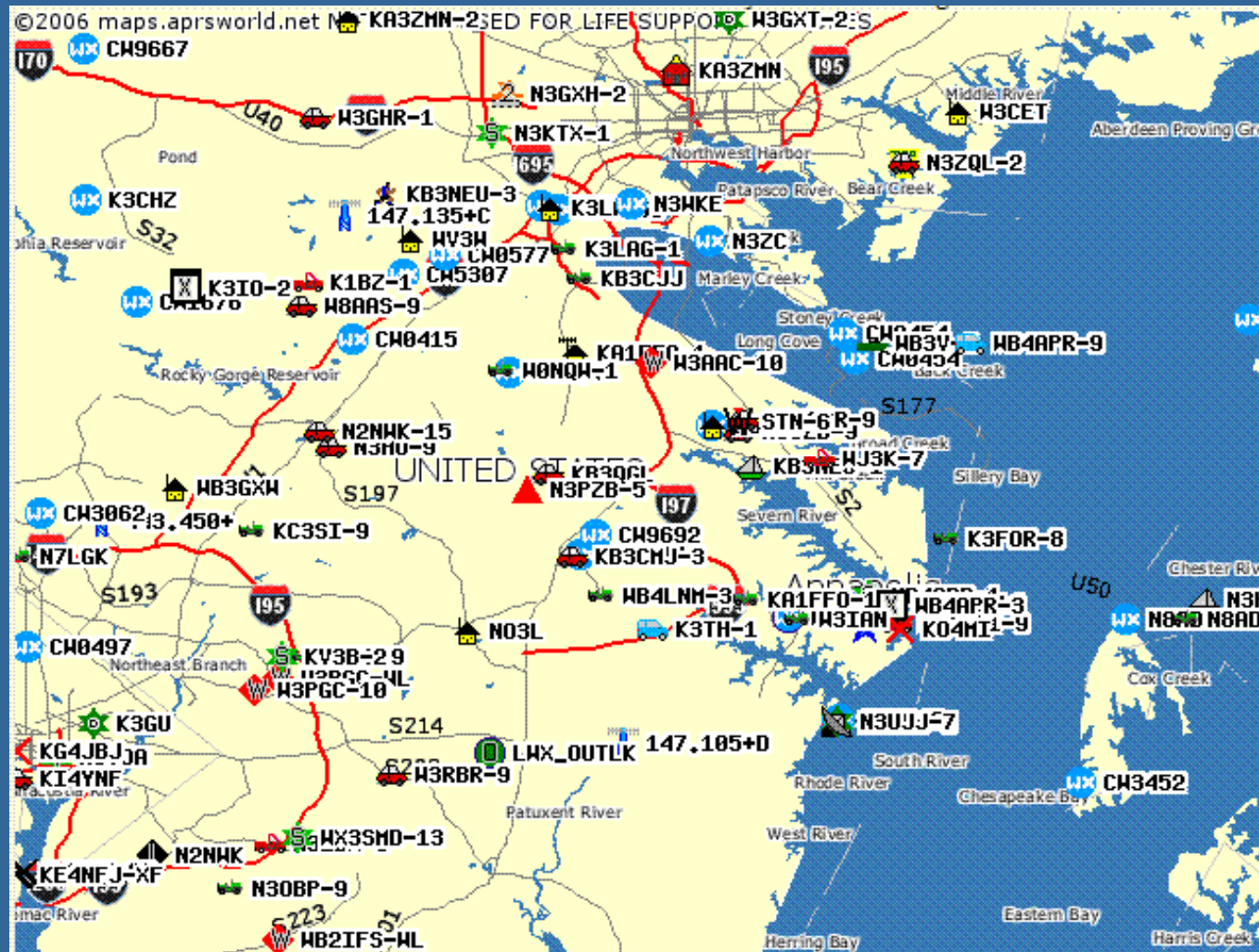
- [QRZ Lookup](#)
- [MSN map \(North America\)](#)
- [MSN map \(Europe\)](#)
- [MSN map \(world\)](#)
- [TopoZone](#)

Call	callbook	msg	wx	lat	lon	distance	direction	Last Position
 WB4APR-9	**	**	.	39.00000	-76.50000	0.0		00:06:02:46
 VA3ADG	**	.	.	38.99717	-76.50450	0.3	SW	05:22:10:17
 WB4APR-1	**	**	.	38.99033	-76.49850	0.6	S	00:00:11:28
 WE4APR-9	**	.	.	38.98667	-76.49283	0.9	SE	00:03:23:42
 WB4APR-3	**	**	.	38.98500	-76.48550	1.3	SE	00:10:55:08
 KB3KAK-9	**	.	.	39.02567	-76.50067	1.5	N	01:00:57:40
 VA2JPN	**	.	.	38.97150	-76.49717	1.7	S	06:07:21:19
 K3FOR-8	**	**	.	39.03200	-76.50267	1.9	N	00:08:58:06
 WB1HAI-9	**	.	.	38.97067	-76.48400	2.0	SE	00:02:25:47
 N3MNT-9	**	.	.	39.02117	-76.46400	2.5	NE	06:21:14:31
 N3HU-9	**	.	.	39.01833	-76.44867	3.3	NE	00:02:18:02
 N3KNP	**	**	.	38.97233	-76.55017	3.4	SW	04:01:37:14
 W3AFE	**	**	.	39.03517	-76.45100	3.6	NE	00:02:14:24
 K3TH-14	**	.	.	38.97383	-76.56283	4.1	SW	08:23:06:24
 K3TH-3	**	.	.	38.97400	-76.56317	4.1	SW	00:00:14:52
 N3HU	**	.	.	39.04017	-76.44183	4.2	NE	00:00:01:28

* Click to see all stations on map



APRS-IS (FINDU – Near Map)



40 miles

APRS is a registered trademark Bob Bruninga, WB4APR

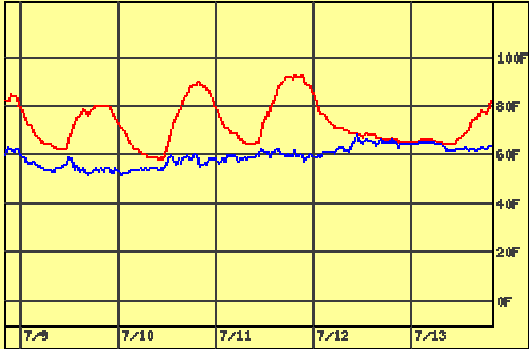


APRS-IS (FINDU - Messages)

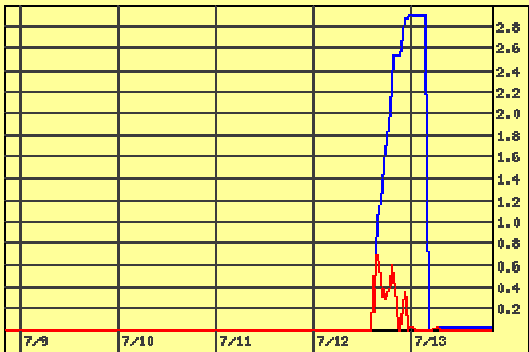
from	to	time	message
WB4APR-9	JA1RBY-4	10/25 00:07:04z	no msg list?{44
WB4APR-9		10/25 00:02:47z	qsl!{43
JA1RBY-9	WB4APR-9	10/24 23:59:59z	hello{15
N3HEV-1	WB4APR-9	10/14 14:09:06z	GM hve a grt day! 73! {0
WB4APR-9	ALL	10/14 13:53:03z	in d700... ignore that msg. It was 4 satellite.{42
WB4APR-9	ALL	10/14 13:50:24z	in d700 {41
WB4APR-9	ALL	10/14 13:49:07z	in d700 use ptt mode to TX while RXing{40
KE4NYV-15	WB4APR-9	09/30 21:55:30z	S1, if that{7
KE4NYV-15	WB4APR-9	09/30 21:51:01z	noisy{6
WB4APR-9	KE4NYV-15	09/30 21:50:32z	6.85?{38
KE4NYV-15	WB4APR-9	09/30 21:49:45z	noisy{5
N8PK	WB4APR-9	09/30 21:12:16z	Try again on 6.835 {003
WB4APR-9	KE4NYV-15	09/30 20:48:11z	52?{37
N1TI	WB4APR-9	09/29 02:47:14z	Good luck @ DCC{82
N3IDX-1	WB4APR-9	09/28 02:06:44z	Greetings from Huntingtown, Md{2b}
KD8ATF-2	WB4APR-9	09/28 01:55:17z	r u going to be on the next pass of go-32 bob?{26
WB4APR-9	ALL	09/28 01:51:40z	ck in!{35
N1TVZ	WB4APR-9	09/28 01:45:12z	%private line{M
WB4APR-9	ALL	09/28 01:43:14z	what is pl?{34
N8PK	WB4APR-9	09/28 01:40:41z	Gud 2 C U on the CARA last night! -Pat {000



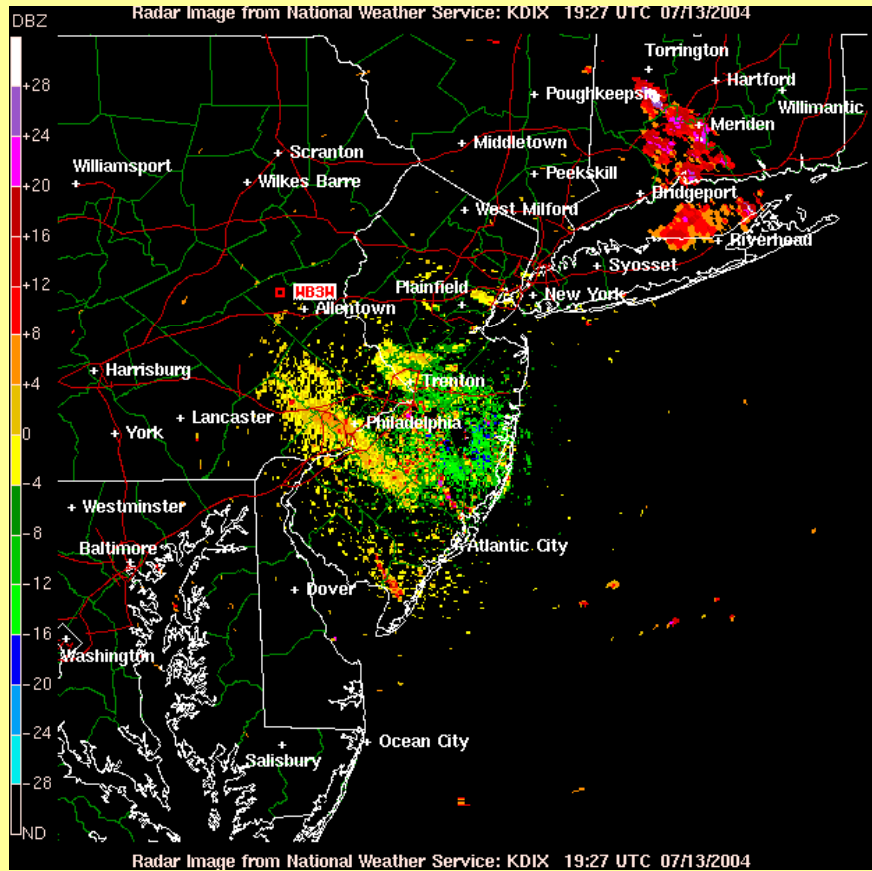
Findu.com Weather Data



Temperature & Dew Point



Rainfall Rates



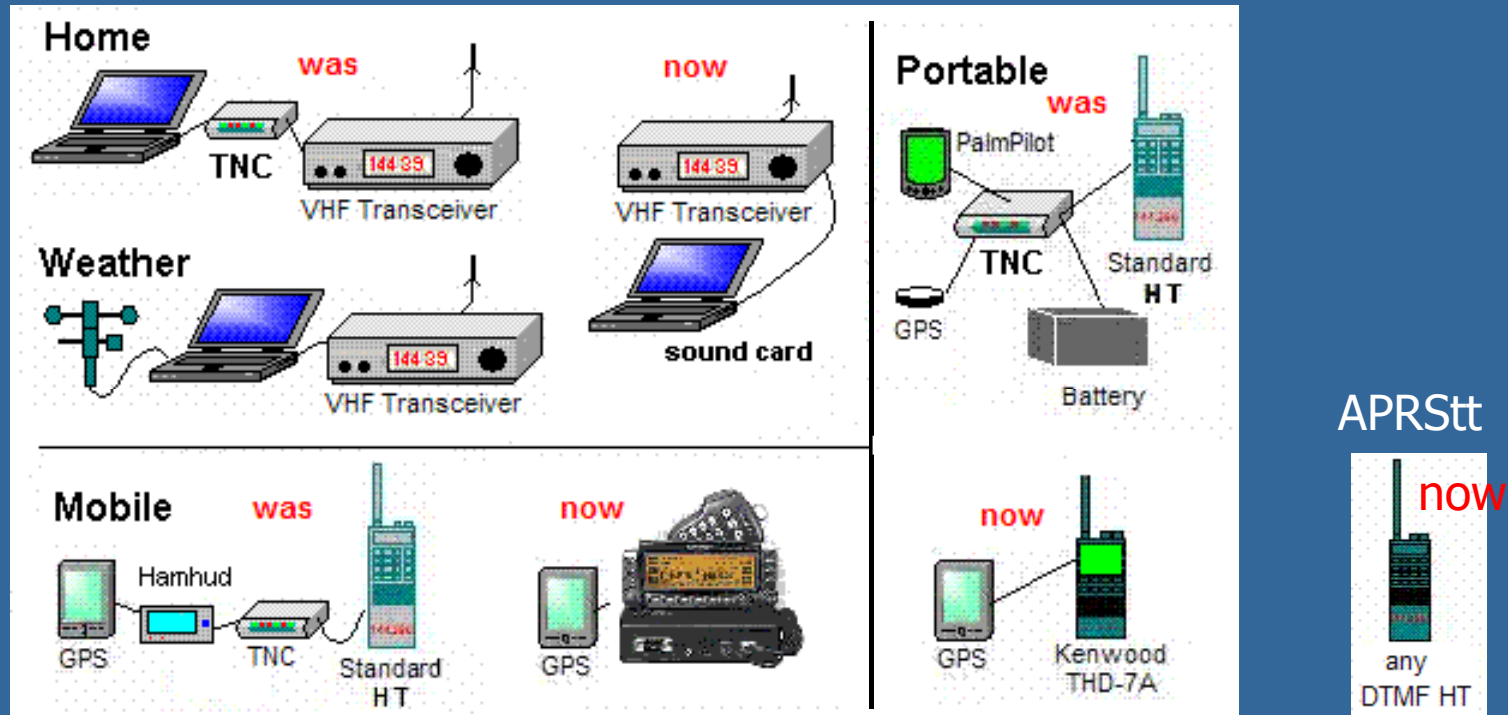
What is APRS all about?

(Humans communicating INFO with Humans)

- Immediate local digital and graphical information exchange between all participants in a local area or event. This includes:
 - **Positions** of all stations and objects
 - **Status** of all stations
 - **Messages**, Bulletins and Announcements
 - **Weather** data and **telemetry**
 - **DF bearings** and **signal strengths** for quick transmitter hunting
 - **RF Connectivity** plots of all stations
 - Local **OBJECTS** on a common map display for all users
 - Local **Freqs, IRLP, ECHOLink, Winlink, Nets, Meetings**
- Typical applications are:
 - **Routine local awareness of all ham radio events and assets around you**
 - Marathons, races, events and public service
 - Search and rescue
 - Family communications and tracking and one-line emails
 - **Mobile-to-mobile global text messaging**
 - Weather data exchange and display
 - **Efficient multi-user Satellite communications**



Various APRS Stations (two-way)



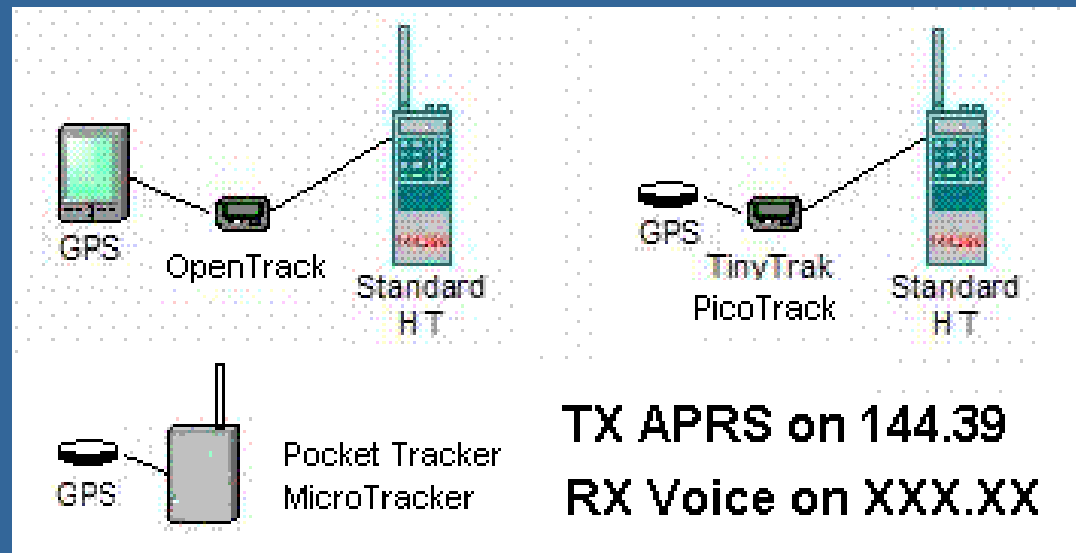
APRS is a Network intended for real-time Tactical INFORMATION exchange. This means TWO-WAY.



TRACKERS (should be two-way)

One-way APRS is not normally recommended. APRS is a Network. We want good 2-way communications among all participants for maximum utility.

Trackers have no APRS data display. So the receiver should be tuned to a beaoned Voice frequency so the operator can be involved in the Net!



One-way trackers are good for non-manned assets at large movement events.. Not as the only APRS asset for a ham.

Trackers may be his 2nd, 3rd or 4th unit for APRS support... not his 1st!

Mobile/Portable APRS Terminals

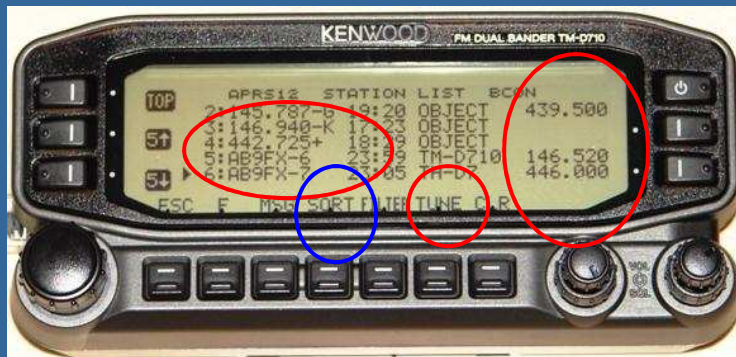
Kenwood TM-D700A

- Dual band 144/440 MHz 50/35 Watts
- Built-in 1200/9600 bps TNC including digipeater
- Built-in APRS Displays and messaging.
- Other APRS stations show on attached GPS map



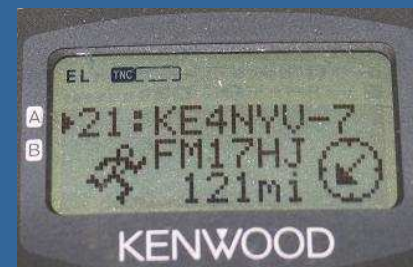
Kenwood TM-D710

- Adds operation Freq to every posit !
- Auto tunes to others with Freq!
- Shows local Voice Repeaters !

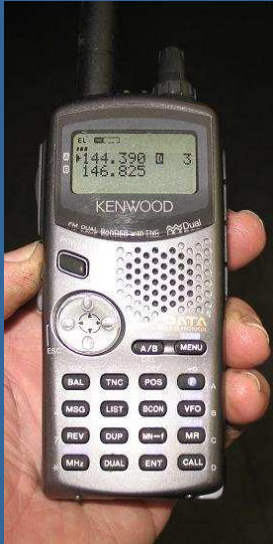


Kenwood D7

Yaesu VX8R



Global APRS Email!



To: EMAIL

MSG: wb4apr@amsat.org ET call home!



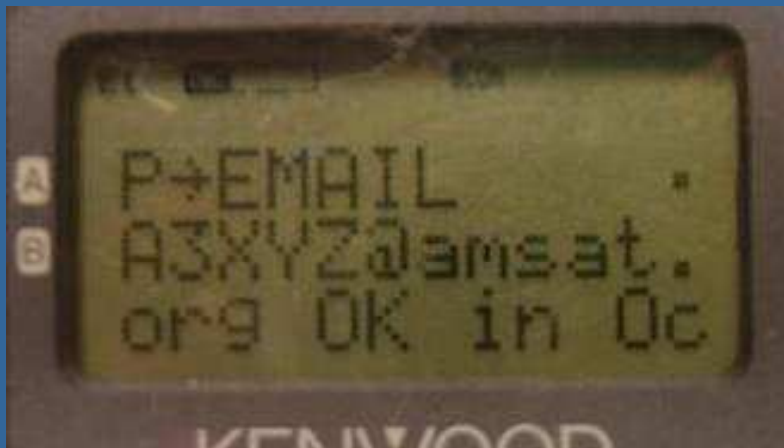
- APRS Global **Text Messaging** since 1993; from HT's since 1998!
- Send Email from any APRS radio anywhere to anyone on the planet, anywhere LIVE.
- WU2Z Email Engine on the APRS-IS gates it to Internet
- **Great Demos.** Send an Email to a Blackberry in the audience.

New Initiative! Universal Amateur Radio Text Messaging



APRS Msgs/Email

MSG
menu



Send/Receive messages or email

Anywhere on the planet via APRS satellite

Confirmation of Relay =>



APRS Voice Alert! *

(For all mobiles!)



- Voice Alert is effectively 3rd Radio channel for the D7 and D700 APRS radios
- By setting the APRS Band, A, to CTSS-100, but keeping the volume turned up:
 - You won't hear any packets on 144.39 *
 - But you will hear a voice call using PL-100 on 144.39
 - And you will hear* an occasional Ping packet if another D700 comes in line-of-site to you, like a proximity radar alerting you to local presence.
- Great for long haul traveling and meeting other APRS users.



APRS – IS - Local Info!

Last 100 stations!



Direction & Distance
Frequency and Tone



APRS is a registered trademark Bob Bruninga, WB4APR

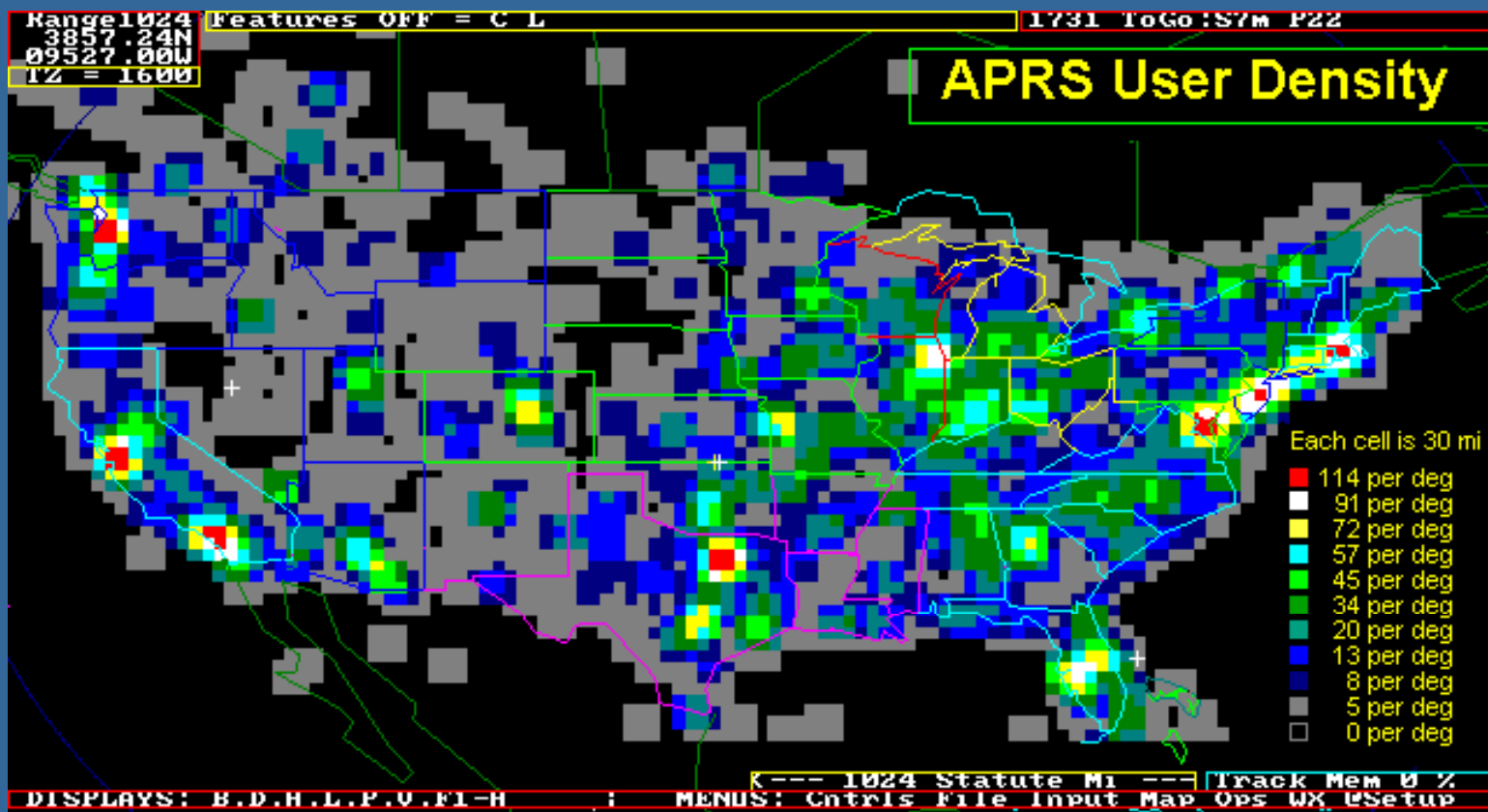


The New-N Paradigm 2005

Factor of 3 to 5 improvement!

- ❑ **APRS Generic Paths** evolved over 13 years and the presence of many old legacy formats and procedures were really bogging down the network making it saturated and unreliable in busy areas.
- ❑ In 2005 all **old paths were declared obsolete** (RELAY & WIDE) and the entire APRS system in the US was then focused only on the WIDEn-N type of generic paths with small values of N.
- ❑ **WIDEn-N** goes **N** hops outward in all directions.
- ❑ **N=2** in most areas colored on next slide





This data is plotted from Steve's FINDU data for 10 days and plotted on APRSdos shows the user density in the USA in Feb 05. Although it appears that most of the USA is low density, remember that a WIDE5-5 launched anywhere in the remotest area will still get to the closer cities and add to the QRM there. And there are 100 times more low density users surrounding these cities hitting them from all sides that really adds up to heavy QRM. We recommend WIDE2-2 in ■ ■ ■ ■ and surrounding areas

The grid size is 30 miles and each is averaged with all 8 of its surrounding adjacent grids.. The file is over 11,000 stations.

But the great news is that the New n-N Paradigm is the right approach. It encourages WIDEn-N everywhere while letting the high density areas trap large values of N to prevent overload in their areas only. WB4APR



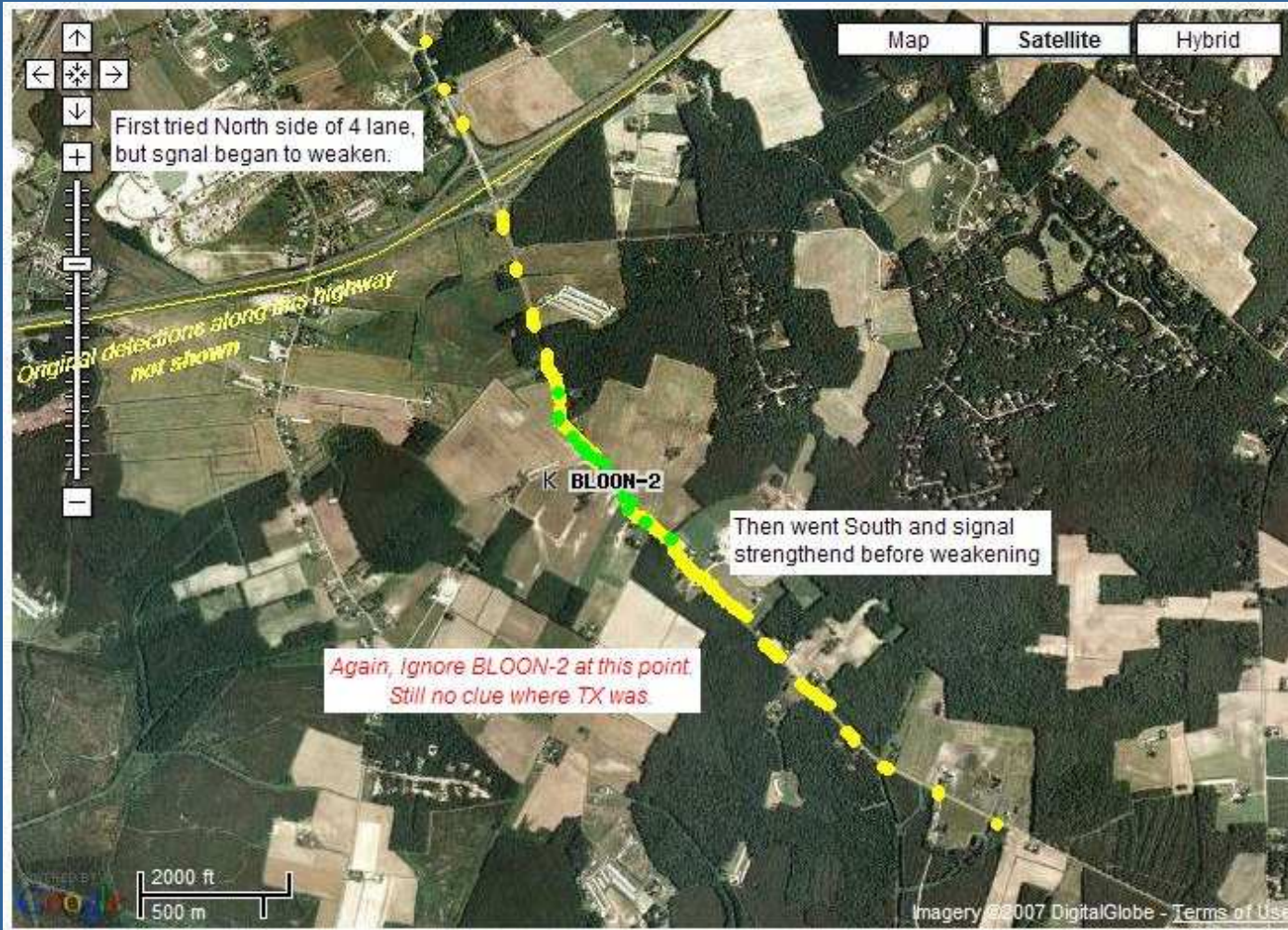
APRS Balloons



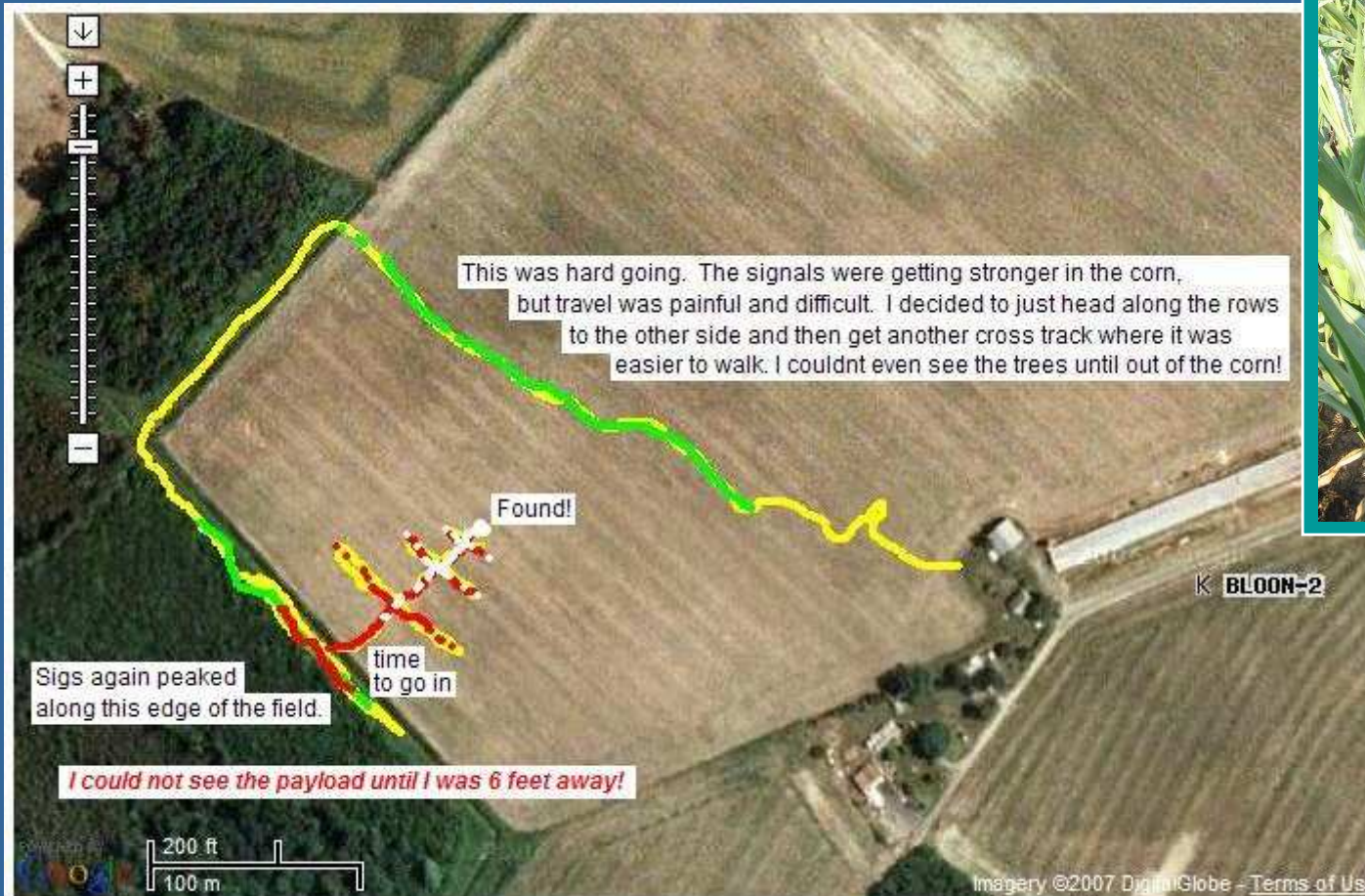
Very Simple



APRS (Solo DF Fade Circle Technique)

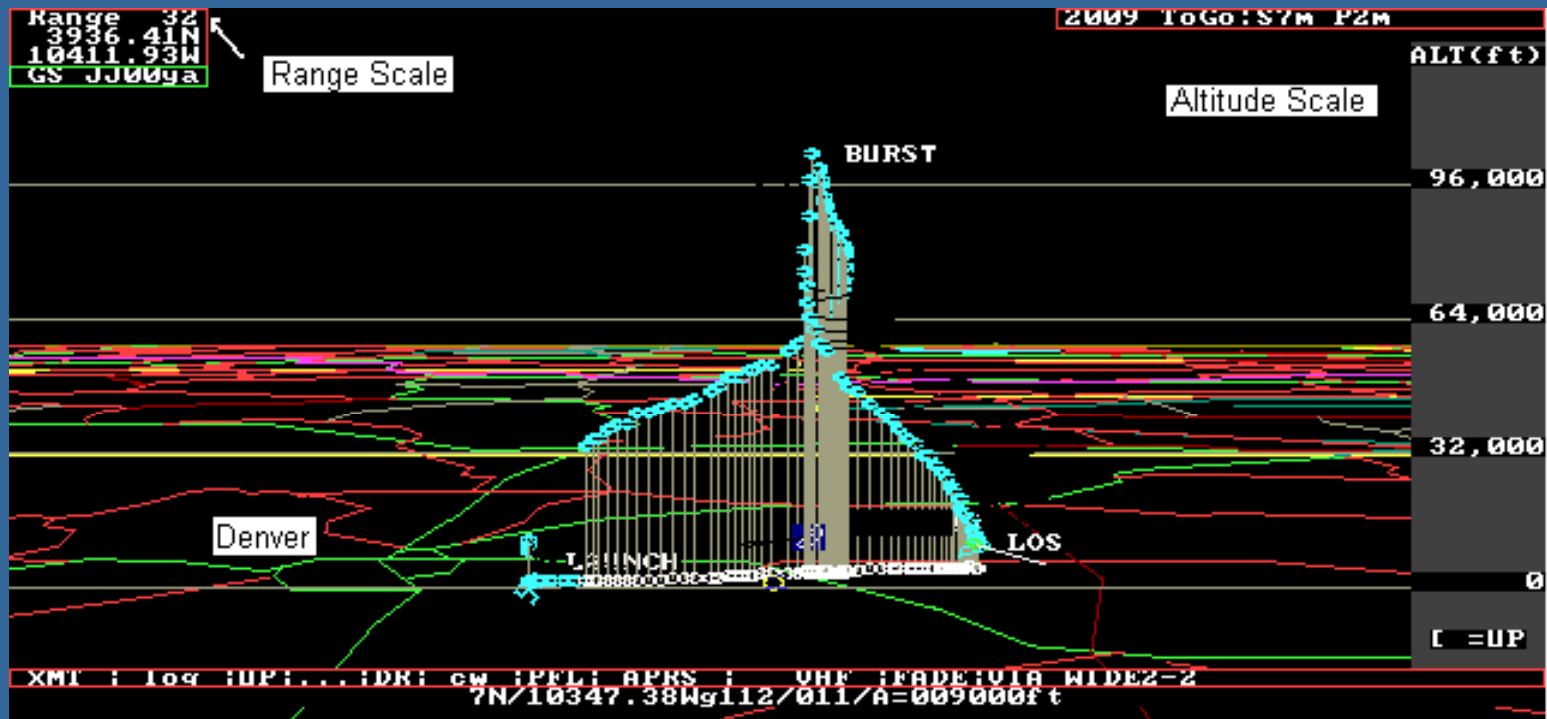


APRS (Solo DF Fade Circle Technique)



I have changed color scale down on this view, since I was now much closer than previous views. On previous views, RED showed places where signals were beginning to sometimes hit S9 full scale on my D7 HT. On this view, however, red shows where it was SOLID S9 with no dropouts. White shows where I could begin to hear signals without the HT antenna.

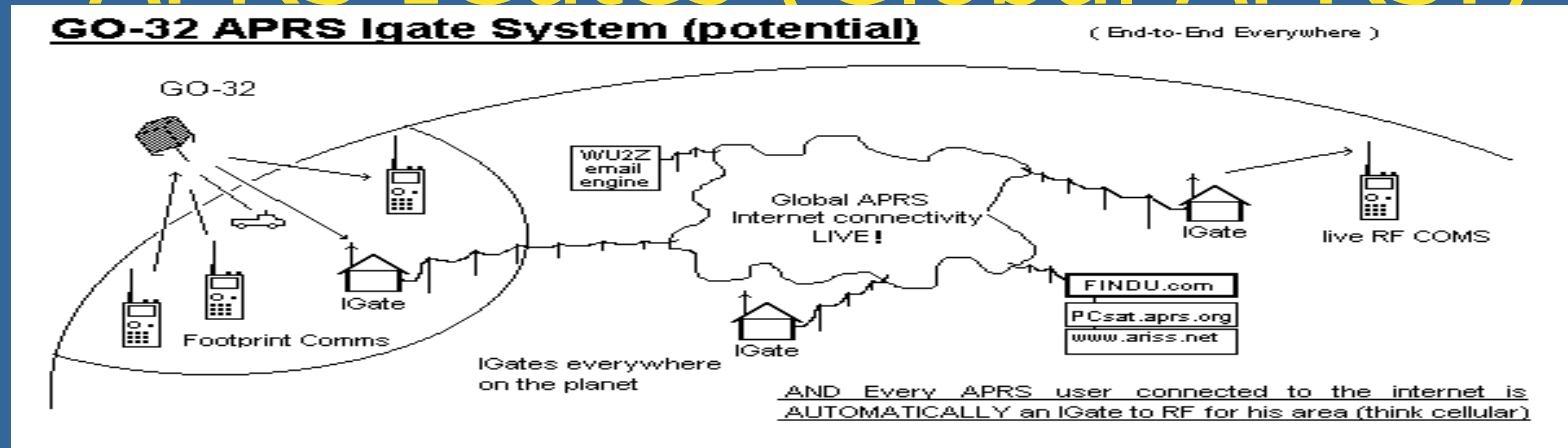
APRS 3D views for Balloon tracking



APRSdos has a 3D map display mode. The vertical scale can be separately set from the normal Range Scale depending on the altitude of objects. This is a typical APRS balloon track.



APRS IGates (Global APRS!)



- An IGATE is a local APRS station that utilizes the APRS-Internet network to pass all packets heard on their local RF back to the Internet. (Gives global views to local activity.)
- Also act as two-way gateways for ALL APRS MESSAGES worldwide (Internet ↔ RF).

APRS for Special Uses

- Bicycle rallies, races
- Walk-a-thons, Parades
- Skywarn
- Weather Nets
- Crime prevention patrols
- Damage assessment
- Direction Finding – Foxhunts
- Voice for communications, APRS for visual mapping
- Now integrating into APRN (Automatic Picture Relay Network)



APRS in Space

- 2001 PCSAT-1 Prototype Comms.
- 2006 PCSAT2 on ISS
- 2007 ANDE
- 2008 RAFT

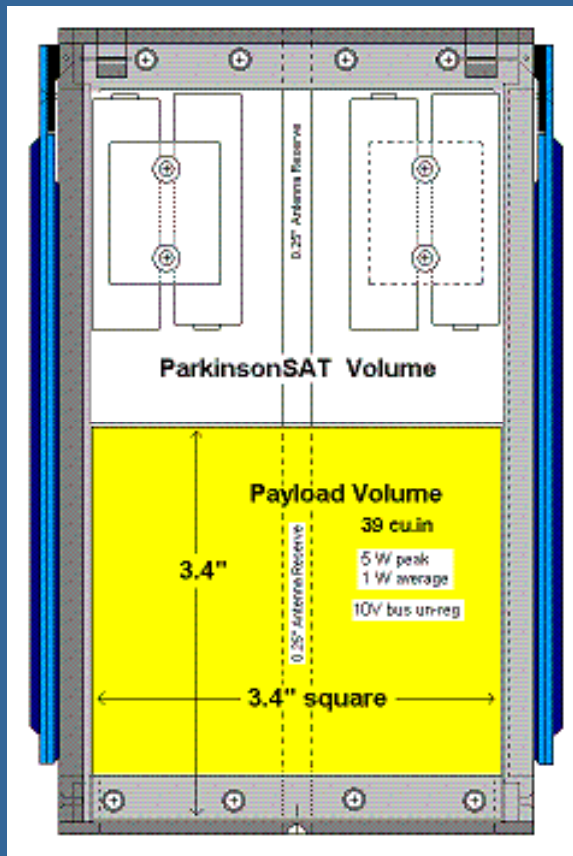


■ APRS space frequency is published as 145.825

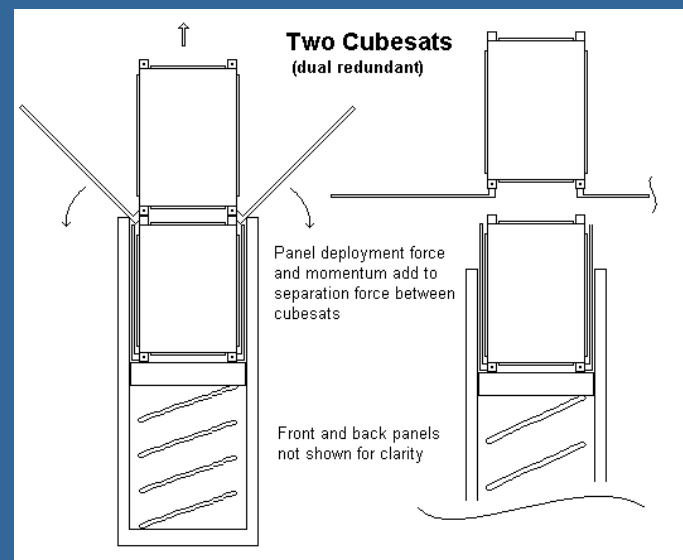
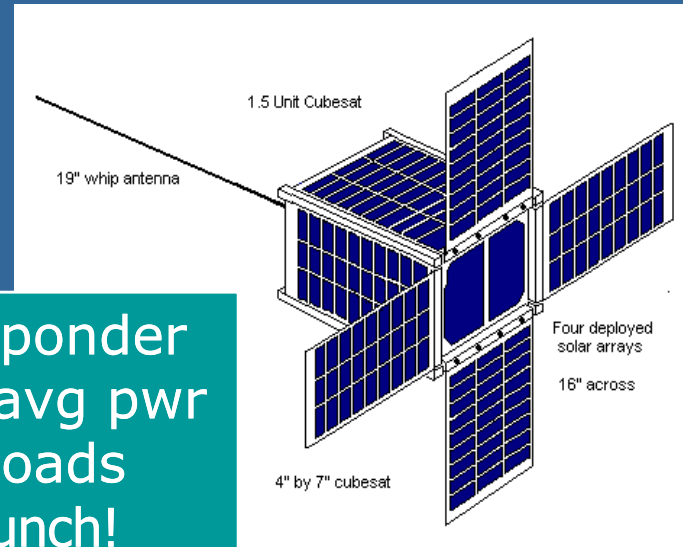
See live downlink on <http://pcsat.aprs.org>



Psat 2009?



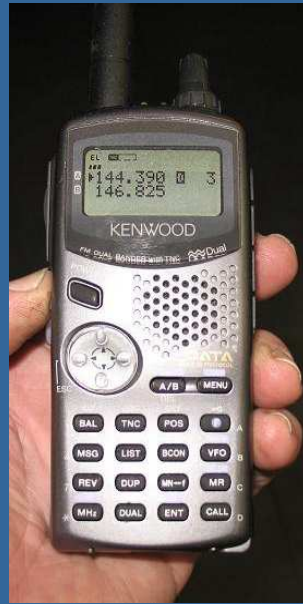
- 145.825 Xponder
- 4.5 watts avg pwr
- Other Payloads
- Two-per Launch!



See live downlink on www.ariss.net



Now GO-32 TECHSAT-1b



- GO-32 now supports APRS on its 435.225/145.85 packet system.

- APRS up on 145.85 (PC's and messages)

- Mic-E up on 145.93 (D7 and D700's)

9600 Baud!

See live downlink on www.ariss.net



APRS is INFO not just tracking!

APRStt?

Milemarks?

Field Data?

Voice Alert?

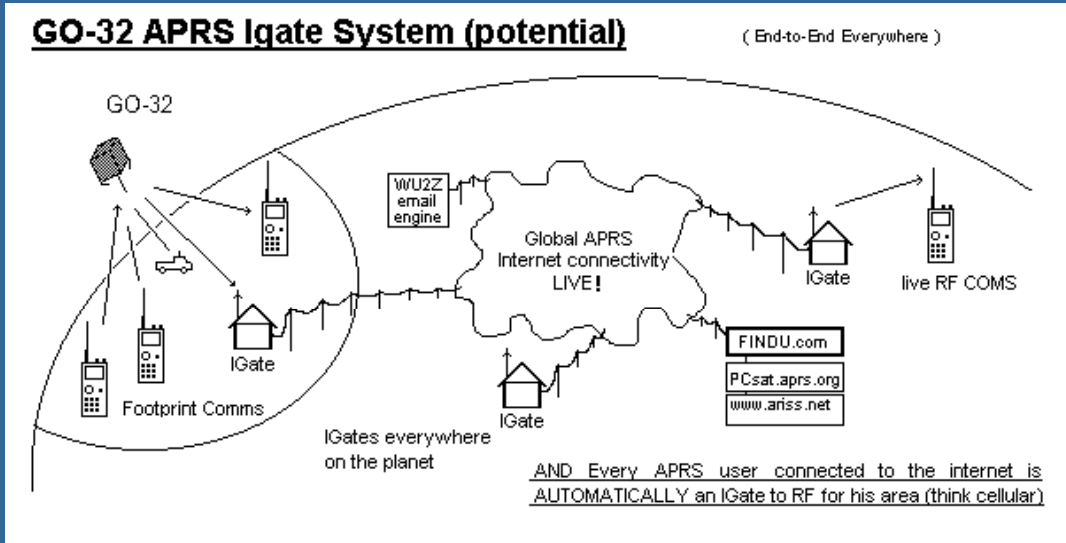
Signal Finding?

Nets?
Meetings?

Tracker-Voice?

AVRS (Ham Radio Mobile Cell via APRS=>VOIP)?

Traffic?



Frequency?

RF Range?

