APRS.org

Maps – Mobiles - Users

APRS Frostfest 2015

Human to human info exchange!

APRStt !!!

Appalachian Trail Golden Packet Event

Who is WB4APR?

The Saga of The Elect-Reck
1970

APRS
1990

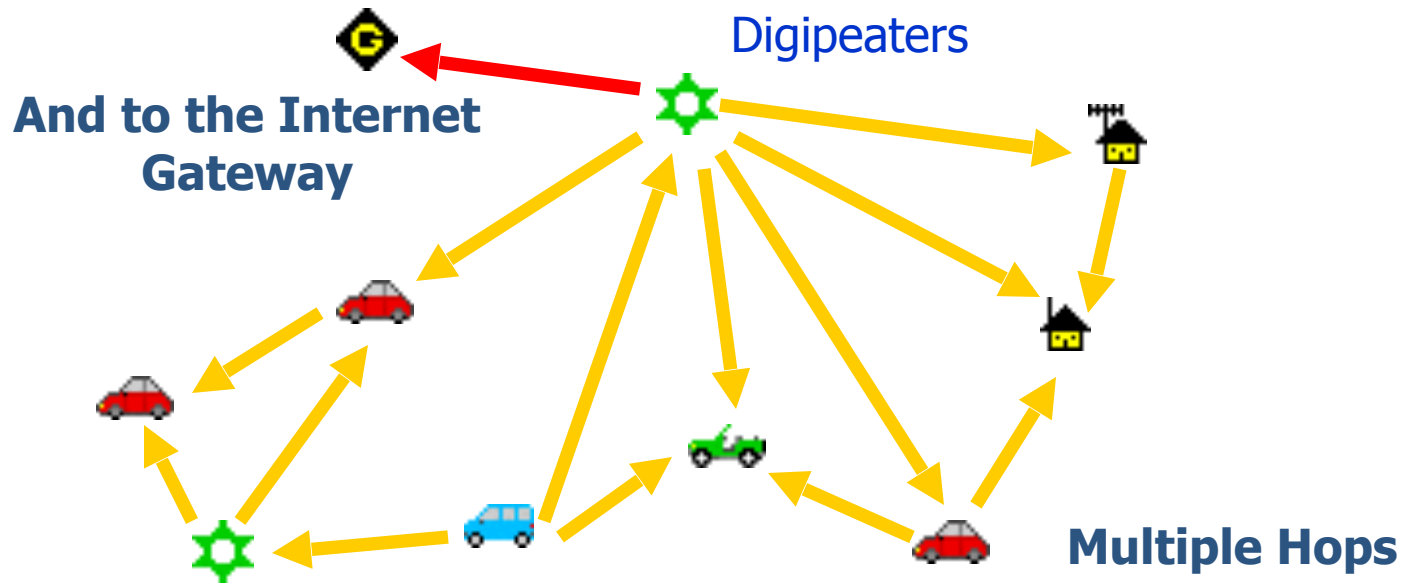
1980

2010

2012

2007
Solar PHEV

2013

Future?

2009

2

The APRS Network
Information exchange between everyone

Digipeaters

And to the Internet Gateway

Multiple Hops

Global Mobile/HT Position and Texting Connectivity

APRS Global Network (End-to-End Everywhere)

GO-32

CQ server

WU2Z email engine

Global APRS Internet connectivity LIVE!

IGate

live RF COMS

Footprint Comms

IGate

IGates everywhere on the planet

IGate

FINDU.com

PCsat.aprs.org

www.ariss.net

AND Every APRS user connected to the internet is AUTOMATICALLY an IGate to RF for his area (think cellular)
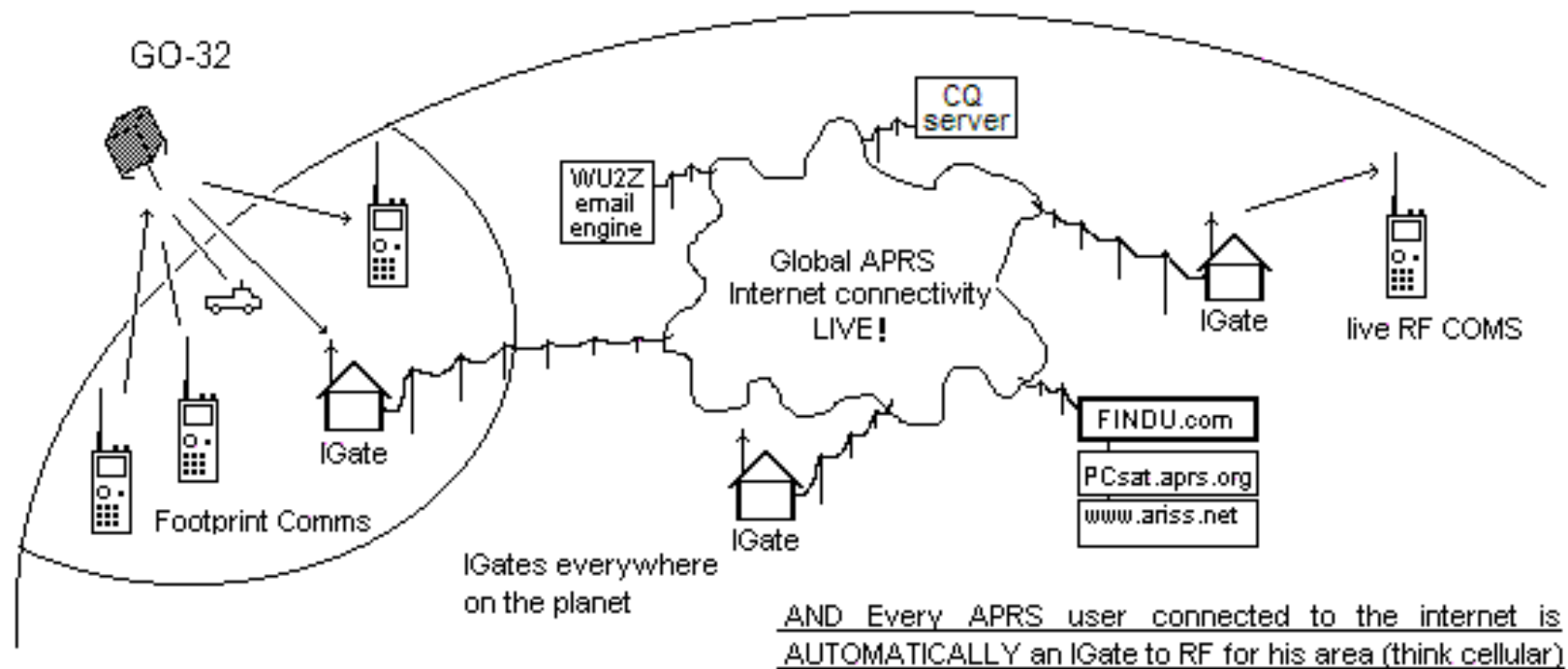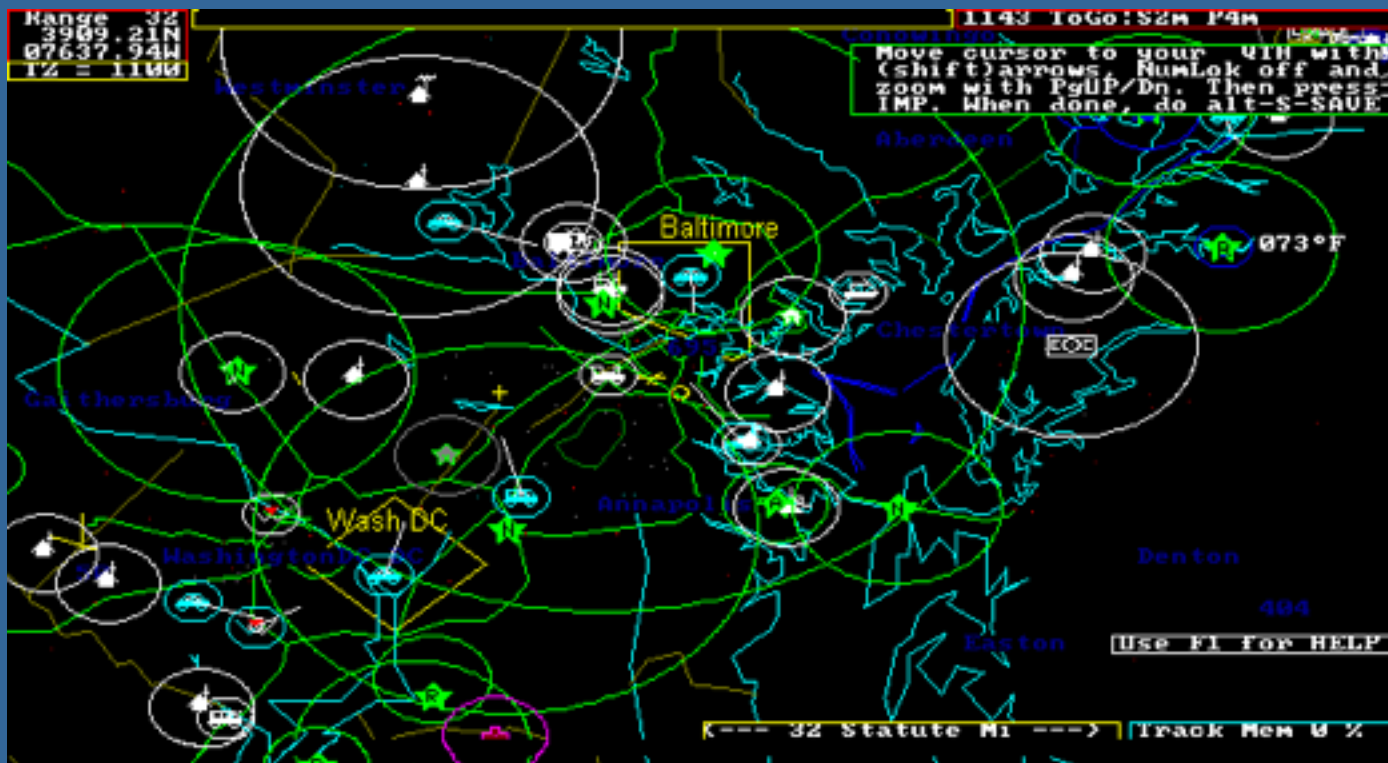
Seeing the Network
(PHG data shows relative station performance)

50 mi

APRSdos map with PHG circles displayed and calls, roads, and rivers turned off to reduce clutter. The green interstates remain and you can see WashDC in the lower left and Baltimore in the upper center. Notice the three WIDEn-N digis cover the area though there are more than 15 digis around. Two stations in the upper center live on hills... 2 hops covers everywhere.

Scope of APRS

- Over 40,000 users worldwide.

- RELAYS every 20-30 mi called "digipeaters."

- All linked by home station Igates

- Global links by Amateur Satellites

- Thousands of Weather stations

- Telemetry and data everywhere

But, only 2% of local ham radio users…

(a side show)…

APRS = Events, Info and Objects!

Universal Ham Radio Text Messaging Initiative 2010

cell

wireless

APRS

EchoLink

DTMF

WINLINK 2000
Global Radio Email System

Send/RX anytime, anywhere, any device by callsign

26 separate systems!

APRS is a registered trademark Bob Bruninga, WB4APR

APRS Texting – Lots'a Radios!
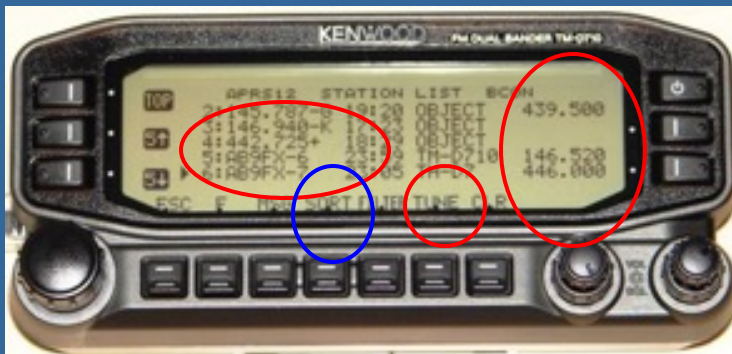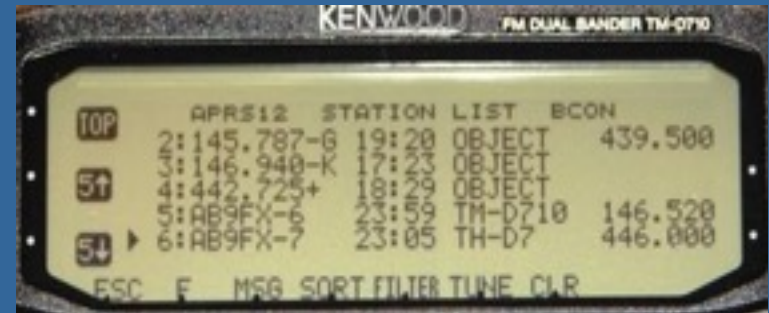

FTM-350R

VX-8GR

VX-8R &

VX-8DR

TH-D72A

All now come with GPS BUILT-IN!

Local Info: FREQUENCY OBJECTS and POSITS

D72, D710 and FTM-350 all TX their voice Freq and can
QSY with one button…

APRS on ANY radio! (using the RC-D710)

Attached to an ALINCO HT

Simple SPKR/Mic connections

NiCd Battery Pack

APRS on ANY radio! (using the RC-D710)

Plug-n-play Audio Connection

RC-D710 DISPLAY

Jeff KB2M

APRS channel   DSTAR channel

On IC-2820 DSTAR

TRACKERS (Now are two-way!)

And should ALWAYS include their voice contact frequencyh in their packets

TT4 with $34 display and AVMAP G5 GPS
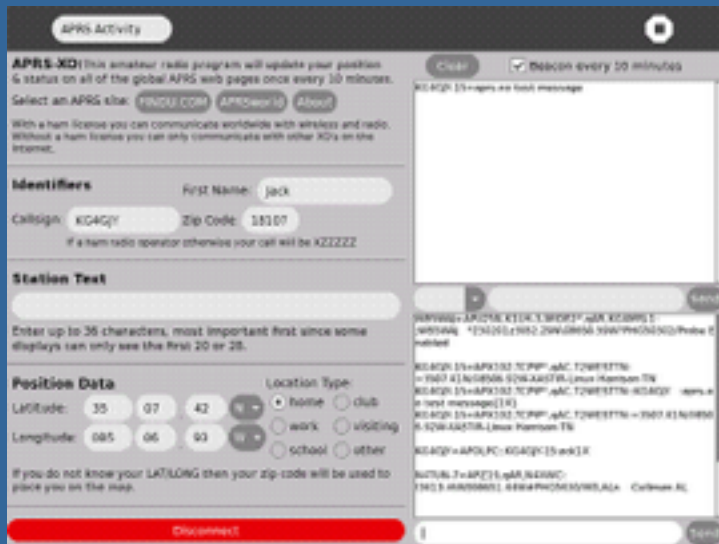
Argent Data Systems

OT2m case front   OT2m case rear   OT2m circuit board

APRS for ALL Portable Terminals & Phones!

OLPC -One Laptop Per Child

- $100 laptop per 3rd world kid
- Low power, no moving parts
- High power WI-FI and MESH net
- Runs Linux
- Sound Card to DC, volts, O'scope
- Jack, KG4GJY's APRS app:

14

APRS.FI (anyone can see APRS)

APRS-IS (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

Also:

APRS.fi

OAPRS.net

Etc...

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APRS MisConceptions!
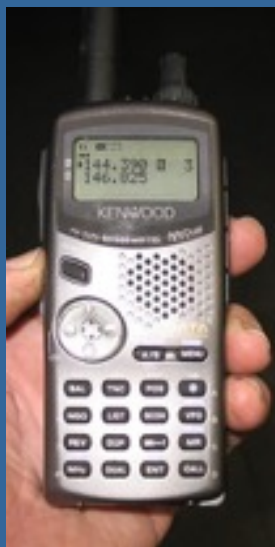See aprs.org/**APRS-tactical.html**

- That APRS is just Vehicle Tracking instead of a **Real-Time Information Distribution System**.
- That APRS is dependent on GPS for its value **(GPS is not needed. See Objects)**.
- Failure to use the APRS built-in **Mile-Marks** for tracking all other non-APRS mobiles.
- Using APRS clients that only do maps and ignored **too many of the APRS fundamentals**.
- Ignored the fundamental **Decay Algorithm** to accelerate new data, and decay old data!
- Failure to understand the importance of OBJECTS: . See **Objects** 101 and **Operations**
- Failure to use real-time messaging: . See **Messages 101** and **Message Operations**
- Failure to implement the original APRS Centralized **Common Bulletin Board** concept.
- Not understanding the APRS operator's role as a **Data Input** **(Objects, Bulletins and Messages)**
- Not using the D7 and D700 as **data entry and clipboard display units** at field events.
- Too much focus on **Large Screen** Displays **–vs- Individual Operator displays for** events.
- Failure to display APRS **symbols with all their attributes** and colors without clicking them
- Failure to manage the network by **adjusting the local digipeater** for the situation at hand.
- Not realizing the importance of **Voice Operating frequencies** in APRS.

APRS is a registered trademark Bob Bruninga, WB4APR

APRS Growth Opportunities!

- **Global Email** Done! (WU2Z) - **Now Universal Text Messaging** (any device)

- **CQSRVR (Global APRS CQ's)**   Done! (AE5PL) & ANSRVR (KJ4ERJ)

- **APRStt (APRS touchtone) – APRS for Every Radio** Done! (W4PC of CSSI)
  - Simple DTMF memory for your Callsign – One Button Send
  - APRStt receiver converts to APRS Position, Time, Frequency and Status!
  - On IRLP nodes, Echolink nodes, some repeaters, anywhere on 146.58

  any
  DTMF HT

- **AVRS (Automatic Voice Relay System) Global Callsign-to-callsign VOIP**
  - Uses APRS message to set up call – APRS knows where you and callee are
  - Automatically links to Echolink or IRLP for nearest node and sends to APRS
  - APRS Radio auto-QSY's to make link (= Ham Radio Cell phone from Mobile) (90% D710)

- **AI-FI** (APRS WIFI) in every laptop
  - OLPC message client (APRS-XO) and XASTIR (50% …)
  - Other Systems (View on OpenAPRS, APRS-fi, FINDU)

- **APRS RFID for ARRL name tags (event locating)**

  WB4APR

  ARRL RFID tag designed to identify the
  wearer whenever he passes through a door

Global APRS Email!
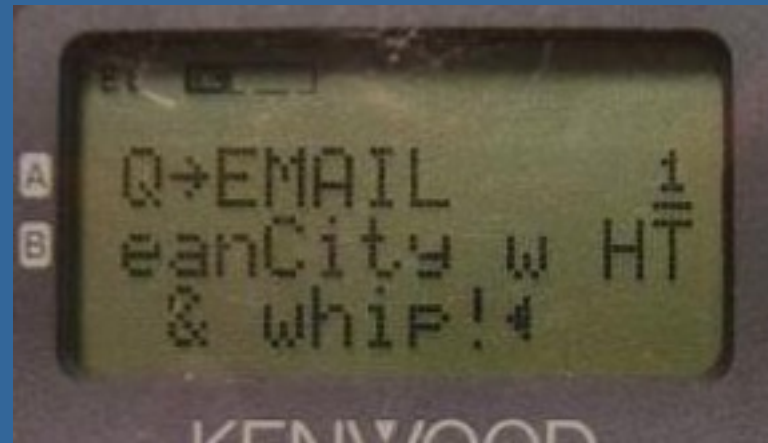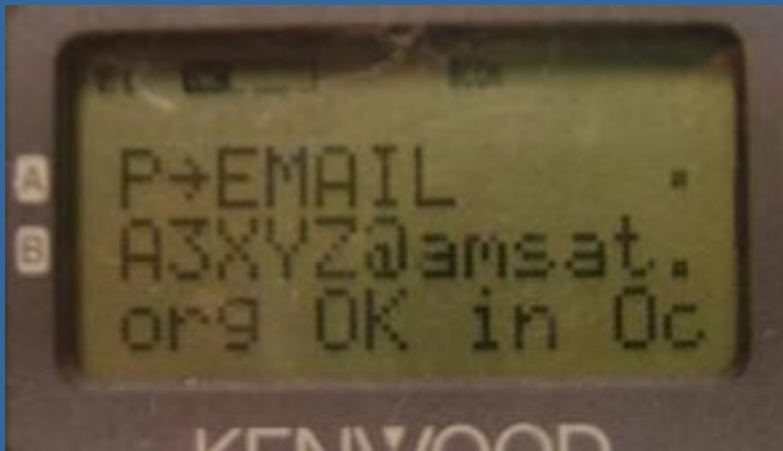
To: EMAIL

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.

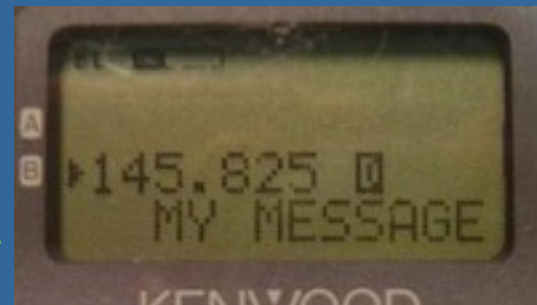New Initiative! Universal Amateur Radio Text Messaging

APRS Msgs/Email

MSG menu

LIST
INPUT
TRANSMIT

KENWOOD

P→EMAIL
A3XYZ@amsat.
org OK in Oc

KENWOOD

Q→EMAIL   1
eanCity w HT
& whip!◄

KENWOOD

Send/Receive messages or email

Anywhere on the planet via APRS satellite

Confirmation of Relay =>

►145.825 ▯
    MY MESSAGE

KENWOOD

New APRS ⇔ SMS

APRS Global CQ's

www.aprs.org/cqsrvr.html

APRS CQ SERVER (End-to-End Everywhere)
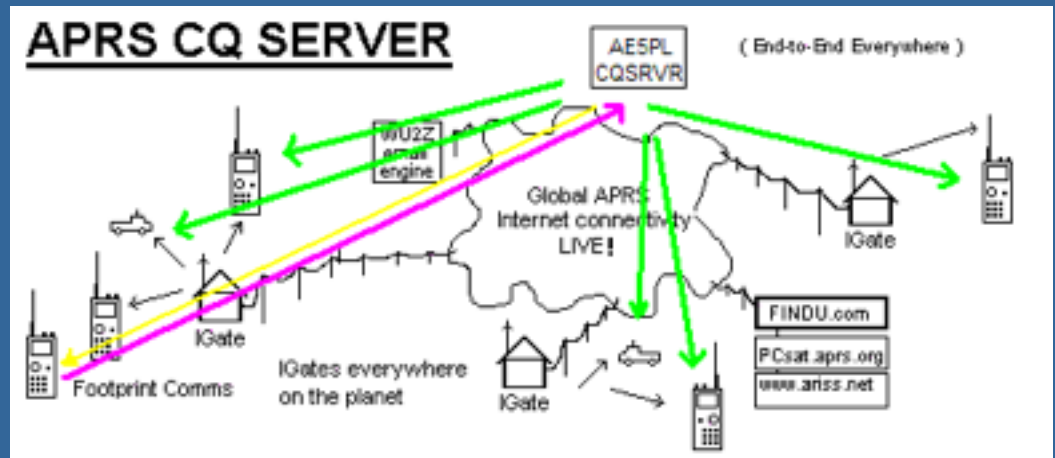
- We needed a CQ System for SCOUTS, JOTA, SATERN, IOTA, SCR and Field Day!
- AE5PL responded with CQSRVR
- Allows anyone to send a global message to everyone involved in an XXXXX activity
- Just send a message to CQSRVR starting with CQ XXXX CQ XXXX message
- Everyone who has sent a similar CQ XXXX message to CQSRVR will get your CQ

- From then on, once you see callsigns, you message normally point-to-point
- To limit load, only one CQSRVR message per 30 minutes is forwarded.

- Can also be used any day, any time, anywhere! CQ CQ CQ CQ anyone around?
- Can also be used for global GROUP comms if 30 minute timer is changed.

APRStt (Touchtone) (every radio!)

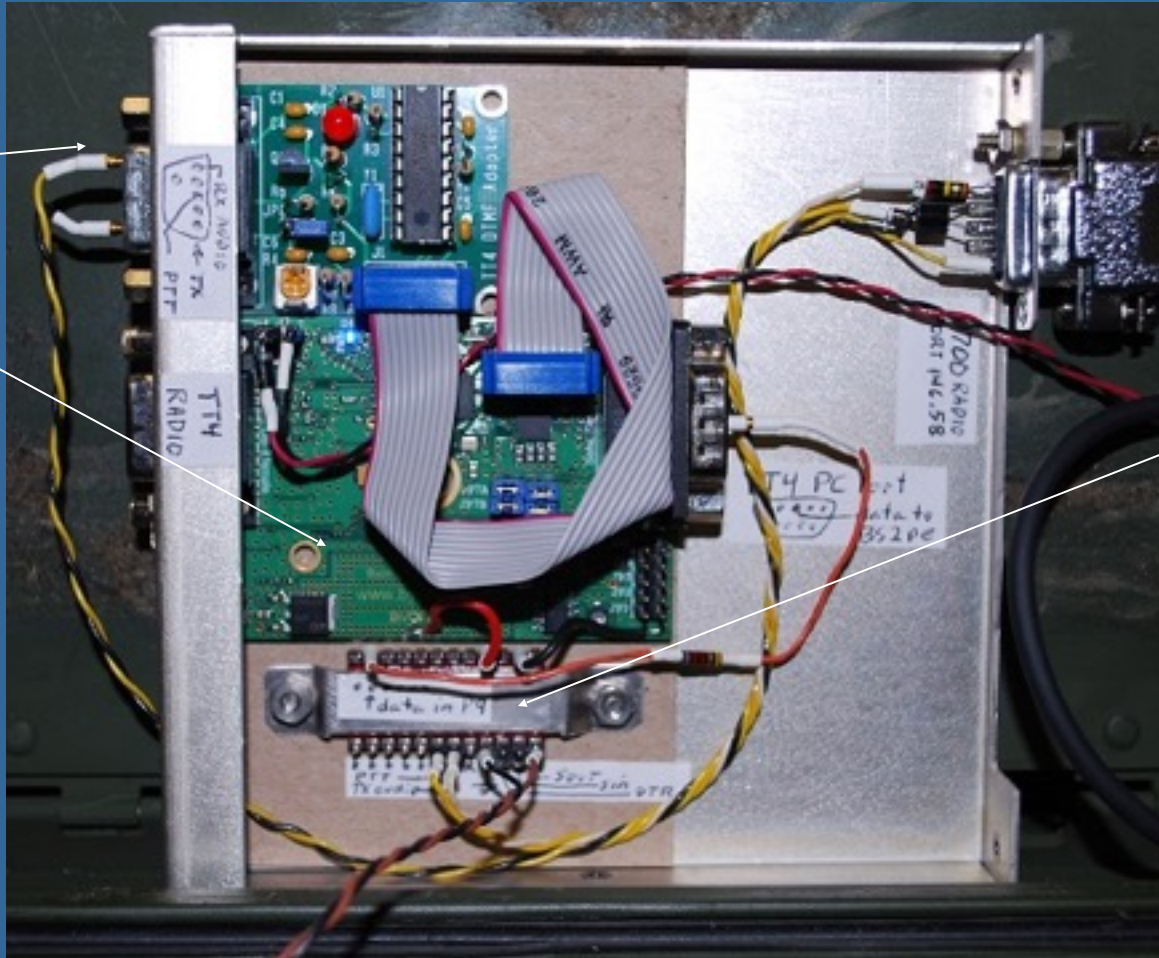See aprs.org/**aprstt.html**

any DTMF HT

- CALLSIGN preloaded in DTMF memory: WB4APR = **A9A2B42A7A7C79#**

- This is converted to an APRS packet on the APRS channel as:
  WB4APR-12>APRStt,WIDE1-1:!DDM_.__N/DDDM_.__W$146.58MHz HAMvention

- **Puts you on global map near Hara Arena, with your immediate calling frequency, your Tone and your Echolink node number and that a Hamfest is going on.**
  - That is everything you need to be known to the Global APRS system!
  - Exists since 2001 (in DOS w DTMF chip). Now we have a Hardware Version! Byonics
  - Also Needed in Echolink, IRLP, repeater controllers - ANYTHING with a DTMF decoder

- APRStt gives 100% situational awareness participation not just the 10% with APRS radios.

- Other Positions: #B95*234*1D => Milemark #234 on Route 95, northbound

APRS is a registered trademark Bob Bruninga, WB4APR

APRStt (hardware) See **aprstt.html**

Byonics
DTMF
Add-on
To TT4

Marathon
MM
Converter

And PACE
generator

any
DTMF HT

APRS is a registered trademark Bob Bruninga, WB4APR

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APRStt (special event) (every radio!)

See **aprstt.html**

any DTMF HT

APRStt Event Engine
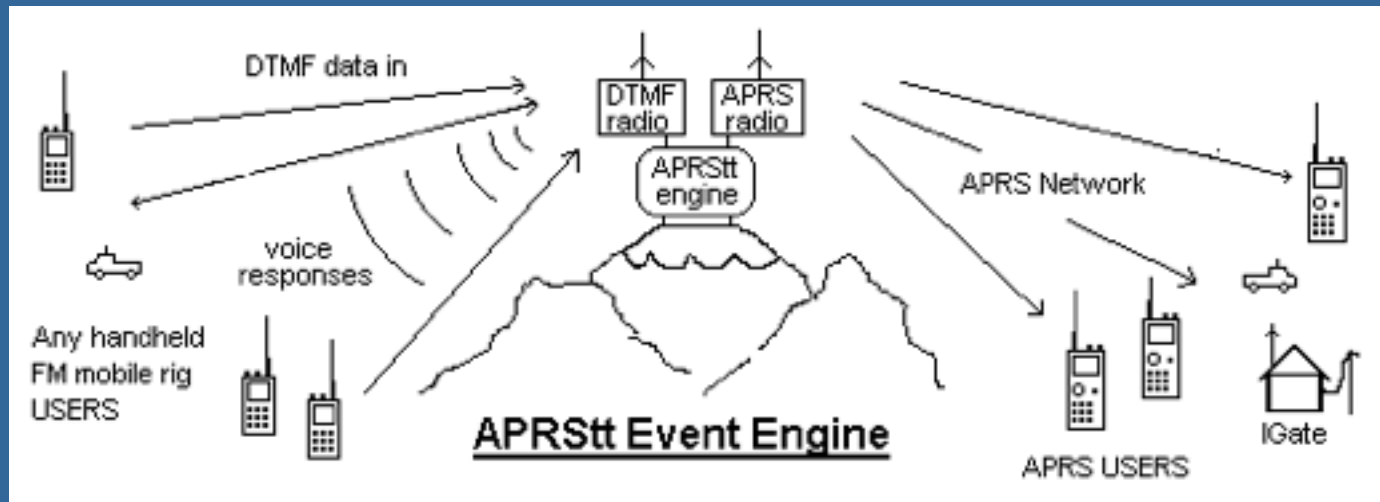
- Simple DTMF memory - One button puts you in APRS (Position, Frequency and Status)!
  - DTMF on voice freq translated to packet on APRS channel (or direct to APRS-IS)
  - Position is .1 mile LIST on map display adjacent to repeater or FREQ object
  - Frequency used is inserted in packet (for return contact)
  - If Echolink, IRLP or Autopatch, APRS packet includes node or Phone number!
  - All responses in Voice

DTMF users show on map See **aprstt.html**
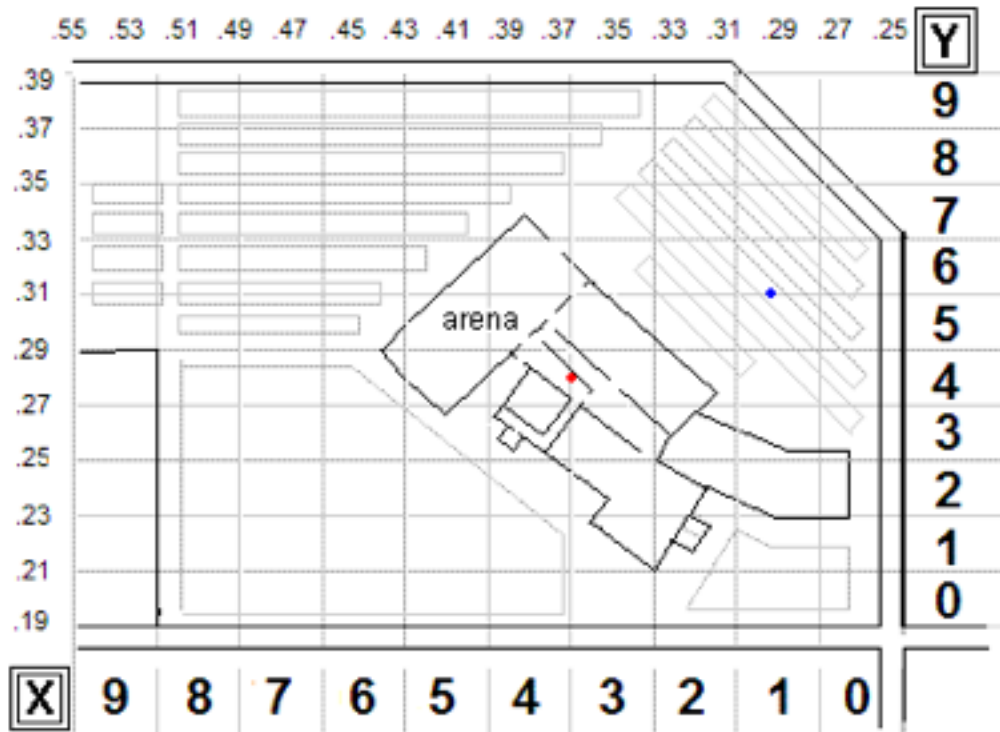

any DTMF HT

147.105MHz T107 R30m

- DTMF Report shows on APRS!
  - CALLSIGN with date and time
  - Position LIST in vicinity of repeater or APRStt entry point
  - Voice Operating Frequency, Tone and local other info
  - Node number if Echolink or IRLP, or reverse patch number if Repeater

APRStt (Hamvention) (Doug Quagliana)

TT Position Format: BXY#

APRStt on 146.58 MHz

$Lat = 3949.20 + .02 \times X$

$Long = 8415.26 + .03 \times Y$

DTMF Users: Report position by pressing B then an X and Y digit from above map, then *, then select your DTMF Callsign memory and send.

THD7 Users: (without GPS): simply set the above aa/bb in your position.

	ABC	DEF	
1	2	3	A
GHI 4	JKL 5	MNO 6	B
PQRS 7	TUV 8	WXYZ 9	C
*	0	#	D

Store Callsign in DTMF memory

Format: AcccccccccccVK#

Where ccc... is call, spelled out using 2-key method. ie W is 9A, E is 3B, L is 5C and S is 7D.

Where V is an overlay digit 0-9

Where K is the checksum by adding all keys and keeping only the units digit. Treat ABCD as hex.

• **Radio Spotter (APRStt) Booth**

• **WB4APR Solar Prius**

WB4APR

APRStt!

APRStt
2x2 digit
reporting!

B2XXYY*

Dayton

APRStt LAT/LONG
Format: B2XXYY★
Simply enter L/L minutes to put
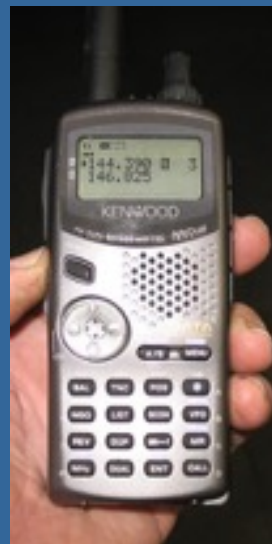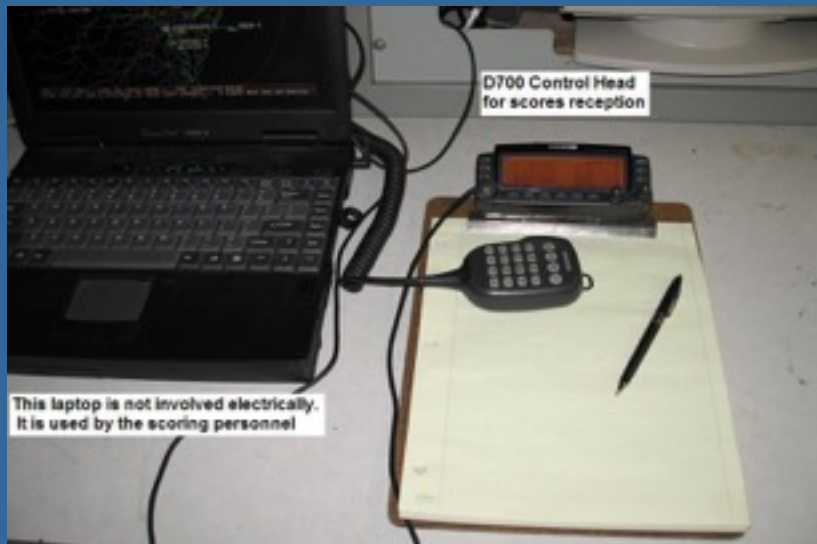you on map with 1 mile ambiguity
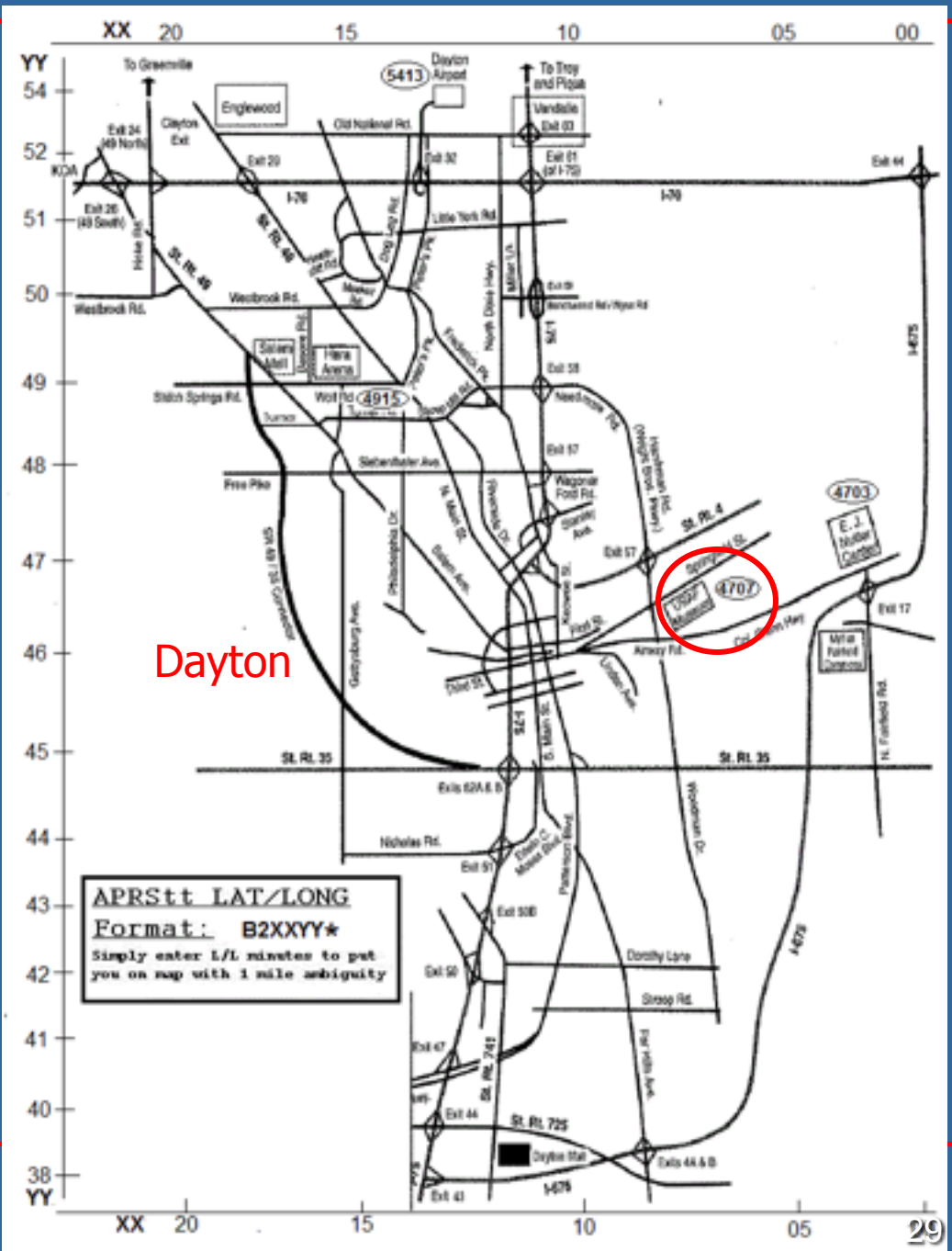
APRStt (Freq Display)

any
DTMF HT

For events, put one on each operating frequency and set posits along unused edge of map.

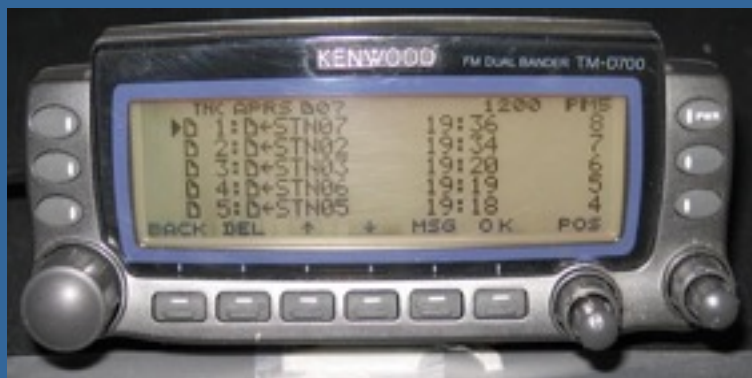See who is operating where, on what frequency and when

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APRS Event Data Entry

Score Message Sent

Score Data Received

Using an HT to report ALL 100 runners!

HIKER-2 messages

http://www.findu.com/cgi-bin/msg.cgi?call=HIKER-2

from	to	time	message
HPRSFY	HIKER-2	05/07 20:26:24z	AJ on the air now?{25}
WA0DYJ-9	HIKER-2	05/07 17:45:01z	rej11
HIKER-2	ALL	05/07 17:44:53z	1342 078. hiker2 @ washmnt, car to gathland{11
WA0DYJ-9	HIKER-2	05/07 17:36:03z	rej10
HIKER-2	ALL	05/07 17:34:58z	1333 095 073 019 120 018 103 056 028 043{10
HIKER-2	ALL	05/07 17:29:34z	1328 041 011 072 069 030 068 063 050{9
HIKER-2	ALL	05/07 17:22:36z	1321 060 066 062 044 124 123 097 084{8
HIKER-2	ALL	05/07 17:14:44z	1313 109 105 033 045 085 038 026 013 047 024{7
WA0DYJ-9	HIKER-2	05/07 17:14:21z	rej6
HIKER-2	ALL	05/07 17:12:15z	1310 117 015 075 053 119 003 017 016 014 125{6
HIKER-2	ALL	05/07 16:55:10z	1250 052 128 093 106 046 098 107 100 020 086{4
HIKER-2	ALL	05/07 16:41:08z	1240 037 104 004 057 070 113 090 132{3
WB4APR-9	HIKER-2	05/07 16:28:38z	rej2
HIKER-2	ALL	05/07 16:28:34z	1226 023 059 096 135 101 058 130 071 032 049{2
W3TDH	HIKER-2	05/07 16:07:30z	rej1
HIKER-2	ALL	05/07 16:05:08z	1203 112 091 067 054 126 009{1
W3TDH	HIKER-2	05/07 15:44:42z	rej0
HIKER-2	ALL	05/07 15:44:25z	1142 029 129 108{0

Hike Across Maryland (40 miles)

Location/time of over 100 runners reported by APRS messages.

Hams (youth < 23) agreed it was as easy as Texting or Tweeting.

APRS is a registered trademark Bob Bruninga, WB4APR

APRStt for SAR XXX-YYY

Coordinate System Grids on a USGS 7.5 Minute Quadrangle
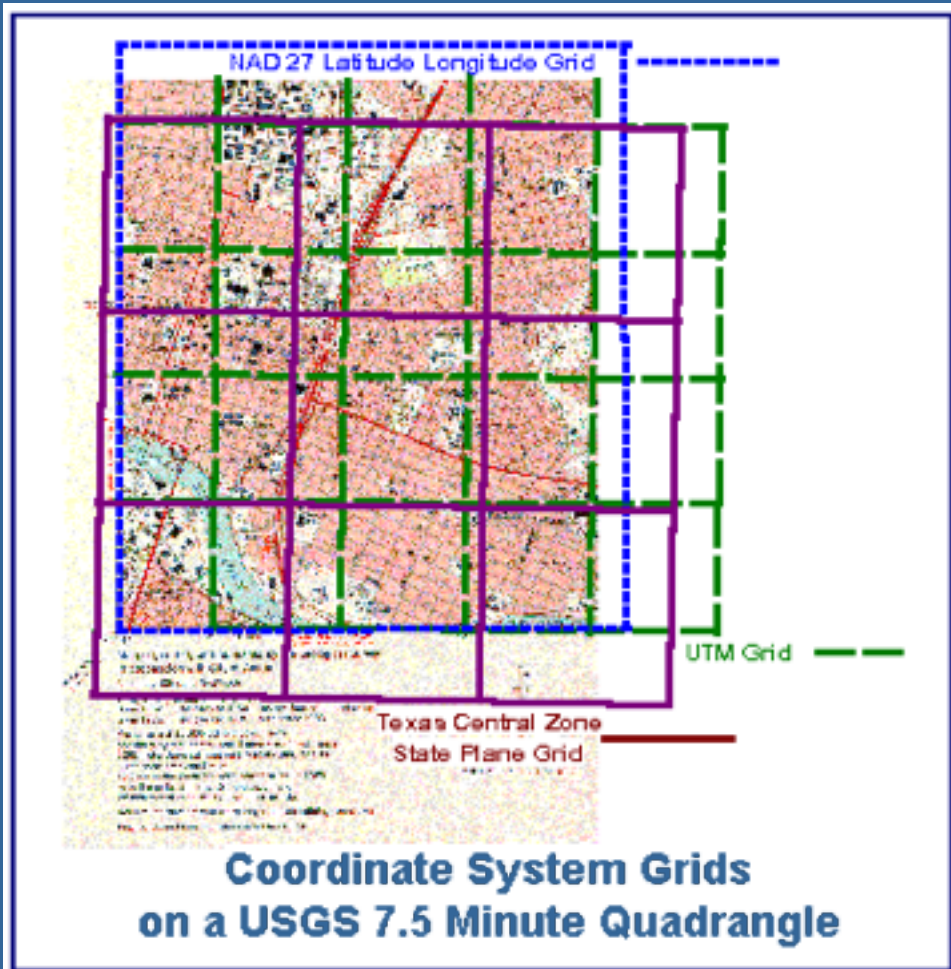
SAR groups are PRO's at using the UTM grid.

It gives resolution:

2 digits – nearest km

3 digits – nearest 100m

4 digits – nearest 10m

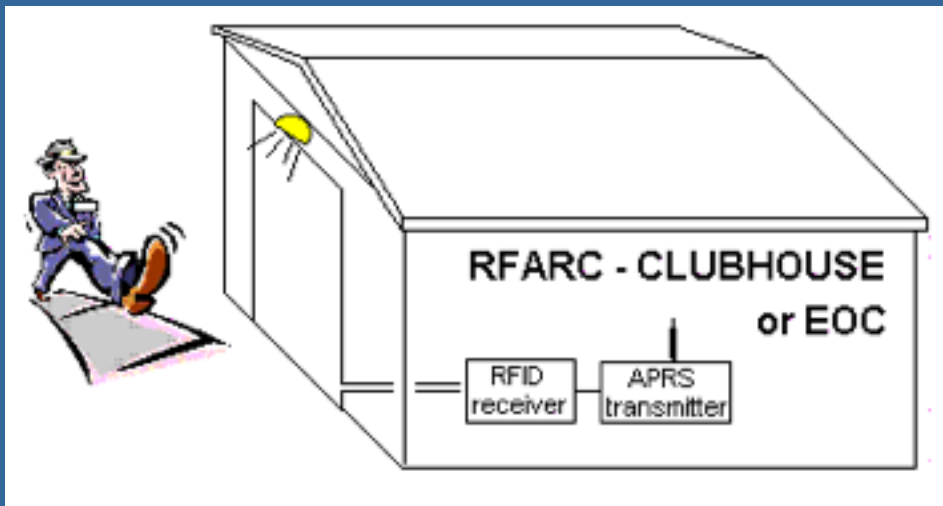5 digits – nearest 1m

APRStt: B3XXXYYY*

APRS (RFID)

See **aprs-rfid.html**

ARRL RFID tag designed to identify the wearer whenever he passes through a door

Hot Spot floor mat

RFARC - CLUBHOUSE or EOC
RFID receiver — APRS transmitter

For big events, put one at each checkpoint or venue.

Every clubhouse/EOC door
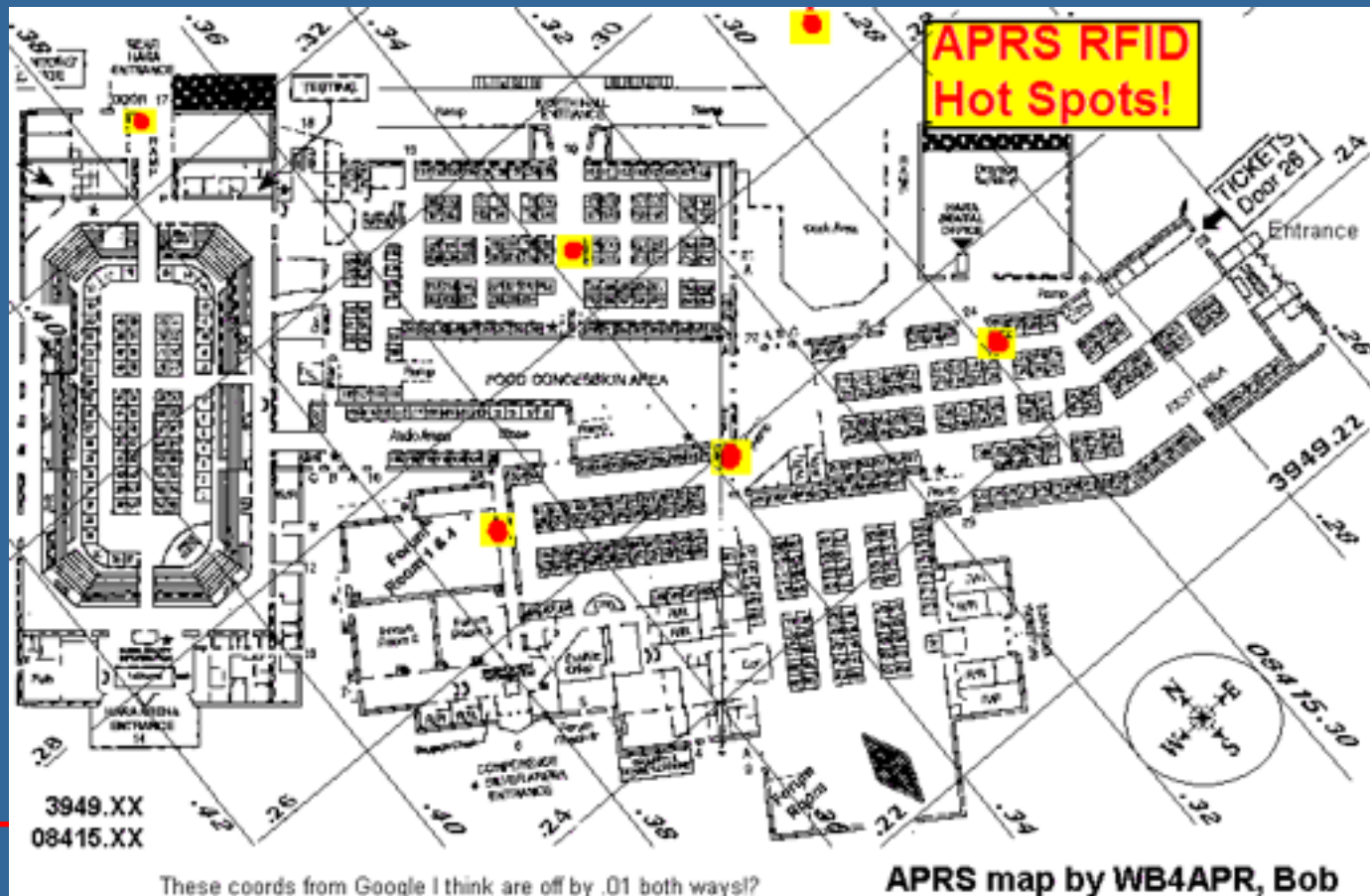
See who is operating where, on what frequency and when

APRS (RFID) (2011)

See **aprs-rfid.html**

These coords from Google I think are off by .01 both ways!?

APRS map by WB4APR, Bob

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 wont 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 (DFing by signal strength)

MAPS-PLOTS-DF-OMNI display of overlapping signal strength contours. All of these "voice" signal reports were entered rapidly on APRS as objects, and everone can see that the FOX was found near the intersection of the colored circles. Notice how VALUABLE the "no-signal" reports were. THey show you almost immediately where the fox is NOT. Great info!

APRS is a registered trademark Bob Bruninga, WB4APR

APRS (Solo DF Fade Circle Technique)
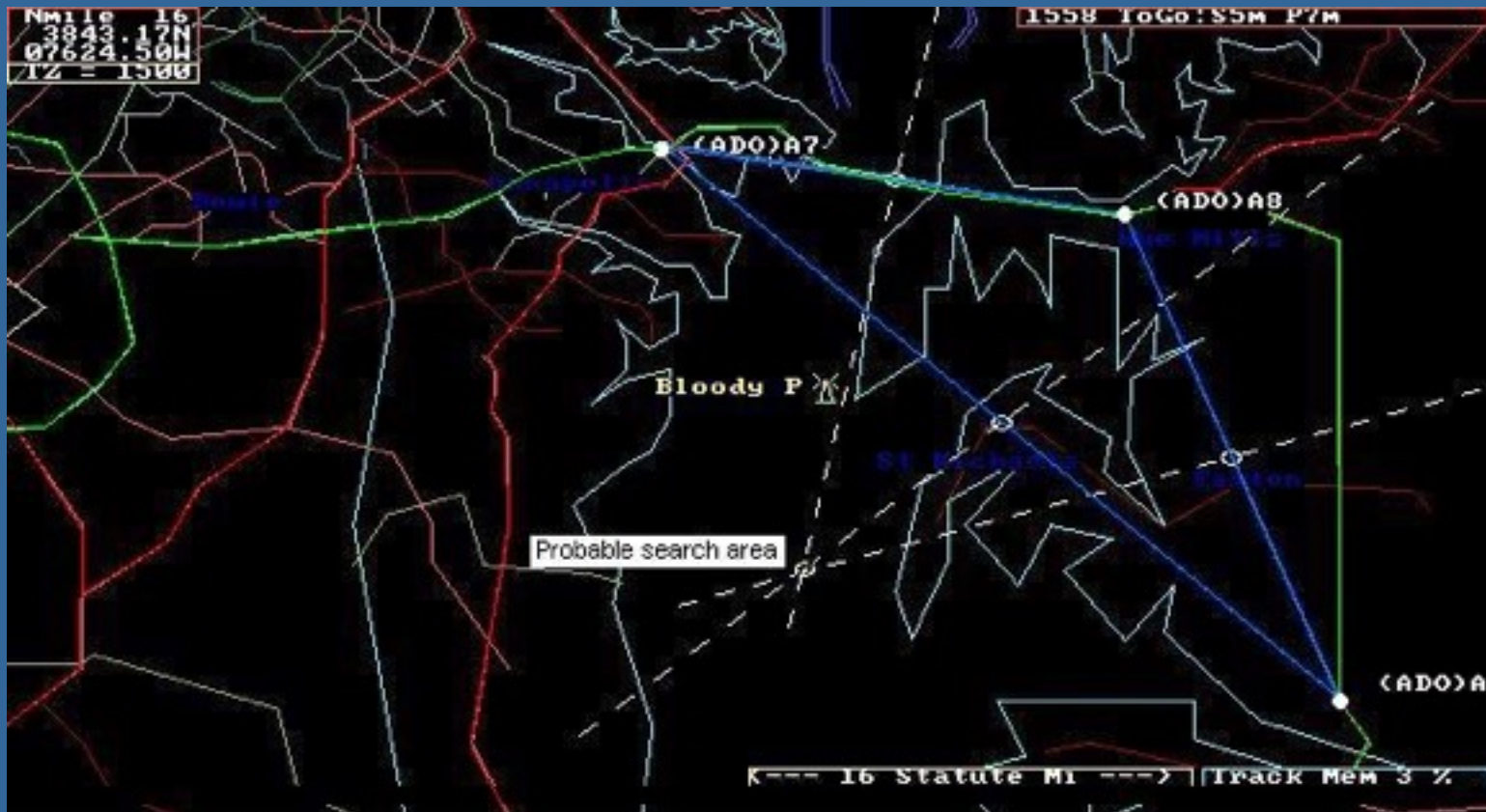
MAPS-PLOTS-DF-FADEcircle - This technique allows a single individual to locate the approximate source of a signal. Just Drive until the signal fades out. Hit F5 key. Turn around, drive the other way to the fade. Hit F5 key. Go a third direction until it fades again. Hit the F5 key. Then hit MAPS-PLOTS-DF-FADE and APRS will compute the approximate location of the signal. Then drive to the indicated area and do it again! THis time mark equal points of signal level X. Do it again. Go to the center, do it again.... and again! You WILL find the signal as long as you have enough gas...

APRS (Solo DF Fade Circle Technique)

Fade Circle Omni DF-ing

Technique was driving E/W on 214, then back to center and N/S on PaxRvrRd

First fade-circle based on loss of signal.
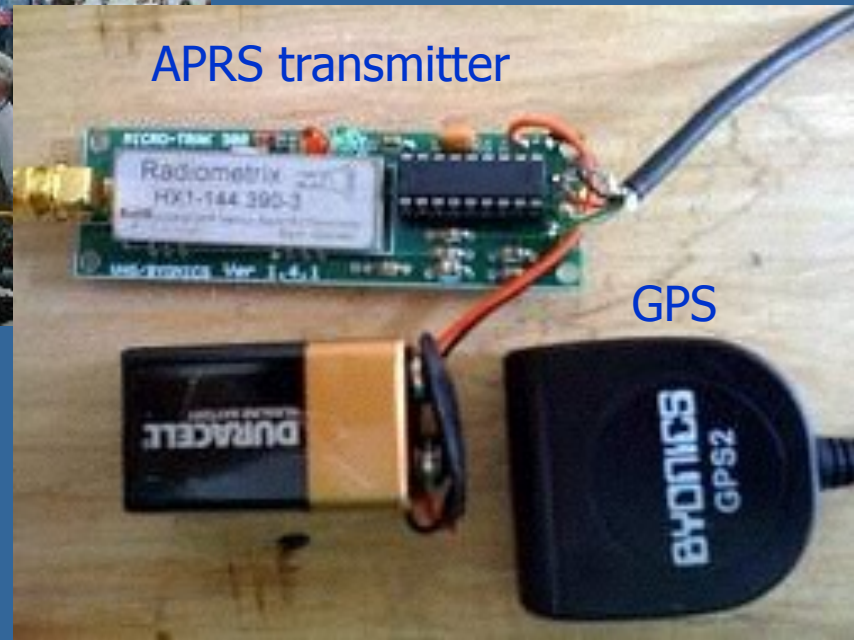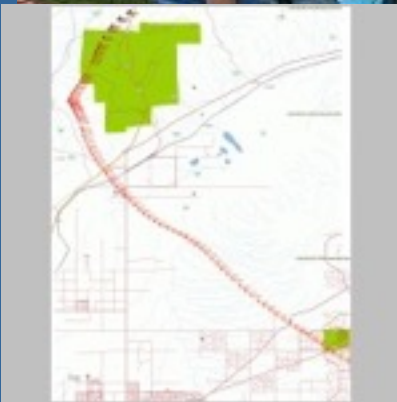
Second fade-circle based on full-scale.

Notice river valley skewed the big circle.

- Fox was 100 mW HT with rubber band

APRS is a registered trademark Bob Bruninga, WB4APR

APRS Balloons

Very Simple

APRS transmitter

GPS

APRS (Solo DF Fade Circle Technique)

APRS (Solo DF Fade Circle Technique)

This was hard going. The signals were getting stronger in the corn, but travel was painful and difficult. I decided to just head along the rows to the other side and then get another cross track where it was easier to walk. I couldnt even see the trees until out of the corn!

Found!

time to go in

Sigs again peaked along this edge of the field.

I could not see the payload until I was 6 feet away!

K BLOON-2

200 ft
100 m

Imagery ©2007 DigitalGlobe - Terms of Use

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 (Solo DF Fade Circle Technique)
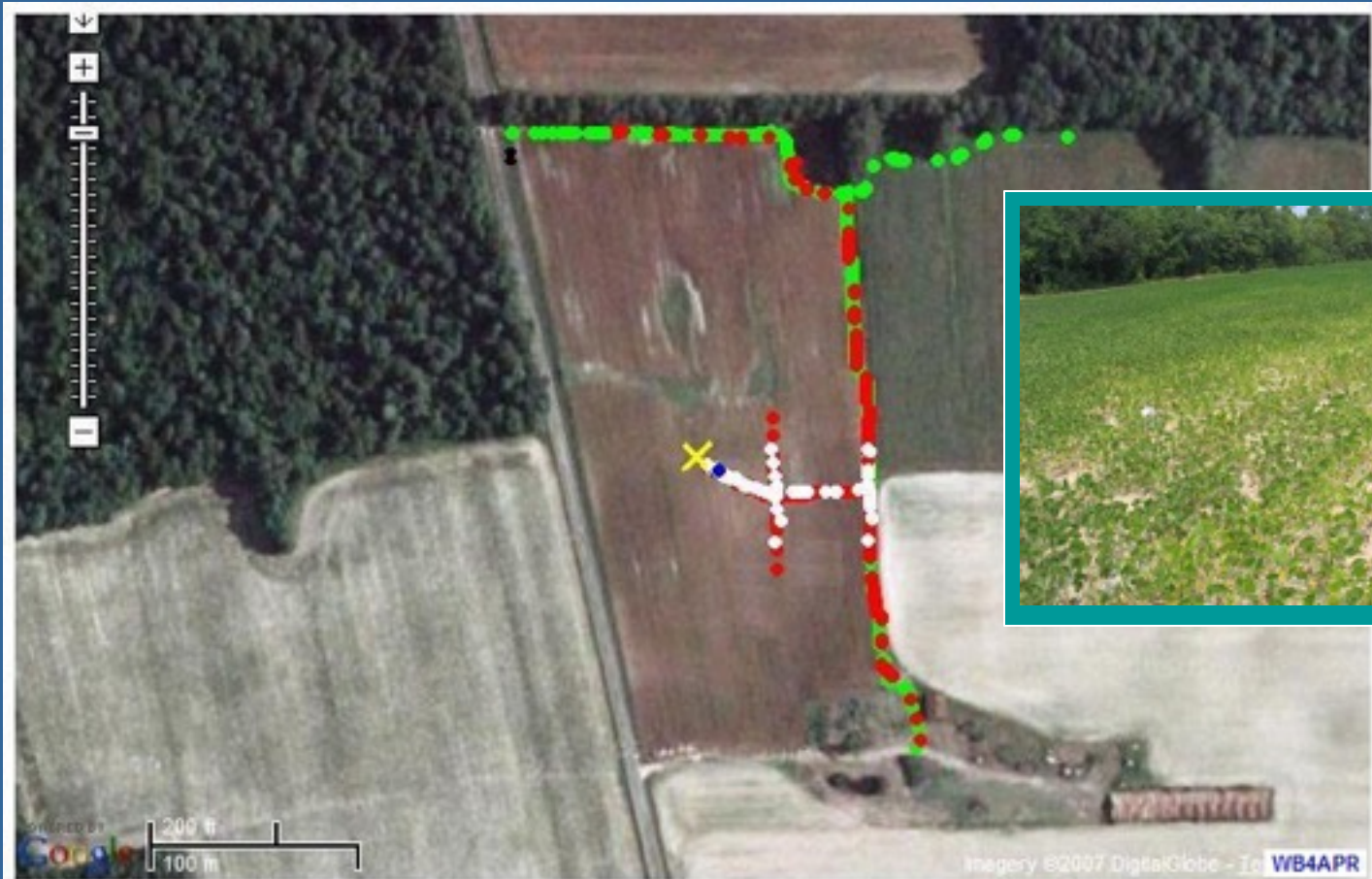
We knew Balloon was headed north at last posit, so I walked along North edge of field where Murphey's law would predict it would land in the thin tree line. Then headed south and sigs got stronger. In this field I was using short 3/4" antenna on my HT. White shows where I removed antenna completely. Blue is where I first could see package in summer crops.

APRS is INFO,
not just tracking!

Milemarks?
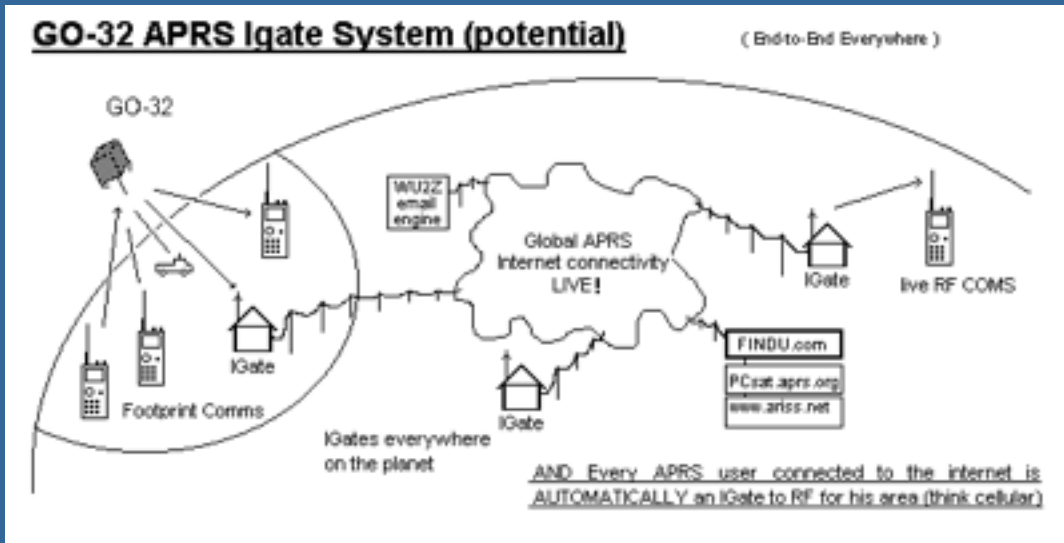
APRStt?

Field Data?

Voice Alert?

Signal Finding?

GO-32 APRS Igate System (potential)

(End-to-End Everywhere)

GO-32

WU2Z email engine

Global APRS Internet connectivity LIVE!

IGate

live RF COMS

IGate

Footprint Comms

IGates everywhere on the planet

FINDU.com

PCsat.aprs.org

www.ariss.net

AND Every APRS user connected to the internet is AUTOMATICALLY an IGate to RF for his area (think cellular)

Nets?
Meetings?

Tracker-Voice?

RF Range?

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

Frequency?

Traffic?

Cave-Link Radio (APRS underground)

3 feet
fc = 150 MHz

5 feet
fc = 100 MHz

vertical antenna

fc(MHz) = 150/w (width in meters)

10 feet
fc = 50 MHz

RF by WB4APR

© Jim Jasek, 2007
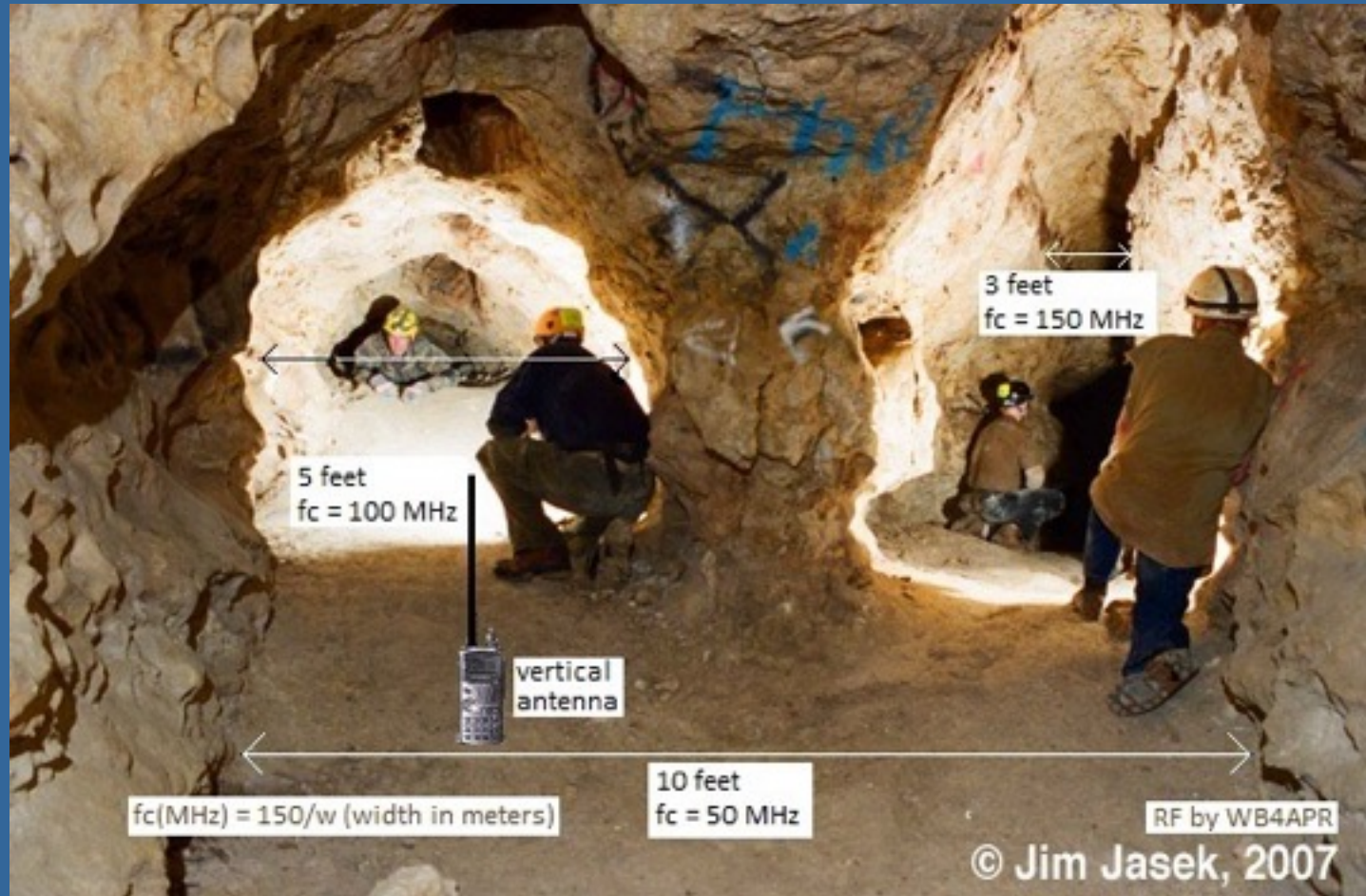
2 March 2013 Mammoth Cave

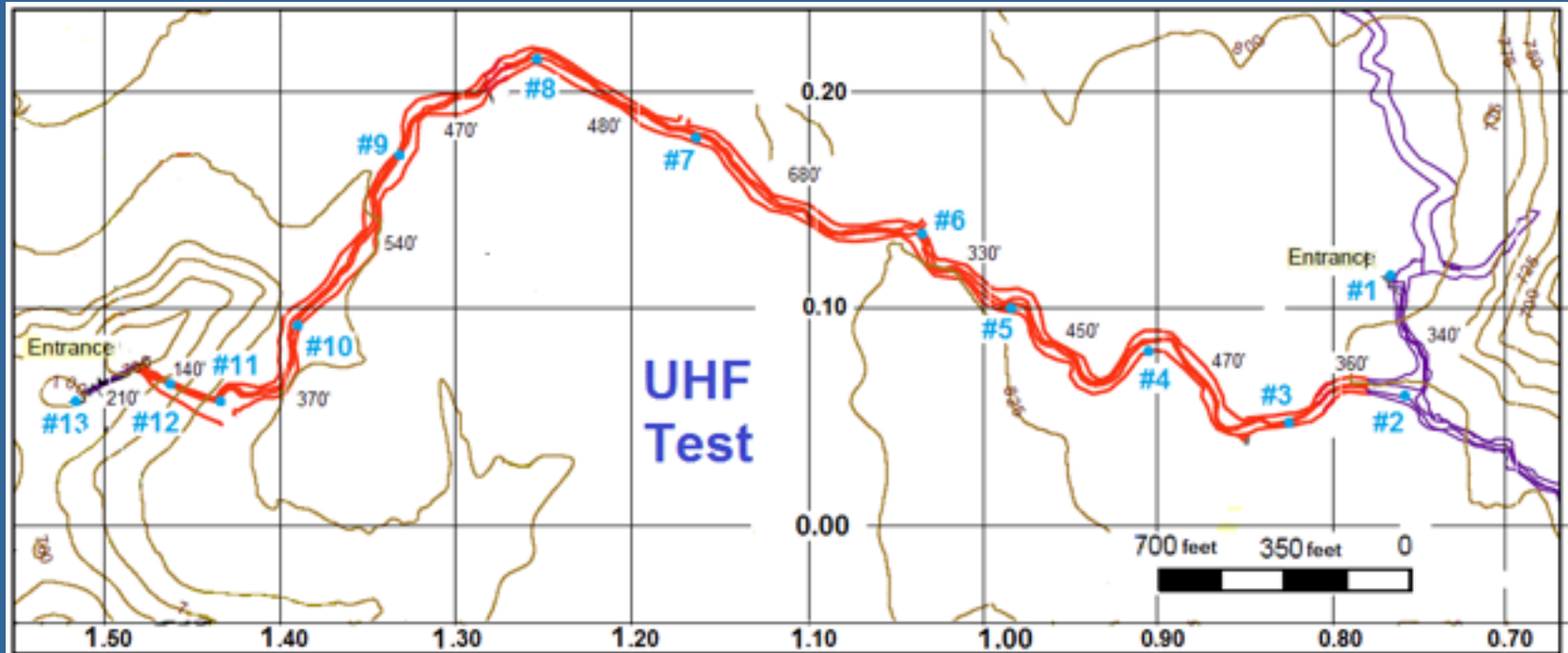# Cave-Link Radio (APRS underground)

2 March 2013 Mammoth Cave

Not Waveguide!… UHF best!

Cave-Link Radio (APRS underground)

2 March 2013 Mammoth Cave

Cave-Link (APRS 1 mi underground)

2 March 2013 Mammoth Cave

National Trail Golden Packet Event
26 July 2009
25 July 2010
July 2014 SUCCESS!

2000 Miles

15 Stations

Two HOP7-7 paths

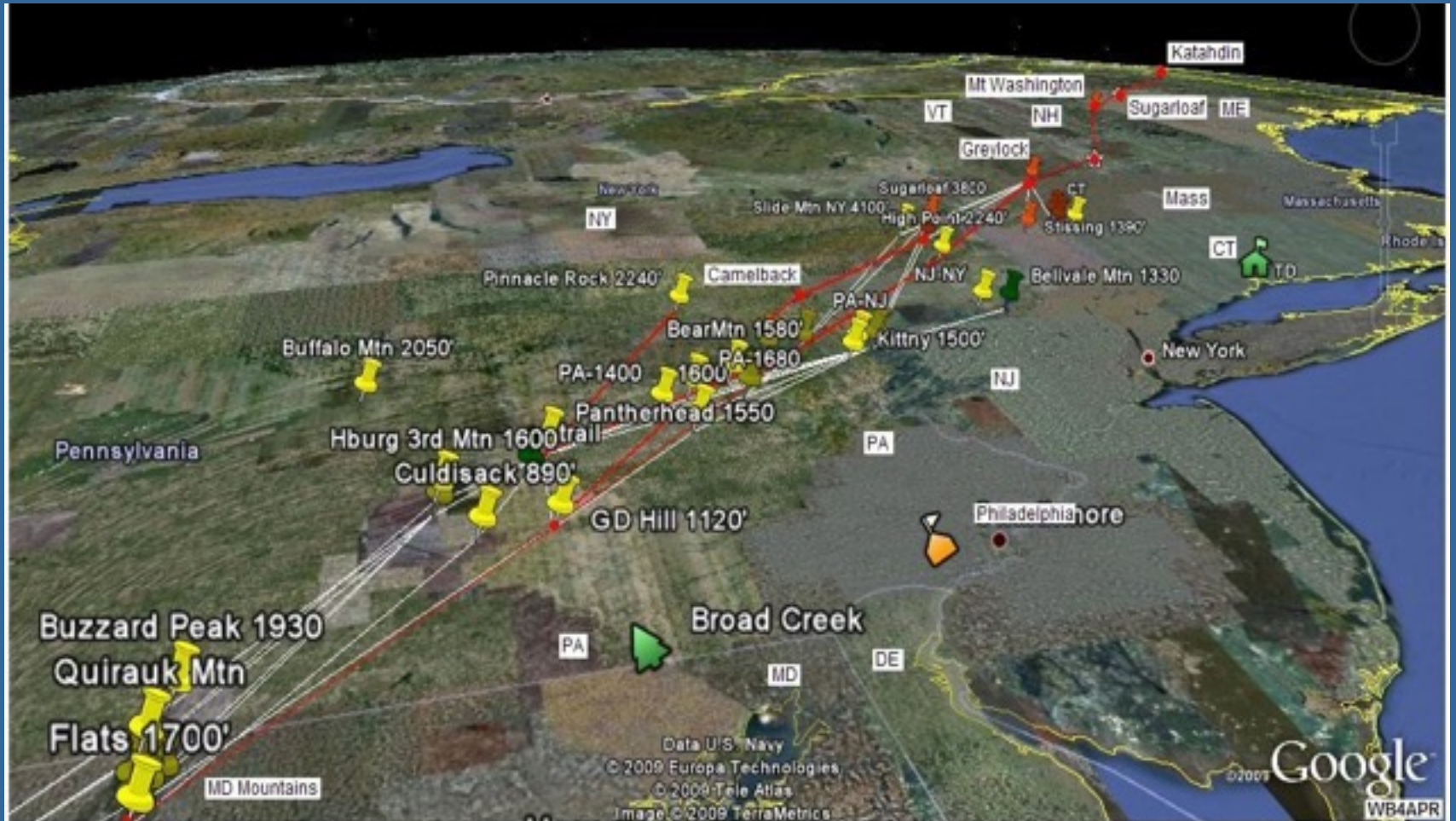Golden Packets end-to-end

Omni Antennas

Others can Monitor!

aprs.org/at-golden-packet.html

Appalachian Trail Golden Packet

The hardest part of the path is going across Pennsylvania with its many low ridges. From NY onward, the path is simply peak-to-peak on popular high mountains.

Using Google Earth for Links
50,000 miles of national linear trails!

APRS is a registered trademark Bob Bruninga, WB4APR

Appalachian Trail Golden Packet

KX4O John Huggins Complete RF Link Analysis!

APRS Emergency Power

200W Solar Power

   - Continuous

10 kW gas Generator 220 VDC

   - Auto-runs as needed

   - lightweight wires

$1 Universal Power Connector

Low Cost

APRS Home Power

Solar Power.. It aint

what it used to be!

✓ 40% drop in price this year

✓ 1% what it cost in 1970

✓ 95% efficient now (no batteries (70%))

Low Cost

✓ 50% total cost Government Rebates!

✓ $500-$3000 annual rebates

✓ FREE Electricity for LIFE

$1 Universal Power Connector

APRS Home Power
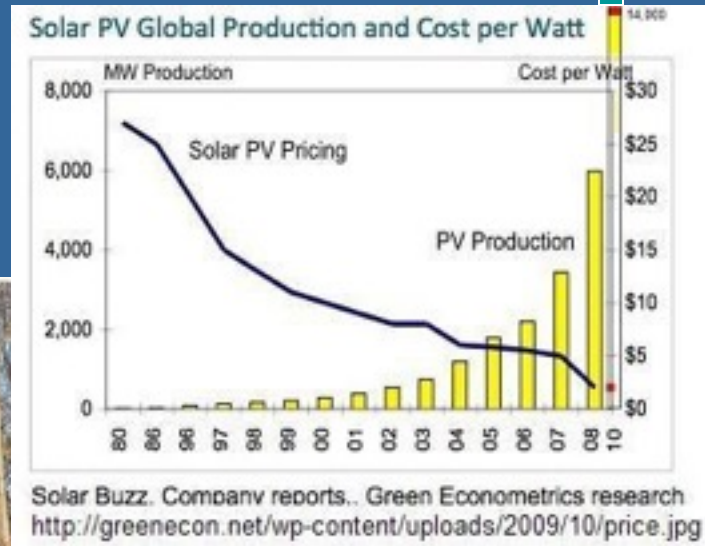
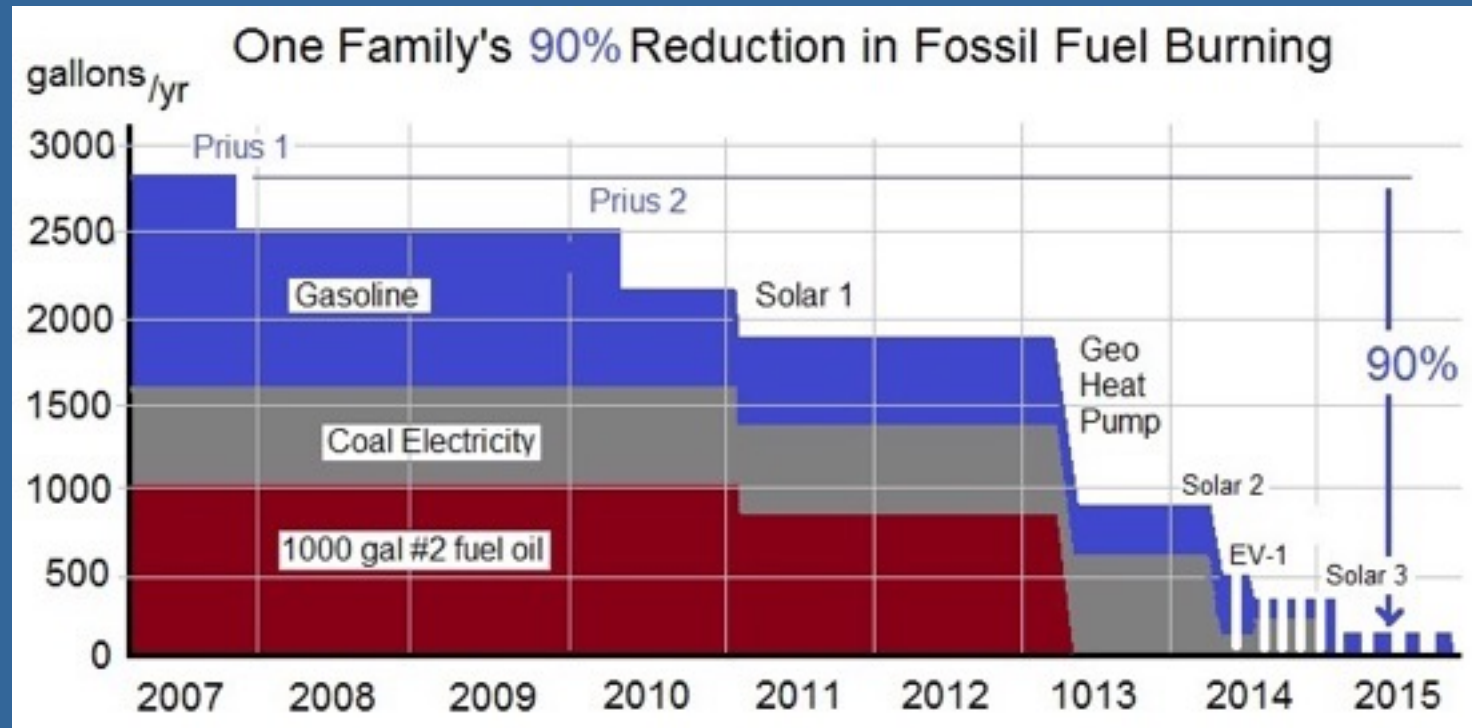2010

Solar Power Now!

Down to $3/watt installed (1$/W deals)

My 8,000 Watt system (shown)

Solar PV Global Production and Cost per Watt

Solar Buzz. Company reports.. Green Econometrics research
http://greenecon.net/wp-content/uploads/2009/10/price.jpg

What can I do?

Energy and Ham Radio are both HUMAN Interest Activities!

Solar Power ≠ Emergency Power

- DIVORCE any thoughts of "emergency power" from Economical power.

- Solar power is ECONOMICAL POWER

- Emergency power is very much different (Solve that problem separately)