

# Amateur Radio From Morse Code To Microwaves



**ARRL** *The national association for  
AMATEUR RADIO*

# About Me

- Rob Roschewsk, KA2PBT
- ARRL Section Manager for Northern NJ
- Licensed since 4/16/1982
- Live in Warren County, NJ

# About the ARRL

- The America Radio Relay League
- “*The national organization for AMATEUR RADIO*”
- Celebrated it's 100 Year Anniversary in 2014
- A member organization that advocates Amateur Radio
  - Magazine
  - Training Material
  - Insurance
  - Advocacy / Lobbying / Spectrum Defense
  - Technical Information / Product Reviews / Interference Assistance

What most people think ...





# What my wife thinks we do ...

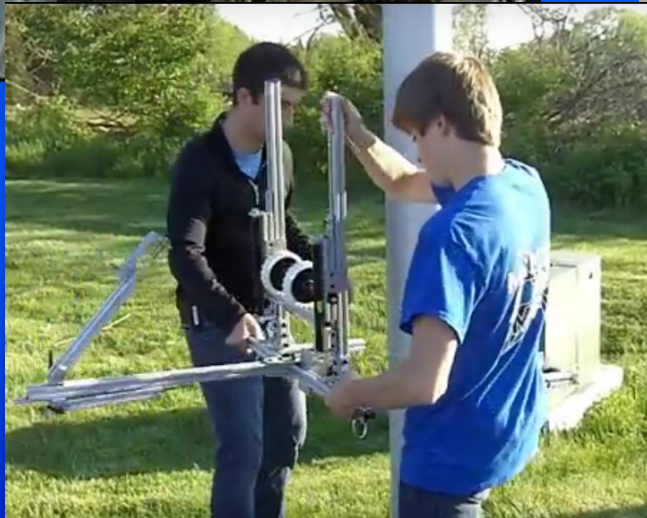


# What I think we do ...





# What we really do!



# What is Amateur Radio?

- A Radio Service created by the Federal Communications Commission (FCC) to:
  - Provide voluntary noncommercial communication
  - Provide emergency communications in times of need
  - Advancement of the radio art and advancing communication skills
  - Expansion of of trained operators, technicians, and electronics experts.
  - Enhance international goodwill



# Extremely Broad Hobby

- Voice (AM, FM, SSB, DIGITAL)
- Digital (CW, PACKET, MESH, RTTY, PSK, JT65, FT8)
- Visual (TV, SSTV)
- Bands (Low Freq, HF, VHF, UHF, SHF)
- Location (Portable, Mountain top, mobile, base, orbit)
- Contesting (Radiosport, Field Day)
- Award Collecting (DX Chasing, Low Power)
- Public Service (Logistics, Traffic Handling)
- Building / Making

# Voice Communication

- Still the most popular form
- HF (Shortwave) is for talking around the world. Mostly Single Sideband, some AM and lately some digital
- VHF/UHF mostly local, repeaters are real popular. Mainly FM but digital is gaining ground

# Digital (HF)

- Morse Code (CW) The First Digital Mode!
- Radio Teletype (RTTY) the old workhorse
- Awesome new modes:
  - PSK31
  - JT65
  - FT8
  - WSPR
  - Too many others to mention



# Digital (HF)

The screenshot displays a digital HF radio software interface. At the top, the frequency is set to 14070.000. The interface includes a menu bar (File, Op Mode, Configure, View, Logbook, Help) and various control buttons for Spot, RxD, TxD, and TUNE. A message log shows a transmission from XE1KCV de W2SP sk at 10/18/2015 23:03Z. A Signal Browser window is open, displaying a list of signals with their frequencies and decoded text. The waterfall display at the bottom shows a spectrum of signals with a red cursor at 1387 kHz. The interface also features a control panel with buttons for CQ, ANS, QSO, KN, SK, Me/Qth, Brag, and T/R, along with a frequency scale from 500 to 2000 kHz.

14070.000

Frq 14071.387 On Off 2304 In Out

Call Op Az

Qth St Pr Loc

10/18/2015 23:03Z XE1KCV de W2SP sk  
cq cq cq de xelkcv xelkcv xelkcv kcq cq cq de xelkcv xelkcv xelkcv  
xelv xelkcv xelkcv kcq cq cq de xelkcv xelkcv xelkcv k

14072.47  
14072.35

3.0 Clear

CQ ANS QSO KN SK Me/Qth Brag T/R

500 1000 1500 2000

WF -20 70 x1 NORM 1387 QSY Store

BPSK31 s/n 23 dB imd -30 dB hamlib\_loop: Rig not -3.0

Signal Browser

Find:

14072.47 niversary group dx of  
14072.35 SFJ KF5SFJ KN nnse e

14071.98 O m  
14071.85 Q de VE7ZN VE7ZN PSE K

14071.68 7KF EF psel ttCQ "E74  
14071.48 b0eL, b0eL0r, b0eL0r c

14071.39 xelkcv xelkcv xelkcv k

14071.18 ee e\_jieaeh e e C

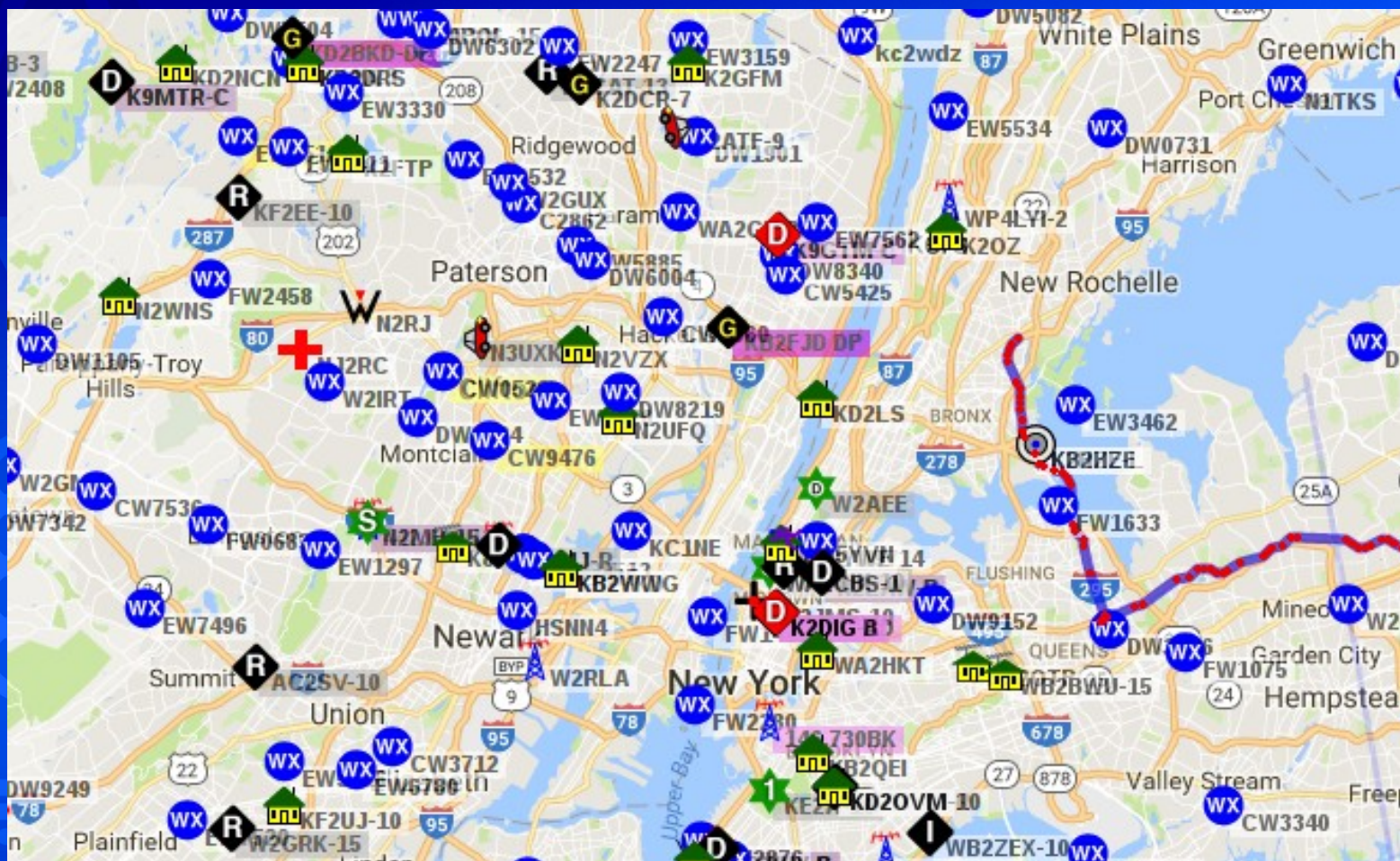
14070.97 kn AG4QQ de PYIHi p  
14070.85 niversary group dx of

# Digital (VHF)

- Packet Radio introduced in the 1980s
  - 1200 Baud packets of data similar to ethernet
  - AX.25 based on X.25
  - Repeated simplex using store-and-forward
- Automatic Packet Reporting System (APRS) uses packet for telemetry
  - Position, weather, status



# Digital (VHF)

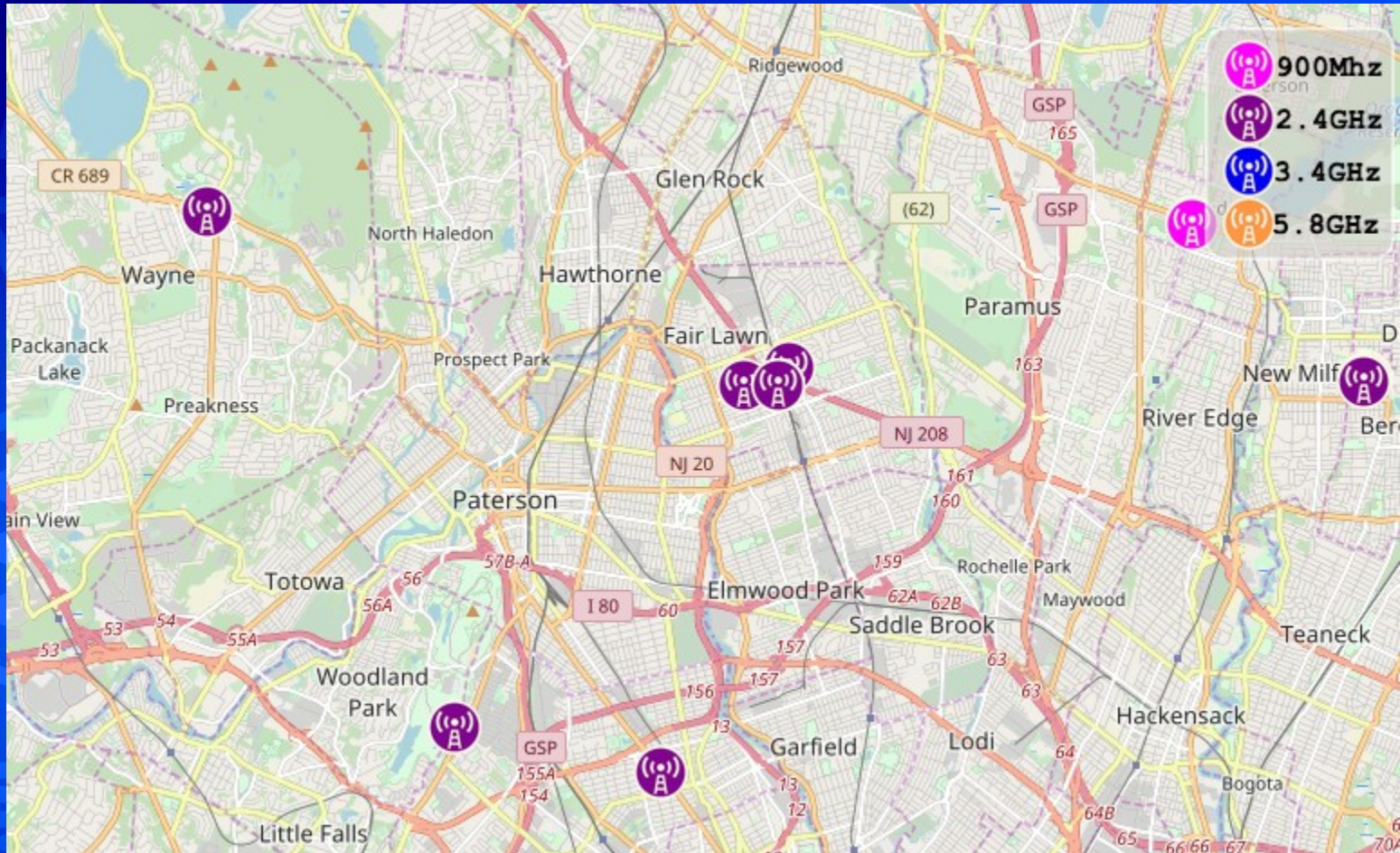




# Digital (MESH)

- 2.4GHz and 5GHz ISM (wifi) bands overlap with Amateur Radio
- 3GHz European ISM band overlaps with Amateur bands
- Hams developed new firmware for Ubiquiti and other wifi devices.
- Amateur Radio Emergency Data Network (AREDN)

# Digital (MESH)





# Visual

- Amateur TV (NTSC Style fast scan) on 420 MHz and higher
  - ATV Repeater in Brookdale, NJ
- Slow Scan TV (SSTV)
  - Before computers long duration phosphor screens were used.
  - Now with computers it's REAL easy.
  - Used for sending still pictures on HF and ISS



# Visual



# Bands / Frequency

- Some folks like the challenge of making contacts using different frequency bands
- Across the spectrum each band has different propagation characteristics
- Using HF you can talk around the world by bouncing signals off the Ionosphere
- As you go higher in frequency propagation is more line-of-site

# Bands / Frequency

- VLF
  - 135.7-137.8 khz (2200M)
- MF
  - 472-479 khz (630M) similar to AM Broadcast
- HF (Shortwave)
  - 1.8 MHz to 29.7MHz in 10 Bands
- VHF
  - 50 MHz – 225MHz in 3 bands
- UHF
  - 420 MHz to 1240 MHz in 3 bands
- Microwaves
  - About 10 banbands starting at 2.3 GHz up to 275 GHz

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# Location

- Home Station
- Mobile
- Portable
  - Mountain Top (SOTA)
  - National Parks (NPOTA)
  - DXpeditions (un-inhabited islands)

# Location



# Contesting / Radiosport

- Make lots of contacts during a period of time for points
- On any given weekend there is at least ten contests going on
- About a dozen big contests per year
- Contests are sponsored by organizations like ARRL or local clubs



# Contesting / Radiosport

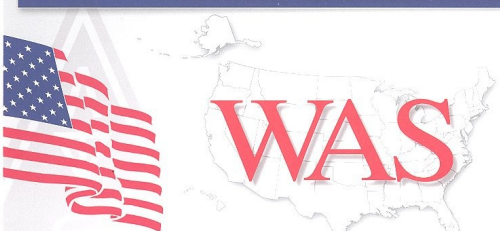
- International DX CW/SSB
- RTTY Roundup
- VHF (and up) Contest
- 10GHz and up
- Earth-Moon-Earth (EME)
- 160 Meter
- 10 Meter
- Field Day (technically not a contest)

# Awards (Paper Chasing)

- “Collect” contacts of a particular type usually location based
- Requires Verification
- DX Century Club (DXCC)
- Worked all States (WAS)
- Worked all Counties
- VHF/UHF Century Club (VUCC)

# Awards (Paper Chasing)

**Worked All States Award**



**WAS**

The American Radio Relay League recognizes that

**Maxim Memorial Station, W1AW**

has submitted confirmation of having conducted two way communication with amateur stations in each of the states constituting the United States of America.

ARRL The national association for AMATEUR RADIO Basic #52,626 16-Jan-08

*Kay Osigi N3KN*  
President

CW  
10 Meters

The American Radio Relay League, Inc.

## DX CENTURY CLUB

This Certifies that  
**Josef Amrein, HB9TKS**

This holder submitted evidence to the American Radio Relay League showing two-way communication with other amateur stations in at least one hundred different countries. This certificate recognizes additional performance and shows to membership in the DX Century Club.

DXCC  
#50,307  
January 13, 2009

Phone

*Joe Harrison*

The International  
Federation of Red Cross Societies

## WAC

Worked All Continents

is presented this award in recognition of the fact that you have contact with amateur Radio stations in each of the recognized continental areas of the world.

**WORKED ALL WINNIPEG**

This award, sponsored by the Winnipeg Amateur Radio Club, Inc., is granted to Amateur Radio Station \_\_\_\_\_ in recognition of his/her outstanding achievement in having accomplished two-way radio communication with \_\_\_\_\_ all Radio Stations located within the area of Metro Winnipeg, Manitoba, Canada. It is with great pride that the Awards Committee of the Winnipeg Amateur Radio Club, Inc., presents this Certificate to Amateur Radio Station \_\_\_\_\_ evidencing friendly contact with the necessary number of stations in Metro Winnipeg and having submitted proof of contact with those stations.

Certificate Award No. \_\_\_\_\_ Dated this \_\_\_\_\_ day of \_\_\_\_\_

Secretary of the Winnipeg Amateur Radio Club, Inc.

Chairman of the Awards Committee



# Public Service

- “When all else fails!”
- Hams provide communications when traditional services go down
- Provide communications for public service officials and “health and welfare”
- Also supplement public service for planned events like the NYC Marathon

# Public Service

- Two separate and distinct organizations
  - Radio Amateur Civil Emergency Service
  - Amateur Radio Emergency Service (ARES)



# Building/Making/Hacking

- Ham Radio operators were the first Makers!



Ham Radio  
Workbench