Jay Taft, K1EHZ
Hillsborough County ARES Zoom Meeting
August 12, 2020

Overview of the Winlink System

Winlink System Overview

This overview is about how the Winlink system works, not about how to set it up yourself.

It covers a lot of material to help convey the range of capabilities Winlink provides, because it's difficult to know in advance which features may interest a particular group or individual.

One Tool in the ARES Toolbox

One Tool in the ARES Toolbox

along with NBEMS, verbal radiograms, tactical messaging, NCS skills, etc

Perspective & Context

Hillsborough County Compared to State of New Hampshire

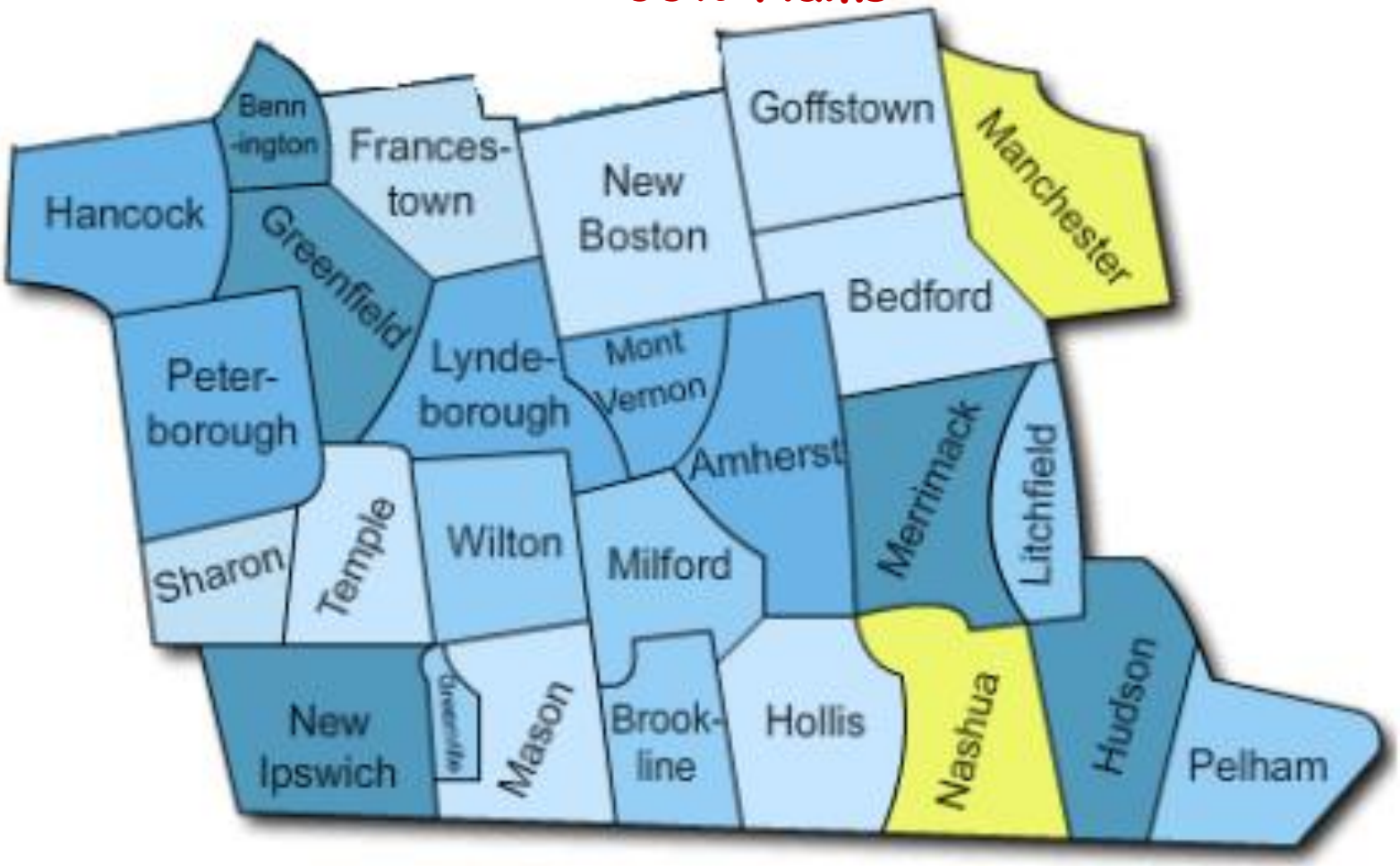
Hillsborough County

Area = HC 892 sq mi vs NH 9,350 sq mi

Population = 410,000 (2,179 Hams)

Population of NH = 1,356,000 (6,678 Hams)

Hillsborough County = 9.5% Area, 30% People, 33% Hams



Topics

- Objectives
- Winlink Structure and Function
- Hardware and Software
- Key Features of Winlink Express
- Our Winlink Hybrid Gateway
- Potential Training Opportunities

Objectives

To understand the basics of the Winlink system and how it complements other messaging tools, and

To encourage you to continue exploring Winlink if you like.

In other words, does Winink provide interesting possibilities for you or for our ARES group?

What I was thinking when first asked to explore learning Winlink --

More Software???

I'm still Learning FLdigi !!!

Happily, with help I found Winlink easier to learn than FLdigi

I'm Learning Winlink !!!

Happily, with help I found Winlink easier to learn than FLdigi

I'm Learning Winlink !!!

and I'm still Learning FLdigi !!!

What is Winlink?

World-wide store and retrieve email system, using radio and internet.

Exchange email with any valid email address in the world, not just with hams.

WINLINK
Global Radio Email®

Operated by the all volunteer

Amateur Radio Safety
Foundation

Brief History

- Winlink's roots can be traced back to the 1980s
- Aplink was a text-based messaging that was adapted for the Navy MARS and the ARRL National Traffic System.
- Winlink Classic was developed for Windows.
- Winlink + Netlink developed for internet email.
- Winlink 2000 planning started in 1998.

Operating Systems

- Winlink has been tied to the Windows operating system since the early days
- The Winlink Development Team has no plans to write Winlink for other operating systems
- However, there are other clients that work with some Winlink features
  - Outpost, Airmail, Pat, Paclink-Unix, Paclink
  - More details here

    https://winlink.org/ClientSoftware

Operating Systems

- Winlink on Linux and iOS using Wine
- Link to more information –
  - https://winlink.org/content/installing_winlink_express_mac_and_linux
- Links to Wine on K6ETA Blog
  - http://k6eta.com/linux/installing-rms-express-on-linux-with-wine
  - http://k6eta.com/mac/installing-rms-express-on-mac-free-wine-option

Operating Systems

- Some have had success with non-Windows implementations of Winlink Express, others have not
- One approach is to run Winlink Express in a Windows partition on a dual-boot computer
- Another approach is to have a separate small computer with Windows just for Winlink Express and other Windows-based software

Winlink is used extensively in the southeastern states subject to tropical storms, and in western states where wild fires occur annually. For example …..

ARRL Web Page - 3/14/2019

Winlink already is well-known for its role in emergency and disaster relief communication, providing email with attachments, position reporting, weather reports, and information bulletins.

The system was extensively used in the aftermath of the high-impact 2017 hurricane season in the Caribbean.

Carr Wildfire - California

August 1, 2018 — Briefing excerpt:

Winlink continues to be the go-to mode to communicate with the Red Cross Disaster Operations Center. There are no voice channels that can reach Sacramento.

There was hope that Carla system would work, but a Carla node burned in the fire.

(What is Carla?)

CARLA

California Amateur Radio Linking Association

The C.A.R.L.A. System is an open repeater network covering California and Western Nevada comprised of 30+ mostly UHF and a few VHF repeaters.

Lessons Learned for us:

- Linked repeaters are great until the one you need burns in a fire or is otherwise disrupted.
- Applies to regular repeaters as well.
- Have a Plan B.

Winlink System Structure

Structure Based on

Common Message Servers (CMS)

on the internet and

Radio Message Servers (RMS)

that bridge radio to internet

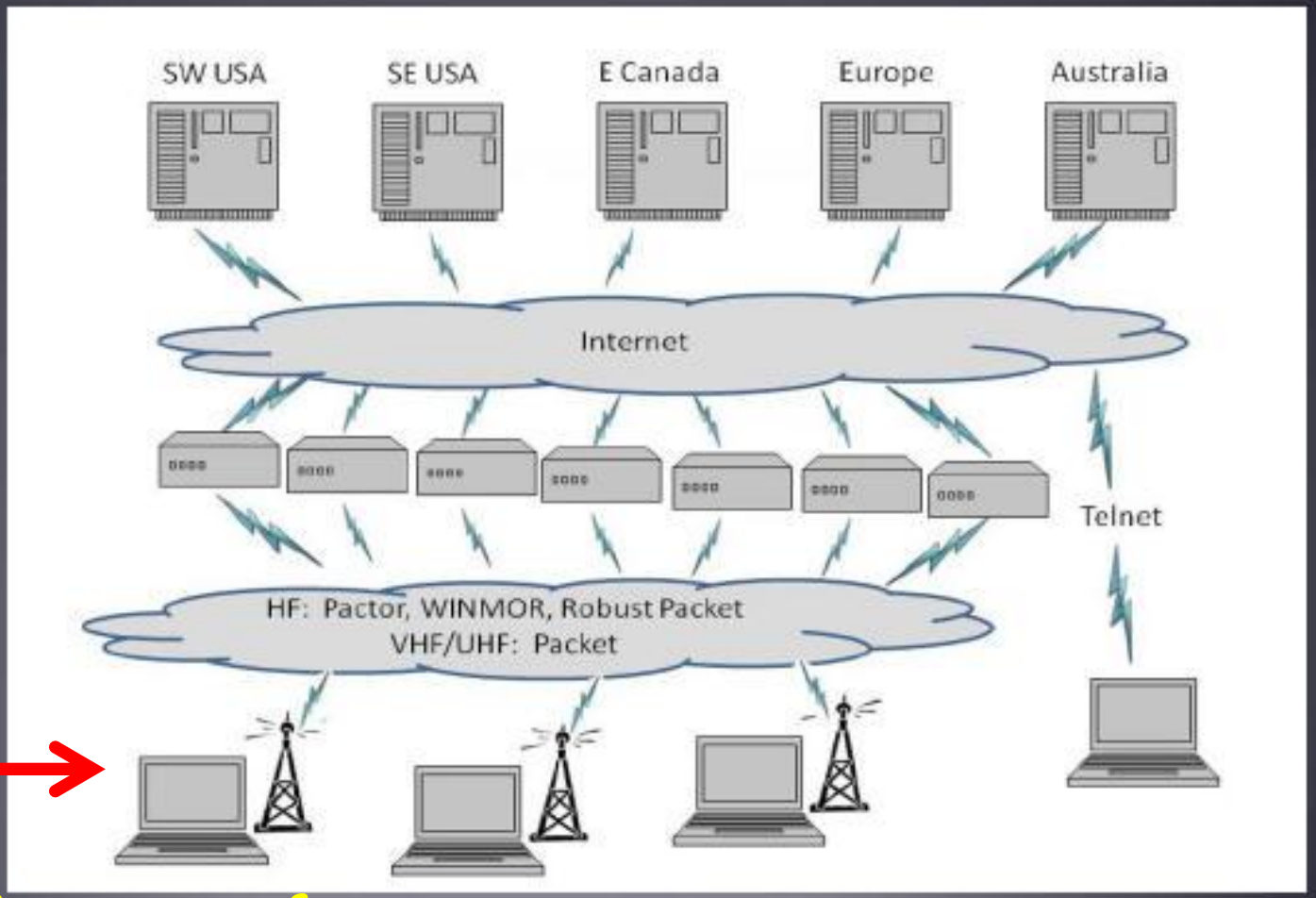
Global Winlink Network

Winlink Normal Network Operation

CMS

RMS (gateways)

Client (us)



Winlink Express software

Global Winlink Network

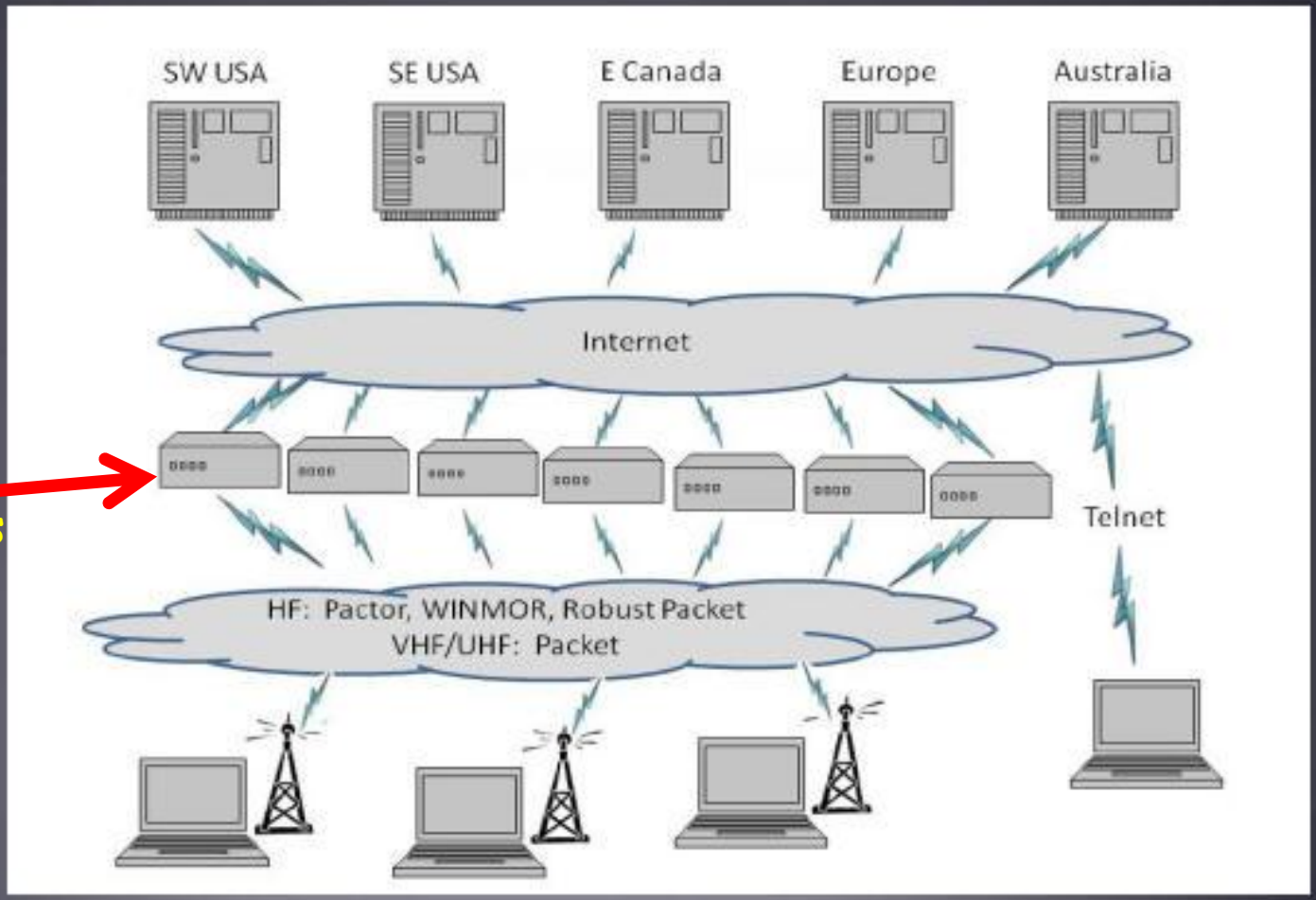
Winlink Normal Network Operation

CMS

RMS
(gateways)

VHF / HF Radios
connected
to the Internet

Client
(us)



Global Winlink Network

Winlink Normal Network Operation

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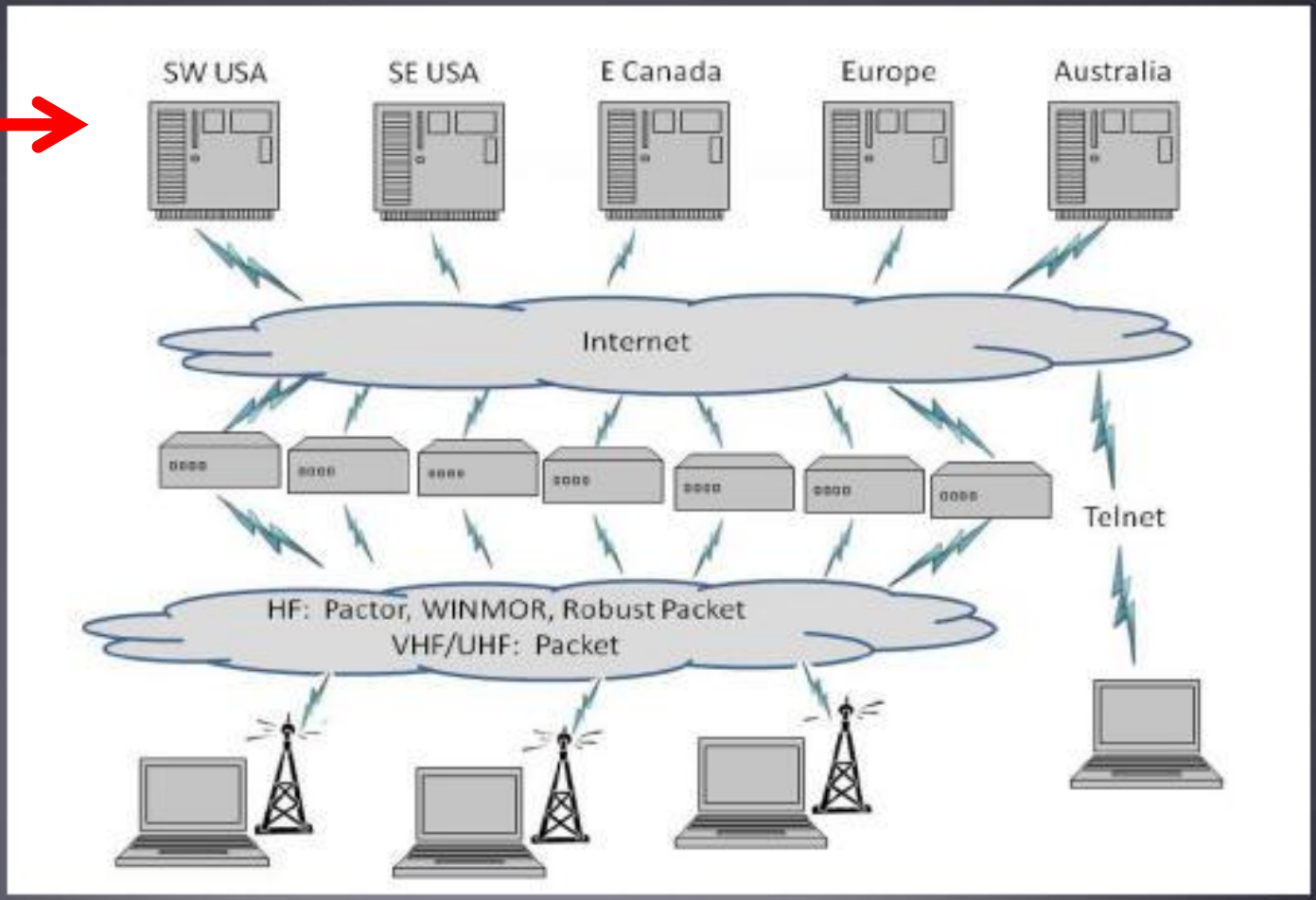

Global Winlink Network

Winlink Normal Network Operation

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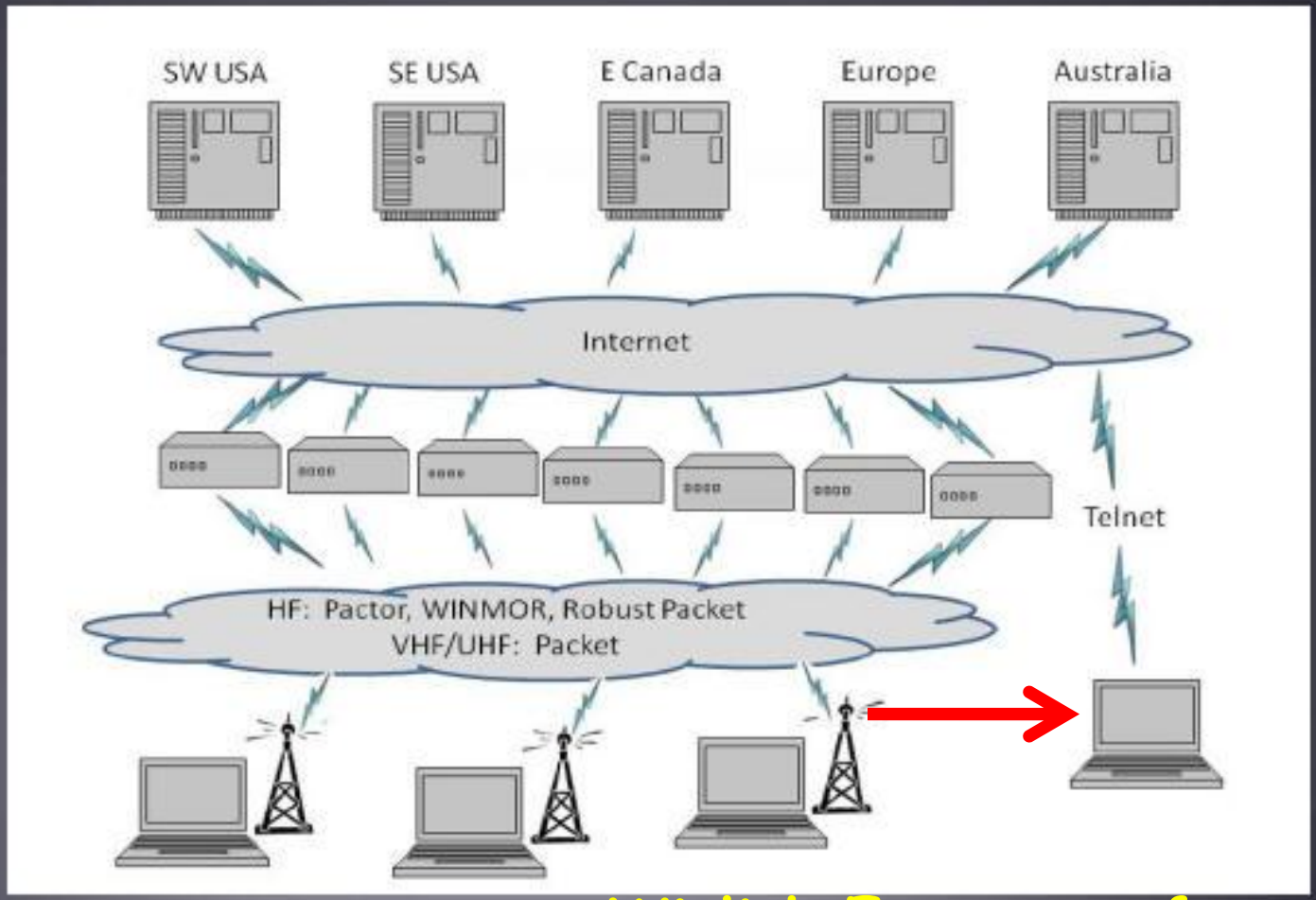


Winlink Express software

Winlink Webmail

Check mail using a browser on smartphone, tablet, computer

https://webmail.winlink.org:446/

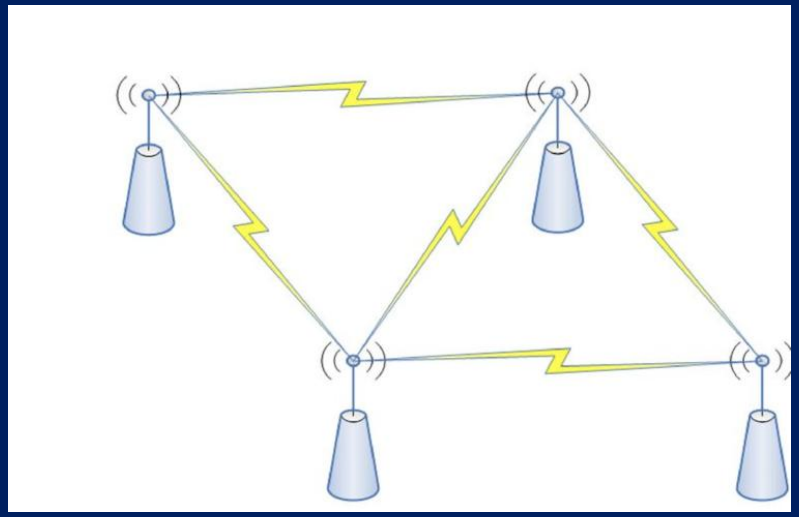
Email resides on all 5 CMS until retrieved, *after which email is deleted from all CMS.*

Consider reading all Winlink email on same device. Otherwise, different messages will download to different devices.

RMS Gateways

Some are "H" Gateways

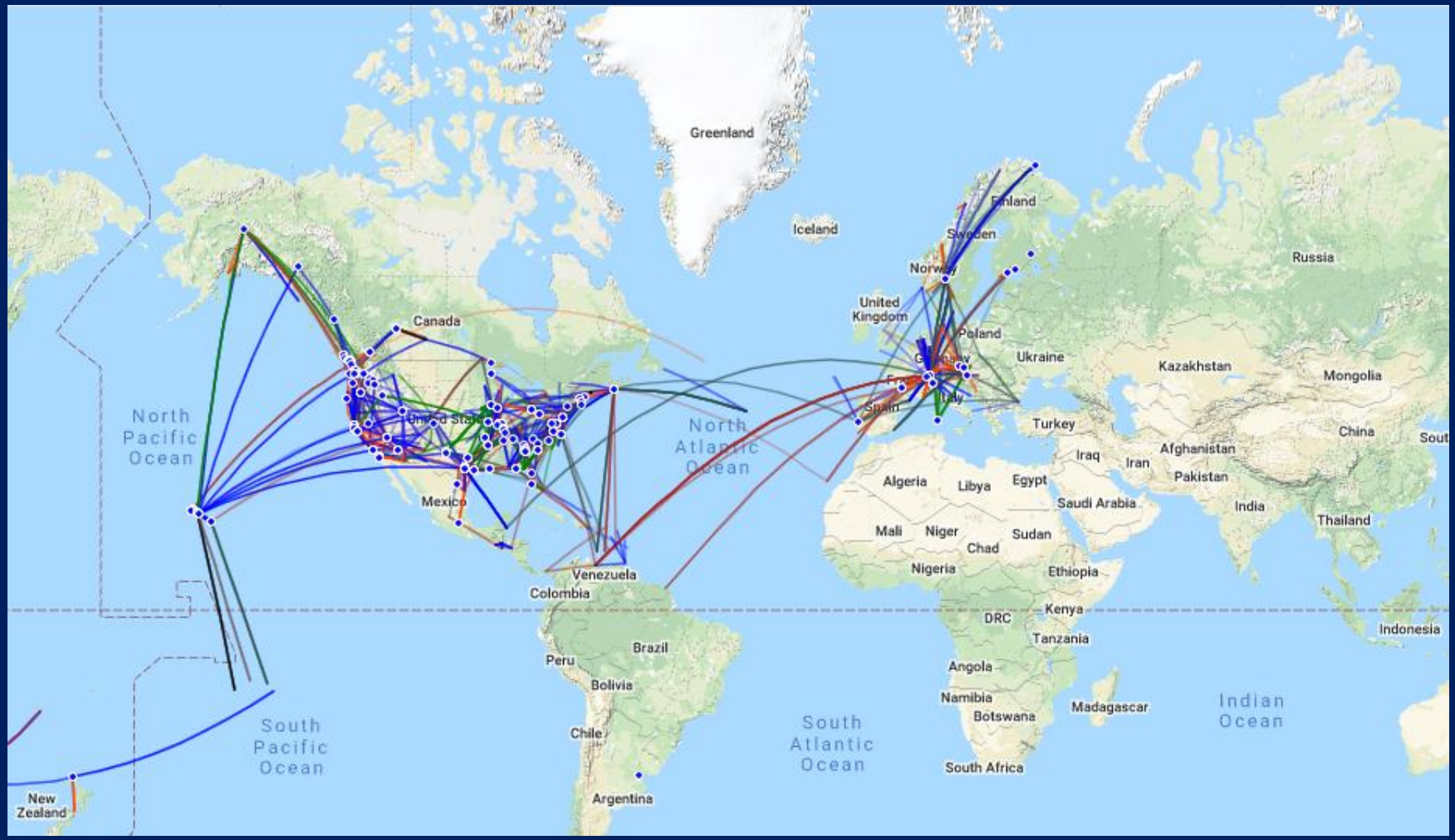
H = Hybrid Gateway Network



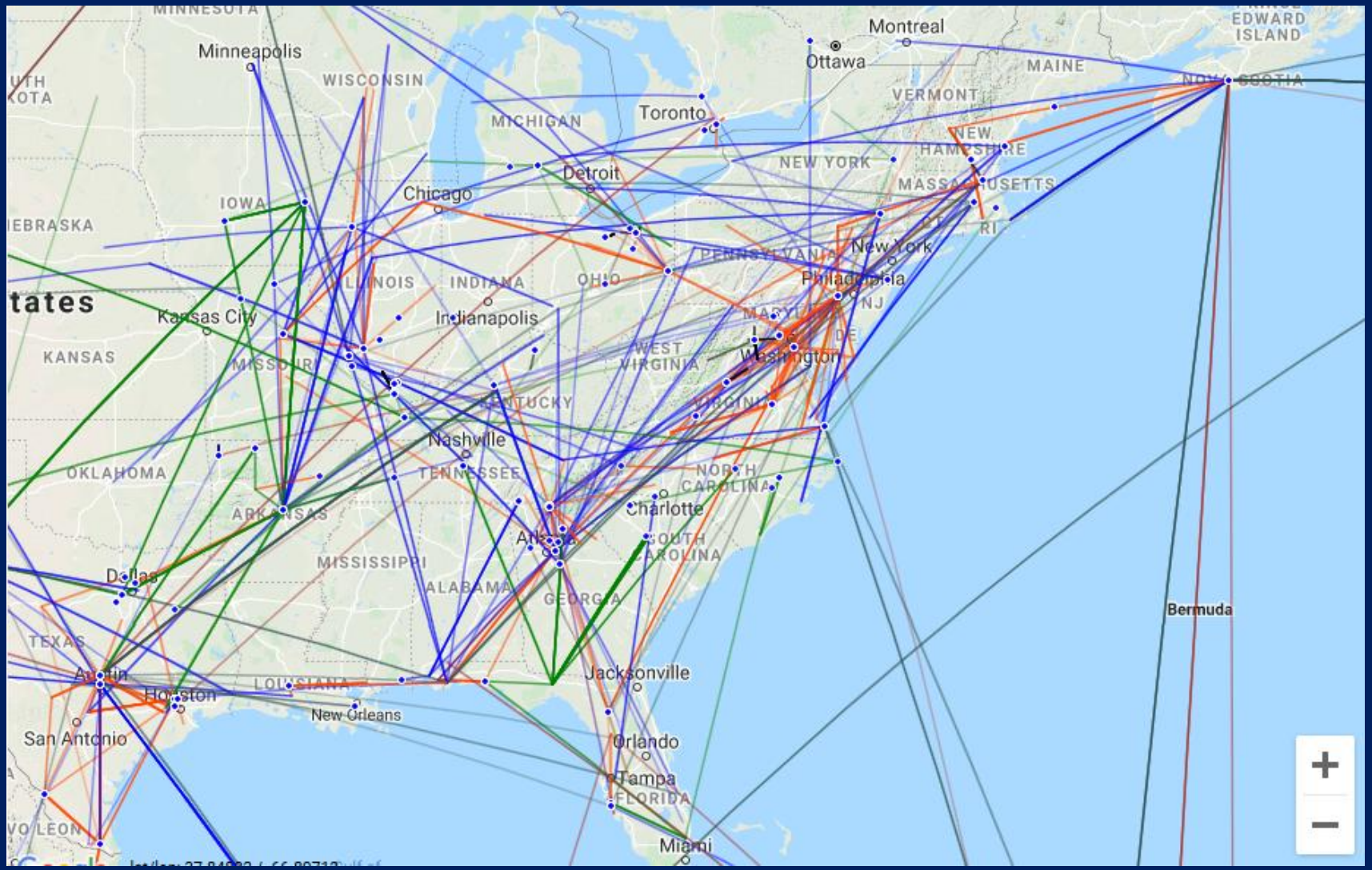
H = Hybrid Gateway Network

- Self-Healing Mesh Network (Pactor)
- Auto-Forwards Email from VHF to HF
- Auto-Forwards Email from HF to HF
- Until Email Reaches the Internet or the Addressee

Winlink System Radio Connections 24-hour Snapshot



Winlink Regional Radio Connections
24-hour Snapshot



Equipment

Terminal Node Controller (TNC)

supports AX.25 packet protocol

over radio

Equipment

Terminal Node Controller

Can Be

Hardware or Software

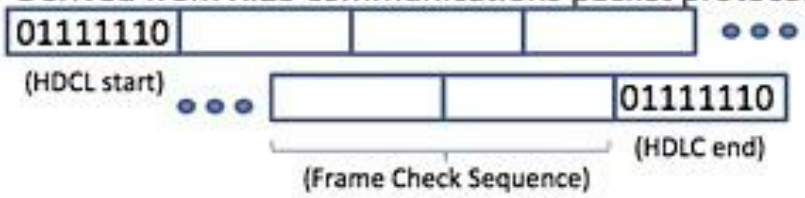
Basic Elements of Packet Radio

1. Hardware: Radio, TNC/modem, Computer

TNC can be implemented in software only on computer: interface uses analog/audio soundcard connection between computer and radio.

2. Encoding

- Computer<->TNC: serial port, ASCII (text) characters
- TNC<->Radio: typically two or three wires
  - Audio Frequency Shift Keying (Bell 202, 1200 baud)
  - 1200 hz: mark, 2200 hz: space
  - 0: change in tone, 1: no change in tone
- Data Link: AX.25
  - Derived from X.25 communications packet protocol

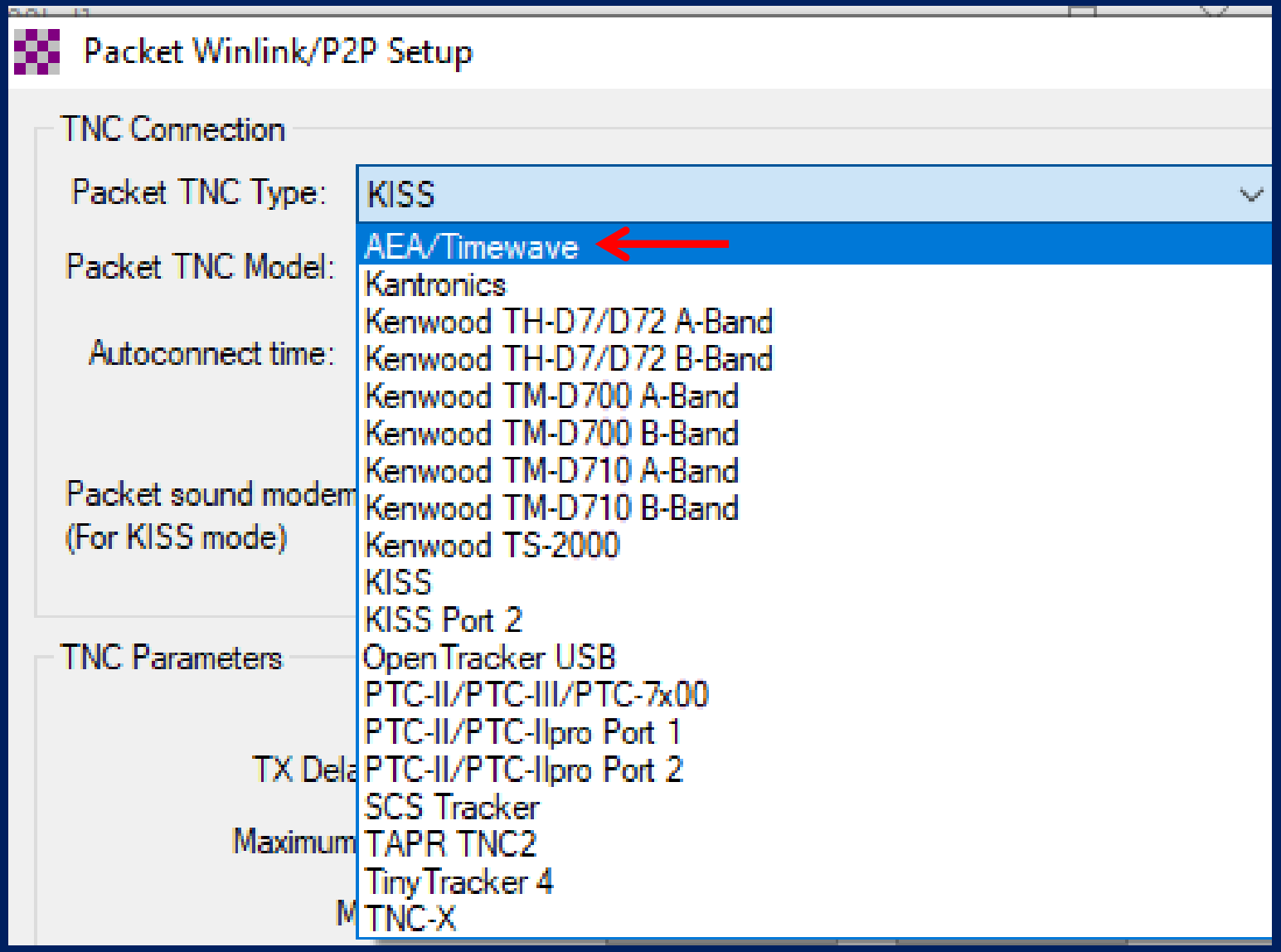


3. Applications

- SCC ARES/RACES: detailed reports (Situation Report, etc. using Outpost and PacForms)
- Automatic Packet Reporting System (APRS): a multi node system for reporting and recording packets that typically includes station ID and position/telemetry

Hardware TNCs

TNCs Winlink Express Supports



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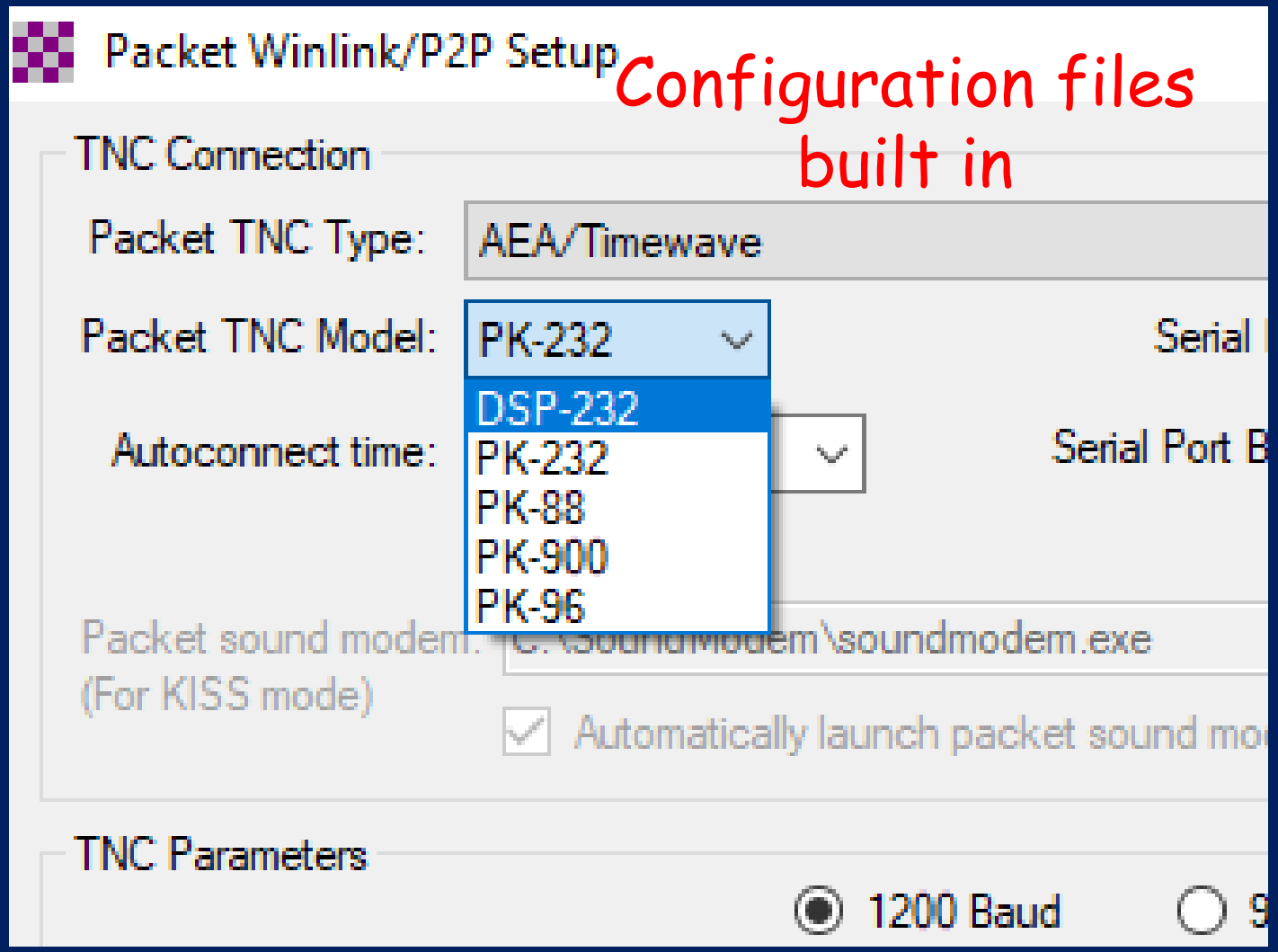

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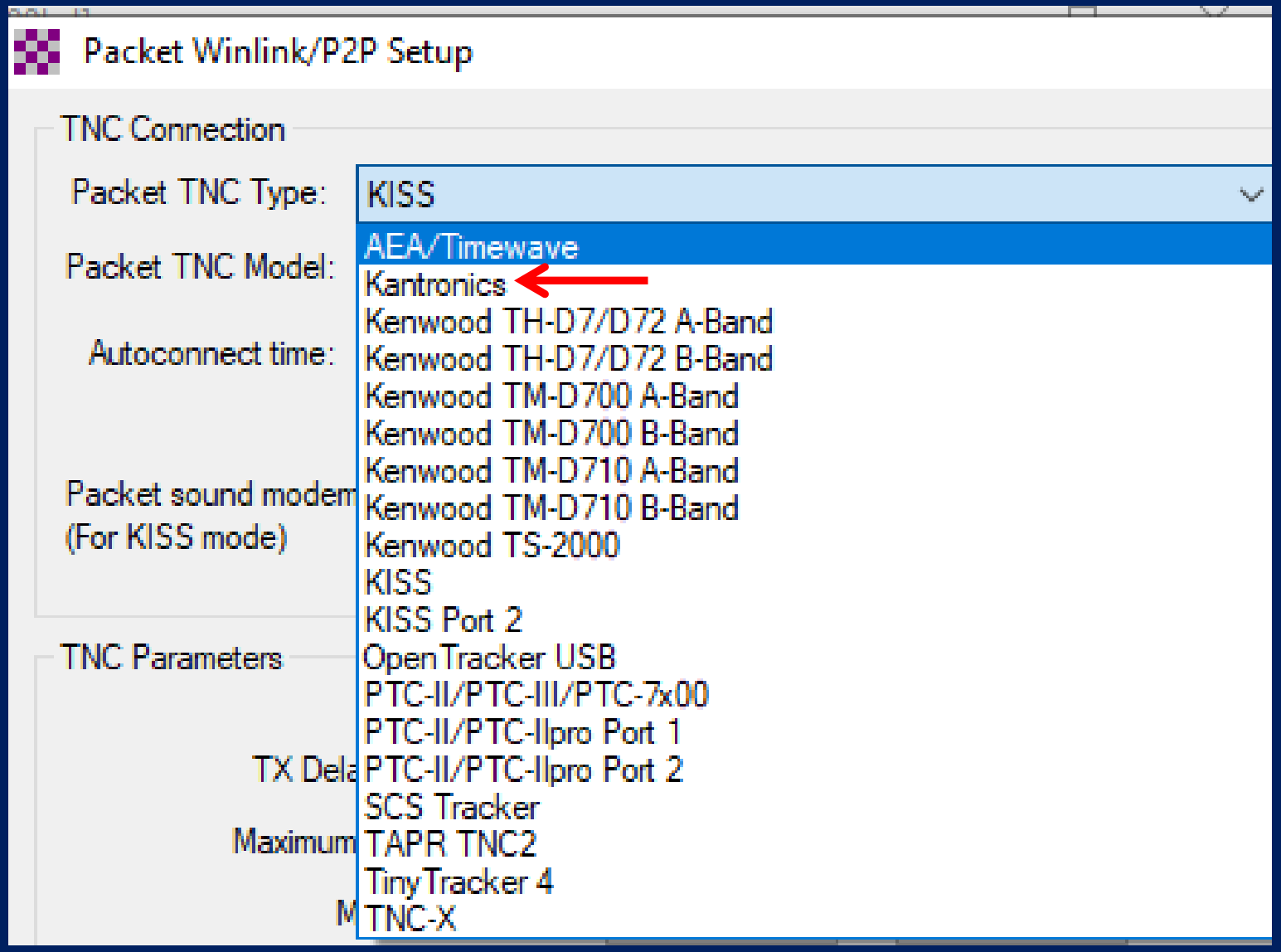

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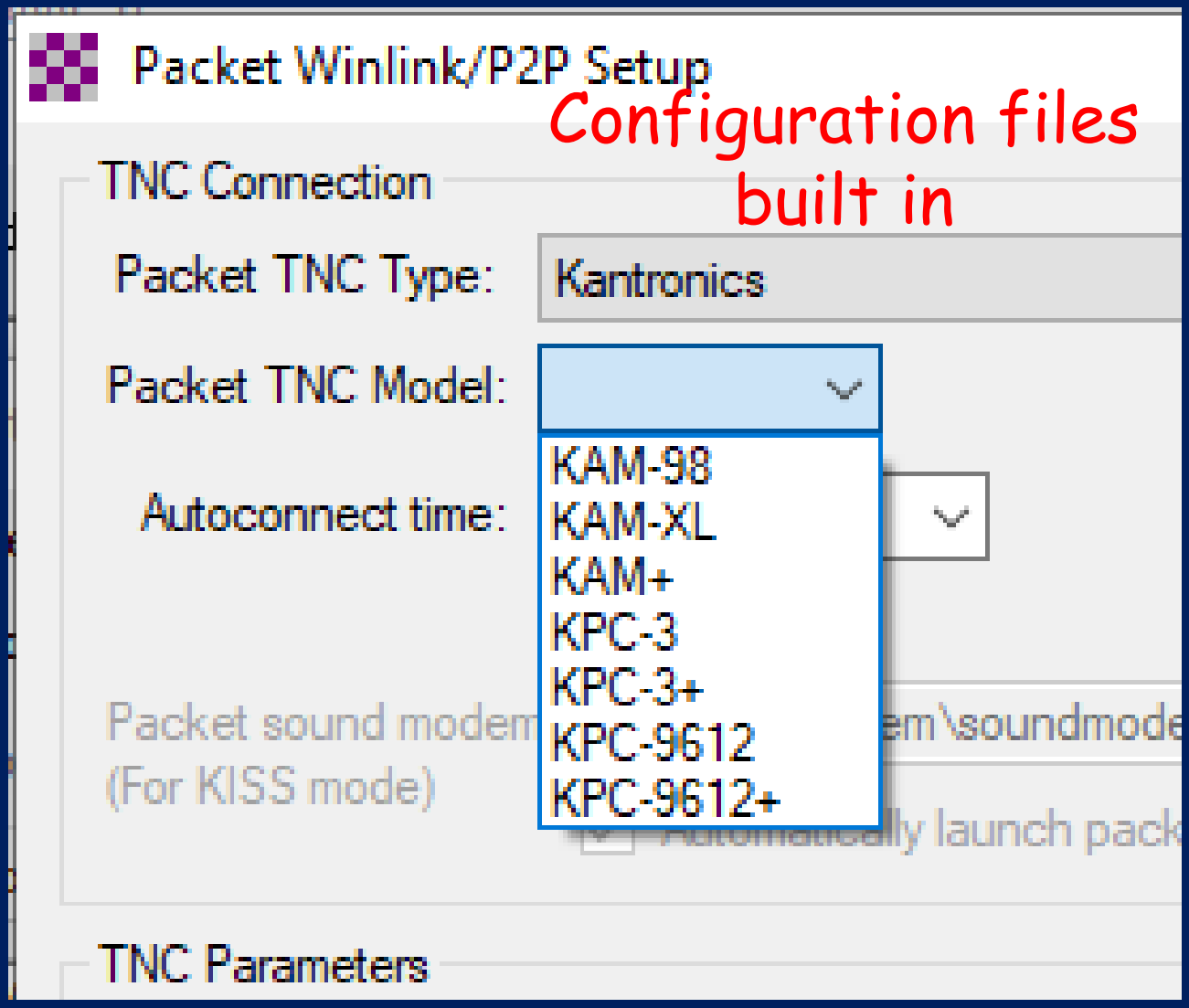
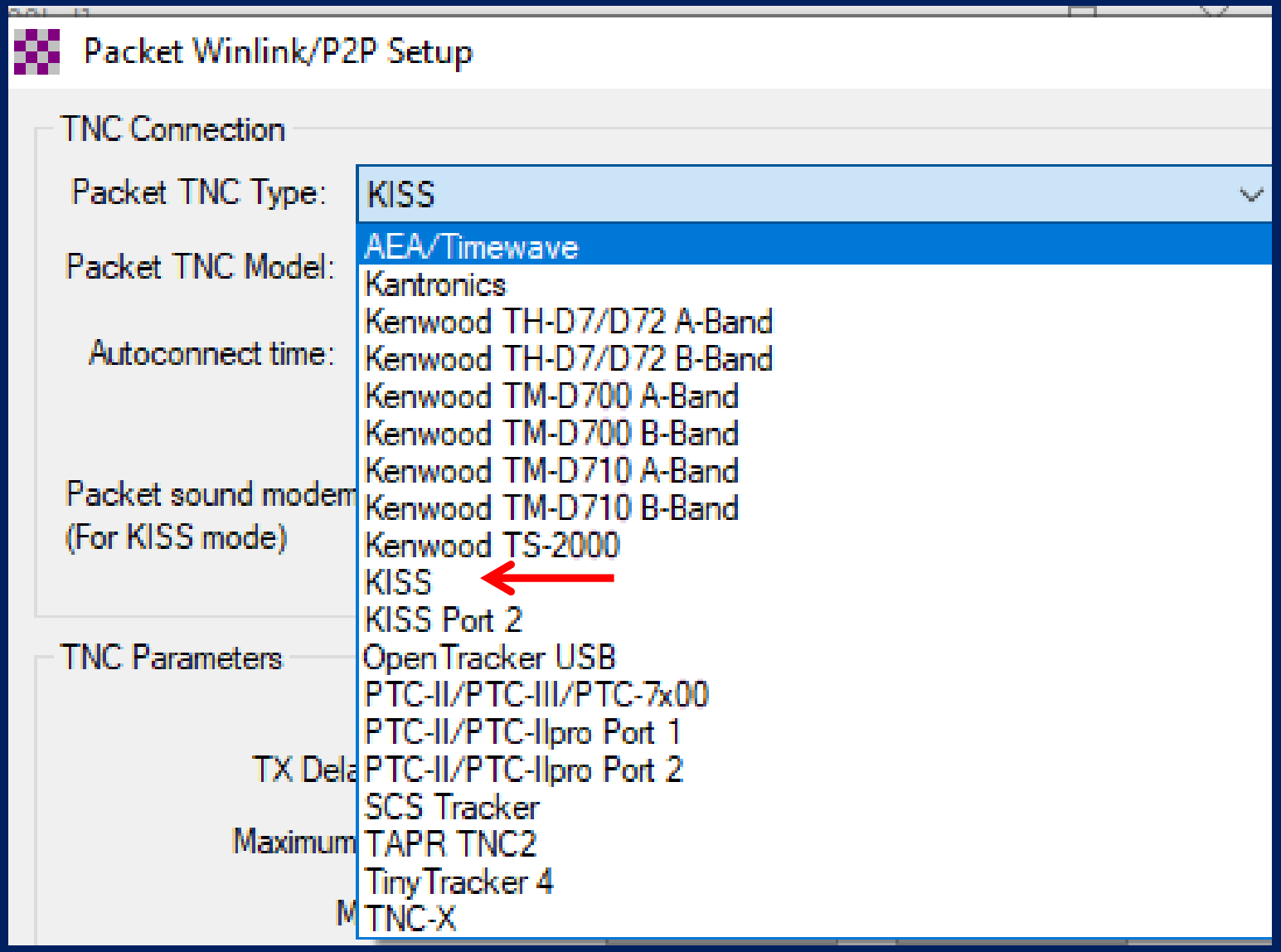


Software TNCs...

Computer converts
ASCII to AFSK
use KISS TNC
with a sound card
SignaLink, Rig Blaster, etc.

TNCs Winlink Express Supports



Soundcard Interfaces

SignaLink

Rig Blaster

Soundcard + Software TNCs

- Packet on HF with ARDOP, VARA TNCs
- Packet on VHF with SoundModem TNC

Software Downloads
(Free – Donation Requested)

- Winlink Express (= RMS Express)

https://downloads.winlink.org/User%20Programs/

- SoundModem for VHF Packet

http://uz7.ho.ua/modem_beta/soundmodem105.zip

Winlink Complements NBEMS

- Both operate on HF and on VHF/UHF with a variety of operating modes and frequencies for differing band conditions.
- Winlink is a radio-to-email system offering 3 modes with 5 redundant world-wide servers, and Message Pickup Stations when internet is out.
- The Narrow Band Emergency Messaging System (NBEMS) is our primary local to regional system offering dozens of modes for a wide variety of propagation conditions.

Winlink Complements NBEMS

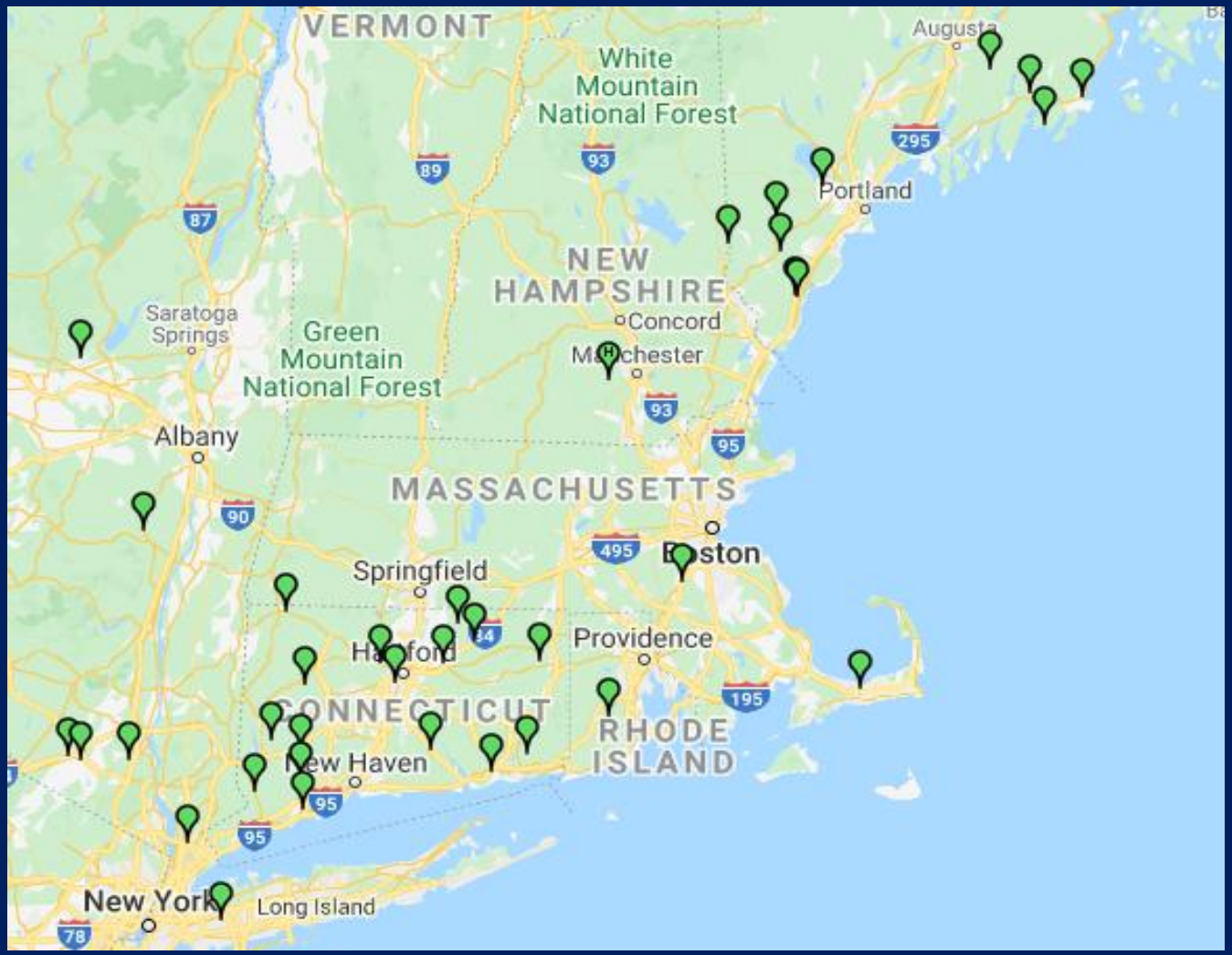
Both programs can be open on the computer simultaneously, share a SignaLink, & share a frequency.

If you are equipped with a soundcard for NBEMS, you are equipped for Winlink.

Our Local Winlink Gateway

VHF Packet RMS Gateways

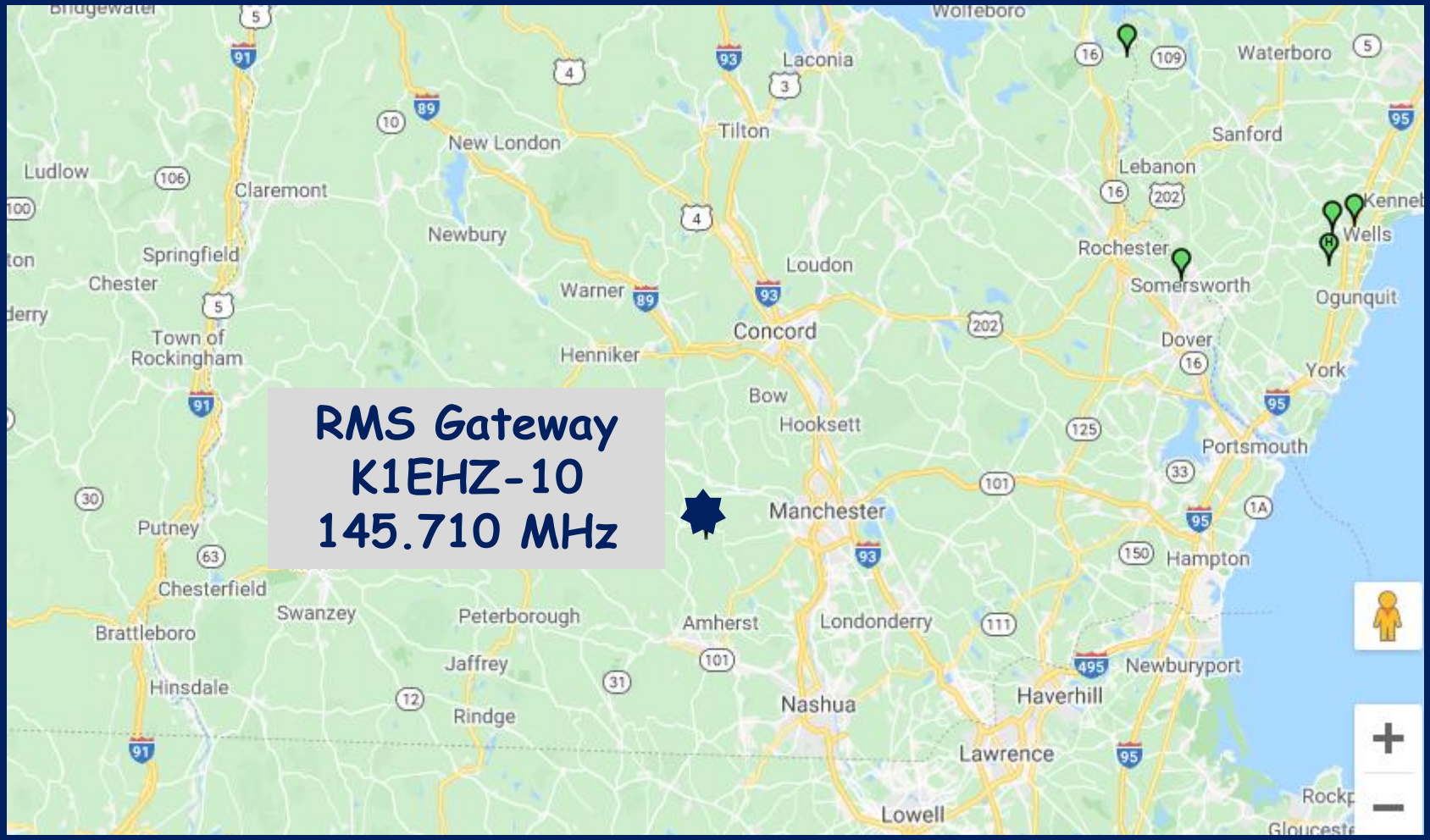
VHF stations with internet connections



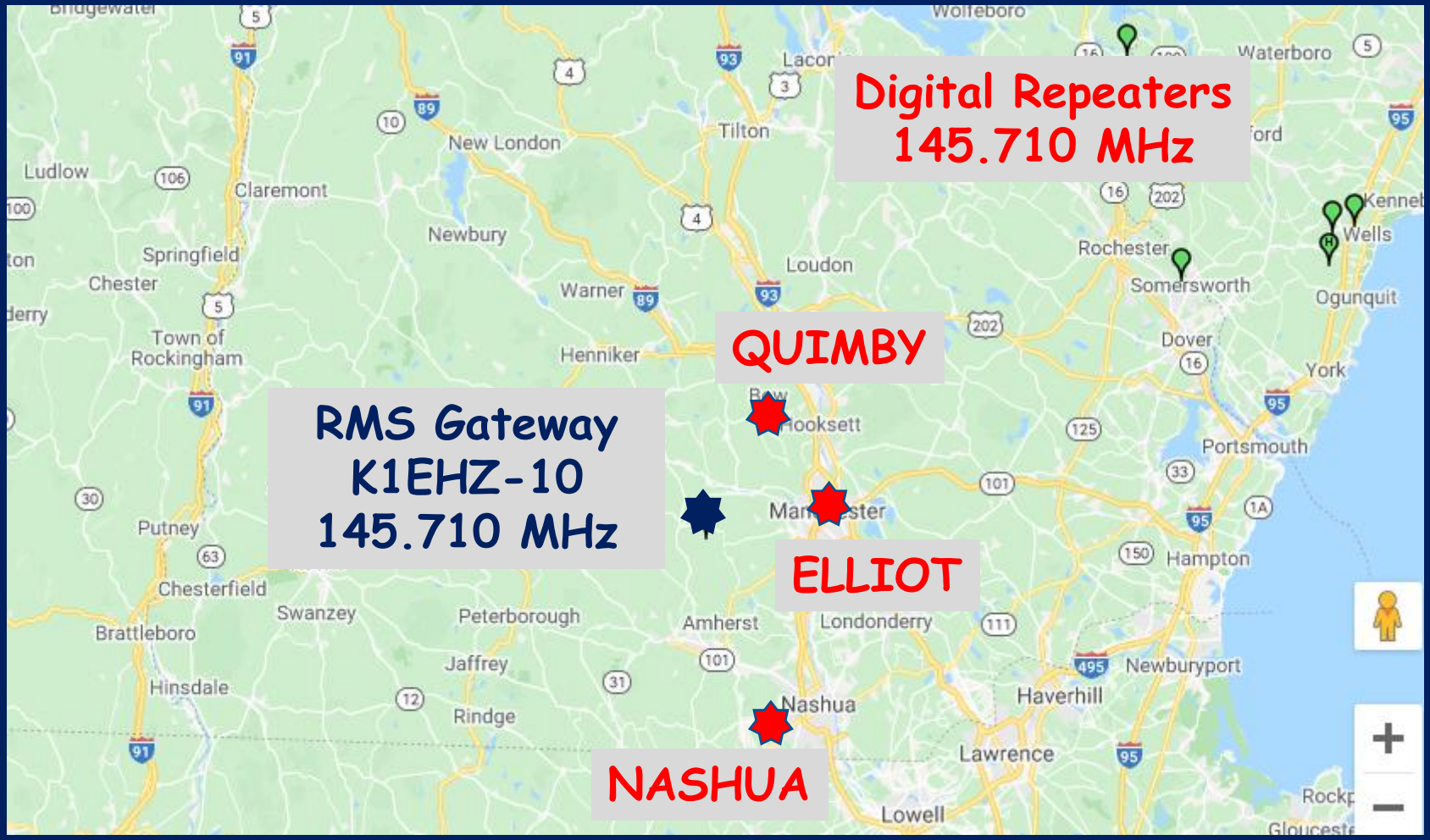
VHF Packet RMS Gateways

VHF stations with internet connections

VHF Side of Our Hybrid Gateway



VHF Side of Our Hybrid Gateway with Digipeaters added



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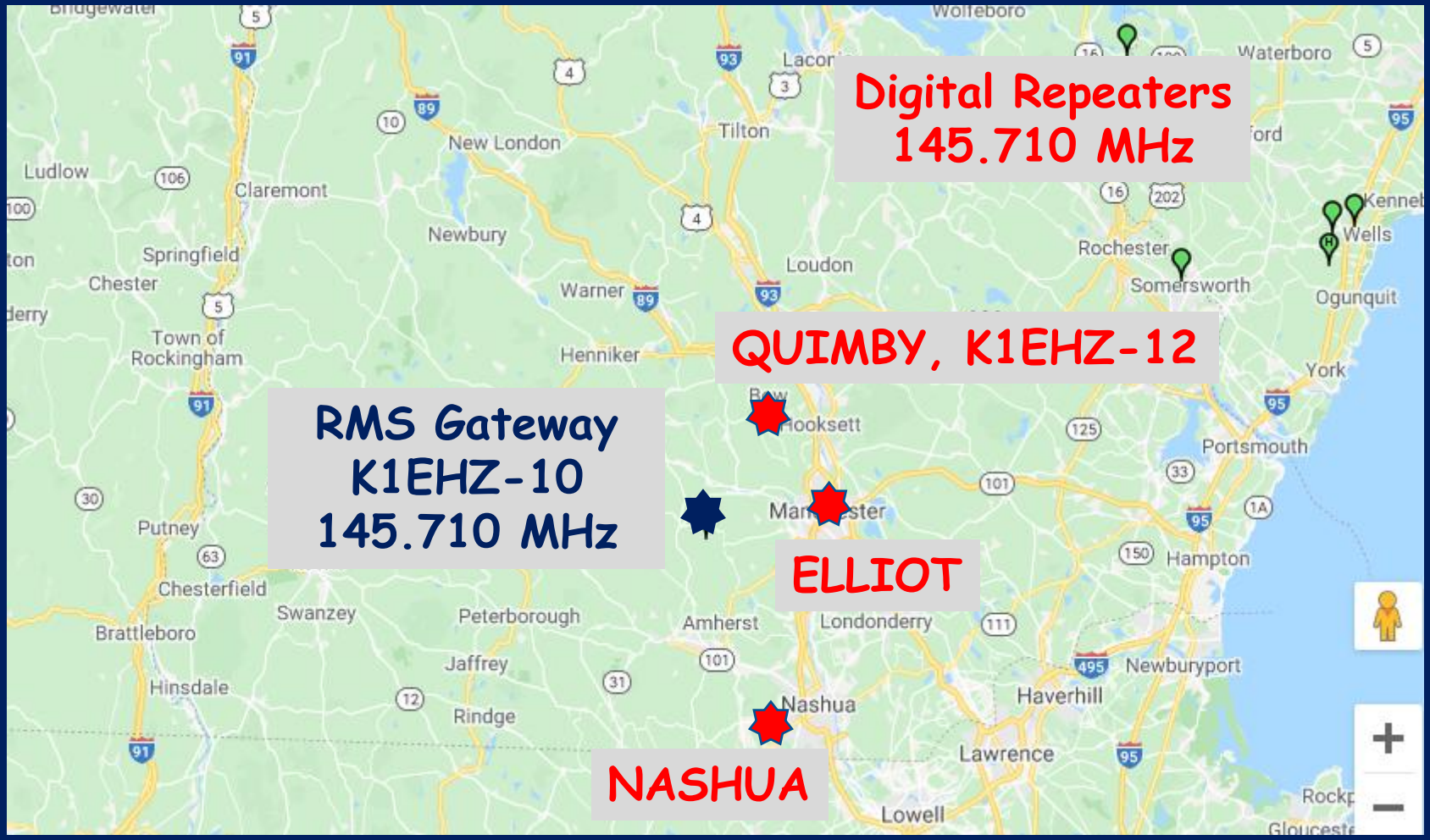

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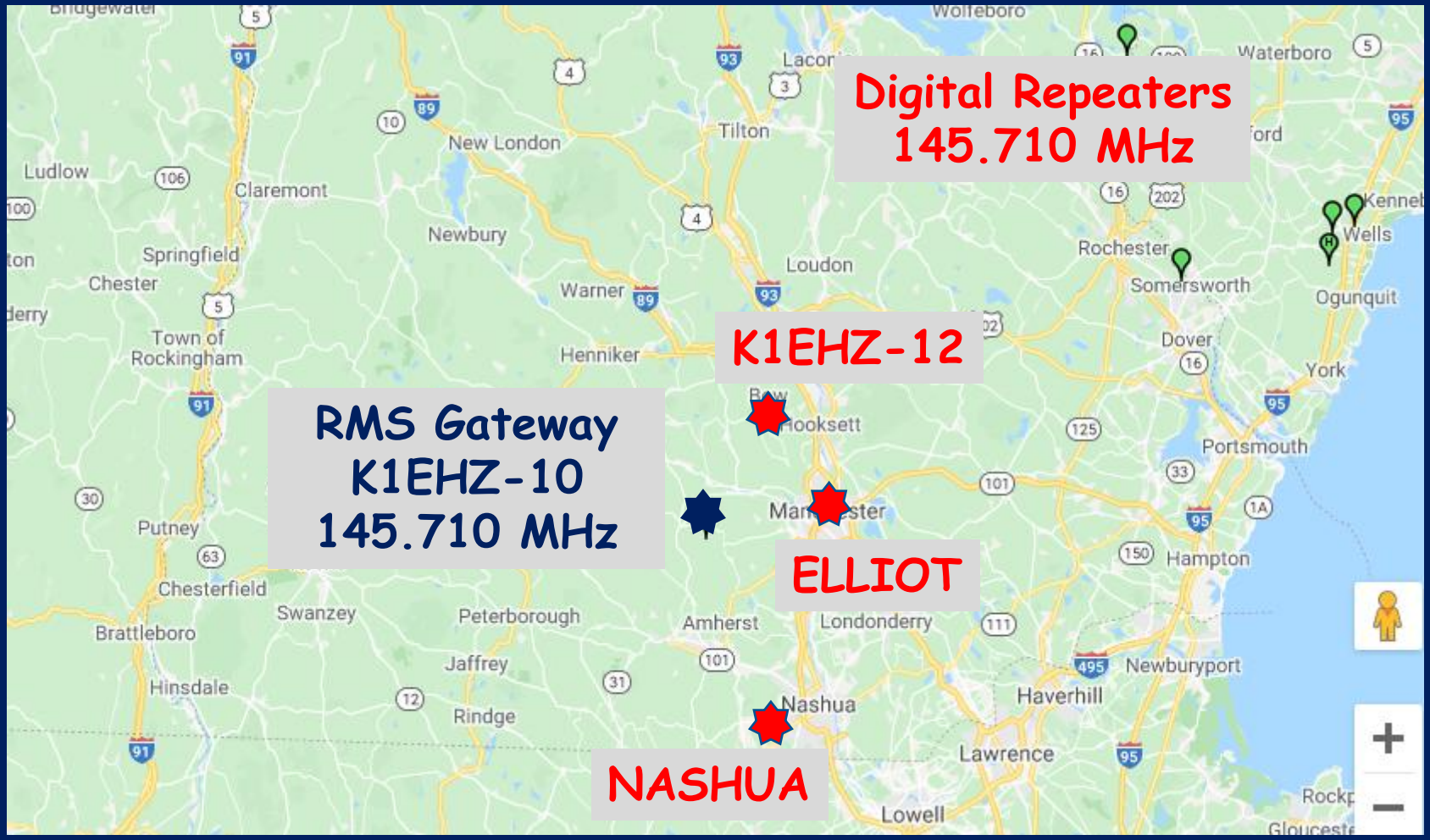
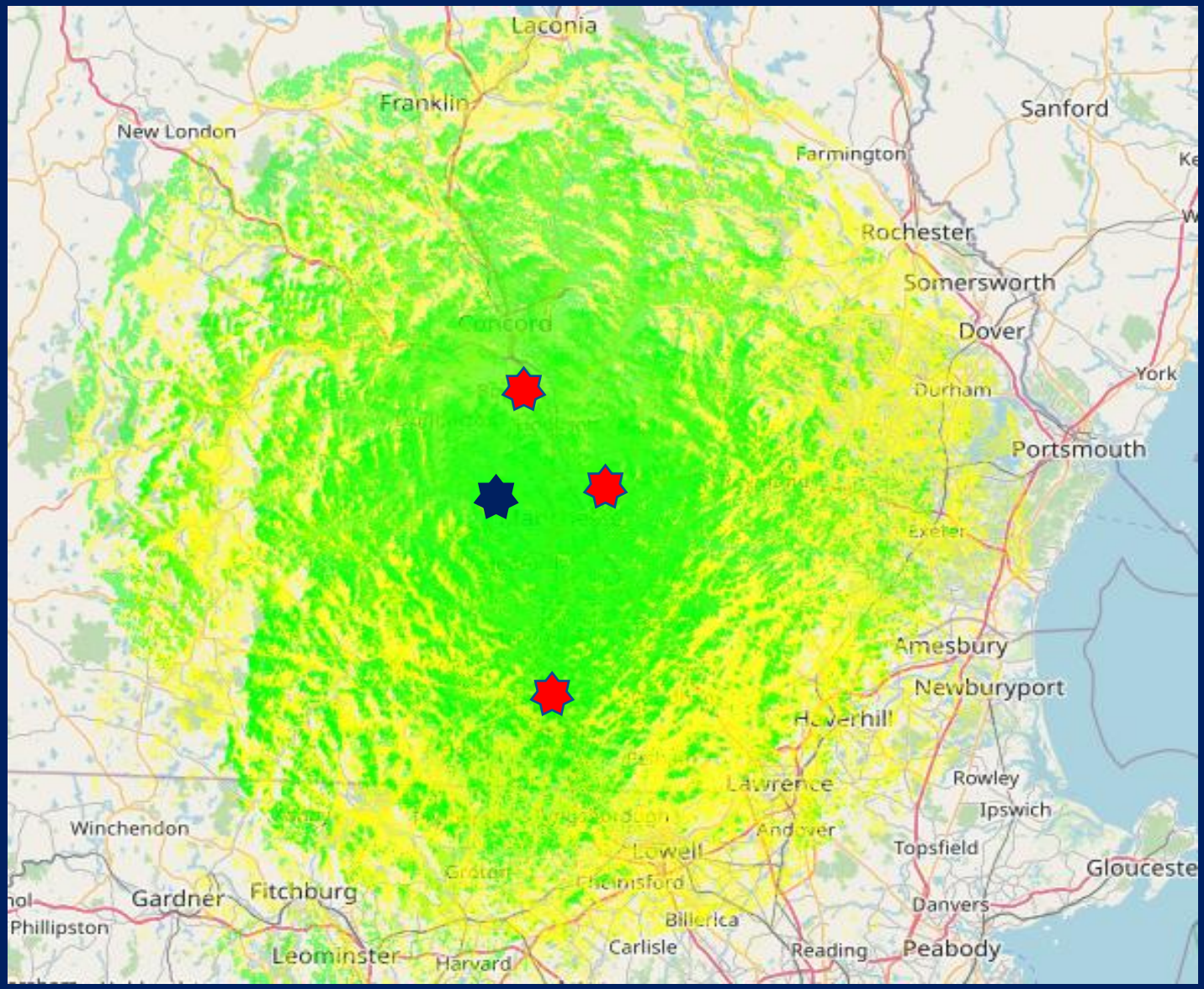


VHF Winlink Coverage - 145.710 MHz



How could we expand VHF coverage?

- Add fixed or mobile digipeaters
- Add VHF Gateways
- Place Gateway on a repeater frequency
- For drills and incidents, currently have the OK to use Winlink on the
  - Fort Mt, Epsom 70cm repeater (HARP)
  - Uncanoonuc Mt, Goffstown 2m repeater

Digipeater


TM-281
KENWOOD
MENU
145.710
TONE
M►V
M.IN
SQL
CALL
VFO
MR
REV
F
samlexpower
SEC-1223
Kantronics
PacketCommunicator 3
Xmit
Rcv
Con
Sta
FM Radio
TNC
Power Supply

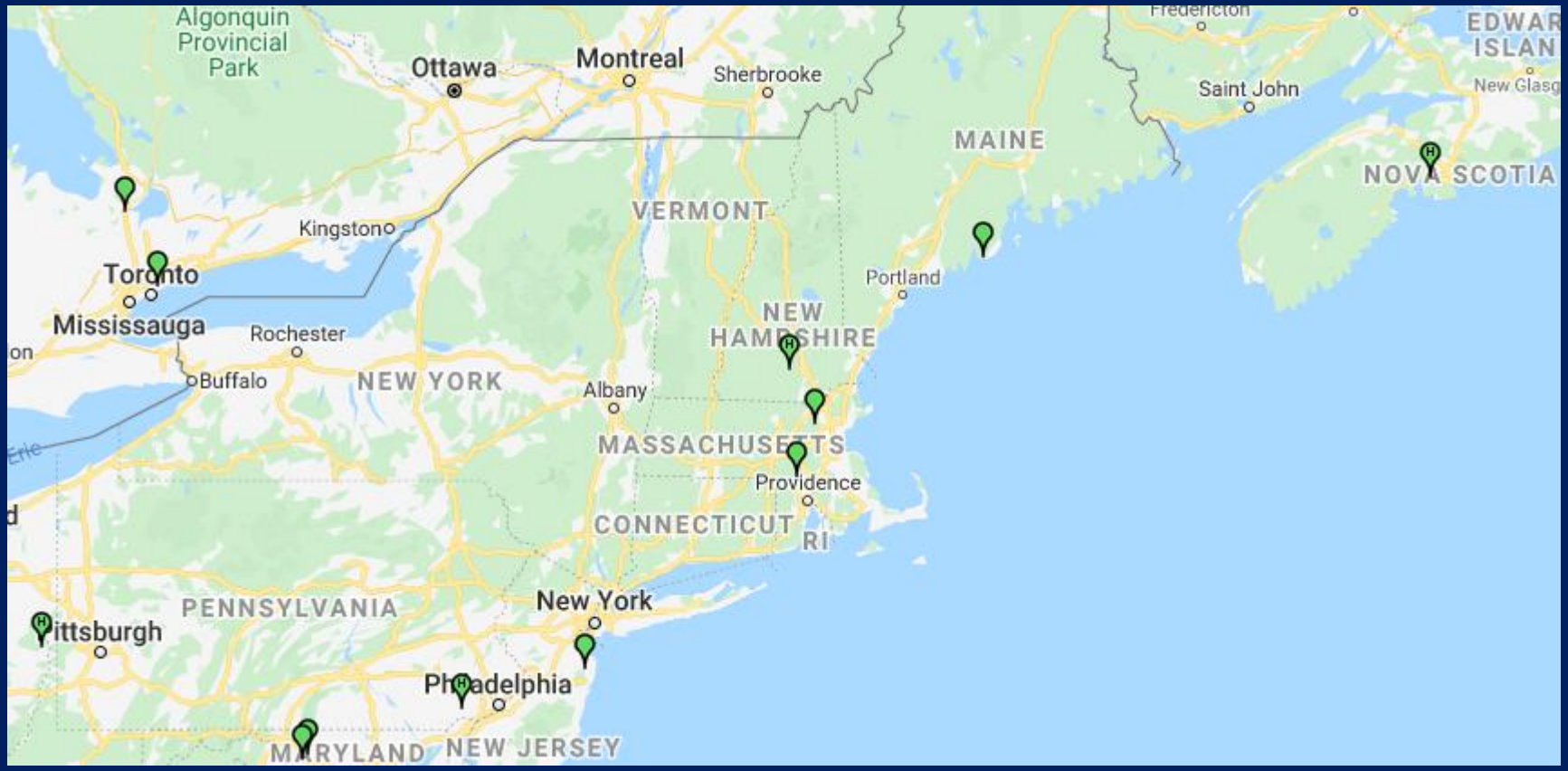
Digipeater + Computer =
RMS Local Standalone Post Office

Digipeater + Computer + Regular Repeater = Local Post Office Covering Wider Area

Digipeater + Computer + Internet =
VHF RMS Gateway to Winlink Global System

HF RMS Gateways

HF stations with internet connections



HF RMS Gateways

HF stations with internet connections

HF Side of Our Hybrid Gateway

Hillsborough County and Greater Manchester ARES Winlink Hybrid Gateway

HF Pactor Modem
P1 to P4 Capability

LDG-200 Auto Tuner
Auto-Forward on 160-10m

VHF/UHF Radio - FT-991

Winlink RMS Server
Dell Optiplex 780

VHF Packet TNC - KPC-3+

HF Radio - IC-718

SignaLink for ARDOP & VARA on HF

HF Capability
Receive 160 – 10m
Transmit 160 -10m

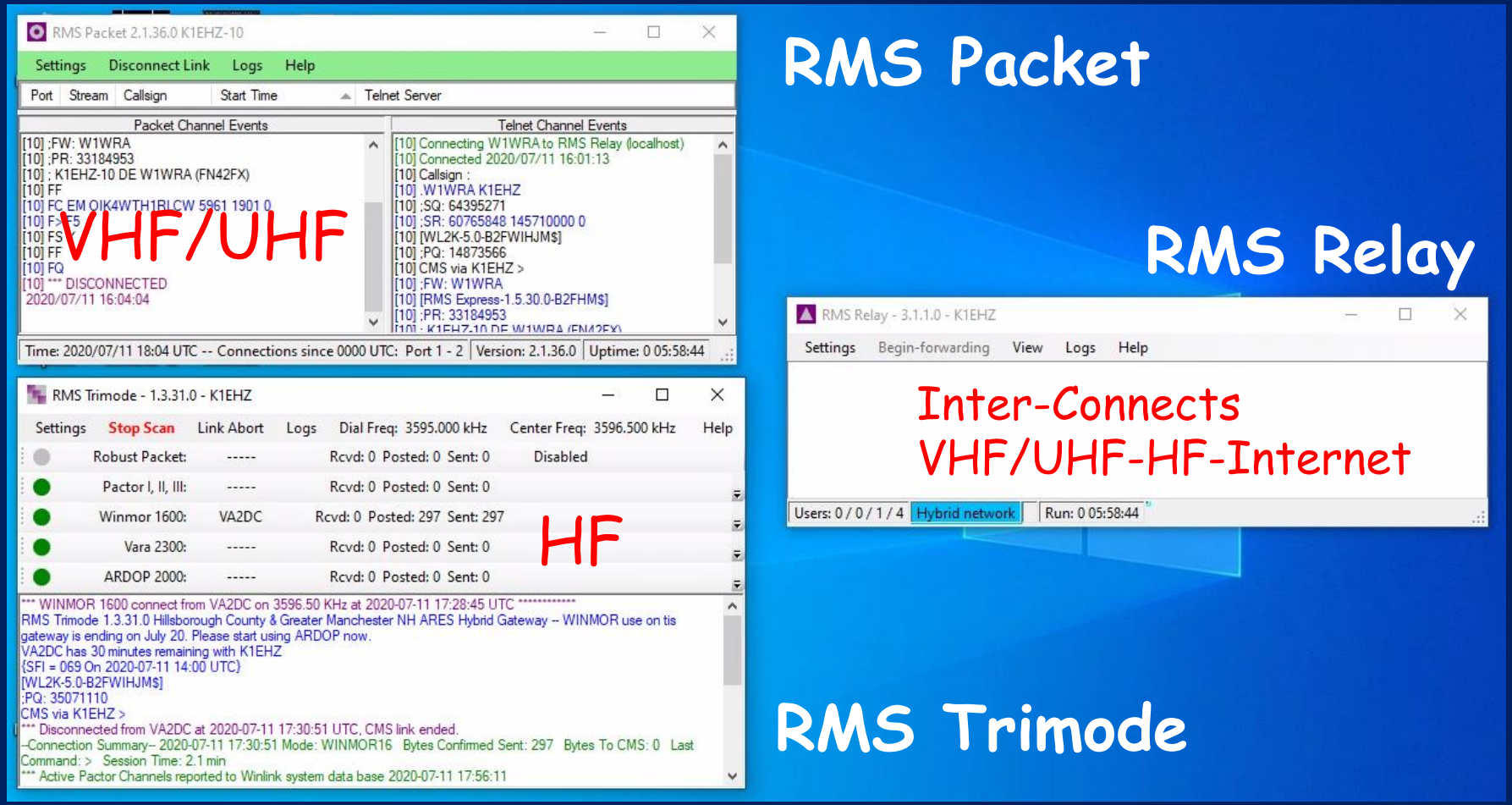
Currently listening on 80m with Auto-Forward on 160-10m

Easily expand listening to additional HF bands with software setting

Remote server management with NoMachine software

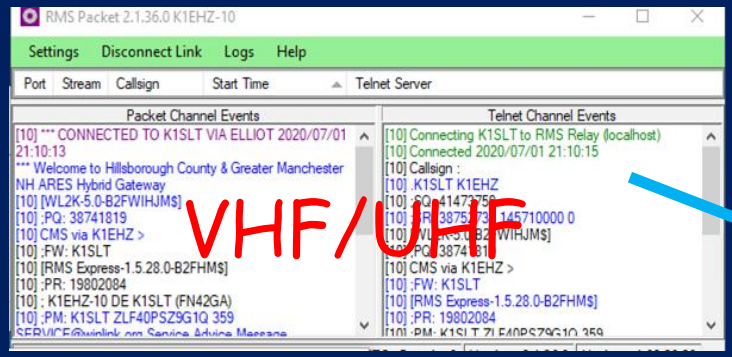
Solar-Battery, Generator

RMS Gateway Server

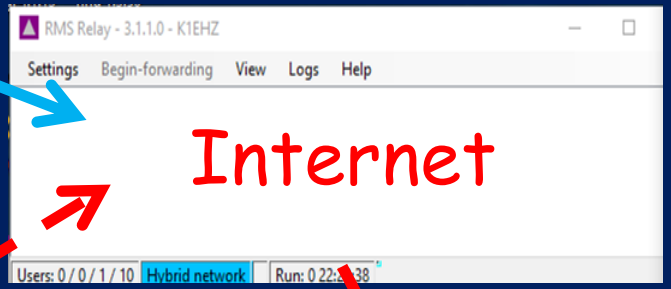


3 Programs Interact

When internet is available



RMS Relay

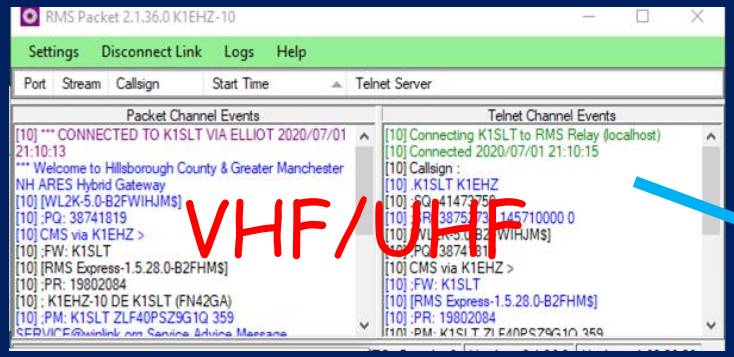


Internet

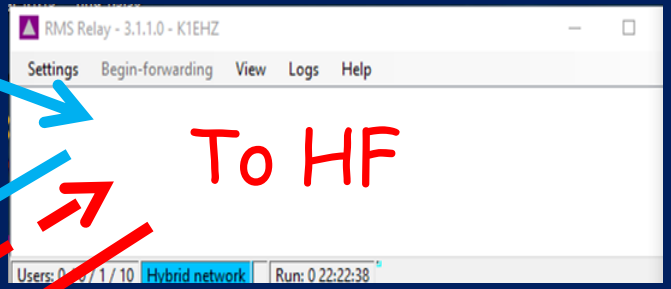
To Internet

3 Programs Interact

When internet is not available

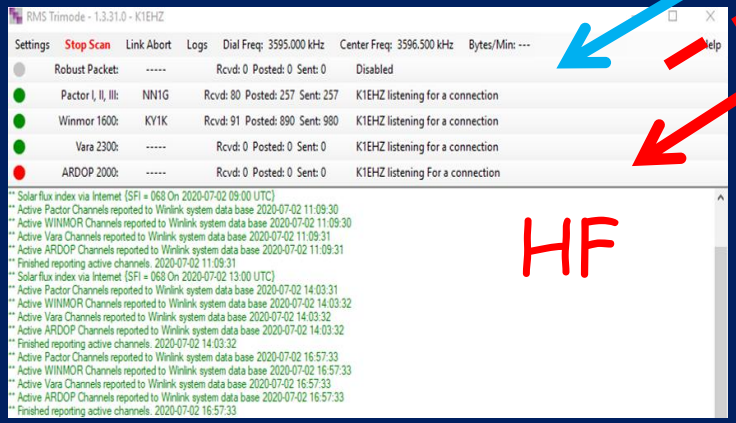


RMS Relay



To HF

Auto-Forwarding



HF

How does Auto-Forwarding work?

- Propagation forecast downloaded daily
- Software uses Reliability and Quality estimates in forecast to determine frequency and station for forwarding
- Software steps radio through calls to stations in decreasing order of Reliability and Quality until message is forwarded
- Pactor 2,3 have been the forwarding modes
- Pactor 4 used when FCC declares emergency
- New high-speed VARA mode may also be used for forwarding

Auto-Forwarding Propagation Forecast
Voice of America Coverage Area Prediction Model

Callsign	Frequency (kHz)	Mode	Grid Square	Hours	Group	Distance (mi)	Bearing (Degrees)	Path Reliability Estimate	Path Quality Estimate
W1EO	1845.000	P2, P1	FN42IM	00-23	PUBLIC	36	151	100	100
K1EHZ	3596.500	P3, P2, P1	FN42EX	00-23	PUBLIC	0	000	99	99
W1EO	3597.900	P3	FN42IM	00-23	PUBLIC	36	151	99	99
W1EO	7102.500	P3	FN42IM	00-23	PUBLIC	36	151	96	96
KQ4ET	7102.700	P3, P2, P1	FM16XU	00-23	PUBLIC	483	210	78	54
KQ4ET	7101.500	P3, P2, P1	FM16XU	00-23	PUBLIC	483	210	78	54
WD1O	3589.500	P3, P2, P1	FN53IX	00-23	PUBLIC	136	059	78	53
KC8YJJ	7102.500	P3, P2, P1	EN90PL	00-23	PUBLIC	498	253	78	54
VE1YZ	5405.000	P4, P3	FN84BQ	00-23	PUBLIC	403	070	76	52
AJ4FW	7103.700	P3, P2, P1	FM07BC	00-23	PUBLIC	595	230	74	50
W6IDS	7084.500	P2	EM79NV	00-23	PUBLIC	717	257	67	45
W6IDS	7061.500	P2	EM79NV	00-23	PUBLIC	717	257	67	45
W3JY	3591.000	P3, P2, P1	FN20FA	00-23	PUBLIC	287	226	63	44
N2LEE	7102.000	P3, P2, P1	FM18HX	00-23	PUBLIC	407	229	63	47
VE1YZ	7096.500	P4, P3	FN84BQ	00-23	PUBLIC	403	070	62	46
N3HYM-10	7102.500	P3, P2, P1	FM19FK	00-23	PUBLIC	392	233	61	46

Reliability = % Time Path SNR meets or exceeds Required SNR

Auto-Forwarding Propagation Forecast
Voice of America Coverage Area Prediction Model

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W6IDS	7084.500	P2	EM79NV	00-23	PUBLIC	717	257	67	45
W6IDS	7061.500	P2	EM79NV	00-23	PUBLIC	717	257	67	45
W3JY	3591.000	P3, P2, P1	FN20FA	00-23	PUBLIC	287	226	63	44
N2LEE	7102.000	P3, P2, P1	FM18HX	00-23	PUBLIC	407	229	63	47
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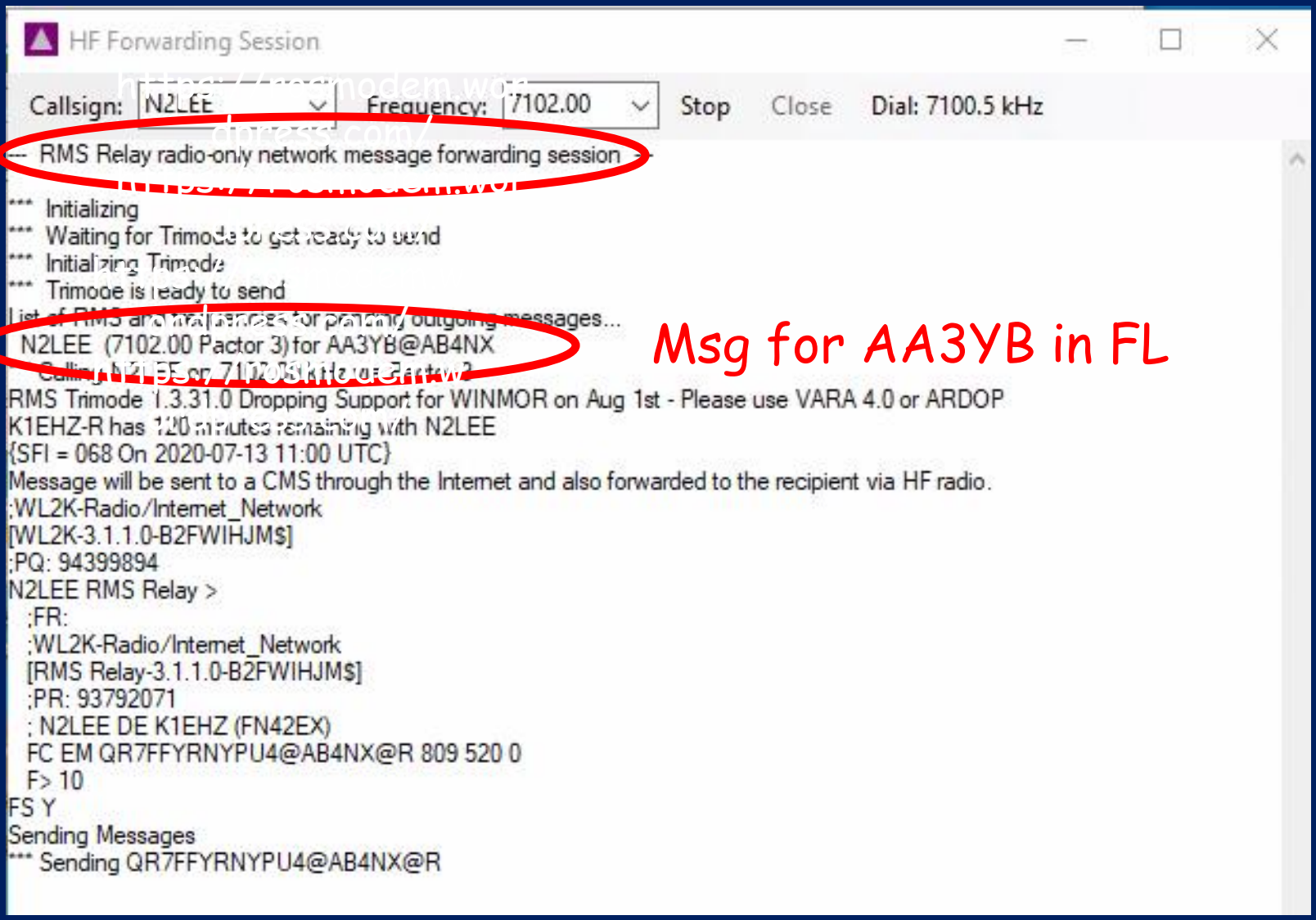
Reliability = % Time Path SNR meets or exceeds Required SNR

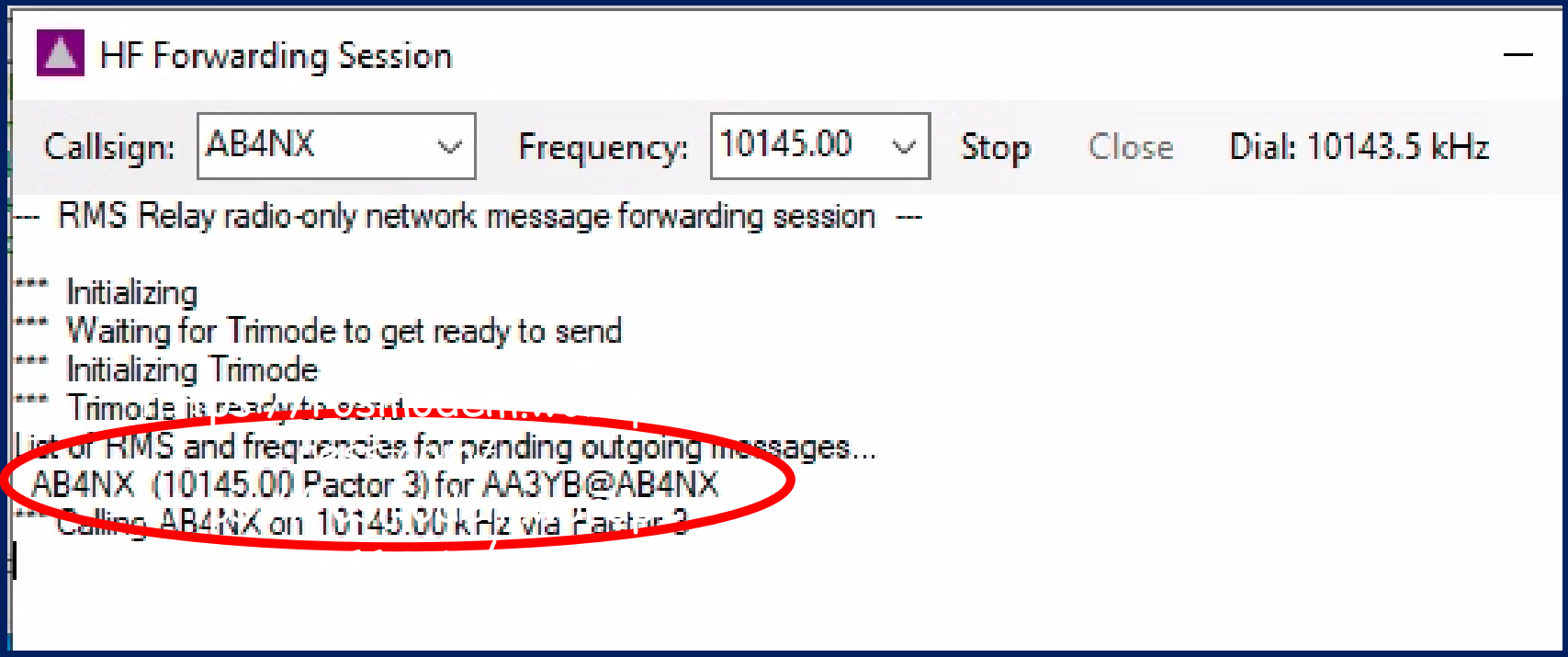
Pactor Connection with N2LEE (VA)

Radio-only Message for AA3YB on 7102 KHz

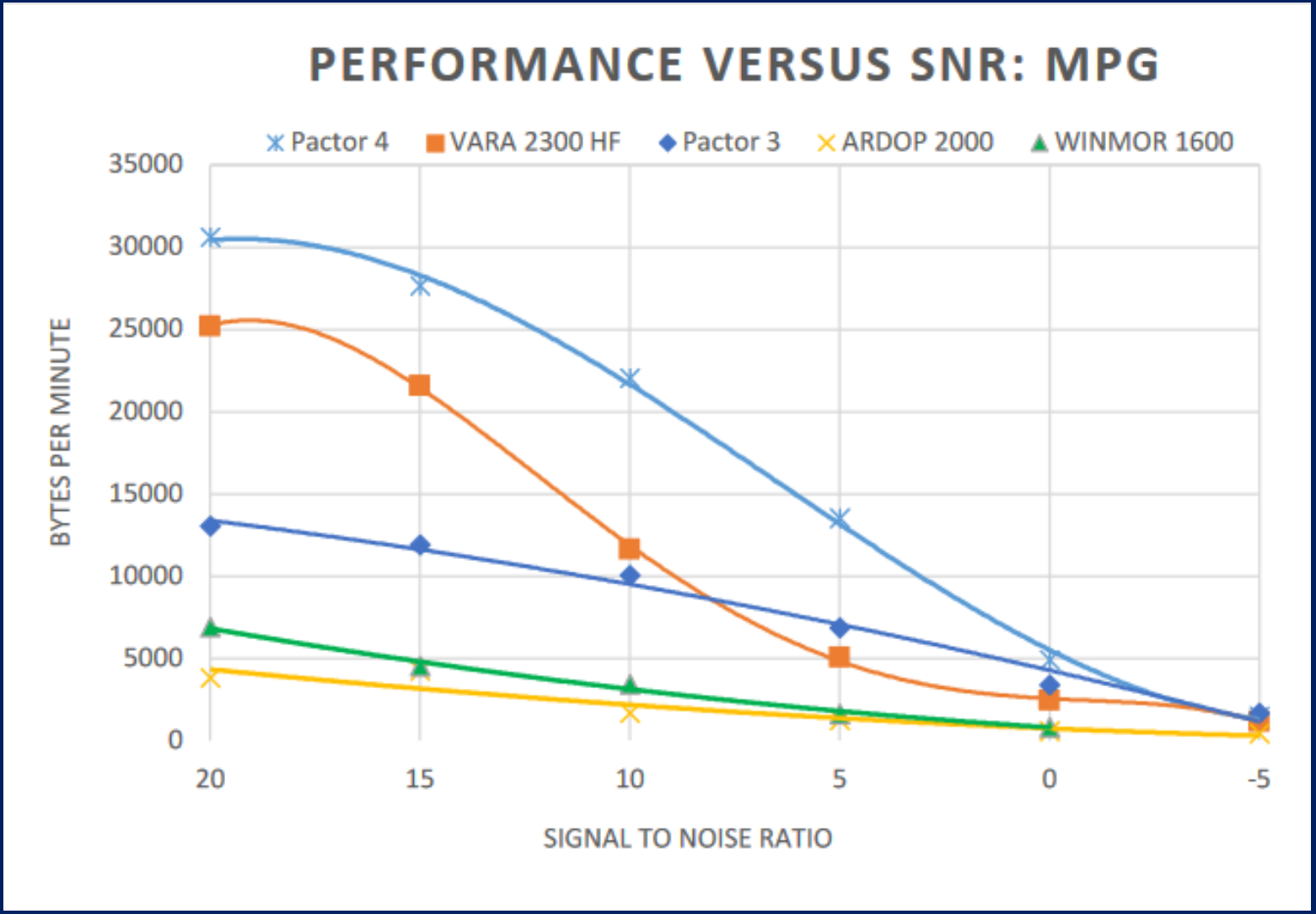


Msg for AA3YB in FL

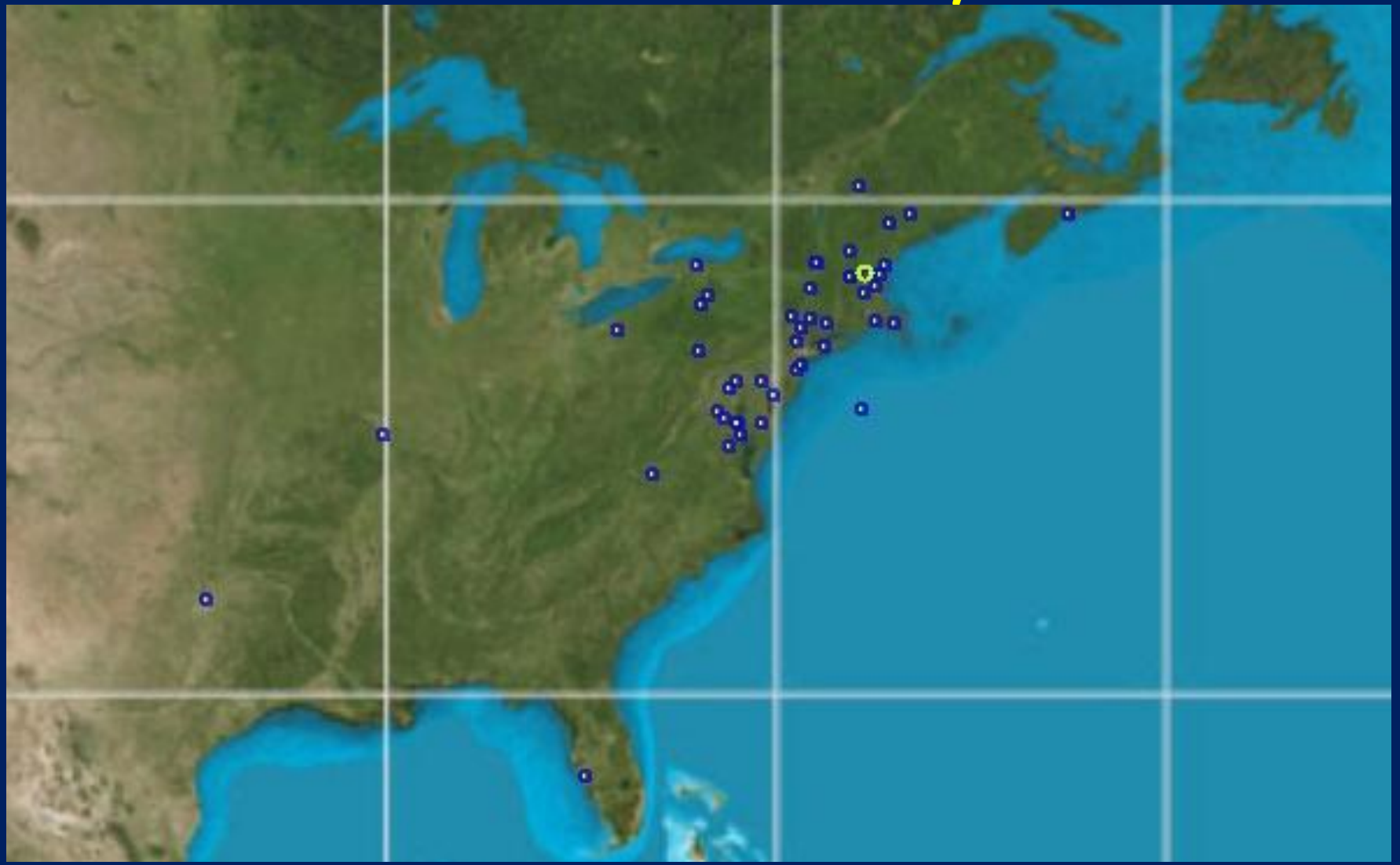
Auto-Forwarding to AB4NX (GA) Message Pick-up Station on 10145 KHz



Winlink Mode Simulations – N5TW

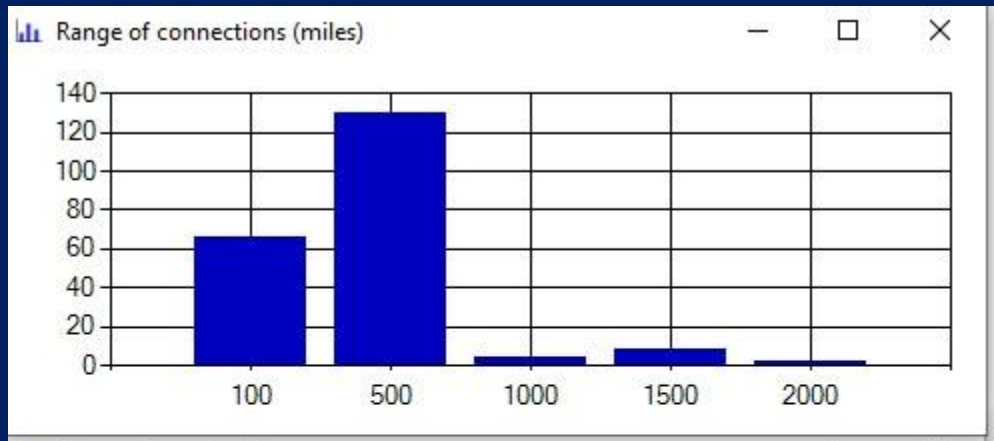


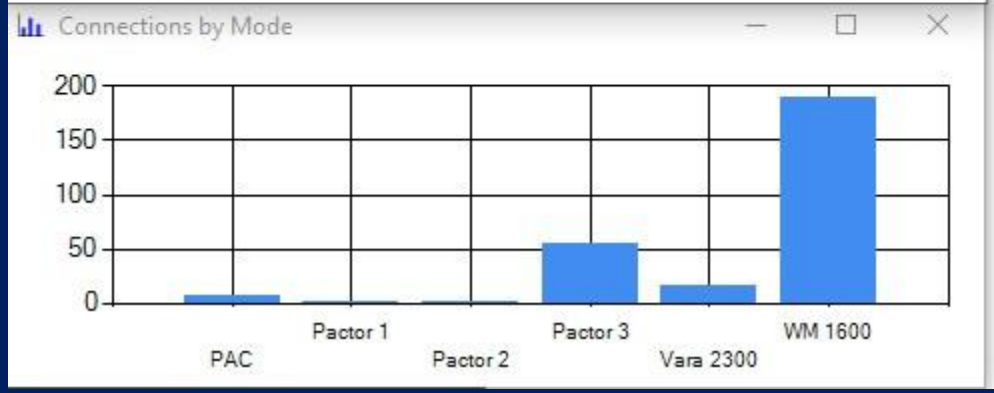
30-day Snapshot of Stations Using Our HF Gateway

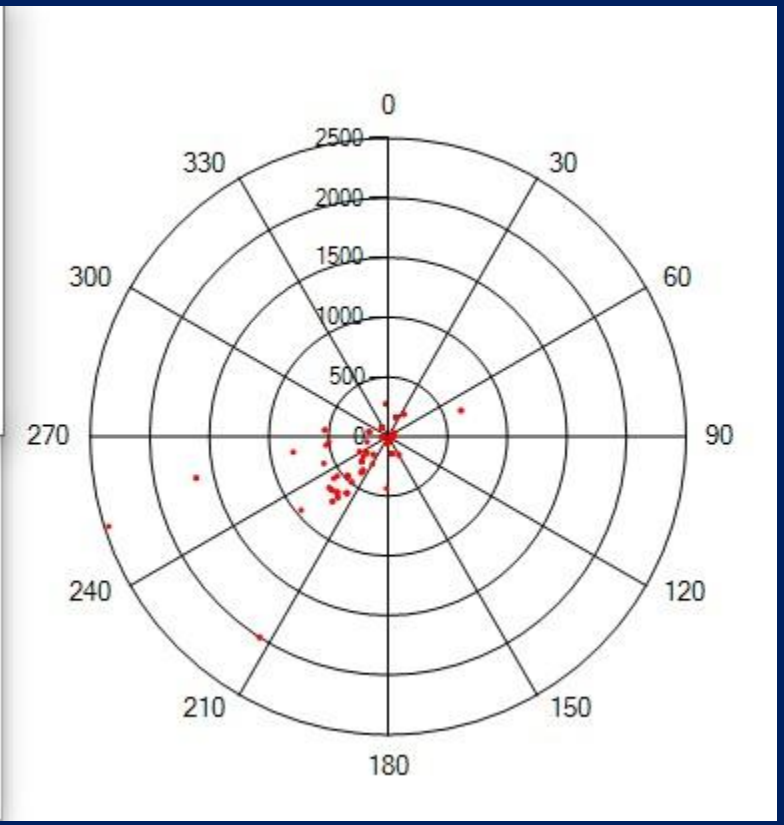


30-day Snapshot of 80m Gateway Use

Intentionally NVIS for Regional Coverage







ARES Groups Use Our HF Gateway

- ARES groups in several states use our HF gateway for training, including check-in nets, sending net reminders and rosters to their ARES members, and doing radio-only messaging drills.
- FL, VA, MD, DE, OH, PA and NY ARES groups use the HF side weekly to monthly.
- WI and MI ARES groups use the HF side occasionally.
- AR and LA ARES used it once or twice.
- VA has state-wide Wednesday Winlink Check-in.

Importantly, if these groups can reach our gateway, we should be able to reach gateways in their areas if (when) the internet is out here.

Winlink Express

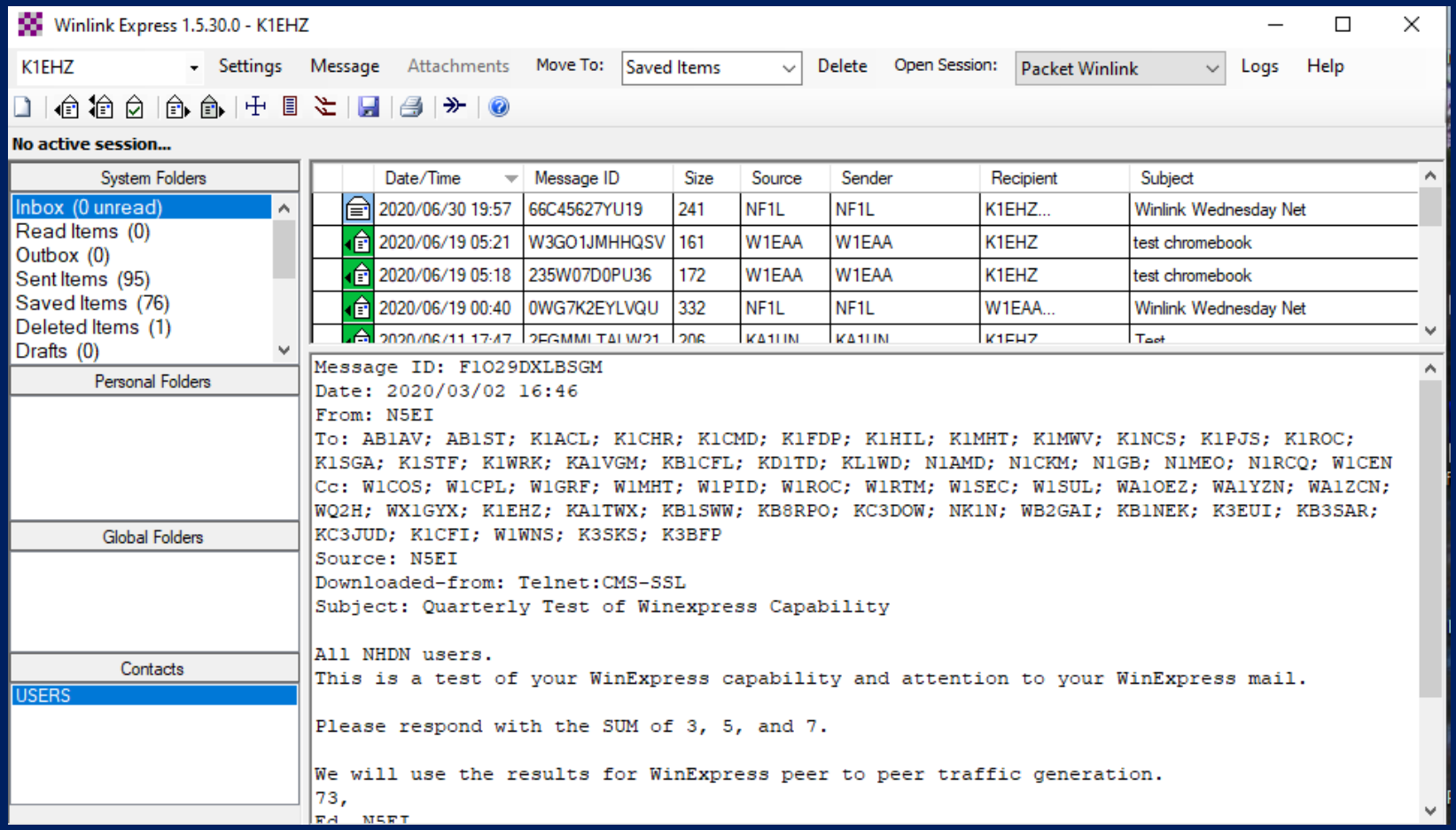
Key Features

Winlink Express

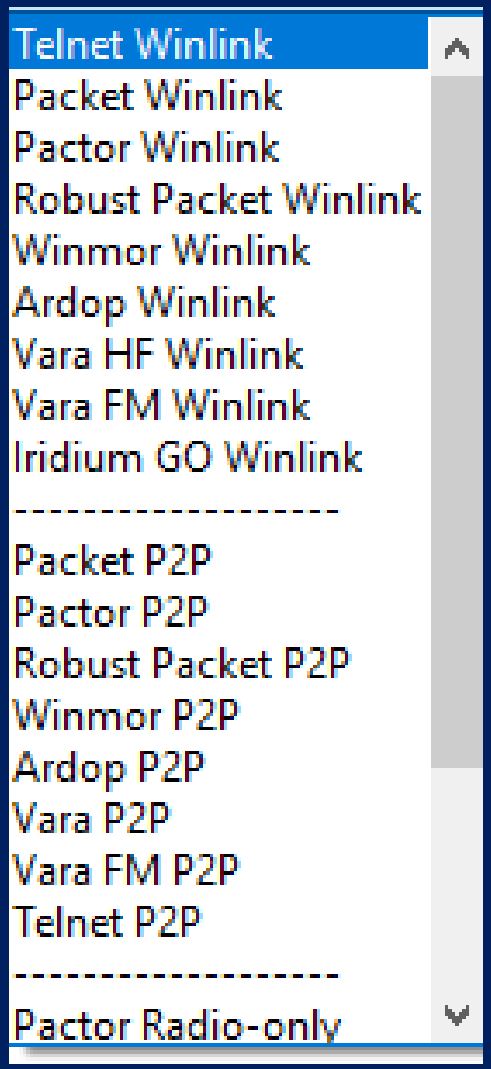
=

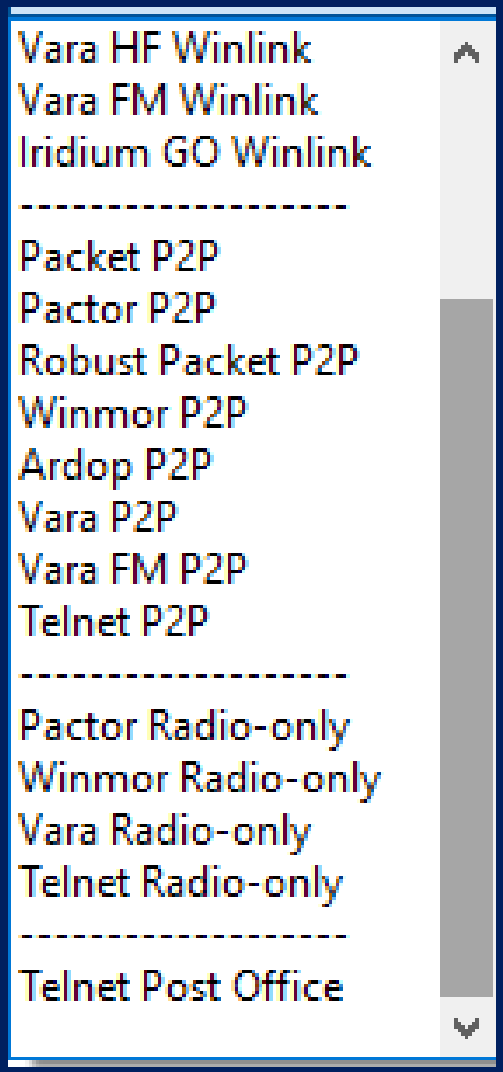
RMS Express

Winlink Express Client

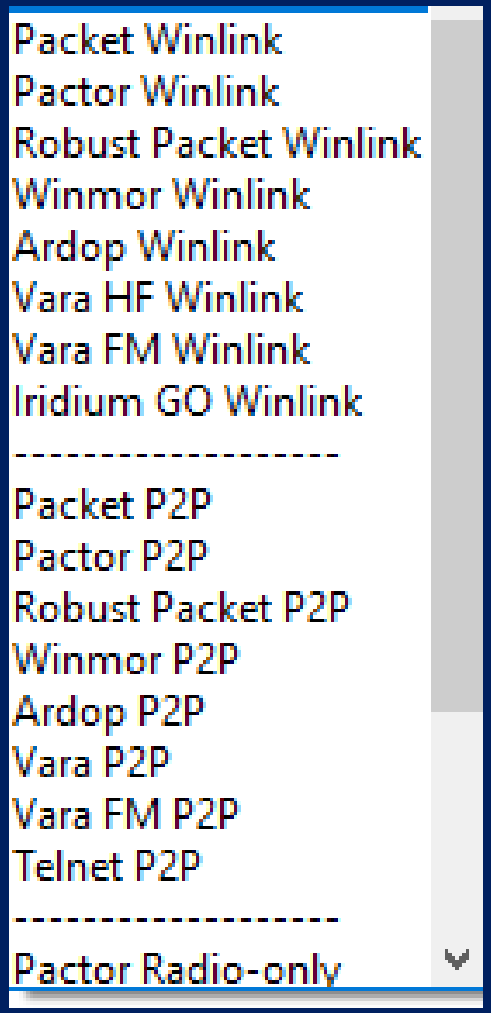


Operating Modes





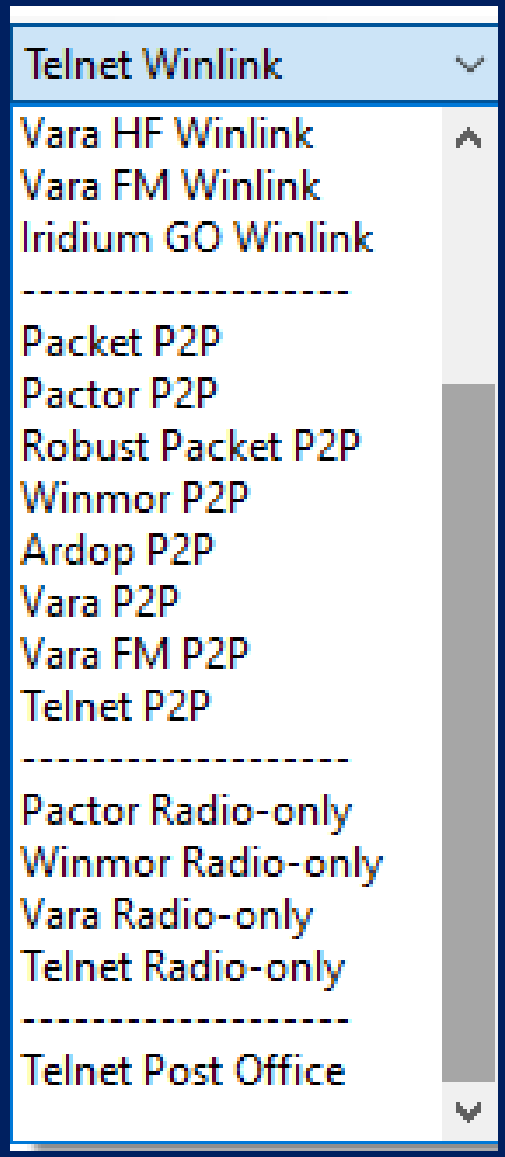
Operating Modes



Modes for Connecting to Radio Message Servers over the air

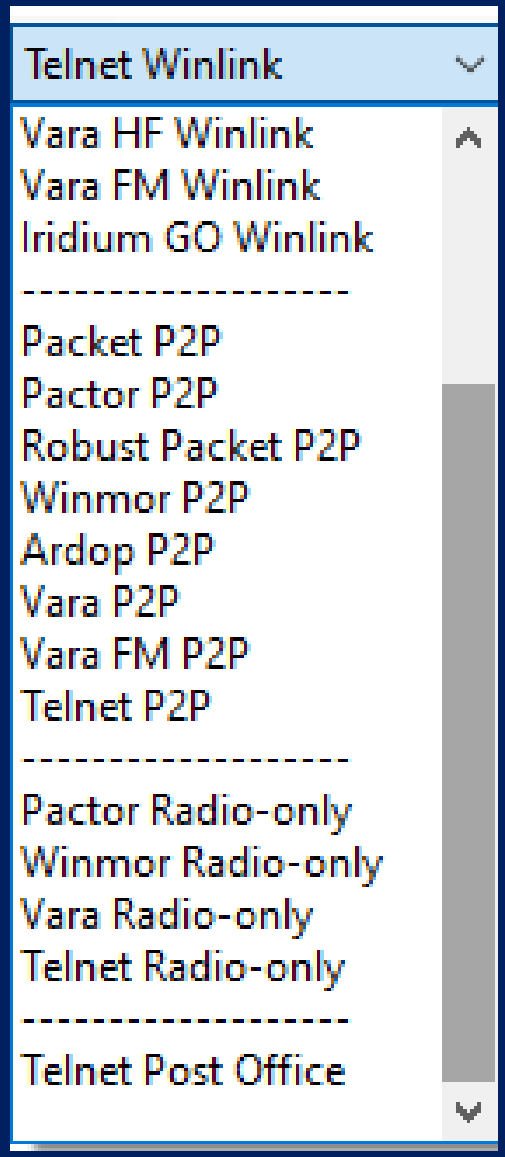
Operating Modes

Peer-to-Peer (Point-to-Point) Modes Don't Need Radio Message Servers or Internet



Operating Modes

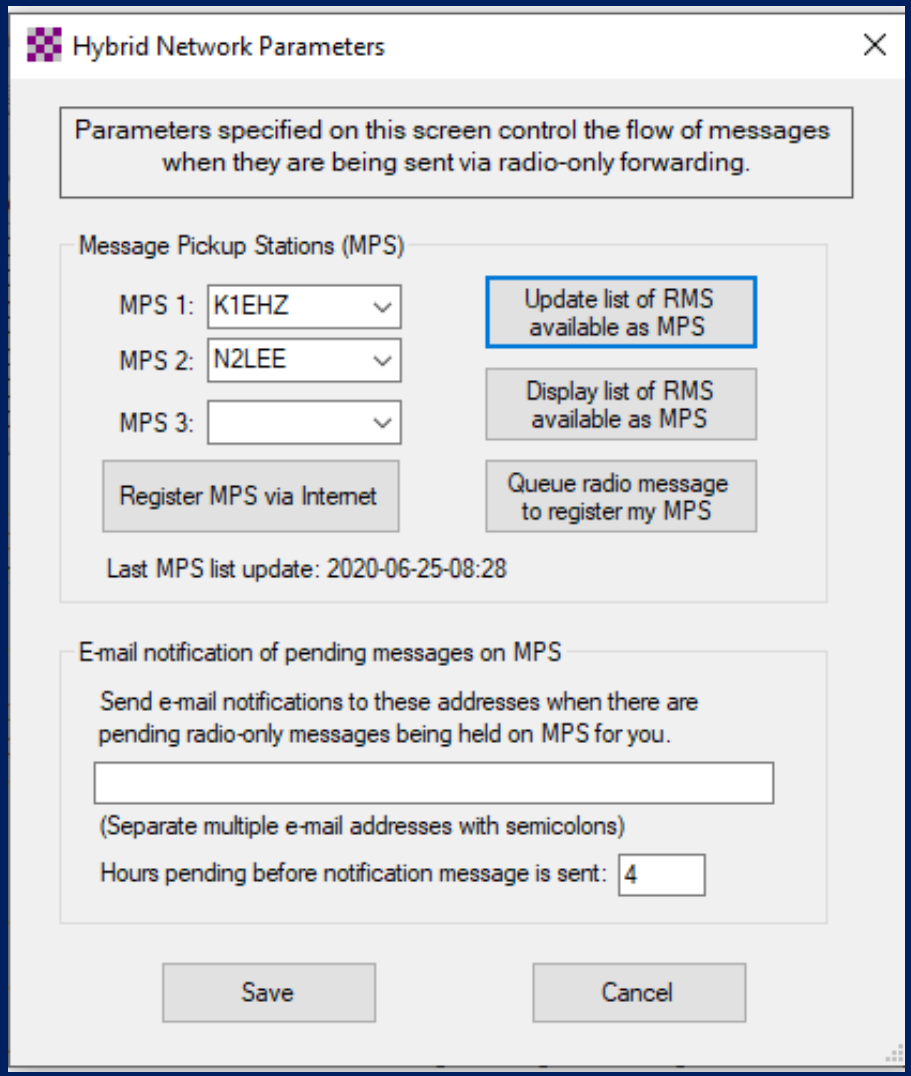
Radio-only Modes Don't Need Internet



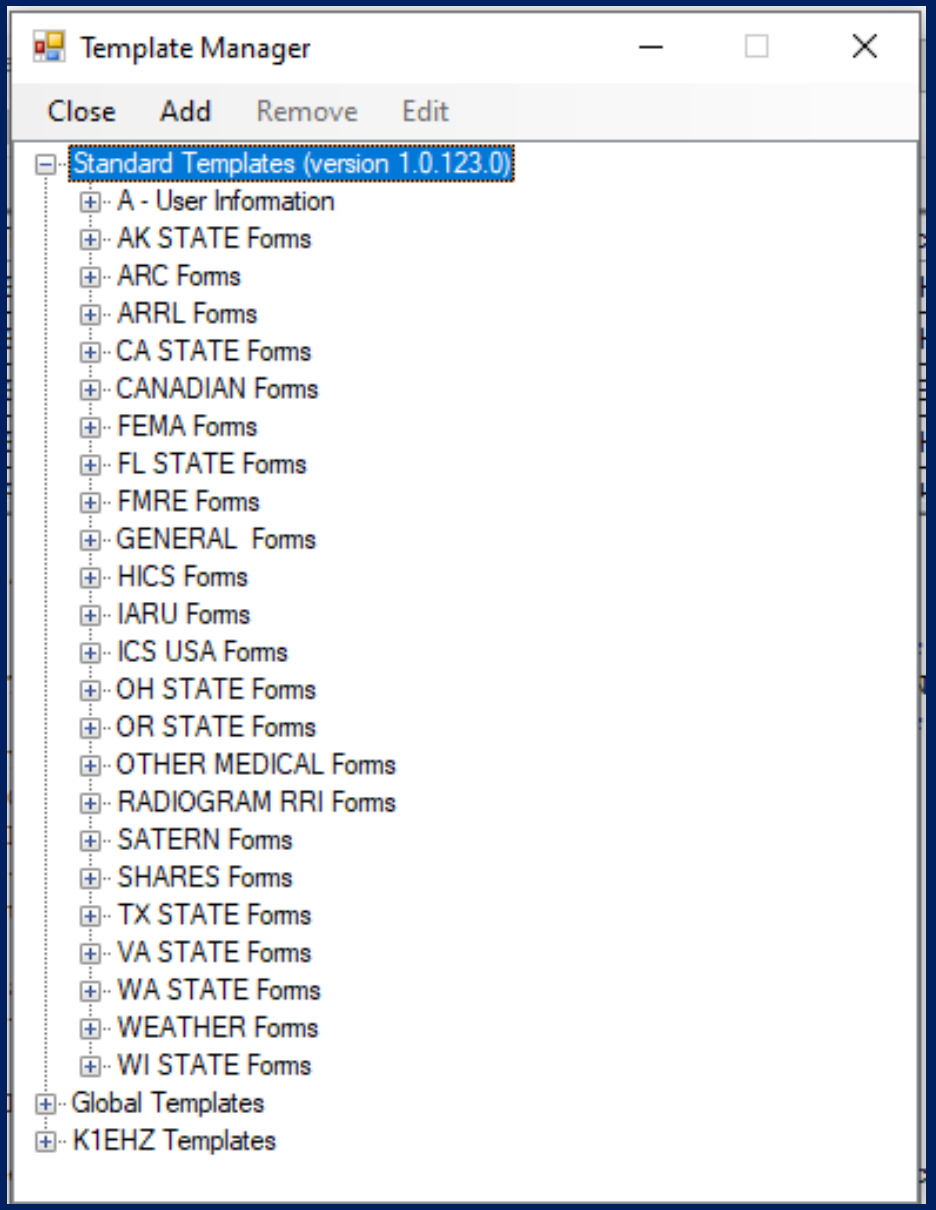
Message Pick-up Stations

During internet outage we still need a place to drop-off & pick-up email

Radio Message Severs on the Hybrid Network Have Built-in Post Offices

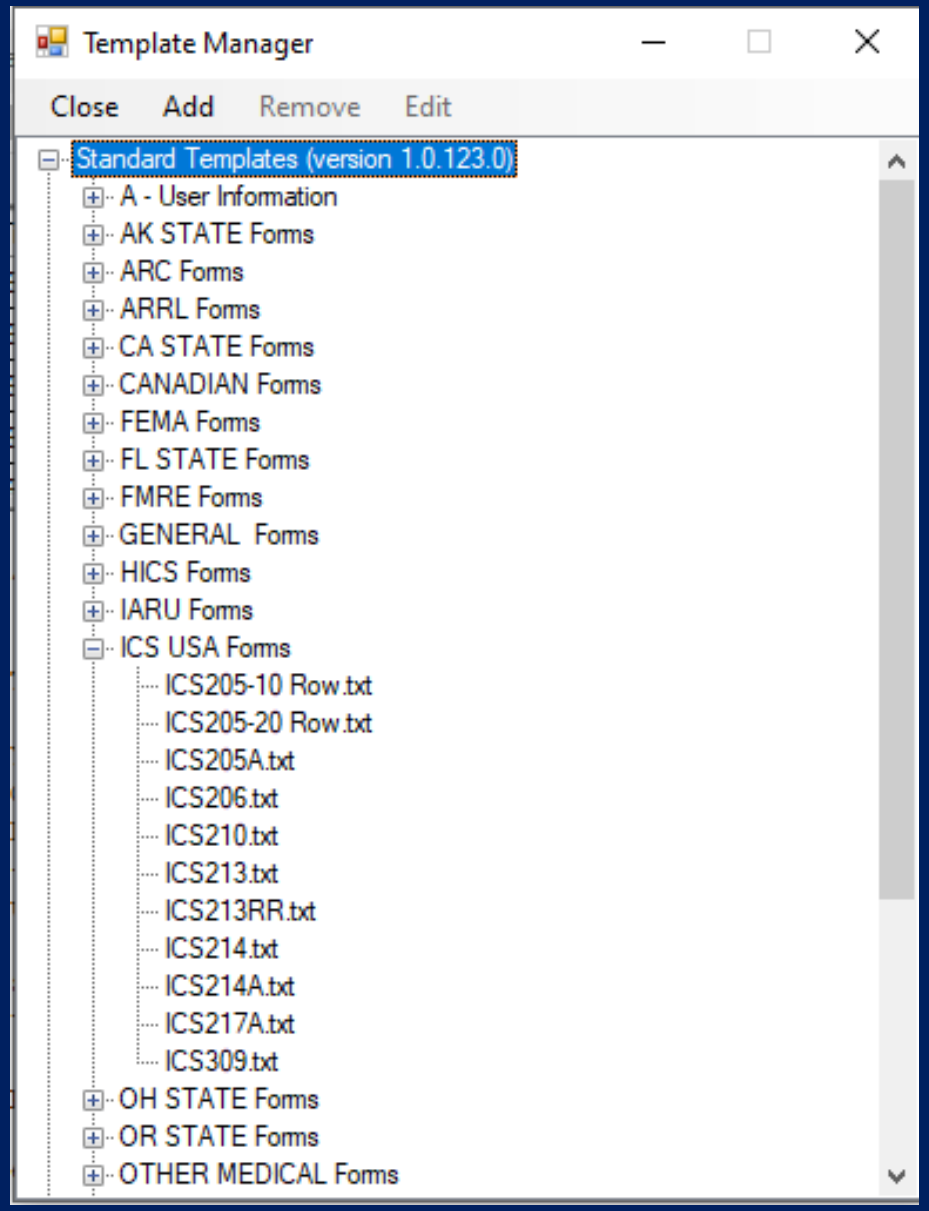


Standard Forms



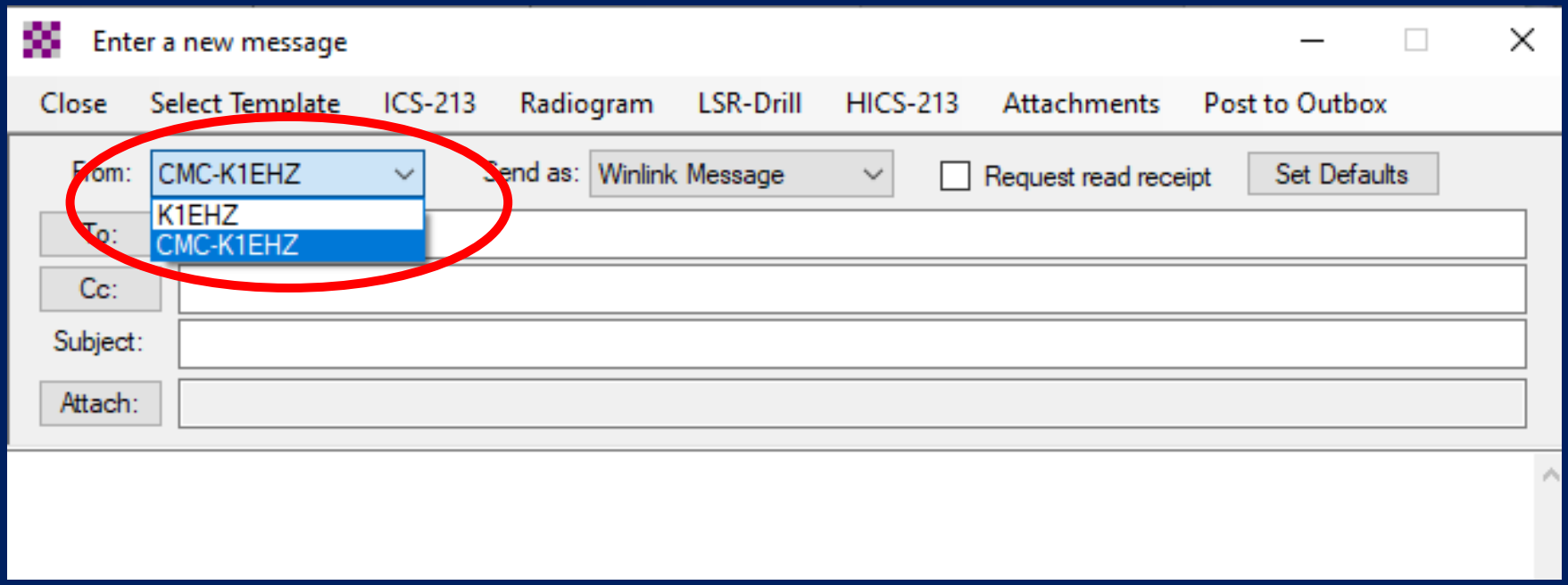
Standard Forms

ICS Forms



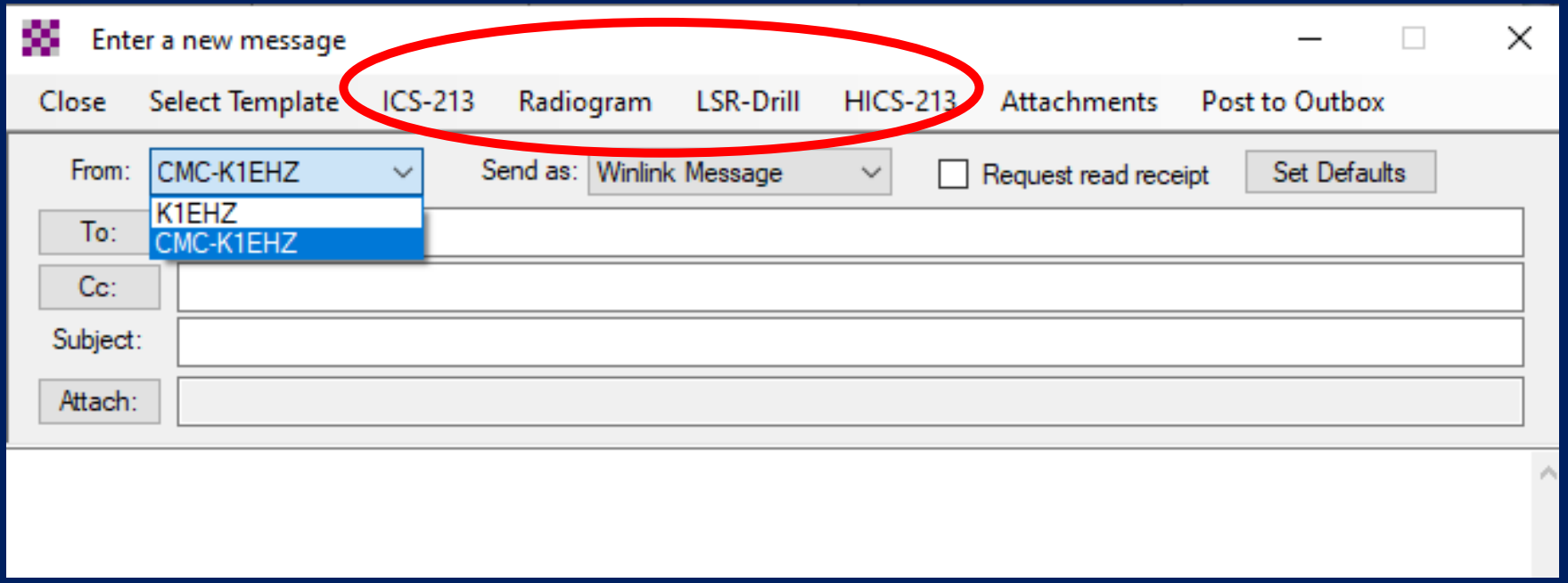
Message Form

FCC or Tactical Callsign Address



Message Form

Favorite Message Templates



ICS-213 Template
Like Custom Forms in NBEMS

General Message (ICS 213)

Load ICS213 INITIAL Data | Form Instructions

1. Incident Name: Incident name is optional

2. To (Name/Position):

3. From (Name/Position):

4. Subject:

5. Date: 2020-06-24

6. Time: 12:05

7. Message:

Be Brief and Concise

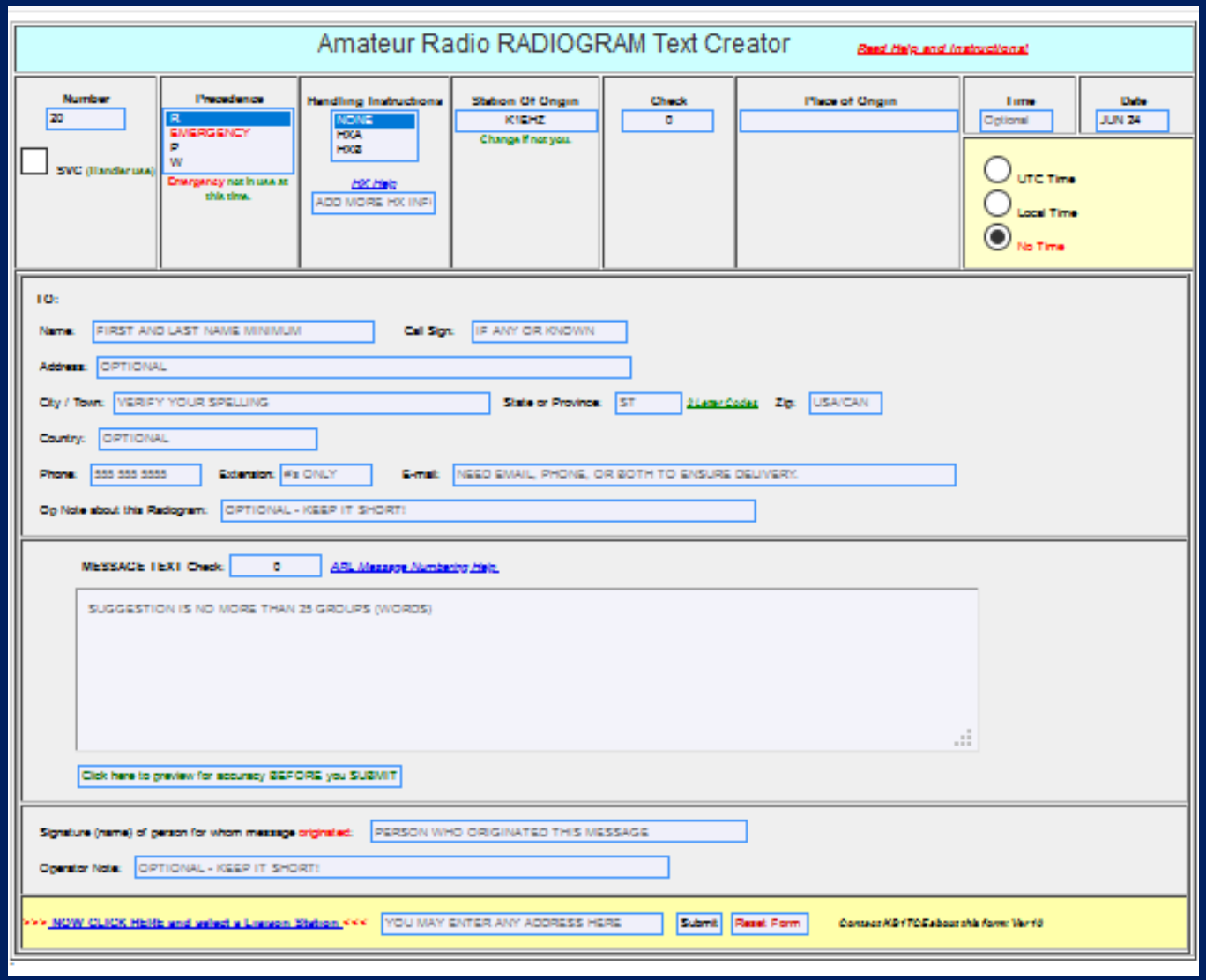
8. Approved by:

Position / Title:

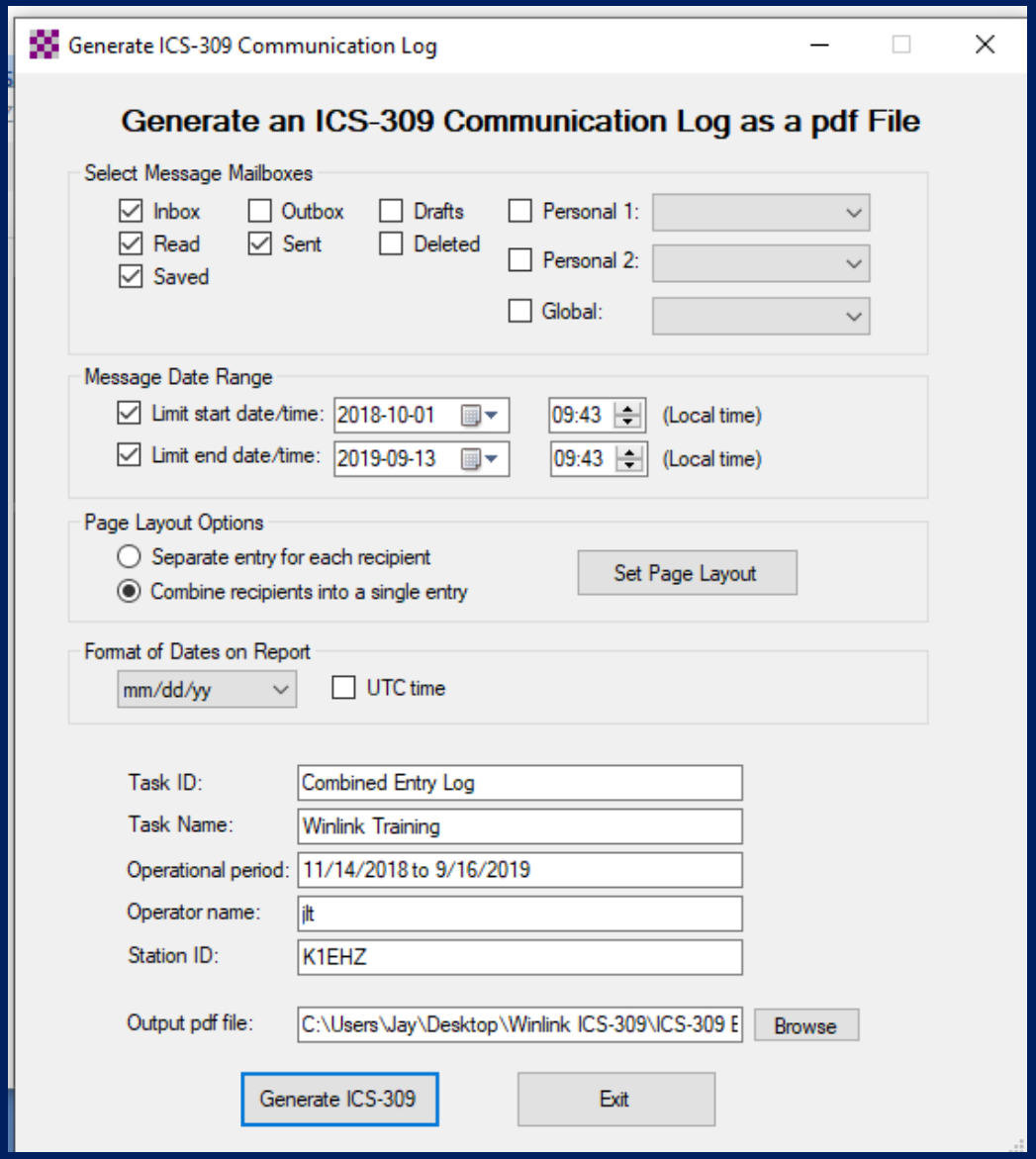
Save ICS213 INITIAL Data | Submit | Reset Form

Ver 41.3

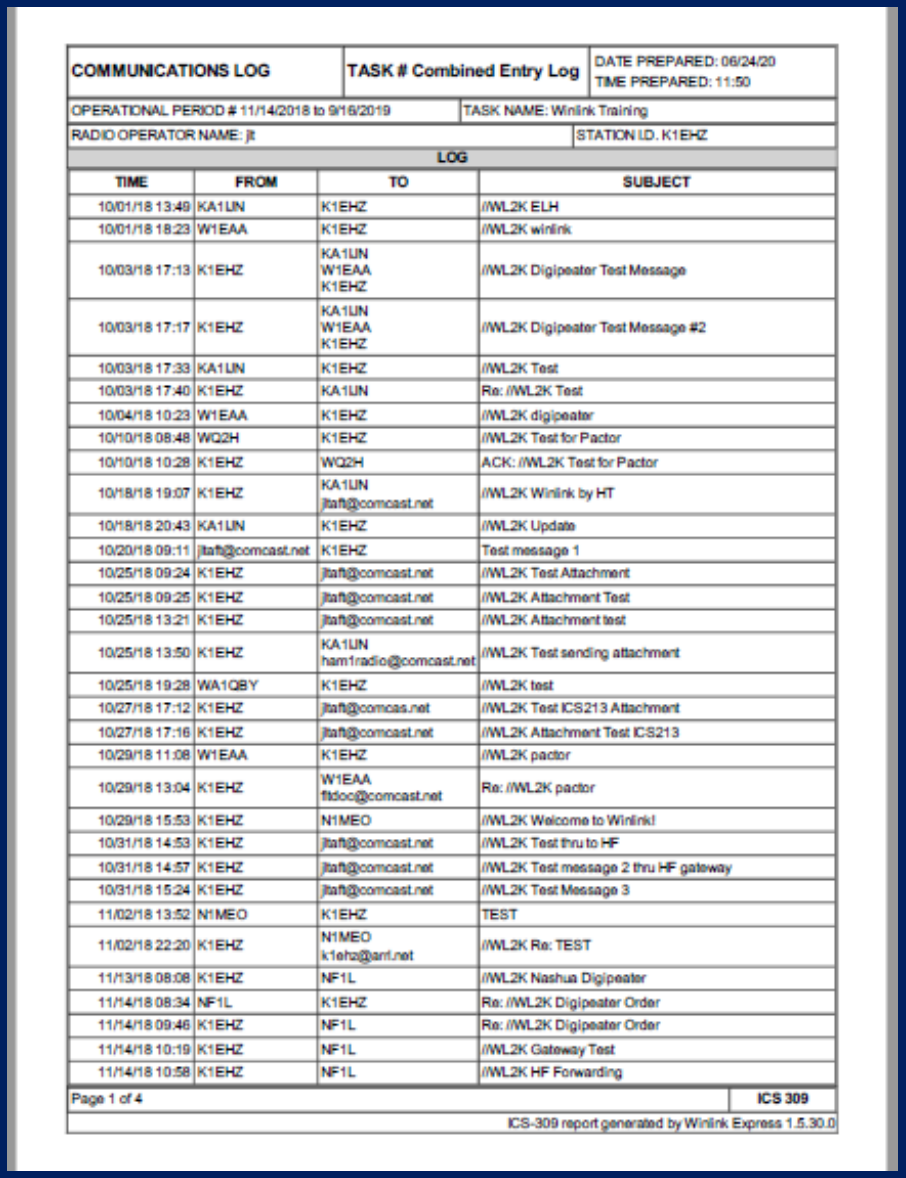
Radiogram
Like Custom Forms in NBEMS



Easily Print ICS-309 Log



Easily Print ICS-309 Log



COMMUNICATIONS LOG	TASK # Combined Entry Log	DATE PREPARED: 06/24/20 TIME PREPARED: 11:50
OPERATIONAL PERIOD # 11/14/2018 to 9/16/2019	TASK NAME: Winlink Training	
RADIO OPERATOR NAME: jt		STATION I.D. K1EHZ

LOG

TIME	FROM	TO	SUBJECT
10/01/18 13:49	KA1LIN	K1EHZ	//WL2K ELH
10/01/18 18:23	W1EAA	K1EHZ	//WL2K winlink
10/03/18 17:13	K1EHZ	KA1LIN W1EAA K1EHZ	//WL2K Digipeater Test Message
10/03/18 17:17	K1EHZ	KA1LIN W1EAA K1EHZ	//WL2K Digipeater Test Message #2
10/03/18 17:33	KA1LIN	K1EHZ	//WL2K Test
10/03/18 17:40	K1EHZ	KA1LIN	Re: //WL2K Test
10/04/18 10:23	W1EAA	K1EHZ	//WL2K digipeater
10/10/18 08:48	WQ2H	K1EHZ	//WL2K Test for Pactor
10/10/18 10:28	K1EHZ	WQ2H	ACK: //WL2K Test for Pactor
10/18/18 19:07	K1EHZ	KA1LIN jtafl@comcast.net	//WL2K Winlink by HT
10/18/18 20:43	KA1LIN	K1EHZ	//WL2K Update
10/20/18 09:11	jtafl@comcast.net	K1EHZ	Test message 1
10/25/18 09:24	K1EHZ	jtafl@comcast.net	//WL2K Test Attachment
10/25/18 09:25	K1EHZ	jtafl@comcast.net	//WL2K Attachment Test
10/25/18 13:21	K1EHZ	jtafl@comcast.net	//WL2K Attachment test
10/25/18 13:50	K1EHZ	KA1LIN ham1radio@comcast.net	//WL2K Test sending attachment
10/25/18 19:28	WA1QBY	K1EHZ	//WL2K test
10/27/18 17:12	K1EHZ	jtafl@comcas.net	//WL2K Test ICS213 Attachment
10/27/18 17:16	K1EHZ	jtafl@comcast.net	//WL2K Attachment Test ICS213
10/29/18 11:08	W1EAA	K1EHZ	//WL2K pactor
10/29/18 13:04	K1EHZ	W1EAA fldoc@comcast.net	Re: //WL2K pactor
10/29/18 15:53	K1EHZ	N1MEO	//WL2K Welcome to Winlink!
10/31/18 14:53	K1EHZ	jtafl@comcast.net	//WL2K Test thru to HF
10/31/18 14:57	K1EHZ	jtafl@comcast.net	//WL2K Test message 2 thru HF gateway
10/31/18 15:24	K1EHZ	jtafl@comcast.net	//WL2K Test Message 3
11/02/18 13:52	N1MEO	K1EHZ	TEST
11/02/18 22:20	K1EHZ	N1MEO k1ehz@arrl.net	//WL2K Re: TEST
11/13/18 08:08	K1EHZ	NF1L	//WL2K Nashua Digipeater
11/14/18 08:34	NF1L	K1EHZ	Re: //WL2K Digipeater Order
11/14/18 09:46	K1EHZ	NF1L	Re: //WL2K Digipeater Order
11/14/18 10:19	K1EHZ	NF1L	//WL2K Gateway Test
11/14/18 10:58	K1EHZ	NF1L	//WL2K HF Forwarding

ICS-309 report generated by Winlink Express 1.5.30.0

Easily Print ICS-309 Log

COMMUNICATIONS LOG	TASK # Combined Entry Log	DATE PREPARED: 06/24/20 TIME PREPARED: 11:50
OPERATIONAL PERIOD # 11/14/2018 to 9/16/2019	TASK NAME: Winlink Training	
RADIO OPERATOR NAME: jlt		STATION I.D. K1EHZ

LOG

TIME	FROM	TO	SUBJECT
10/01/18 13:49	KA1IJN	K1EHZ	//WL2K ELH
10/01/18 18:23	W1EAA	K1EHZ	//WL2K winlink
10/03/18 17:13	K1EHZ	KA1IJN W1EAA K1EHZ	//WL2K Digipeater Test Message
10/03/18 17:17	K1EHZ	KA1IJN W1EAA K1EHZ	//WL2K Digipeater Test Message #2
10/03/18 17:33	KA1IJN	K1EHZ	//WL2K Test
10/03/18 17:40	K1EHZ	KA1IJN	Re: //WL2K Test
10/04/18 10:23	W1EAA	K1EHZ	//WL2K digipeater
10/10/18 08:48	WQ2H	K1EHZ	//WL2K Test for Pactor
10/10/18 10:28	K1EHZ	WQ2H	ACK: //WL2K Test for Pactor
10/18/18 19:07	K1EHZ	KA1IJN jltaft@comcast.net	//WL2K Winlink by HT
10/18/18 20:43	KA1IJN	K1EHZ	//WL2K Update
10/20/18 09:11	jltaft@comcast.net	K1EHZ	Test message 1

Potential Training Opportunities

- Assistance setting up Winlink
  - Help Individuals by Phone – K1EHZ
  - Small Group Workshops by Zoom – K1EHZ
- Wednesday Winlink Net Check-in
  - Email NF1L@winlink.org by HF, VHF, or UHF
  - Email K1EHZ@winlink.org by Winlink Express Telnet
- Quarterly Winlink Email Test – AI1R
- Radio Messaging Drills via Local Post Office
- Radio Messaging with other ARES Groups
- SET – NBEMS ⟸⟹ Winlink messages
- You will come up with more training ideas

Winlink System Summary

- ✓ Local, regional & global coverage
- ✓ System is mature & software is well-supported
- ✓ Complements NBEMS & uses same hardware
- ✓ Access mail by VHF, HF, Telnet, Browser
- ✓ Expand coverage with digipeaters or repeaters
- ✓ Radio-only mail boxes when internet is out
- ✓ Automatic forwarding by HF radio
- ✓ Peer-to-Peer = Point-to-Point messaging
- ✓ Built-in message forms, reports, bulletins
- ✓ Modes for various band conditions
- ✓ Easily generates ICS-309 Message Logs

Watch Winlink Tutorials
by K4REF on YouTube
https://www.youtube.com/user/K4REF/videos

Contact Jay Taft at
k1ehz@arrl.net
for training / assistance

K6OLI Winlink Workshops
https://vimeo.com/user107547861

Hillsborough County Digital webpage
http://k1hil.org/

WINLINK

Global Radio Email ®