Pinellas ACS Training

Introduction to Winlink

Part 2

3/2/2022

Mike Drake

WA1RYQ

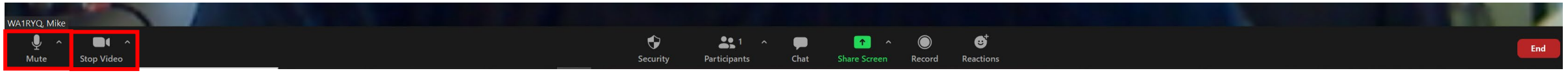
Zoom Settings

Mute – on/off

Video – on/off

Name – Call sign and First name

Right click on your current name



Meeting is being recorded

Agenda

- Winlink Operating Modes
- Winlink Connection Modes
- Virtual TNC installation and Configuration

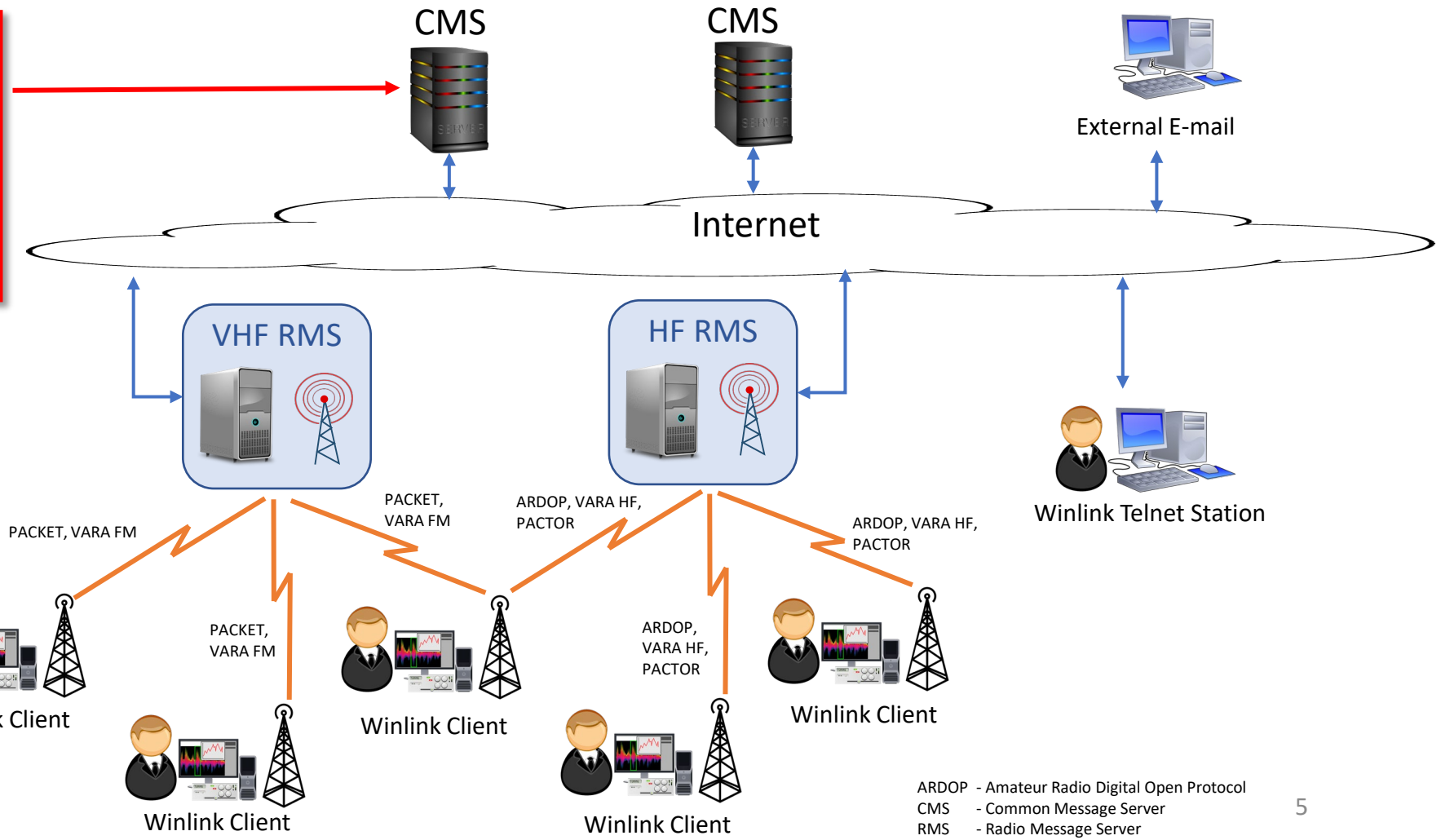
Introduction to Winlink
Operating Modes

- Conventional Mode
- Peer-to-Peer (P2P) Mode
- Hybrid Mode

Winlink Operating Modes
Conventional

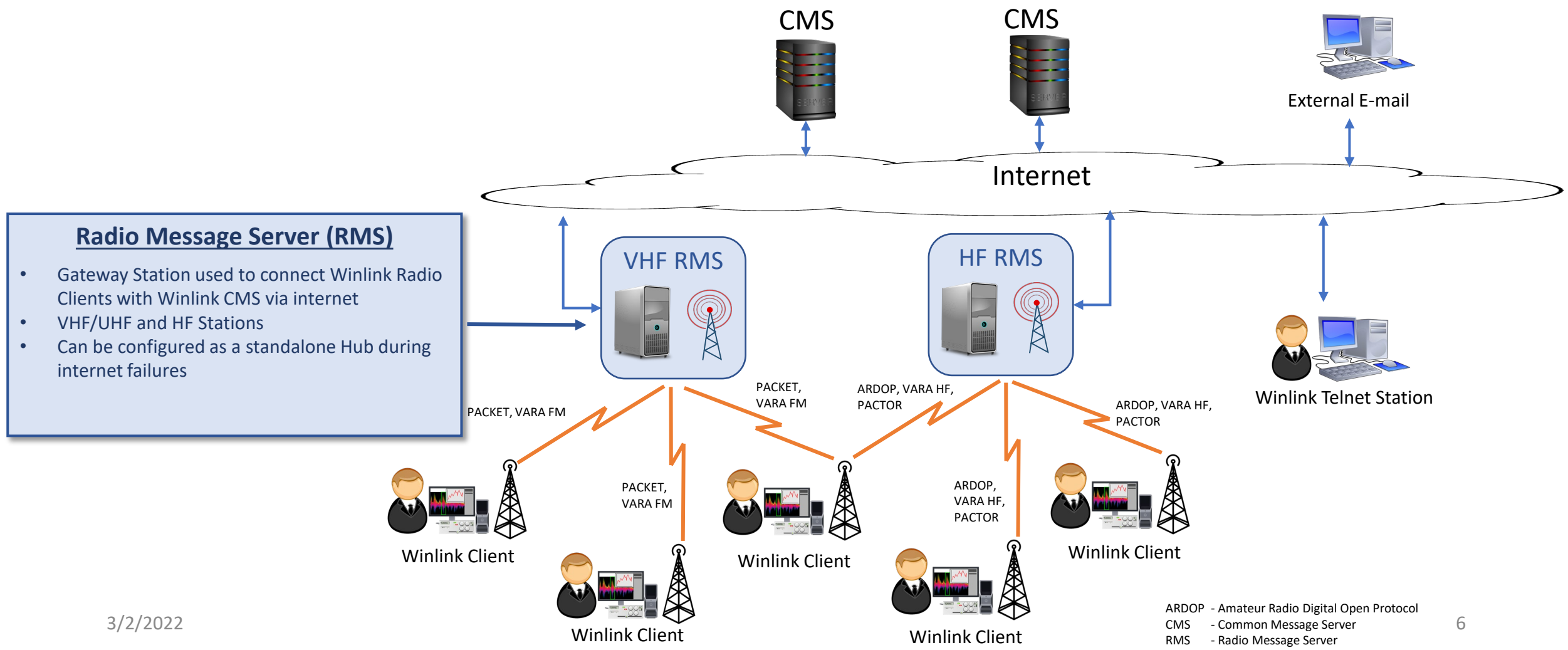
Common Message Server (CMS)

- Winlink Email Server
- Redundant Locations
- Hosted by Amazon Web Services (AWS)
- Realtime Backups between servers
- Automatic switchover is primary Server fails



ARDOP - Amateur Radio Digital Open Protocol
CMS - Common Message Server
RMS - Radio Message Server

Winlink Operating Modes
Conventional

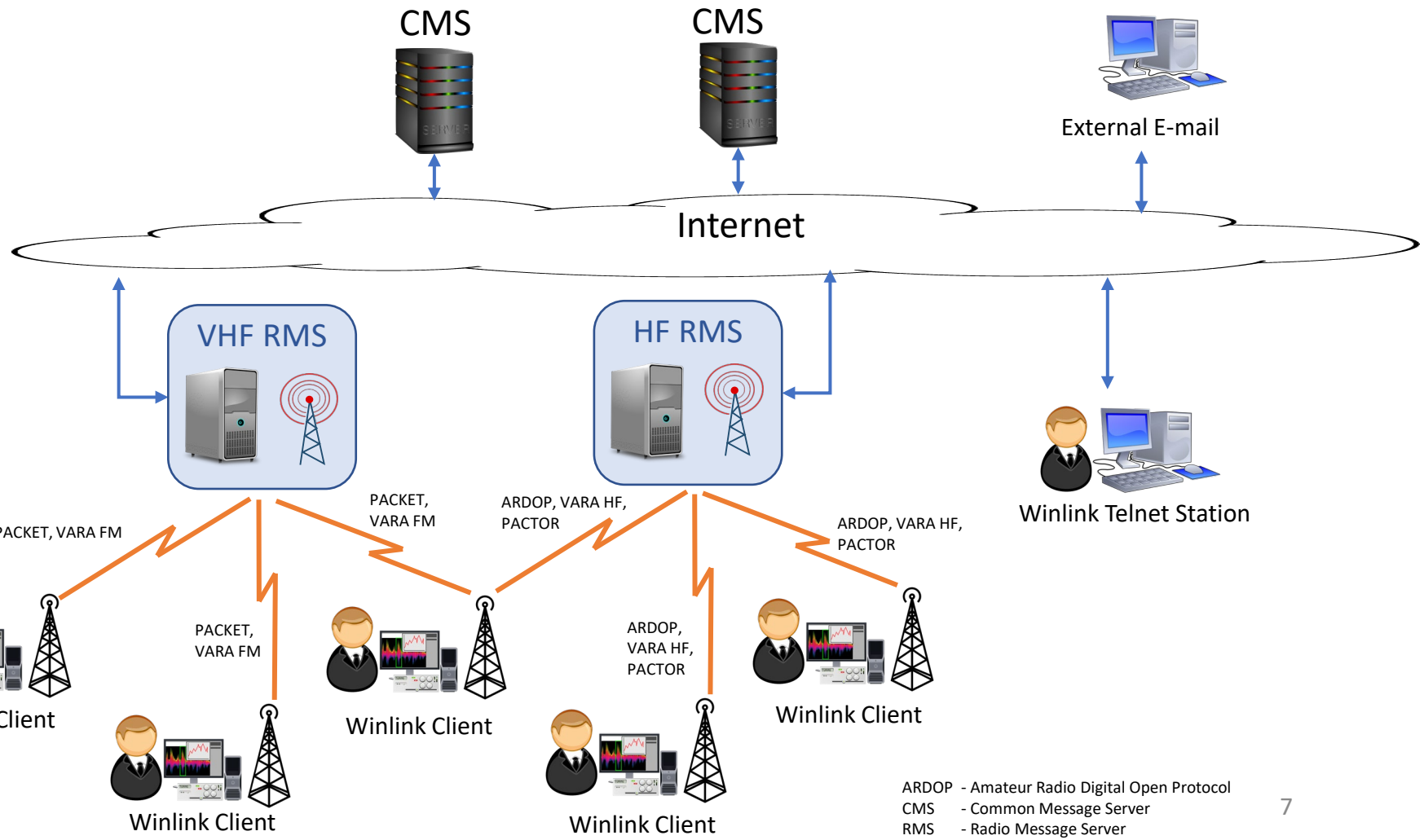


Radio Message Server (RMS)

- Gateway Station used to connect Winlink Radio Clients with Winlink CMS via internet
- VHF/UHF and HF Stations
- Can be configured as a standalone Hub during internet failures

ARDOP - Amateur Radio Digital Open Protocol
CMS - Common Message Server
RMS - Radio Message Server

Winlink Operating Modes
Conventional

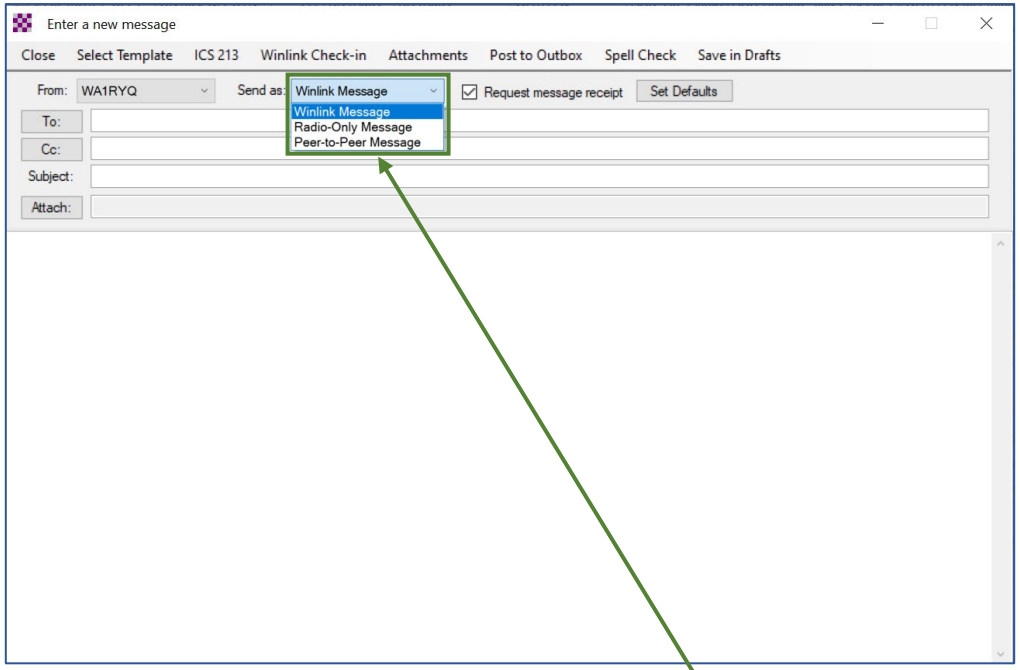


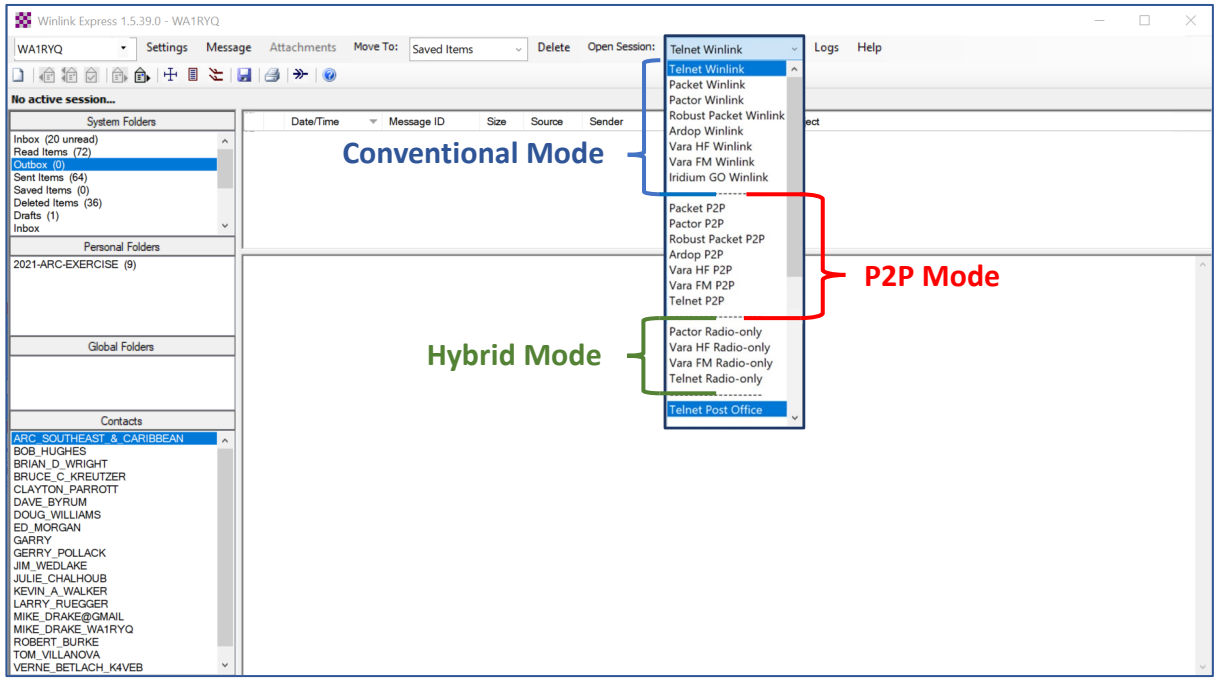
Winlink Client

- Individual Winlink User
- Winlink Express Computer Program
- Telnet
- VHF/UHF – Packet, VARA FM
- HF – ARDOP, VARA HF, Pactor

ARDOP - Amateur Radio Digital Open Protocol
CMS - Common Message Server
RMS - Radio Message Server

Winlink Operating Modes
Conventional – Message Creation





Message Mode Selection

- Defines Mode that will be used to send message
- Defaults to Conventional Mode (Winlink Message)
- Message will only be sent during corresponding Session Type

Message Type and Session Type Must Match

Winlink Operating Modes
Peer-to-Peer (P2P)

- Direct radio connection between two HF or VHF/UHF client stations
- The Internet is not used
- Only the two client stations are involved.

Advantages

- Can operate independent of Internet and RMS
- Mixed mode nets possible on VHF/UHF (voice and digital)

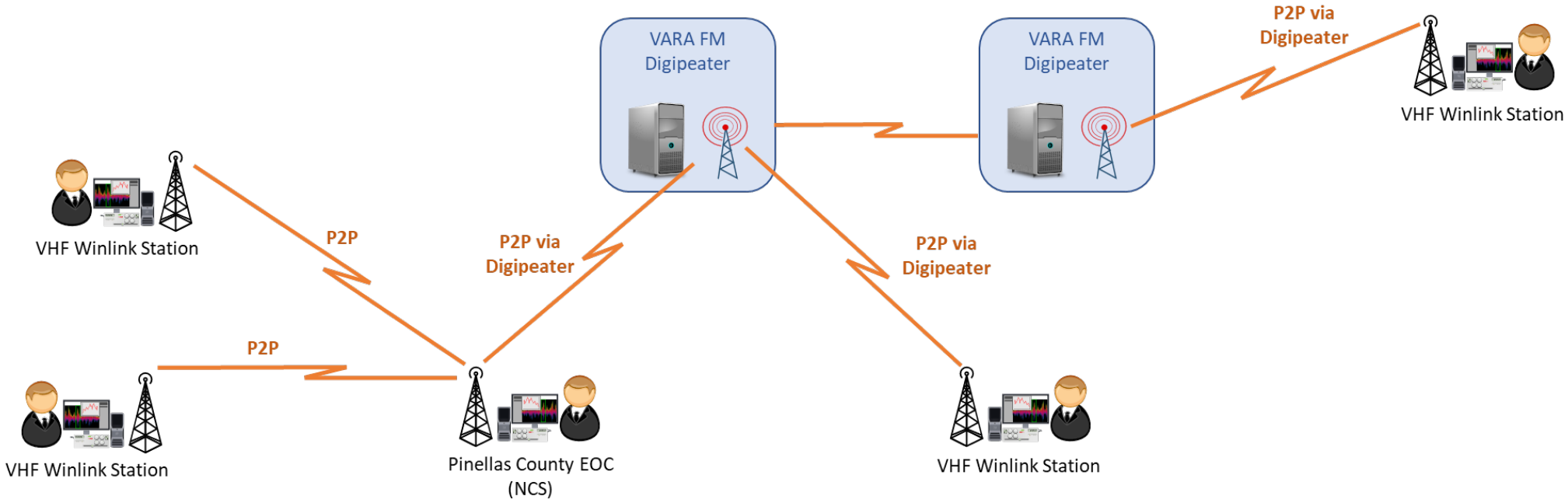
Disadvantages

- Connections are limited by RF propagation
- Both stations must be on the air at the same time
- Stations must use some other form of communication to coordinate connections or have a pre-established plan for frequency and time.

Winlink Operating Modes
Peer-to-Peer (P2P)

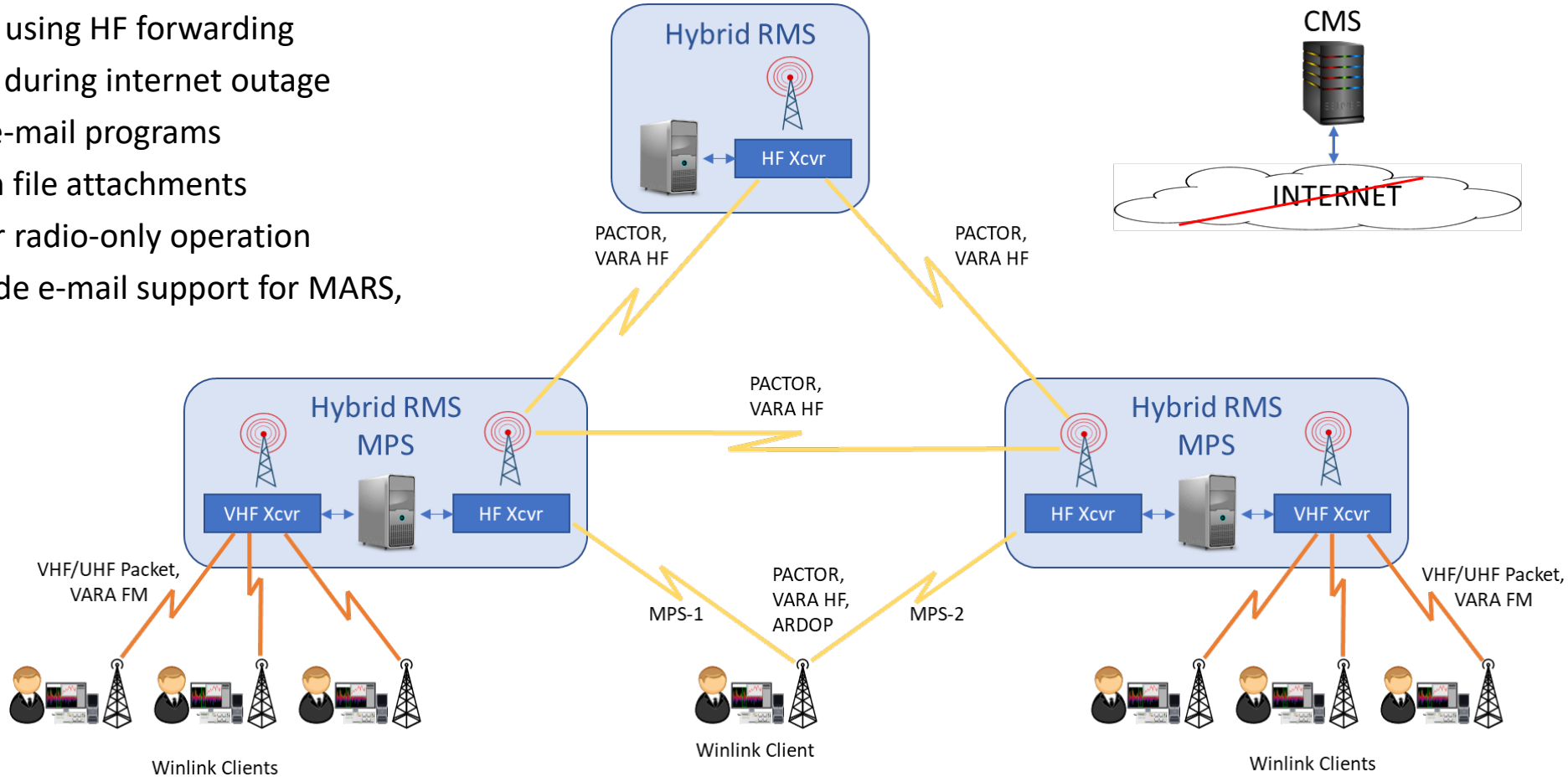
Digipeaters

- Extend the range of Conventional or P2P VHF/UHF Exchanges
- Winlink Supports exchanges through one or two digipeaters
- VARA License required to use VARA Digipeater



Winlink Operating Modes
Hybrid

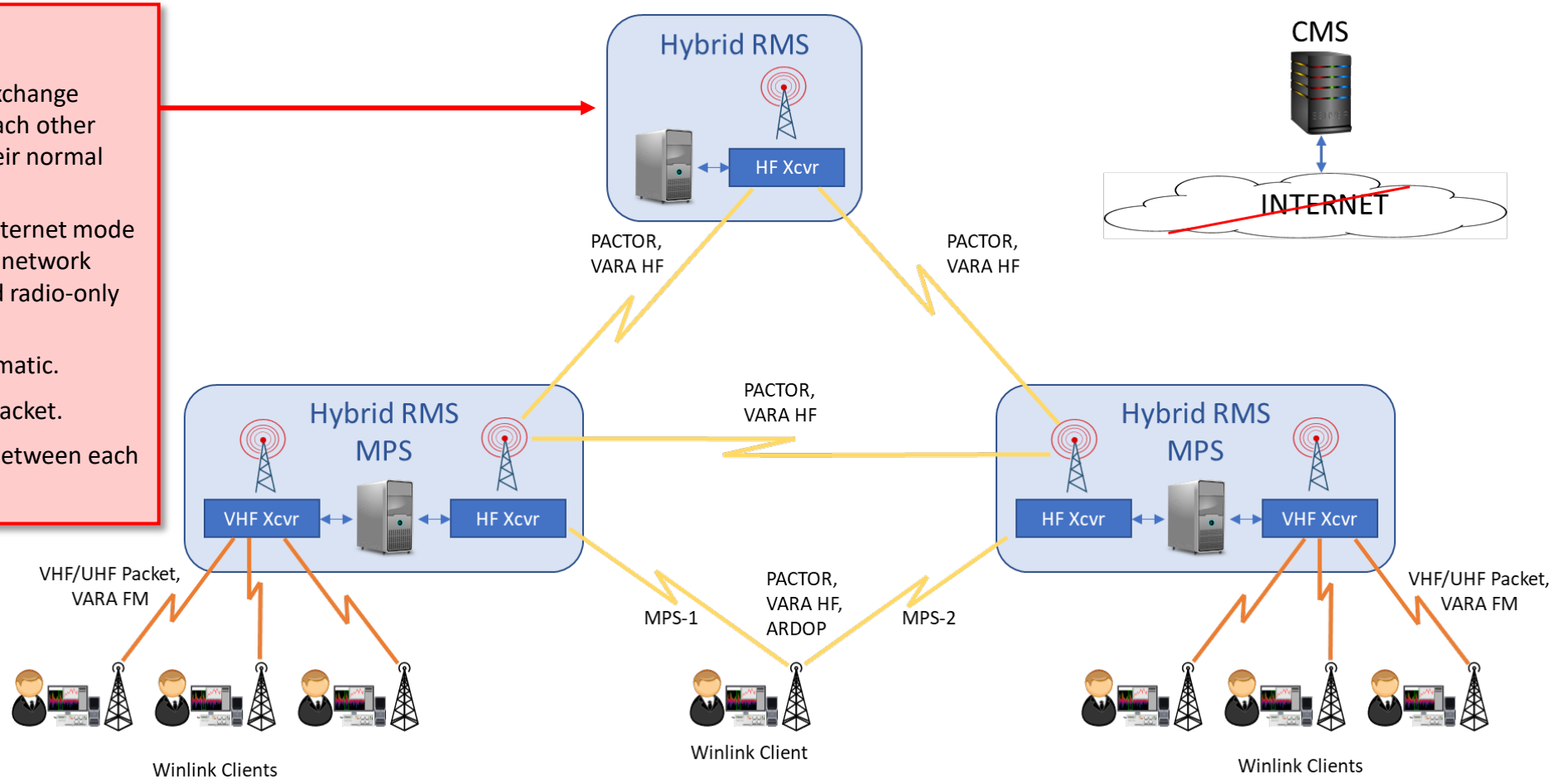
- Wide-area, RF MESH network using HF forwarding
- Radio-only Winlink Operation during internet outage
- Uses standard Winlink client e-mail programs
- Supports standard e-mail with file attachments
- Satisfies DoDI requirement for radio-only operation
- Currently providing nation-wide e-mail support for MARS, SHARES and civil agencies



Winlink Operating Modes
Hybrid

Hybrid RMS

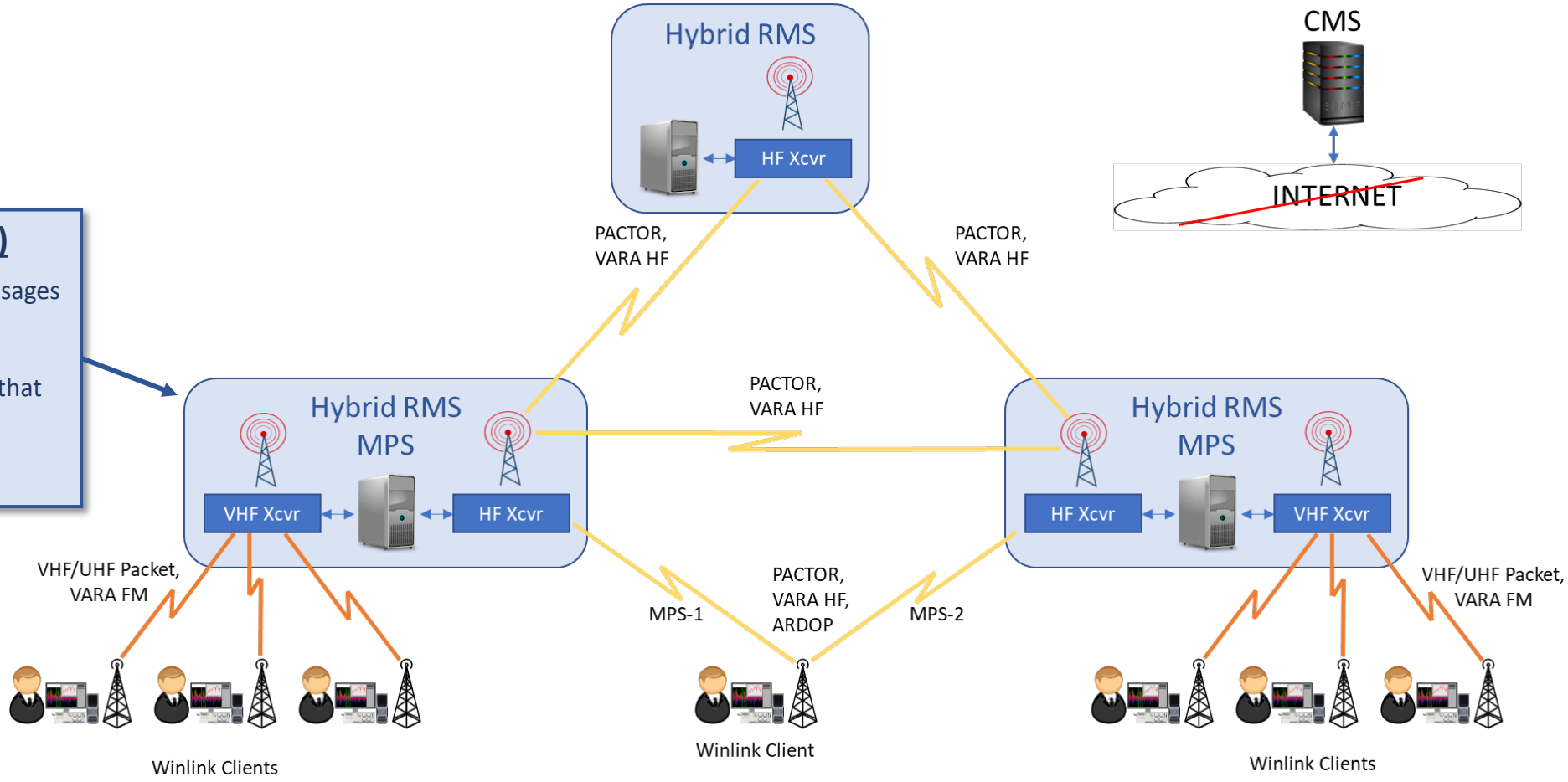
- RMS HF and RMS VHF/UHF stations that exchange messages (on behalf of others) between each other using "radio", in addition to performing their normal WL2K functions.
- Each Hybrid RMS runs in normal Winlink Internet mode and will switch automatically to radio-only network mode during an internet outage to forward radio-only messages.
- Message routing is dynamic and fully automatic.
- Users can connect using Pactor, VARA, or Packet.
- Pactor and VARA used for backbone links between each Hybrid RMS



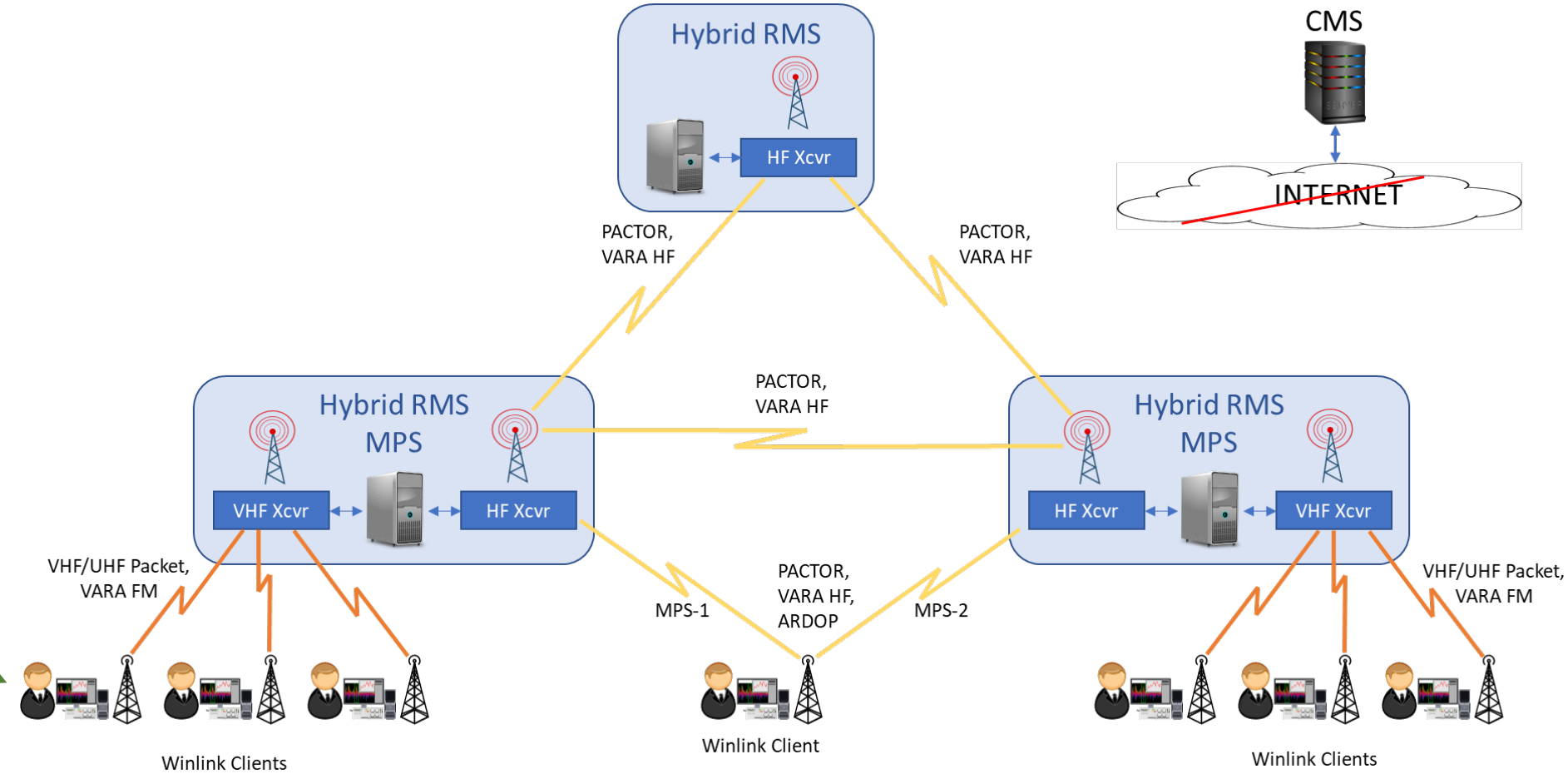
Winlink Operating Modes
Hybrid

Message Pickup Stations (MPS)

- Hybrid RMS used to by client to receive messages during an internet outage
- Each user can select up to 3 MPS to store incoming messages (Winlink Recommends that no more than 2 are selected)



Winlink Operating Modes
Hybrid

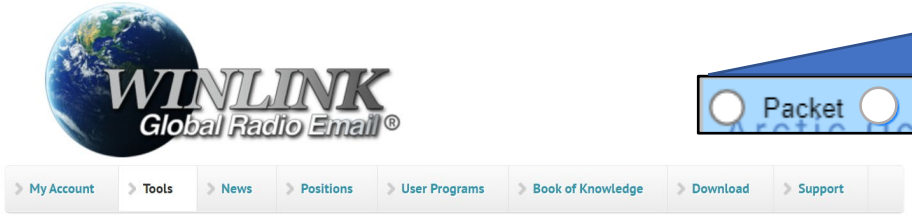


Winlink Client

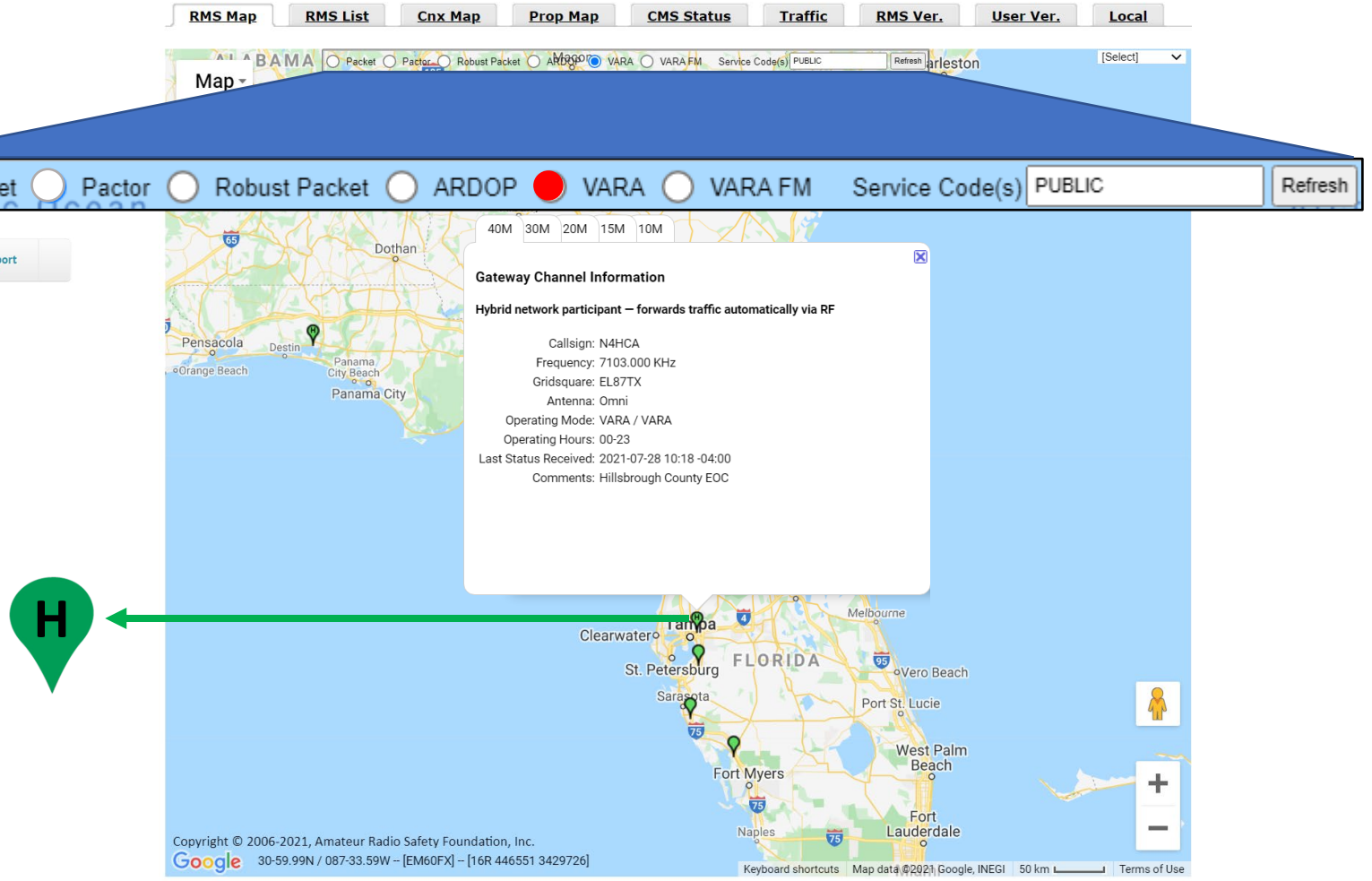
- Individual Winlink User
- Winlink Express Computer Program
- VHF/UHF – Packet, VARA FM
- HF – ARDOP, VARA HF, Pactor

Winlink Operating Modes
Hybrid Station Identification

Go to the Winlink Website



Select Tools

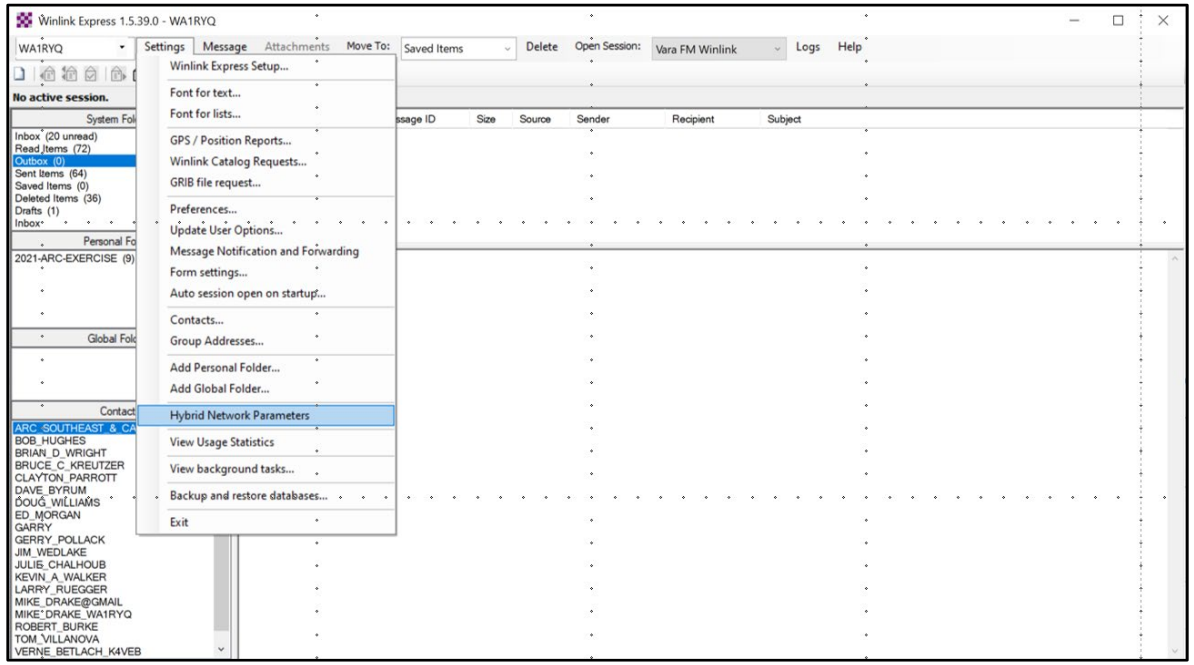


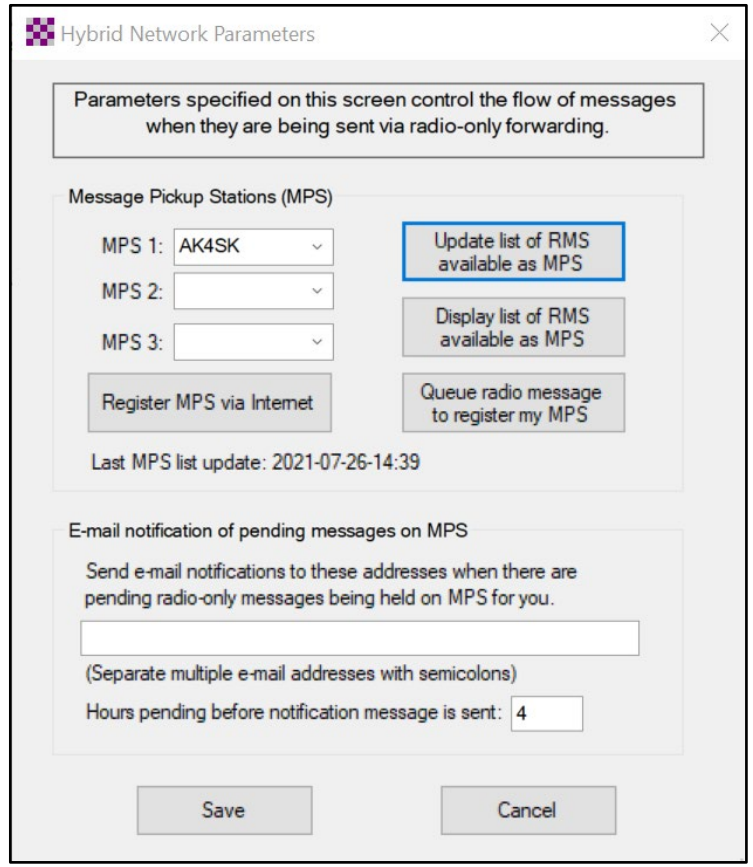
LEGEND:

'**H**' markers - Winlink Hybrid Network participants. They offer RF message forwarding if local internet links are not available.

Winlink Operating Modes
Hybrid Station Selection

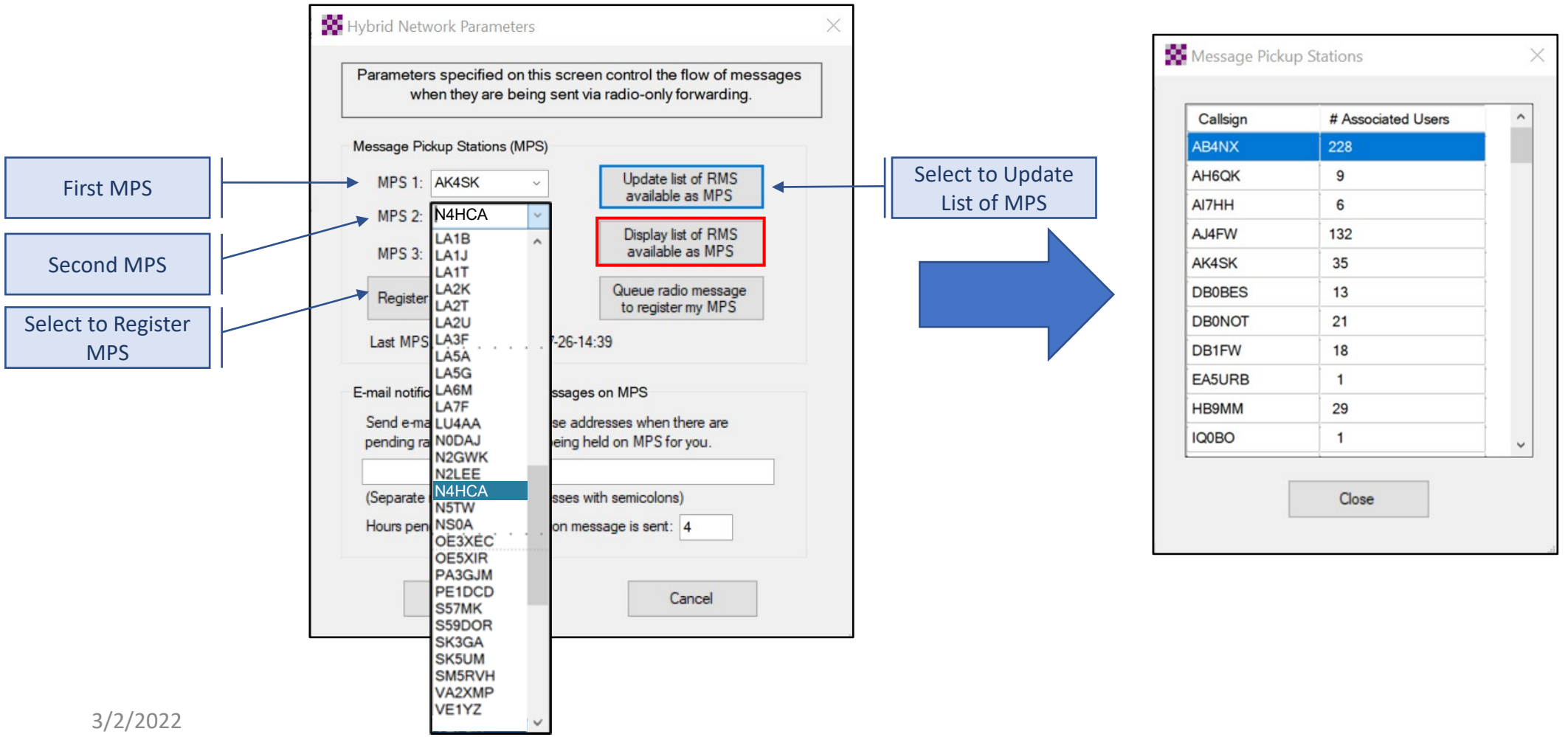
Winlink Express Main Menu





MPS selected by current user

Winlink Operating Modes
Hybrid Station Selection



Agenda

- Winlink Operating Modes
- Winlink Connection Modes
- Virtual TNC installation and Configuration

Winlink Connection Modes

- Data Exchange protocols
  - Packet AX.25
    - 1200 and 1900 baud
  - VARA
  - VARA FM
  - Amateur Radio Digital Open Protocol (ARDOP)
  - Pactor 1, 2, 3, 4
  - Telnet

Today's Presentation will be limited to Packet, VARA FM, and VARA

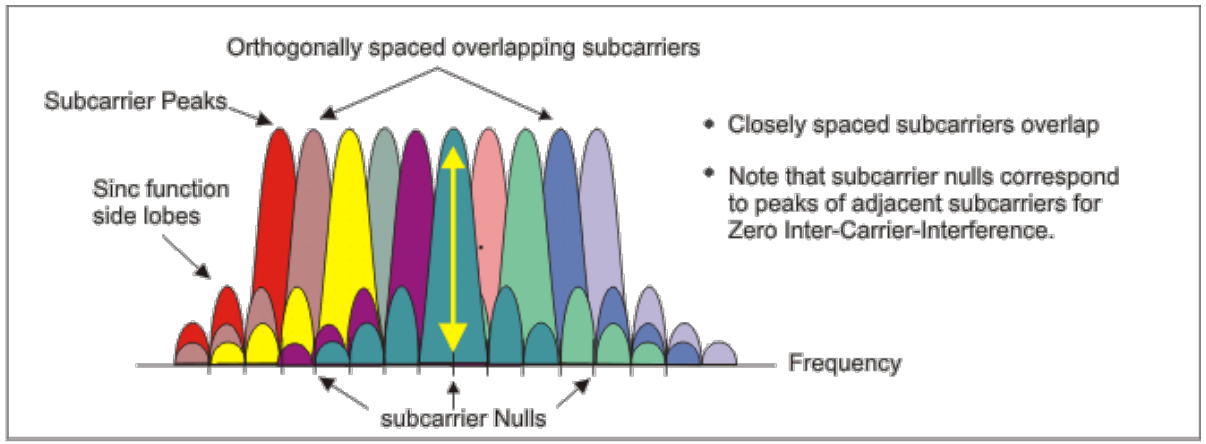
Winlink Connection Modes
Comparison

Following are approximate air times needed to transfer a 4K message (after compression) for several modes of operation, under ideal conditions:

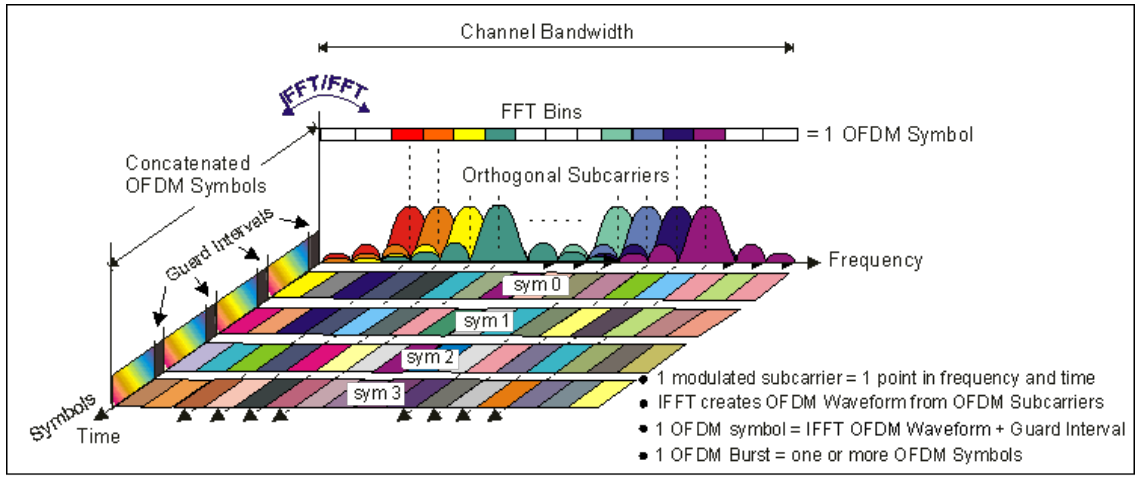
Pactor1	15 Minutes
Pactor 2	4 Minutes
Packet (1200) 1 Node	2.5 Minutes
Packet (1200) Direct	2 Minutes
Packet (9600) Direct	1 Minute
ARDOP	Faster than Pactor 2 Slower than Pactor 3
VARA	Faster than ARDOP, Slower than Pactor 3
Pactor 3	30 Seconds
VARA FM	20 Seconds
PACTOR 4	15 Seconds
Telnet	(Internet Access) Seconds

Winlink Connection Modes
VARA HF

- High Speed HF modem based on Orthogonal Frequency-Division modulation (OFDM)
- 94 bps Symbol Rate maximum
  - Part 97 requirement states that baud rate must be less than 300
- Forward Error Correction (FEC) with Turbo Codes
- Automatic Repeat Request (ARQ) protocol



OFDM Signal Frequency Spectra



Frequency-Time Representative of an OFDM signal

Winlink Connection Modes
VARA HF

- Three Modes of operation
  - Narrow
    - Designed for operation within a SSB Bandwidth of 500 Hz
    - Providing uncompressed User Data Rate to 1543 bps
    - Fast adaptive 13 speed levels
  - Standard
    - Designed for operation within a SSB Bandwidth of 2300 Hz
    - Providing uncompressed User Data Rate to 7050 bps
    - Fast adaptive 16 speed levels
  - Tactical
    - Designed for operation within a SSB Bandwidth of 2750 Hz
    - Providing uncompressed User Data Rate to 8489 bps
    - Fast adaptive 17 speed levels

Data Rates shown are for licensed versions of VARA

Winlink Connection Modes
VARA HF Levels

DEMO Mode Limit

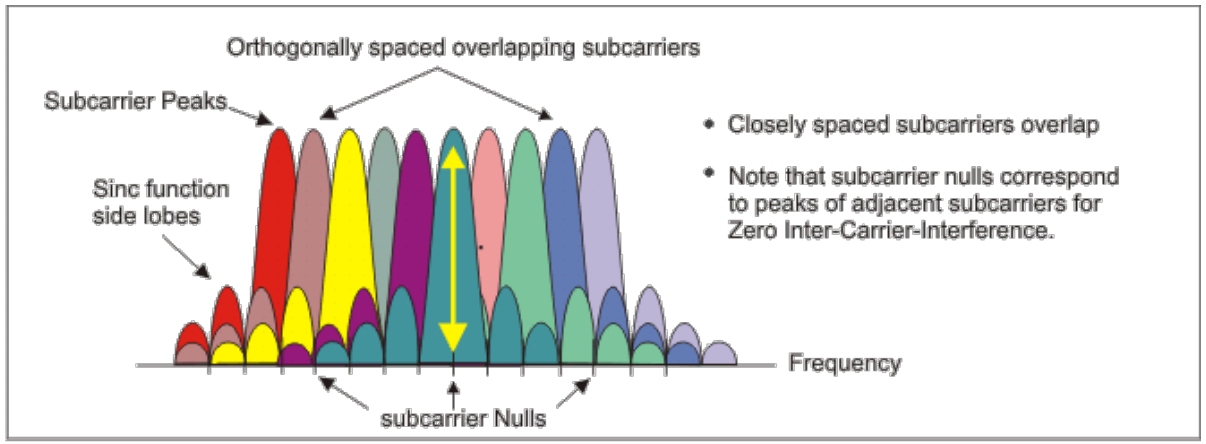
VARA HF v4.3.0

	VARA HF 2750 (Tactical)				VARA HF 2300 (Standard)				VARA HF 500 (Narrow)			
Level	Symbol Rate	Carriers	Mod.	Net Rate (bps)	Symbol Rate	Carriers	Mod.	Net Rate (bps)	Symbol Rate	Carriers	Mod.	Net Rate (bps)
1	23	40	FSK	18	23	32	FSK	18	23	11	FSK	18
2	47	20	FSK	41	47	16	FSK	41	47	11	FSK	41
3	47	20	FSK	82	47	16	FSK	82	47	11	FSK	61
4	94	20	FSK	175	94	16	FSK	175	94	2	BPSK	88
5	94	3	4PSK	270	94	3	4PSK	270	94	2	4PSK	177
6	94	4	4PSK	363	94	4	4PSK	363	94	3	4PSK	270
7	94	6	4PSK	549	94	6	4PSK	549	42	11	4PSK	441
8	94	8	4PSK	735	94	8	4PSK	735	42	11	4PSK	588
9	94	10	4PSK	922	94	10	4PSK	922	42	11	4PSK	705
10	94	13	4PSK	1203	42	49	4PSK	2011	42	11	8PSK	884
11	42	59	4PSK	2423	42	49	4PSK	2682	42	11	8PSK	1060
12	42	59	4PSK	3230	42	49	4PSK	3219	42	11	16QAM	1286
13	42	59	4PSK	3877	42	49	8PSK	4025	42	11	32QAM	1543
14	42	59	8PSK	4848	42	49	8PSK	4830				
15	42	59	8PSK	5817	42	49	16QAM	5872				
16	42	59	16QAM	7074	42	49	32QAM	7050				
17	42	59	32QAM	8489								

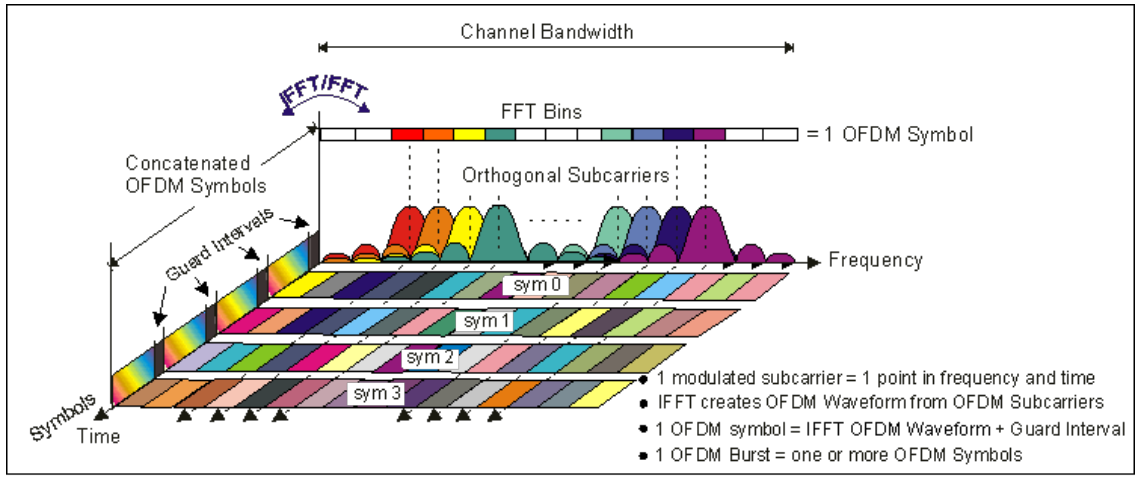
FSK - Frequency Shift Keying
PSK - Phase shift Keying
QAM - Quadrature Amplitude Modulation

Winlink Connection Modes
VARA FM

- High Speed FM modem based on Orthogonal Frequency-Division modulation (OFDM)
- 42 bps Symbol Rate maximum
  - Part 97 requirement states that baud rate must be less than 300
- Forward Error Correction (FEC) with Turbo Codes
- Automatic Repeat Request (ARQ) protocol



OFDM Signal Frequency Spectra



Frequency-Time Representative of an OFDM signal

Winlink Connection Modes
VARA FM

- Two Modes of operation
  - Narrow
    - Designed for operation with an FM Transceiver
    - Providing uncompressed User Data Rate to 12,750 bps
    - Fast adaptive 11 speed levels
  - Wide
    - Designed for operation with an FM Transceiver
    - Providing uncompressed User Data Rate to 25,210 bps
    - Fast adaptive 13 speed levels
    - Requires Vara License

Data Rates shown are for licensed versions of VARA

Winlink Connection Modes
VARA FM Levels

DEMO Mode Limit

	VARA FM WIDE				VARA FM NARROW			
Level	Symbol Rate	Carriers	Mod.	Net Rate (bps)	Symbol Rate	Carriers	Mod.	Net Rate (bps)
1	42	14	4PSK	566	42	14	4PSK	566
2	42	29	4PSK	1188	42	29	4PSK	1188
3	42	58	4PSK	2390	42	58	4PSK	2390
4	42	98	4PSK	4040	42	58	4PSK	3188
5	42	98	4PSK	5387	42	58	8QAM	4252
6	42	98	8QAM	7185	42	58	16QAM	5668
7	42	98	16QAM	9580	42	58	32QAM	7087
8	42	116	16QAM	11340	42	58	64QAM	8505
9	42	116	32QAM	14144	42	58	64QAM	9567
10	42	116	64QAM	16932	42	58	128QAM	11162
11	42	116	64QAM	19003	42	58	256QAM	12750
12	42	116	128QAM	22102				
13	42	116	256QAM	25210				

PSK - Phase shift Keying
QAM - Quadrature Amplitude Modulation

Agenda

- Winlink Operating Modes
- Winlink Connection Modes
- Virtual TNC installation and Configuration

Virtual TNC Installation
UZ7HO

http://uz7.ho.ua/packetradio.htm

This dll is needed for PTT and CAT control on some sound cards

UZ7HO Sound Modem

Applications for Soundmodem / AGW PE:

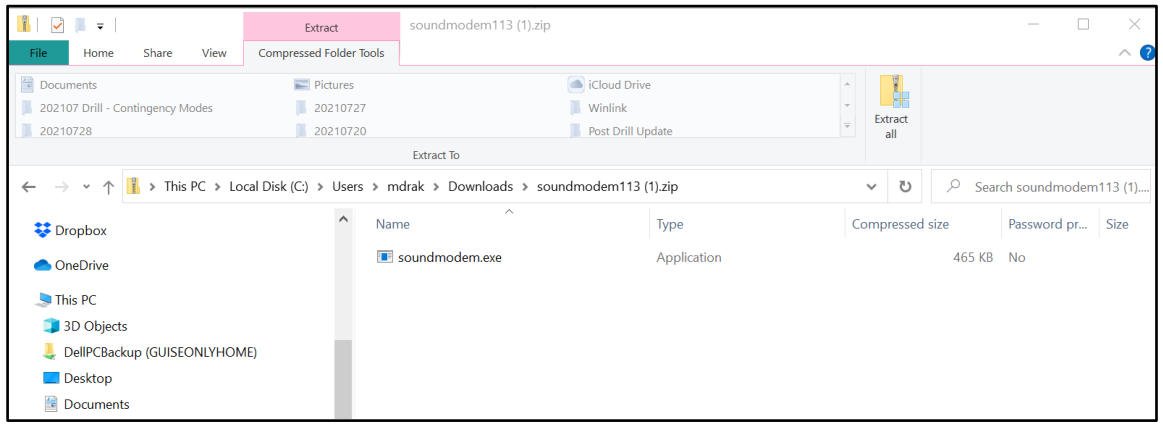
checkers6.zip	18-Aug-16 22:01	342.94K
chess10.zip	18-Aug-16 22:02	355.82K
easyterm49.zip	10-Feb-21 07:12	401.73K

Soundmodem versions, manuals and utility:

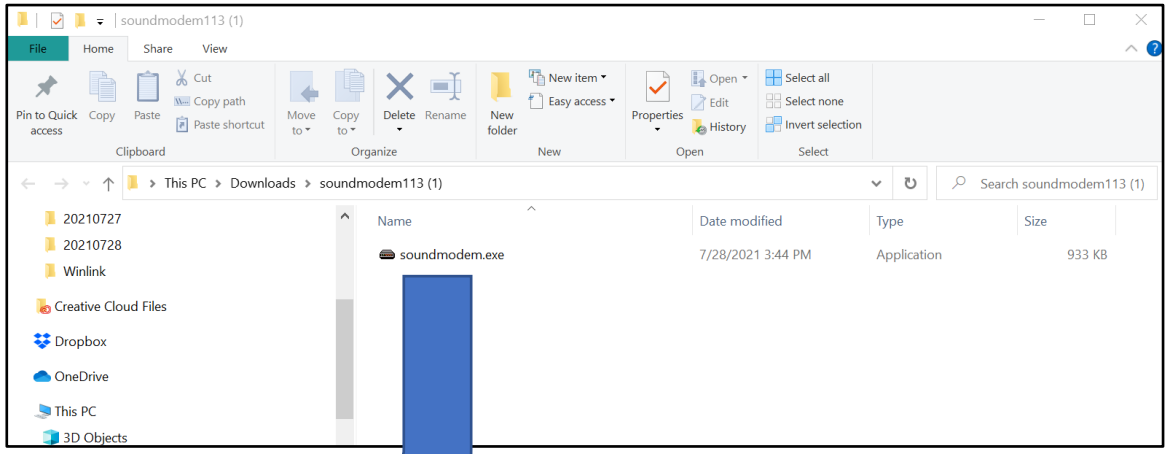
CHANGELOG.txt	10-Feb-21 07:15	9.88K
hs_soundmodem27.zip	11-Feb-21 09:15	454.19K
other-versions.zip	22-May-21 12:02	6.99M
ptt-dll.zip	30-Oct-19 22:39	247.22K
soundmodem113.zip	11-Feb-21 09:14	465.15K
user_guide_v045b_FR.pdf	11-Oct-13 19:13	333.12K
user_guide_v105_EN.pdf	03-Dec-19 18:01	504.65K
utils.zip	28-Feb-15 04:59	68.21K

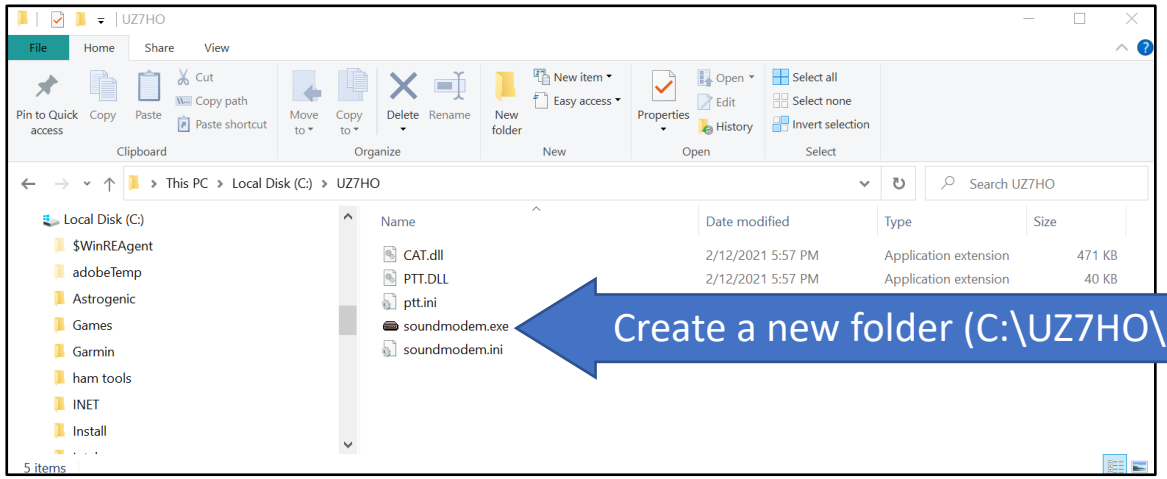
Virtual TNC Installation

UZ7HO



Unzip the Downloaded Files

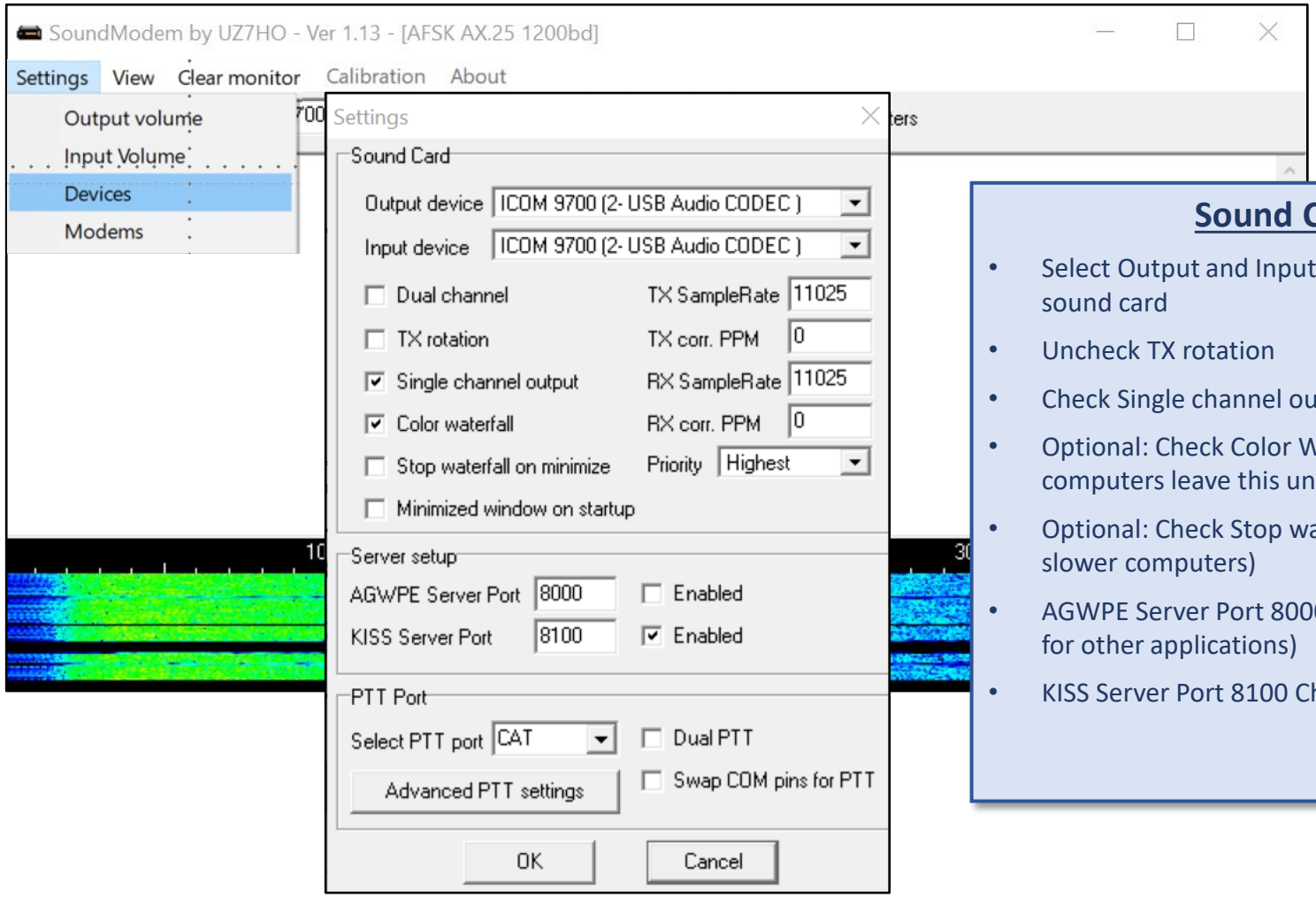




Create a new folder (C:\UZ7HO\) and then move the files

No installation required

Virtual TNC Configuration
UZ7HO



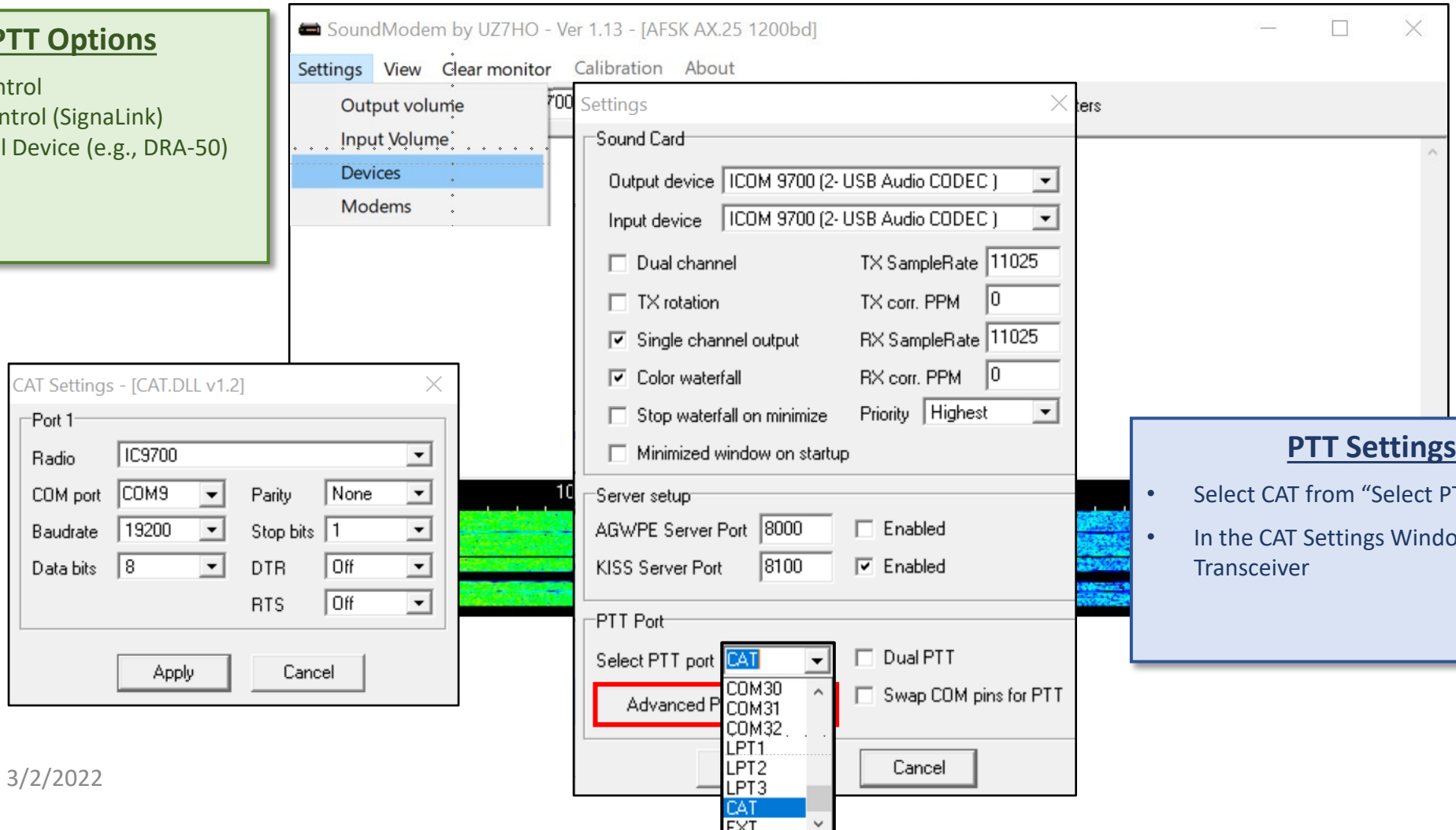
Sound Card Settings

- Select Output and Input device associated with system sound card
- Uncheck TX rotation
- Check Single channel output
- Optional: Check Color Waterfall (on older and slower computers leave this unchecked)
- Optional: Check Stop waterfall on minimize (also good for slower computers)
- AGWPE Server Port 8000 Uncheck Enabled (unless needed for other applications)
- KISS Server Port 8100 Check Enabled

Virtual TNC Configuration
UZ7HO PTT – CAT Control

PTT Options

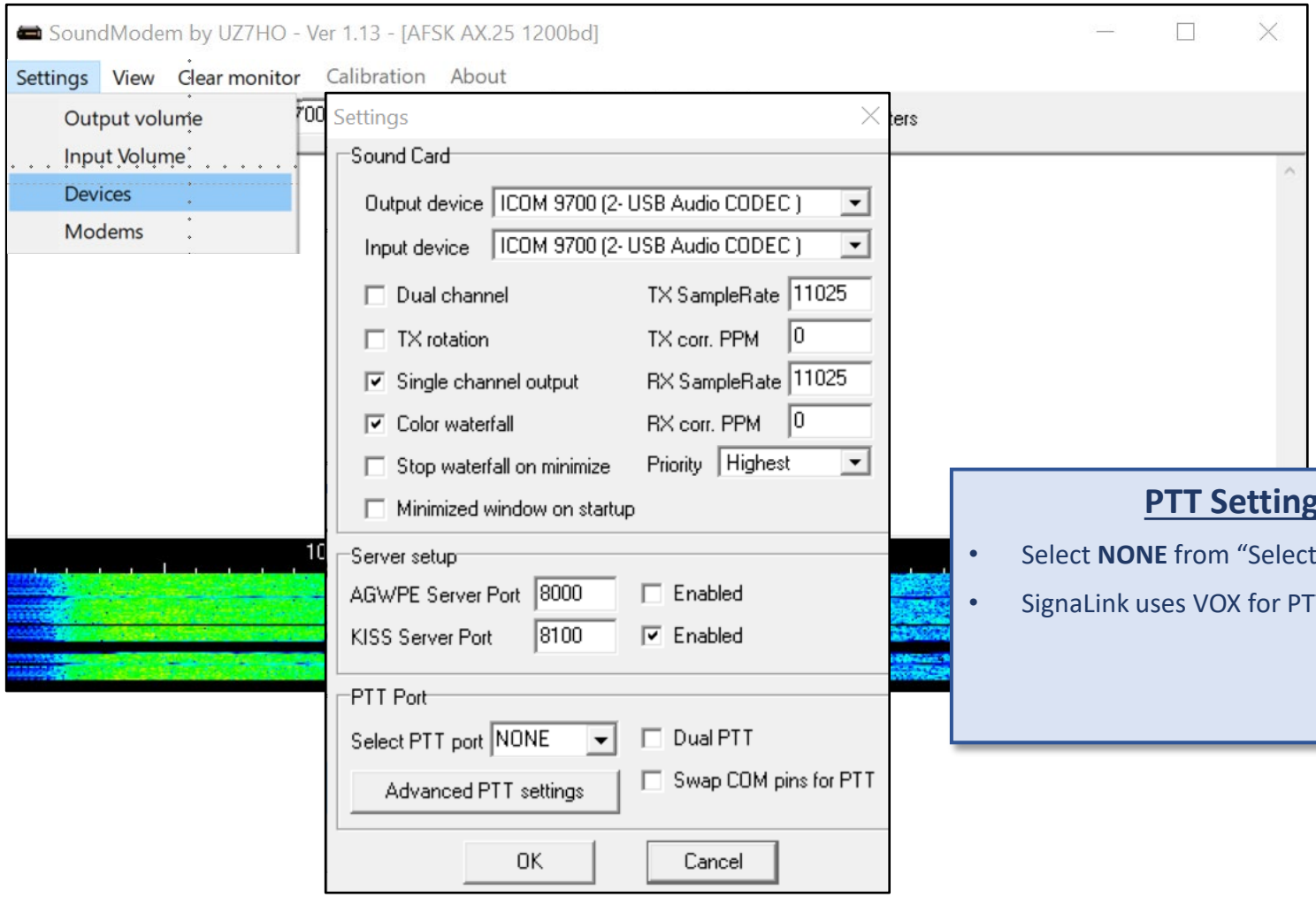
- CAT Control
- VOX Control (SignaLink)
- External Device (e.g., DRA-50)



PTT Settings – CAT Control

- Select CAT from “Select PTT Port” Pull down Menu
- In the CAT Settings Window, Configure settings for Transceiver

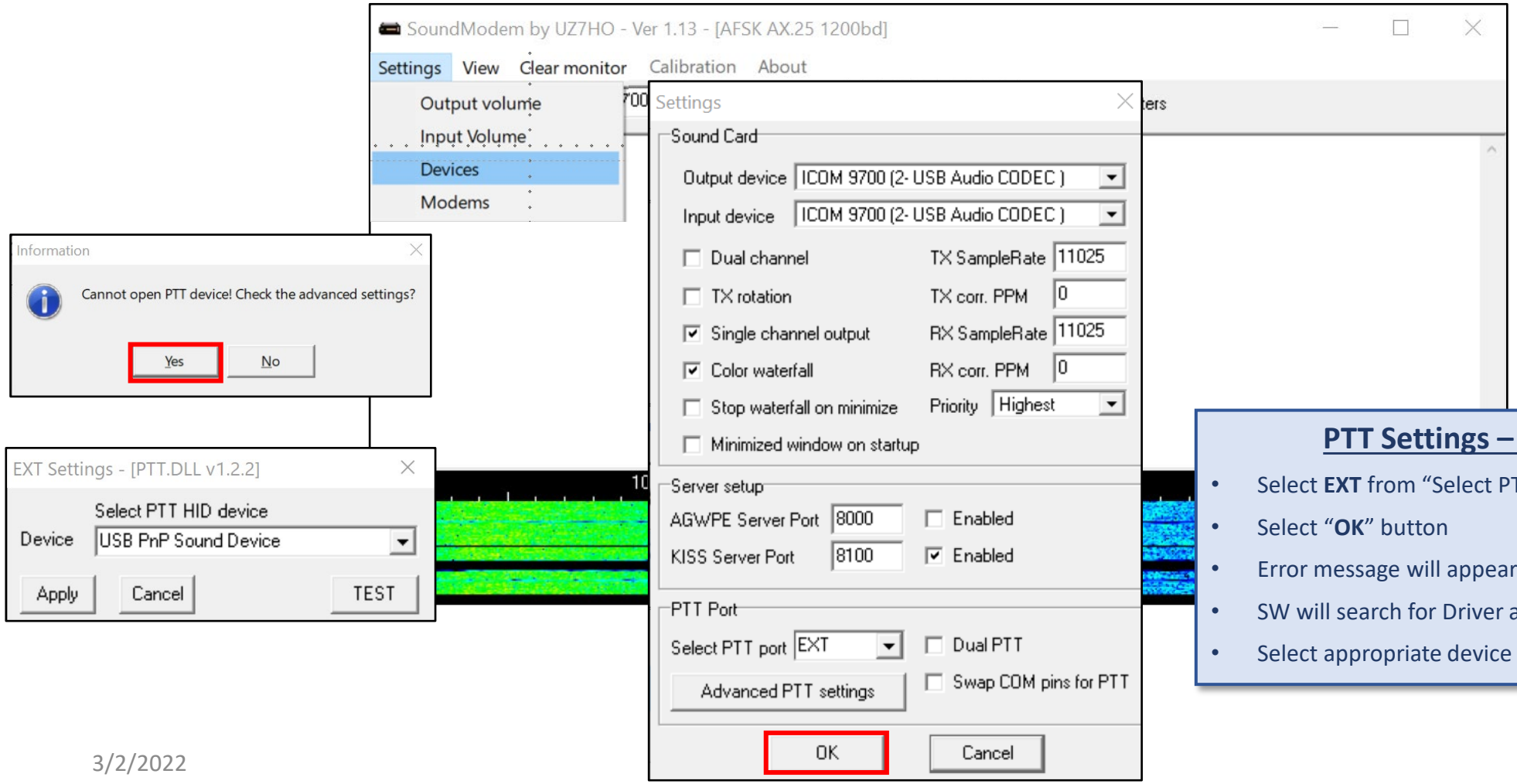
Virtual TNC Configuration
UZ7HO PTT – SignaLink



PTT Settings – SignaLink

- Select **NONE** from "Select PTT Port" Pull down Menu
- SignaLink uses VOX for PTT

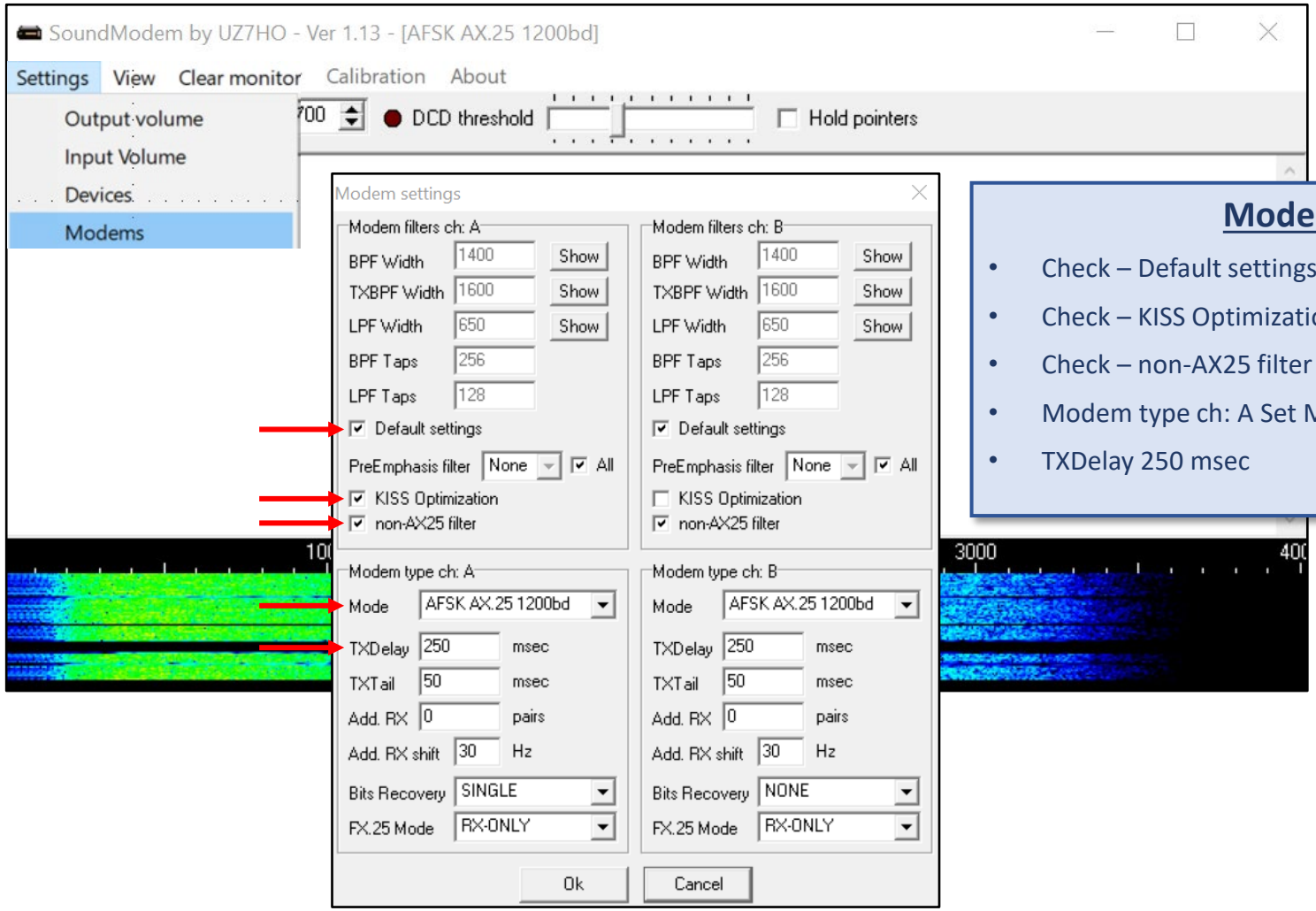
Virtual TNC Configuration
UZ7HO PTT – External Device



PTT Settings – External Device

- Select **EXT** from "Select PTT Port" Pull down Menu
- Select "**OK**" button
- Error message will appear – Select "**Yes**"
- SW will search for Driver and display options
- Select appropriate device

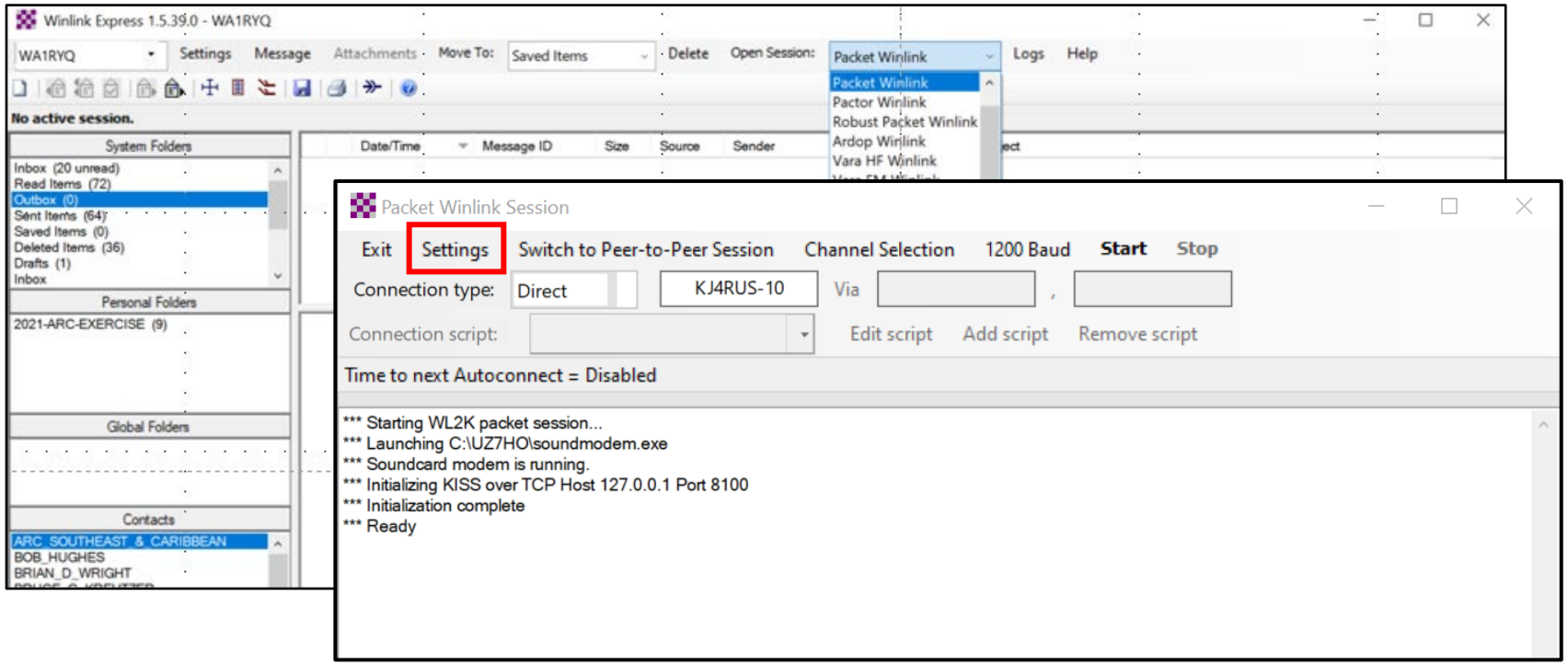
Virtual TNC Configuration
UZ7HO

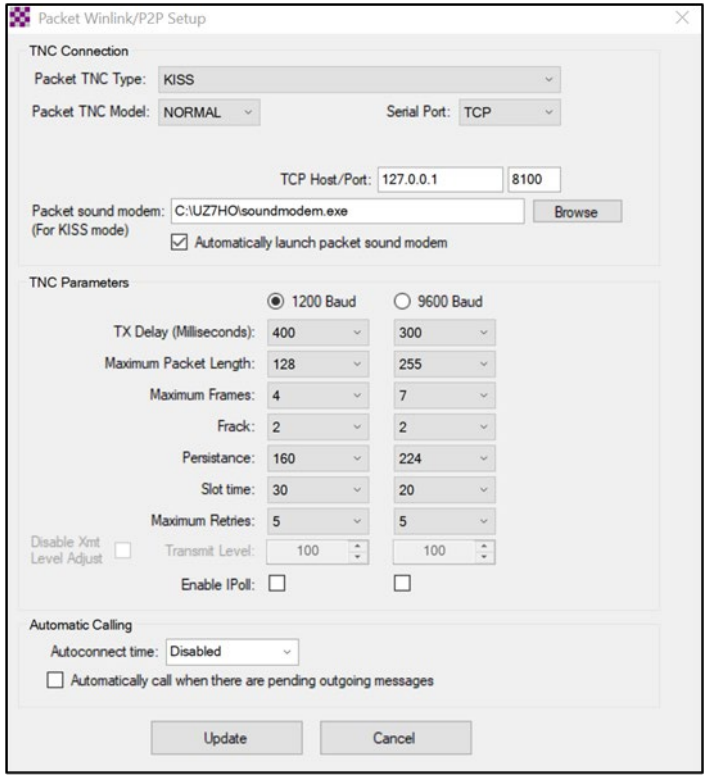


Modem Settings

- Check – Default settings
- Check – KISS Optimization
- Check – non-AX25 filter Under
- Modem type ch: A Set Mode to AFSK AX.25 1200bd
- TXDelay 250 msec

Virtual TNC Configuration
Winlink Packet TNC Settings



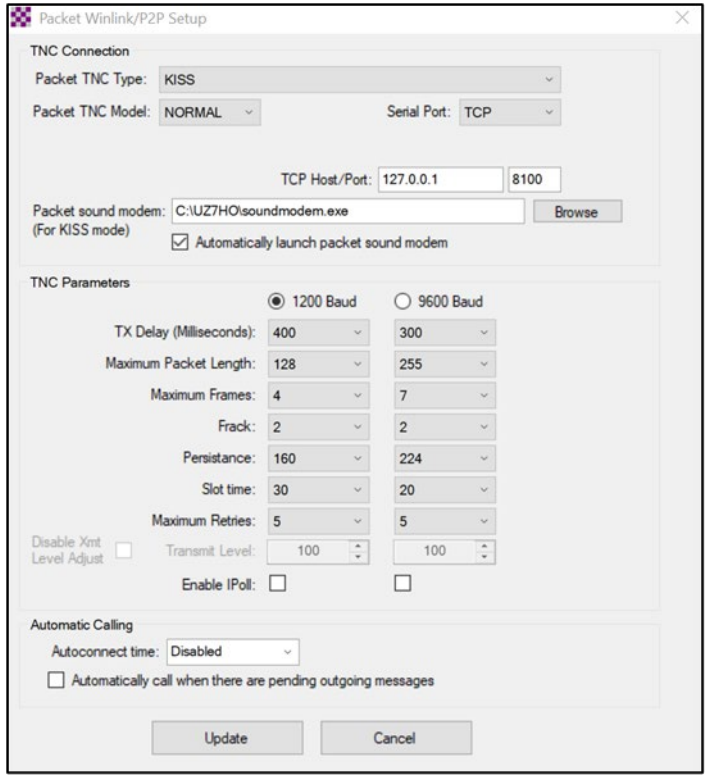


Winlink Packet TNC Setting

- Open Packet Winlink Session
- Select **Settings** from the Winlink Packet Window

Virtual TNC Configuration

Winlink Packet TNC Settings



Packet Winlink Setup

- Packet TNC Type: **KISS**
- Packet TNC Model: **NORMAL**
- Serial Port: **TCP**
- TCP Host/Port: **127.0.0.1**
- Select location of UZ7HO sound modem executable
- Check – "**Automatically launch Packet Sound Modem**"

Virtual TNC Configuration
UZ7HO – Additional Information

Users Guide

http://uz7.ho.ua/modem_beta/user_guide_v105_EN.pdf

Quick Installation Guide

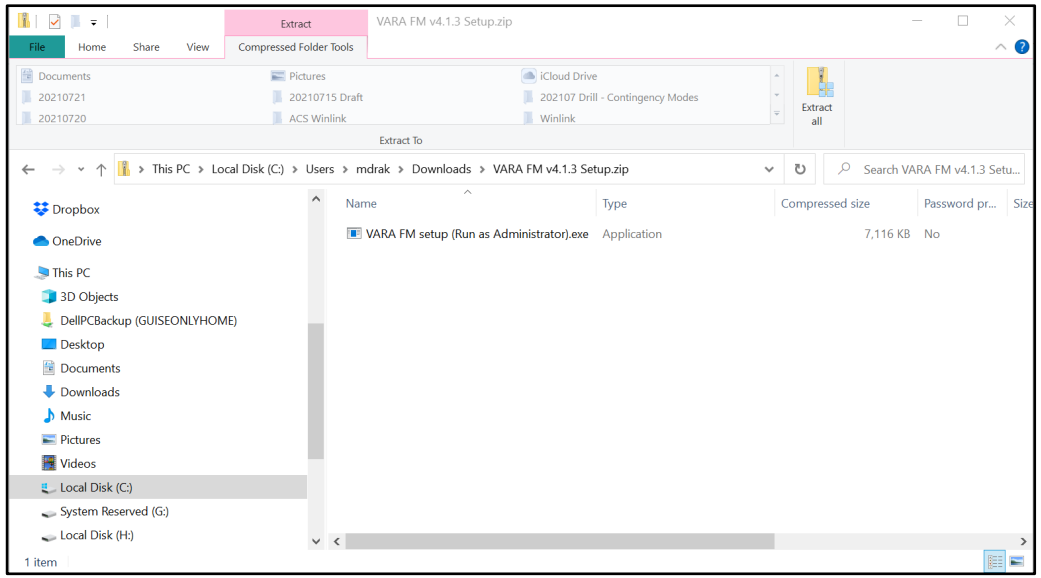
https://winlink.org/sites/default/files/RMSE_FORMS/quick_setup_guide_for_winlink_sound_card_packet_for_vhf-uhf_on_windows_v1.2.pdf

Virtual TNC Installation
VARA HF, FM, and Chat

https://rosmodem.wordpress.com/

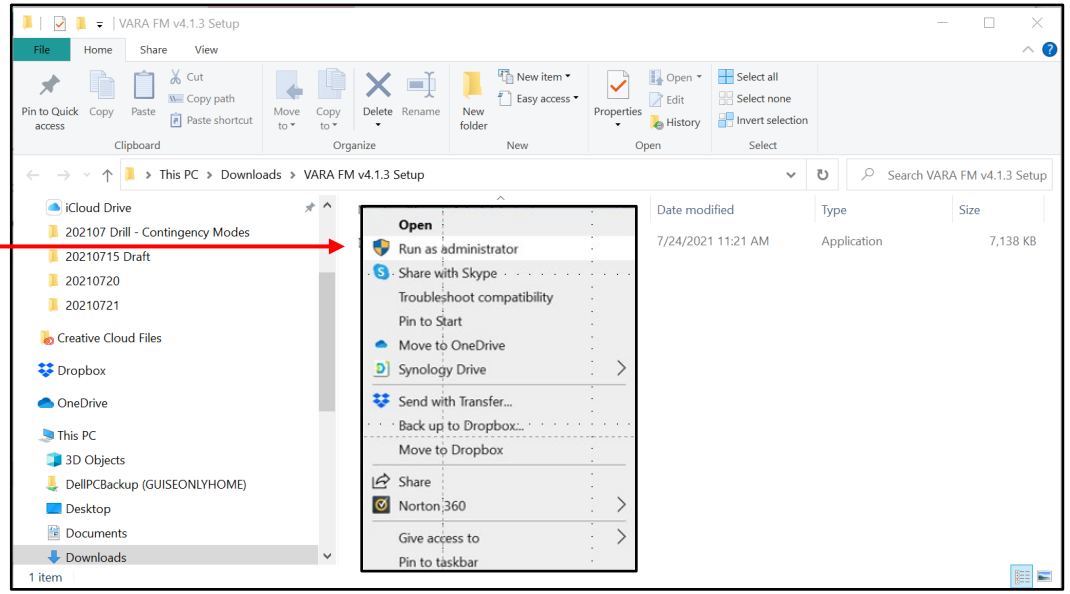
Virtual TNC Installation

VARA HF, FM, and Chat



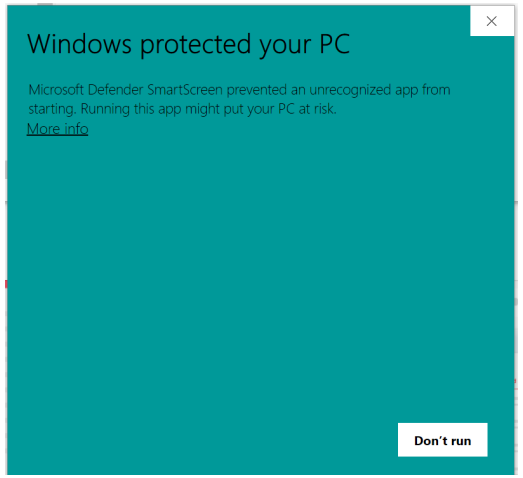
Unzip the Downloaded File

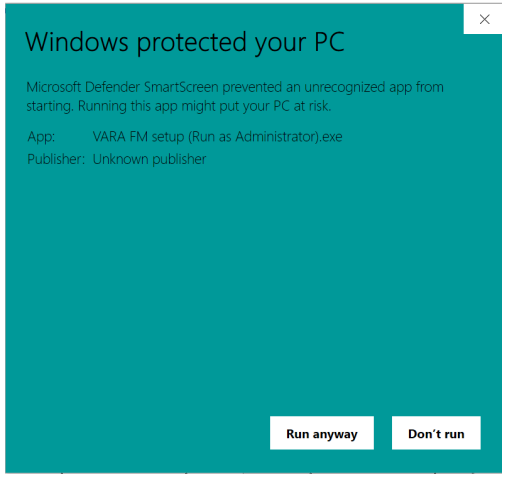
Run file as Administrator



Virtual TNC Installation
VARA HF, FM, and Chat

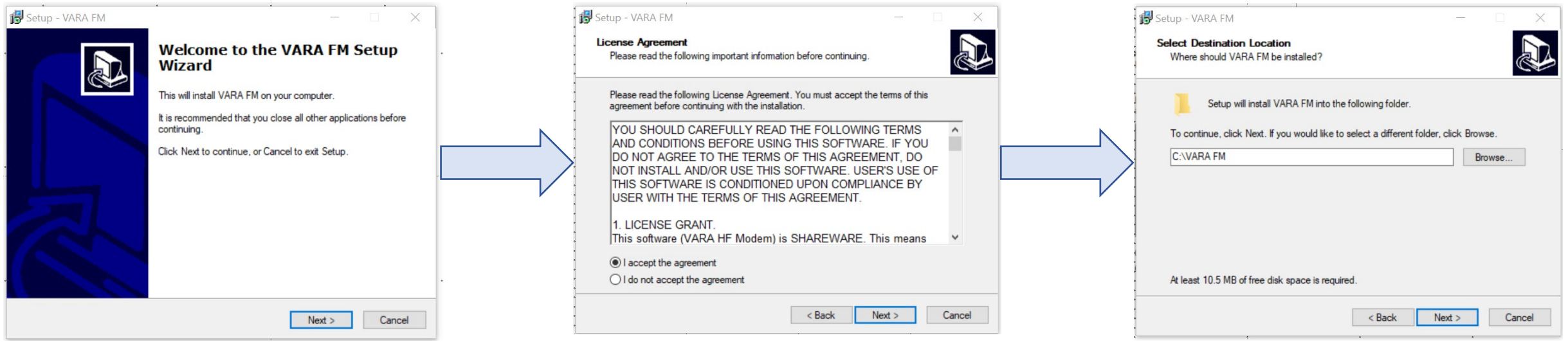
- Warning Pop-up may be displayed
  - Safe if file has been downloaded from rosmodem.wordpress





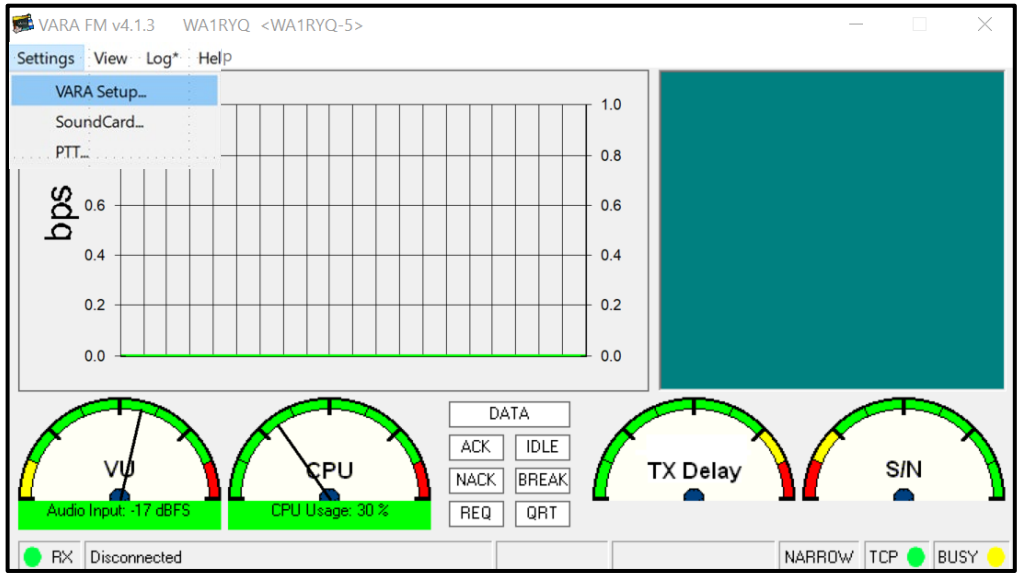
Virtual TNC Installation

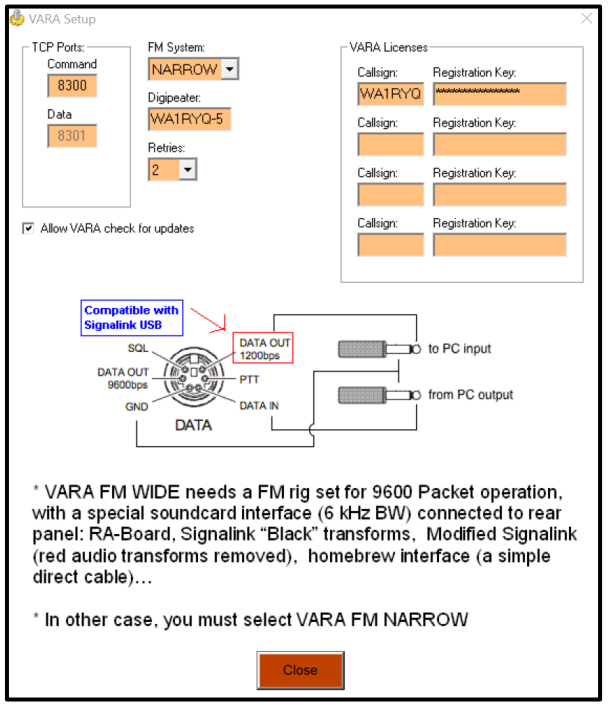
VARA HF, FM, and Chat



Follow instructions and install in default locations

Virtual TNC Configuration
VARA FM – VARA Setup

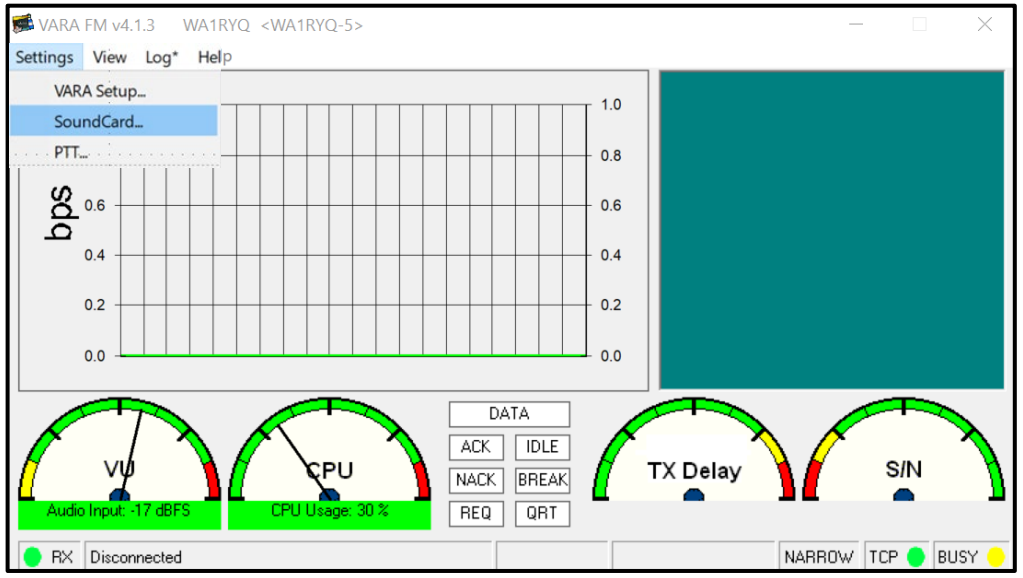


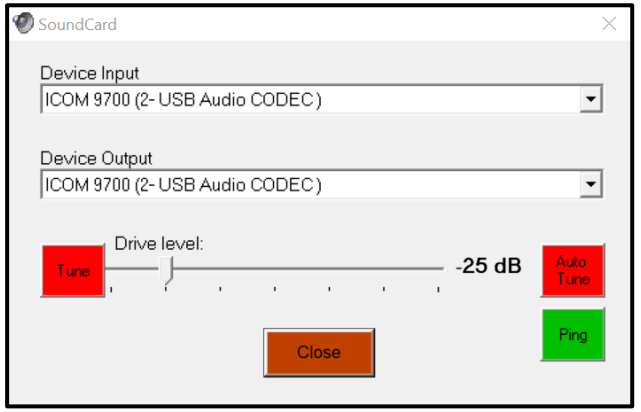


VARA Setup

- TCP Ports Command: **8300**
- TCP Ports Data: **8301**
- FM System: **NARROW**
- Digipeater: Optional
- VARA Licenses: Call Sign
- Registration Key: Optional

Virtual TNC Configuration
VARA FM – Sound Card Settings

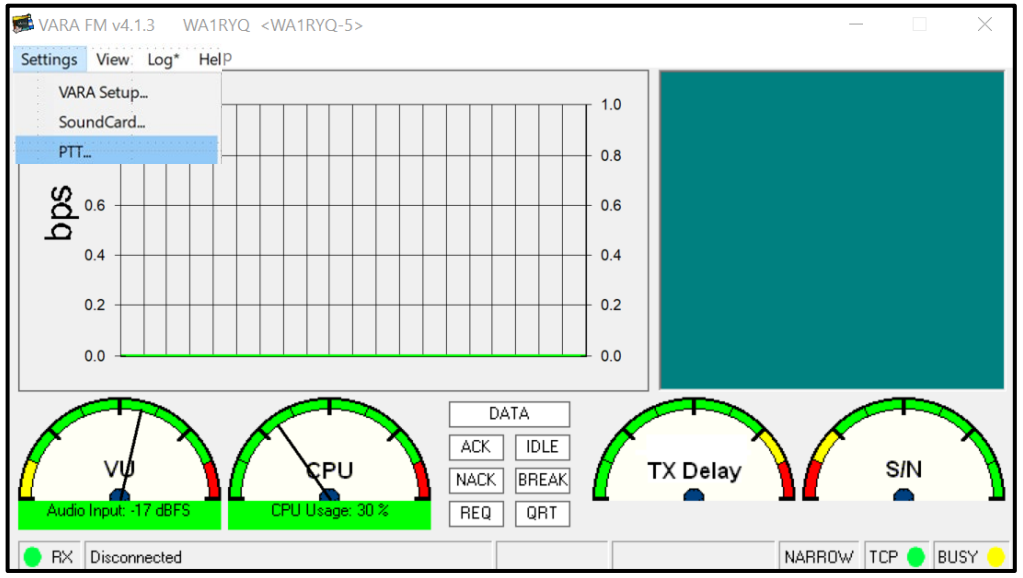


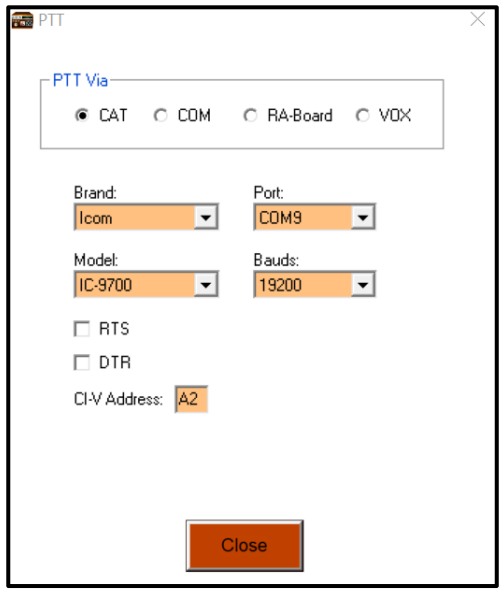


VARA Sound Card Settings

- Device Input: **Select appropriate CODEC**
- Device Output: **Select appropriate CODEC**

Virtual TNC Configuration
VARA FM – PTT Settings

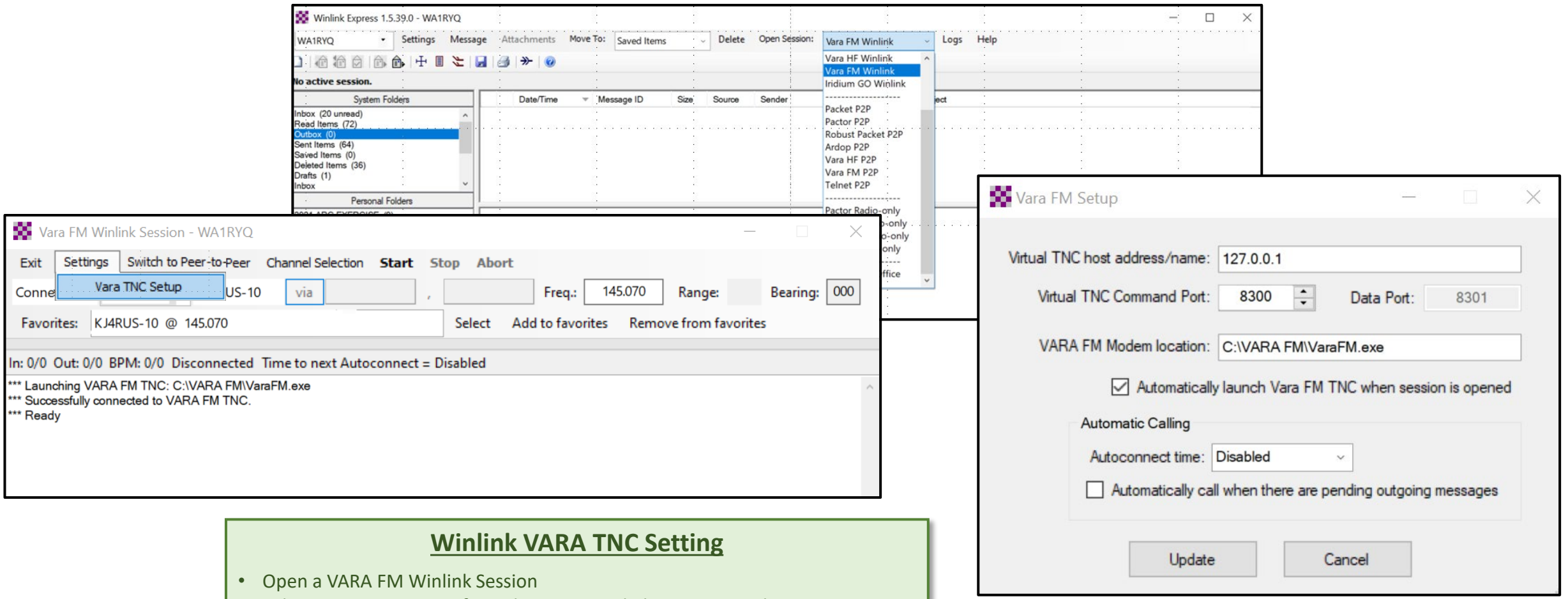




VARA PTT Settings

- CAT Setup
- Enter data associate with users Transceiver

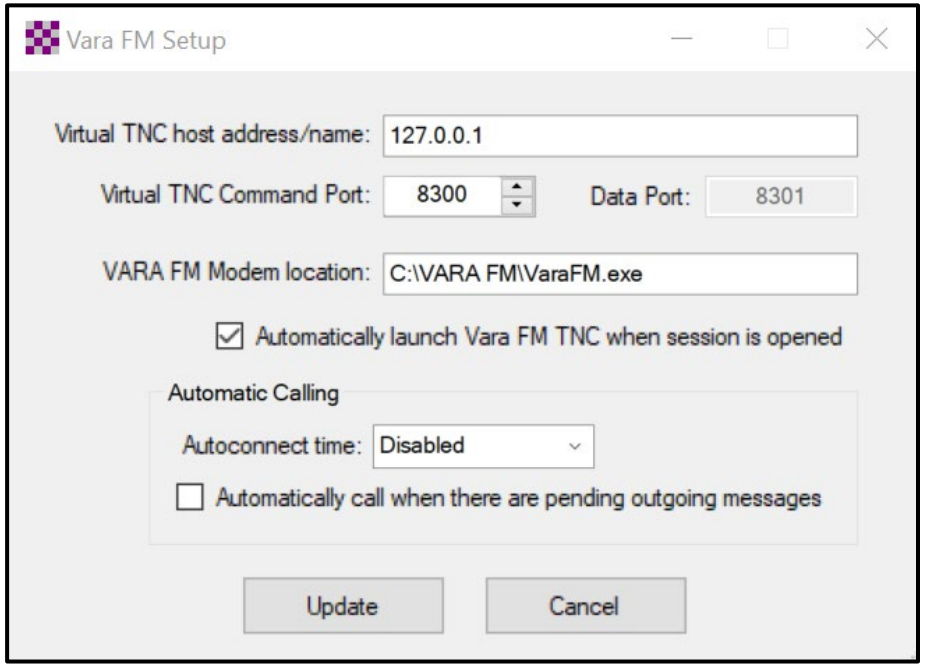
Virtual TNC Configuration
Winlink VARA FM TNC Settings



Winlink VARA TNC Setting

- Open a VARA FM Winlink Session
- Select **VARA TNC Setup** from the VARA Winlink Session Window

Virtual TNC Configuration
Winlink VARA FM TNC Settings



VARA FM Winlink Setup

- Virtual TNC Host Address/name: **127.0.0.1**
- Virtual TNC Command Port: **8300**
- Data Port: **8301**
- VARA FM Modem location: Select location of VARAFM executable
- Check – "**Automatically launch Packet Sound Modem**"

Virtual TNC Configuration
VARA – Additional Information

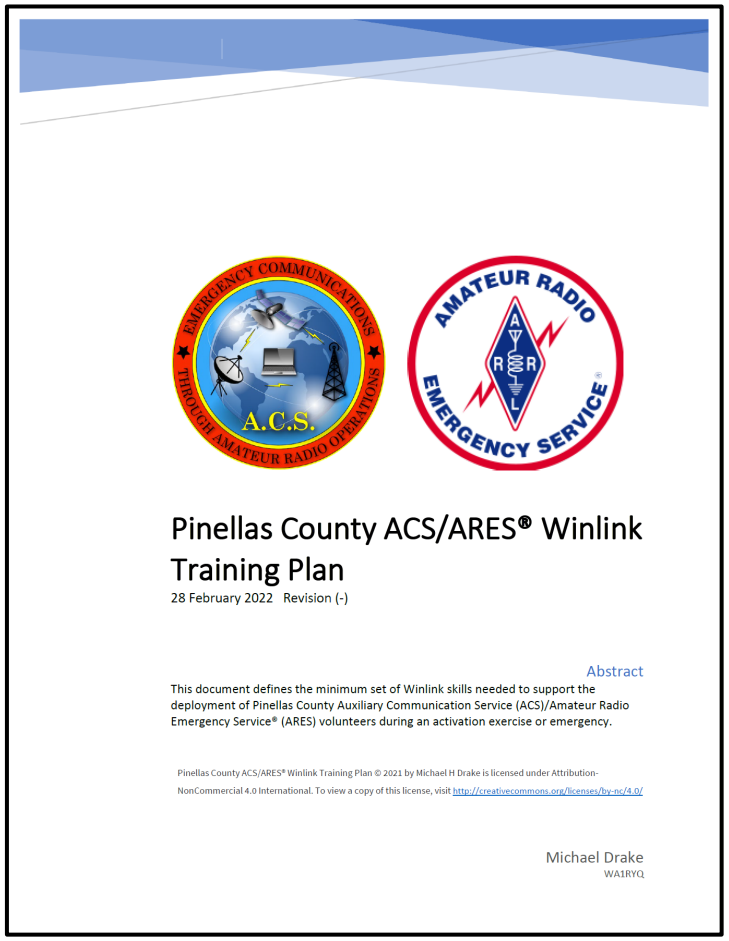
VARA Documentation

https://rosmodem.wordpress.com/

Quick Installation Guide

https://winlink.org/sites/default/files/RMSE_FORMS/vara_fm_for_winlink_with_signalink_on_windows_v4_0.pdf

Conclusion



Pinellas County ACS/ARES® Winlink Training Plan

28 February 2022 Revision (-)

Abstract

This document defines the minimum set of Winlink skills needed to support the deployment of Pinellas County Auxiliary Communication Service (ACS)/Amateur Radio Emergency Service® (ARES) volunteers during an activation exercise or emergency.

Michael Drake
WA1RYQ

- Skills, Rationale, and Training Approach
  - Five Winlink Skills Sets Defined
    - Basic Winlink VHF/UHF Communication Skills
    - Basic Winlink HF Communication Skills
    - Deployment Ready VHF/UHF Communication Skills
    - Deployment Ready HF Communication Skills
    - Advanced HF/VHF/UHF Communication Skills
  - Web Site References

- Located on PACS Website:
  - https://www.pcacs.org/training/training-documents/winlink-training/

Back-up