

The logo is a circular emblem with a red outer ring containing the text "EMERGENCY COMMUNICATIONS" at the top and "RURAL RADIO AMATEUR OPERATIONS" at the bottom, separated by two stars. The inner blue circle features a satellite, a laptop, a radio tower, and a lightning bolt. The acronym "A.C.S." is written in large yellow letters at the bottom of the inner circle.

Pinellas ACS Training

Introduction to Winlink

Part 2

3/2/2022

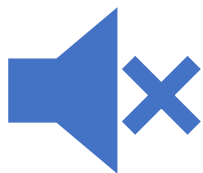
Mike Drake

WA1RYQ

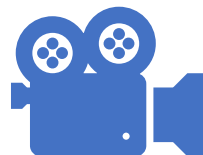
A.C.S.



Zoom Settings



Mute – on/off

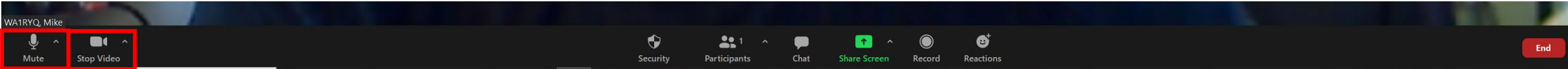


Video – on/off



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

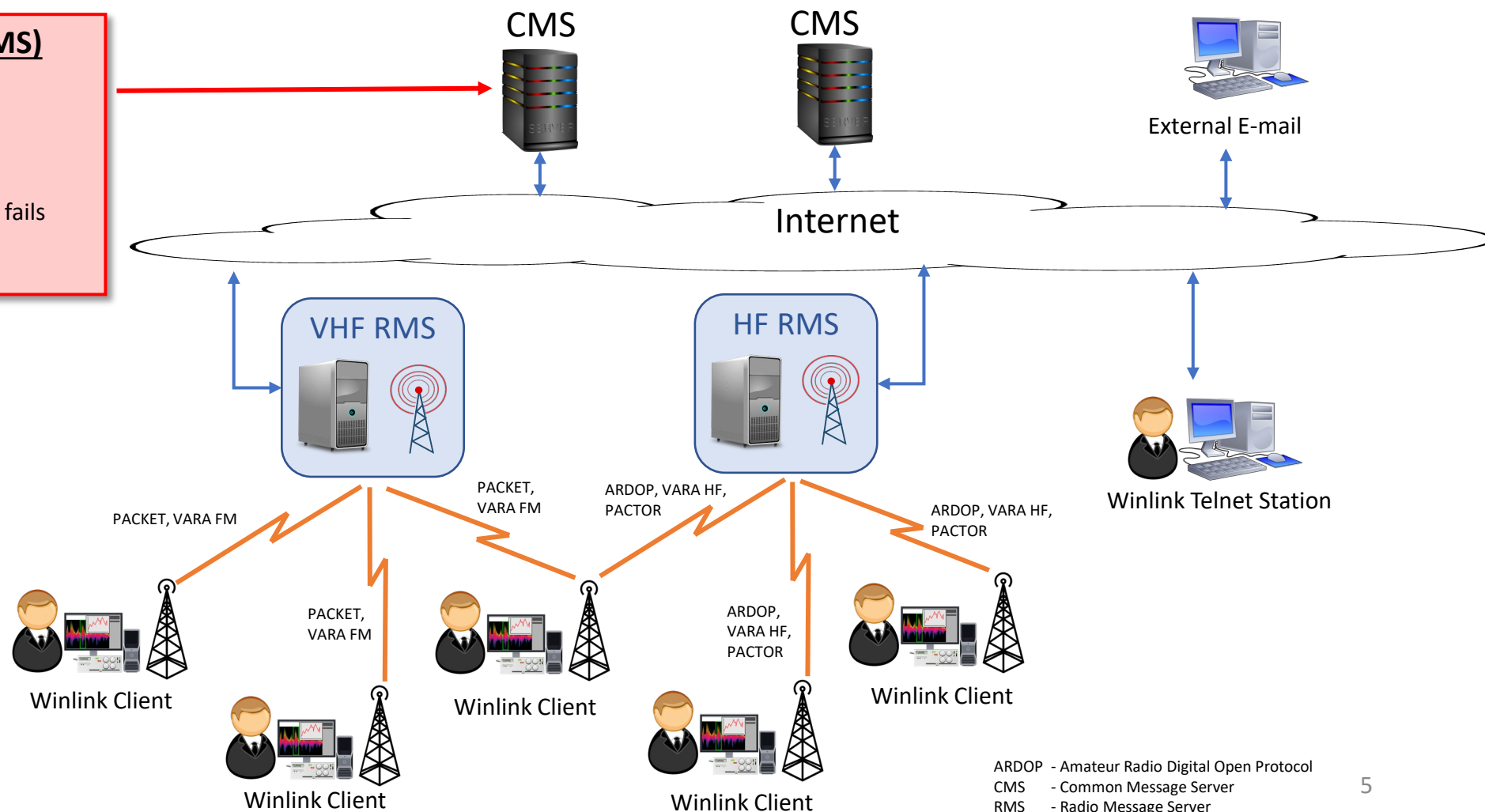


Winlink Operating Modes

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

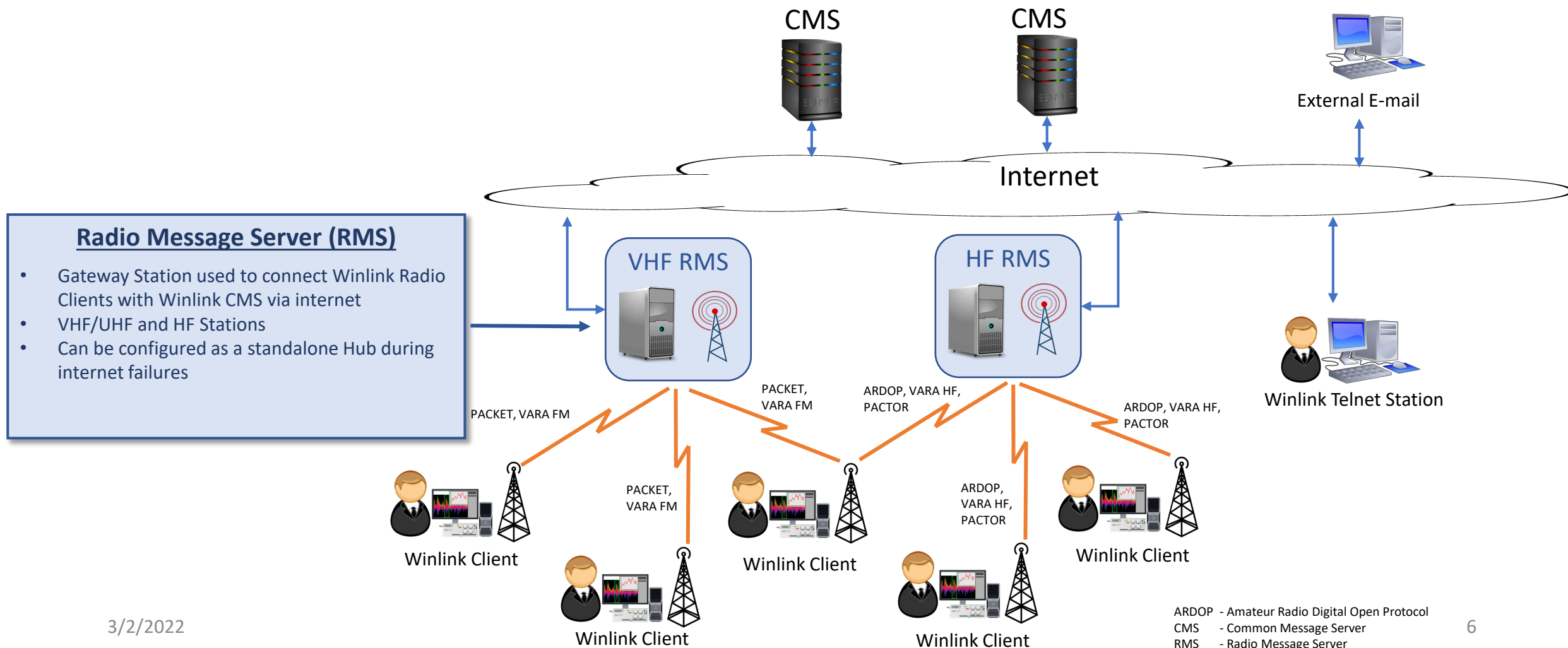


ARDOP - Amateur Radio Digital Open Protocol
CMS - Common Message Server
RMS - Radio Message Server



Winlink Operating Modes

Conventional





The diagram illustrates the Winlink system architecture. At the top, two **CMS** (Common Message Servers) are connected to the **Internet** cloud. An **External E-mail** system is also connected to the Internet. Below the Internet, there are two **RMS** (Radio Message Servers): **VHF RMS** and **HF RMS**. The **VHF RMS** is connected to the Internet and the **Winlink Client** via **PACKET, VARA FM**. The **HF RMS** is connected to the Internet and the **Winlink Client** via **ARDOP, VARA HF, PACTOR**. On the right, a **Winlink Telnet Station** is connected to the Internet. At the bottom, four **Winlink Client** icons are shown, each connected to either the VHF or HF RMS. A legend at the bottom right defines the acronyms: **ARDOP** - Amateur Radio Digital Open Protocol, **CMS** - Common Message Server, and **RMS** - Radio Message Server.

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

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

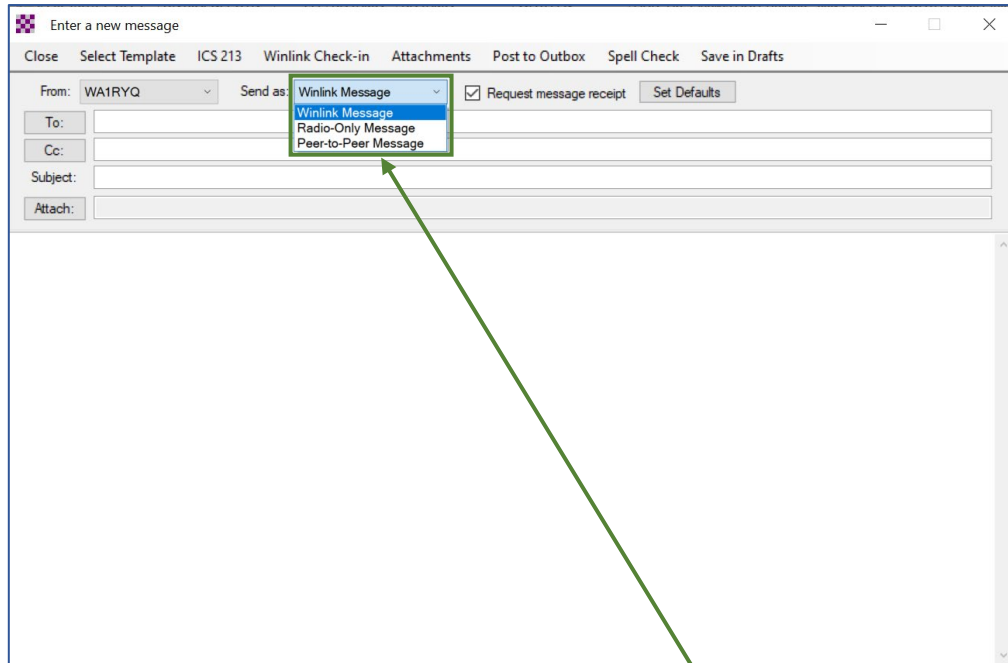
3/2/2022

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



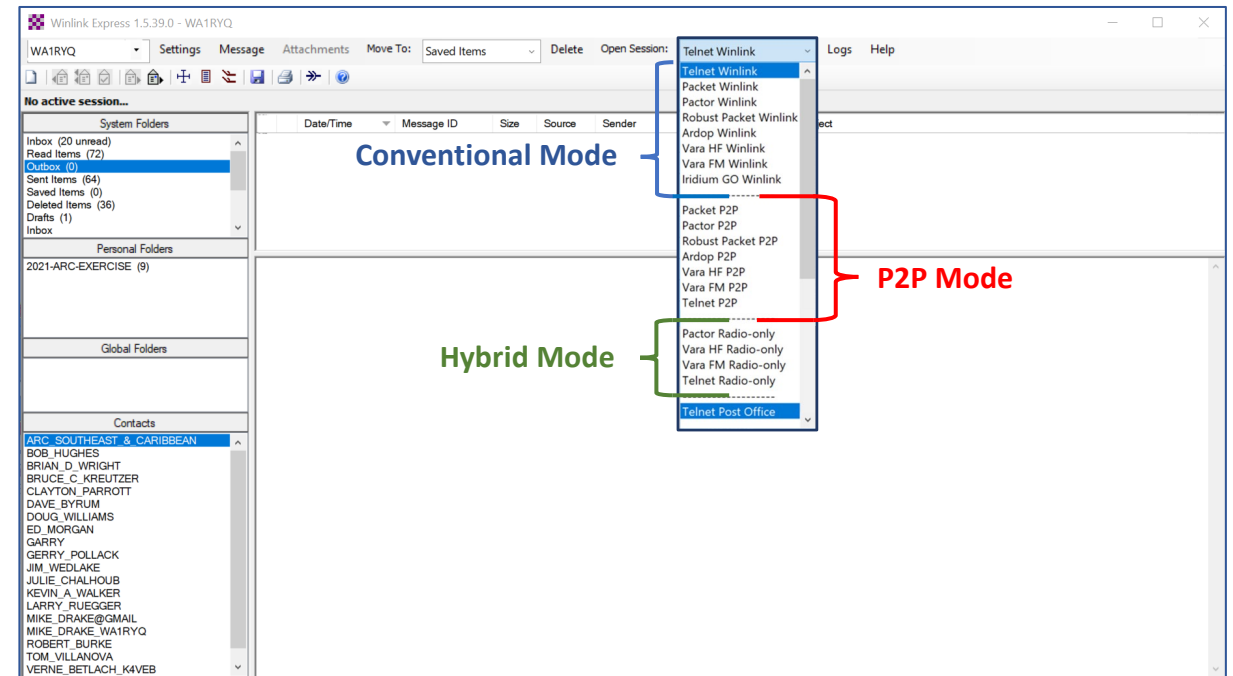
Winlink Operating Modes

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



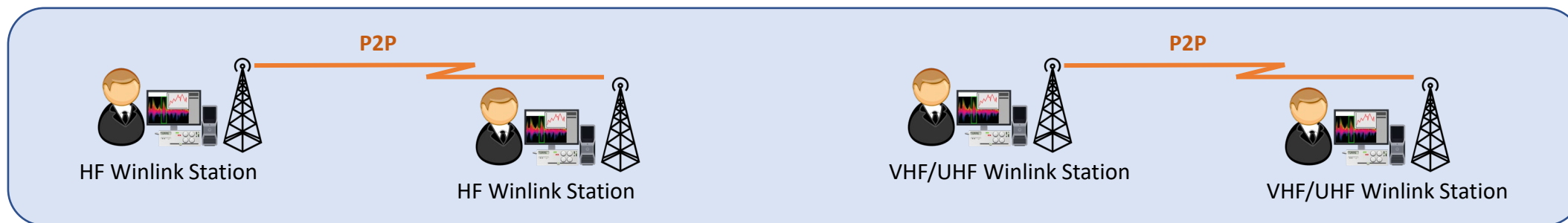
Message Type and Session Type Must Match



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.

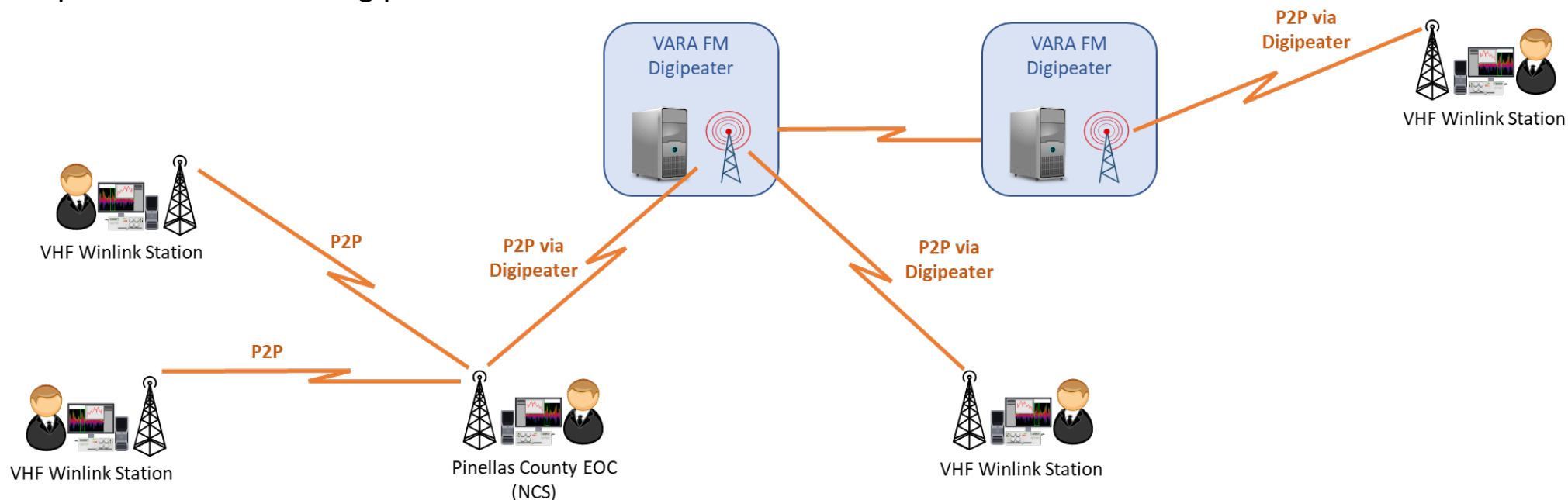


Winlink Operating Modes

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

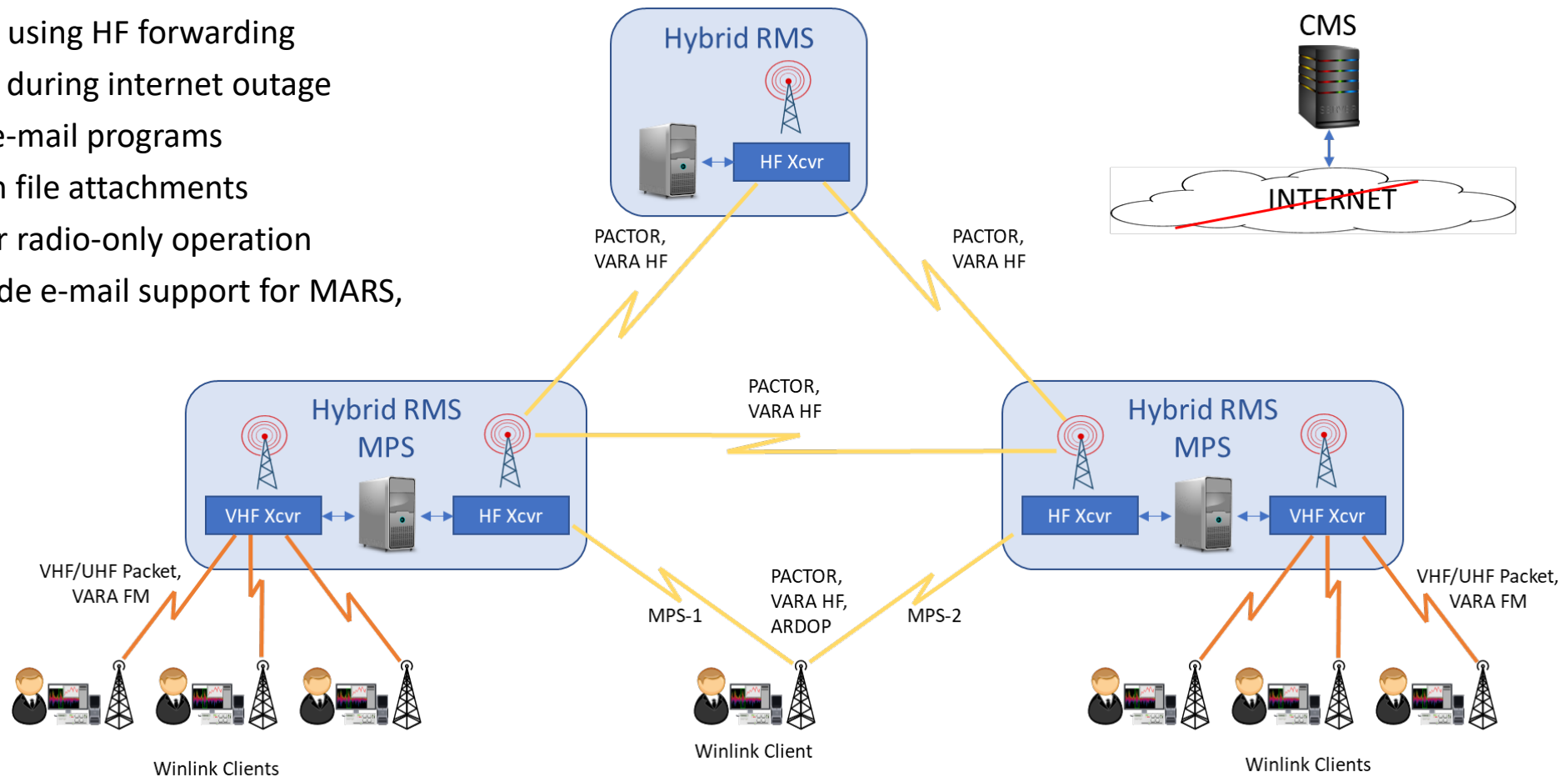




Winlink Operating Modes

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



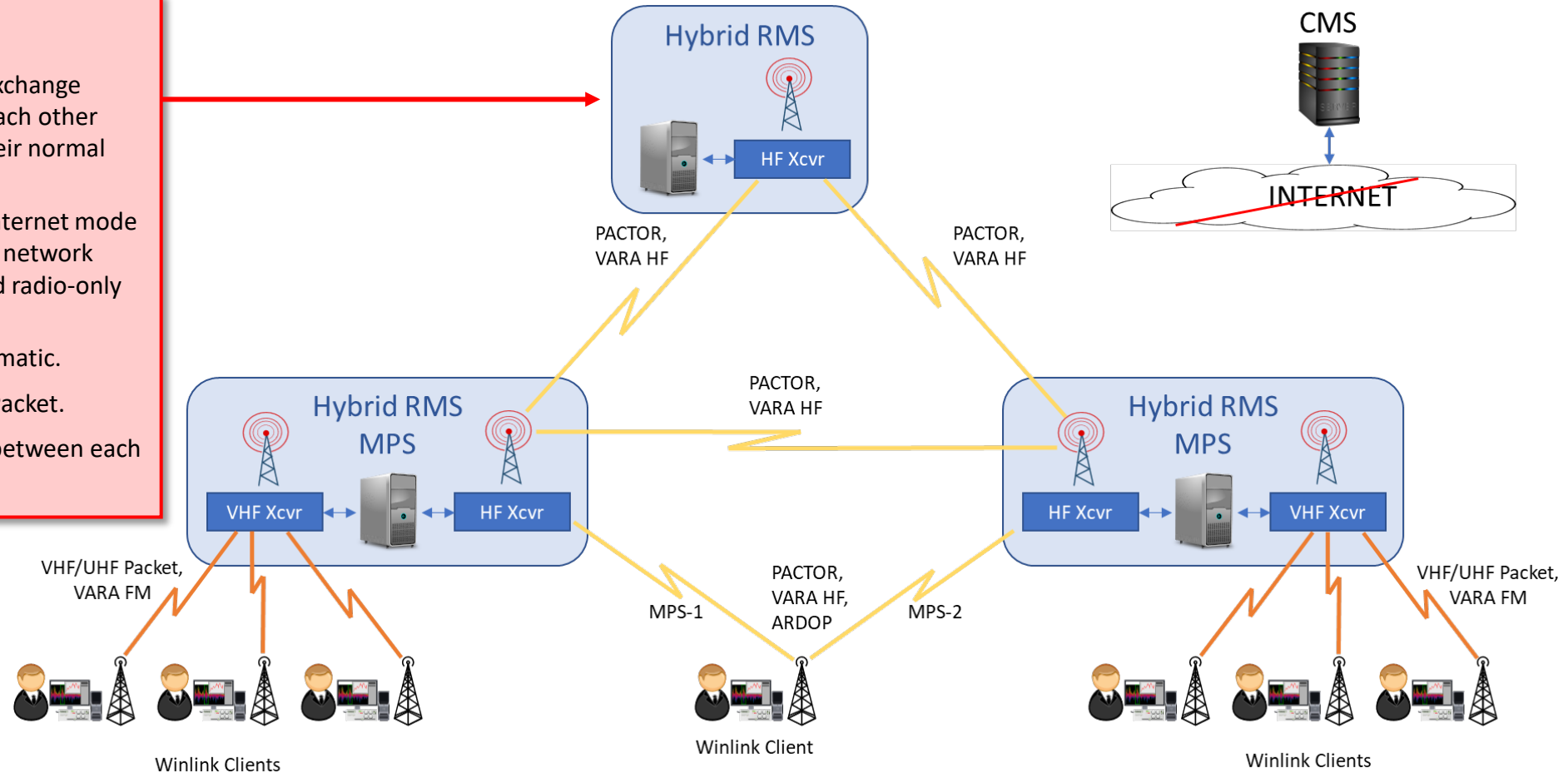


Winlink Operating Modes

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



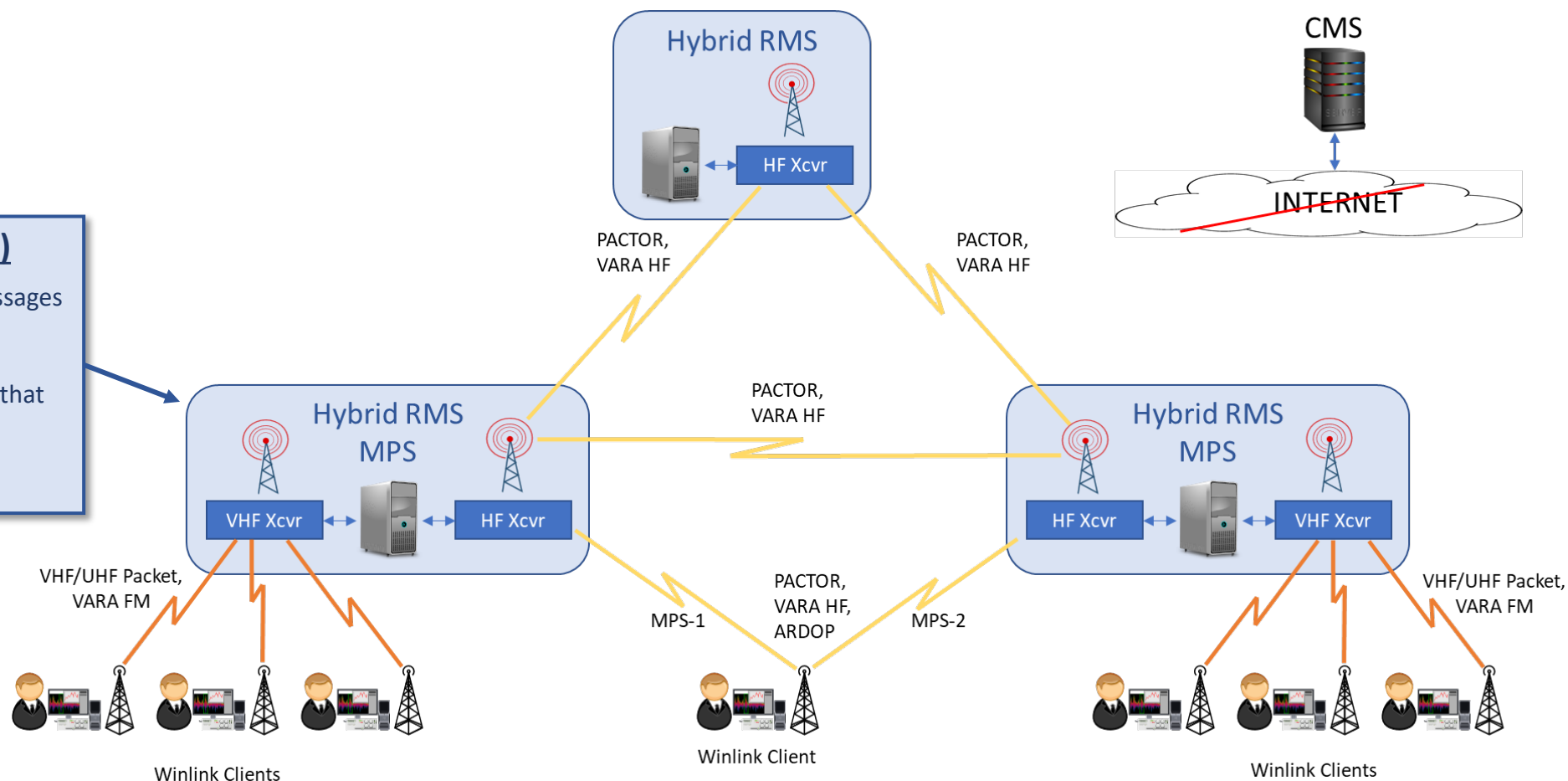


Winlink Operating Modes

Hybrid

Message Pickup Stations (MPS)

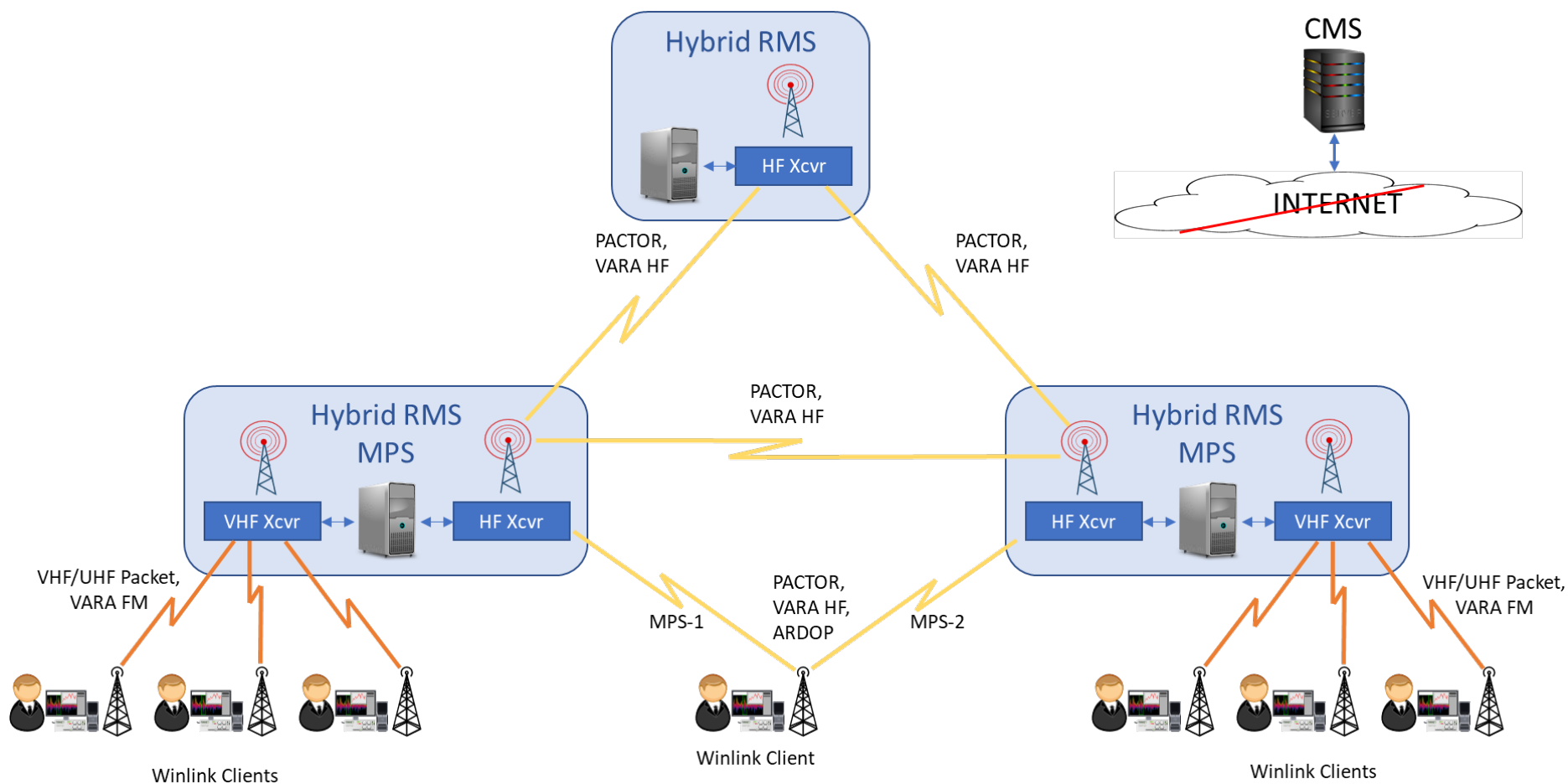
- Hybrid RMS used by client to receive messages during an internet outage
- Each user can select up to 3 MPS to store incoming messages (Winlink Recommends that no more than 2 are selected)





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



[My Account](#) [Tools](#) [News](#) [Positions](#) [User Programs](#) [Book of Knowledge](#) [Download](#) [Support](#)



Select Tools

Gateway Channel Information
Hybrid network participant — forwards traffic automatically via RF

Callsign: N4HCA
Frequency: 7103.000 KHz
Gridsquare: EL87TX
Antenna: Omni
Operating Mode: VARA / VARA
Operating Hours: 00-23
Last Status Received: 2021-07-28 10:18 -04:00
Comments: Hillsborough County EOC



LEGEND:

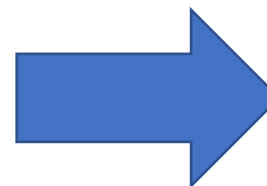
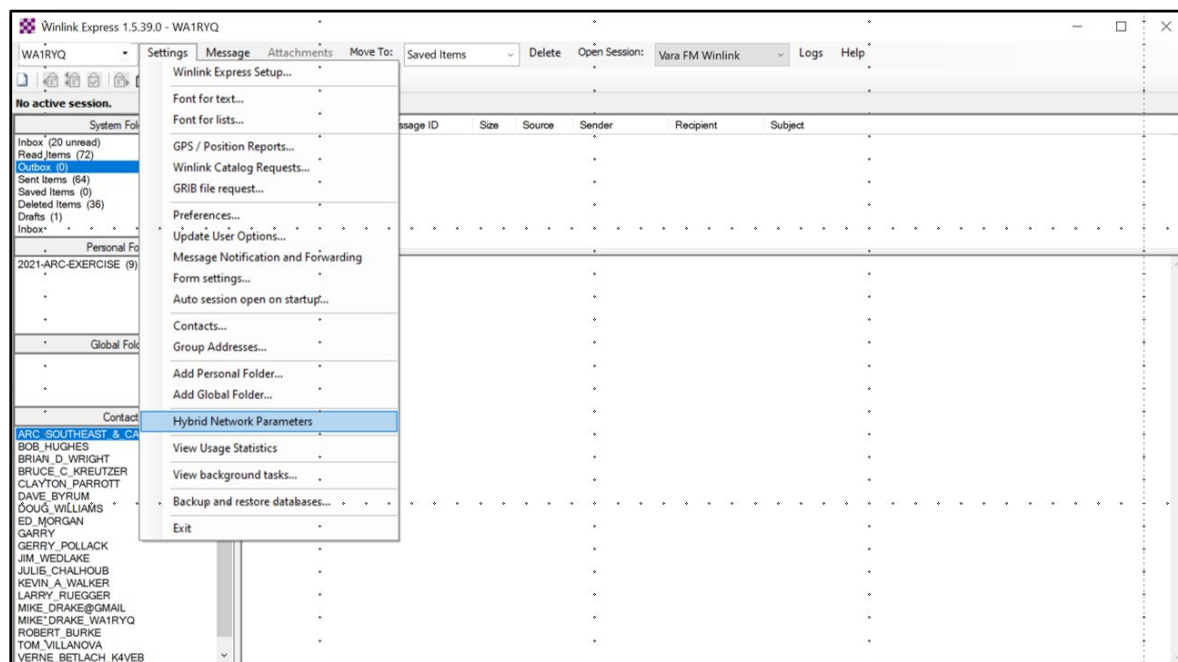
'H' markers - Winlink Hybrid Network participants. They offer RF message forwarding if local internet links are not available.



Winlink Operating Modes

Hybrid Station Selection

Winlink Express Main Menu



Hybrid Network Parameters

Parameters specified on this screen control the flow of messages when they are being sent via radio-only forwarding.

Message Pickup Stations (MPS)

MPS 1: AK4SK

MPS 2:

MPS 3:

Last MPS list update: 2021-07-26-14:39

E-mail notification of pending messages on MPS

Send e-mail notifications to these addresses when there are pending radio-only messages being held on MPS for you.

(Separate multiple e-mail addresses with semicolons)

Hours pending before notification message is sent:

MPS selected by current user



Winlink Operating Modes

Hybrid Station Selection

First MPS

Second MPS

Select to Register MPS

Hybrid Network Parameters

Parameters specified on this screen control the flow of messages when they are being sent via radio-only forwarding.

Message Pickup Stations (MPS)

MPS 1: AK4SK

MPS 2: N4HCA

MPS 3: LA1B

Register

Last MPS: LA3F 7-26-14:39

E-mail notification

Send e-mail addresses when there are pending radio messages on MPS

Hours per message is sent: 4

Cancel

Update list of RMS available as MPS

Display list of RMS available as MPS

Queue radio message to register my MPS

Select to Update List of MPS

Message Pickup Stations

Callsign	# Associated Users
AB4NX	228
AH6QK	9
AI7HH	6
AJ4FW	132
AK4SK	35
DB0BES	13
DB0NOT	21
DB1FW	18
EA5URB	1
HB9MM	29
IQ0BO	1

Close



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:

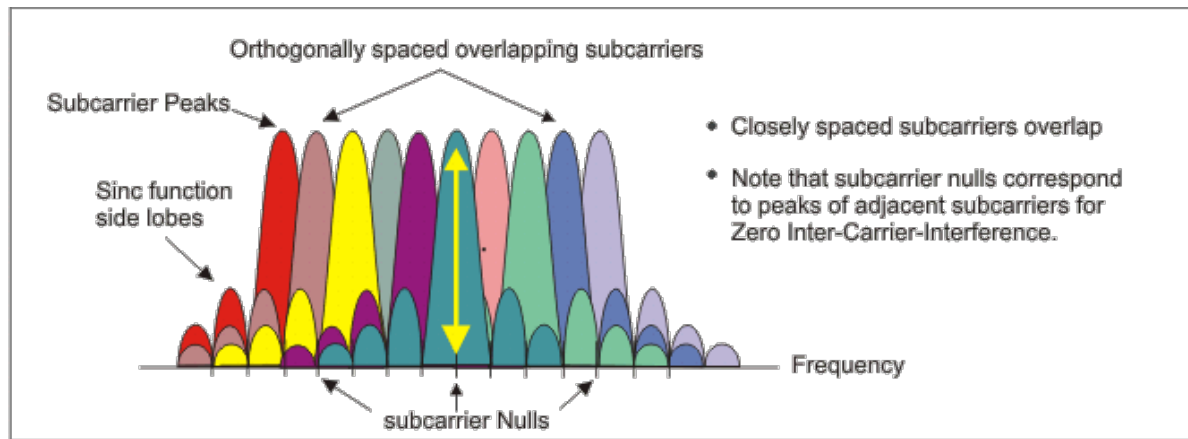
Pactor1	15 Minutes
Pactor 2	4 Minutes
Packet (1200) 1 Node	2.5 Minutes
Packet (1200) Direct	2 Minutes
Packet (9600) Direct	1 Minute
ARDOP	Faster than Pactor 2 Slower than Pactor 3
VARA	Faster than ARDOP, Slower than Pactor 3
Pactor 3	30 Seconds
VARA FM	20 Seconds
PACTOR 4	15 Seconds
Telnet	(Internet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



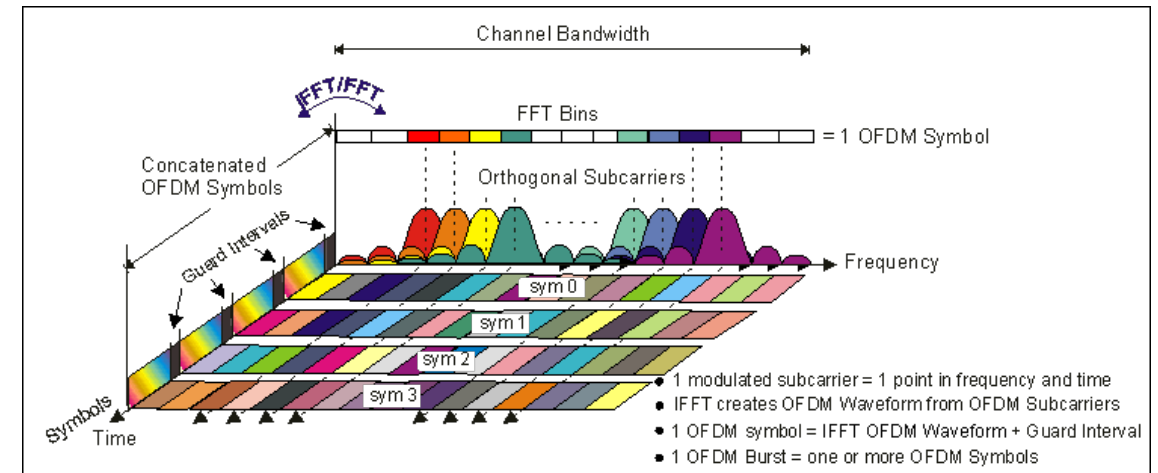
Winlink Connection Modes

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

Level	VARA HF 2750 (Tactical)				VARA HF 2300 (Standard)				VARA HF 500 (Narrow)			
	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								

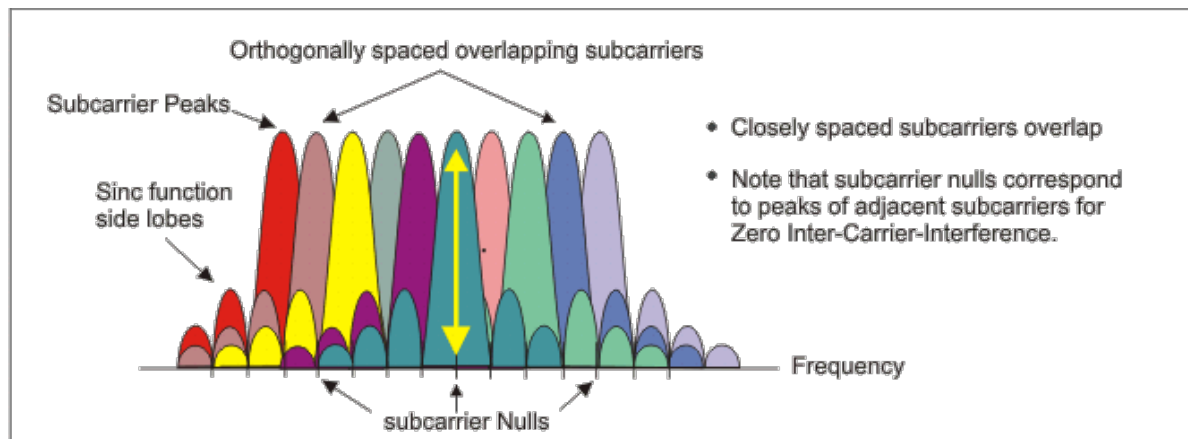
FSK - Frequency Shift Keying
PSK - Phase shift Keying
QAM - Quadrature Amplitude Modulation



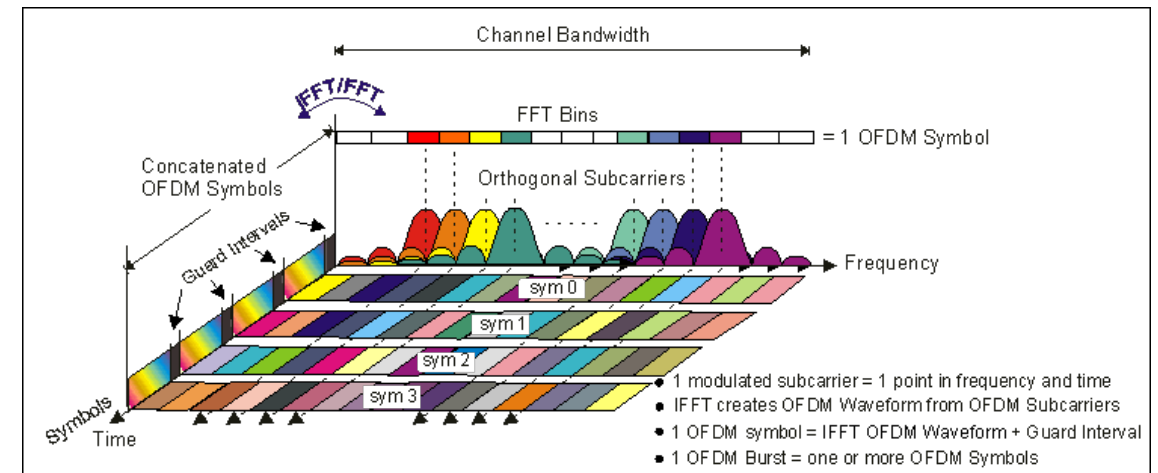
Winlink Connection Modes

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



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

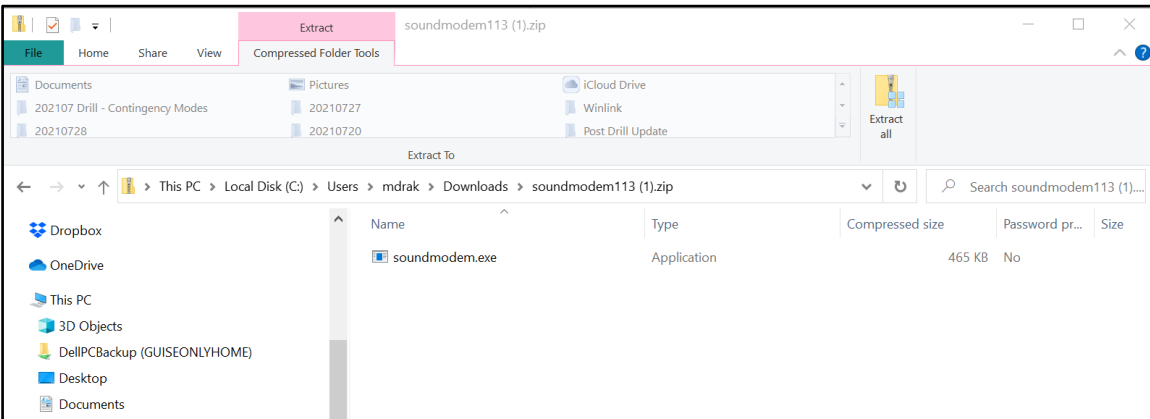
Applications for Soundmodem / AGW PE:		
<u>checkers6.zip</u>	18-Aug-16 22:01	342.94K
<u>chess10.zip</u>	18-Aug-16 22:02	355.82K
<u>easyterm49.zip</u>	10-Feb-21 07:12	401.73K
Soundmodem versions, manuals and utility:		
<u>CHANGELOG.txt</u>	10-Feb-21 07:15	9.88K
<u>hs_soundmodem27.zip</u>	11-Feb-21 09:15	454.19K
<u>other-versions.zip</u>	22-May-21 12:02	6.99M
<u>ptt-dll.zip</u>	30-Oct-19 22:39	247.22K
<u>soundmodem113.zip</u>	11-Feb-21 09:14	465.15K
<u>user_guide_v045b_FR.pdf</u>	11-Oct-13 19:13	333.12K
<u>user_guide_v105_EN.pdf</u>	03-Dec-19 18:01	504.65K
<u>utils.zip</u>	28-Feb-15 04:59	68.21K

UZ7H0 Sound Modem

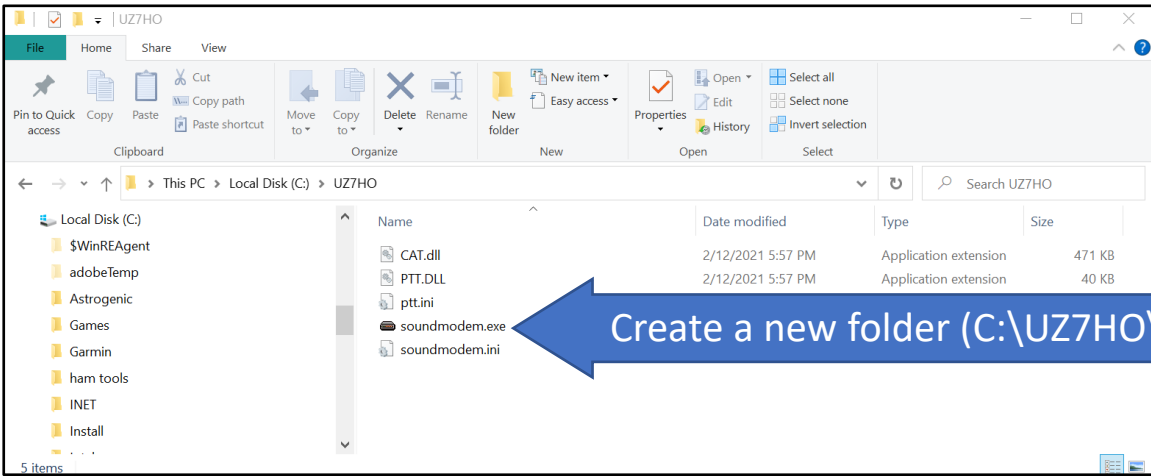
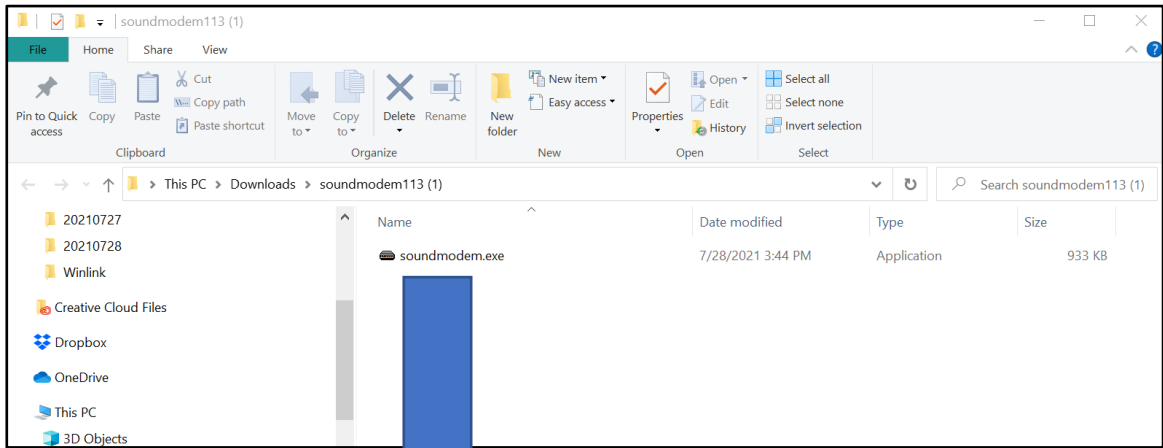


Virtual TNC Installation

UZ7HO



Unzip the Downloaded Files



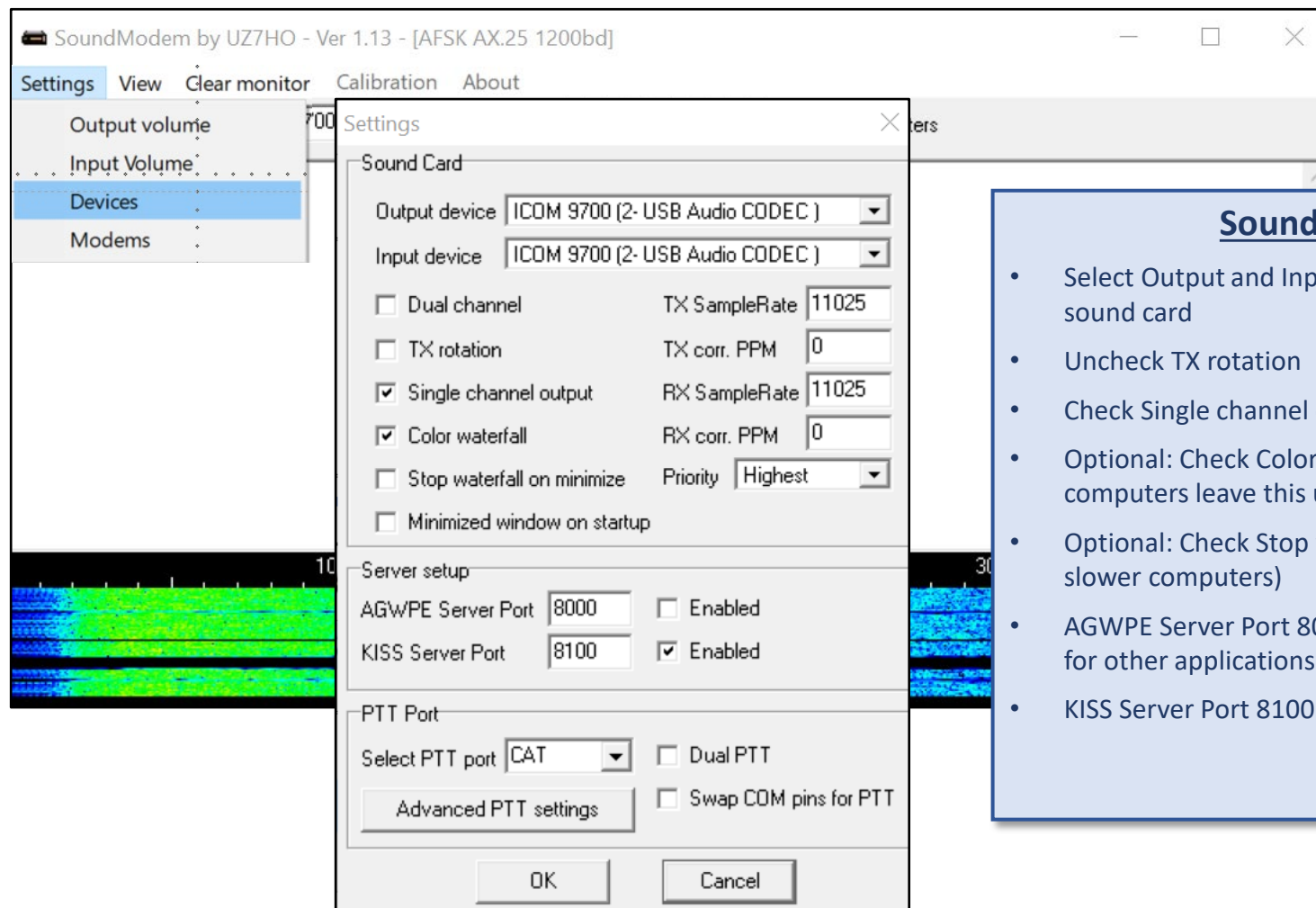
Create a new folder (C:\UZ7HO\) and then move the files

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

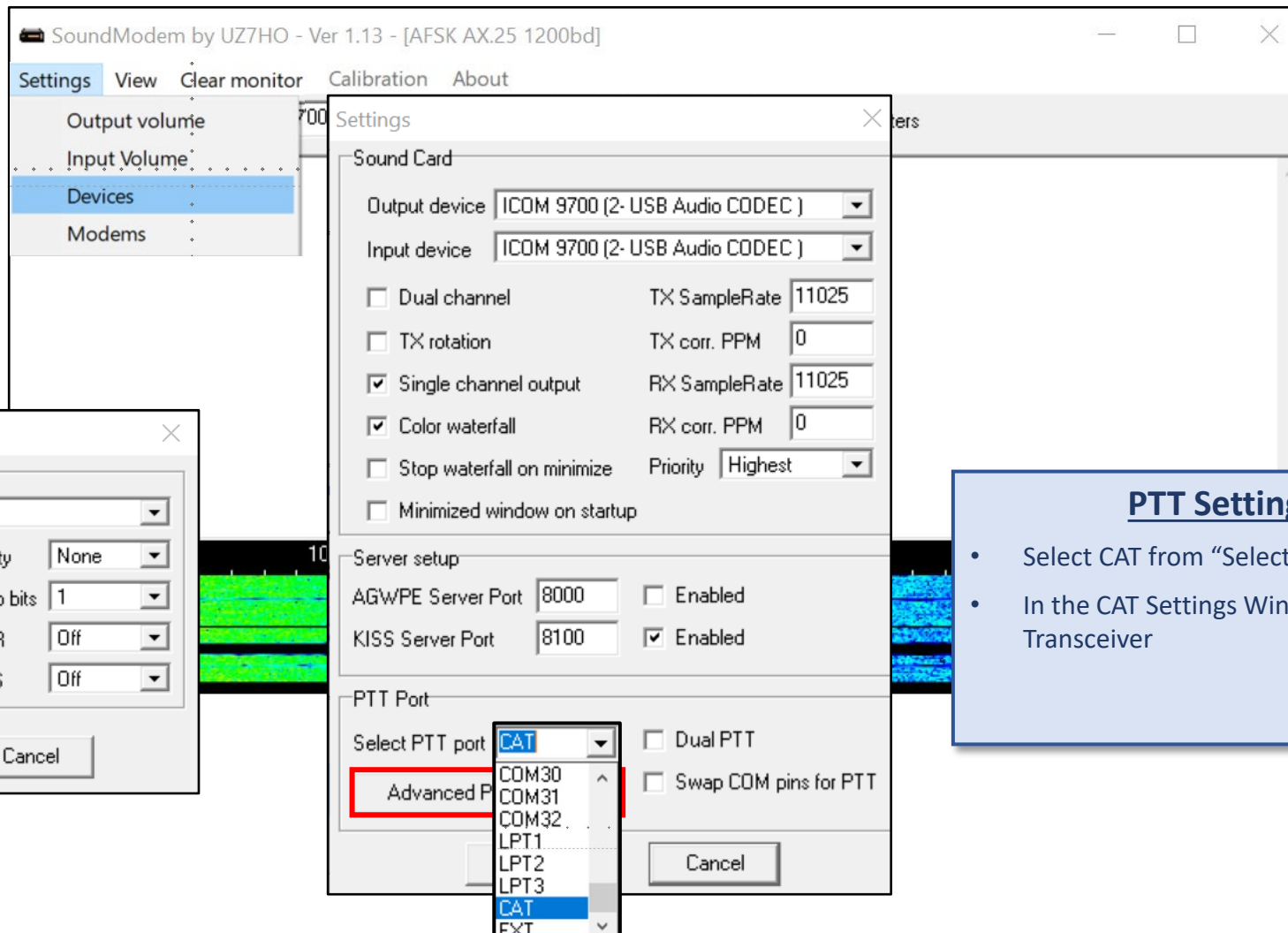


Virtual TNC Configuration

UZ7HO PTT – CAT Control

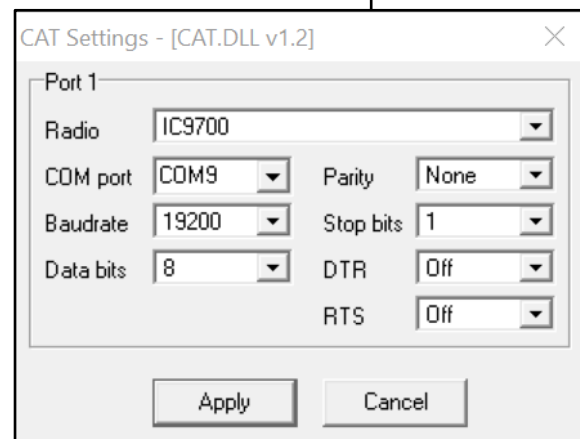
PTT Options

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



PTT Settings – CAT Control

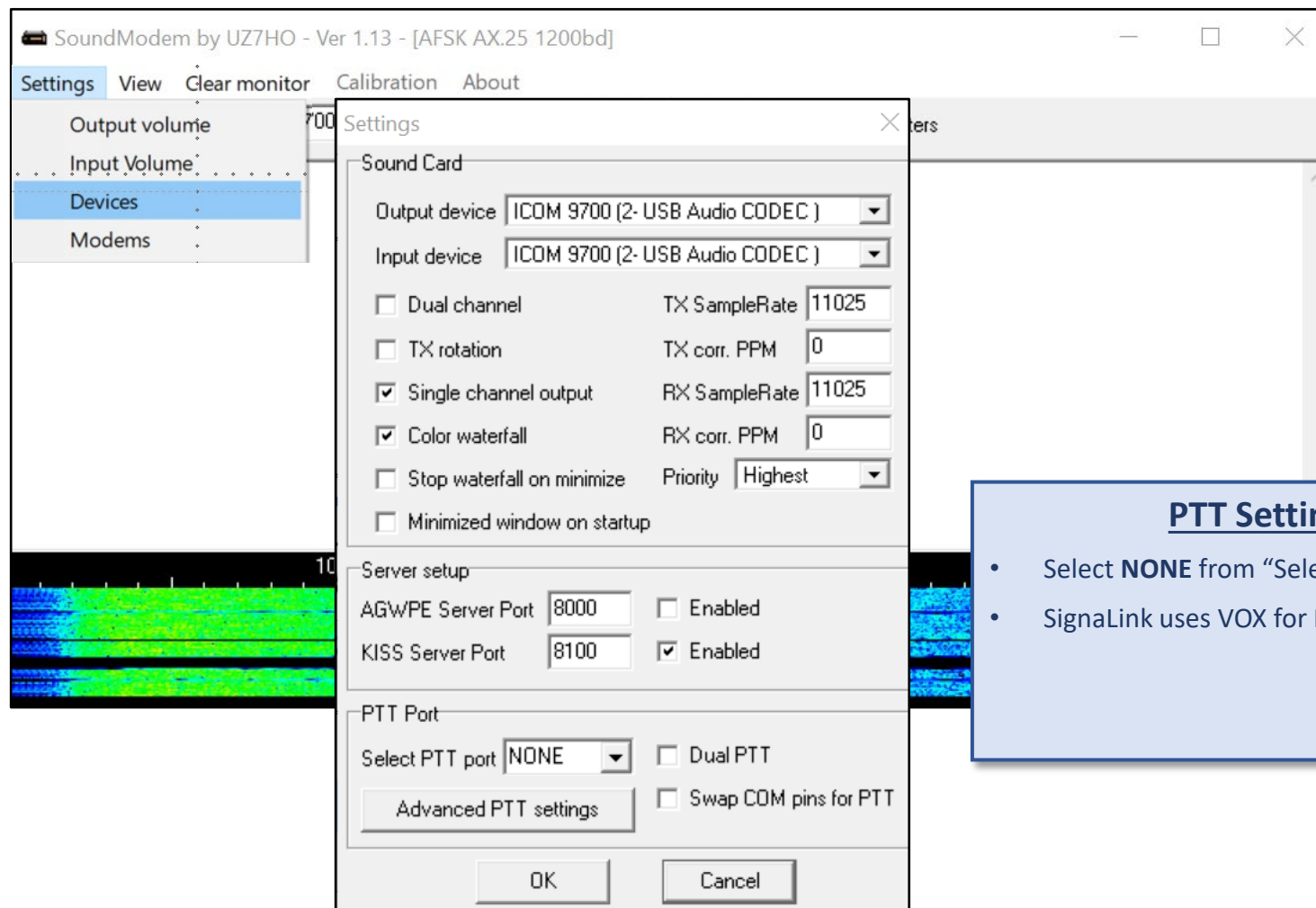
- Select CAT from “Select PTT Port” Pull down Menu
- In the CAT Settings Window, Configure settings for Transceiver





Virtual TNC Configuration

UZ7HO PTT – Signalink



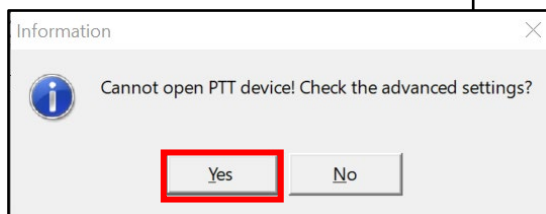
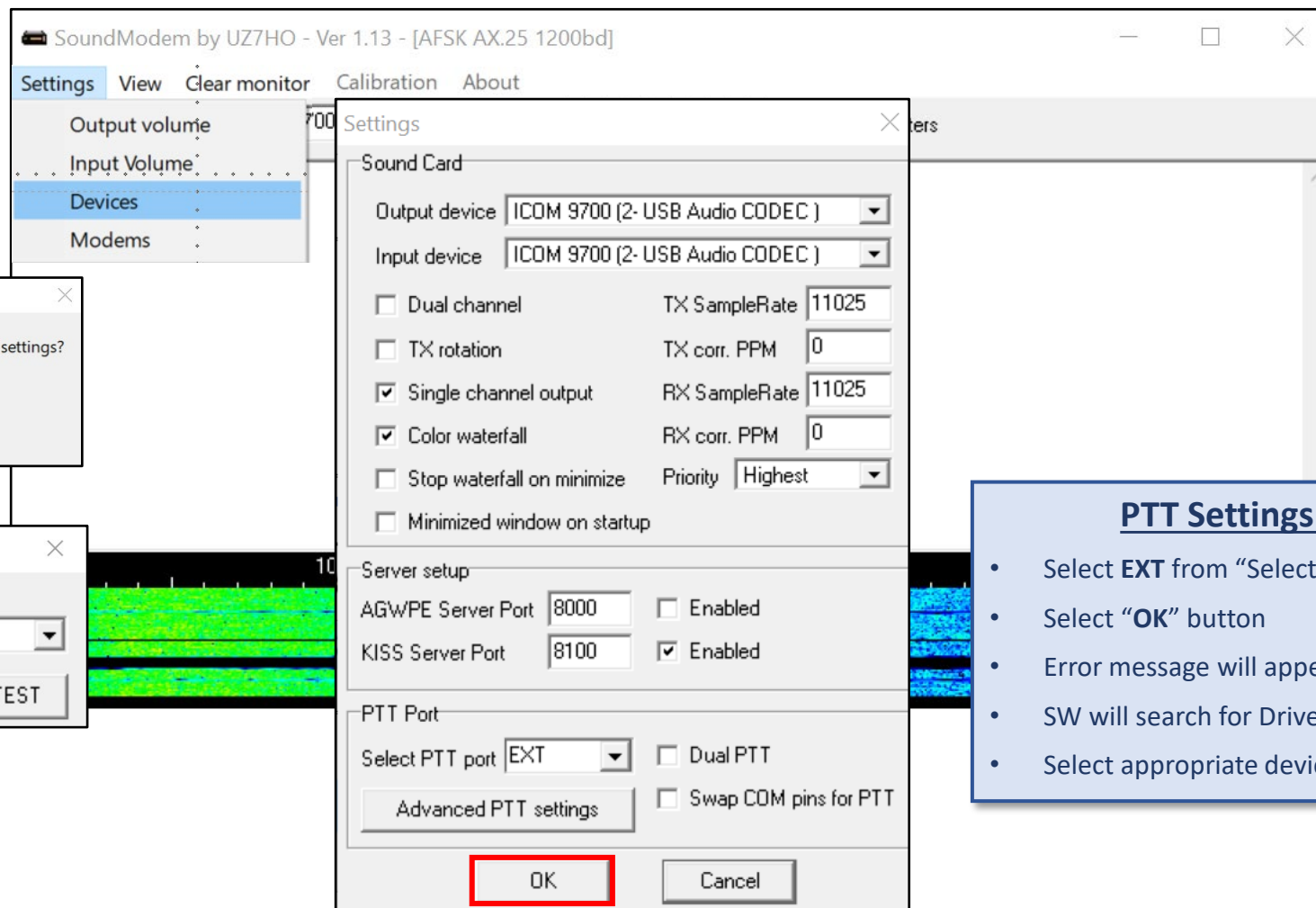
PTT Settings – Signalink

- Select **NONE** from “Select PTT Port” Pull down Menu
- Signalink uses VOX for PTT



Virtual TNC Configuration

UZ7HO PTT – External Device



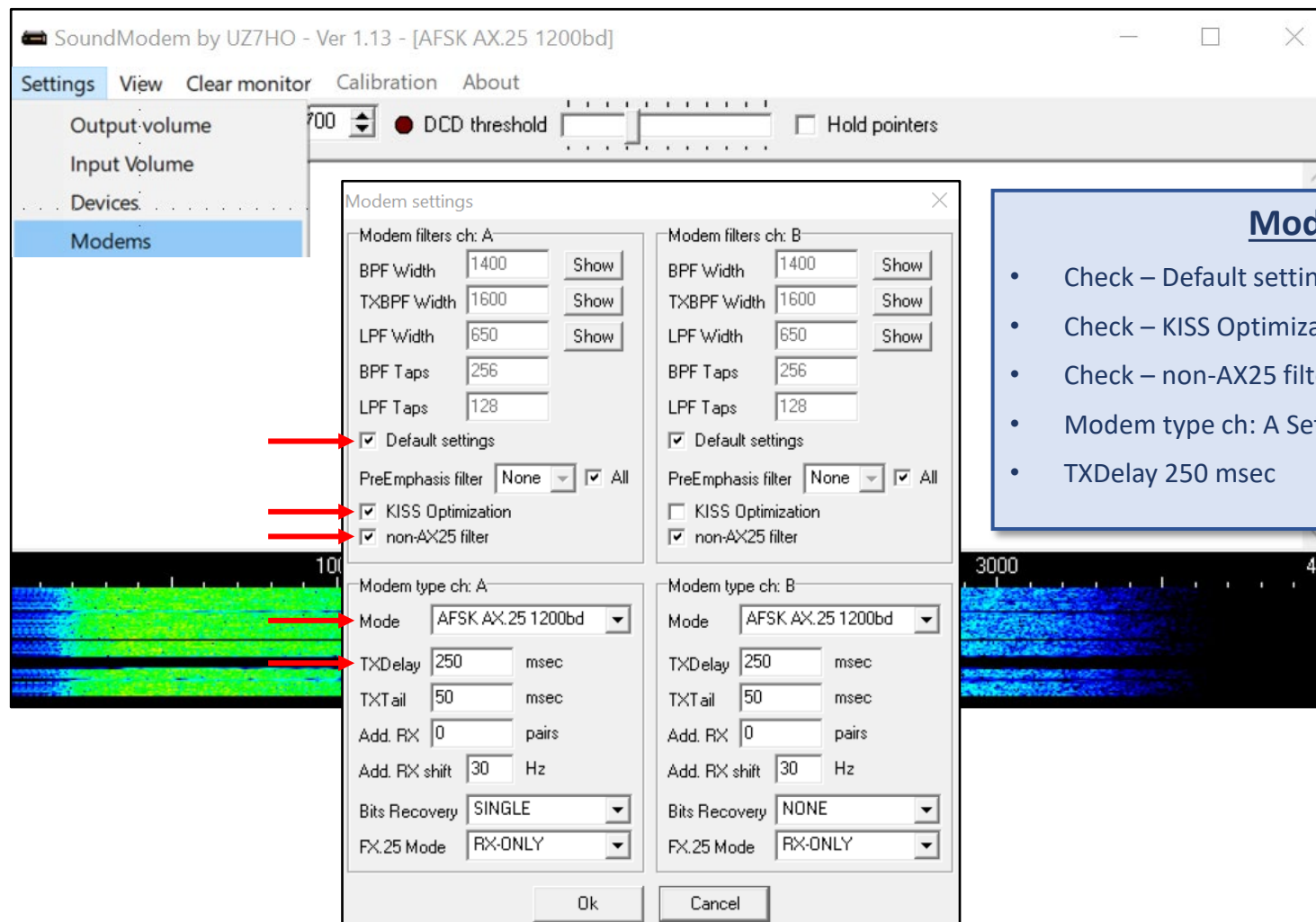
PTT Settings – External Device

- 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



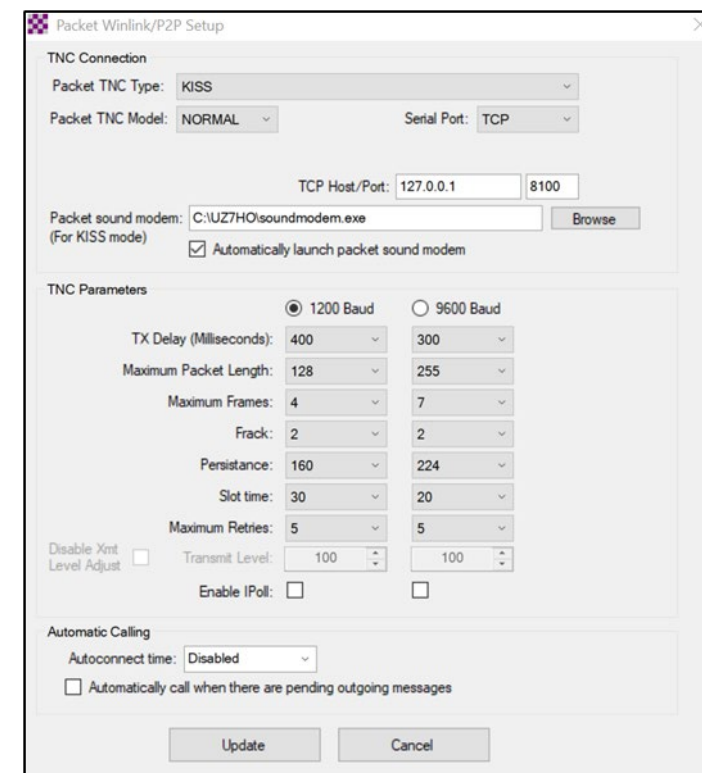
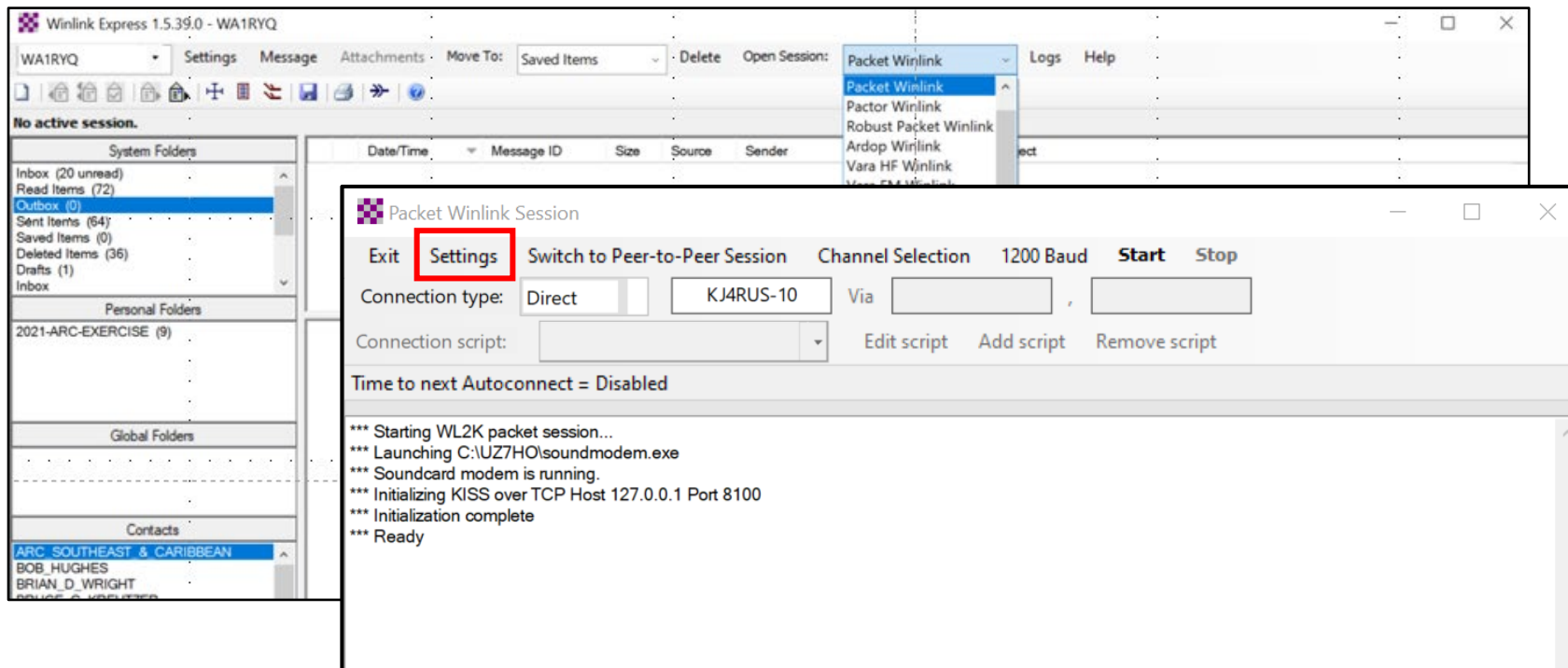
Modem Settings

- 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/P2P Setup

TNC Connection

Packet TNC Type: **KISS**

Packet TNC Model: **NORMAL** Serial Port: **TCP**

TCP Host/Port: **127.0.0.1** **8100**

Packet sound modem: **C:\UZ7HO\soundmodem.exe** **Browse**

(For KISS mode) ☒ Automatically launch packet sound modem

TNC Parameters

☒ 1200 Baud ☐ 9600 Baud

TX Delay (Milliseconds):	400	300
Maximum Packet Length:	128	255
Maximum Frames:	4	7
Frack:	2	2
Persistence:	160	224
Slot time:	30	20
Maximum Retries:	5	5
Disable Xmt Level Adjust <input type="checkbox"/>	Transmit Level: 100	100
Enable IPoll: <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Automatic Calling

Autoconnect time: **Disabled**

☐ Automatically call when there are pending outgoing messages

Update **Cancel**

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/>

EA5HVK

Weak signals Software

EA5HVK software

10 January, 2011

-  **VARA HF v4.4.3 (High Performance HF Modem)**
-  **VARA FM v4.1.2 (VARA for FM transceivers)**
-  **VARA SAT v4.2.0 (VARA for QO-100 geostationary SAT)**
-  **VARA Chat v1.2.5 (Text and File transfer P2P app)**
-  **VARA Terminal v1.1.5 (VARA dumb terminal for BBS's)**



Blogroll

- » ROS takes the Blue Riband
Fastest live data to cross the Atlantic G > VE

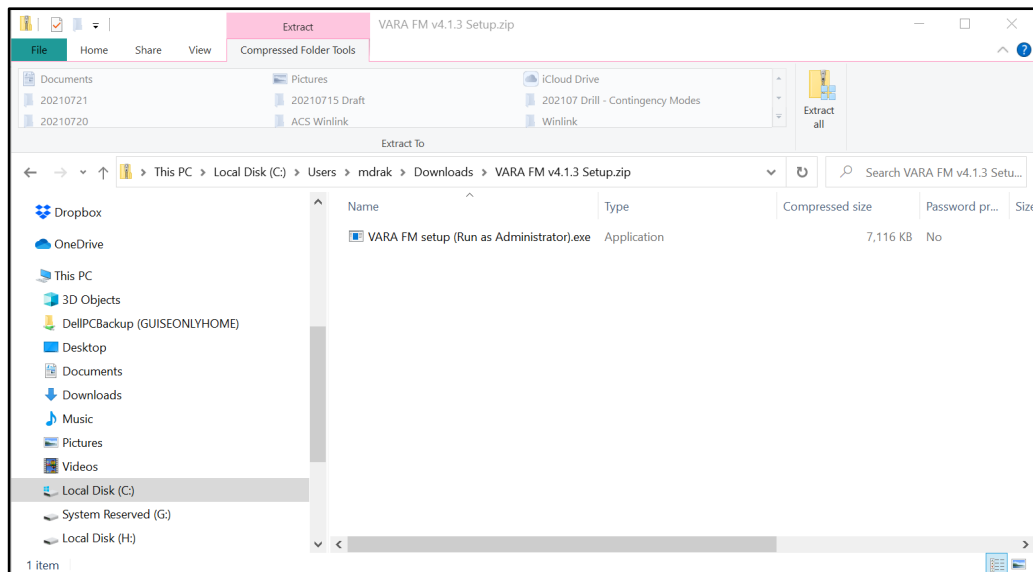
Recent Posts

- » VARA HF Modem
- » New ROS v7.4.0
- » (no title)

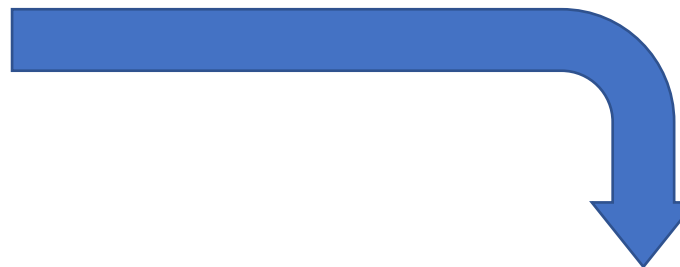


Virtual TNC Installation

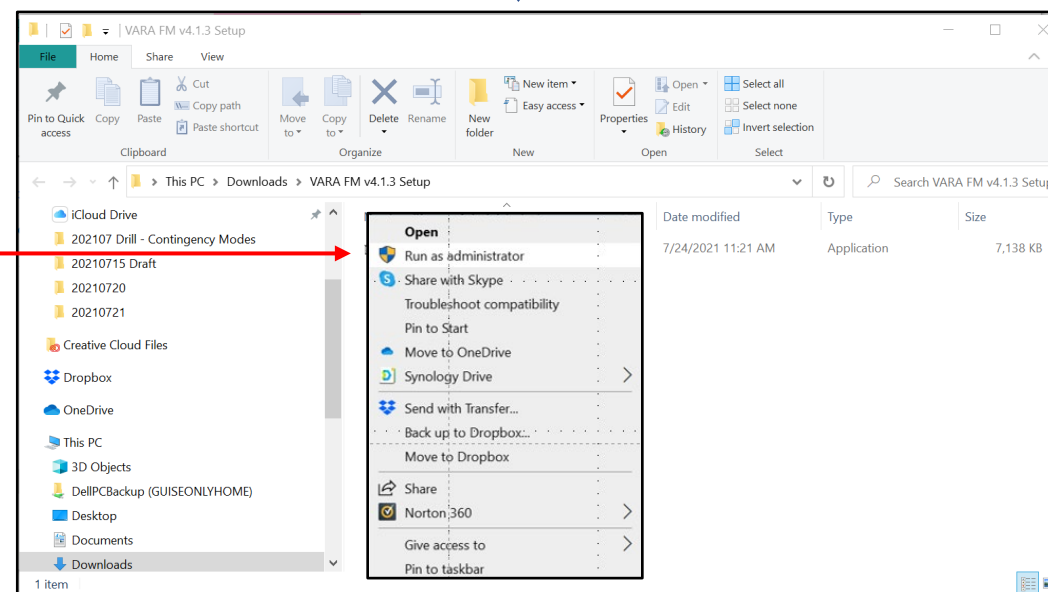
VARA HF, FM, and Chat



Unzip the Downloaded File



Run file as Administrator



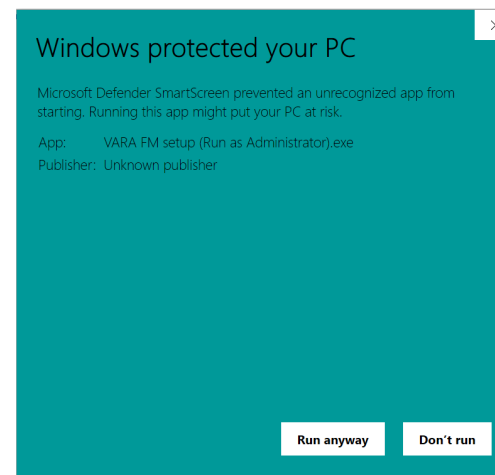
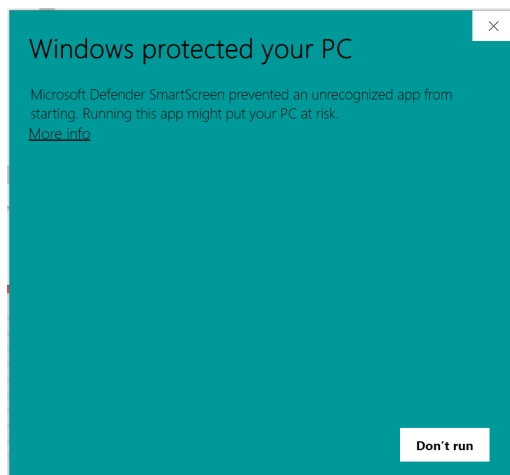


Virtual TNC Installation

VARA HF, FM, and Chat



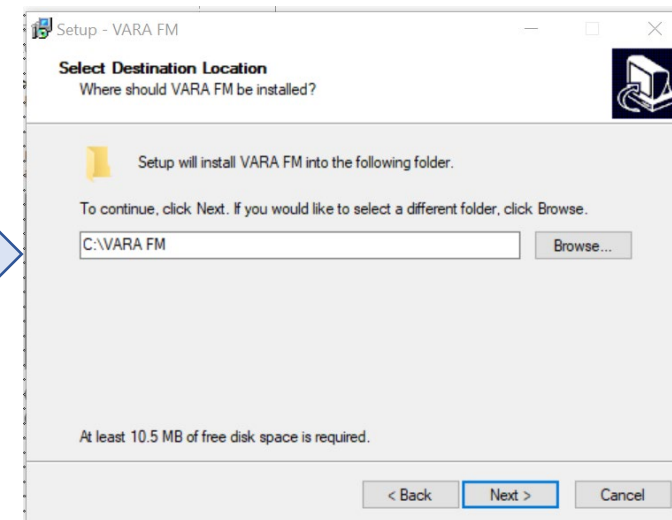
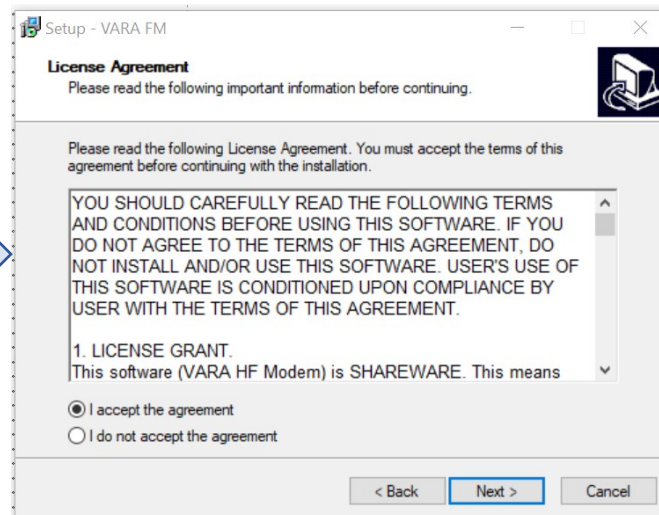
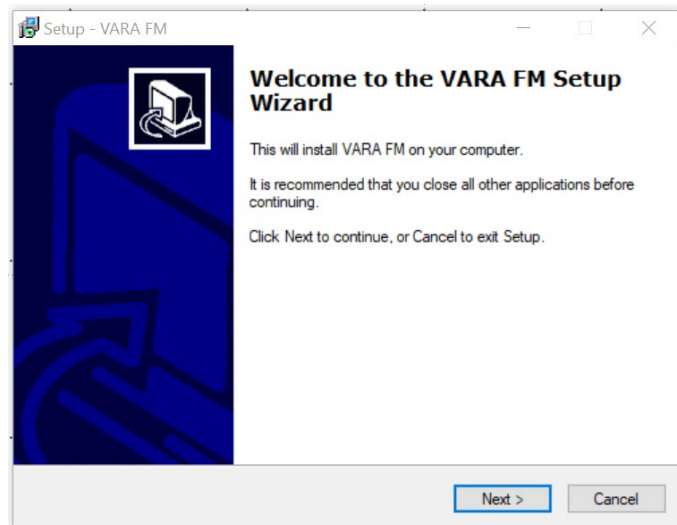
- Warning Pop-up may be displayed
 - Safe if file has been downloaded from [rosmodem.wordpress](https://rosmodem.wordpress.com)





Virtual TNC Installation

VARA HF, FM, and Chat

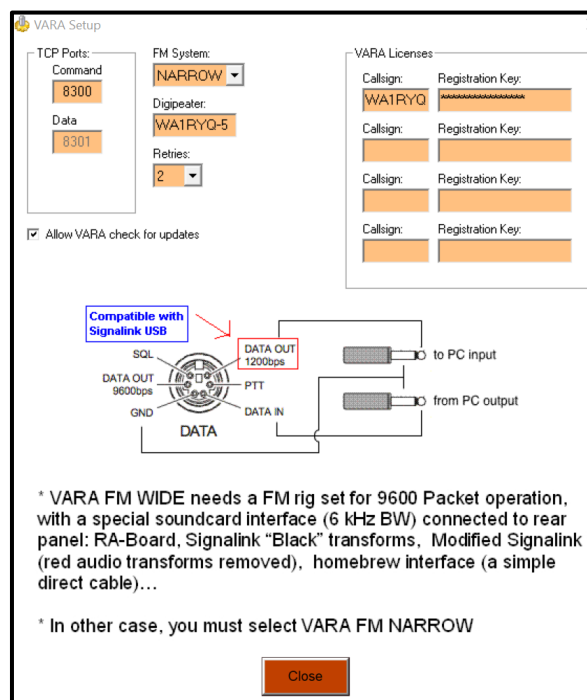
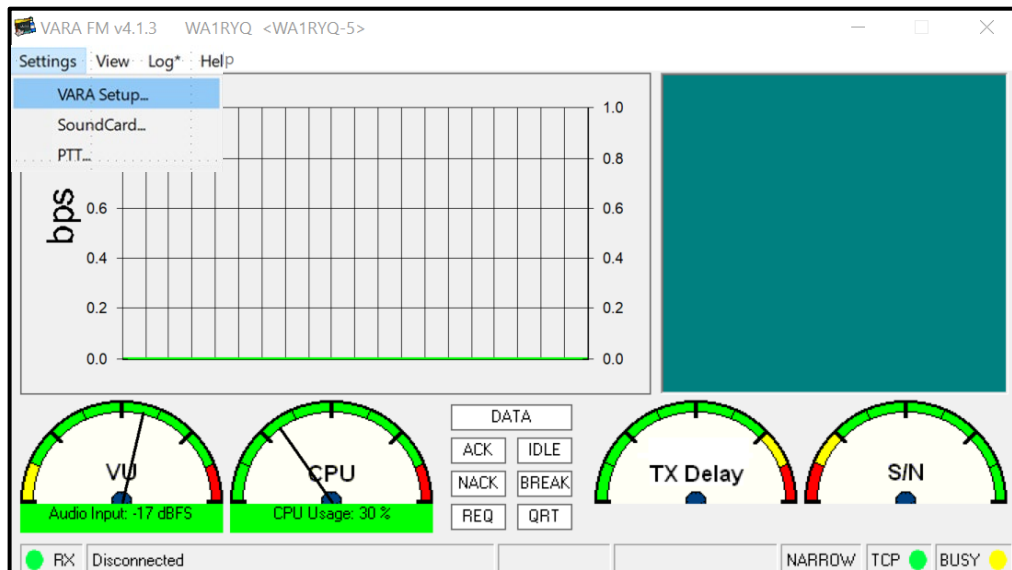


Follow instructions and install in default locations



Virtual TNC Configuration

VARA FM – VARA Setup



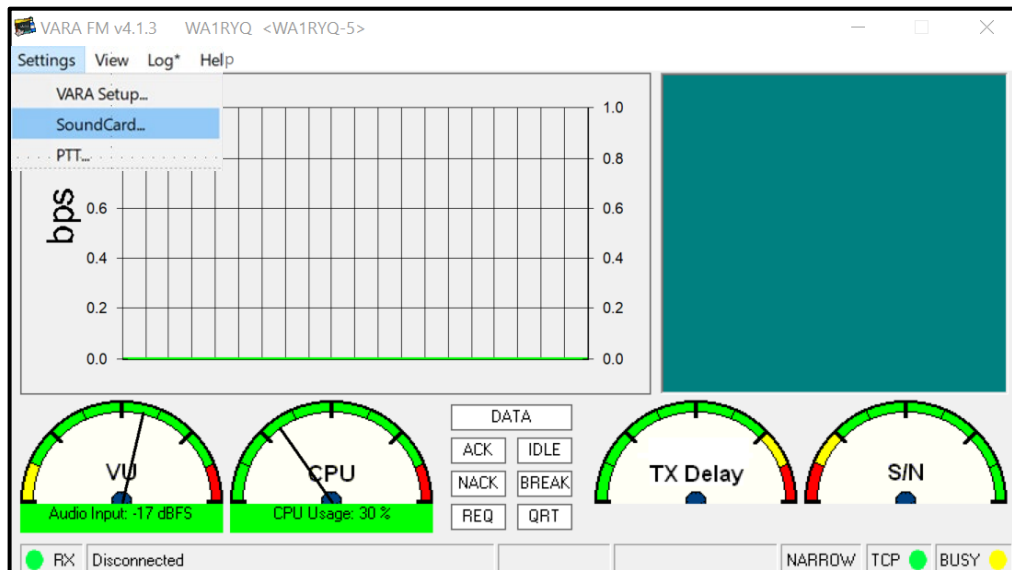
VARA Setup

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



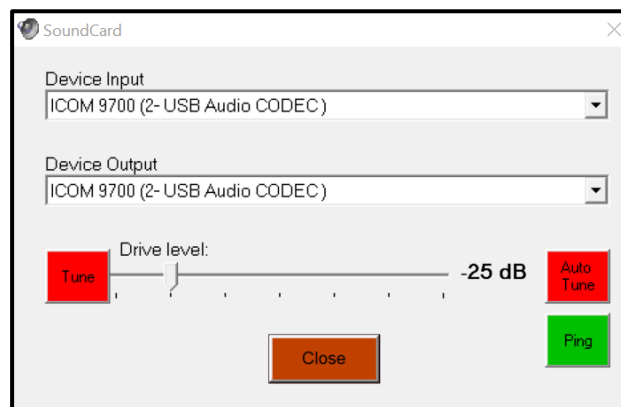
Virtual TNC Configuration

VARA FM – Sound Card Settings



VARA Sound Card Settings

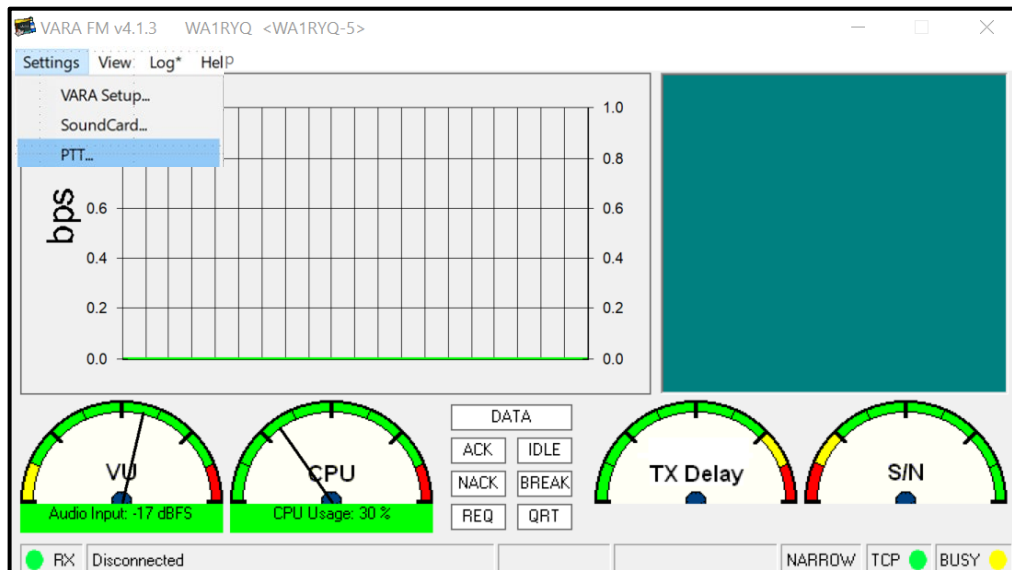
- Device Input: Select appropriate CODEC
- Device Output: Select appropriate CODEC





Virtual TNC Configuration

VARA FM – PTT Settings



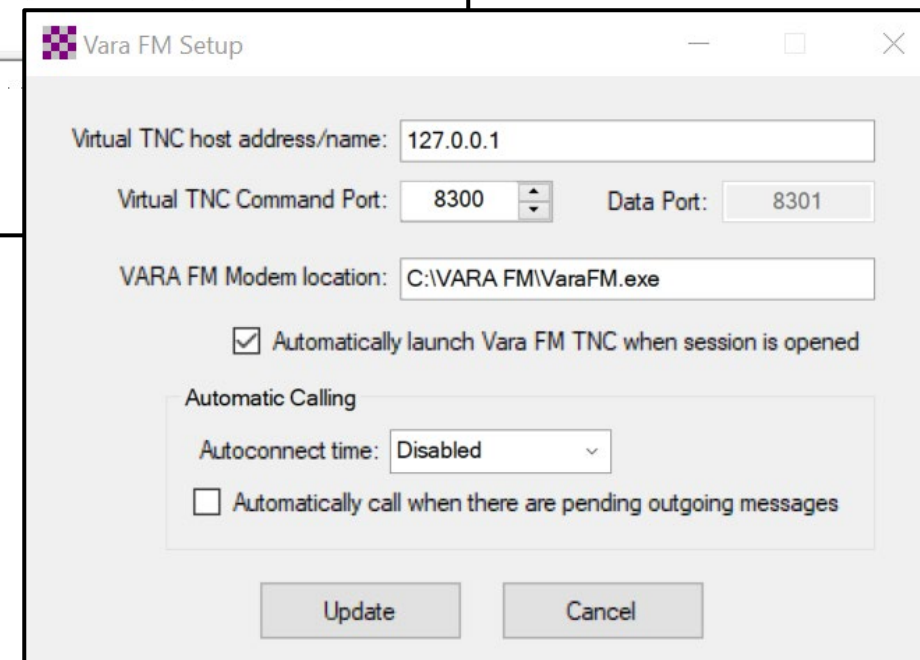
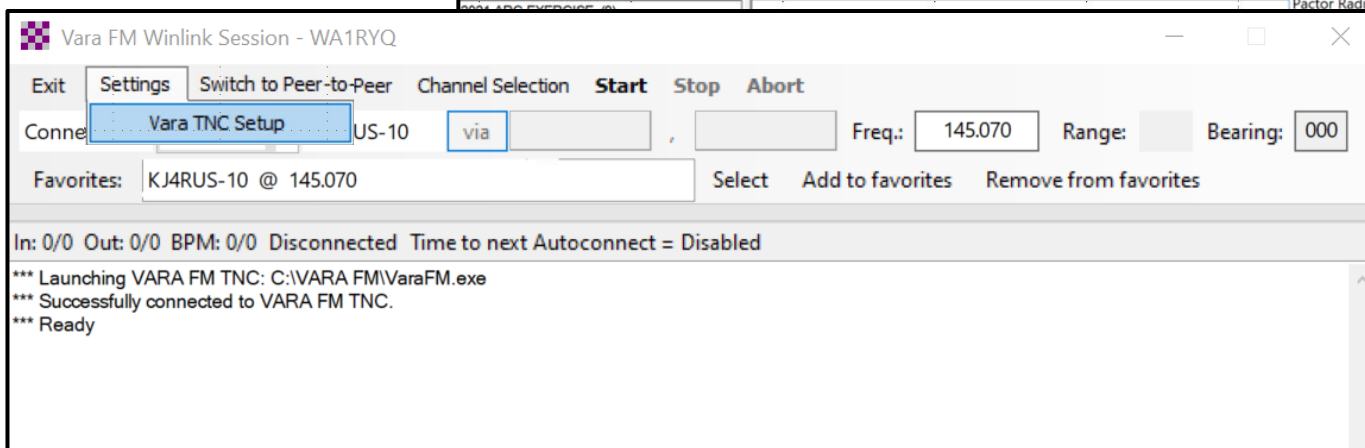
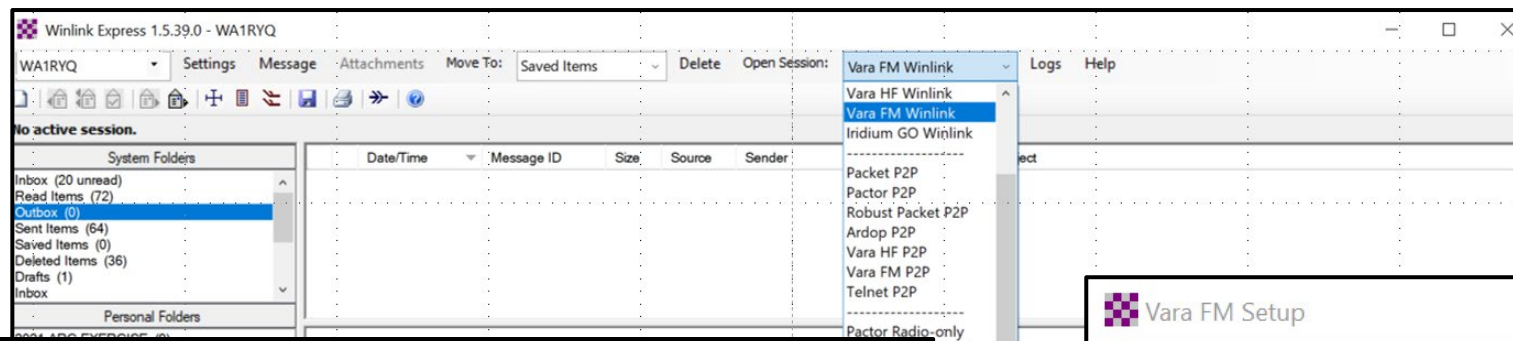
VARA PTT Settings

- 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 Setup

Virtual TNC host address/name: 127.0.0.1

Virtual TNC Command Port: 8300 Data Port: 8301

VARA FM Modem location: C:\VARA FM\VaraFM.exe

☒ Automatically launch Vara FM TNC when session is opened

Automatic Calling

Autoconnect time: Disabled

☐ Automatically call when there are pending outgoing messages

Update Cancel

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/)

<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)

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

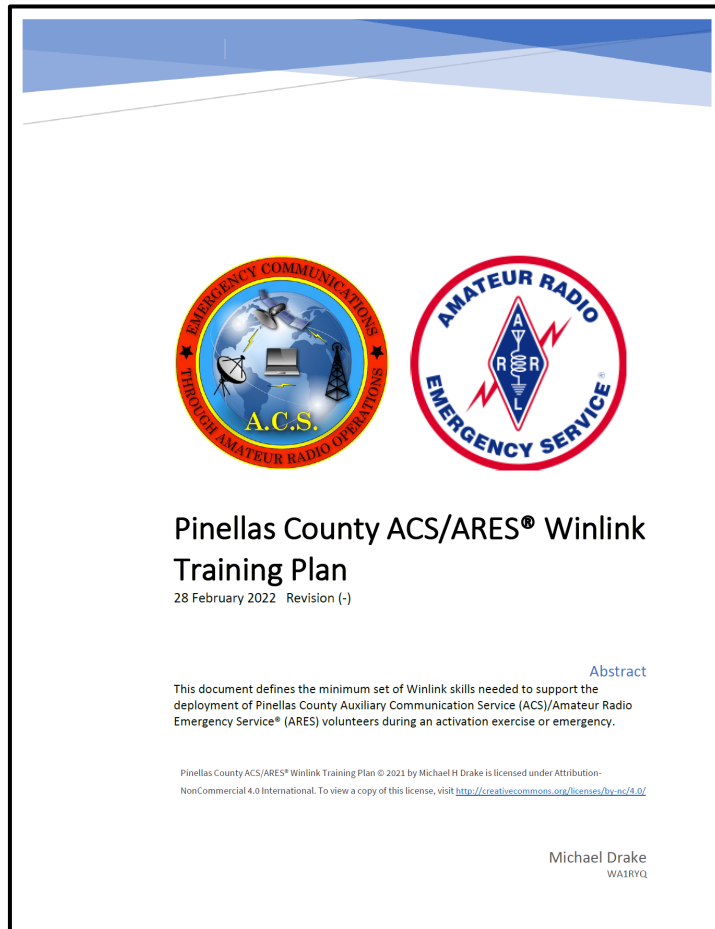
EA5HVK
Weak signals Software

- VARA HF 4.3 Quick Guide
- VARA HF 4.0 kurzanleitung
- VARA HF Tactical
- VARA Documentation
- VARA Huffman compression
- VARA TNC Commands (for developers)
- CM108 Simple Soundcard Interface
- VARA Modem: Innovation aus Spanien (by HB9AUR)
- "VARA", e il modem non c'è più (by IZ2RLJ and IZ5IVV)
- VARA Eine innovative Softwarelösung zur Übertragung von Daten über Funk (by HB9NBG)
- Operación con VARA y Winlink Express (by EA3OG)
- Webinar modo digital VARA en español (by XE1BRX)
- VARA Chat over HF (OE3FQU<->OE3CQB)
- Testing VARA (by K2MO)



Conclusion

- 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