The Winlink
Radio e-Mail Network
Winlink for Emergency Communication

Phil Sherrod – W4PHS / NCS398

Developed by
The Winlink Development Team

Defense Secretary Leon Panetta warns of "Cyber Pearl Harbor".

What is Winlink

- Email over radio, worldwide.

- Mature, well-tested, and full-featured system.

- Adopted by government agencies at all levels for contingency communications.

- Extensive use by CISA SHARES and their member agencies.

- Used by the National Guard

- Used by infrastructure-critical NGOs.

- Historical usage trend from Maritime to EmComm.

- Development is driven by user input and experiences during incidents and exercises.

Winlink Interoperability

- Connects amateurs, SHARES, USCG Aux, National Guard, NGO, and many others.
- HF – Pactor, Winmor, Vara, ARDOP
- VHF / UHF – Packet, Vara FM
- SMTP/POP/IMAP – Outlook and other mail clients
- MESH over microwave (for example, AREDN)
- Radio bridge to Internet e-mail allows connectivity to almost everyone in the world.
- A radio system is worthless unless it's interoperable with the person you want to reach. With the e-mail bridge, Winlink is the most interoperable radio system in the world.

Winlink Has Been Used in Multiple Incidents

overnment Activation

Exercise for Congress

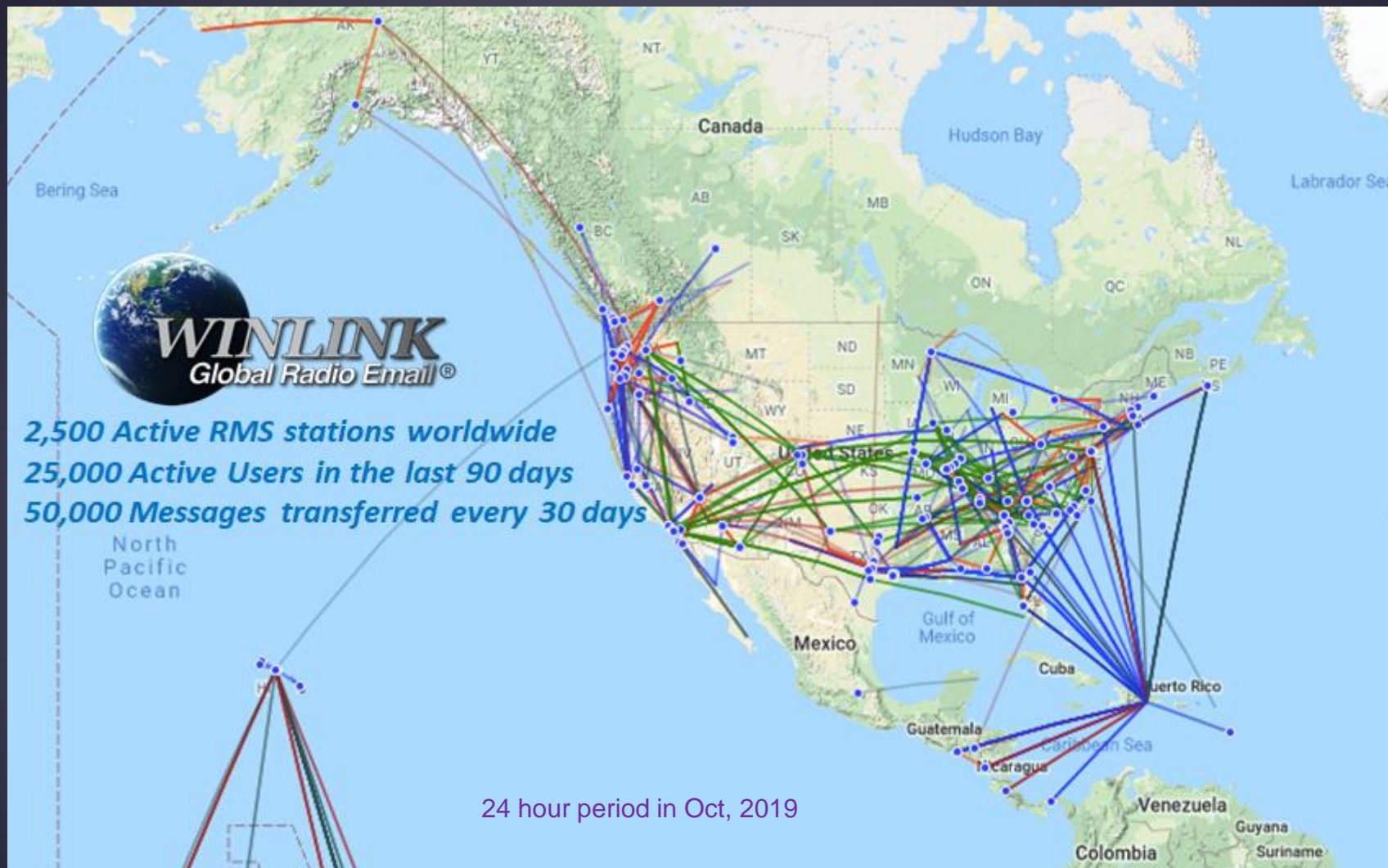
Hurricane Maria

California Fires
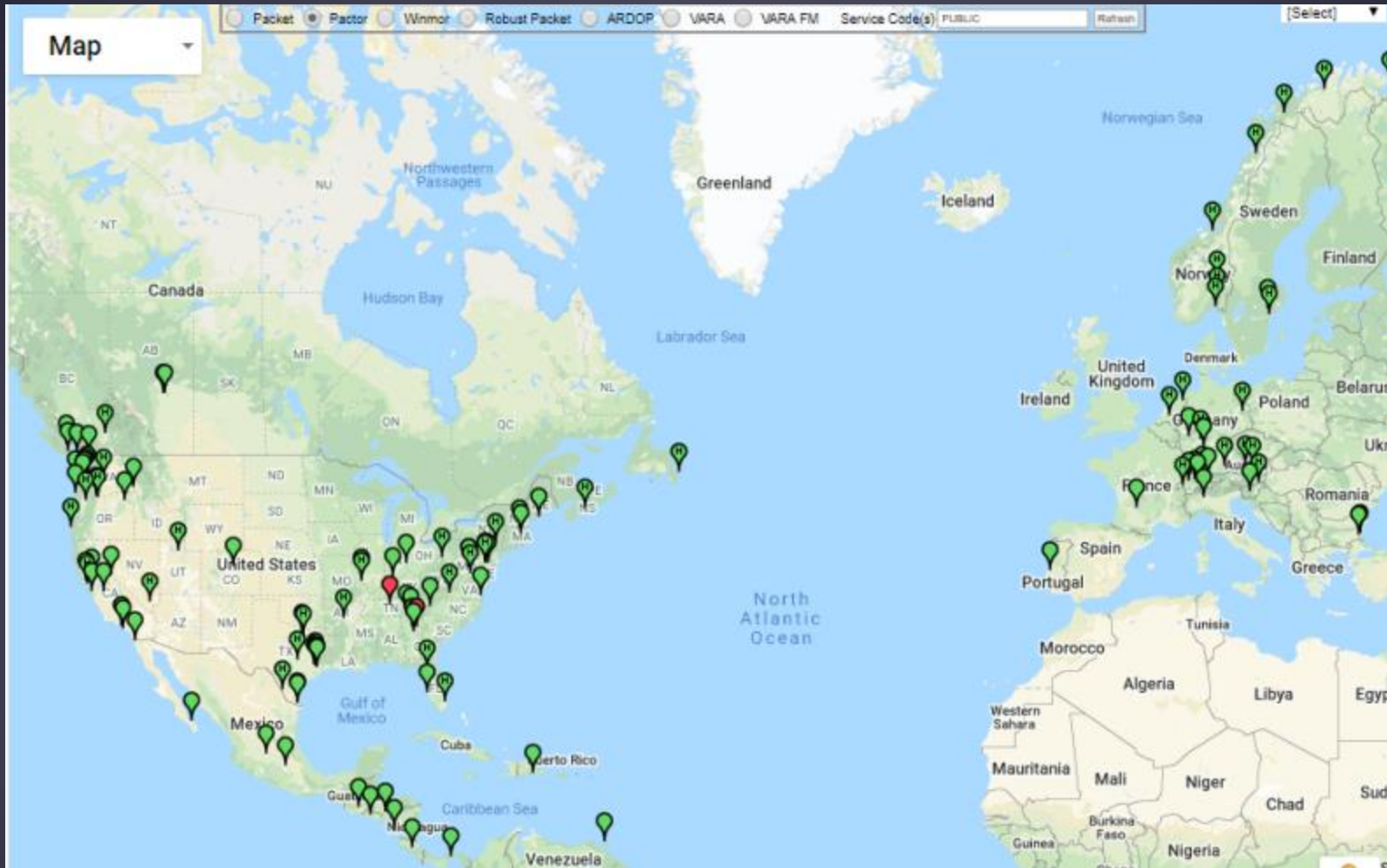
Winlink System – Inexpensive & Portable

- Equipment for a Winlink station:
  - HF Radio and Power supply – Ham radios are fine
  - HF antenna – Must be frequency agile
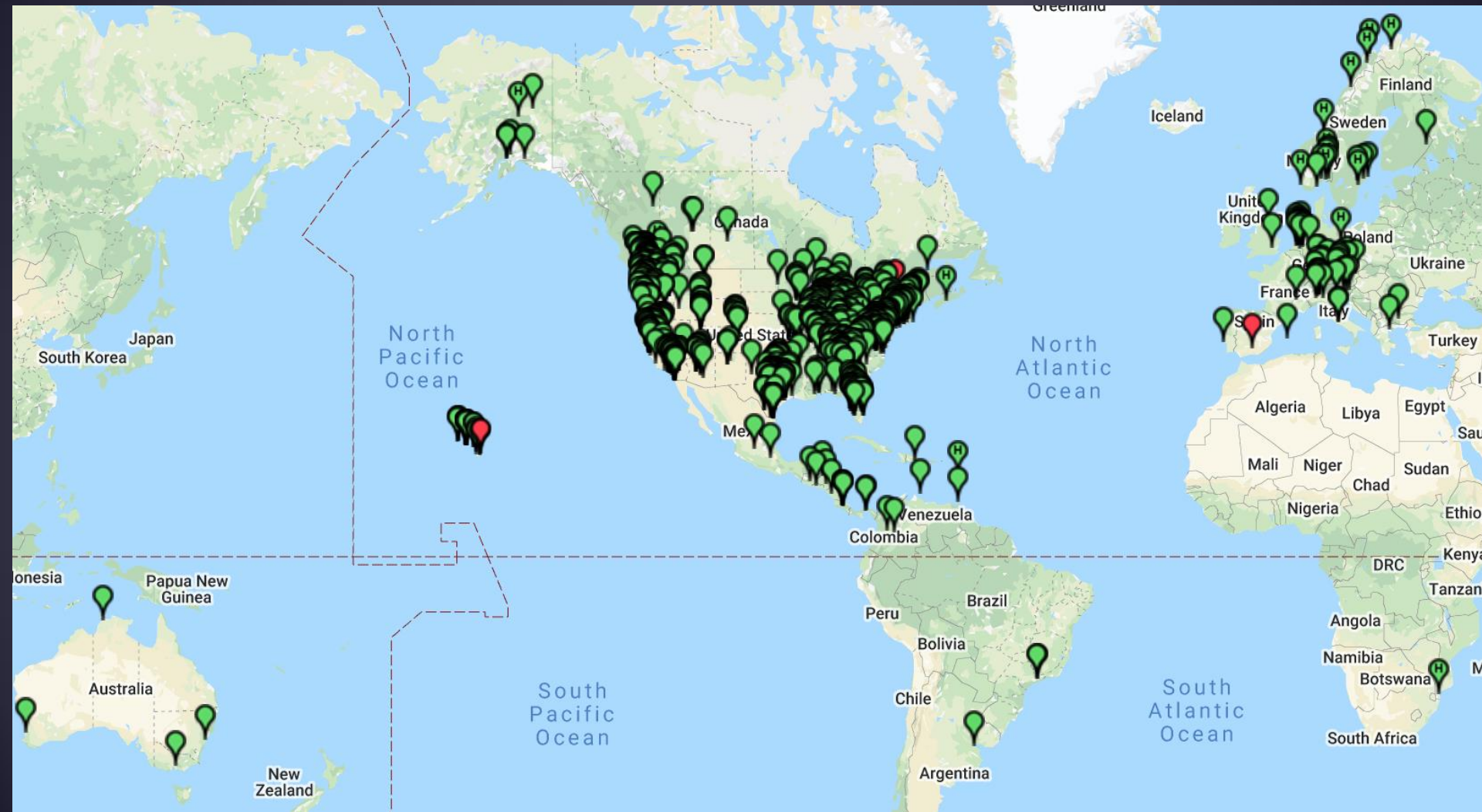 - Pactor modem
  - Soundcard
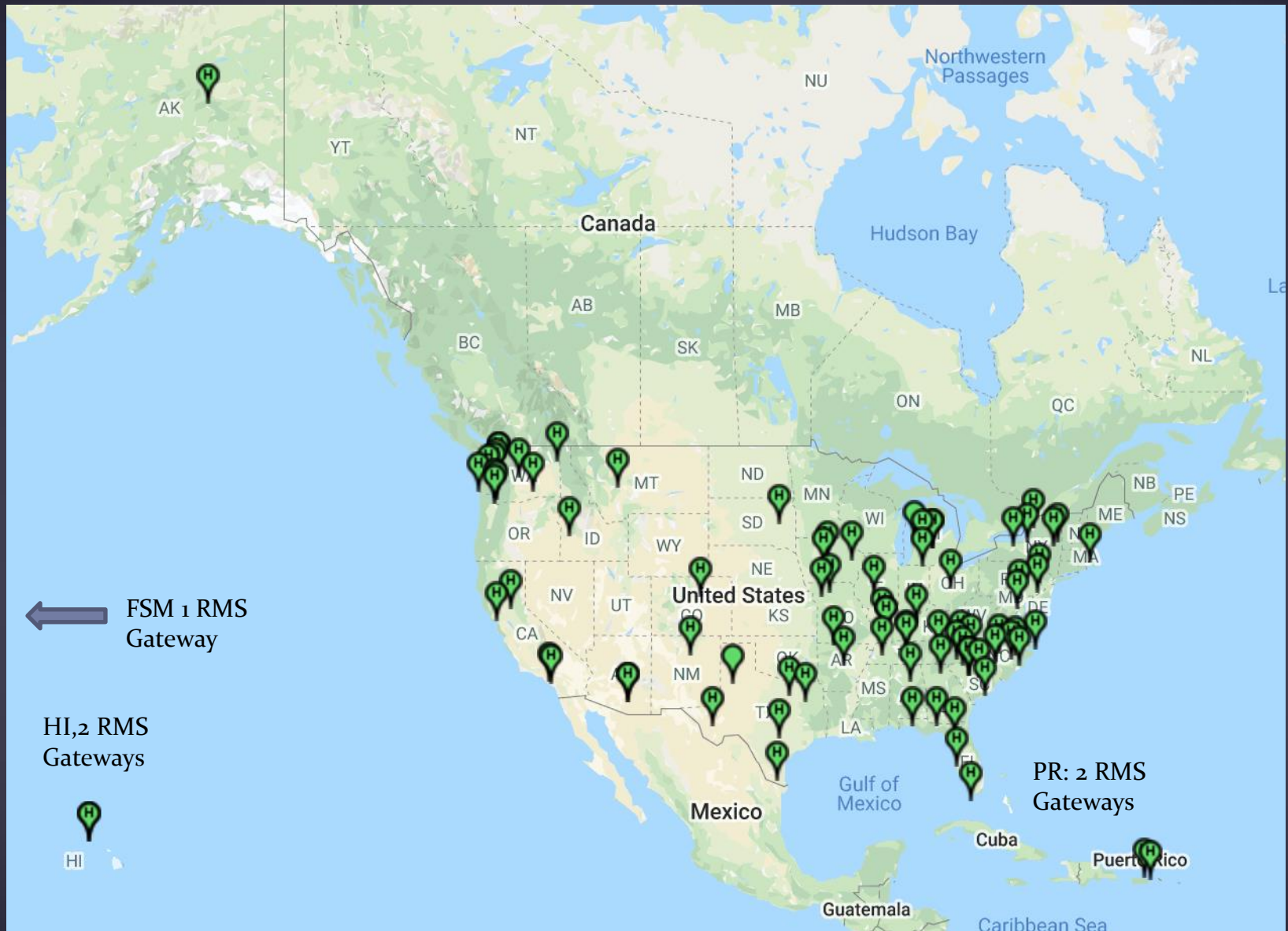 - Cost about $3,200

Scope of Winlink System

WINLINK
Global Radio Email ®

2,500 Active RMS stations worldwide
25,000 Active Users in the last 90 days
50,000 Messages transferred every 30 days

24 hour period in Oct, 2019

Current Ham HF Pactor RMS Stations

Ham VHF/UHF RMS gateways

CISA SHARES Winlink Hybrid RMS Gateways

FSM 1 RMS Gateway

HI,2 RMS Gateways

PR: 2 RMS Gateways

Why Do We Need HF Radio and Winlink?

- We have ever-expanding cell phone coverage, FirstNet, IPAWS, Satellite systems & Internet communications.

- So why do we need HF radio and Winlink...

- Because of hurricanes, ice storms, earthquakes, forest fires, cyberattacks, and many other events that knock out everything else.

- Because of its reach, HF radio can provide essential communication when all other communication is gone. Puerto Rico and New Orleans are good examples.

- HF Winlink requires no external existing infrastructure.

Disaster Assessment Picture – Kentucky Ice Storm

Kentucky Ice Storm

Cell, Land-line or Fax? NO!

- Air Card? NO!

-Public Safety, Mutual Aid? NO!

- Satellite/Microwave? NO!

-Winlink Radio E-Mail?
Yes! Mobile from a TEMA vehicle.

This picture was one of several sent by TEMA mobile through the Winlink radio email system.

DHS Submission to FCC After Puerto Rico

The value of volunteer amateur operators cannot be overstated. DHS comments filed to the FCC regarding the use of amateur volunteers during the 2017 Hurricane season (mainly Maria):

"FCC *Q1: To what extent were response efforts facilitated by amateur radio operators?*

DHS A1: In addition to the direct services provided by amateur radio operators, the indirect services of technology development, operator training, and support of the SHARES Winlink network (among others) makes amateur radio an indispensable component of our national capability to prepare for, protect against, respond to, recover from, and mitigate against all hazards."

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Additional DHS Comments

The value of volunteer amateur operators cannot be overstated. DHS comments filed to the FCC regarding the use of amateur volunteers during the 2017 Hurricane season (mainly Maria):

"FCC *Q2: Going forward, should efforts be made to increase the use of amateur radio services in connection with the planning, testing and provision of emergency response and recovery communications?*

DHS A2: We ask the Commission to review those aspects of Part 97 of their rules relating to emergency communications, including operational and technical restrictions, which limit utilization of new technologies".

What Winlink Offers for EmComm

- Reliability, Accuracy, and Interoperability:
  - High reliability (99.99% availability for 15 years)
  - 100% accurate message transmissions (ARQ protocol)
  - Radio bridge to Internet e-mail.
- Geographical dispersion and redundancy for reliability
- A communication system is only useful if the recipient can receive the messages. Winlink is used by *many* agencies and NGO. Even if they don't have a radio, you can send and receive Internet e-mail.
- Interoperability is vital in EmComm.

What Winlink Offers for EmComm (more)

- Standard e-mail format with many features
  - Binary file attachments (pictures, pdf, spreadsheets)
  - Automatic message compression/decompression
  - On SHARES, encrypted attachments and Pactor 4.
- Time independence – Stores messages for pickup at a later time.
- Good operation at most power levels
- Not limited by station-to-station propagation
- Many built-in ICS and other forms
- Automatic message logging, and 309 report generation
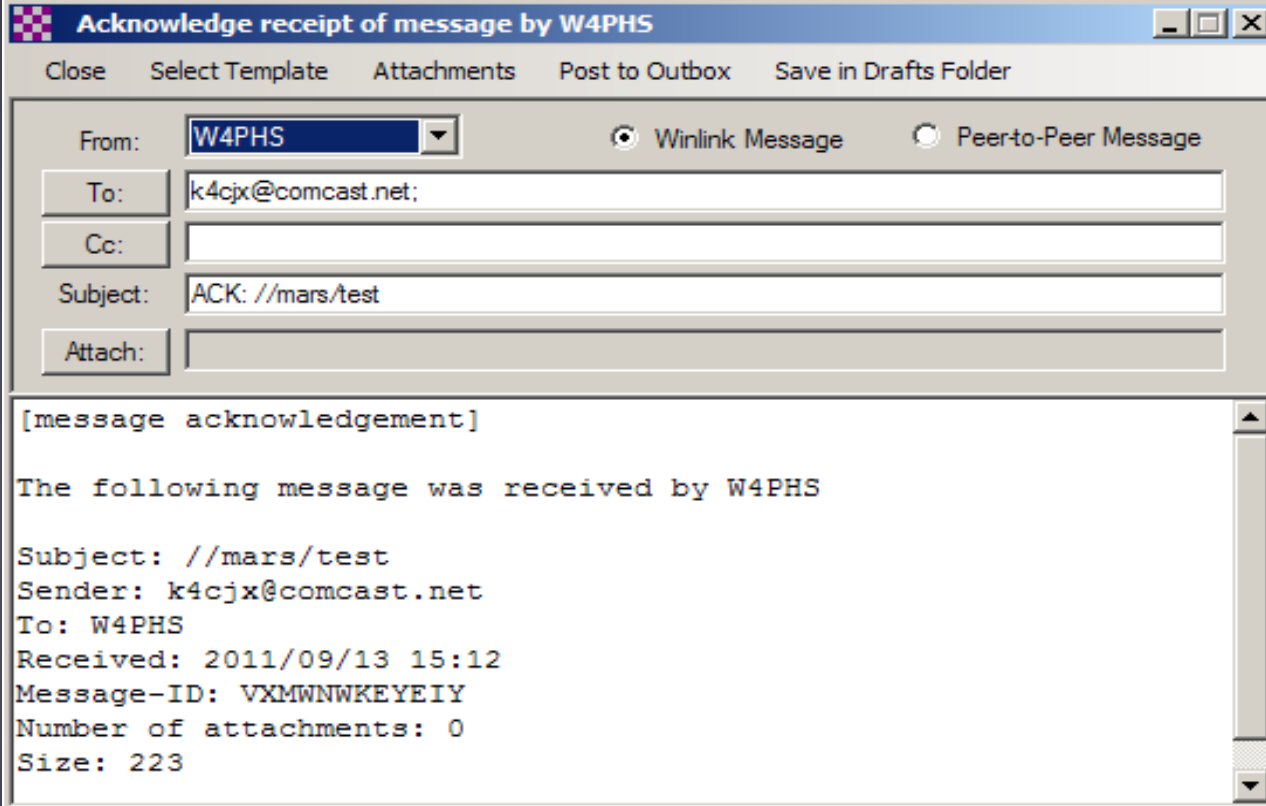
Winlink Express Features for EmComm

- Message read receipt acknowledgments
- Picture editor
- Position reports
- Catalog requests
- Standard forms
- 309 Message log generation
- Conventional, Radio-only, and MESH operation

Message Receipt Acknowledgements

- Positive acknowledgment that message was received
- Information about message filled in automatically
- Proof of message delivery

Requesting Receipts and Setting Message Defaults

Request read receipt for this message

Primary callsign or tactical address

Default to conventional, radio-only, or peer-to-peer

Automatically use these CC addresses

Request read receipts by default

Message may not be altered when forwarded or received

Set message sending defaults

to Outbox   Spell Check   Save in Drafts

☐ Request read receipt   Set Defaults

Message Default Settings   —   ☐   ✕

Default account for sending: W4PHS

Default sending mode: Winlink Message

Default CC addresses

Message sending options
☐ Default request read acknowledgement
☐ Disallow editing or altering sent messages

To use defaults, close and reopen the message screen

Save   Cancel

Setting User Preferences

Review pending messages before downloading

Options for message acknowledgments

Preferences ✕

Message Reading Options
Viewing seconds before marking message read: [2]
Automatically move read items to Read Items folder ☐

Message review before downloading
☐ Display list of pending incoming messages prior to download

Message acknowledgement options
☐ Default to requesting message read acknowledgements
☐ Automatically send message read acknowledgements when requested
☐ Automatically send message read acknowledgements for all read messages
☐ Ignore read acknowledgement requests on incoming messages

Message sending options
☐ Automatically add contact entry for each destination address
☐ Disallow editing or altering messages you send

Line wrapping
☑ Wrap print lines after this many characters: [72]

Distance Units
○ km   ◉ Miles

Update   Cancel

Posting Position Reports

- Send message with your current position
- Manually enter or use GPS input
- Use Catalog Request to locate nearby users

Winlink Webpage Position Map

- Position map at https://winlink.org/userPositions
- Updated as new position reports are received
- Click a pin for detailed information
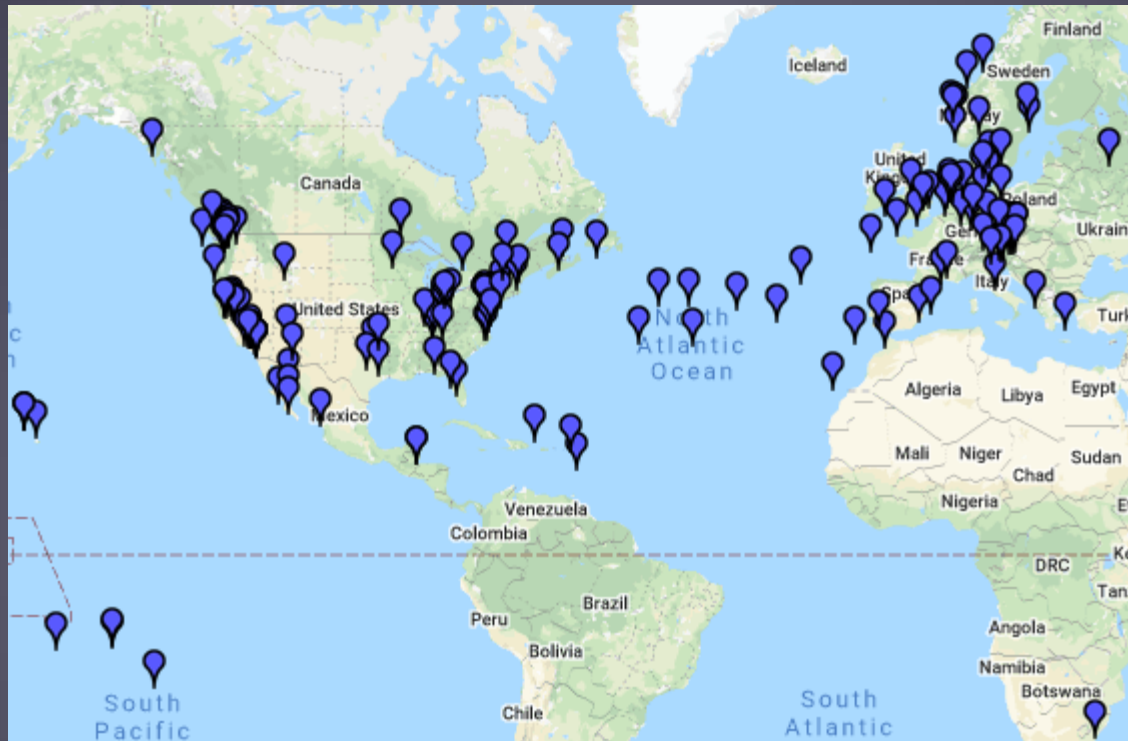
Winlink Catalog Requests

Reply to Catalog Request

Request for Report of Closest Users

Built-in Picture Cropping/Resizing
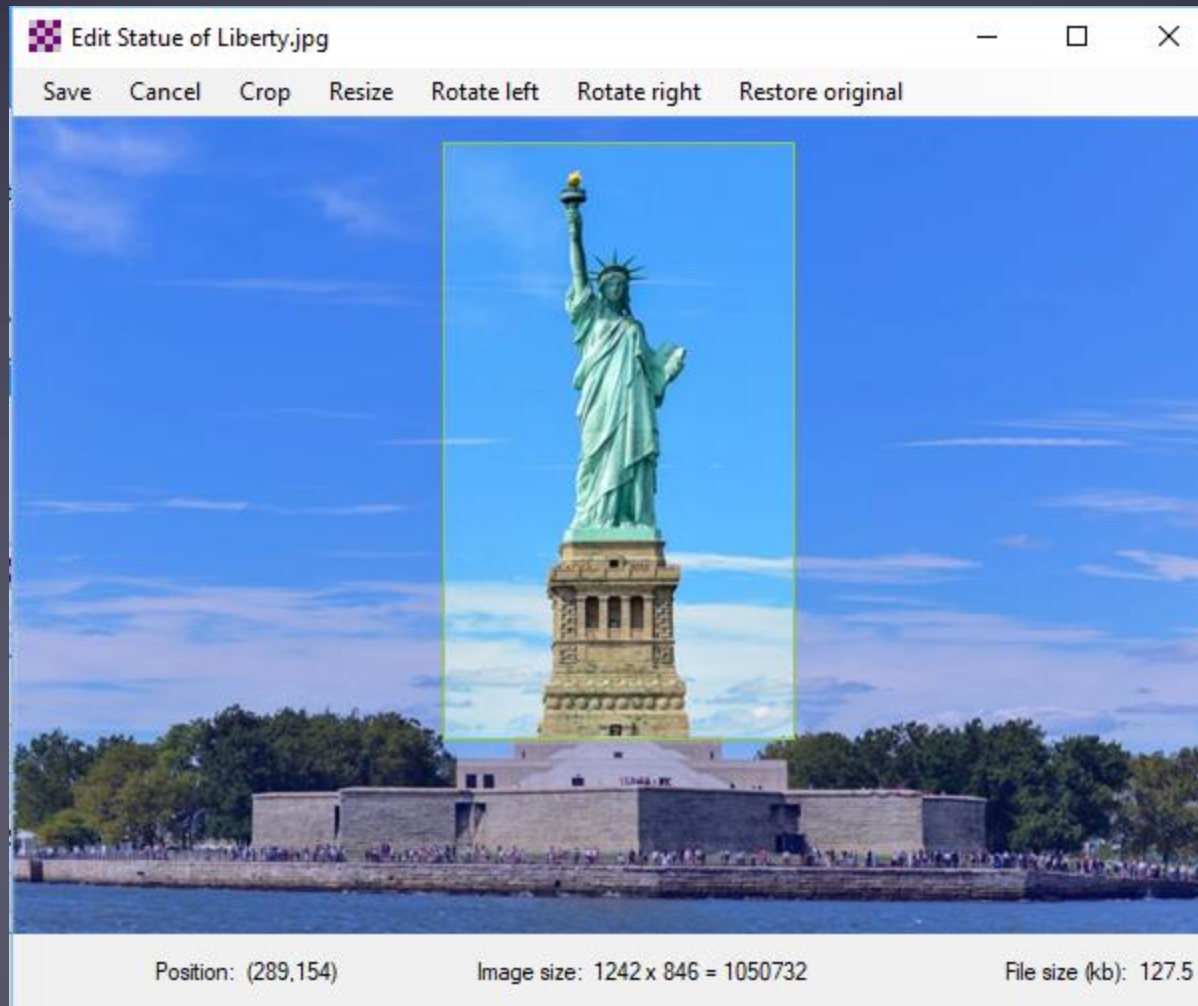
Message Templates & Forms

- Winlink Express has built-in message templates and html forms.
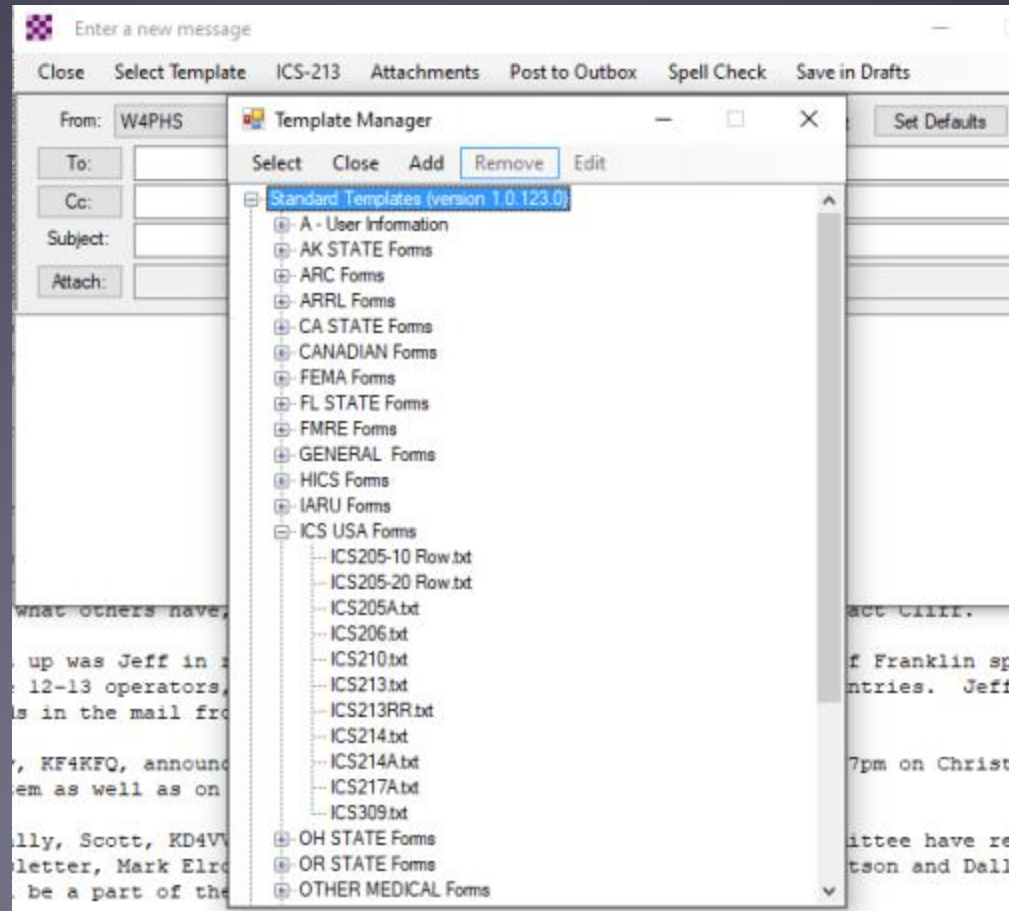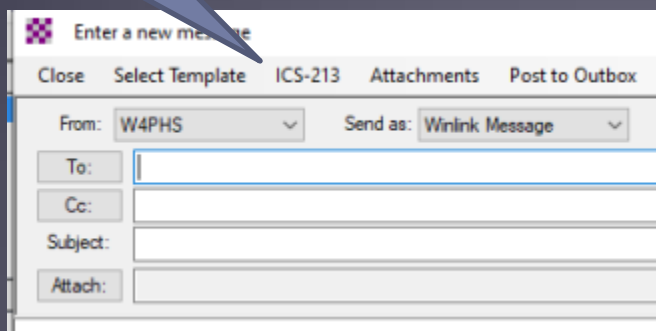
Example 213 Message Form

General Message (ICS 213)

1. Incident Name: Test 213 message form

2. To (Name/Position): Phil Sherrod

3. From (Name/Position): Phil Sherrod

4. Subject: Test message sent as an ICS 213 form   5. Date: 2019-7-11   6. Time: 12:44

7. Message

Situation at shelter:

23 persons currently being held.
20 adults and 3 children
1 dog
Running on generator power. Estimated fuel 12 hours.
Food available for today, but not tomorrow.
Water sufficient for two days.
10 additional blankets needed.
Dog food needed

8. Approved by: Phil   Position / Title: Shelter RADO

Selecting Favorite Forms/Templates

- Favorite forms/templates have buttons on the message composition screen.

ICS-213 has been set as a favorite form
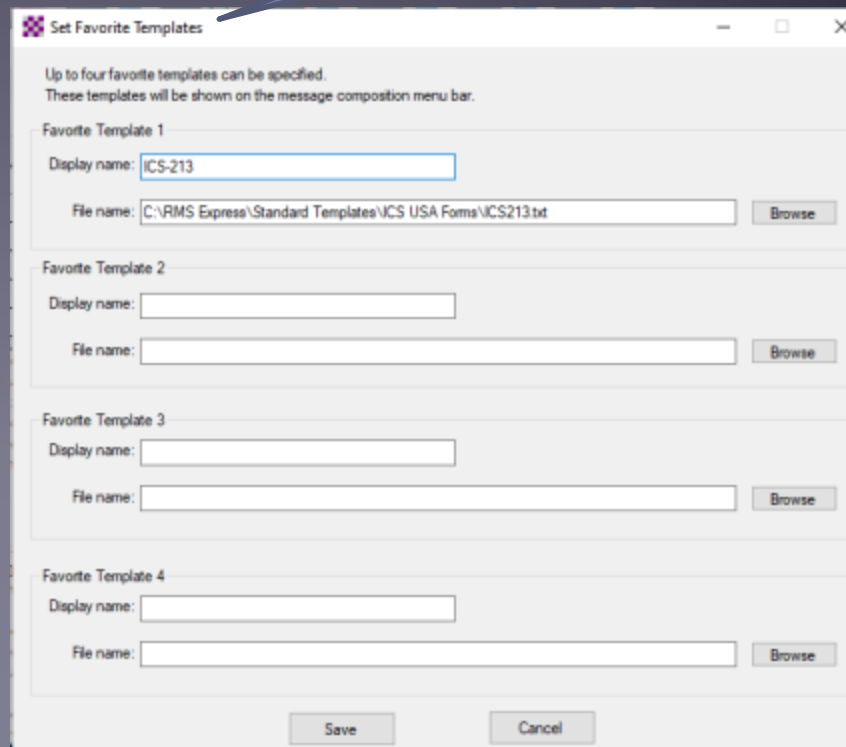
Message/Set favorite templates screen

Built-in ICS-309 pdf Message Log Generator

Winlink Operating Modes

- For efficiency, reliability and flexibility, the Winlink system provides four modes for transferring messages:
  - **Conventional** system that stores messages on CMS "backbone" servers. Uses Internet from RMS to CMS.
  - **Radio-Only ("Hybrid")** network that transfers messages over long distances using automatic HF forwarding without the Internet.
  - **Peer-to-Peer** direct connections between two client stations without any use of Internet or Infrastructure.
  - **MESH Network**
    - **Peer-to-peer** through MESH between two Winlink Express.
    - **Post office server** hosted by RMS Relay.

Winlink Architecture (Conventional Mode)

- CMS

- RMS (gateway)

- Client (you)
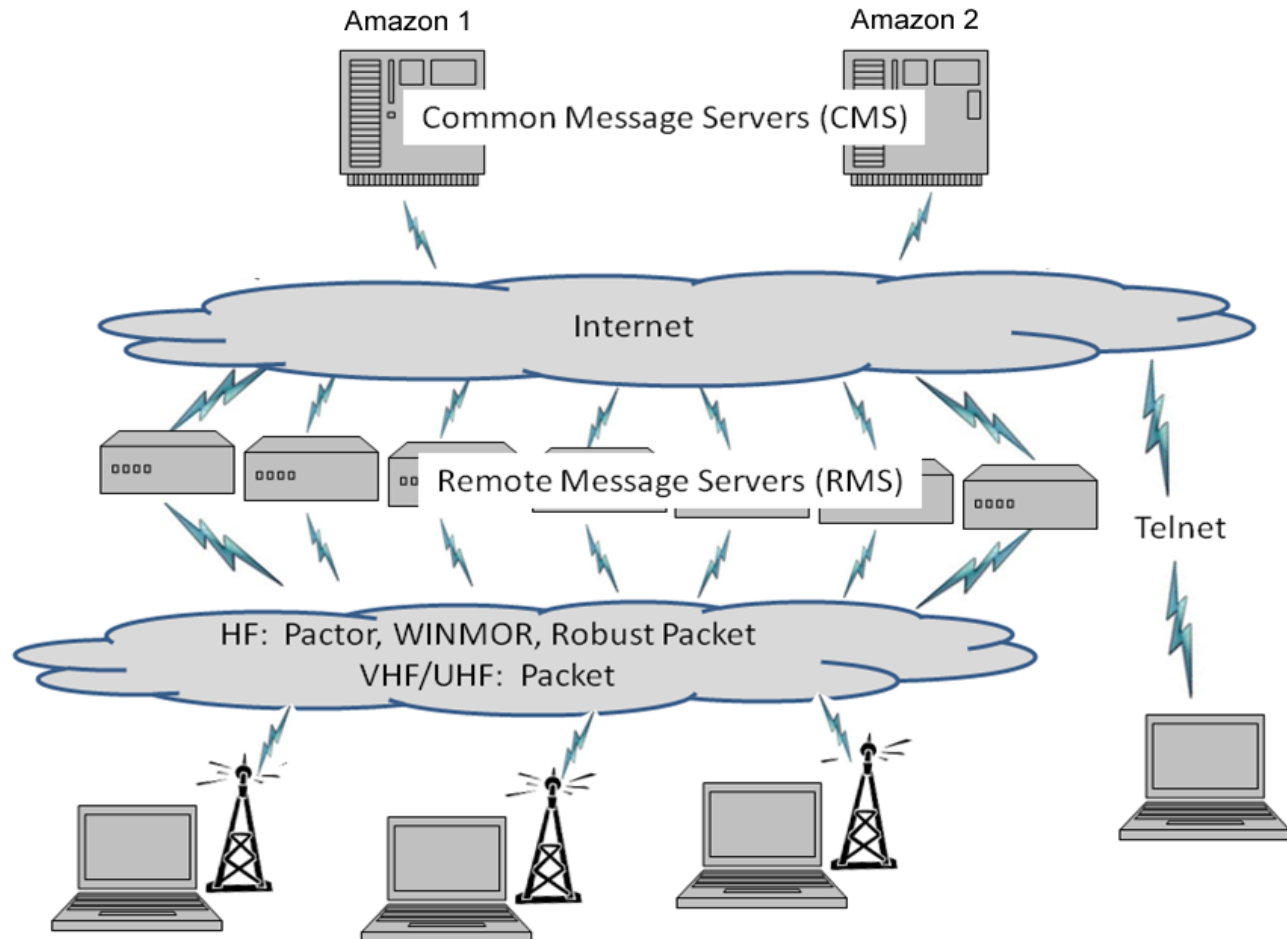
What if the Entire Internet is Down?

- Winlink offers a contingency "Radio-Only" operating mode that transfers messages without using the Internet.

- Not for use under normal circumstances, but it's there if the need arises.

- Note: Conventional Winlink works fine if you are in a no-Internet zone, but you can make an HF connection to an RMS with Internet.

- Radio-only mode is if the whole Internet is down or it's required by the agency you're supporting (e.g., SHARES).

Radio-Only Winlink Network (No Internet)
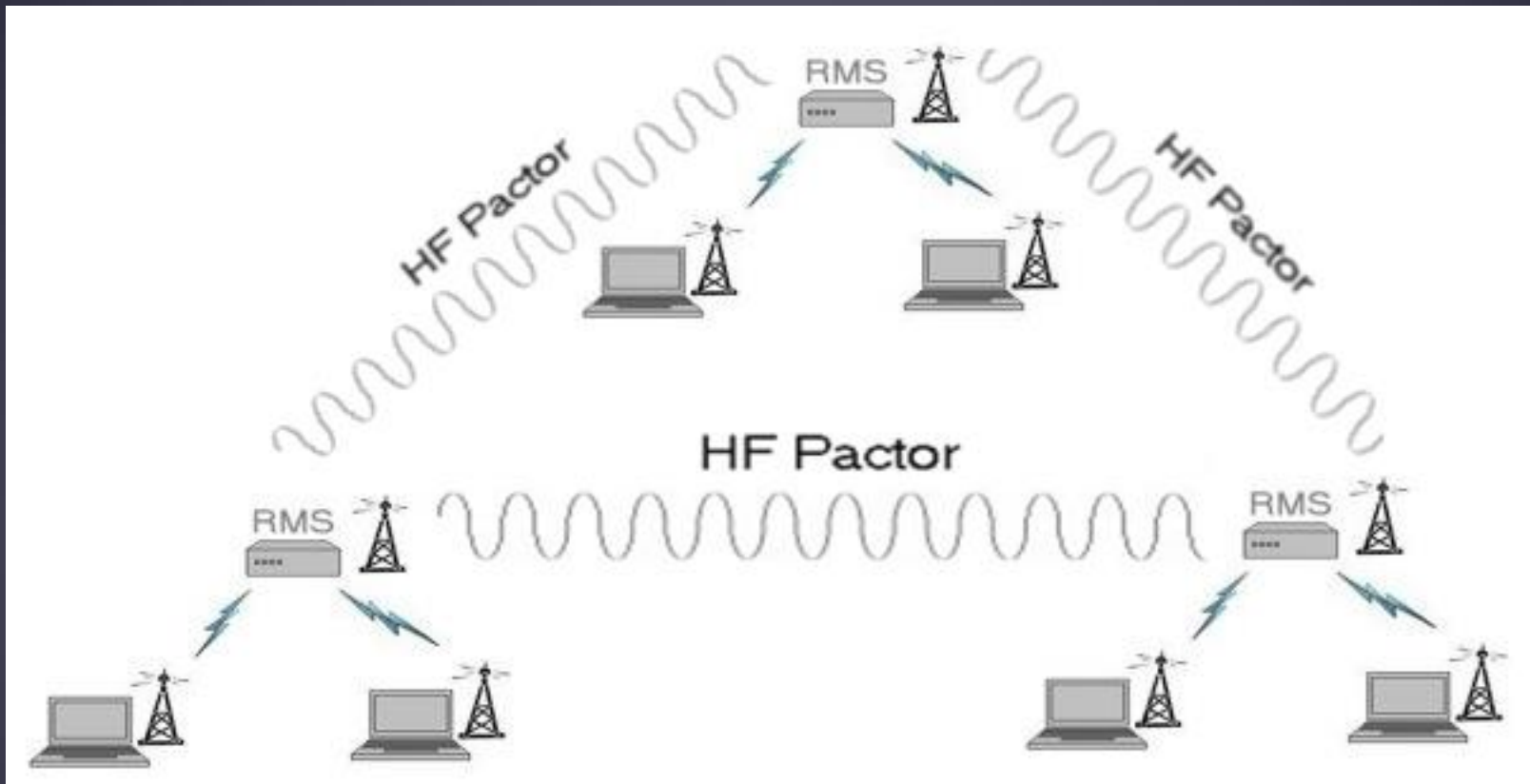
Message Pickup Stations (MPS)

- Radio-only messages for you are stored on your designated Message Pickup Stations (MPS).
- Select your MPS in Winlink Express

Select two RMS as your Message Pickup Stations (MPS)

Specify e-mail address(es) to receive notifications of pending radio-only messages

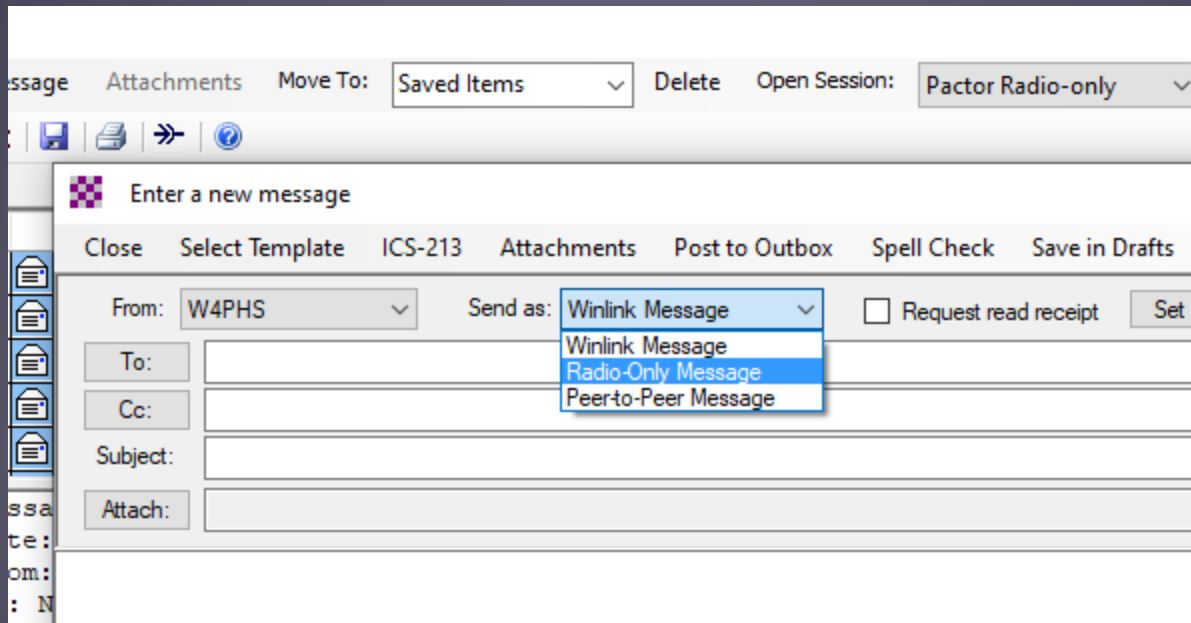# Sending a Radio-Only Message

- Select "Radio-Only Message" when composing message.
- Select one of the Radio-only session types

Pros and Cons of Radio-Only Network

- **Advantages:**
    - Operates completely independent of the Internet.
    - Satisfies requirements of some organizations.
- **Disadvantages:**
    - Messages must be picked up from designated Message Pickup Stations (MPS).
    - Less reliable than conventional mode.
    - There is a delay in message delivery due to relaying.
    - Reduced message traffic capacity due to HF relaying.
    - Cannot send messages to Internet e-mail addresses.

Winlink over MESH Networks

- Winlink Express and RMS Relay work well with MESH networks like AREDN.
- RMS Relay can function as a MESH "Post Office."
- Winlink Express can connect to post office servers through MESH connections.
- RMS Relay can accept Winlink Express and SMTP/POP/IMAP connections for other e-mail programs.
- Contact entries can designate users on post office servers.
- RMS Relay can automatically synchronize messages between post office servers.

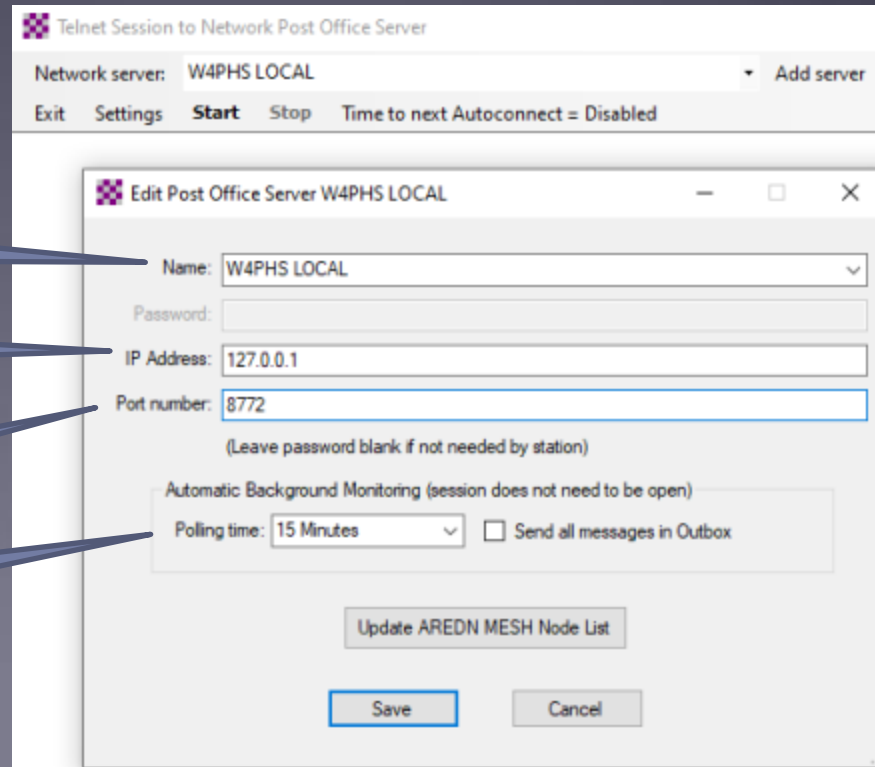# Accessing Post Office Server from Express

- Winlink Express stores a list of P.O. servers you use
- It can do background send/receives

Name you use to reference the mail server.

IP address or domain name of mail server.

Port server is listening on.

Background sending/polling controls.

Adding a Contact Entry on a P.O. Server

- The "Name" is how messages are addressed to it.
- Open the list of mail servers, and select (CMS), a network post office server or a Telnet P2P connection.

Name of the contact. Use as a To address to send messages to this contact.

Actual e-mail address or callsign

Optionally, select mail server where messages are to be sent.

Sending Messages to a Contact

- Specify the contact name as the recipient
- Message will be sent to the callsign/address at the designated server using a background task.

Use name of contact as To address.

"PO" with recipient in outbox shows message is queued for a post office server

Using RMS Relay with Outlook and other Clients
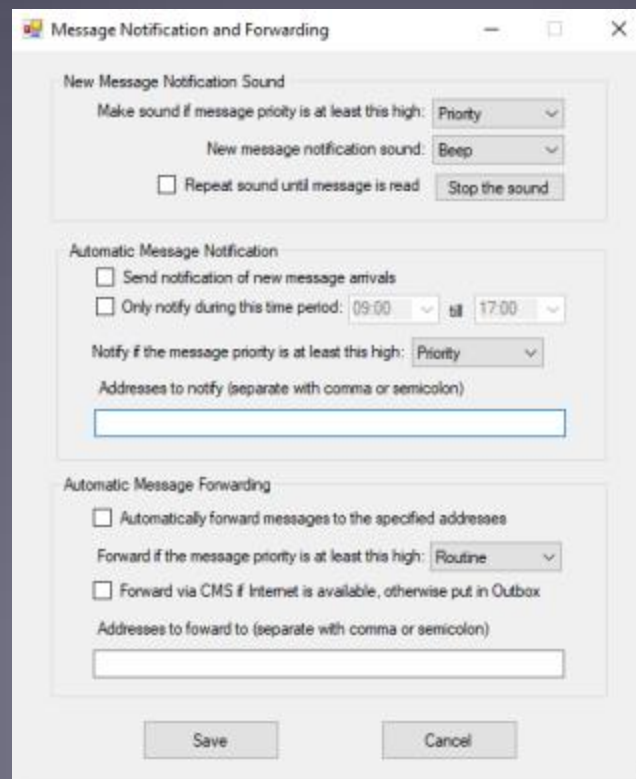
- Outlook and other conventional e-mail programs can connect to RMS Relay using SMTP, POP, and IMAP.

- Tactical addresses are used to identify each individual.

- Radio control and HF forwarding/receiving is done without users' involvement.

- Allows non-radio people to continue sending-receiving e-mail if the Internet goes down.

- Good choice for administrator, mayor, etc.

Message Priority Indicator

- A priority indicator can be specified for a message when it's composed by putting "//WL2K *x*/" on the front of the subject where '*x*' is a single letter indicating the priority.

- //WL2K R/ -- Routine (this is the default priority)
//WL2K P/ -- Priority message
//WL2K O/ -- Immediate priority
//WL2K Z/ -- Flash priority

- Example: "//WL2K Z/ Need immediate assistance"

- Messages are delivered in priority order

Message Notification Feature

- See Settings/Message notification and forwarding
- Winlink Express can ring the computer bell or forward messages if the priority is at least the specified priority.
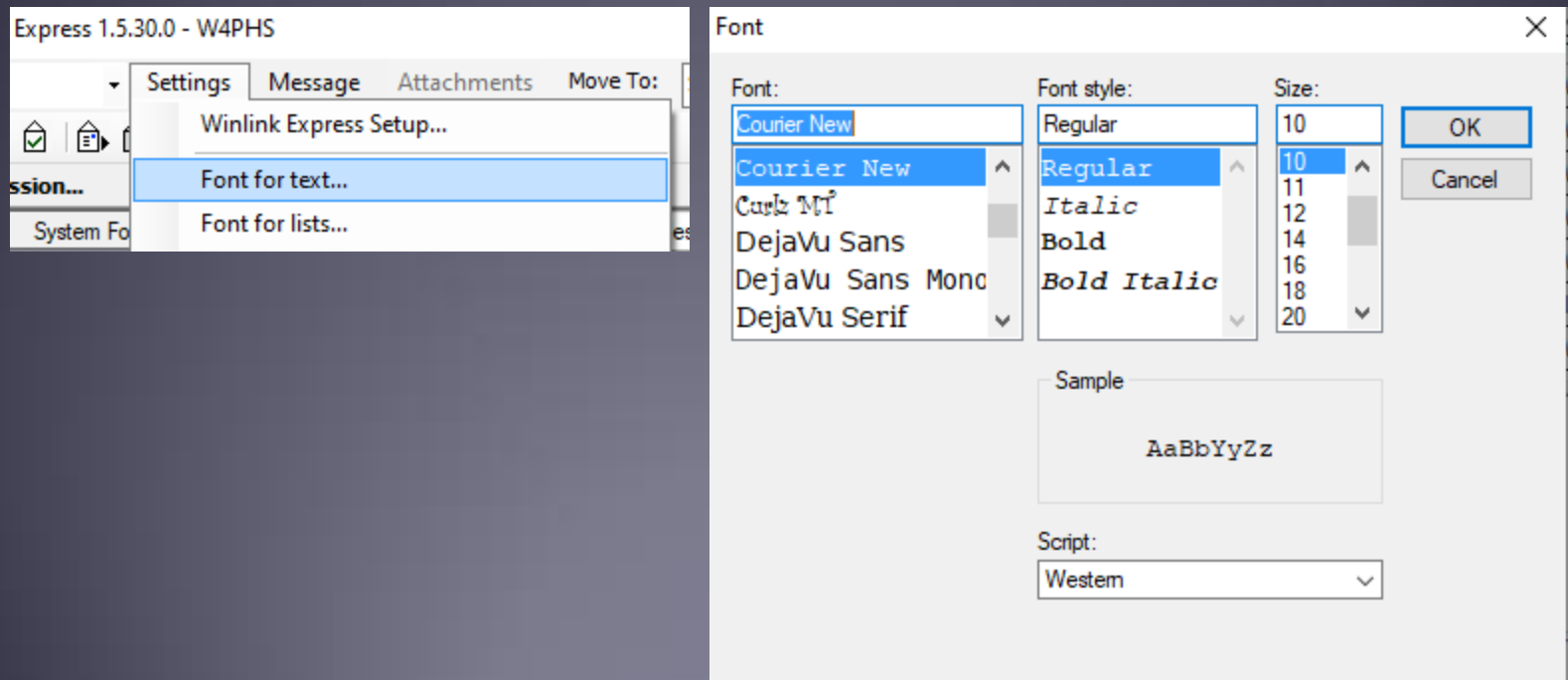
Setting the Typeface in Winlink Express

- Click Settings/Font for text or Font for lists
- Select the font type and size

Winlink Future

- Growth in civil agency support
- Additional forms as requested by agencies (~90 now)
- Feature requests based on incidents & exercises
- Slow phase-out of WINMOR and ARDOP on HF
- VARA HF 2300 and 500 Hz growth
- VARA FM becoming popular (much faster than packet)
- Some programs becoming open-source projects
- IONOS HF/VHF Channel Simulator (KN6KB)
- Busy detector research
- Keeping U.S. hams/sysops legal (frequency/message contents)

Prepare *Yourself* for EmComm Service

- Technology is only one component
- Formula for successful EmComm: I = (2P + 2T)*R
- **I**nteroperability, **P**lanning, **P**olicy, **T**raining, **T**echnology, **R**elationships
- When times are good, people work with people they know. When times are bad, people work with people they know. Relationships are the key.
- When you need a friend, it's too late to make a friend.
- Minimum ICS training: IS-100, 200, 700, 800
- Recommend ICS-300, ICS-400, COML, COMT
- AuxComm training good. ICS training for relationships.
- Participate in exercises. Keep system updated and tested.

![WINLINK 2000 Global Radio Email System]

- Winlink team:
  - Phil Sherrod, W4PHS   (Developer)
  - Steve Waterman, K4CJX   (Administrator)
  - Lor Kutchins, W3QA   (President, ARSFi)
- Winlink web site: www.winlink.org
- White papers about Winlink: www.qrz.com/db/W4PHS
- Support group: https://groups.google.com/forum/#!forum/winlink-programs-group