



Sarasota County ARES (SRQARES)

Winlink



An Introduction to Winlink

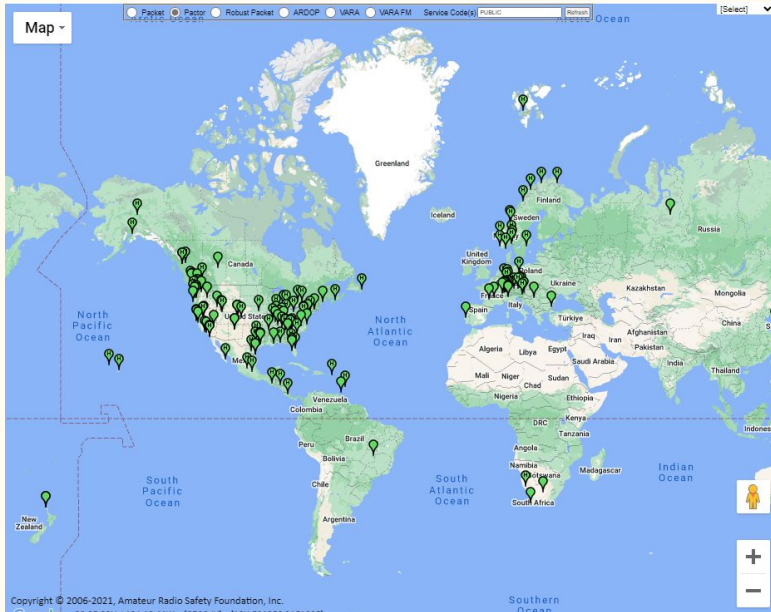
Introduction

- What is Winlink?
- What do I need to use Winlink?
- How does it work?

What is Winlink?

- Winlink is a way for users to send email messages to internet email accounts using ham radio
- Users can send emails over the air, when there is no internet available
- This is accomplished by connecting to a gateway
- Winlink had its origins with the sailing community with email, position reporting and weather information. It now has a substantially broader role supporting emergency and disaster relief communications
- Where can I find out more information? Winlink.org

Winlink Gateways



- RMS: Radio Mail Server
 - An RMS Gateway is connected via the internet to the Common Message Server
 - Client Stations connect by RF to an RMS

Winlink Gateways



- CMS: Common Message Server
 - A CMS Server is the Winlink server that is situated in the Cloud
- Radio-Only Operation
 - This consists of RMS stations that can auto-forward by RF, independent of the internet availability
- MID: Message ID
 - This is a unique alpha-numeric code that is assigned to each message

What do I need to use Winlink?

- Computer (PC, MiniPC, Laptop, Raspberry Pi, Tablet)
 - Windows, Linux, PiOS, Android
- Radio
 - Almost any modern radio should work
- TNC
 - SignaLink, Digirig, Mobilinkd, RigBlaster
- Client Application
 - Winlink Express, PAT, WOAD

Signalink



- Signalink \$120
 - The Signalink™ USB works with virtually ALL radios and can be attached to the Mic jack, Data Port or Accessory Port
 - Front Panel Controls for Audio Levels and PTT delay

Mobilinkd



- Mobilinkd \$150
 - Uses a USB-C connector for charging and USB serial connections
 - Support for M17 data modes
 - Uses a precision oscillator (TCXO) for improved symbol timing
 - The TNC4 is a 1200/9600 baud KISS TNC. It is capable of AFSK, GFSK and 4-FSK modulation.

Digirig



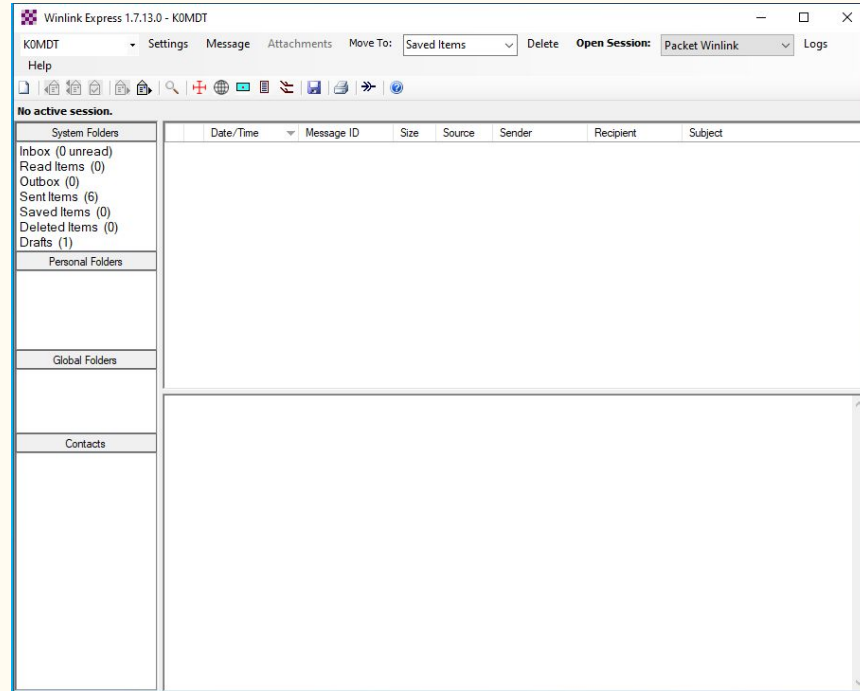
- Digirig \$60
 - Uses a single USB connection to computer minimizing the cables mess
 - Combines audio codec, serial CAT interface and PTT switch
 - Supports full featured CAT interface: PTT, bands, tuning etc. (not just VOX based PTT)
 - Serial computer aided transceiver (CAT) port can be configured for logic levels, RS-232, CI-V or TX-500

Client Applications

Programs (Download)-> Features below	Outpost	AirMail	WoAD	Pat	RadioMail	Paclink- Unix	Paclink	Winlink Express
TELNET	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AX.25 PACKET	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PACTOR 1-3	No	Yes	No	Yes	No	Yes	Yes	Yes
PACTOR 4	No	Yes	No	Yes	No	No	Yes	Yes
ARDOP	No	No	Yes	Yes	No	No	No	Yes
VARA HF and VARA FM	No	No	Yes, limited	Yes, limited	Yes, limited	No	No	Yes. VARA is speed- limited unless licensed.

Winlink Express

[Winlink Express | Winlink Global Radio Email](#)



Winlink Commonly Supported Protocols

- Telnet
- VHF
 - Packet (AX.25)
 - VARA FM
- HF
 - VARA HF

Telnet

- Telnet
 - This is simply a way to connect to the winlink system using the internet
 - This is the fastest way to send messages.
 - This is a great way to test sending messages to verify that part of your system is working correctly

VHF Protocols

- Packet (AX.25)
 - Runs at 1200bps
 - AFSK Modulated Signal, centered at 1700Hz
- VARA FM
 - There are 2 modes
 - Narrow 1200*
 - Wide 9600*
 - (the numbers relates to the port connection speed on the radio)
 - VARA FM is roughly 18x faster than Packet
 - Unlicensed versions of VARA run at roughly 10% the speed of a licensed version
 - Uses PSK Modulation

HF Protocols

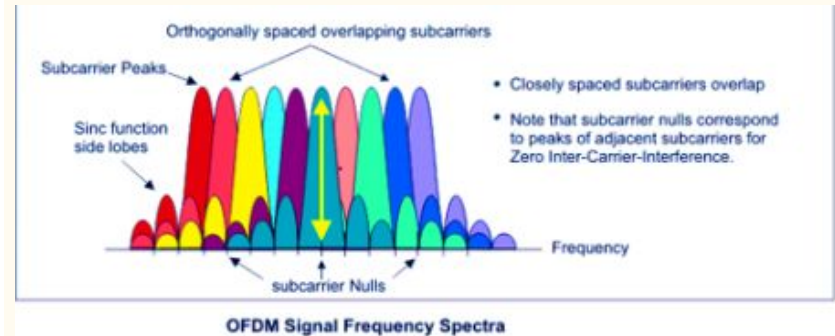


Providing uncompressed User Data Rate to 5629 bps at a low (S/N 14.5 dB @ 4kHz)

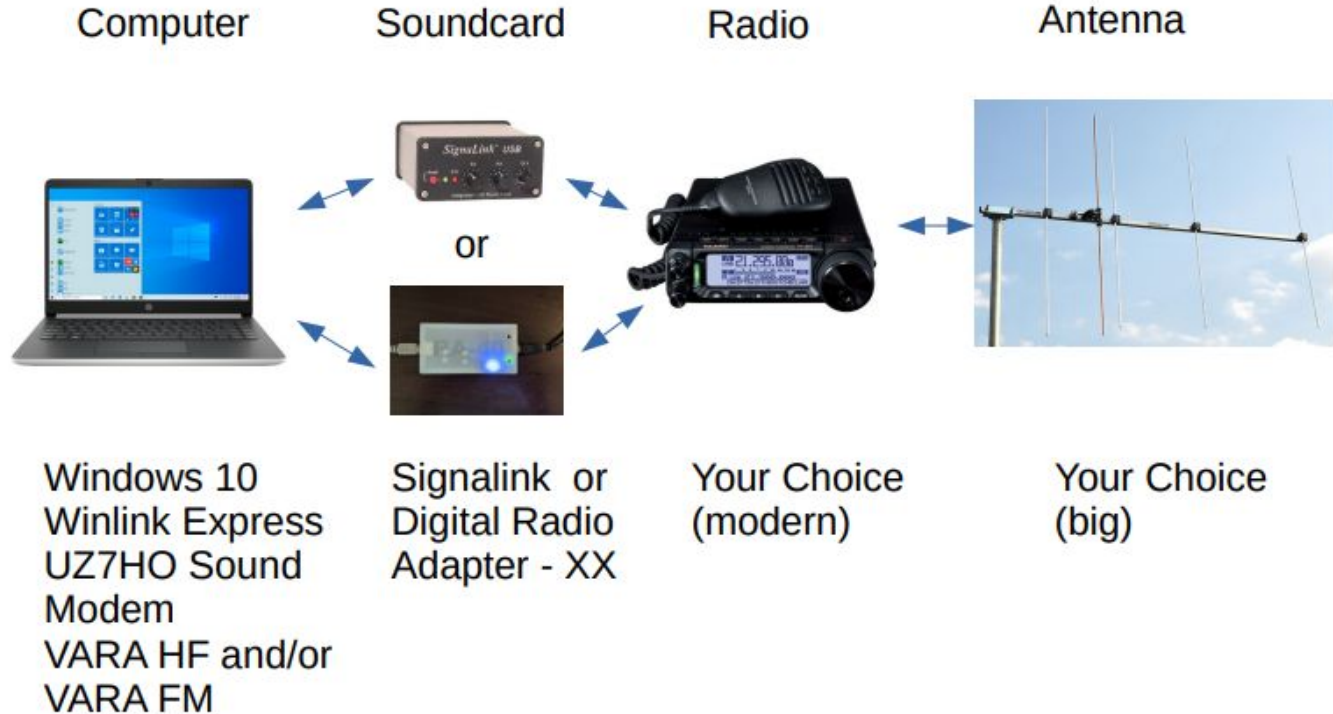
Level	Symbol Rate	Carriers	Mod.	Bytes / Packet	Net Data Rate	User Data Rate
1	37,5	52	BPSK	20	35	29
2	37,5	52	BPSK	32	54	45
3	37,5	52	BPSK	71	113	94
4	37,5	52	BPSK	150	234	194
5	37,5	52	BPSK	308	476	395
6	37,5	52	BPSK	626	963	799
7	37,5	52	4PSK	1257	1929	1601
8	37,5	52	8PSK	1887	2893	2401
9	37,5	52	16QAM	2951	4521	3752
10	37,5	52	32QAM	3690	5653	4692
11	37,5	52	32QAM	4428	6782	5629

37,5 bps Symbol Rate with 52 carriers

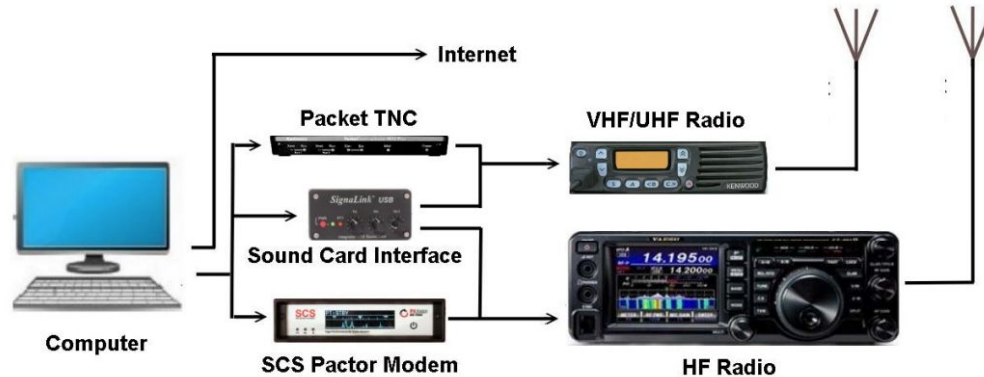
- VARA HF
 - There are 2 modes
 - VARA HF 500
 - VARA HF 2300
 - VARA HF 2300 is roughly 5x faster than ARDOP
 - Designed for use in SSB bandwidth of 2400Hz
 - Uses OFDM Modulation



The Setup

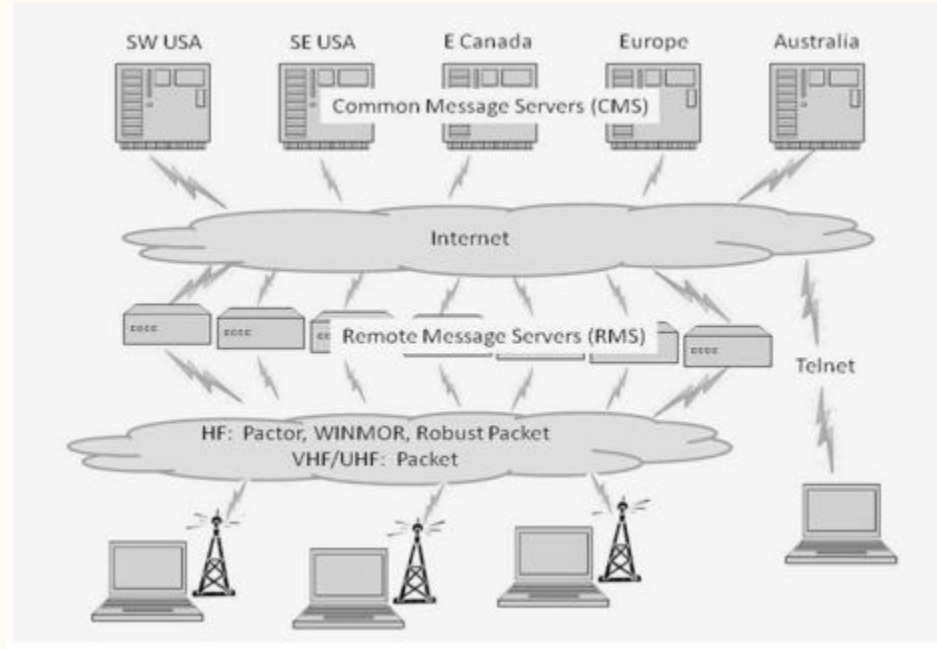


The Setup



- Internet (Telnet): if the internet is available locally
- Packet (VHF/UHF): can use a dedicated hardware TNC or software TNC with sound card modem
- Sound card modes (HF): Winmor, ARDOP, VARA
- Pactor (HF): Proprietary but highest HF performance. Required for governmental SHARES operation (e.g. SHARES)

How does it work?

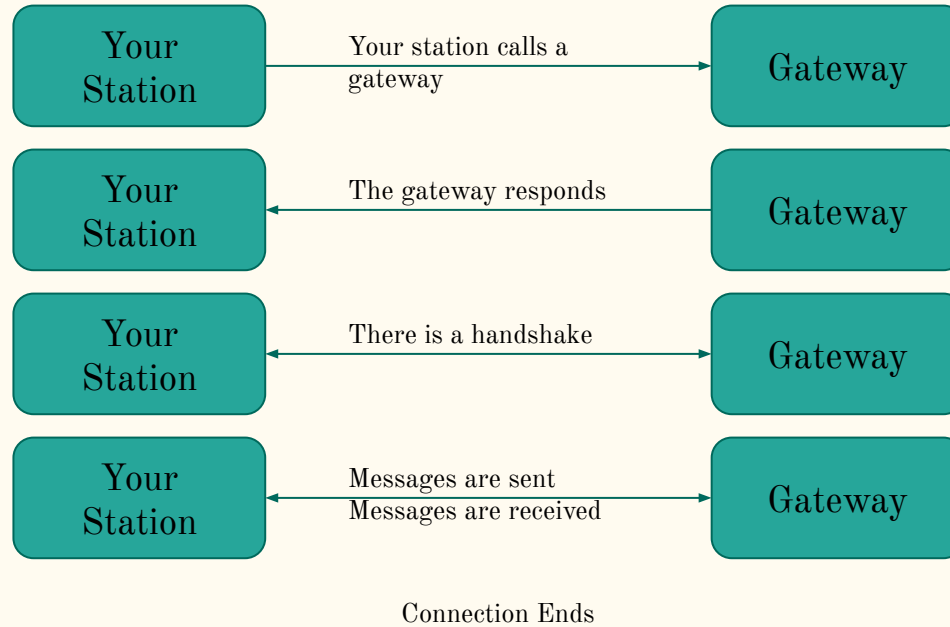


How does it work?

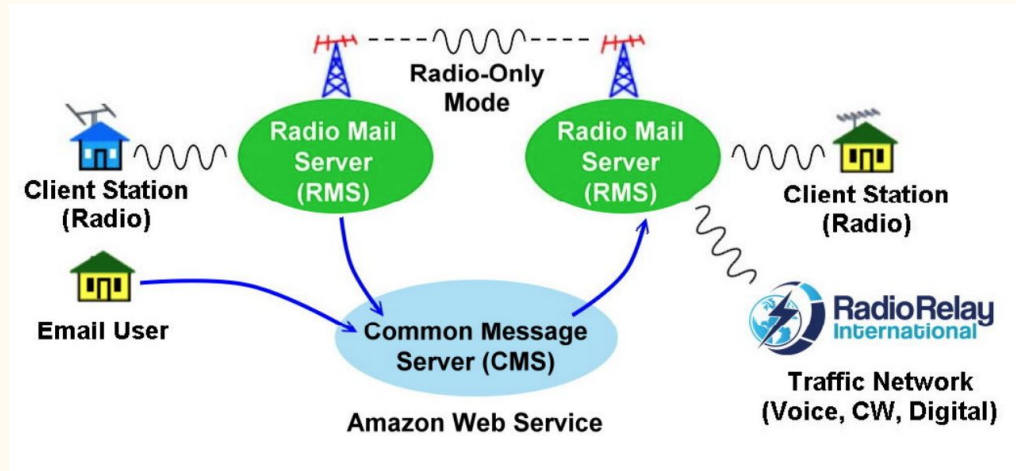
The Winlink system consists of a group of Common Message Servers (CMS) placed at various locations around the world. These servers connect via the Internet to Radio Message Servers (RMS) in many geographic locations. The RMS stations are the HF, VHF, UHF gateway to the Winlink system. The client (your system) is used to send or receive messages through the system using your radio.

Like regular email, winlink messages use addresses. Messages can contain pictures, weather maps, spreadsheets, ICS forms, etc. Emails can be sent between winlink stations and normal POP/SMTP email servers like gmail.com

Connection Diagram

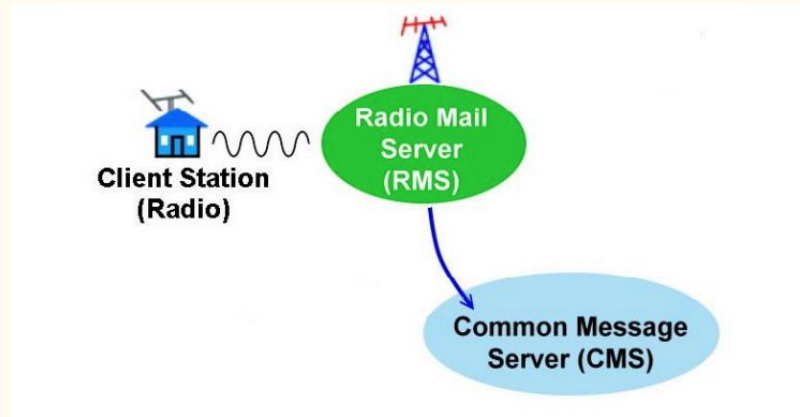


Winlink System & Linkages



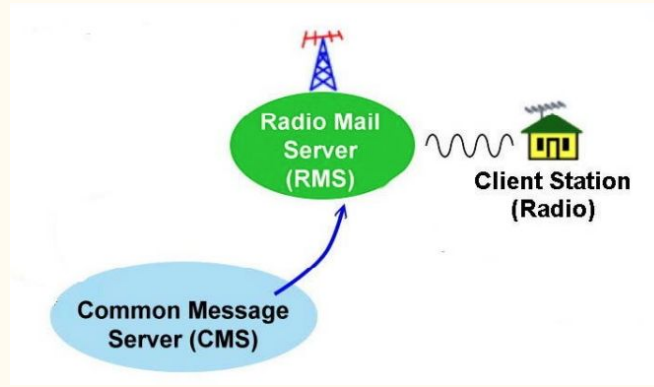
This is the overall scheme with a number of connection alternatives.

Outbound Message



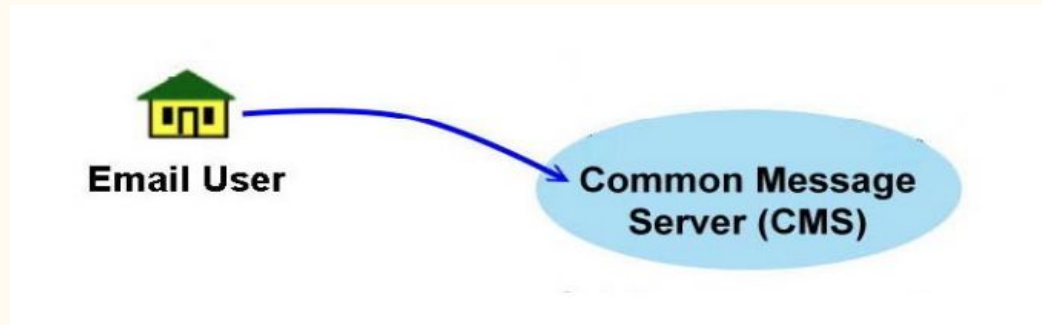
- Upon composing and saving a new message, the message is assigned a unique ID
- The operator selects and then connects to an RMS Gateway by radio. If the CMS cannot be reached, the connection will be refused or a message will be displayed saying that the message will be delivered when internet connection is restored.
- After the initial handshaking, the message is transferred to the CMS via the RMS.
- Telnet works the same way, but the connection is direct to the CMS.

Inbound Message



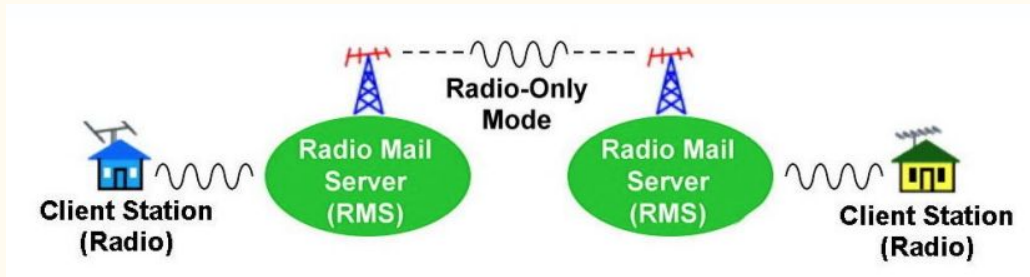
- The client station connects to any available RMS gateway
- The CMS is searched for any messages that are destined for the client station's address
- Matching messages are transferred to the RMS and then to the client station
- The message is saved in the CMS for 21 days but has been tagged as retrieved
- Telnet to a client ham station works in the same manner but the connection is direct to the CMS.

Using Commercial Email



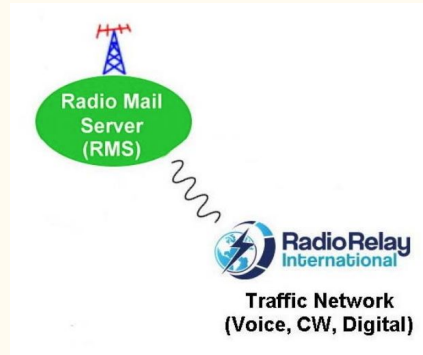
- Anyone can send a message to or receive a message from a Winlink address using regular email. The message is addressed to: <callsign>@winlink.org
- To avoid spam, the outbound message must contain “//WL2K” at the start of the message subject line. Otherwise the system will reject the message as spam.
- By default, “//WL2K” is inserted in the subject line of all outgoing Winlink messages.
- Once a Winlink user sends a message to a commercial email address, that address is placed on the senders “white list” and the spam filter is bypassed.

The Radio Only Network



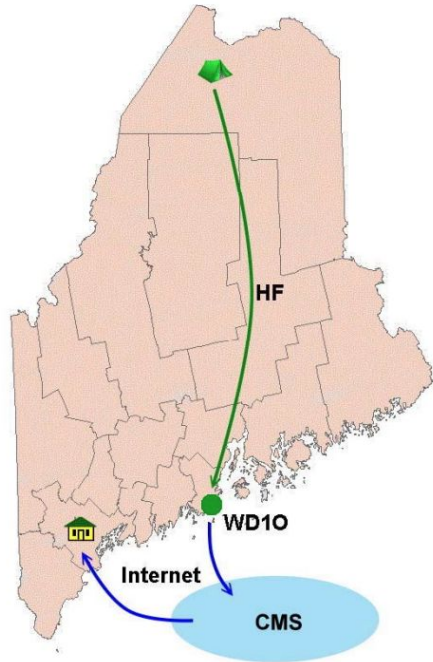
- Provides
 - Operation completely independent of the internet
 - Fully automatic routing and forwarding
 - Automatic routing around any unavailable RMS
- On the other hand
 - Messages must be picked up from designated Message Pickup Stations (MPS) This requires pre-event planning
 - There is a delay in message delivery due to relaying
 - Reduced message traffic capacity due to HF relay
 - Cannot send messages to internet e-mail addresses

Relays to the Traffic Networks



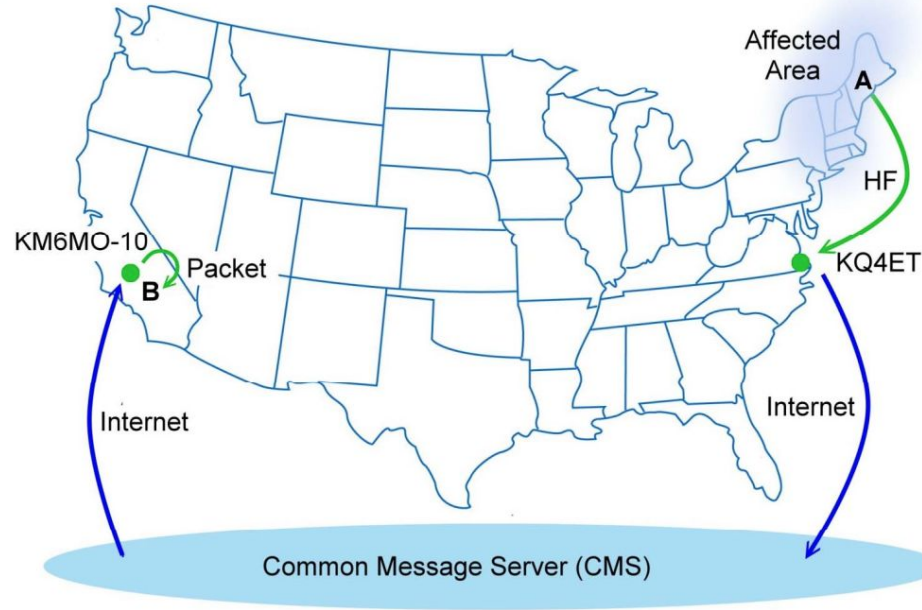
- The Traffic Networks (NTS) Transfer messages by voice, cw, and digital. These are fully interoperable.
- System established in 1949.
- Messages use the universally recognized Radiogram format.
- Routing is based on state and postal code.
- Networks run 24/7

Message Routing Example 1



- A station is located in northern Maine and has no access to conventional communications. Fortunately he's a ham and is equipped with a portable Winlink station.
- The station connects by a HF mode to the WD10 RMS in Tenants Harbor.
- WD10 relays the message to the CMS via internet.
- The receiving station has no radio but can connect to the internet through their regular email.
- The system works in the other direction.

Message Routing Example 2



The process is the same as that shown in Example 1. Station A is in an area without standard communications services. It connects by HF to a RMS outside the affected area. Station B connects to a local RMS via packet and the message is retrieved.

Winlink Modes and Transfer Times

Mode	Transfer Time
Packet 1200 (Direct)	2 minutes
Packet 1200 (1 node)	2.5 minutes
Packet 9600 (Direct)	1 minute
Pactor 1	15 minutes
Pactor 2	4 minutes
Pactor 3	30 seconds
Pactor 4	15 seconds
Winmor 500	10 minutes
Winmor 1600	3 minutes
Telnet	<< 1 second

- The times are based on a 4k message after compression
- ARDOP can approach Pactor 2 speeds under good conditions at both ends
- VARA (3rd party) can approach Pactor 3 speeds under good conditions at both ends
- Pactor 4 is not yet legal in the US as it violates Part 97, 300 baud symbol rate restriction.

Guidelines for Sending Messages

- In an emergency and/or there is a significant amount of traffic and the internet is available, use telnet to avoid congestion at the RMS stations
- Each RMS can only handle one HF connection at a time. If you don't hear any activity on a given RMS, it may be busy on another frequency.
- Packet gateways can generally handle more than one simultaneous connect.
- Establishing and closing each connect session takes time. If possible, batch your messages rather than sending one at a time.
- If there are multiple stations in an affected area that need to use the system, each station should try to use a different RMS.
- Keep messages as brief as possible

Conclusion

- This concludes the Winlink Introduction Tutorial
- Questions?