

Winlink – Global Radio Email Introduction



WHAT IS WINLINK

- Worldwide system for sending e-mail via radio.
- Provides e-mail from almost anywhere in the world.
- Entirely supported and operated by amateur radio volunteers (Amateur Radio Safety Foundation, Inc.).
- Started as “SailMail” providing support for sailors.
- Adopted for contingency communication by many government agencies.
- Used by infrastructure-critical NGOs such as International & American Red Cross, Southern Baptist Disaster Relief, DHS Tiered AT&T Disaster Response & Recovery, FedEx, Bridgestone Emergency Response Team, etc.

WHAT WINLINK OFFERS FOR EMCOMM

Flexibility:

- Internet-only (Telnet) direct connections to Winlink.
- Radio link bridge to Internet e-mail.
- Radio-only store and forward messaging.
- Peer-to-peer connections between radio end-users.
- Familiar and simple e-mail client interface.

Interoperability: Connect different types of systems

- Bridge different radio capabilities (VHF/UHF/HF).
- Seamless integration with Internet e-mail.

Geographical dispersion and redundancy for reliability

WHAT WINLINK OFFERS FOR EMCOMM (MORE)

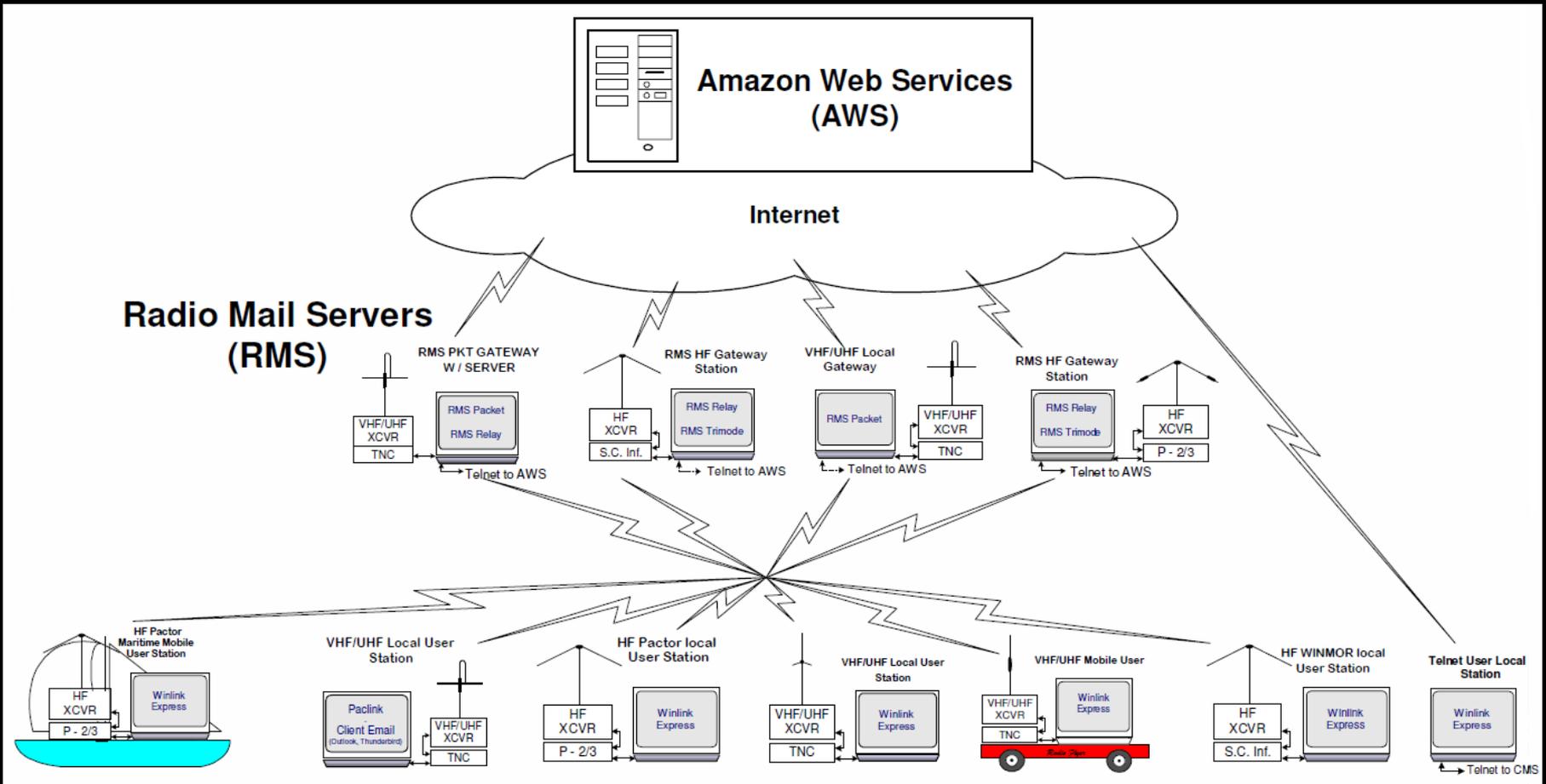
- Standard e-mail format with many features.
 - Binary file attachments (pictures, pdf, spreadsheets).
 - Automatic message compression/decompression.
 - White listing used to prevent spam.
- Time independence.
- Ability to collect messages while unattended.
- Good operation at most power levels.
- Not limited by station-to-station propagation.
- Message logging, and ICS report generation.
- Forms and template support.
- Wide adoption by EmComm related agencies.

WINLINK SYSTEM ARCHITECTURE

Hierarchical levels of the Winlink system:

- 1. *Client system*** – Radio, computer with Winlink software (Winlink Express), TNC (or sound card) and you, the end-user!
- 2. *Radio Message Server (RMS)*** – Radio gateway between the client (end-user) and the Winlink system backbone.
- 3. *Common Message Servers (CMS)*** – Winlink backbone.
 - uses AWS (Amazon Web Services)
 - redundant, fault-tolerant

WINLINK NORMAL NETWORK OPERATION

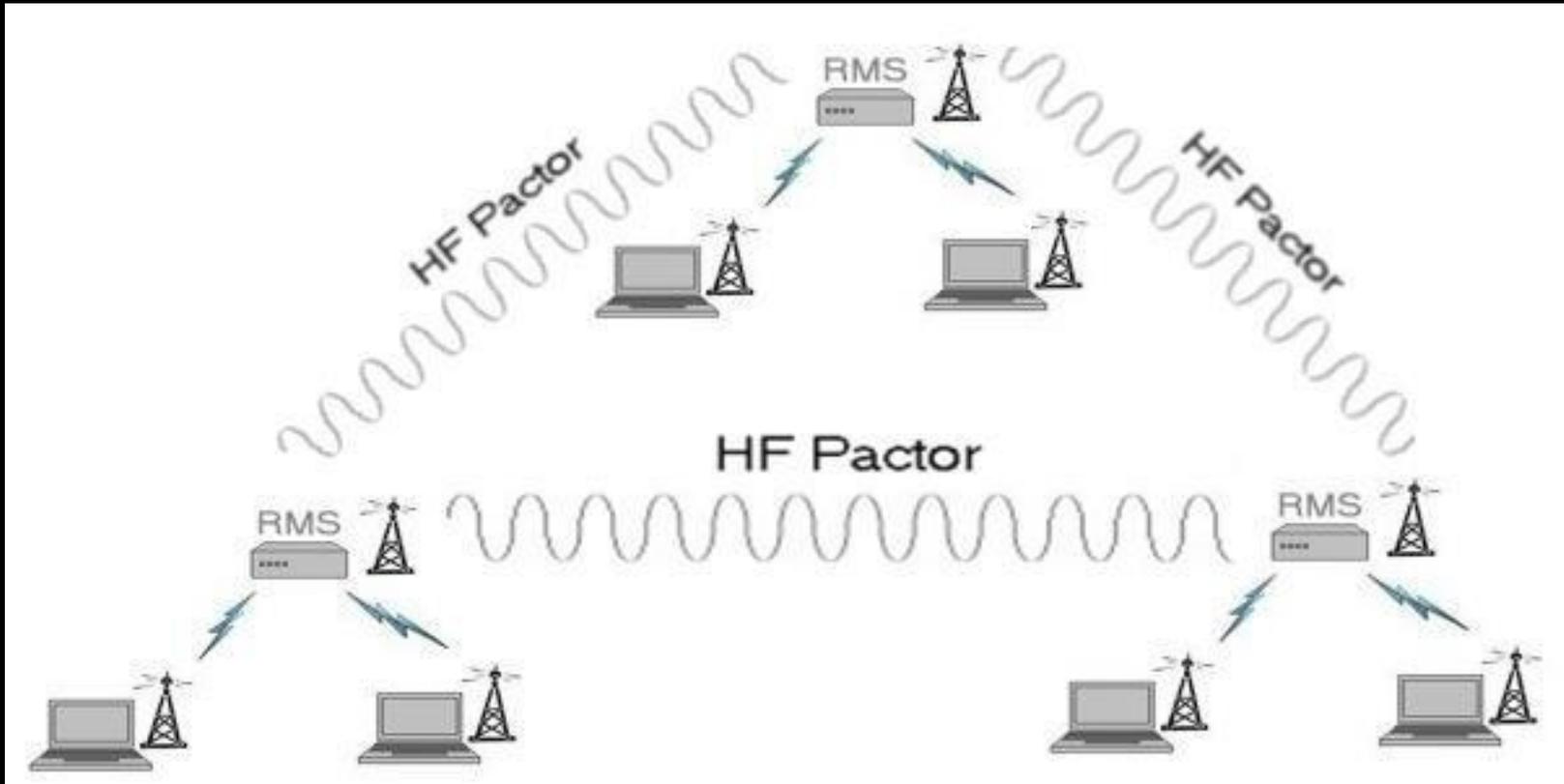


WINLINK SYSTEM ARCHITECTURE

- Client users connect to gateway stations over RF (local or long distance).
- Gateway stations then connect to the CMS via the Internet.
- Local RF connections can be direct to the gateway, or use digital repeaters and/or network nodes to extend LOS range.
- Radio-Only “mesh” networks can be built where the gateway stations operate as message servers and do not use the internet. This creates a “local LAN” which can then be connected to other LANs via HF forwarding, regional or long distance.
- Direct peer-to-peer connections between clients are also supported, both local and long distance.

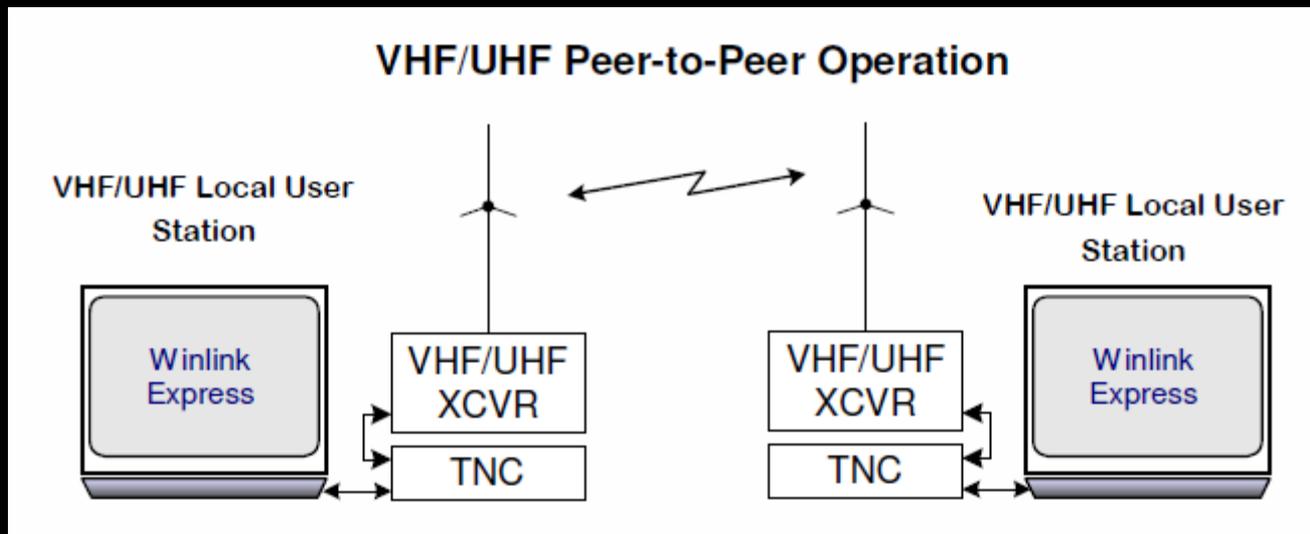
WINLINK RADIO-ONLY NETWORK

LOCAL NETWORKS CONNECTED BY HF, REGIONAL OR LONG DISTANCE



WINLINK PEER-TO-PEER RADIO-ONLY OPERATION

- Peer-to-peer: direct radio connection between end-users.
- The Internet is not used, all communication by radio.
- Only the two client stations are involved.
- 100% error-free transmission and file attachments.



WINLINK CONNECTION MODES

- **Telnet** – Non-radio connection through the Internet. Good for training (no radio equipment required) and use if radio is down or network is busy.
- **VHF/UHF Packet** (local LOS propagation) –
 - **9600 baud** – Fast, reliable, range limited and requires \$400 modem (Kantronics or SCS Tracker) or soundcard modems.
 - **1200 baud** – Slower, but can use inexpensive TNC (TinyTrak-4, TNC-X) or soundcard modems.
- **HF WINMOR/ARDOP** – “Poor man’s Pactor”. Not as good as Pactor, but operates with inexpensive sound card device (\$100), speed between Pactor 2 and 3.
- **HF Pactor 1, 2, 3 and 4** – Fast and reliable but requires an expensive modem (\$1500+).

WINLINK CONNECTION MODES

- **Vara HF** - VARA is a High Performance HF modem based on OFDM modulation. VARA Modem, brings state of the art Military grade technology to new and existing HF data.

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

- **Vara FM** - VARA optimized for V/UHF LOS links. Replacement for 9600b packet with speeds up to 15,300 bps.
- Vara must be registered to operate at full speed. Registration fee is \$69US per call sign (discounted to \$50/call for 10+ calls).

LEVELS OF MESSAGE VALIDATION & CORRECTION

- **No validation or correction** –RTTY, BPSK-31.
- **Forward Error Correction (FEC)** – Redundant information transmitted so minor errors can be corrected: MT63, Olivia, QPSK-31, MT2K (fldigi)
- **Automatic Repeat Request (ARQ)** – Positive or negative packet acknowledgements from receiving station: Pactor, Winmor, ARDOP, Vara, Packet, TCP/IP.
- Pactor, Winmor, ARDOP and Vara all use both FEC and ARQ.
- Only ARQ provides 100% accurate message delivery.
- Accuracy is essential for EmComm.

RESOURCES NEEDED FOR WINLINK EXPRESS

VHF/UHF Packet Radio

- Computer running Windows 7 through Windows 10.
- .NET 3.5 framework.
- Winlink Express program.
- V/UHF radio with data port (1200/9600) or speaker/mic connection (1200 only).
- Signalink or similar USB soundcard interface, or Packet TNC (Kantronics, TNC-X, MFJ, etc.). Might require a USB to Serial dongle.
- Note: Some new radios have built-in soundcards/TNC's.
- Software downloads: winlink.org
- All software is free (except Vara), donation is suggested.

SIGNALINK SOUND CARD INTERFACE

- Simple device powered by USB connection.
- Cost is about \$100 including radio-specific cable.
- Radio needs to have a data (sound) port, or use microphone and speaker connections.
- Need to run “Software TNC” application like Direwolf or UZ7HO soundmodem (for packet) or Vara FM.



PACKET TNC

- Can be simple KISS mode, or full function.
- Cost from about \$100 to \$1500.
- Radio needs to have a data port (1200/9600), or use microphone and speaker connections (1200 only).
- Some radios include a built-in TNC or sound card.



INSTALLING WINLINK EXPRESS

- Download zip file from winlink.org
- Extract the .msi installer from the zip file and run it.
- Complete the setup screens (call sign, location, etc.).
- Browse C:\RMS Express\, right click on.
 - RMS Express.exe and select option to create a shortcut.
- Note: HF Modems (except Vara) will be installed automatically.

WINLINK EXPRESS MAIN SCREEN

Begin connection

Connection Mode

Multiple call sign support

Standard Folders

Personal message folders

Contacts address book

Winlink Express 1.5.18.1 - NS7C

NS7C Settings Message Attachments Move To: Saved Items Delete Open Session: Winmor Winlink Logs Help

No active session...

	Date/Time	Message ID	Size	Source	Sender	Recipient	Subject
	2018/11/12 17:30	UKYMQWP6YAZO	2710	KF7UXB	KF7UXB	NS7C	//WL2K After Action Report - Veteran
	2018/11/12 16:54	36HYBU4LTVON	2285	KF7UXB	KF7UXB	NS7C	//WL2K ICS217A-Veteran's Day Para
	2018/11/12 16:42	ZCW2H9EM7RFA	2108	KF7UXB	KF7UXB	NS7C	//WL2K ICS214A-Veteran's Day Para
	2018/11/12 03:58	AB6H6924QMTL	1515	KD7GXN	KD7GXN	NS7C	//WL2K ICS214A-2018 Auburn Veter
	2018/11/11 03:02	TZ64UEN9YXA	2307	KI7SXX	KI7SXX	NS7C	//WL2K ICS217A-AUBURN VETERA

Message ID: UKYMQWP6YAZO
Date: 2018/11/12 17:30
From: KF7UXB
To: NS7C
Source: KF7UXB
Downloaded-from: Telnet:cms.Winlink.org
Subject: //WL2K After Action Report - Veteran's Day Parade - Dave Conrad

Report Date/Time: 2018-11-12 08:55:53

Incident-Event Name: Veteran's Day Parade
Date: 11/10/18
Location: Main Street, Auburn, WA

Reporting Name: Dave Conrad
Call Sign: KF7UXB
Normal Email: [REDACTED]
Phone: [REDACTED]

Assignment or role on this incident-event:

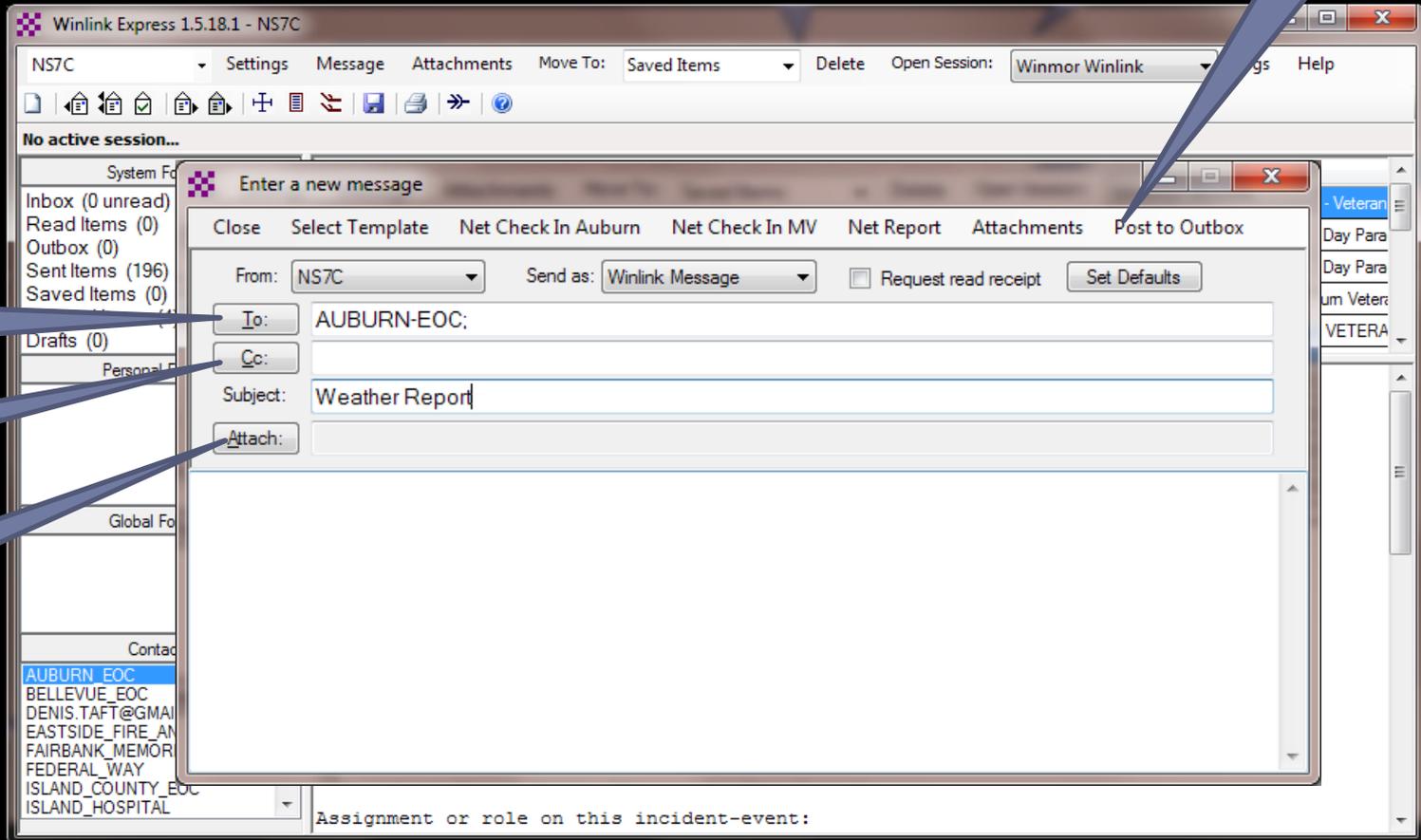
System Folders
Inbox (0 unread)
Read Items (0)
Outbox (0)
Sent Items (196)
Saved Items (0)
Deleted Items (4)
Drafts (0)

Personal Folders

Global Folders

Contacts
AUBURN_EOC
BELLEVUE_EOC
DENIS.TAFT@GMAIL.COM
EASTSIDE_FIRE_AND_RESCUE
FAIRBANK_MEMORIAL_HOSPITA
FEDERAL_WAY
ISLAND_COUNTY_EOC
ISLAND_HOSPITAL

COMPOSING A MESSAGE



New Message Button

Click "To" or "CC" for contacts

Multiple recipients and CC

File attachments

Post to Outbox

USING A MESSAGE TEMPLATE

Begin composing a message

Click “Select Template” and select the template

Click to
select a
template

CC and subject
filled in
automatically

Body
initialized
from
template

Enter a new message

Close Select Template Net Check In Auburn Net Check In MV Net Report Attachments Post to Outbox

From: NS7C Winlink Message Peerto-Peer Message Request read receipt

To: WA7AUB;

Cc: W7JKC;

Subject: AAECT Net Check In

Attach:

Greetings!

Please record a Winlink Check In from SCOTT, NS7C on Monday, 2016-02-15 at 14:34:02.

Regards,
SCOTT, NS7C

PENDING MESSAGE IN OUTBOX

The screenshot shows the Winlink Express 1.5.18.1 - NS7C interface. The title bar indicates the application name and version. The menu bar includes NS7C, Settings, Message, Attachments, Move To, Saved Items, Delete, Open Session (circled in red), Winmor Winlink, Logs, and Help. The toolbar contains various icons for navigation and actions. The main window is divided into three panes. The left pane shows a folder tree with System Folders (Inbox, Read Items, Outbox (1), Sent Items, Saved Items, Deleted Items, Drafts), Personal Folders, Global Folders, and Contacts (AUBURN_EOC, BELLEVUE_EOC, DENIS.TAFT@GMAIL.COM, EASTSIDE_FIRE_AND_RESCUE, FAIRBANK_MEMORIAL_HOSPITAL, FEDERAL_WAY, ISLAND_COUNTY_EOC, ISLAND_HOSPITAL). The middle pane displays a message list with columns for Date/Time, Message ID, Size, Source, Sender, Recipient, and Subject. A single message is listed: 2019/02/17 19:50, YA4MNBOD8J99, 183, NS7C, NS7C, AUBURN-EOC, //WL2K Weather Report. The right pane shows the message details: Message ID: YA4MNBOD8J99, Date: 2019/02/17 19:50, From: NS7C, To: AUBURN-EOC, Source: NS7C, Subject: //WL2K Weather Report. Below the details, it says <No message body>.

Once a message has been posted to the outbox, it remains there until a transfer session has been opened and started. Kind of like the old dial-up days.

RESOURCES NEEDED FOR WINLINK EXPRESS

HF Winmor/ARDOP/Vara

- Same computer and software requirements as V/UHF connections.
- HF radio with data (sound) port and optionally computer control (CI/V, CAT, etc. for rig control).
- Signalink or similar USB soundcard interface.
- Note: Some new radios have built-in soundcards.
- All software is free (except Vara), donation is suggested.

ACTIVE WINMOR CONNECTION

WINMOR Sound Card TNC Ver:1.5.8.0 Port:8500 NS7C / VA7DEP

Help Hide Send ID

Connection State

IRS

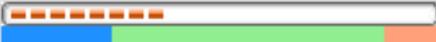
TCP Capture OK

Transmit

0 Avg ACK Percentage 100

Xmt Frame:

Receive

Rcv Level: 

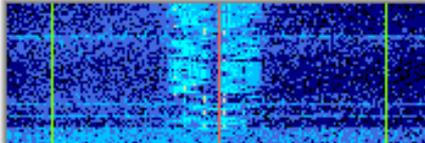
Remote Station Offset: -23.7 Hz

Rcv Frame: 2 Car 4FSK FEC Data

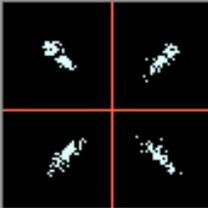
Busy Detector

Squelch: 5

Waterfall Spectrum Disable



500 Waterfall 2KHz 2500



4FSK / 74

WINLINK EXPRESS HTML FORMS

- HTML forms are efficient and professional looking.
- Forms can be simple or very complex.
- Forms can look as good as any web site.
- Forms are easy to use.
- Attractive forms are difficult to create unless you understand HTML, cascading style sheets and JavaScript.
- The Winlink team has built a library of forms.
- Standard forms are included with the installation and automatically updated

HTML FORM AND TEMPLATE SET

- A full form set has three components:
 - A template that displays the form and generates the text message to be sent.
 - An input form that solicits input from the user.
 - A display form that formats and displays the information on the recipient's computer.
- The form itself is not transmitted, only the data entered on the form.
- Forms may be very complex and feature rich, but the actual data transmitted is very compact.
- Receiving station must have the display form installed for proper display, but they will still receive a text-only version.

WINLINK EXPRESS FORMS COMPLETED FORM READY TO SEND

The screenshot shows a 'Winlink Express' window titled 'Enter a new message'. The window has a menu bar with options: Close, Select Template, Net Check In Auburn, Net Check In MV, Net Report, Attachments, Post to Outbox, and Spell Check. Below the menu bar, there are fields for 'From:' (NS7C), 'Send as:' (Winlink Message), and a checkbox for 'Request read receipt'. There is also a 'Set Defaults' button. The 'To:' field contains 'k7ecc'. The 'Subject:' field contains 'ICS205-Seattle Snowpocalypse 2019 - 2019-02-13 06:00'. The 'Attach:' field contains 'RMS_Express_Form_ICS205_Viewer.xml;'. Below the attachment field, there is a list of form data: 1. Incident Name: Seattle Snowpocalypse 2019, 2. Date & Time Prepared: 2019-02-13 06:00, 3. Operational Period: From: 2019-02-13 06:00, To: 2019-02-14 06:00, 4. BASIC RADIO CHANNEL USE: ZONE GRP: A, CH#: 3, FUNCTION: TAC, CH NAME: AUB PS, ASSIGNMENT: All city departments, RX FREQ: KC800. Red arrows point from the text 'Captured data entry' to the attachment field and from 'Plain text version' to the list of form data.

From: NS7C Send as: Winlink Message Request read receipt Set Defaults

To: k7ecc

Cc:

Subject: ICS205-Seattle Snowpocalypse 2019 - 2019-02-13 06:00

Attach: RMS_Express_Form_ICS205_Viewer.xml; ← Captured data entry

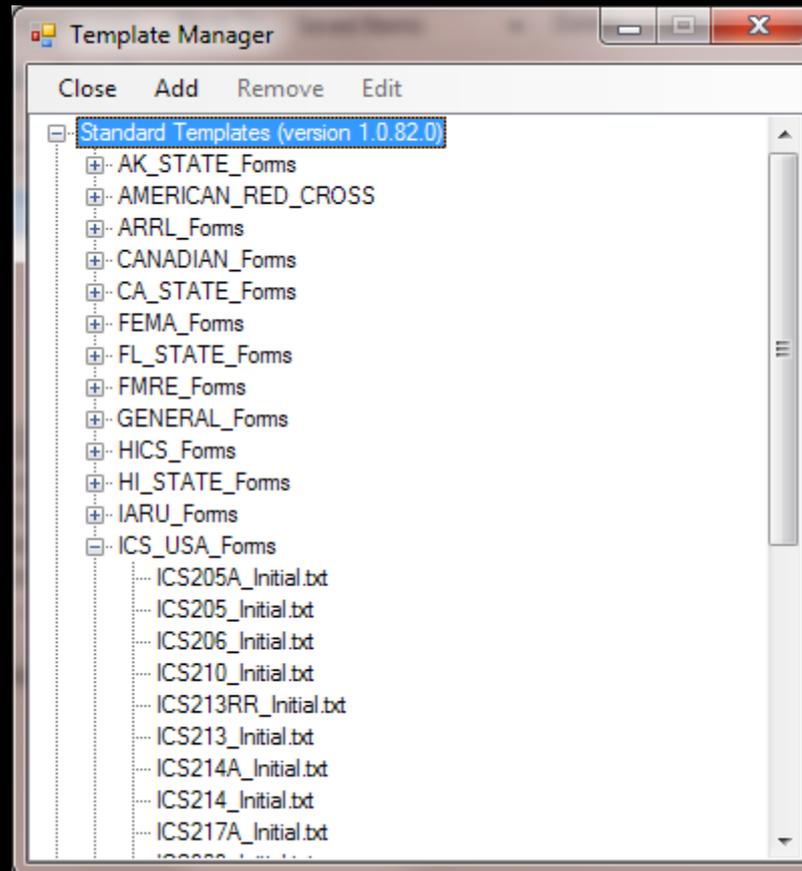
1. Incident Name: Seattle Snowpocalypse 2019
2. Date & Time Prepared: 2019-02-13 06:00

3. Operational Period:
From: 2019-02-13 06:00
To: 2019-02-14 06:00

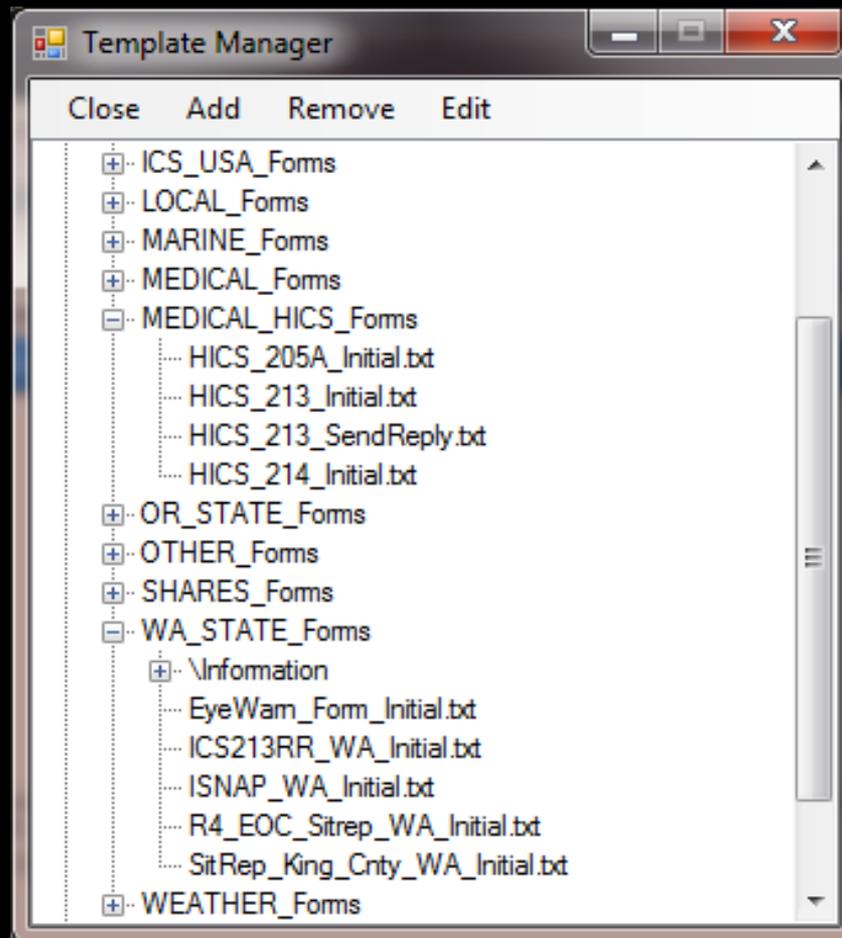
4. BASIC RADIO CHANNEL USE: ← Plain text version

ZONE GRP: A
CH#: 3
FUNCTION: TAC
CH NAME: AUB PS
ASSIGNMENT: All city departments
RX FREQ: KC800

AVAILABLE WINLINK EXPRESS FORMS (ICS)



AVAILABLE WINLINK EXPRESS FORMS (GENERAL)



AVAILABLE WINLINK EXPRESS FORMS

- A full set of standard forms are included
 - Installed with the application
 - Maintained by WDT
 - Updates are downloaded when application starts
- Locally developed forms must be maintained by users
 - If there are enough users, local forms can be added to the distribution

CONCLUSION

- Winlink use continues to grow, especially for EmComm.
- The Winlink Development Team continues to enhance capabilities to adapt to changing needs.
- Winlink has three modes of operation to send and receive messages, even if the Internet is down:
 - RF connection through a gateway to a CMS Internet server.
 - Radio-only “MESH” network with HF relaying.
 - RF Peer-to-Peer connections between client stations.
- Steady improvements are being implemented.

FOLLOW ON SESSIONS

Session 21 (Sunday) will focus more in depth on the various sound card modes.

Session 25 (Sunday) will focus on the technical details of installing, configuring, and operating Winlink Express for V/UHF and HF operation using TNC's and sound card modems.

CONTACT



Scott Currie

NS7C

Auburn Emergency Management

ARES Emergency Coordinator

ns7c@arrl.net

253-569-5102