Digital Notes

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Using digital applications in amateur radio

Introduction to Using Winlink Over VHF or UHF

What is the Winlink system

Winlink 2000 (often referred to as "WL2K", or simply "Winlink") is a "last mile", radio-based email transport system developed and sponsored by the Amateur Radio Safety Foundation, Inc. ("ARSFI"), its many donors and numerous volunteers.

The Winlink Development Team, at www.winlink.org, describes Winlink as follows:

"Winlink 2000 is a worldwide radio messaging system that takes advantage of the Internet wherever possible while retaining the ability to function without major parts of it. It combines the best attributes of wireless communications and the Internet to allow remote users to send and receive email to and from correspondents on the Internet as well as other users of the system. The synergy of this combination provides fast Internet message forwarding worldwide with the long reach of radio links to places without normal Internet service. The system is carefully designed to provide important side benefits:

• To operate without the Internet over major portions of the earth.

• To minimize the spectral footprint needed to accomplish the task."

Winlink provides the capability to exchange email at locations without Internet connectivity, including during emergencies. In such situations Winlink may be utilized to provide email capability both within the affected area and to the "outside world".

How Winlink works

The Winlink system consists of numerous Radio Mail Server ("RMS") stations maintained on a volunteer basis by licensed Amateurs. RMS Packet stations operate on the VHF or UHF bands while RMS HF stations operate on the high frequency bands.

Each RMS station is connected through the Internet (using the Telnet protocol) to the Winlink system, a network of five redundant Common Message Servers ("CMS"). The geographically-dispersed CMS are located in San Diego, Brentwood (Tennessee), Halifax, Perth and Vienna. Messages to or from users are normally transmitted through one of the CMS using a RMS station. Users with an active Internet connection may connect directly to a CMS using a Telnet connection, or may send and receive email using a browser-based Web-mail interface.

Email messages are handled within the Winlink system in accordance with established Internet standards, allowing for the seamless exchange of messages with any standards-compliant system or device worldwide.

Setup and operation of a RMS station, as well as access over the HF bands, is beyond the scope of this discussion.

Requirements for VHF or UHF access

Connecting with a RMS Packet station requires:

- A VHF or UHF radio. While an HT may be adequate to connect with a nearby RMS Packet station , a base or mobile transceiver providing additional power may be required.

- An appropriate antenna system.

- A terminal node controller ("TNC") or sound card interface, together with appropriate cables for connection to your radio and computer.

- A personal computer. The computer need not be of recent vintage; any moderately powerful computer will usually be adequate. While most users seem to be operating Windows-based systems, and most software development is focused in that direction, software is available for both Linux and Mac systems.

- Appropriate user software of your choice.

Terminal Node Controllers

Connections to a RMS Packet station on VHF are usually made at 1200 baud, while those made on UHF are usually at 9600 baud. Note that a 9600 baud connection requires both stronger signal strength and less interference to be successful.

A VHF or UHF connection to Winlink is made using the AX.25 packet data standard. Thus a TNC supporting the proprietary Pactor 1, 2 or 3 protocols used for HF digital communications is not needed. A less expensive TNC complying with either the "KISS" or similar "TNC2" (promulgated by Tucson Amateur Packet Radio, Inc.) standards will be fine. If planned operations are limited to VHF only a single-speed, 1200 baud TNC is required.

Sound card interfaces, in particular external devices such as the SignaLink and similar products, may also be used successfully in many situations. Keep in mind, however, that the setup and configuration of a sound card-based solution often presents more of a challenge than use of hardware TNCs.

Figure 1 – An interior view of TNC-X, one of many available KISS mode TNCs.   Photo from the manufacturer's Web site.

Winlink User Software

There are a number of software options available to users for connecting with a RMS Packet station or CMS. This overview will focus on those available for a Windows environment. All programs discussed are available from the Internet without cost.

RMS Express

A relatively recent product, RMS Express is supported by ARSFI as part of Winlink development. RMS Express provides a complete email messaging system similar to Outlook or Outlook Express. A limited number of callsign or tactical accounts are supported. Address book and message attachment functionality is provided.

In addition to VHF or UHF packet connection access, direct connection to a CMS via Telnet is available, as well as HF connection using the various versions of Pactor. Connection using the HF WINMOR protocol using a sound card interface is also available.

Most popular hardware TNCs are supported by RMS Express, including the various Kenwood radios with an integrated TNC. KISS TNCs can often be used, and some users have reported success using sound card interfaces in connection with AGW Packet Engine ("AGWPE").

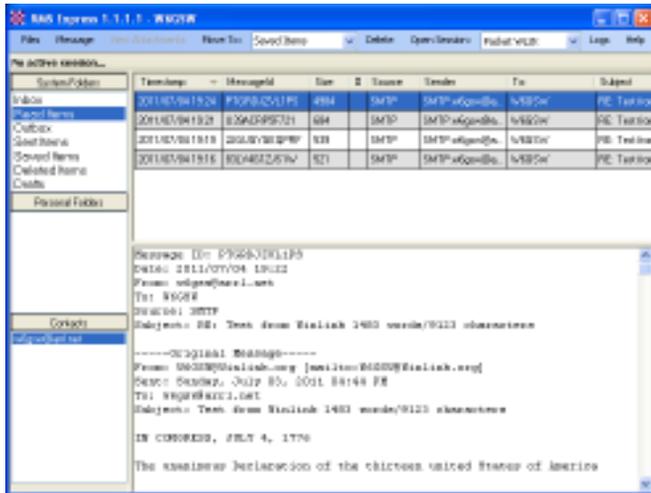RMS Express requires Microsoft .NET 3.5 installed on the computer.

Figure 2 – The main display of RMS Express showing message folders at left, and individual messages at right with a message preview below.

Figure 3 – Paclink's main display showing activity to and from the CMS (via Telnet) at left, and local message activity (via SMTP and POP3) at right.

Paclink

Paclink is another program from ARSFI and the Winlink Development Team. Unlike RMS Express, Paclink does not provide email client (inbox, outbox, address book, etc.) functionality. Instead, Paclink is a mail server, providing an operator with the ability to support multiple email users on a local area network. With relatively minor computer reconfiguration, users can send and receive email messages through Paclink using their regular email client, such as Outlook. Attachments are supported, and Web browser-based access may be provided.

While Paclink may provide users at a served organization with seamless and familiar email access, there are potential issues. The most significant is that users may not fully comprehend the limitations of radio-based email and attempt to utilize the system as they normally would, possibly overloading the available bandwidth with large messages or attachments. When considering the use of Paclink, this concern should be addressed through the use of program limits and adequate end-user training.
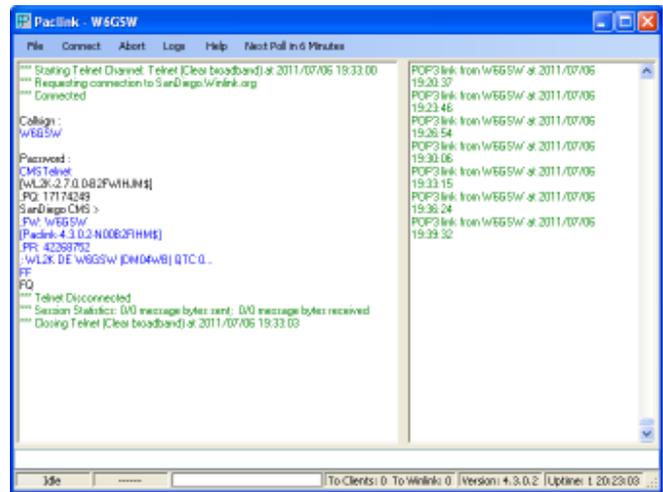
Airmail

Developed and supported independently of ARSFI, Airmail is an email client providing inbox, outbox, address book and attachment functionality. Airmail supports only a single callsign account; tactical accounts are not supported.

While an older program, Airmail supports a wide variety of hardware TNCs, including those using KISS mode, and sound card interfaces, either natively or through use of AGWPE. Use of AGWPE does require the Airmail-to-Packet Engine ("AMPE") linker.

Airmail supports direct Telnet connection to a CMS, VHF or UHF packet connections and HF connections using Pactor. WINMOR is not supported at this time.

Practical considerations

At 1200 baud on VHF, or even 9600 baud on UHF, radio-based email is slow in comparison to available fixed Internet connections. But "when all else fails", or there is simply no other means available, it is a viable option for sending and receiving email communications.

System throughput is improved by keeping email messages as concise as possible. Use plain
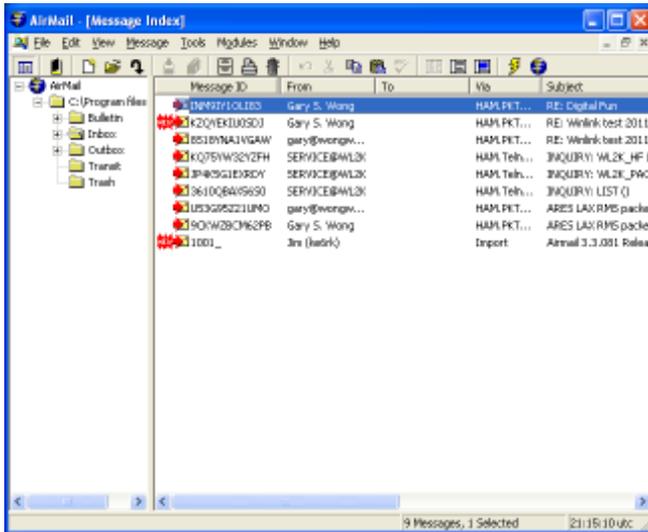
Figure 4 – Airmail's message index showing the folder tree at left and individual messages at right.

text messages and small attachments whenever possible. Winlink normally utilizes "B2F" (Level B2 FBB) compression, which can reduce the size of plain text data by as much as half. Binary data, such as graphic or Adobe document files, achieve significantly lower compression ratios.

When transmitting email attachments, keep them as small as possible by reducing their resolution or document size. Winlink enforces a maximum compressed message size of 120,000 characters; RMS station operators may establish their own, smaller, limits.

Following are sample average message transfer times over VHF at 1200 baud with an excellent signal (and thus no packet errors or retrys):

- Text of the Preamble to the Constitution, 504 characters including email overhead, compressed to 383 characters, 27 seconds.

- Text of the Lord's Prayer, 555 characters including email overhead, compressed to 404 characters, 32 seconds.

- Text of Psalm 23, 778 characters including email overhead, compressed to 538 characters, 34 seconds.

- Text of the Declaration of Independence, 9518 characters including email overhead, compressed to 4687 characters, 1 minute, 24 seconds.

- Brief text email with 66k Adobe pdf attachment, 66523 characters including email overhead, compressed to 63733 characters, 16 minutes, 35 seconds.

Useful Internet links

- The Winlink system – www.winlink.org

- RMS Express, Paclink and related software – www.winlink.org/ClientSoftware

- Airmail – http://siriuscyber.net/airmail

- AGW Packet Engine – www.sv2agw.com/ham/agwpe.htm

- Airmail-to-Packet Engine – www.qsl.net/mararc/ampe.htm

- Sound card packet information – www.soundcardpacket.org

Digital Notes covers topics related to the use of digital applications in amateur radio, with a focus of emergency communication, and represent the views of Gary S. Wong, W6GSW. A CPA and technology consultant, W6GSW holds an Amateur Extra license. Located in Southern California (DM04WB), he is a member of the Amateur Radio Relay League, an ARRL–accredited Volunteer Examiner and an Emergency Coordinator for the Northeast District, Los Angeles Section of the Amateur Radio Emergency Service.

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