

# “Winlink, Digital Information”

## (PART 1)

There has been over the past few months a lot of discussions, both negative and positive about Winlink 2000. I believe that there is a lot of confusion about what winlink is and what it can and has done. First of all let's get this out of the way, Winlink 2000; Telpac and Paclink are **NOT** the old style packet system that most of us are familiar with. The Winlink 2000 radio-email digital network system is intended to greatly extend the ability of the Amateur Radio to provide a [public service](#) to the greater community by linking to the Internet email system. The emphasis is to accomplish this while providing additional features that are of particular value to amateur users for use in emergency management and everyday use to those in the Amateur service who may not otherwise have access to the Internet. The primary purpose of the Winlink 2000 network system is to assist the remotely located user, and to provide emergency email capabilities to Local, State or Federal Emergency Management agencies. Using MS Outlook or MS Outlook Express, the Paclink mini-email server can replace a network of computers as a transparent substitute for normal SMTP mail. WL2K uses no external source for sending or receiving Internet email. It is a stand-alone function which interacts directly with the Internet rather than through any external Internet service provider.

It now becomes the task of the Amateur Emergency Communications professionals to supply Internet connectivity where there is none. An insurmountable task, you say? Not hardly. Enter WinLink, the next generation in emergency communications support.

WinLink is the new standard that meets current Department of Homeland Security and Emergency Management Agencies standards. In other words, our served agencies have “raised the bar” when it comes to what they want and need for emergency communications.

WinLink can provide end to end e-mail with or without Internet connectivity (Internet Service Provider) via VHF/UHF and HF radio links. If you have been involved with Emergency Communications planning you have undoubtedly heard the term, “The Last Mile.” This is the area that is actively affected by the disaster. Nobody knows exactly how big “The Last Mile” really is until the disaster actually

occurs. However, it encompasses the area that has no “**normal**” communications channels and is essentially cut off from the rest of the world. “The Last Mile” is where we, the Ham Radio Emergency Communications volunteers have our work cut out for us to furnish the type of communications that our served agencies need to implement the Disaster Plan and start the recovery process. Today’s disaster professionals are requiring more than simple point to point tactical and long haul radio communications. In the last couple of years the Federal Communications Commission has been pushing the ARRL to move forward and promote digital modes as opposed to the traditional ham radio menu of FM/CW/Packet/SSB HF communications. They have been coaching the ham radio community to adopt Software Defined Radios that can be adapted, on the fly with updated software and firmware as needed, to meet specific user requirements. In short, everyone is waiting for the hams to make it into the 21<sup>st</sup> century. Unfortunately, most of us are still clinging to our time honored traditions of FM or HF voice traffic nets using the NTS message format to provide our customers with communications during emergencies. About now, many of you are asking, why the sudden shift in direction when it comes to the needs of the served agencies? First of all it has not been a sudden shift at all. The handwriting has been on the wall for several years. Secondly, the professional world revolves around the Internet and e-mail. That’s how business is conducted in today’s world. Everyone from the CEO to the janitor knows about and uses e-mail. Huge messages can be passed with ease using email and attachments. Try passing a five page report using the ARRL NTS message format! I think you’ll get the picture pretty quickly.

The Amateur Radio community needs to be proactive and get on board with digital modes in order to be players in today’s Emergency Communications world. It’s just that simple. **As emergency communicators we have to give our clients what they need to do their jobs.** If we don’t then they will find another way to do business and we won’t be in the game much longer. Let’s talk more about WinLink now. WinLink provides Internet access to affected disaster areas by routing e-mail traffic using e-mail programs like Outlook Express from the deployed disaster mitigation personnel to an ISP outside the area using HF, VHF/UHF radio systems. The on-site interface consists of a HF, VHF/UHF FM radio, some form of digital modem and a terminal or computer. As the e-mail is generated on this terminal it is

fired off on a radio link to a participating station mode called a PMBO (participating mailbox office), that maintains a constant Internet connection. Should the PMBO that you are using suffer loss of the ISP connection, it can utilize another VHF/UHF radio link or an HF radio link to find another PMBO that has Internet connectivity. In other words, the Radio Amateur furnishes the on-site equipment to connect to a PMBO to interconnect local users at the disaster site, and he or she manages the system, but does not have an active message handling role in the disaster communications. In turn, the users of the WinLink system have a “business as usual” day sending and receiving e-mail just like they were connected to an on-site ISP. Life is good. I can hear some of you now, groaning and moaning about handling traffic, “shadowing” key personnel, etc. The way things are going, those days are almost gone. As I stated before, many of the Local, State and Federal agencies have their own tactical communications systems that are not only deployable but they are secure.

## **WINLINK 2000** (part 2)

Winlink 2000 is a worldwide radio messaging system that mixes internet technology and appropriate amateur radio technologies to deliver advantages not possible with each alone. The system provides email with attachments, position reporting, graphic and text weather bulletins, and robust emergency communications capabilities between internet users and the amateur radio.

Daily, Winlink users in remote jungles or traveling anywhere exchange emails with friends and family that assure their safety and express the joys of their travels. Users at fixed locations or mobile can post their positions on a map and retrieve helpful weather information wherever and whenever they need it. The system is most popular with remote or mobile users who do not have internet access available.

Winlink also has capabilities attractive for emergency communications where local or regional internet and wireline services are disrupted, overloaded, or down. It is especially useful where accuracy is essential, where information quantity makes voice communications inefficient, and where accurate records of the information sent and received are important. The Amateur Radio Emergency Service (ARES),

Radio Amateur Civil Emergency Service (RACES), Military Affiliate Radio Systems (MARS), the Salvation Army (SATERN), the Baptist Disaster relief and other emergency response communications volunteers have all officially adopted the Winlink system for critical email emergency communications with the government and civil agencies they serve.

Anyone with an email account can exchange emails with Winlink radio users.

Winlink was used during the 1991 Gulf War. In fact, the CBS documentary, "The last Voice from Kuwait," spearheaded by Frank Moore, WA1URA illustrates the heroic efforts of several Winlink stations. During this period, Internet use ramped up and email became a preferred communications tool. On the Amateur radio scene, the VHF/UHF packet radio networks lost users and started to deteriorate. It was obvious that for Winlink to continue to have value, it now must also interface into this new communications medium.

Airmail followed the development of Winlink Classic, and continues to be the state of the art client program for today's Winlink 2000 system.

The tragic events of September 11, 2001 and more recent national disasters have transformed the emergency management world. There is increased urgency to adapt Amateur Radio tools for efficient emergency service in a fast changing environment. Winlink developers responded and added Telpac gateway software to the system. This software allows an amateur operator to create a packet radio gateway station into the Winlink system. When a Telpac station is in range, other operators can use common packet radio equipment and Airmail client software to send and receive email over VHF and UHF frequencies and it allows the use of any common SMTP email software (Outlook, etc.) as the user interface. This is especially important in emergency situations where there is no time for software training. Telpac and Paclink software are enhancing and revitalizing long forgotten packet radio networks in many locations.

In 2005, the server side software also was significantly improved and the network was enhanced by adding additional, redundant and transparent Central Message Servers around the world. Should the Internet fail at any or several sites, there are

other fully-synchronized servers to handle the worldwide system at full capacity.

After the Amateur Radio response to the Hurricane Katrina and Hurricane Rita disasters of 2005, APRS (Automatic Position Reporting System) was presented into the winlink system to enable mobile and remote APRS users to access their Winlink e-mail accounts under emergency or unusual conditions. In 2006, an interface was developed that allows short messages to be sent and received via APRS. Called APRSlink, this system interlinks Winlink with APRS messaging, expanding the utility of both.

Several years ago, the Department of Homeland Security suggested to the ARRL President that the Amateur community should design and maintain a national digital network for emergency communications purposes. Winlink 2000 was their network of choice. Today, the ARRL Amateur Radio Emergency Service® (ARES) and Radio amateur civil emergency service (RACES) has been busy deploying Winlink county by county across the country for use both in emergencies and when no other communications outlets are available.

PACTOR, HF message transfer speeds have increased to over 3600 bits per second while features have become more sophisticated and user-friendly. AirMail also continues to keep pace and improve as a user friendly client for the Winlink end-user. With the help of the National Oceanic and Atmospheric Administration (NOAA), the system provides critical weather data to those who need it. With the help of the American Radio Relay league, Winlink 2000 is currently being deployed as an excellent alternative for internet email in the Amateur Radio Emergency Services.

The voluntary efforts of the Winlink Development Team, the participating stations and the user community have been on going and extremely productive. Through the cooperative efforts among people from many different cultures and countries, Winlink has made the world smaller and a little friendlier. Winlink continues to provide a public service to the everyday Amateur Radio user as well as those deploying emergency preparedness and disaster recovery for their served agencies.

Thousands of hams are able to keep in touch via e-mail using the WinLink 2000

system. Emergency Communicators, boaters, RVers, hikers, and a lot of other folks have found the Winlink 2000 system quick, easy, and convenient.

Winlink 2000 is kind of like the old Packet BBS forwarding system on steroids. This unique system has taken a giant step forward, thanks to the two new utilities called Telpac and Paclink.

Do you remember back in the heyday of packet when Packet Bulletin Board System (PBBS) operators accepted your text-only message, and if you addressed it correctly, it could get across the state in a day or two, and across the country in under a week? Later, when HF was used for message forwarding, times were cut to a day or so for most of the world. Then the internet came along, just about killing that idea.

WinLink 2000 was introduced in late 1999. Basically, with WinLink 2000 you have Participating Mail Box Operators (PMBOs) scattered throughout the world, generally with HF and some VHF radio ports. Users connect to the PMBO site over the air and interact with it much like one would interact with a PBBS. All of the PMBOs, there are 73 plus at present, are linked via the internet to a central server, which intelligently routes the messages to the best PMBO for the addressee, defined as the one(s) the addressee has used in the last 90 days. All this makes for a very fast, wide-reaching, and reliable message system, while eliminating the need for users to deal with address routing as in the old packet days.

Winlink 2000 is directed at hams who want to keep in touch, but is designed to be “Emergency Management” ready. If a large area was affected by some kind of disaster, one could expect that PMBO stations outside the affected area would remain operational and ready to accept emergency traffic via HF from the affected area. The system has achieved much better than a 99% uptime over the past four years of operation.

So there you have it: WinLink 2000 and the new Paclink and Telpac utilities. WinLink 2000 is everything the worldwide packet radio network wanted to be, but never attained. Although it uses the internet, it is a valid and valuable synergy, which makes the entire system much more valuable for all of us. Paclink lets us use

off-the-shelf e-mail programs for messaging, and supports virtually any TNC and lets most anyone get involved in providing infrastructure for the rest of us so that access to the WinLink 2000 system can become universal and ubiquitous.

## External links

- [The official Winlink Web Site](#)
- [Winlink 2000 EmComm Yahoo Group](#)
- [Winlink 2000 Help Yahoo Group](#)

### “WINLINK” (PART 3)

In today’s fast-paced world, text email is essential to maintain communication during everyday situations. Most do not realize how necessary email becomes during a time of disaster, such as acts of terrorism or weather-related events. A revolutionary new technology called Winlink 2000 allows for regular email use during periods that internet connectivity might not be available. Radio email has become a crucial amateur radio emergency communications tool for establishing communications to replicate wired email during an emergency.

In most cases, critical communications infrastructure is severed by natural or man-made disasters. Without internet connectivity, email is useless. “The Winlink 2000 radio-email digital network system is intended to greatly extend the ability of Amateur Radio to provide a public service to the greater community by linking to the Internet email system”. In fact, Winlink 2000 can be used to completely replicate the internet without any connection to the internet. Users may use popular email programs such as Microsoft Outlook and Outlook Express to connect to the system.

One of the main components of this network is the Common Message Server (CMS). The CMS operates as a global “email server” for all user clients which can access the system over radio links. This CMS is the main junction between the

internet and amateur radio by handling the email between all connecting clients with either call-sign addresses or addresses from the public internet. Without the Common Message Server, no radio-originated emails can travel to the internet or vice versa. If the primary CMS fails or loses internet connectivity, the backup CMS will come online. However, messages may still be sent without a CMS between the various Participating Mailboxes. These Participating Mailboxes play a huge role in how the system operates during a crisis. PMBO's allow messages to be sent over small regional networks without internet connectivity. Agencies may set up winlink Amateur Radio nodes at their locations in order to connect to the PMBO. The PMBO acts as a central "radio email" server similar to the ones that a user may experience with internet based email. The majority of the connections to PMBO's are using HF radio and these HF connections use the digital radio protocol PACTOR I, II, or III to transmit data between the links.

Likewise, a user may connect to a Participating Mailbox using VHF and UHF radio's as well using a "Telpac" node. Telpac stands for TELnet-PACket bridge and allows the user to employ a VHF/UHF packet mode with the B2F protocol to take advantage of "last mile" coverage. Telpac nodes may be set up in any location that has an Internet Protocol connection to the PMBO. A Telpac node usually consists of a VHF radio, Terminal Node Controller (TNC), and a Computer. A Telpac node may be located at a PMBO site to provide local hubbing between users with no internet at all. A connection can easily approach speeds of 1200 to 9600 baud rates.

A main benefit of using Winlink 2000 is the flexibility of connections. The user may connect to any of the PMBO's or Telpac nodes with their single address. This allows the user to be deployed to a remote location far from home and still receive email from a different PMBO. To make winlink more efficient, it uses a technology called "smart routing" to send messages from the Central Mail Server to the Participating Mailboxes.

Using the amateur radio network, Winlink 2000 is extremely reliable. It gains this reliability because it doesn't rely on the fragile internet to pass email messages between users. Having this network built using amateur radio technology, chances for a connection between units to be severed is slim to none. If a radio on one side

of the link goes bad, it can be easily replaced saving time and money. Wired networks require a huge amount of infrastructure to operate efficiently.

In addition, Winlink 2000 incorporates an assortment of features to augment usability in the system. The user may get a position report on a Winlink user via the Automatic Position Reporting System (APRS) maps and the Global Positioning System. This capability allows other users to track the positions of mobile winlink users. Winlink 2000 also includes an attachment feature similar to the one a user may have with internet-based email. Messages may include binary attachments containing files up to 80,000 bytes. However, use of Winlink 2000 on Amateur Radio frequencies comes with some restrictions. Users may not send messages that could give them financial gain on amateur radio frequencies. They must not send obscene content or encrypted messages either.

With the increased need of text-based email in disaster situations, amateur radio email has an enormous role in communications. The amateur radio network is a reliable system that many agencies can use to communicate crucial messages back and forth. People in the field must be able to communicate with their team members, other response organizations, and supporters in order to be effective regardless of their location.

Effective communications within your teams and with their family, friends, and supporters means:

- Increased support.
- Improved morale.
- Maximum efficiency.

Timely and dependable communications is one of the keys to success in the field during disasters.

## **WINLINK 2000 RADIO-EMAIL OVERVIEW** (Part 4)

The Winlink 2000 global radio network messaging system gives amateur radio operators the ability to send email by radio to augment the operations of our own

responders and those we support. Email messaging is the common denominator which ensures interoperability between our operators and all those agencies we serve. This attribute is very well suited to modern incident command strategies.

Amateurs and officials alike are familiar with creating and sending emails. The Winlink 2000 system uses email applications for the user interface and the process of sending and receiving mail is similar to using any internet service provider. Not only can radio email now be sent when the telephone system and internet are down in an affected area, but officials may send such mail from their own computers at their own desks or in the field with amateur radio operator supervision. This is what our served agencies need.

The Winlink 2000 system operates as a global “email server” for all user clients which can access the system over amateur radio links. It can handle email between all connecting clients with call sign or “tactical” addresses and exchange email with addressees on the public internet through a filtered and secure interface. The system also provides valuable weather, location information and system bulletins for all users.

Radio-email on Winlink 2000 may contain multiple addressees and multiple copies, and may contain binary attachments limited in size only by the speed of the radio links in use. Winlink 2000 radio-email generally moves quickly around the world with delivery times to the addressee’s mailbox or Internet Service Providers within a few minutes or less.

**AIRMAIL:** The Winlink 2000 system uses two different client software programs. Any amateur operator in ARES/RACES or the National Traffic System/National Traffic System Digital can access the system as an email client using free **AirMail** software with a modest computer (Windows 95 or better). With the addition of a basic KISS TNC and a VHF/UHF radio the operator can bridge across the “last mile” where the telephone service and internet are down. This is a very modest equipment list allowing ARES/RACES teams to deploy the technology at minimal cost. AirMail has its own built-in email application and can access the system via the internet, VHF/UHF packet radio, or HF radio for use in remote areas

**PACLINK:** The **Paclink** client software provides a more robust email server

program using an operator email interface application such as Outlook Express, Outlook, Eudora, etc. The Paclink server allows officials to connect to the system as remote clients using the email applications on their own computers. Paclink stations access the system via the internet or via VHF/UHF radio. The AGW Packet Engine (**AGWPE**) software provides the interface for multiple connection channels and a number of different TNCs for radio connections. Use of the Paclink server and radio connections is transparent to the email user.

**PMBOs:** Winlink 2000 distributes email through “public” primary mailboxes (PMBOs) set up around the world, and through special PMBOs within ARES/RACES jurisdictions, all linked over private internet connections to a distributed central mailbox (CMS) system. ARES/RACES PMBOs can serve all radio connected clients even without an internet connection. There are many PMBOs in operation in the US and more are being deployed in jurisdictions throughout the US and many with both VHF/UHF and HF radio access. In most ARES/RACES jurisdictions the deployment of Winlink 2000 will consist of local area networks on VHF, UHF or frequencies permitting higher speed wideband connections. Stations in VHF/UHF range access the system through local gateway (**Telpac**) stations. There are over 600 Telpac gateways already in operation.

**ROUTING:** A powerful feature of Winlink 2000 is that the routing of all mail is automatic and dynamic. A client can connect to any of the system ports and exchange mail with any other client in the system. Client stations may move about and connect via any link path to an available port and mail will be automatically forwarded.

**Local Area Networks:** Building radio local area networks to connect everyone to the system and tie our clients together when the telephones lines and internet are down lets all of us exchange email over radio as easily as clicking “send” on our email program. This also gives the Amateur radio operators a common communications layer to fully integrate the operations of all ARES/RACES, NTS and NTSD services nation-wide.

**Listening to our Customers:**

To be an effective and valued service, ARES/RACES volunteers must first listen and respond to their customers or served agencies. Such customers may include community hospitals, the Red Cross, and other public safety and disaster relief agencies, and especially the local emergency operations center.

What do these community served agencies need? Many are now blessed with existing ARES/RACES communications, but what do you think they would say if you offered them an alternate path for e-mail using their own e-mail programs on their own computers, in their own offices without the disruption of other unfamiliar devices? Let's face it, SMTP e-mail is the current medium for written communications, and there is no reason now to attempt to adopt something special during a time when unfamiliarity may be a huge deterrent to their assigned tasks. The Internet is sufficiently reliable and redundant to be considered by emergency management professionals a valuable communications tool that is a secure, multi-point, communications network. As long as it functions, those we are serving expect to receive information and resource requests by that route. If the Internet is not available to our served agencies, our Winlink 2000 for the ARES/RACES system can now provide a system whereby messages can still arrive by traditional packet radio. The solution to meet our customer's needs is within our grasp. All that remains is to physically implement what already exists.

- Winlink for ARES - [Part I](#) [Part II](#)

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*The concept of using Winlink2000 on a national basis is considered by the ARRL Board of Directors and the ARRL Ad-Hoc Committee on ARES Communications.*

- [Introduction to Winlink 2000](#) (67,237 bytes, PDF file)

*QST* June, 2002, p.31

One integrated digital system links the VHF/UHF packet networks, ham-to-ham radio messages and Internet e-mail—worldwide.

- [WinLink 2000--Internet E-mail from Anywhere!](#)
- [WinLink 2000: A Worldwide HF BBS](#) (98,548 bytes, PDF file)

*QST*, March, 2000, p.90