

The 27th Annual ARRL and TAPR Digital Communications Conference

September 26-28, 2008 - Chicago, Illinois



Winlink 2000 – An Update

Victor Poor, W5SMM / AAA9WL
Winlink Development Team
1282 York Circle
Melbourne, FL 32904
vpoor@cfl.rr.com

Abstract

A lot has happened in the evolution of Winlink 2000 (WL2K) since the paper I presented at the Des Moines DCC in 2004. That paper presented the then current architecture as well as the plans for changes to accommodate ARES and RACES emergency operations. The purpose of this paper is to provide a brief review of its current design and implementation.

Introduction

In the intervening four years those changes have been implemented and more besides. Today WL2K is widely used by amateur emergency services as well as our many ham RV and sailing friends who continue to find it a valuable tool when separated from an Internet connection.

Last year the three MARS services adopted WL2K to support their missions and it is now widely also deployed on MARS HF and VHF frequencies.

What is Winlink 2000 – A Very Brief Review

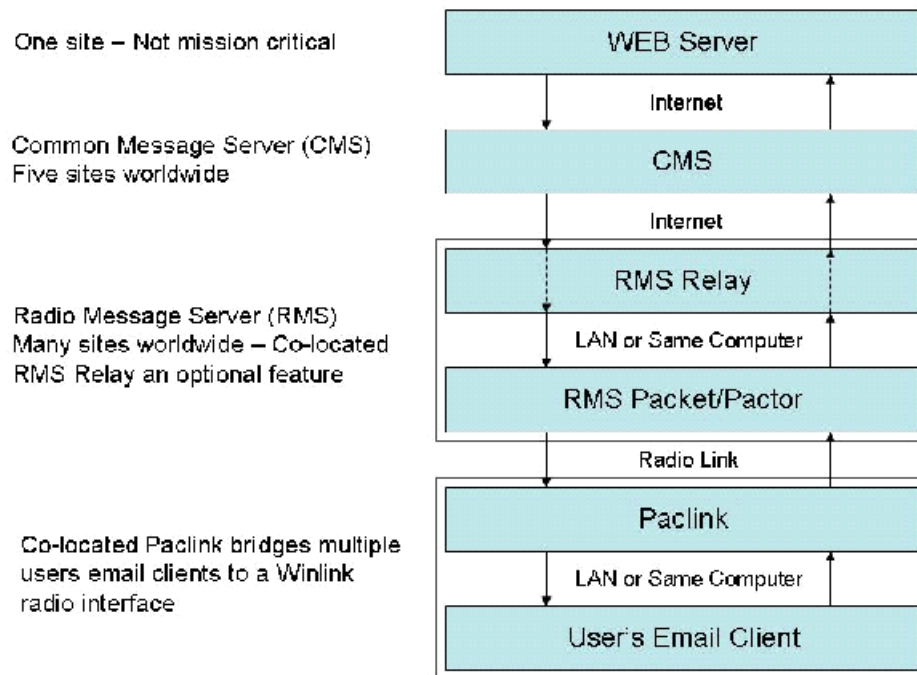
WL2K is a system for providing the exchange of email-like messages between hams and between hams and the Internet mail system using amateur (and not MARS) radio frequencies, HF and VHF.

The primary characteristics of the system compared to existing legacy packet systems are this:

- Multiple Address Messaging
- Transparent File Attachments
- Elimination of the Need for a “Home” mailbox
- Access to Radio Messages with a WEB Browser
- Reduction in Use of HF Spectrum
- Support for Any Number of Radio Access Points
- Very Rapid Delivery of Messages
- Redundant 24/7 Operation

View from 30,000 Feet

Perhaps one of the easiest ways of visualizing the system is to represent it as a “stack” of programs each interconnecting with the previous or next. The complete stack is represented in the following drawing.



Starting from the bottom at the stack is the individual user’s preferred email program such as Outlook, Eudora, Thunderbird, etc. A user may be a ham with an account set up with his callsign or an individual in a served agency with an established tactical address that WL2K will recognize. There may be any number of these programs (users) accessing *Paclink* the next program up in the stack over a local area network (LAN).

Paclink provides an SMTP/POP3 interface to the individual user’s client programs on one side and to one or more radio channels that can communicate with WL2K radio gateway points; RMS Packet or RMS Pactor. *Paclink* provides a message buffer between the two sides so that messages can be held while waiting for a radio connection or for a user to access via the POP3 port. *Paclink* also forwards messages locally between users at the same *Paclink* location.

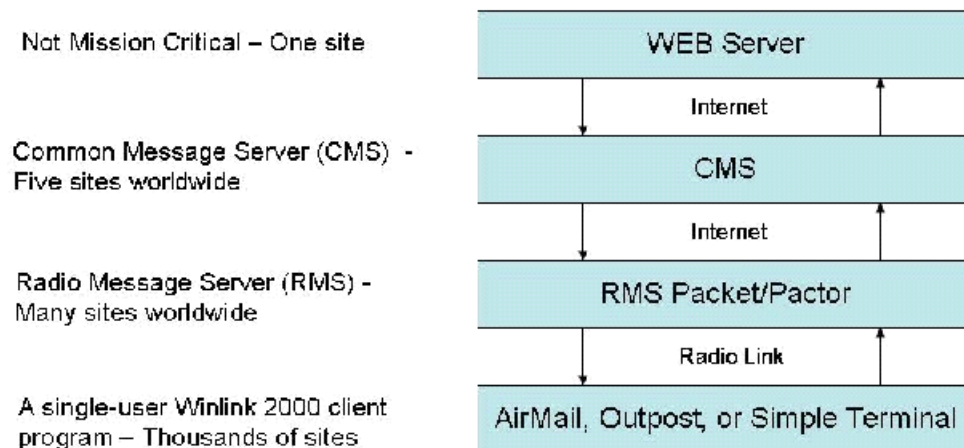
Above *Paclink* in the stack is either an RMS Packet (for VHF) or RMS Pactor (for HF) program. *Paclink* initiates links with either type of WL2K gateway to exchange messages with the WL2K system.

RMS Packet in turn connects either directly to a common message server (CMS) site via Internet or in certain special cases to RMS Relay that provides limited local message services in the event that Internet has failed. RMS Pactor always connects directly to a CMS site.

In the simplest case WL2K can be represented by a simple illustration that I call the “short stack”.

While the full stack provides all of the features required by typical emergency services the short stack illustrates the components normally invoked by a casual user such as an individual on an RV, sailboat,

or remote location that has no other communications available.



In this case the bottom of the stack is a simple user client such as AirMail, Outpost, or even a simple terminal. These client programs provide an interface to WL2K without the complications of Paclink and separate SMTP/POP3 email client programs.

Program Details – Paclink

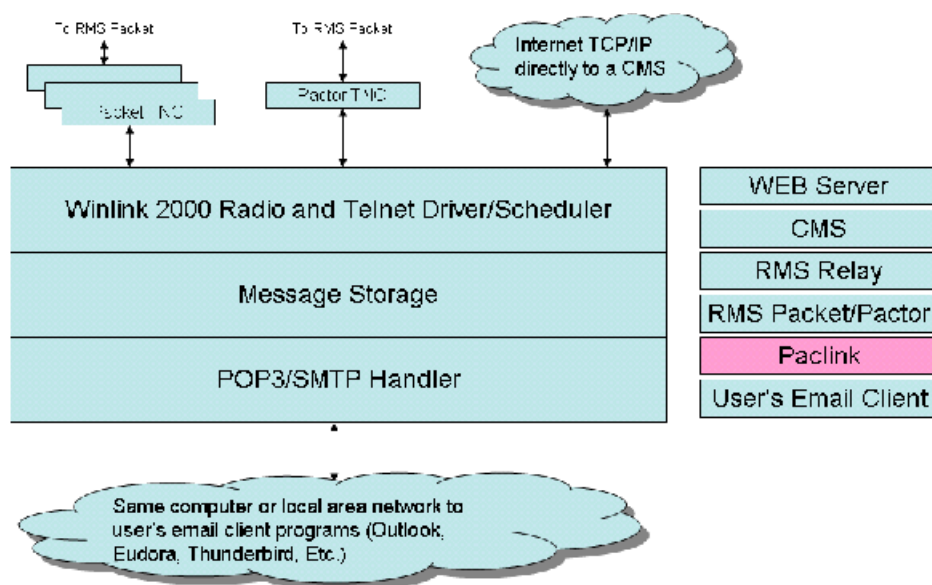
For emergency services Paclink may be the most visible element in the WL2K system. There are three components to Paclink; the Radio/telnet interface, message storage and local routing, and the SMTP/POP3 interface.

I won't discuss the user's email client in this context other than to say that any SMTP/POP3 client program should be able to interface with Paclink. Paclink can support a large number of these email clients locally either in the same machine as Paclink or in the area of an associated LAN. The ultimate limitation is the capacity of the radio channels to support the traffic offered.

As do most WL2K programs, Paclink runs on a PC under Microsoft Windows 2000 or later operating system. Installation is quick and easy; just run the installation file then run the program and fill in the blanks on the configuration dialog boxes. The sysop installing the program requires some knowledge about installing a packet or Pactor controller and associated radio but that is what hams do!

When setting up Paclink an "account" and password is entered for each user that will be accessing it via POP3/SMTP. The domain name for all accounts is always Winlink.org. To the individual user Paclink will appear as an ISP's mail server does. The served agency does not have to be trained to operate special radio orientated software that is different from everyday use.

On the radio side a "channel" is set up for every frequency and callsign that Paclink may use to exchange messages. These channels are assigned a priority so that the preferred (and presumably faster) channels are attempted first and if not successful the progressively lower priority channels are tried.

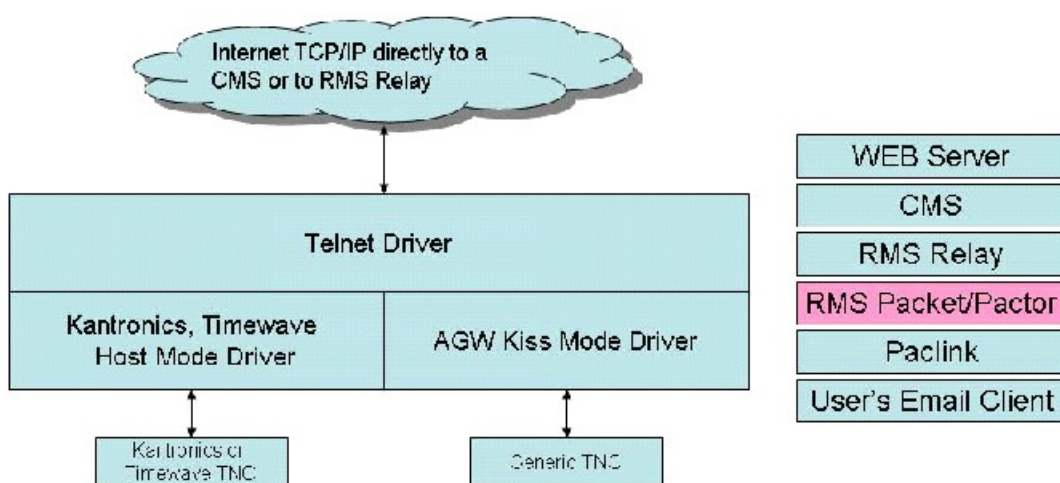


Paclink MP

Except when using HF channels; Paclink runs unattended. HF can also run unattended on MARS frequencies but on the amateur bands FCC rules dictate that a properly licensed operator be controlling the transmission. This is not such a bad thing in any case; a skilled operator can pick the optimum frequency, monitor the flow of traffic, and take steps to quickly clear up the kinds of problems that normally develop on the HF bands. This is the “added value” that skilled hams bring to the served agencies in times of emergency.

Program Details – RMS Packet / RMS Pactor

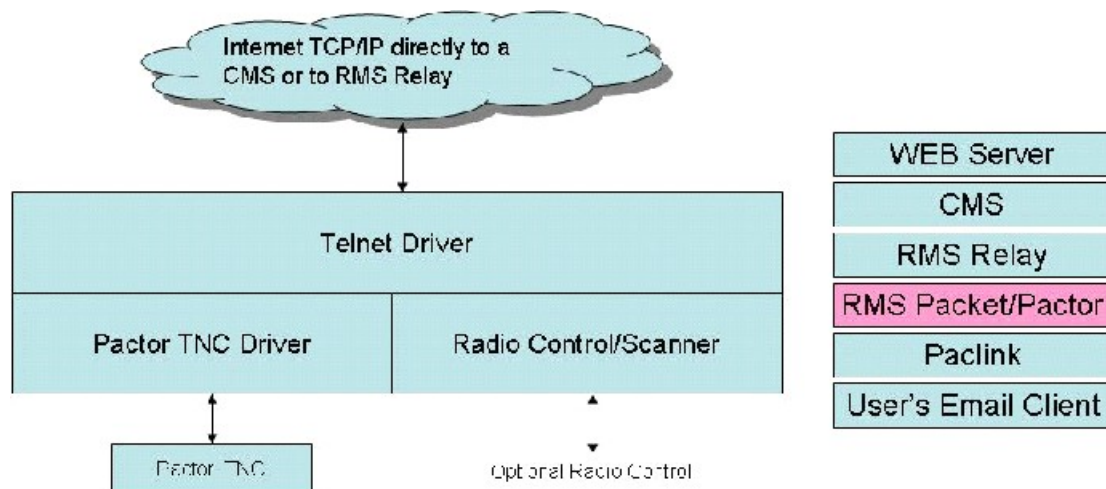
The RMS Packet and RMS Pactor programs provide the “gateway” into the Winlink 2000 system from the radio channels.



RMS Packet

The two programs are very similar in most respects. RMS Packet on the radio side interfaces to and controls a packet TNC. The TNC may be a single or dual channel controller and the software will support up to 10 concurrent connections to remote clients on each channel.

In addition to the RMS Packet program developed by the Winlink Development Team, Hans, DL5DI, has developed a functional equivalent to RMS Packet that runs on the Linux operating system. He has named it the Linux-RMS-Gateway. For those who prefer using Linux to MS Windows an interest group can be found at <http://groups.yahoo.com/group/LinuxRMS>.



RMS Pactor

Any number of instances of RMS Pactor may be run on the same computer enabling the sysop to support more than one packet TNC.

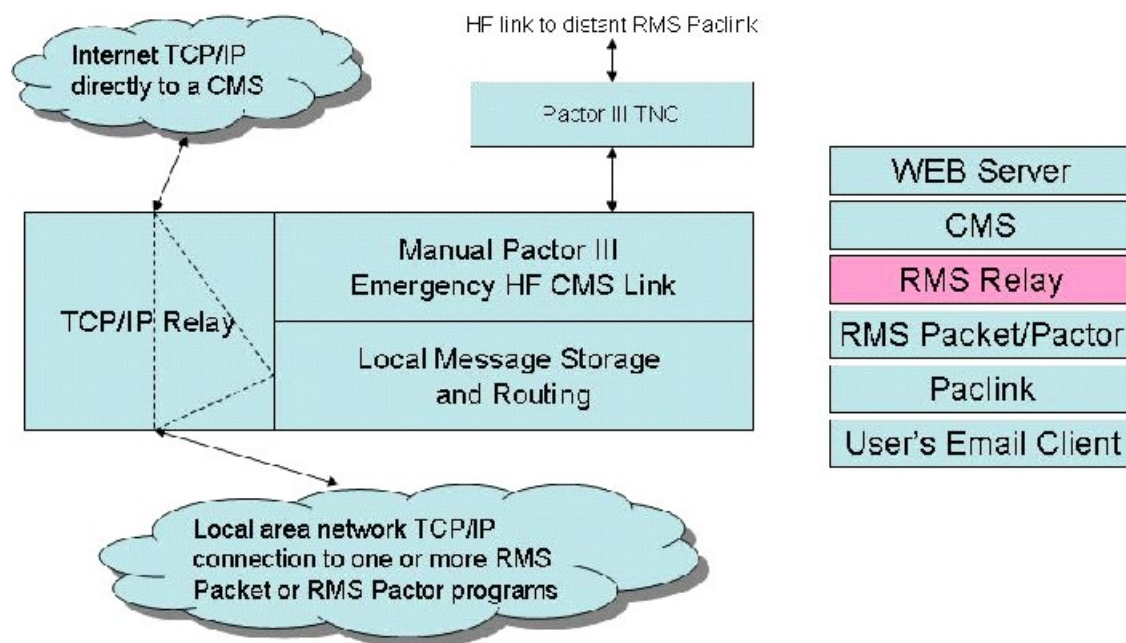
RMS Pactor supports a single Pactor TNC. The TNC may be any of the SCS Pactor controllers that offer Pactor II or Pactor III. The TNC connects to an HF radio. The radio may monitor a single frequency or scan multiple frequencies under RMS Pactor software control.

On the network side of either program there is a telnet client style interface that connects either directly to the CMS sites or in special cases to a local RMS Relay program (see below). A full-time Internet connection is required and in the event of Internet failure the programs will refuse to respond to requests to connect (unless RMS Relay is in use).

In a nutshell, the function of these two programs is to form a bridge or gateway between a radio connection and a telnet connection to a CMS site or to RMS Relay if it is being used. Installation is very simple and the programs can be left running unattended. The programs can be configured to update automatically if new versions become available.

Program Details – RMS Relay

In areas where Winlink 2000 is used for emergency communications the dependence on Internet being operational can be problematical. When using HF it is always possible to make contact with an RMS Pactor site that is out of the distressed area but where VHF is being used something more is required.



RMS Relay

RMS Relay provides a local temporary store and forward message service that operates independently when no Internet service is available. One or more RMS Packet gateways can connect to RMS Relay either by running in the same computer or by reaching RMS Relay via a local area network not dependent on Internet.

RMS Relay will hold all messages entered and not delivered locally and forward them to a CMS site automatically when Internet service is restored. Alternatively, where HF can be installed and operated, RMS Relay can use Pactor III to port through a distant RMS Pactor site to a CMS to maintain a flow of traffic outside of the local area.

Program Details – Common Message Server (CMS)

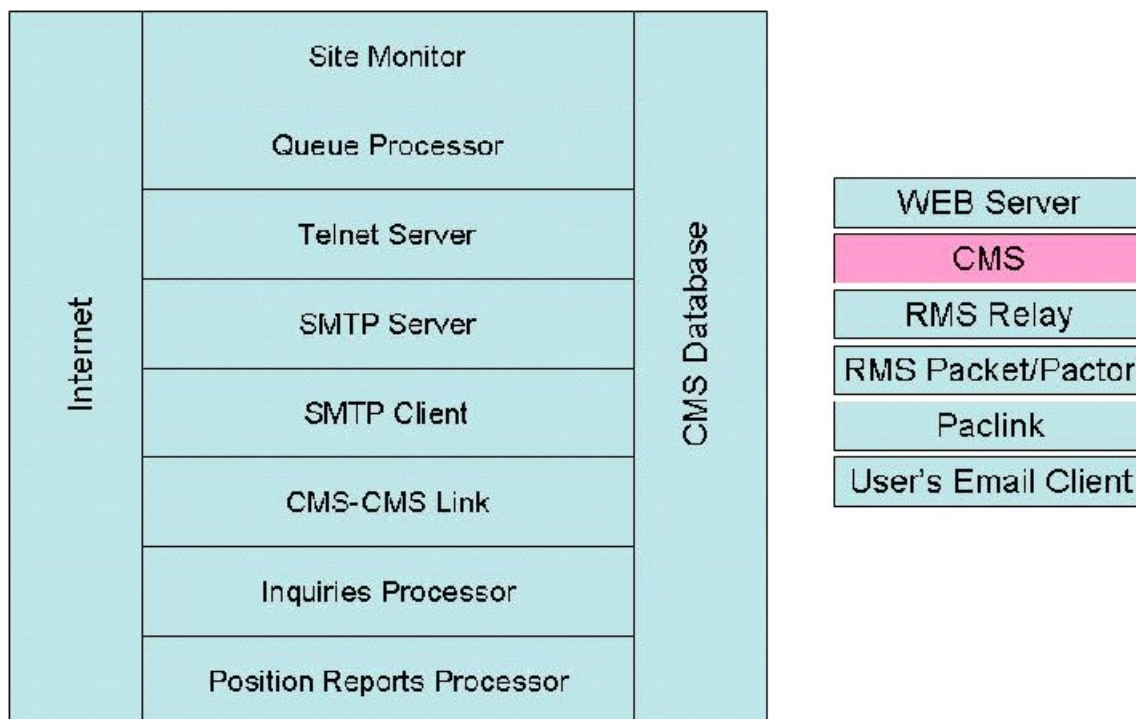
The Common Message Server (CMS) is the heart of Winlink 2000. At this writing there are four sites in operation with the potential for one more site. Every site is a near real-time mirror of every other site and any one site can support the entire network. The sites are geographically dispersed; Australia, the U.S., and Canada with the possibility of a site in Europe. Each site is “hardened” with physical access protection, backup power, and high speed access to Internet.

The CMS is actually a suite of eight programs each providing a unique service or set of services. Each of these programs interfaces to Internet and to a shared local copy of the master CMS database.

The *Site Monitor* monitors the health of the other programs in the suite. It attempts to clear any problems automatically and, if unable, to report the problem status to a status table visible on one of the Winlink.org WEB pages.

The *Telnet Server* accepts connections from remote RMS sites or directly from client programs and is

the vehicle for exchanging messages between remote sites and the master database. Undelivered outbound messages are found on an outbound pending queue and inbound messages are placed in an inbound queue for further processing. The *Telnet Server* also implements the data protocol that is used over the air; providing formatting, compression, decompression, and error control.



Common Message Server (CMS)

The *SMTP Server* supports an interface to email inbound from Internet. It implements the necessary SMTP protocol and provides SPAM and virus filtering and whitelist checking for messages to WL2K users.

The *SMTP Client* provides for the forwarding of messages addressed to Internet email addresses outside of the WL2K system.

The *CMS-CMS Link* updates all of the other CMS sites with any changes to the local master database. Through this mechanism all messages and other WL2K records are available at all CMS sites.

The *Inquiries Processor* receives messages requesting stored data files and selected WEB pages. The program processes each request and returns messages to the requestor containing the requested data.

The *Position Reports Processor* receives position and weather report messages, parses them and adds the reported data to the position and weather reports tables. This data can be accessed from the Winlink WEB site, by a request message (also processed by the *Position Reports Processor*), or from the APRS database and other privately supported WEB pages.

Current Deployment

The WEB site is not redundant and only runs at a single site currently located in San Diego. It is not mission critical so the loss of the WEB site would not affect operation of the rest of the network.

There are four CMS sites deployed located in Perth, Australia; San Diego, California; Washington, DC; and Halifax, Nova Scotia.

There are about 150 RMS Pactor sites and about 800 RMS Packet sites world wide including MARS, emcomm, and public gateways.

There are over 13,000 registered users at the time this is being written.

WWW.Winlink.Org

WINLINK 2000
Global Radio Email System **TUN AIR**

Image courtesy of the Image Science & Analysis Lab, NASA Johnson Space Center

Home About Applications Contact How to... Links Maps Reports Software WebMail Login FAQ Site Login

Winlink 2000

Winlink 2000 (WL2K) is a worldwide **system** of volunteer resources supporting e-mail by radio, with non-commercial links to internet e-mail. These resources come from Amateur Radio, the Military Affiliate Radio Systems (MARS), and other volunteer organizations. The system provides valuable service to emergency communicators, and to licensed operators without access to the internet. The Winlink Development Team (WDT) is committed to improving the system using the most efficient and effective radio modes for local, regional and long-distance applications, together with modern computer and networking technology.

To use the Winlink 2000 system, you must hold an Amateur Radio License granting appropriate operating privileges and/or be a member of a supported organization or agency. Use of the system and all software is free of charge for those who qualify.

Winlink 2000 is a 100% volunteer, non-profit project of the Amateur Radio Safety Foundation, Inc. It functions only through your generous donations and the unselfish efforts of hundreds of Amateur Radio operators around the world. Please support WL2K with your tax-deductible donation.

Is this an EMERGENCY?

- Concerned about a WL2K user or family or friends at sea?
Get help through Winlink 2000 NOW.
- Depending on your location, you may wish to contact the various marine or Amateur VHF networks.
- Want the position of a WL2K user?
Click here: **Position Reporter FASTLINK**
- For WL2K Airmail users in the field or at sea:
--For medical assistance: WL2K Catalog Item > ZSSS_BULLS, check "MEDICO"
--For the 30 closest WL2K users: WL2K Catalog Item > Winlink_User, check "WL2K_Nearby"

The WEB site, in addition to providing general information regarding WL2K provides password protected mail access, status pages for the CMS and RMS sites, map displays for reported positions, and many other useful features too numerous to discuss here. Just go and explore it!
