Winlink 2000

Enhanced Digital Messaging for Amateur Radio

Don Bush, KL7JFT

MATSU DEC

Winlink! 2000 CMS

Background

Winlink 2000 is a system originally developed ***over 15 years ago*** for recreational sailors to allow them to access Internet **email** via their marine radios, while out at sea, and was named **“sailmail”**

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More than EmComm

While Winlink 2000 lends itself well to emergency communications, it can also be used by Hams for many other purposes.

Each year a group of Hams travel to remote South American regions, along with a volunteer medical team, to provide the doctors and nurses communications and email back home.

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Annual IHS Honduras Trip

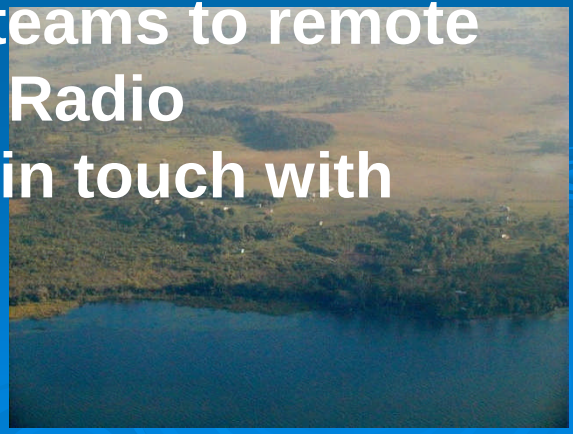
Lor Kutchins (W3QA) – Chester County RACES officer and EPA AEC.

Lor recently received the Atlantic Division Technical Achievement Award for his many contributions to Digital Communications and his work at organizing the Chester County EOC network

Loading the plane

Each year the International Health Service (IHS) sends medical, dental and surgical teams to remote villages. The HIS relies on Amateur Radio operators and Winlink 2000 to keep in touch with the rest of the world.

The ‘first class” section



An aerial view of the remote village

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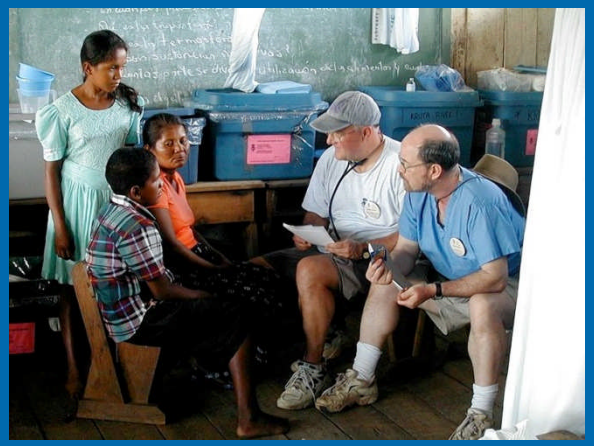
IHS at Work



Family Checkup

Some Dental Work

Minor Surgery in the temporary O.R.

New Glasses

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Email Comes to the Jungle

"Comm Center" with temporary dipole

Daily "net" back to the States –

Note the Pactor TNC

Local Tower Climber

Nurse sending email with an xray attachment to Mayo Clinic

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What is Winlink 2000

- It's a robust wireless backup system for Internet ***E-mail*** linking Radio to the Internet.
- It supports attachments, position reporting, graphical and text weather bulletins in a redundant, mirrored worldwide network
- It's highly adaptable for emergency communications.

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What is Winlink 2000

- Email can be sent to and from Radio users or regular everyday Internet addresses.
- It can automatically switch from normal “wired” Internet connection to a radio connection via VHF or HF.
- It can be used in either mobile or fixed operations

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Winlink 2000 is E-Mail

It is the fastest most dependable, transparent backup e-mail network that bridges any distance, when the normal Internet connection is "broken"

…It's Email via Ham Radio !!!

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Why E-mail ?

•E-mail is “universal” and has become the standard method for fast written communications for all of us.

•It is used extensively by individuals, government agencies, and organizations like the Red Cross and Salvation Army, replacing other means like Telegrams and Telex messages.

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Served Agencies rely on e-mail

- Between different Agencies
- Between an Agency and the Field
- Between an Agency to multi-points
- Between Agencies and *anywhere!*

Critical

Routine

Normal E-mail requires an Internet Connection

I can't receive the list of donors

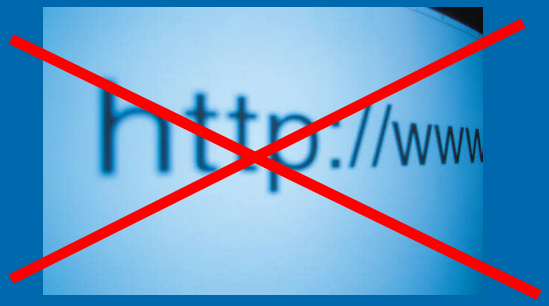
It won't let me send the request for tactical assistance

What happened to my connection?

Are the phone lines down?

If a disaster strikes, and a community's "Last Mile" Internet link is broken, or the agency email server is down, then normal email cannot flow.

The “Last Mile” is an important concept!



The “Last Mile” is the path across an area where conventional communications have been ***disrupted or overloaded*** by an incident.

Why Winlink 2000?

- **Winlink can provide e-mail to served agencies:**
  - Using their ***existing*** e-mail programs,
  - With minimal or no additional training,
  - On their ***own*** computers in their ***own*** offices,
  - With ***no*** additional software installed on their computer,
  - From ***inside*** a disaster area, and ***without*** normal e-mail servers or Internet connection.
  - It doesn't ***add to the stress*** or learning curve when in an emergency situation

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Email Features

- It works with familiar e-mail software like ***Outlook***, ***Eudora***, ***Netscape***, ***Lotus***, ***Thunderbird***, etc.
- Anyone can use their current ***address book*** and a ***spell-checker***
- They can send to ***multiple recipients*** ***(to:, cc:)*** and use ***attachments***
- It works with ***multiple computers*** on a LAN with no additional user software, ***without compromising security***

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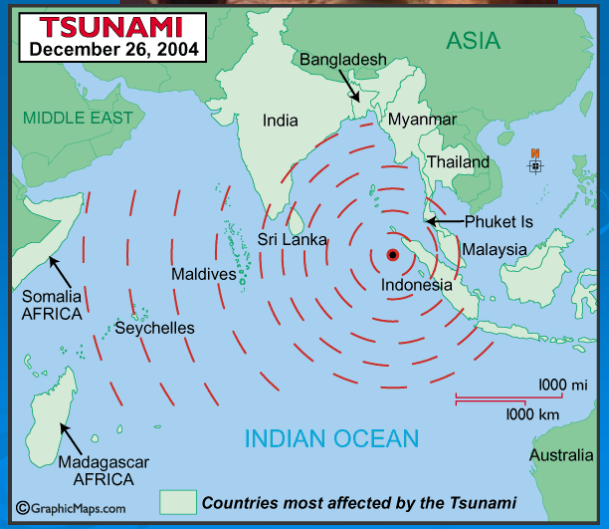
Unfortunately, in today's World, we cannot predict the frequency, size, nature or location of our disaster areas! We be must prepared, Globally.

Local?

Regional?

Global?



Traditional Role of Amateur Radio support

- Report ***health and welfare*** of affected public
- ***Voice communications*** among served agencies (EOC's, hospitals, shelters, and incident command.)
- Site ***tactical support*** – Incident Command, search and rescue, damage and storm reporting (SKYWARN).
- Hand the microphone to the served agencies whose radio isn't working
- Formal, structured ***written emergency traffic*** handling

But, our traditional methods ***fail*** for message handling in today's agencies…….

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For Complex Messages

- Voice, Morse code, Radiograms, and traditional Packet radio ***won't*** do…
  - way **too slow**, translation required, inflexible, **prone to error**, no permanent record, **not self-originating**, not point-to-multipoint.
  - doesn't go **end-to-end** from user-to-user on their ***own*** computers in their ***own*** offices & **no attachments** and no automatic distribution..

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Since the Advent of e-mail

- There is a need for delivering **written** procedures, lists, graphics, images, etc. in the documents to multiple recipients!
- Multiple recipient ***e-mail*** with ***attachments*** is the de facto standard to carry written information.
- **Hand-written** message forms are seldom used, and are ***not transparent*** to normal operations!

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E-MAIL VIA AMATEUR RADIO

How ?

…do Hams do that?

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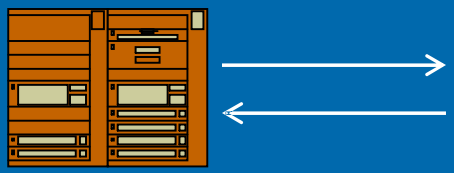
The Winlink 2000 Network

Full-time (redundant) Central Mail Servers (CMS)



PMBO

HF long-haul *PMBO* Internet Gateway

PMBO

HF long-haul *Airmail* email Client

VHF/UHF regional *Paclink* email Client

VHF/UHF regional *Telpac* Internet Gateway

Winlink 2000

Does it look

…Complicated?

…..Confusing??

…..Intimidating???

But, it is really straight forward when we break it down into its basic components for the local Amateur wanting to get involved…….

- VHF/UHF using Paclink or Airmail
- VHF/UHF RMS Internet Gateways
- Long Range High Frequency with Airmail

Paclink for VHF/UHF

- *Paclink* is a "**user**" program installed on a local Ham's computer to allow them to send and receive email via the **Internet** or by using **VHF/UHF packet communications**, usually connecting to a remote RMS station.
- Paclink is an **email server** acting like your local **ISP** connecting via the **Internet** or over **Radio** to transfer mail using *Outlook*, *Endura*, *Thunderbird*, *Netscape*, or other email clients.
- A single Paclink server can host **multiple other computers** on an agency LAN.
- Paclink will **automatically switch** from an Internet connection to a Radio connection upon detecting that the Internet is down..

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Airmail for HF or VHF

- **Airmail** is also a **“user”** program used primarily for a connection to an **HF radio** participating station, using **PACTOR**.
- However, it can also be used for **VHF/UHF Packet**.
- Airmail also has an option for a **direct Internet** connection similar to Paclink.
- Airmail also contains **position** reporting, **weather faxing**, and a **propagation** predictor showing each of the participating PMBO’s throughout the Globe.

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VHF/UHF RMS Gateway

- Since VHF/UHF is basically **line-of-site**, Paclink stations typically connect to dedicated 24/7 RMS Gateway stations strategically located within a county or local area
- RMS stands for ***Radio Message Server***, and is a **"host"** program on a remote PC that bridges the gap from that "**Last Mile**" to the wired Internet connection.
- It allows VHF/UHF packet users to access regular Internet email from a basic radio connection.
- It is **simple to setup**, and acts muck like a regular packet or APRS digipeater, but "relays" the radio signal to an Internet email server, and is ideal for a **temporary emergency** setup at an unattended remote location.

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What Equipment and Software is needed?

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Basic VHF/UHF Winlink E-mail setup

Paclink Requirements:

Software:

- Microsoft NET framework 1.1
- AGWPE Packet Engine Driver
- Paclink
- Windows 2000 or XP, Vista, & Windows 7 & 8

Hardware:

- VHF Radio
- TNC modem or Internal Radio TNC
- PC (Preferably a Laptop)

You can also use Airmail with VHF

But is not as user friendly to employees or volunteers at the various served agency

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What is required for HF Pactor?

Airmail Requirements:

Software:

- **Airmail Software**
- **Windows 98, ME, 2000, Vista, or Windows 7**

Hardware:

- **HF Radio**
- **Pactor capable HF TNC**
- **HF Antenna and perhaps Tuner**
- **Personal Computer**

Pactor 3 or 2 is highly recommended over Pactor 1

An 80 kb file on Pactor 1 transfers in approx. 80 mins. – On Pactor 3, it is only 5-7 mins.

The HF software is free – but the Pactor Modems can get very expensive…..

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Basic VHF/UHF RMS setup

RMS Requirements:

Software:

- **AGWPE Packet Engine Driver**
- **RMS Software**
- **Windows 98, ME, 2000 or XP, Windows 7 & 8**

Hardware:

- **VHF Radio**
- **TNC modem**
- **PC -- at Home or Agency**

There is nothing special about a RMS. It is a basic packet radio station running 24/7 with an Internet connection – either full-time or dial-up.

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And how does it all come together?

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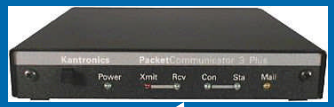
A Basic Paclink e-mail Station

A typical ham radio "Last Mile" e-mail station is basically composed of three simple components operating on VHF/UHF.

A VHF or UHF **Radio** and a *Good* **Antenna**



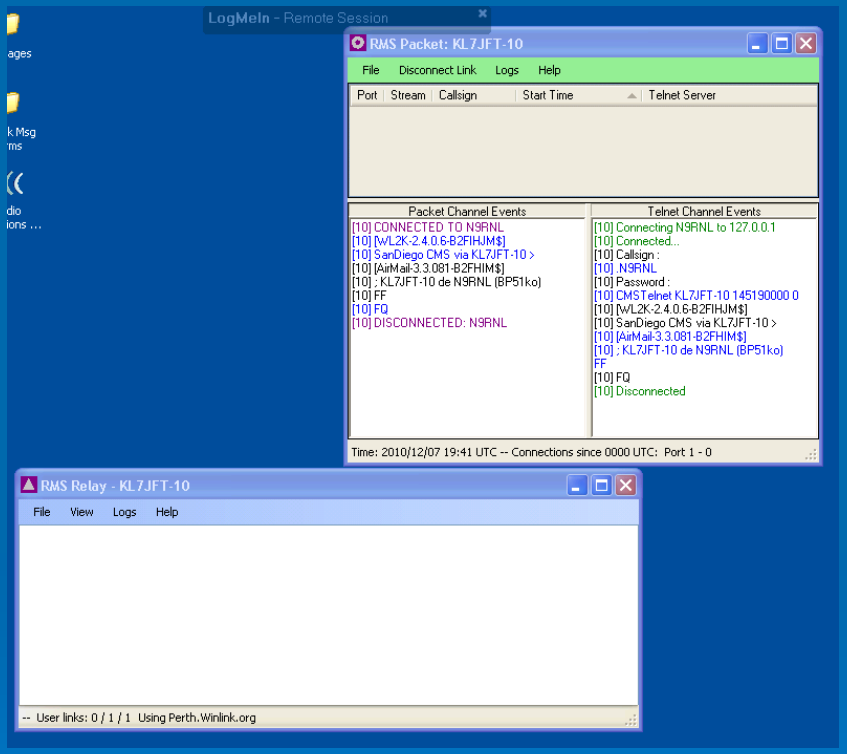
A basic Packet Radio Modem (**TNC**.) or Radio with internal TNC

Laptop for a Portable Station.

Or a Desktop for an agency

The software is free and most Amateur Radio stations already have these available, so cost is minimal or none..

The RMS client typically routes email messages To and From a RMS gateway

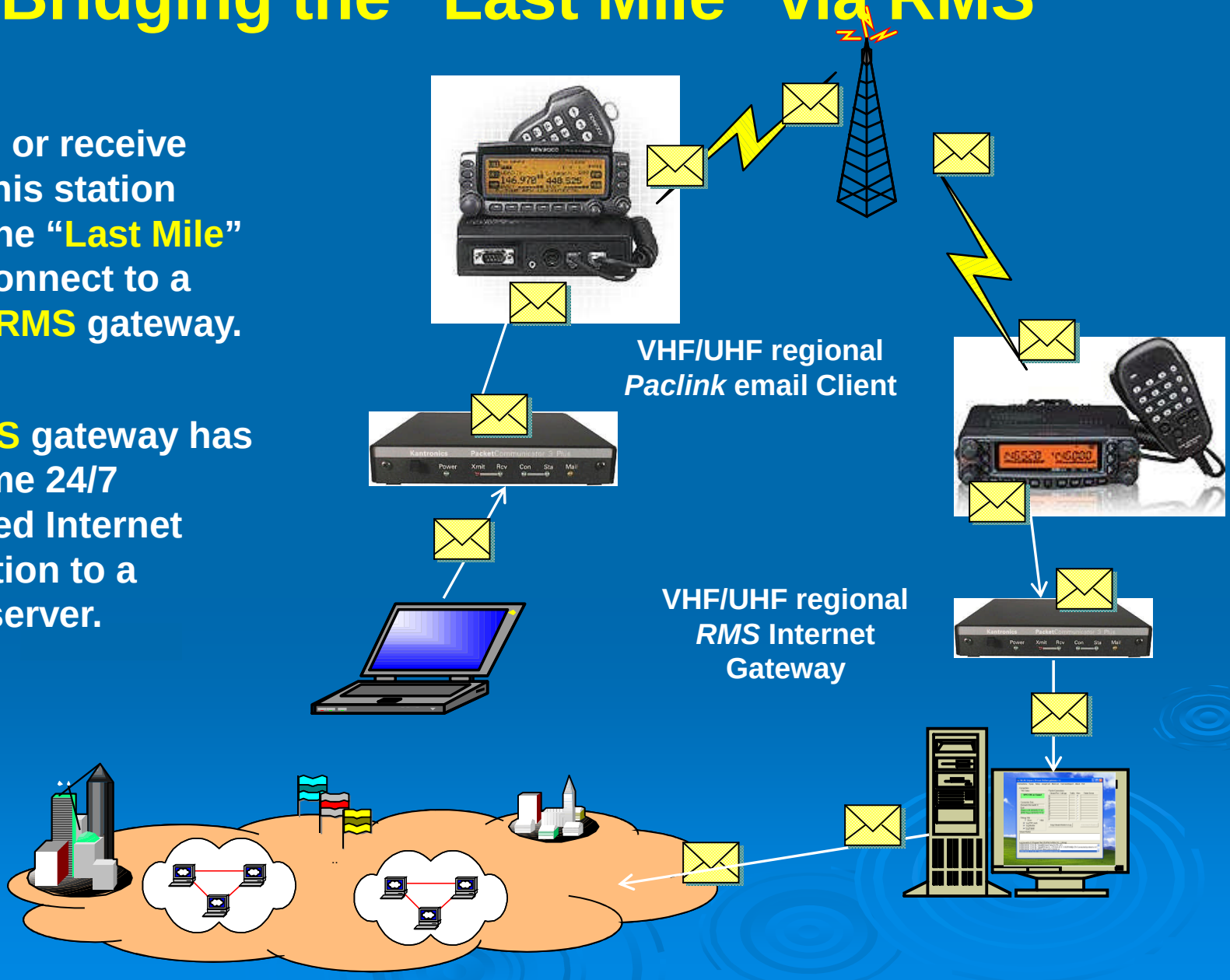


The **RMS software** is basically a program that waits for a RF packet connection, and then sends and receives email to and from that RF station by a direct connection to the Internet. ***It runs automatically and unattended.***

Bridging the “Last Mile” via RMS

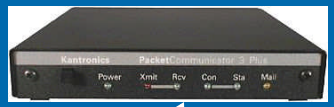
To send or receive email, this station within the “Last Mile” could connect to a nearby RMS gateway.

The RMS gateway has a full time 24/7 dedicated Internet connection to a PMBO server.

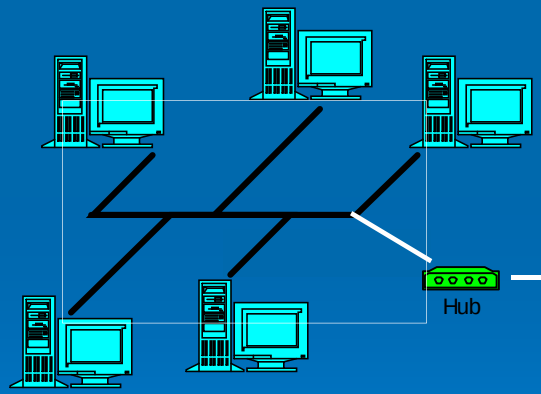


Connecting to the Agency LAN

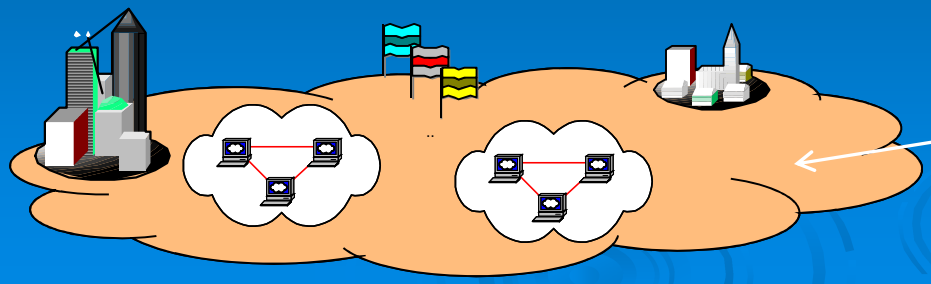
All the computers within the agency can use their existing Local Area Network to tie into the Paclink client server.



VHF/UHF regional *Paclink* email Client



VHF/UHF regional *RMS* Internet Gateway



What if no Regional RMS is available?

If the local area is completely cut off, then communications can switch to distant **High Frequency stations**.

The VHF components are replaced with HF running **Pactor** protocol.

There are currently 25 full-time stations in the U.S. with more around the world.

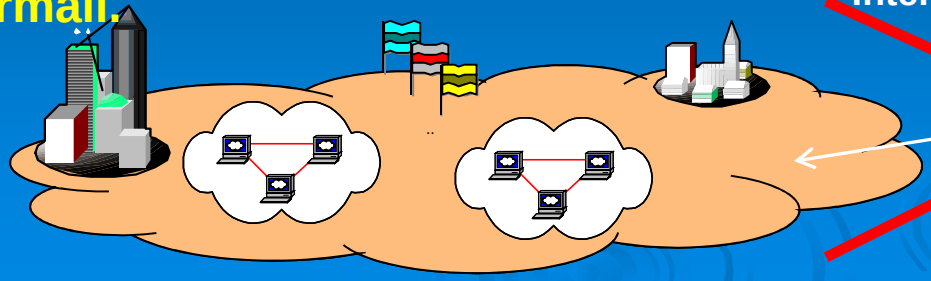
In this case, the software used on the PC is a program named **Airmail**.

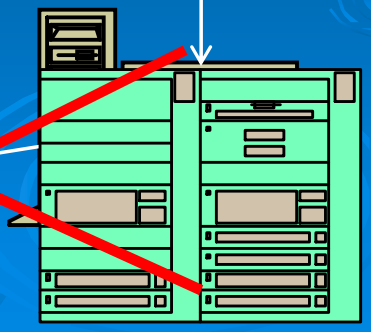
VHF/UHF regional ***Paclink*** email Client

HF Long-Haul ***Airmail*** email Client

HF Long-Haul ***PMBO*** Internet Gateway

VHF/UHF regional ***RMS*** Internet Gateway





PMBO

So now let's go back and look at the network again, and see how these components all fit together…….

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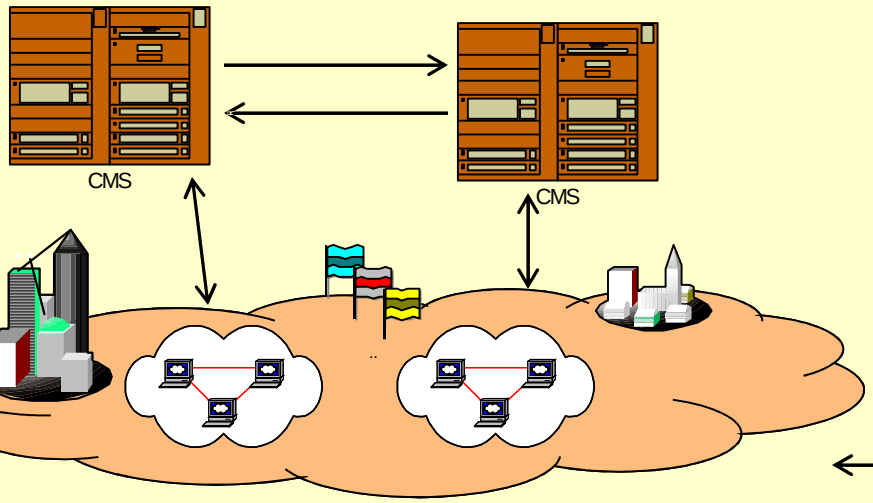
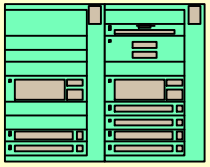
The Winlink 2000 Network

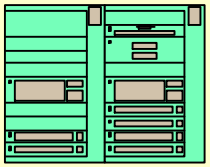
Full-time (redundant) Central Mail Servers (CMS)



HF PMBO's



HF long-haul *PMBO* Internet Gateway



HF & Airmail

HF long-haul *Airmail* email Client

VHF & Paclink

VHF/UHF regional *Paclink* email Client

VHF RMS

VHF/UHF regional *RMS* Internet Gateway

Winlink 2000 Today

- It has been supporting emergency communications worldwide with **> 99%** availability for **seven years**.
- Over **50** Amateur Radio EmComm Participating locations (**PMBOs**) with 25 in USA. Many locations contain multiple stations.
- There are approximately **9,500 radio** users and approximately **98,000 Internet** email recipients.
- Monthly traffic averages over 150,000 messages or 280,000 minutes.
- Over **300** VHF/UHF **Active RMS Gateways** in operation.

Winlink! 2000 CMS

The ARRL is implementing a National Plan

In cooperation with its partnership with Homeland Security, and at their recommendation, the ARRL Board has agreed to provide a ***nationwide digital system to enhance the communications capability of the Amateur Radio Emergency Service (ARES®).***

There are situations, the Board said, when ARES® "must have the capability to pass digital traffic across the nation quickly and accurately."

It must also be transparent, seamless,end-to-end, and take only minutes from origination to destination.

Winlink! 2000 CMS

Army MARS Network

(Mar. 2, 2006) …..The Army Military Auxiliary Radio System (**MARS**) announced that they have implemented Winlink 2000 as a new Global Network which can tie to the Canadian system CFARS.

They expect it will provide interconnection from within their own network and other local and regional agencies served by Amateur Radio

Winlink! 2000 CMS

New Mexico & Tennessee Grants

(Mar. 24, 2006)…New Mexico allocated $500,000 to design, construct and install a statewide **Amateur Radio** emergency communications network, as well as Tennessee in 2008.

Plans call for interlinked VHF and UHF repeaters to handle both Voice and Digital communication including Winlink

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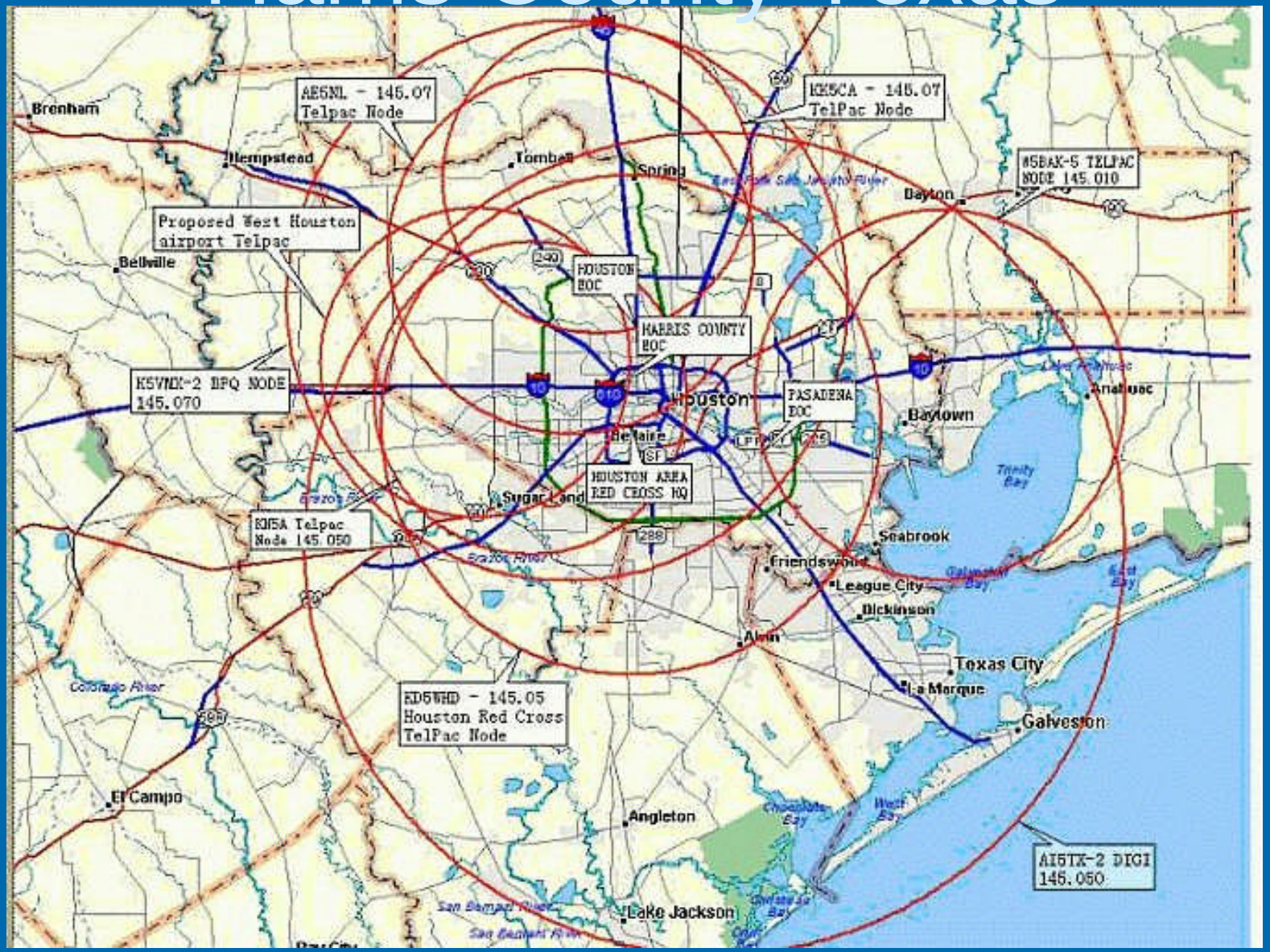
Harris County (Houston,) Texas. “A mature system.”

Harris County Texas



So, What can *You* do?

- Learn to use ***Airmail*** and ***Paclink***.
- Help deploy **local *RMS*** gateways throughout Alaska.
- Help deploy **mobile *Paclink*** & fixed Paclink LANs in places where it will be of **value during an emergency**.
- Consider self-powered, mobile or fixed ***Airmail***, long-range HF Stations.

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Devise A Plan

Set up a **strategy** and a **time-line** for each task.

- **Coordinate efforts with the EC's, SEC's, DECs, SM.**
- **Ask other ARES® communities for assistance.**
- **Involve and commit the end-user. They are the one's to benefit!**

- Implement the plan in stages.

- **Test it, Test it,…..and Test it again.**

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With Winlink…..

We can keep Agencies connected *without* an immediate Internet connection.

Let's make EmComm as easy & transparent as possible for those who need it during an emergency situation.

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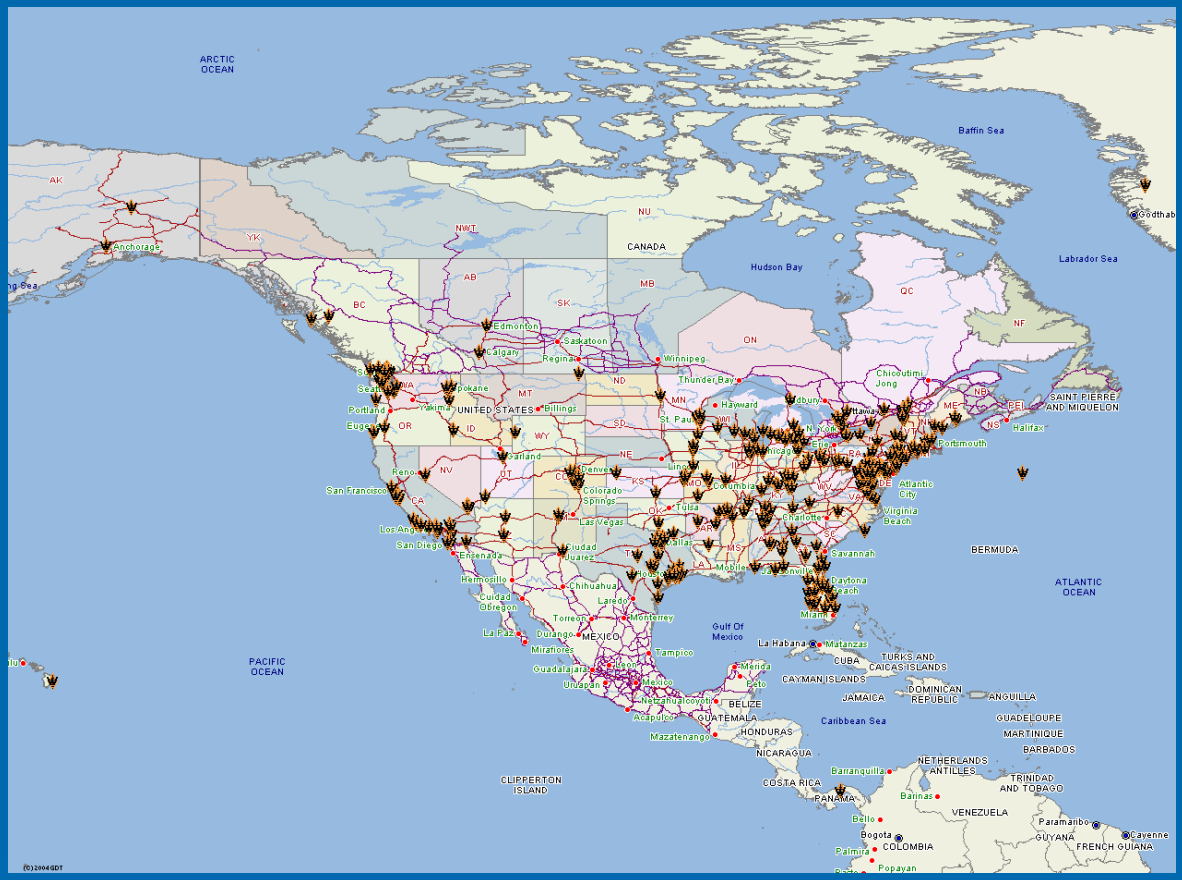

Winlink 2000 is a *proven, existing, operational, dependable, redundant, secure, reliable Amateur radio email messaging network* that is being made available to the ARES® & RACES communities.

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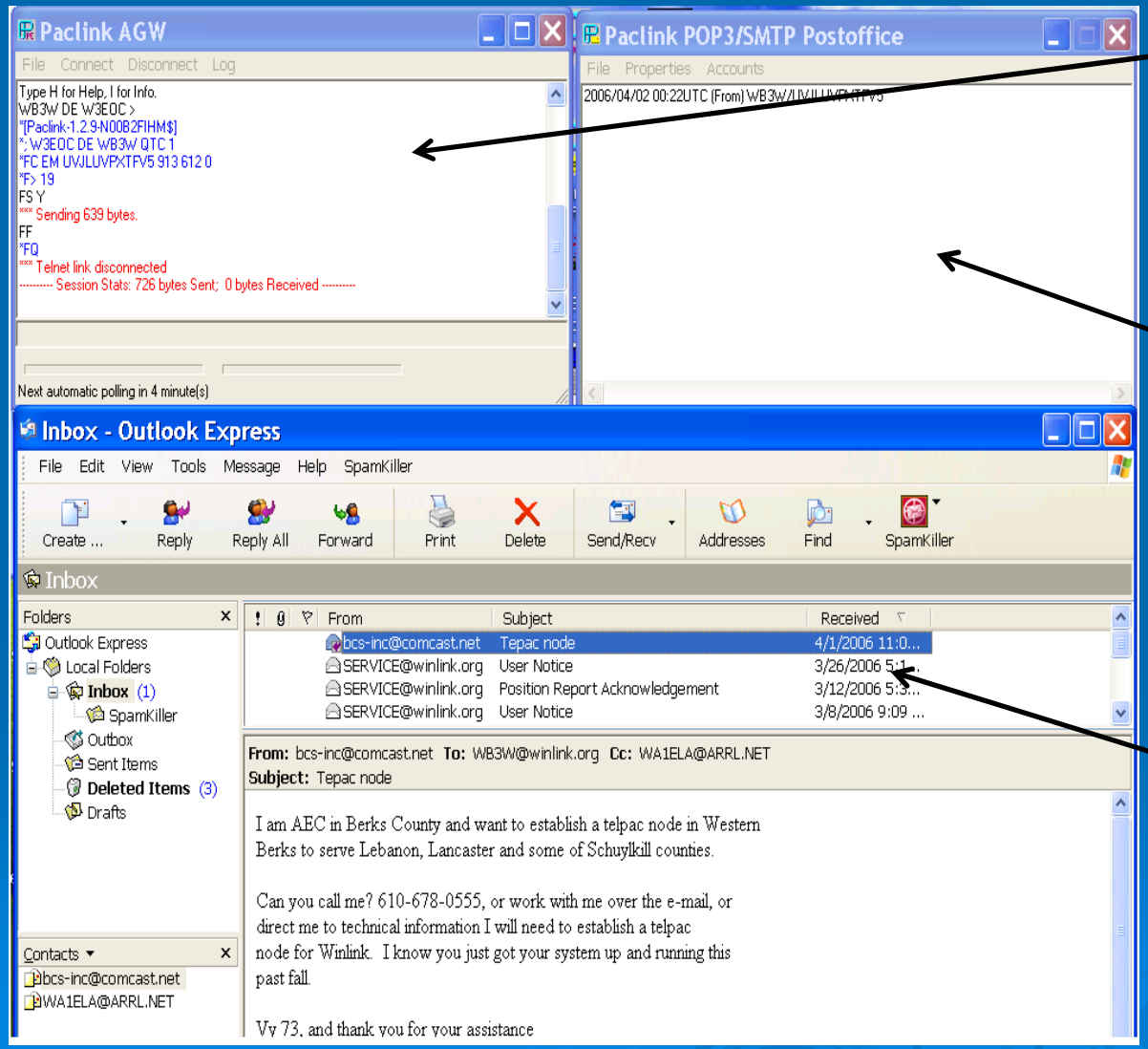
Paclink Screen Shot

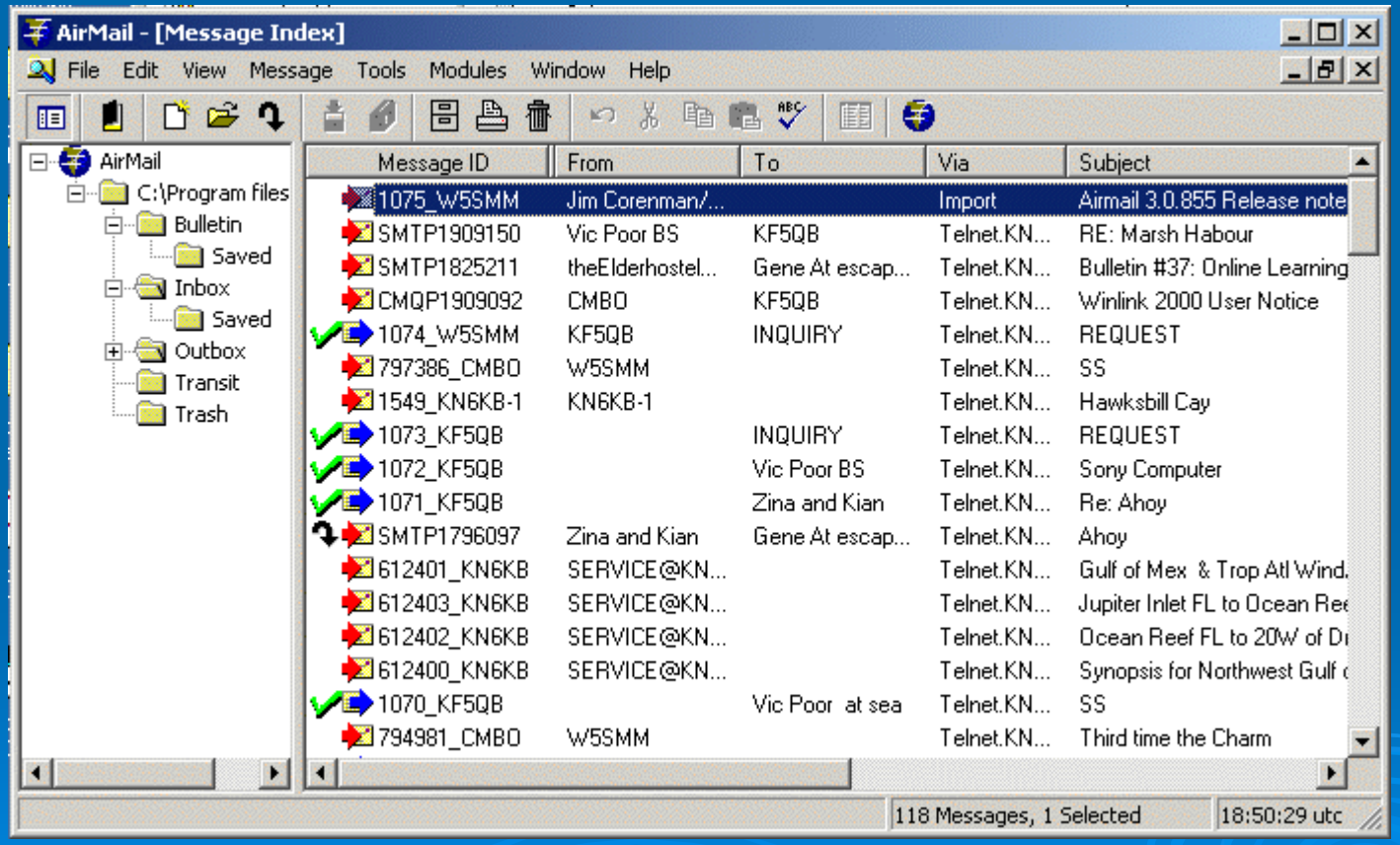


PacklinkAGW communication module

Packlink PostOffice Email Server

Regular MS Outlook Express Email program

Airmail Main Screen



RMS EXPRESS Main Screen

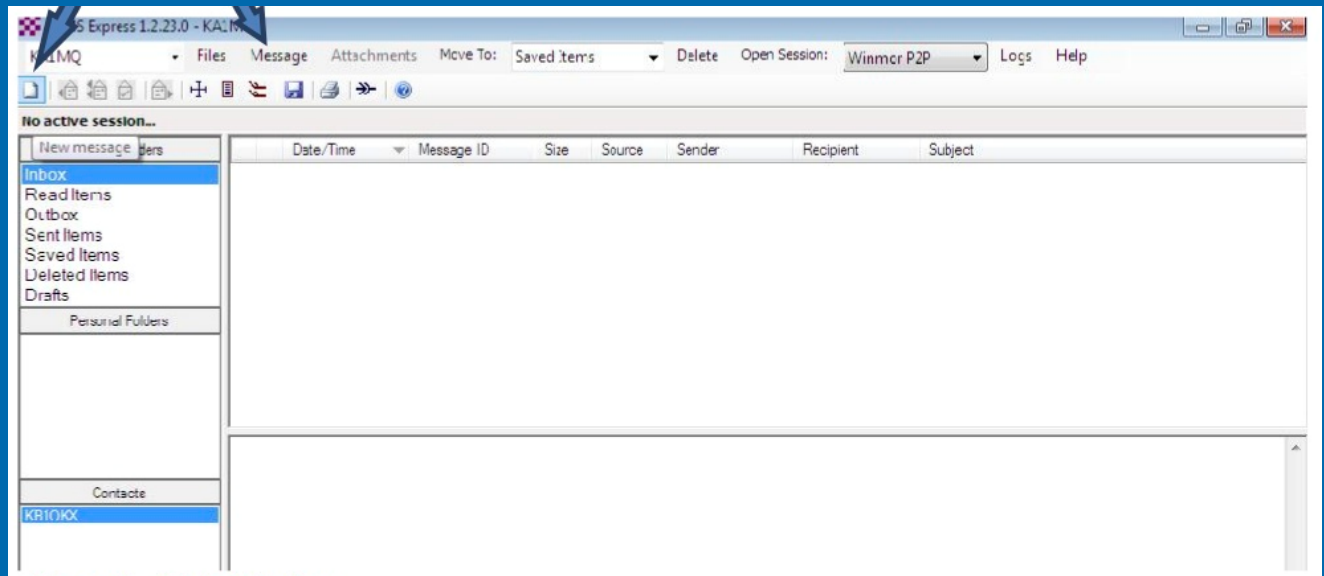


Figure 2 – Main Window

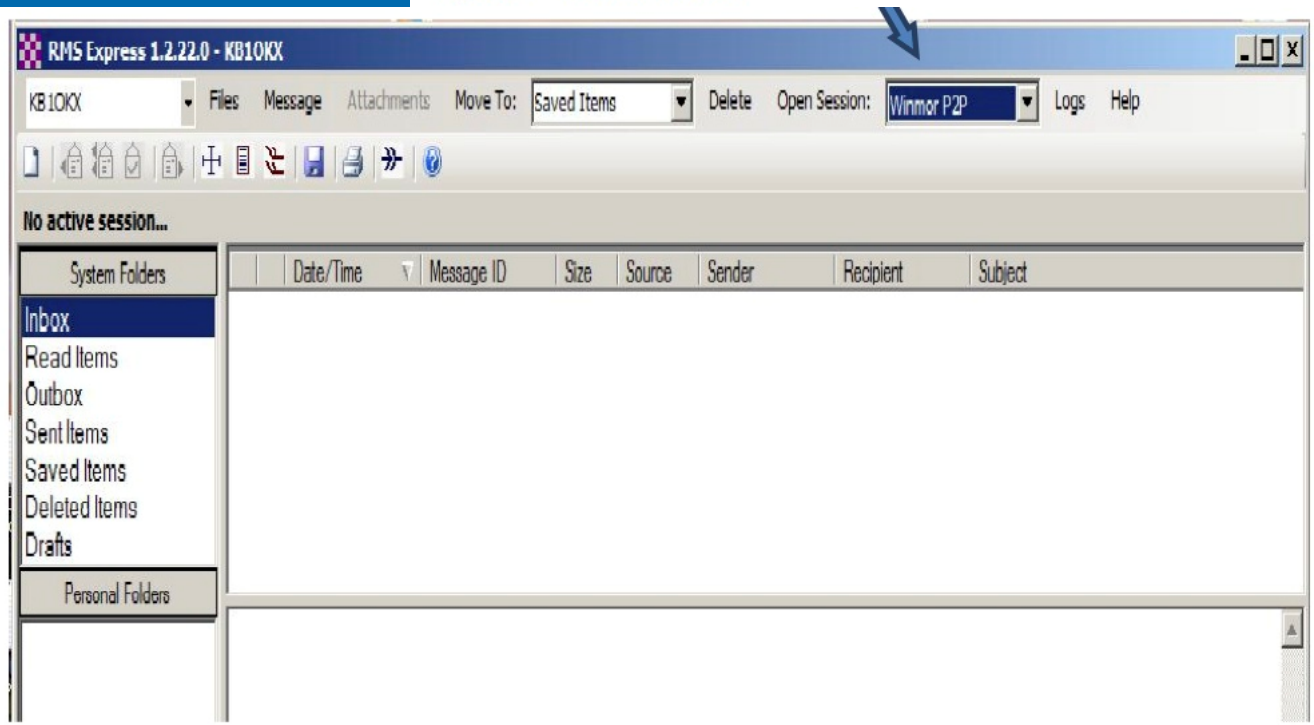


Figure 1 – Main Window

RMS EXPRESS Msg & Transmit Screens

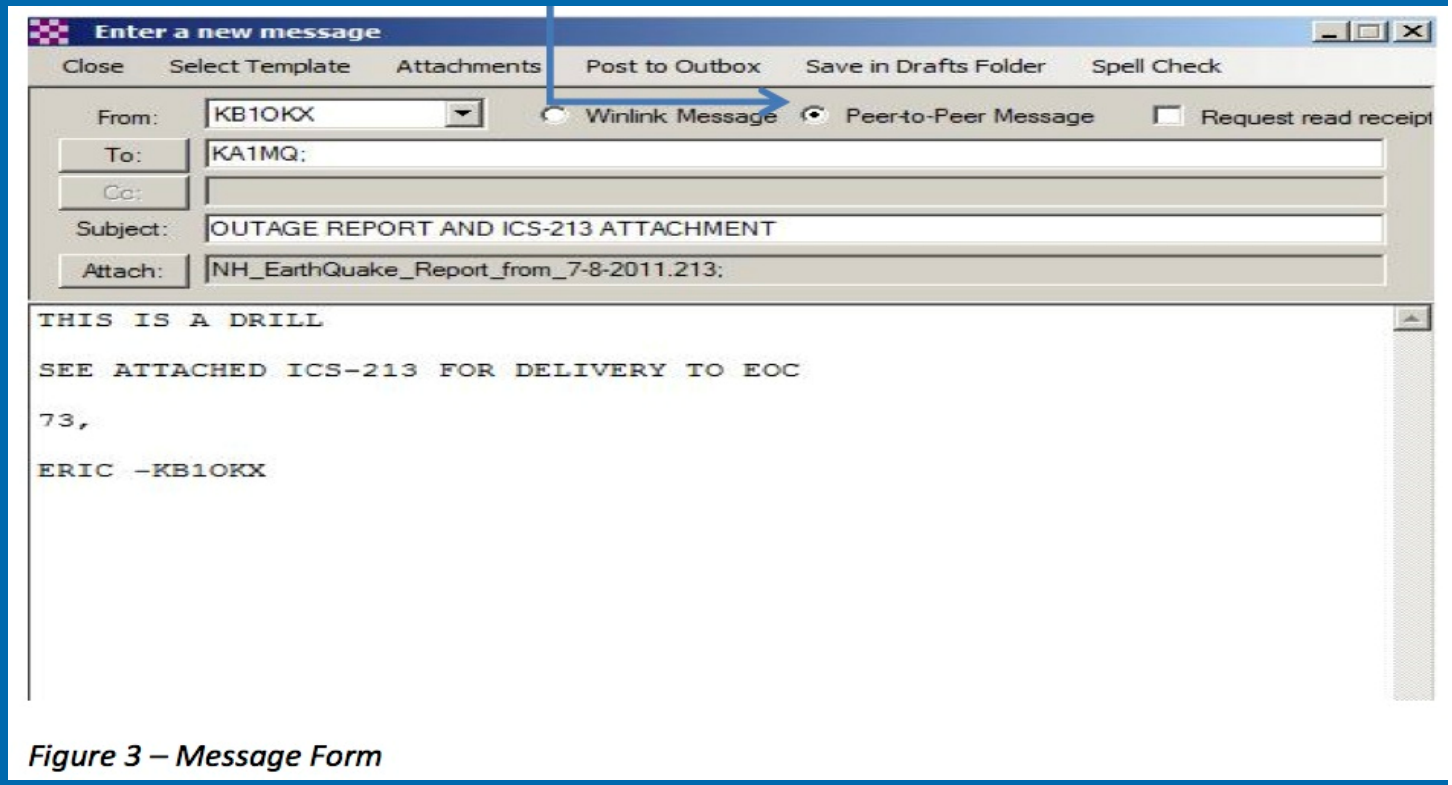


Figure 3 – Message Form

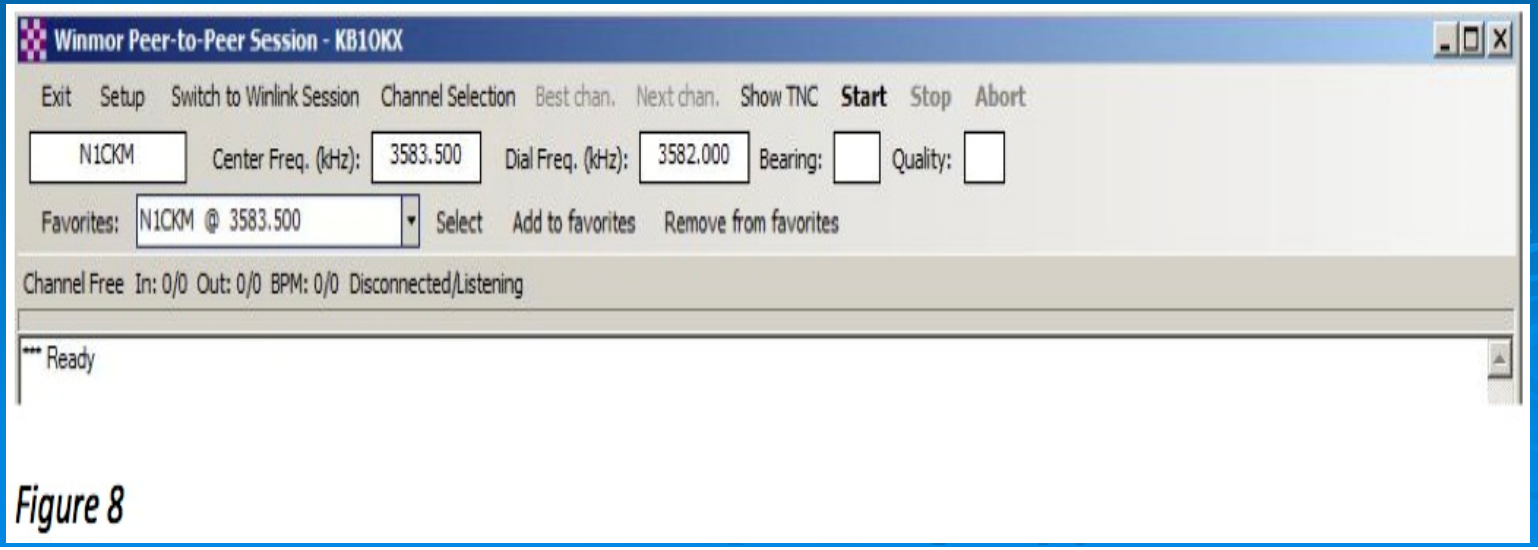


Figure 8

Credits and Thanks

STEVE WATERMAN, K4CJX

Winlink 2000 Network Administrator,

Winlink 2000 Development Team

LORING A KUTCHINS, W3QA

EPA Assistant SEC

Don Bush, KL7JFT

MATSU DEC

For earlier research and presentations that helped in putting this one together