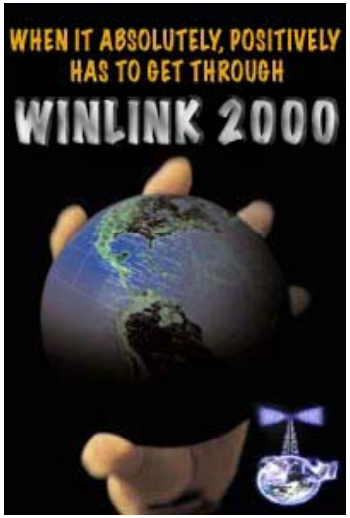
Winlink 2000

Digital Messaging in the 21st Century



Gary J Takis, NNN0KUL

Region Ten Conference – 9 May 2009

NNN0KUL@winlink.org

Subjects to cover

- What is WinLink?
- The Founders
- The History
- The Mission
- The System 1
- How does it work?
- CMS Topology
- RMS Topology
- The System 2
- The Users
- The Real Users
- Why WL2K for Emcom?
- What's Up?
- The Client Programs
- Airmail & Paclink
- Does it really work?
- URLs of Interest
- Credits
- Questions…

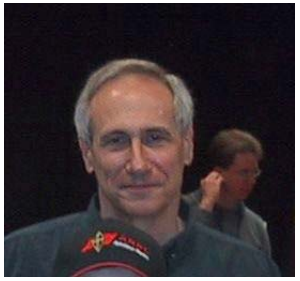
What is Winlink?

- Winlink 2000 (WL2K) is a global amateur radio service. Remember, ***there is no privacy over amateur radio.***
- It is subject to amateur radio regulations of the country where each participating station is located.
- On **HF PACTOR**, the radio users of the Winlink 2000 system initiating a contact are present as control operators, and therefore, WinLink 2000 operations do not fall within the category of "automatic control" per U.S. FCC Part 97.221 as described within Part 97.221, such operations are either under "automatic control" or "local or remote control.“
- Winlink 2000 complies with FCC Part 97 Section
  - *§97.109 Station control, for 3rd Party traffic rules*
  - *§97.219(c) for 3rd Party traffic Content Rules*
  - *§97.309 for data emission codes*
  - *§97.403 Safety of life and protection of property*

The Founders

- What is now the Winlink 2000 development team has evolved since the early 1980's. The original program, Aplink (Amtor-Packet link), an earlier DOS-based mailbox program and the first versions of Winlink were the brainchild of **Victor D. Poor**, **W5SMM**, then a semi-retired engineering executive and one of the major forces behind the development of the modern microprocessor.

- *** Hans Kessler, N8PGR**
- **Steve Waterman K4CJX** ⟶
- *** Jim Jennings W5EUT**



- *** Jim Corenman KE6RK *(created the Airmail program)***
- **Rick Muething, KN6KB**

**** Indicates not currently on WDT***

The Current WDT

Victor D. Poor, W5SMM

Rick Muething, KN6KB

Steve Waterman, K4CJX

Tom Lafleur, KA6IQA

Lee Inman, K0QED

Don Moore, KM0R

Bud Thompson, N0IA

Tyler Gaillard, KT4XD

Lor Kutchins, W3QA

Neil Hughes, VE1YZ

Don Trotter, VE1DTR

Phil Sutherland, VK6KPS

Peter Woods, N6PRW

Michael Kasteli, OE1MCU

Gerhard Kmet, OE3ZK

The History

- **Early 1980's** – **ApLink** (Amtor-PACKET Link) created
- NavyMARS asked for a smaller client version to use aboard ships called **PAMS**
- **Mid-80's** – With the advent of Windows programming language, Vic upgraded the program to **Winlink Classic** (never meant to interface with Internet email)
- **80-s/90's** – Hans enhanced **Winlink Classic**
- Late1990's – **NetLink** provided the interface between radio digital and internet email
- **1998 -** Steve, Rick, Hans, and Vic, met in Cleveland, Ohio, and planned **Winlink 2000,** (1999-to-present).
- **The rest is history!**

The Mission

WL2K MISSION

Our primary mission is to provide our agencies with the value-added services *they* want.

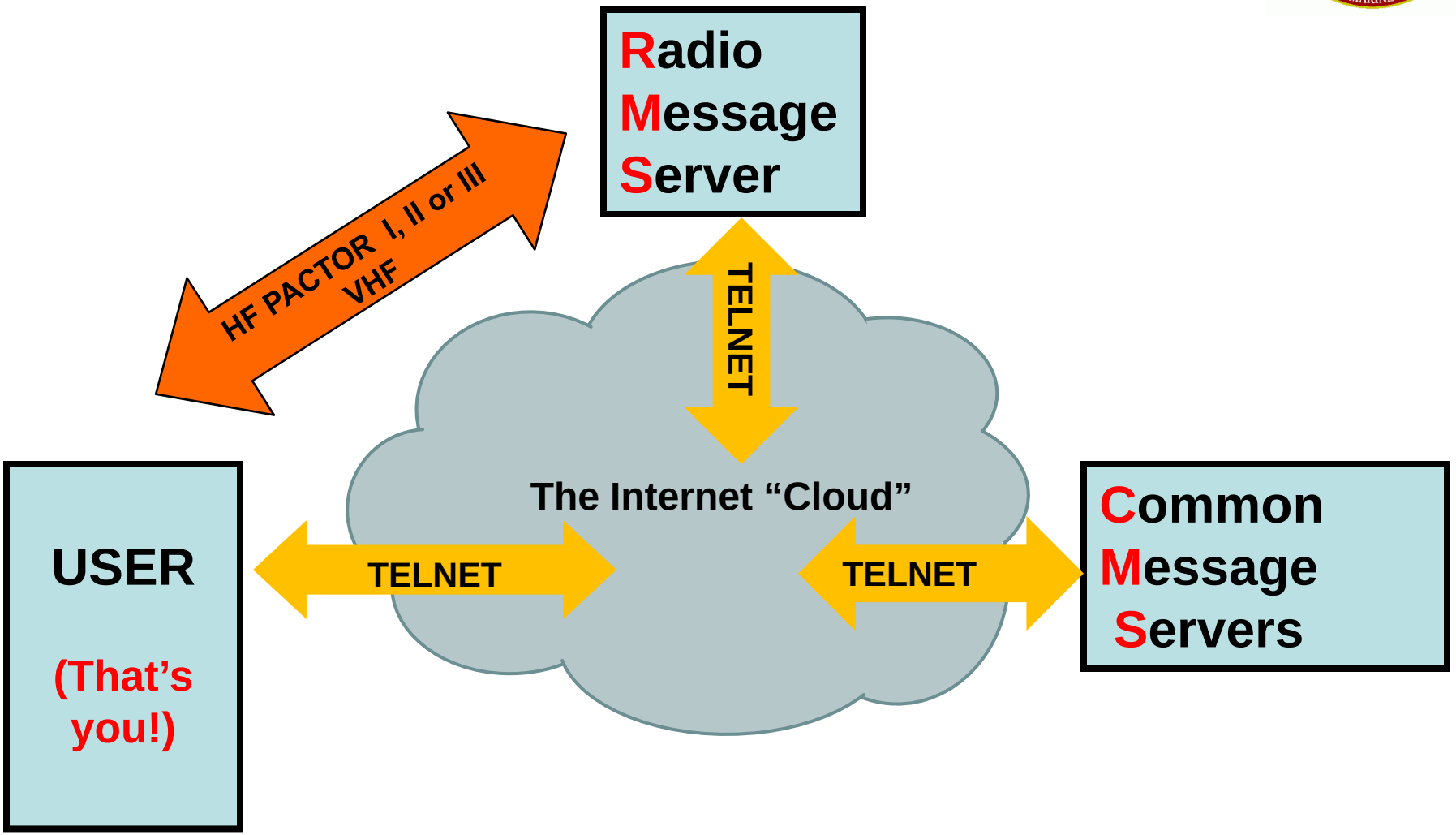
They want "interoperability among all available services."

*Today, that includes digital messaging in the form of **de facto e-mail extendibility** from all available resources. We have such a network in place. It is now up to us to be organized and trained with the proper tools to respond to any casualty event. Certainly, in such events, **being available to provide de facto e-mail where it is otherwise unavailable is key**.*

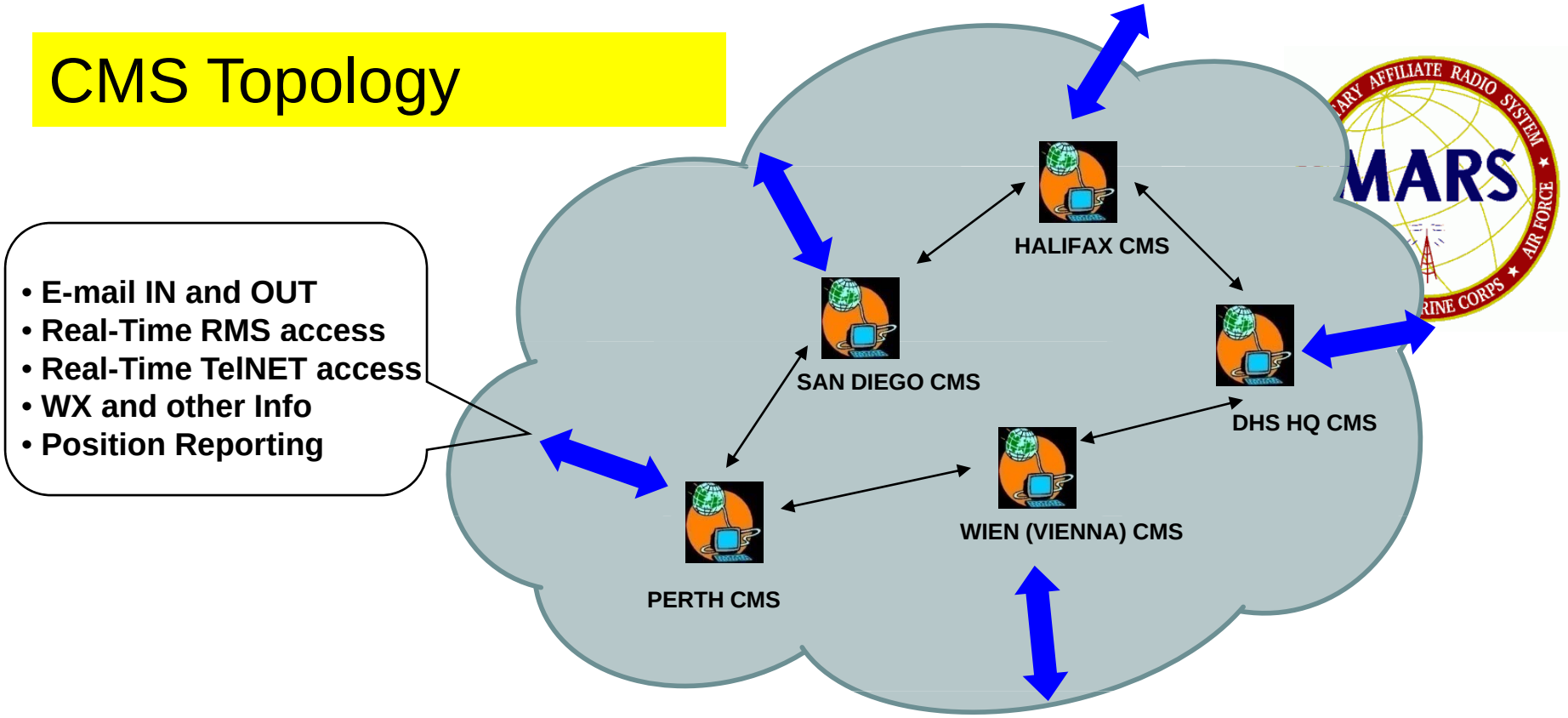
The System – Part 1

- **5** Full-time, Redundant, Mirror image, Common Message Servers (CMS)
  - Halifax, San Diego, Washington DC, Perth Australia, and Vienna, Austria,
  - All in hardened sites, providing excellent reliability, worldwide.
  - Wash DC is DHS sponsored, Halifax is Canadian Sponsored
- **165** total HF Radio Message Servers, worldwide
- **2** major **Service Classes** maintaining separate operations.
  - Public & EmComm & Amateur
  - Government (MARS controlled).
- More than 346 VHF/UHF entry points in CONUS.
- Over **99%** system availability since Nov, 1999.

How does it work?

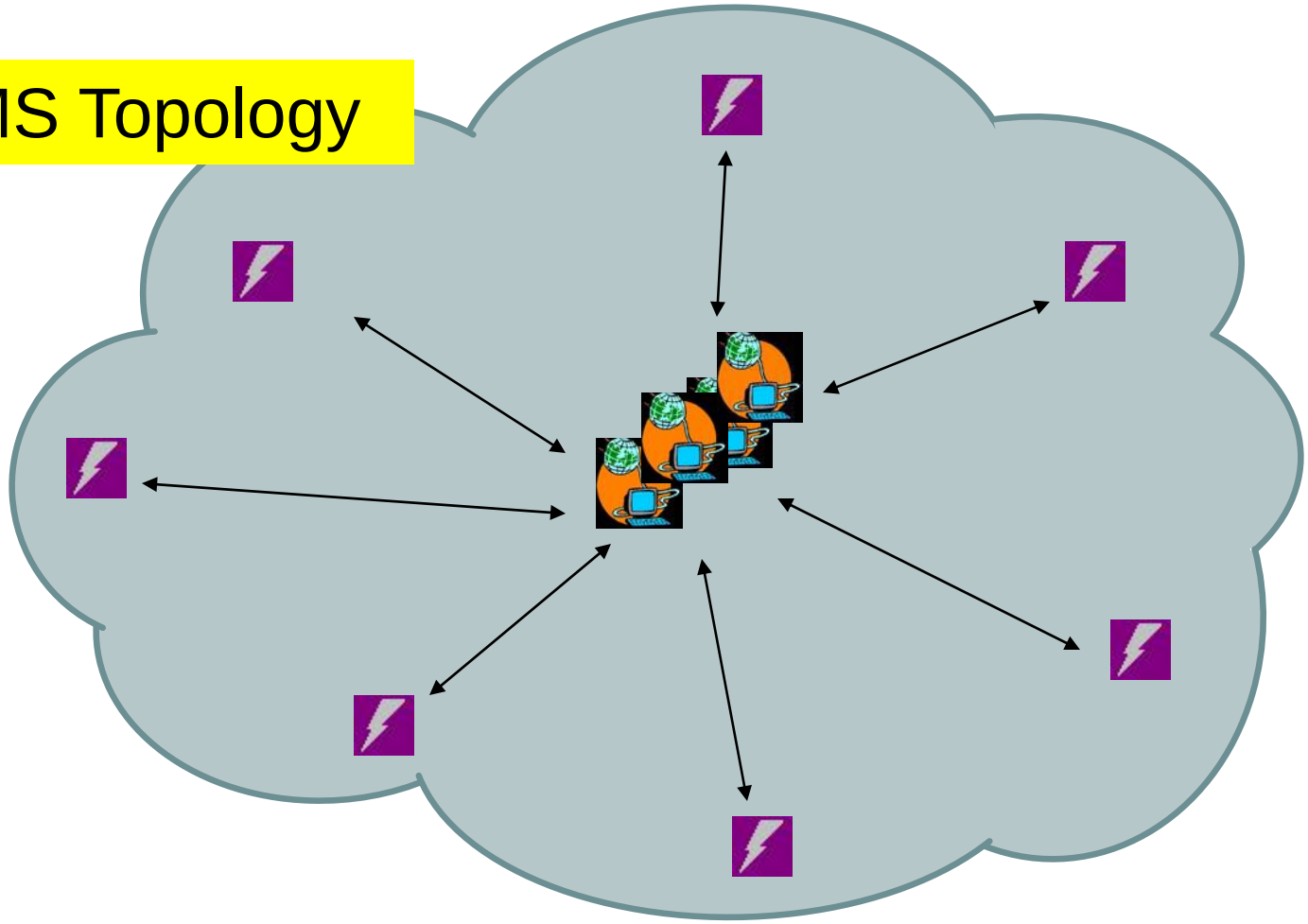


CMS Topology



- Mirror image, redundant Common Message Servers (CMS) provide:
  - **IETF RFC 2821 de facto e-mail** between Winlink 2000 users and Internet Recipients over telnet, Web mail or Radio links.
  - **Retrieval of Weather** and other information available as files or URL pages from the Internet.
  - **Position Reporting** for Mobile applications.

RMS Topology



- Radio Message Servers “RMS” are always connected to the CMS System via the Internet in a **star network topology**, serving as radio nodes on the Winlink 2000 network.
  - RMS Pactor for HF provides short or long haul availability to internet e-mail.
  - RMS Packet for VHF/UHF “last mile” e-mail availability to Internet e-mail.
  - RMS Relay provides continual communications with the CMS system when no Internet is available to bridge the “last mile.”

The System – Part 2

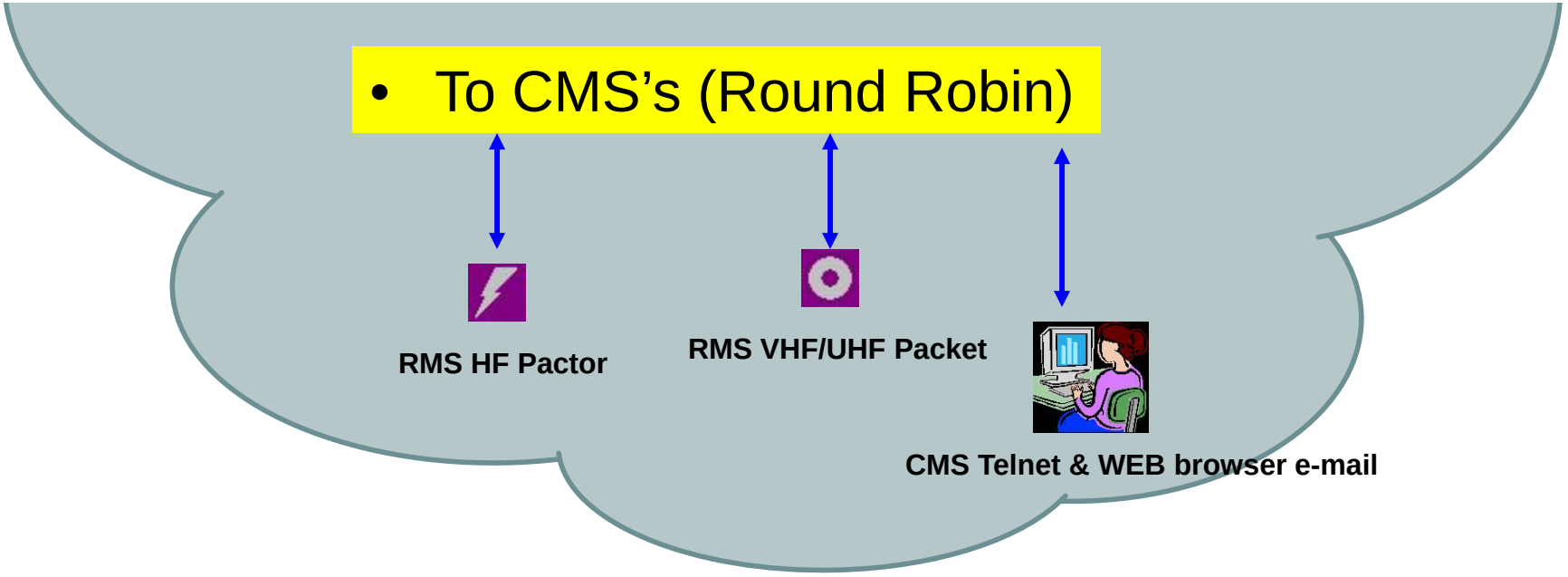
- Geography of RMS stations
- “Last Mile” RMS Packet provides real-time access to the CMS system
- RMS Gateways provides real-time access to the CMS system
- Two separate clients – Airmail & Paclink

The System – Part 2

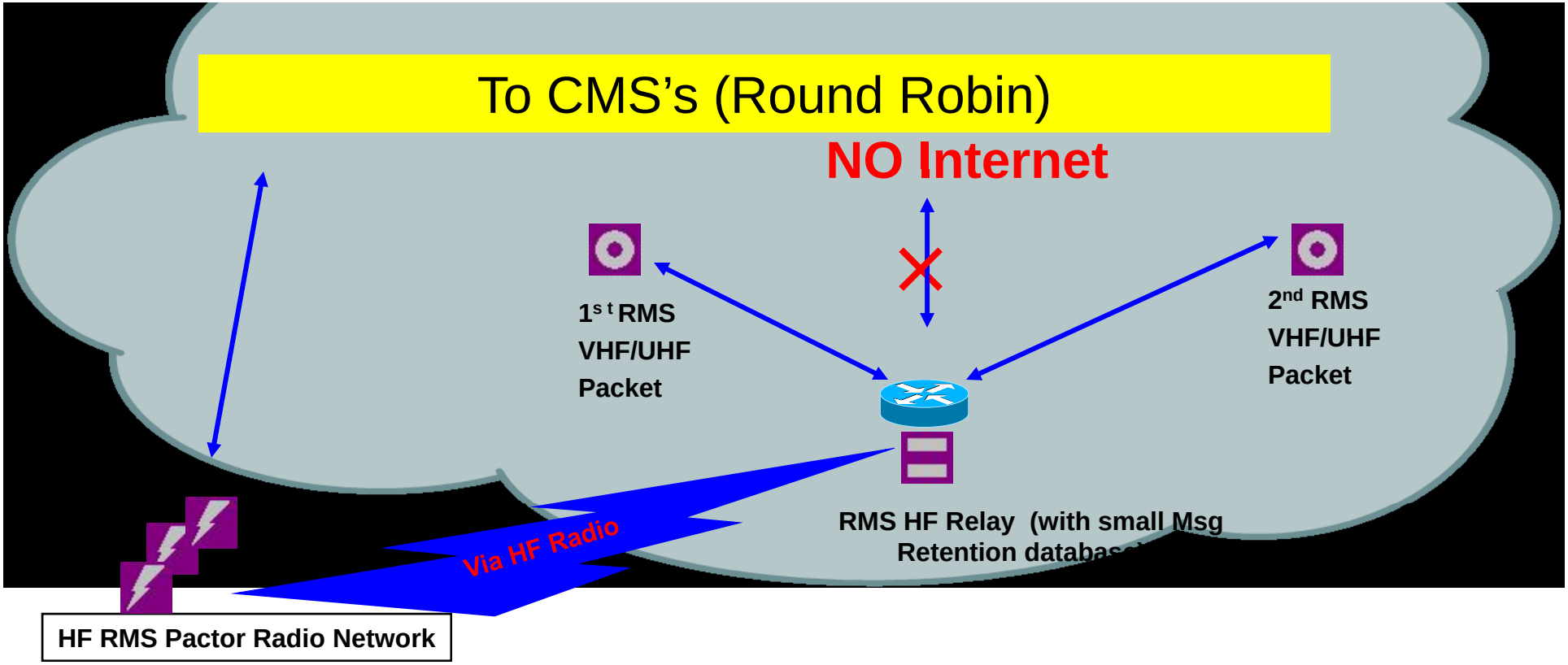
- HF RMS stations operate on +/- 5 HF frequencies
- 151 amateur frequencies (80 Tri-Service MARS) are assigned to RMS stations based on geography
- HF RMS stations ‘scan’ the frequencies on a rotational basis
- Scanning operates at about 1ch each 5-10 seconds.
- When they detect a calling station, they connect.
- When the transaction (up/down messages) is complete, they resume scanning

HF RMS PACTOR Stations Worldwide

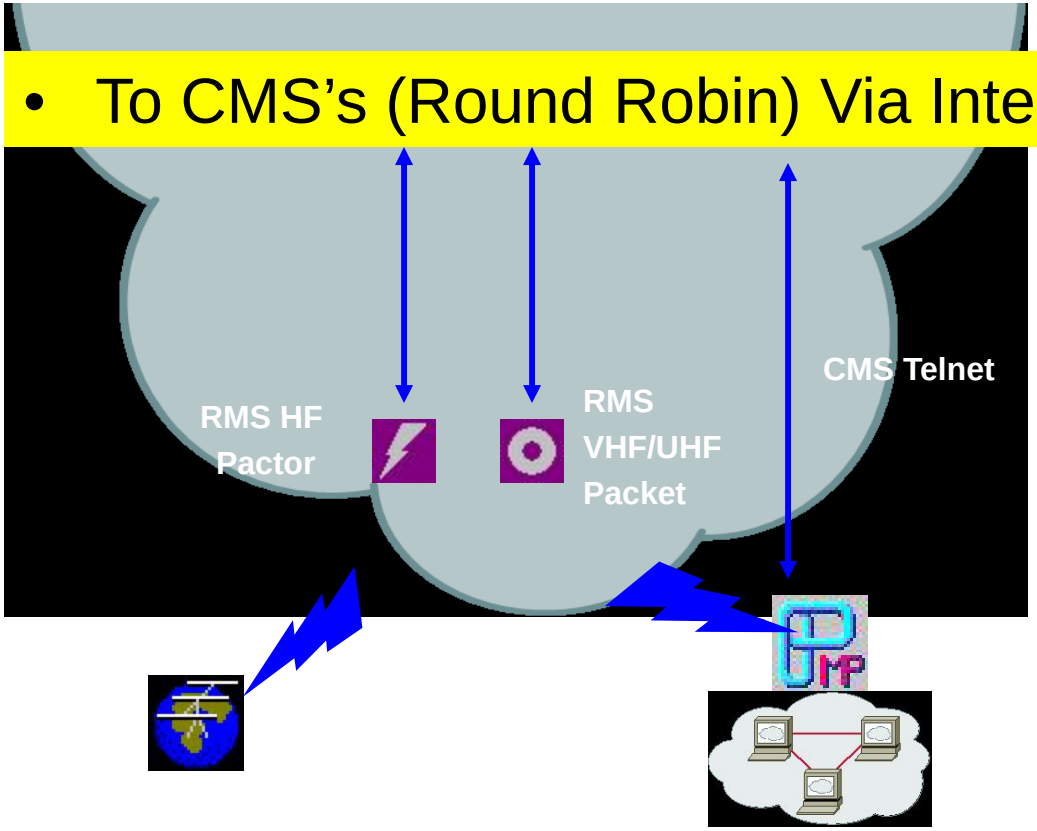
85 Public **30 EMCOMM** **45 MARS** **1 UK Cadet Force**



- RMS Gateways provides real-time access to the CMS system from many locations, worldwide. It actually bridges HF radio to the Internet.
  - The RMS systems are separated into "classes" such as the "Government" class, or the Amateur Radio class.
  - In each class, the RMS system nodes are all redundant, mirror images of each other.
  - Should an RMS Pactor Gateway be separated from the Internet, it will become *invisible* to the radio user.
  - Radio users understand that they may check in on any RMS Pactor Gateway within their licensed class, depending on propagation, and the RMS availability to the Internet.



- "Last Mile" RMS Packet provides real-time access to the CMS system from the "last mile," in support of local areas such as County governments, or other communities of interest.
  - Multiple RMS Packet (VHF/UHF) gateways may be linked to one RMS Relay for local hubbing and HF relay to an RMS Pactor gateway.
  - **RMS Relay allows RMS Packet to reach the rest of the Winlink 2000 system via HF (Radio) Pactor when local Internet is broken.**



- Two separate clients:
  - **Airmail,** a single application client.
  - **Paclink MP,** a single/Multiple user client with standard POP3 e-mail clients as a user interface. Contains automatic hierarchical routing, secure login, and "auto-precedence."

Users

- Approximately **15, 000** client accounts
- Approximately **10,000** Weekly Radio users communicating with over **98,000** Email recipients,
- An average of **150,000** messages or 280,000 minutes **monthly**
- An average duration of 3.4 Minutes at 3,600 bytes/per message.
- The average time from message origination to pickup for delivery is approximately **1.0** minute, regardless of distance.
- The greatest growth is now in Emergency Communications preparedness.

The Real Users

In a "Real-Life" Mass Casualty Event, we must look at WL2K from an "Interoperability" Point-of-view.

Why Winlink is used for EmComm

- Uses de facto e-mail, the World's standard for written communications.
- Provides "last Mile" local radio digital messaging directly for served agencies, using existing e-mail programs, on existing computers, with no additional "invasive" software…seamlessly and transparently.
- Provides wide area coverage from inside a disaster area without the Internet, and with a minimum amount of additional client hardware or software.
- Has a proven record of reliability, and continues to be responsive to the needs of its user communities.

Although Winlink 2000 has proven itself to be attractive to the agencies we wish to serve, like anything else, it must first be Implemented by those who will benefit by its use.

TSA HF Sites – WL2K MARS

Voice Only | Mobile | Non-operational | Operational

Northwest Area (Region 5)
Karen Burke / 571-227-2430

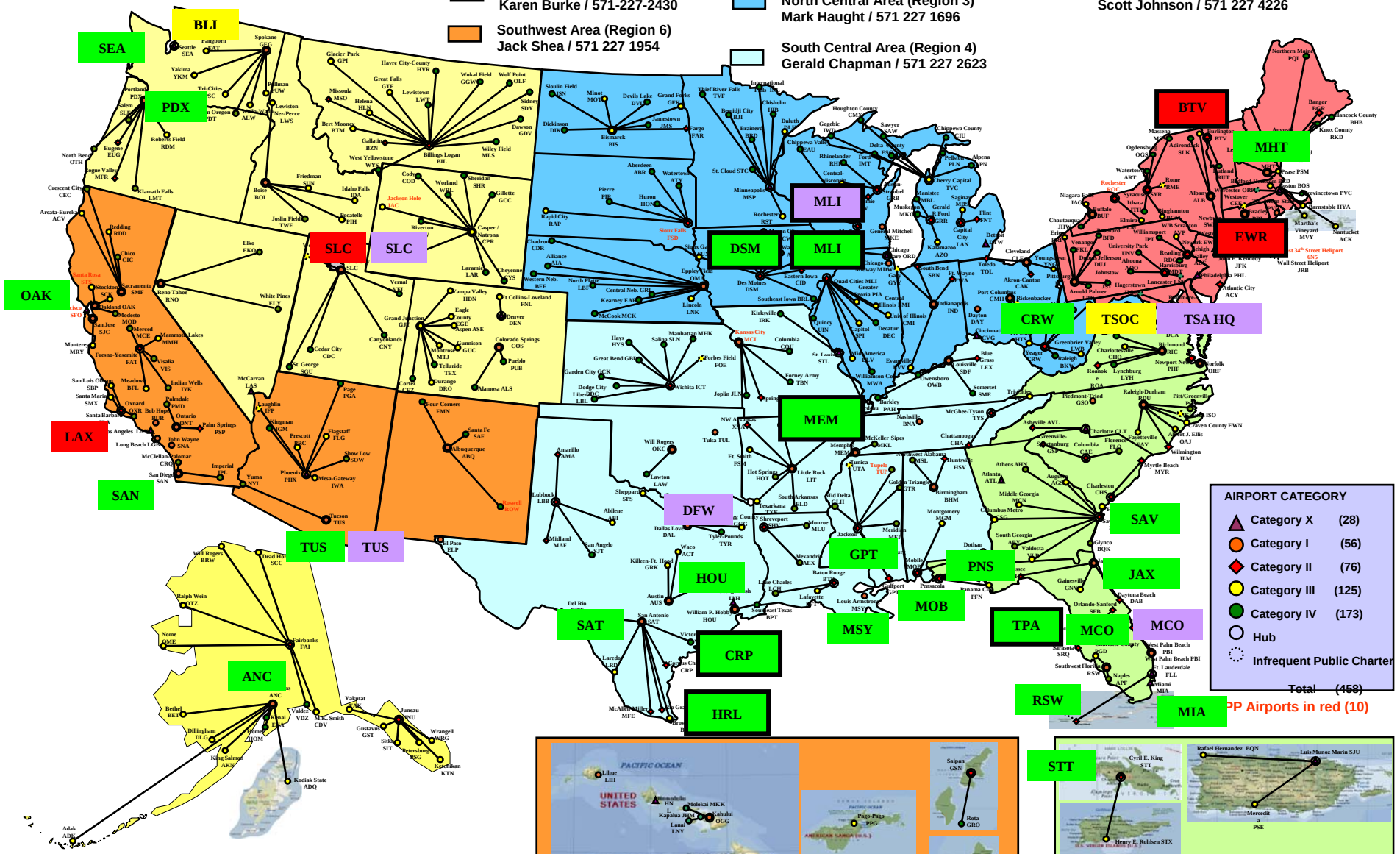
Southwest Area (Region 6)
Jack Shea / 571 227 1954

North Central Area (Region 3)
Mark Haught / 571 227 1696

South Central Area (Region 4)
Gerald Chapman / 571 227 2623

Northeast Area (Region 1)
Bill Hall / 571-227-4758

Southeast Area (Region 2)
Scott Johnson / 571 227 4226



AIRPORT CATEGORY

Category X	(28)
Category I	(56)
Category II	(76)
Category III	(125)
Category IV	(173)
Hub	
Infrequent Public Charter	
Total	(458)

PP Airports in red (10)

Transportation Security Administration

Federalized Airports / Dec 1, 2008

OPR: Airport Federalization, Randy Webb

Additions, changes, and deletions since Oct 1, 2008 edition:

Additions:
In FL - PGD Charter;

Cat III;

Changes: NEW AREA DESIGNATIONS, also:
ISO – from Cat III to Cat III, Infrequent Public

TLH – now a spoke of JAX; CPR – from Cat IV to

In Alaska – numerous hub / spoke changes;
GJT – name change to Grand Junction Regional

What's up?

- **Real Time status**
  - CMS servers
  - HF Pactor RMS stations
  - VHF RMS stations
  - Other
- **Presentation**
  - Raw Data available
  - Google Graphics available

Real-Time Status - CMS

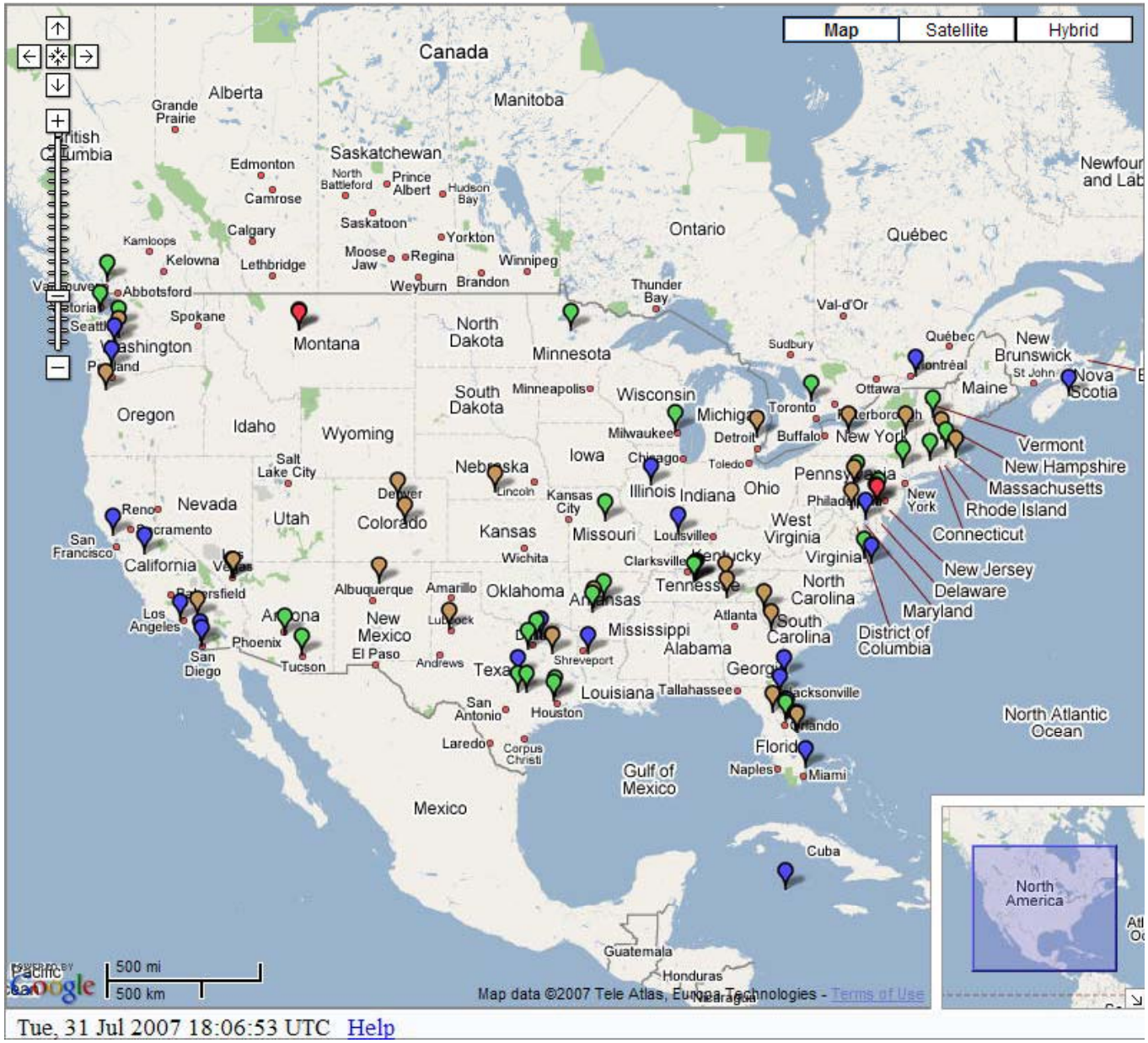
Common Message Server Status

View | Outline | Track

@2008/04/07 07:58 UTC	State	Last Update	Status Message
CMS Site - Halifax		**2008/04/07 07:58 UTC**	**On-Line**
CMS Access Port	Running	2008/04/07 07:57 UTC	
CMS Inquires	Running	2008/04/07 07:57 UTC	
CMS Position Reports	Running	2008/04/07 07:57 UTC	
CMS Queue Processor	Running	2008/04/07 07:58 UTC	
CMS Site Monitor	Running	2008/04/07 07:58 UTC	
CMS SMTP Client	Running	2008/04/07 07:58 UTC	
CMS SMTP Server	Running	2008/04/07 07:57 UTC	
CMS Telnet Server	Running	2008/04/07 07:57 UTC	
CMS-CMS Link	Running	2008/04/07 07:57 UTC	
CMS Site - Perth		**2008/04/07 07:58 UTC**	**On-Line**
CMS Access Port	Running	2008/04/07 08:00 UTC	
CMS Inquires	Running	2008/04/07 08:00 UTC	
CMS Position Reports	Running	2008/04/07 08:00 UTC	
CMS Queue Processor	Running	2008/04/07 08:00 UTC	
CMS Site Monitor	Running	2008/04/07 08:01 UTC	
CMS SMTP Client	Running	2008/04/07 08:01 UTC	
CMS SMTP Server	Running	2008/04/07 08:00 UTC	
CMS Telnet Server	Running	2008/04/07 08:01 UTC	
CMS-CMS Link	Running	2008/04/07 08:00 UTC	
CMS Site - SanDiego		**2008/04/07 07:58 UTC**	**On-Line**
CMS Access Port	Running	2008/04/07 07:58 UTC	
CMS Inquires	Running	2008/04/07 07:57 UTC	
CMS Position Reports	Running	2008/04/07 07:57 UTC	
CMS Queue Processor	Running	2008/04/07 07:57 UTC	
CMS Site Monitor	Running	2008/04/07 07:58 UTC	
CMS SMTP Client	Running	2008/04/07 07:58 UTC	
CMS SMTP Server	Running	2008/04/07 07:57 UTC	
CMS Telnet Server	Running	2008/04/07 07:57 UTC	
CMS-CMS Link	Running	2008/04/07 07:57 UTC	
CMS Site - Washington		**2008/04/07 07:58 UTC**	**On-Line**
CMS Access Port	Running	2008/04/07 07:58 UTC	
CMS Inquires	Running	2008/04/07 07:57 UTC	
CMS Position Reports	Running	2008/04/07 07:57 UTC	
CMS Queue Processor	Running	2008/04/07 07:58 UTC	
CMS Site Monitor	Running	2008/04/07 07:58 UTC	
CMS SMTP Client	Running	2008/04/07 07:57 UTC	
CMS SMTP Server	Running	2008/04/07 07:57 UTC	
CMS Telnet Server	Running	2008/04/07 07:58 UTC	
CMS-CMS Link	Running	2008/04/07 07:57 UTC	

Vienna, Austria
“Wien”
not shown

Real-time Status - ALL HF RMS



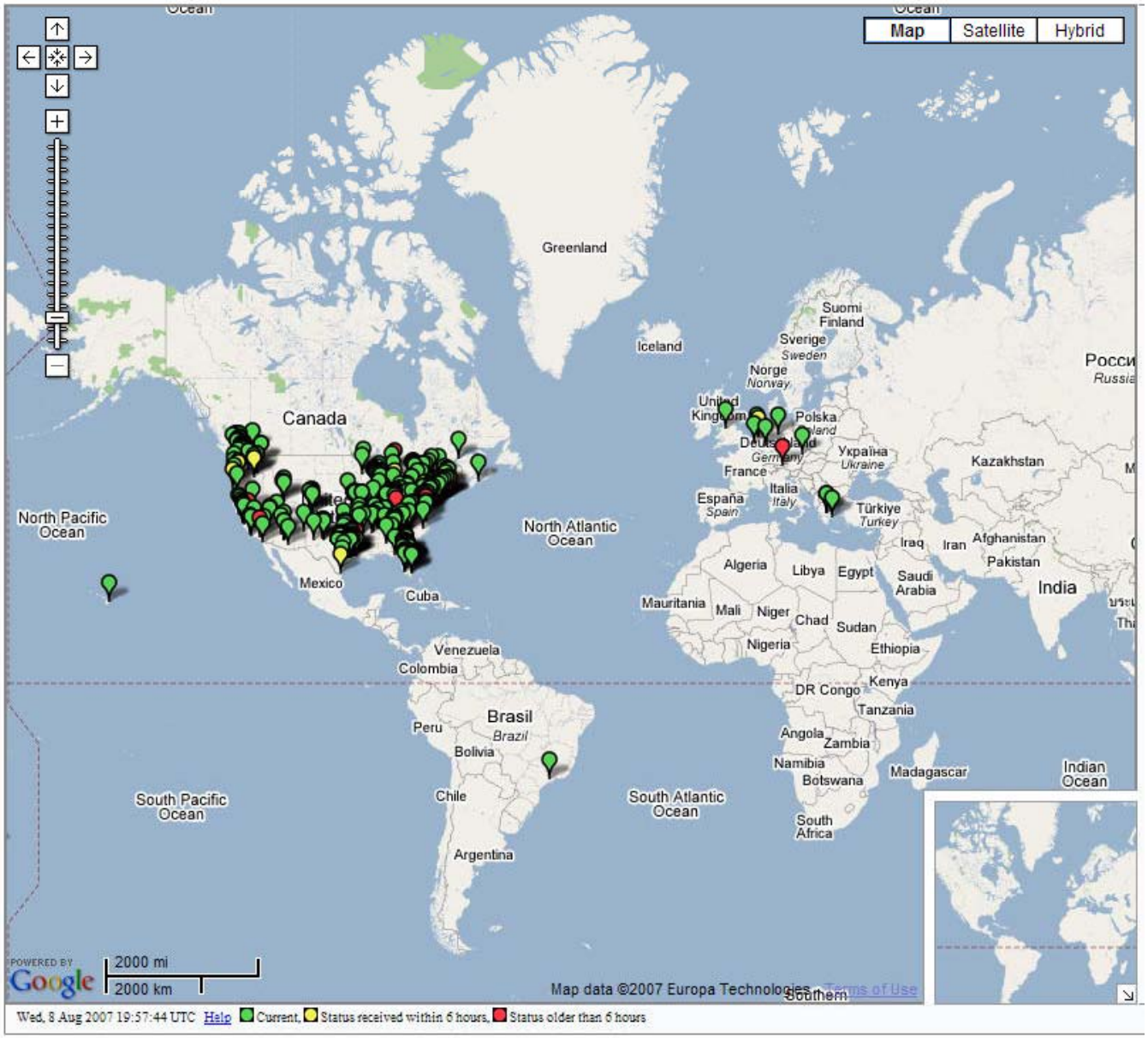
Blue = Public

Green = EmComm

Brown = MARS

Red = Off-line

Real-Time Status – VHF RMS

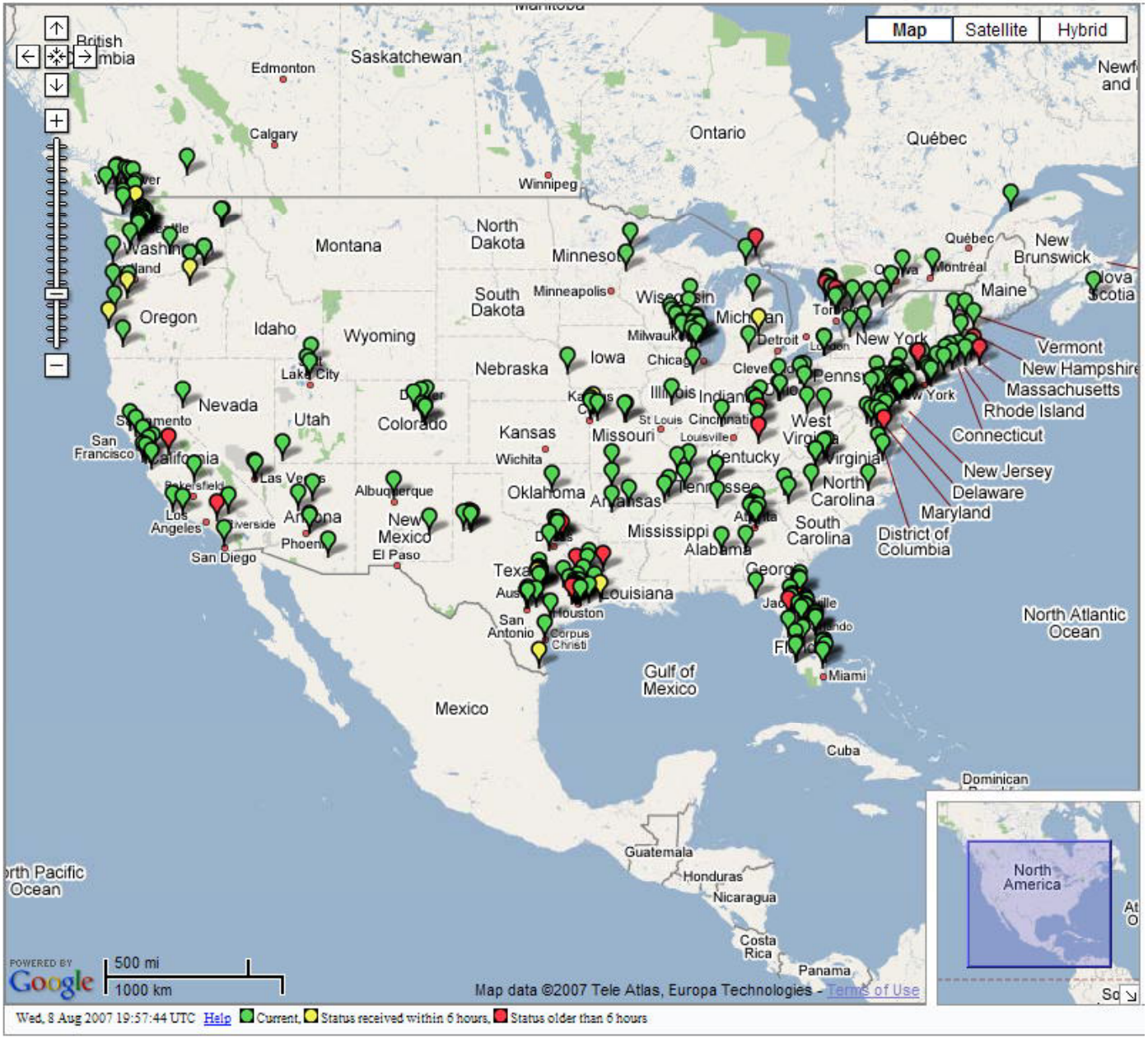


VHF/UHF Telpac/RMS Packet:

346 Active shown

MARS VHF numbers increasing (not shown).

REAL TIME STATUS - TELPAC/VHF RMS



MARS NOT SHOWN

Near Real-Time Proactive User Position Reports

MARS NOT SHOWN

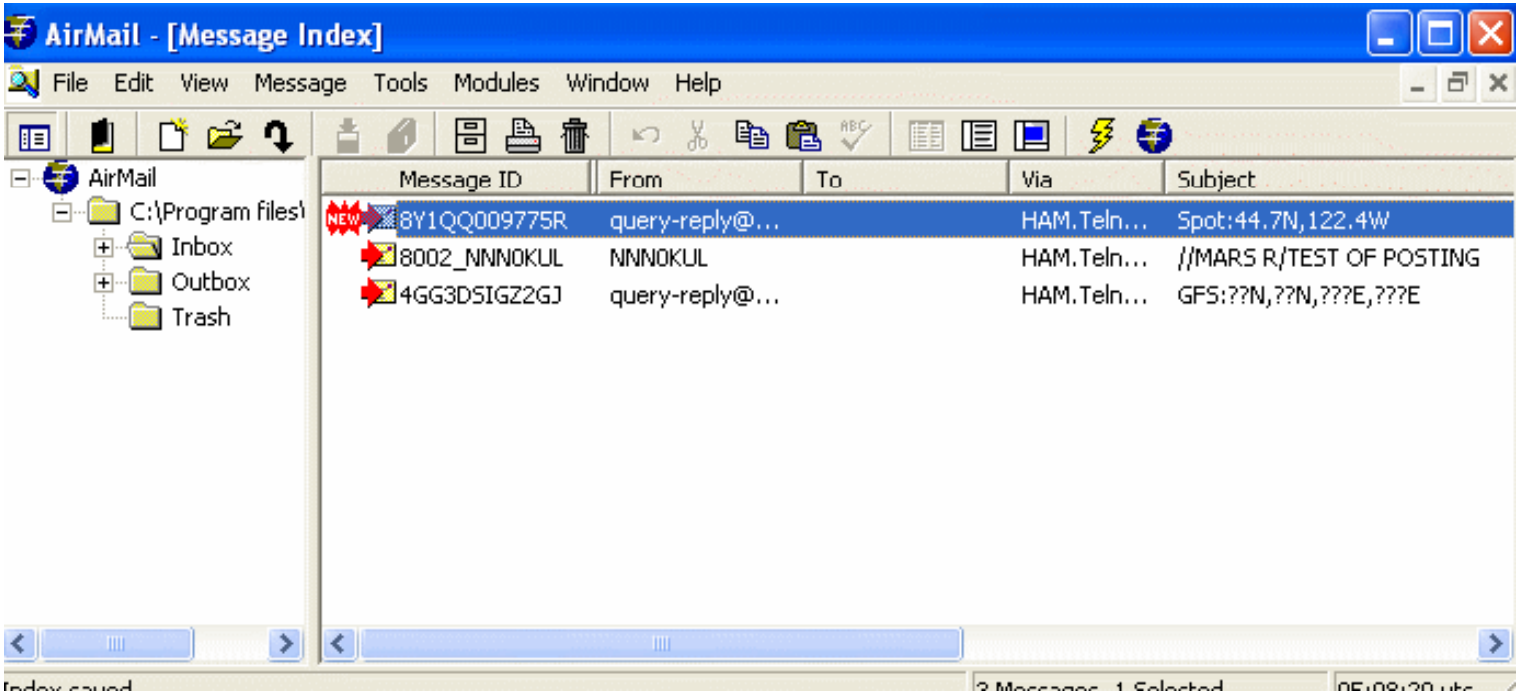
Real-Time Status – MARS HF RMS

Client Programs

- **Airmail**
  - Written by Jim Corenman, KE6RK
  - Adapted for MARS use (v3.3.0.81)
  - Uses NTIA/ITS ICEPAK program for propagation predictor
- **Paclink**
  - Written by Rick Muething, KN6KB
  - 3 Versions
    - Original Paclink - obsolete
    - PaclinkMP – current
    - PaclinkW – Beta testing
    - Paclink – Final solution w/embedded WINMOR

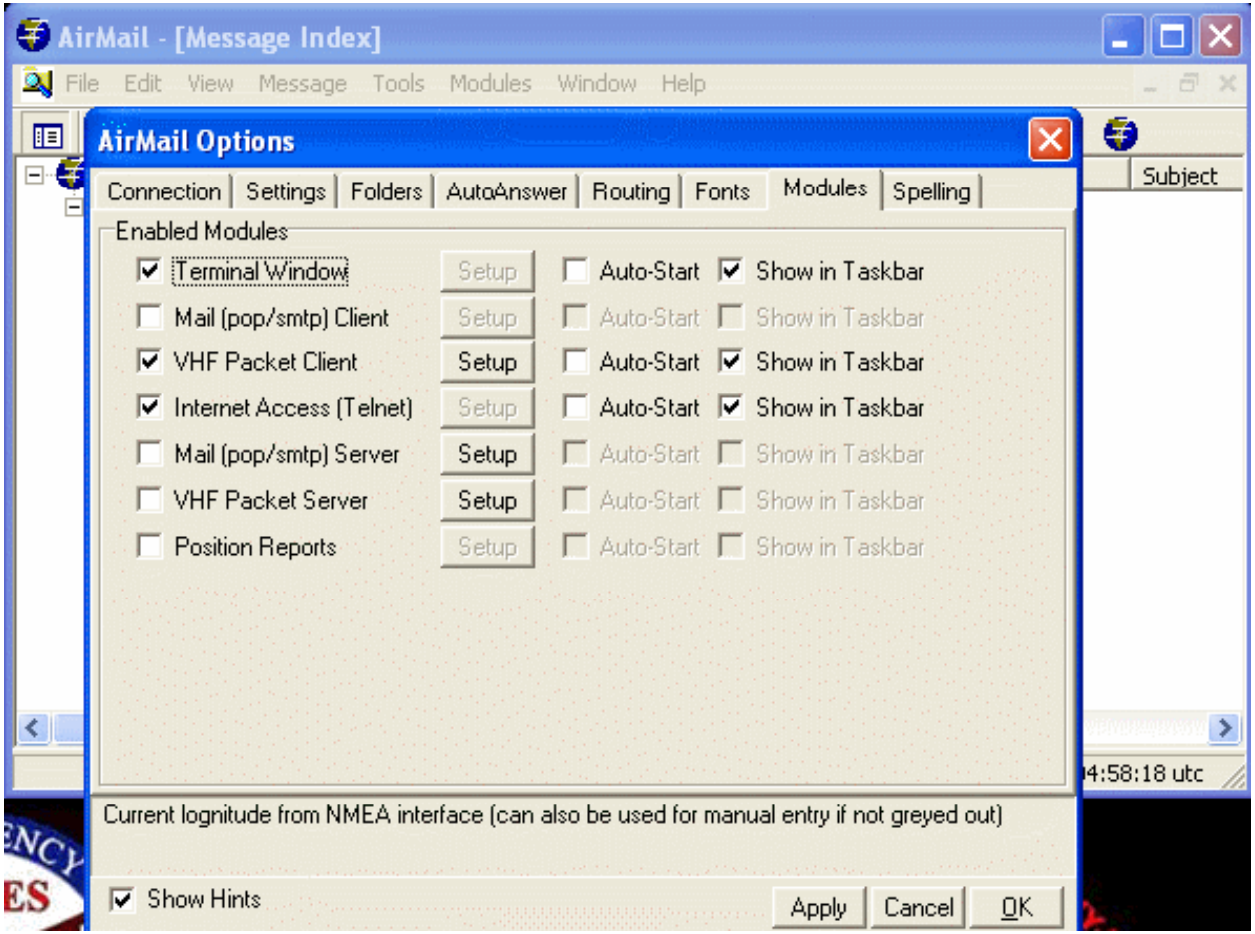
Airmail

Written by Jim Corenman KE6RK



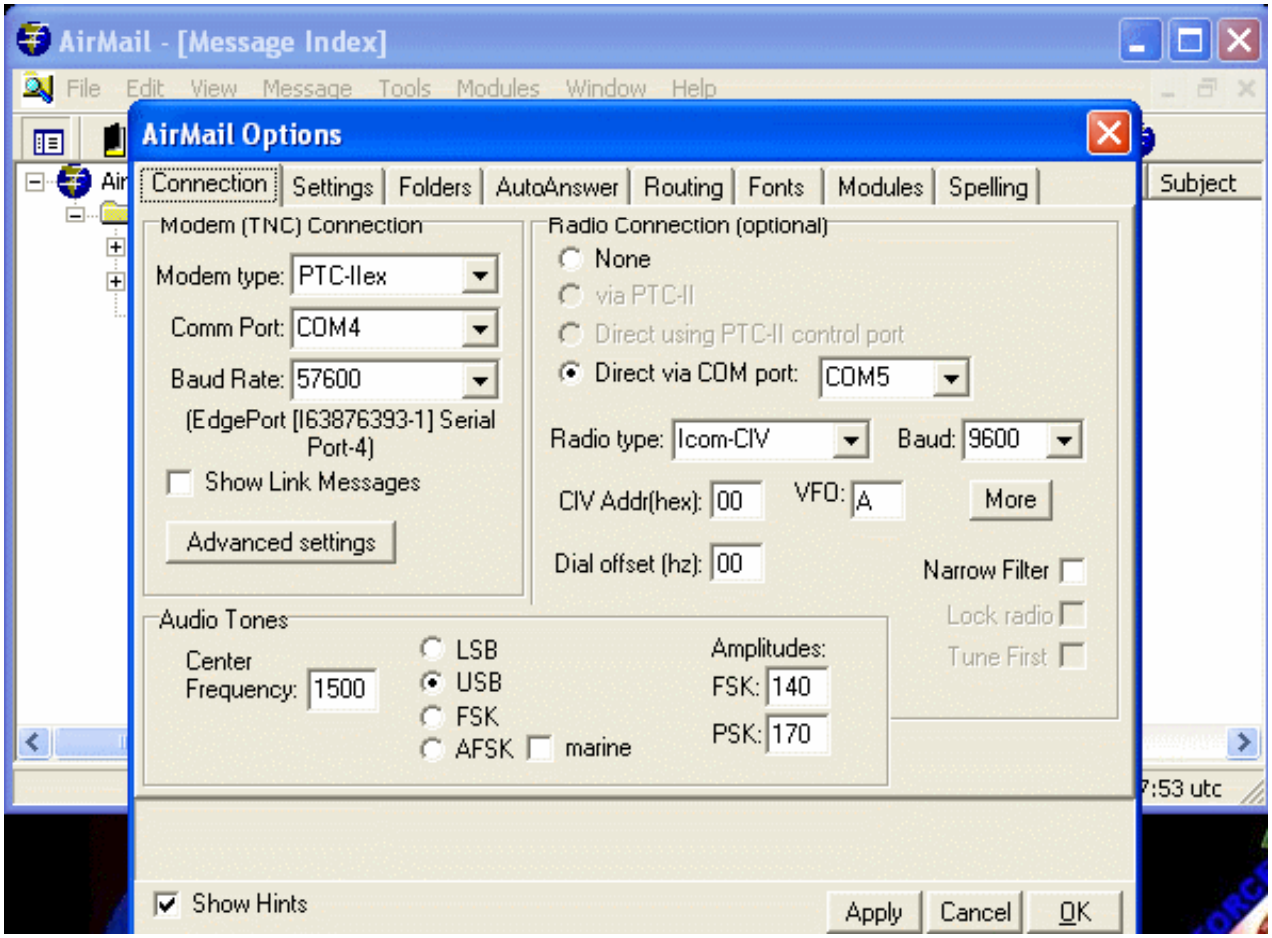
Airmail

Module selection



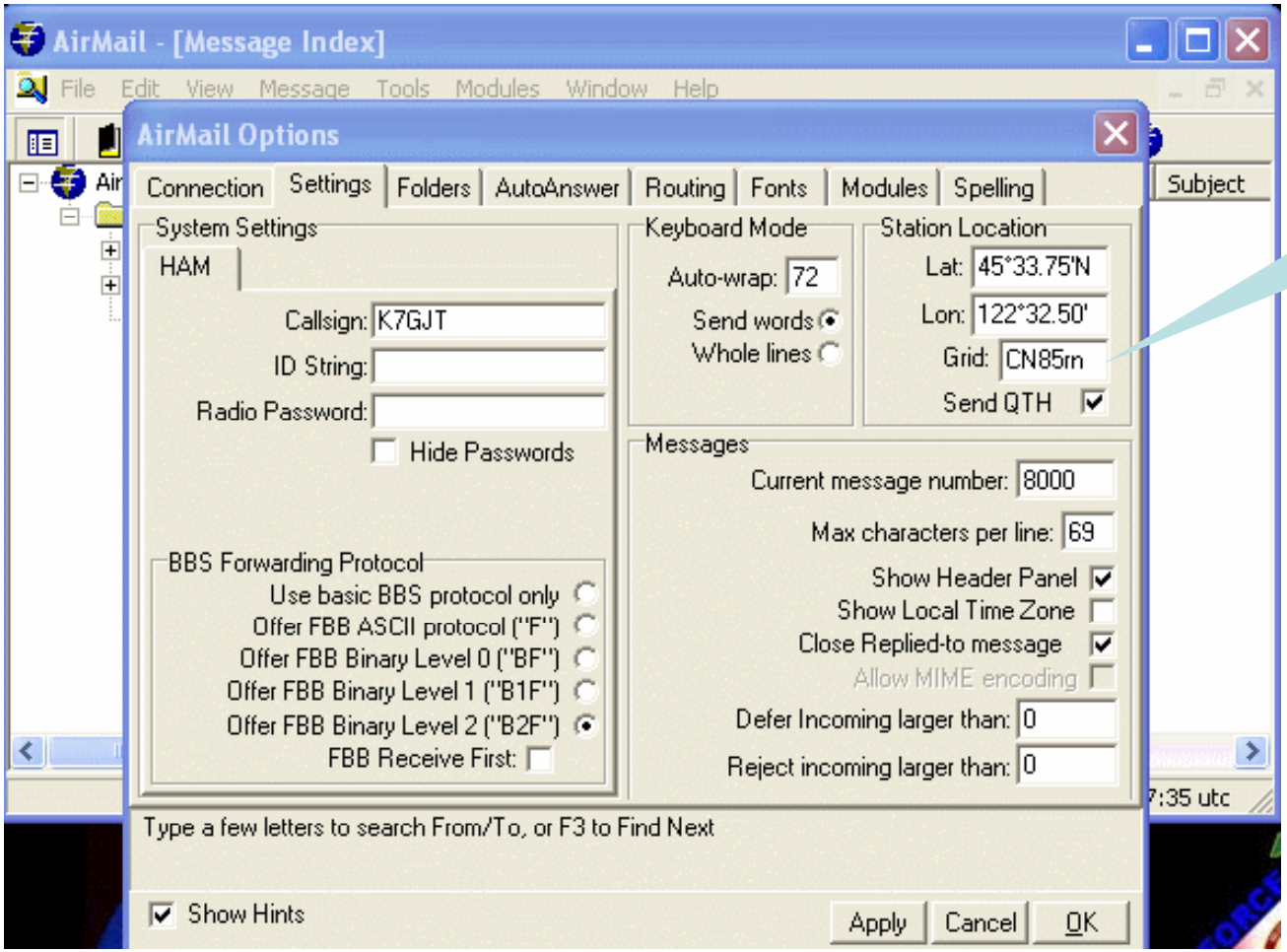
Airmail

Setup Screen 1



Airmail

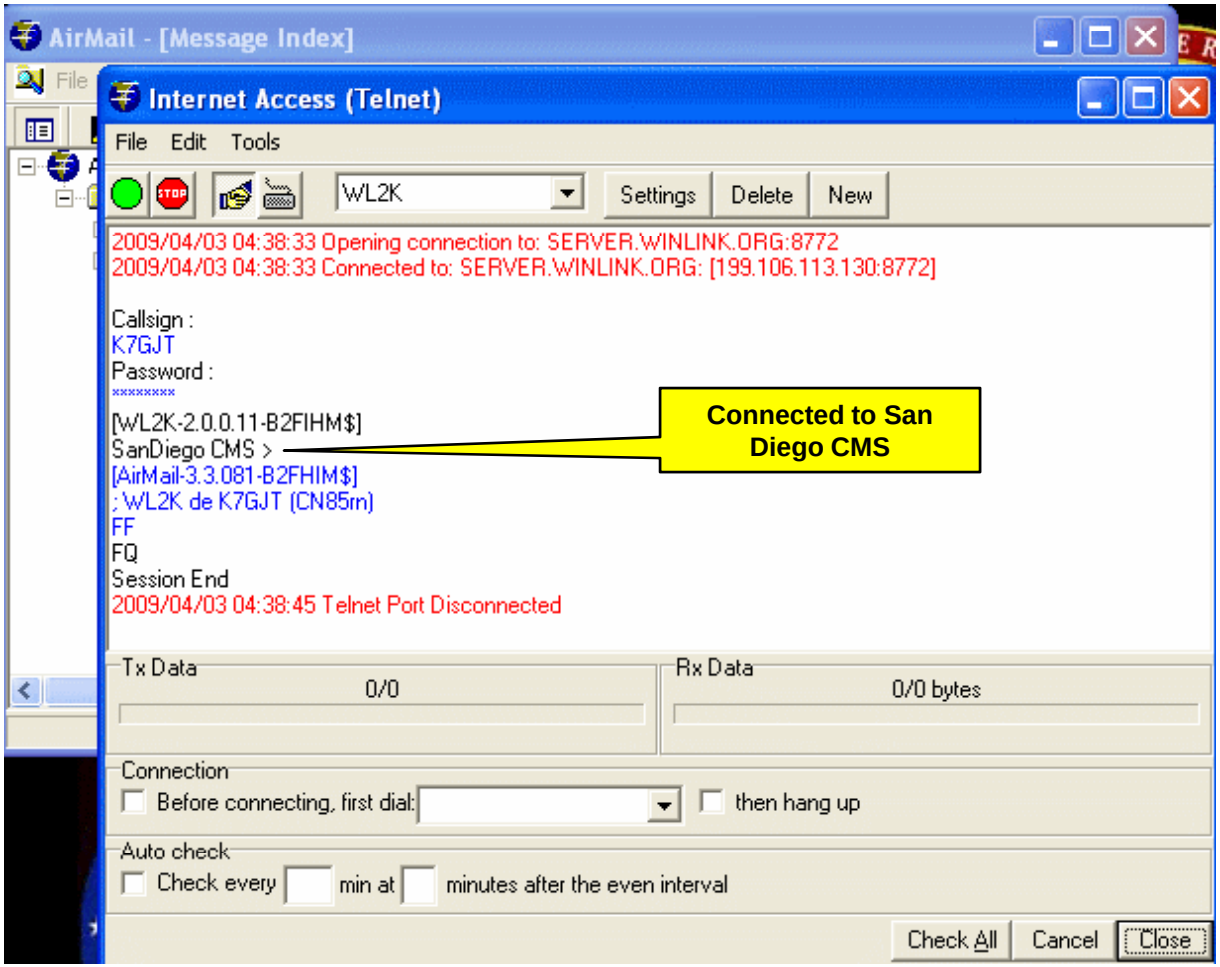
Setup Screen 2



Filling in grid square will auto-populate Lat/Lon

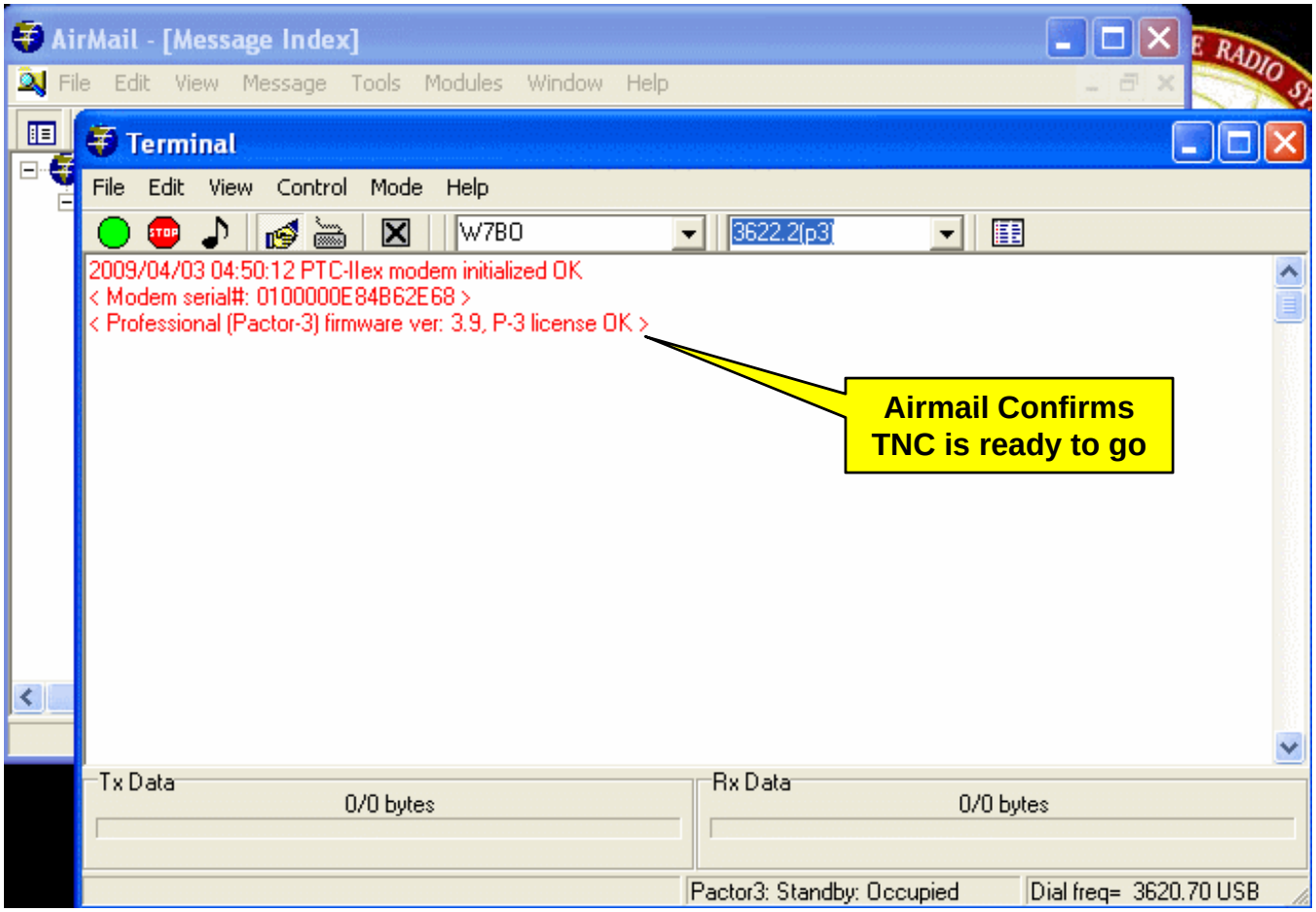
Airmail

Internet Module (TELNET) (transaction example)



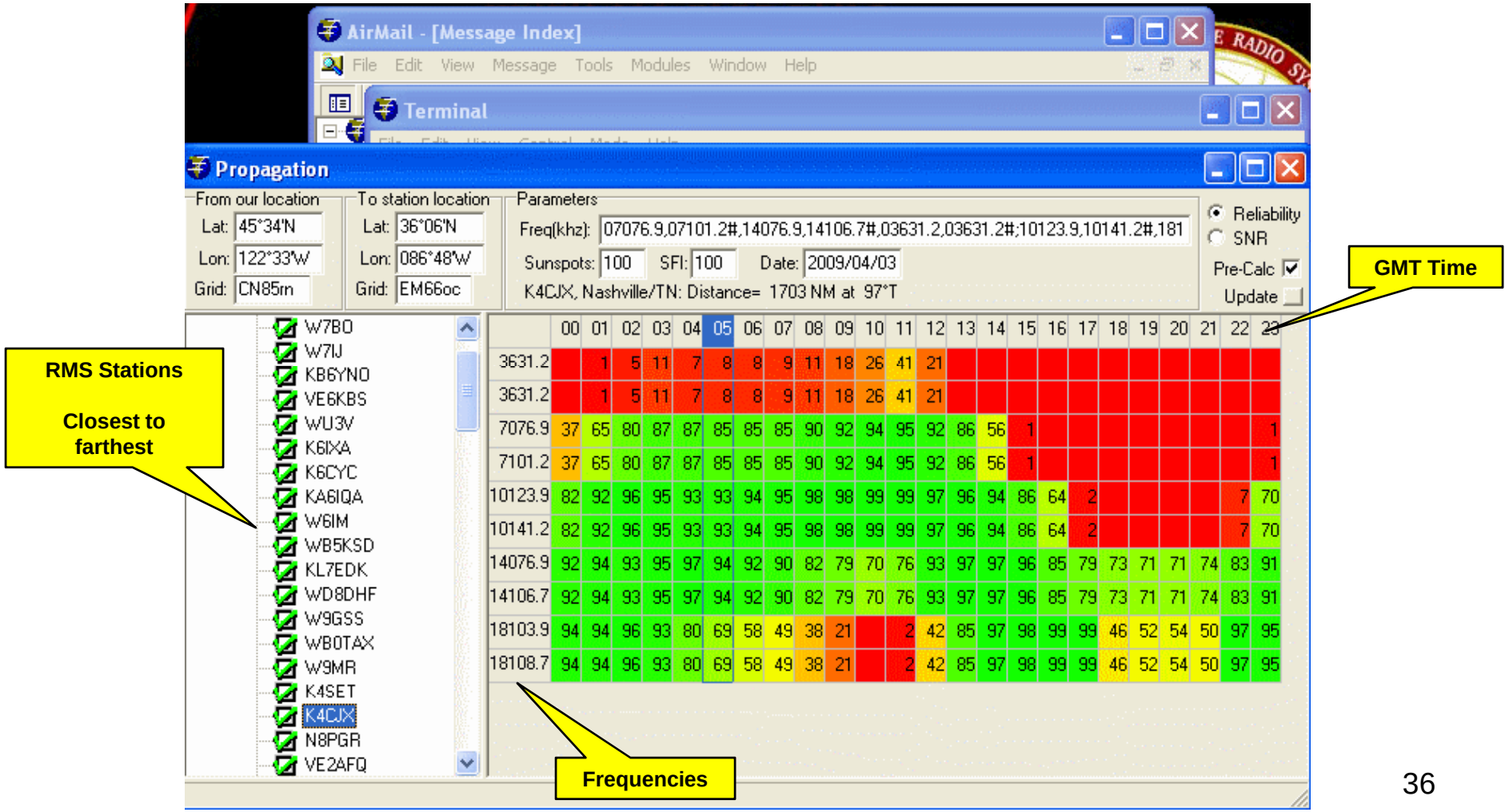
Airmail

HF Terminal (PACTOR)



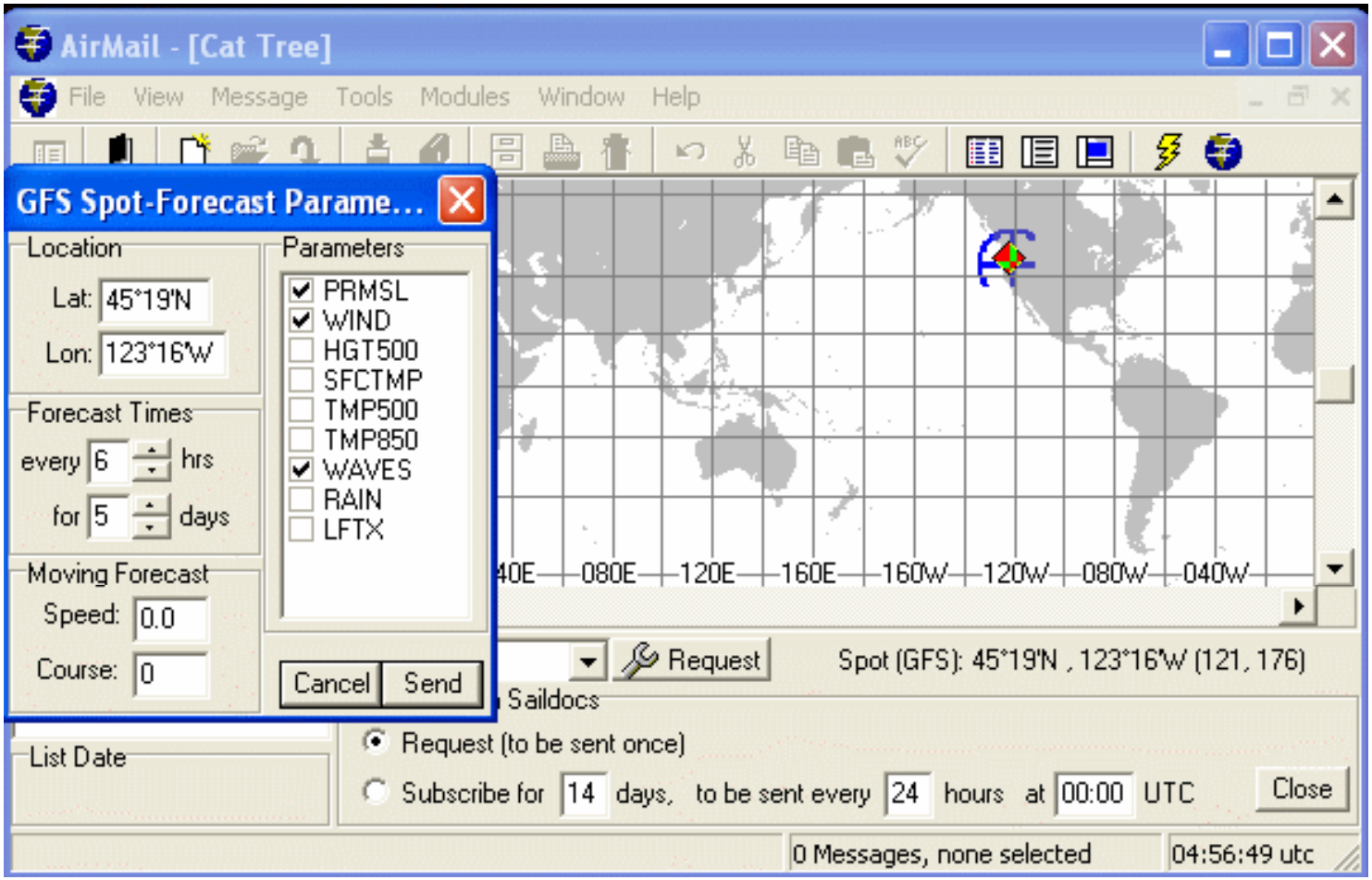
Airmail

HF Terminal – ‘F8’ propagation predictor



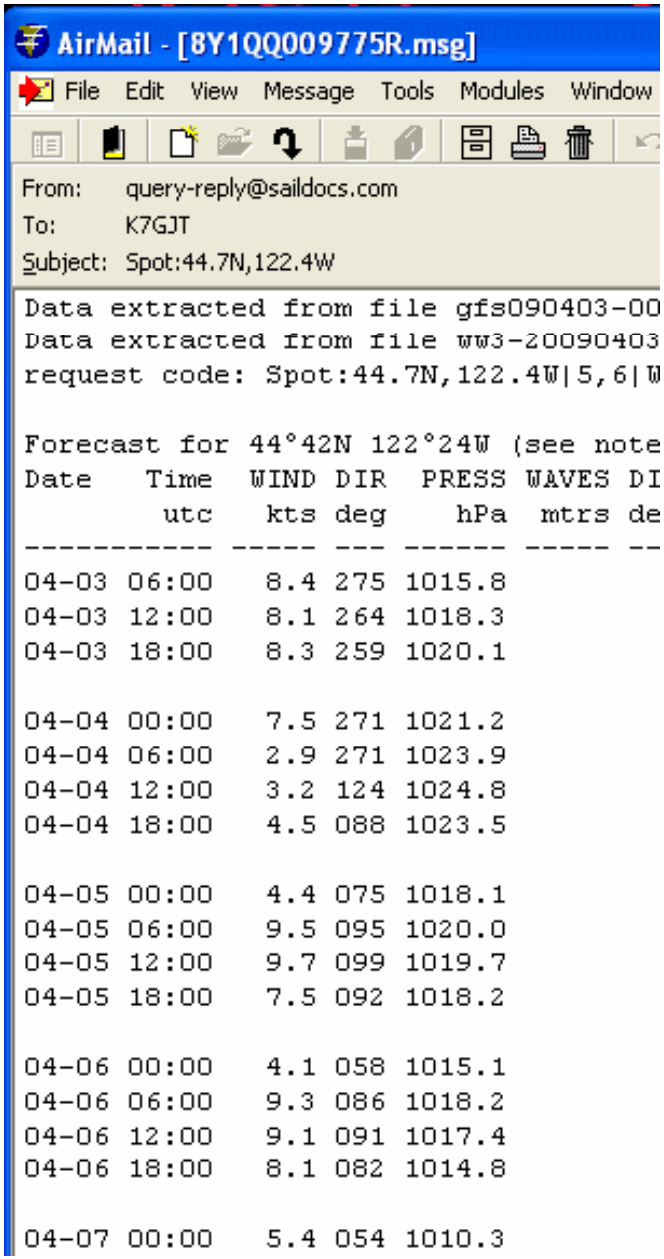
Airmail

GFS Spot-Forecasting capability



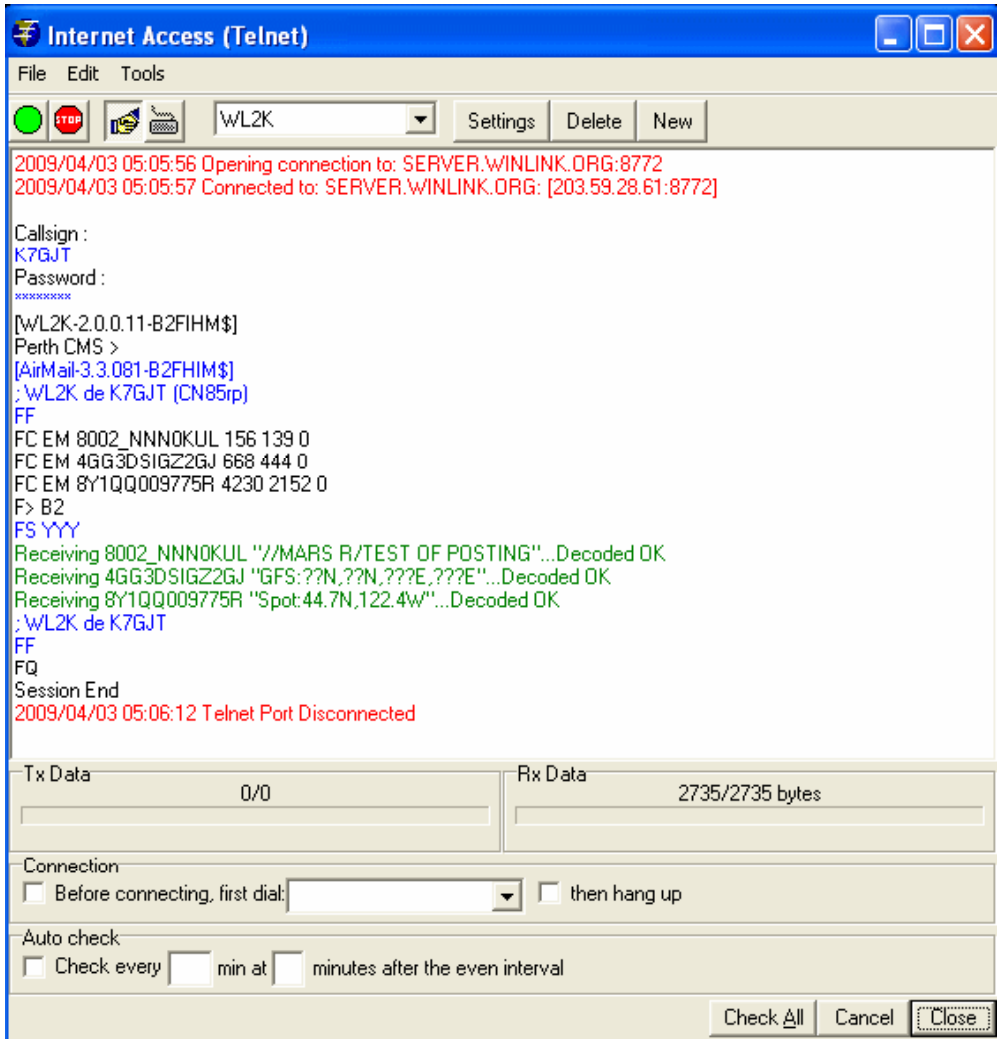
Airmail

GFS Spot-Forecast

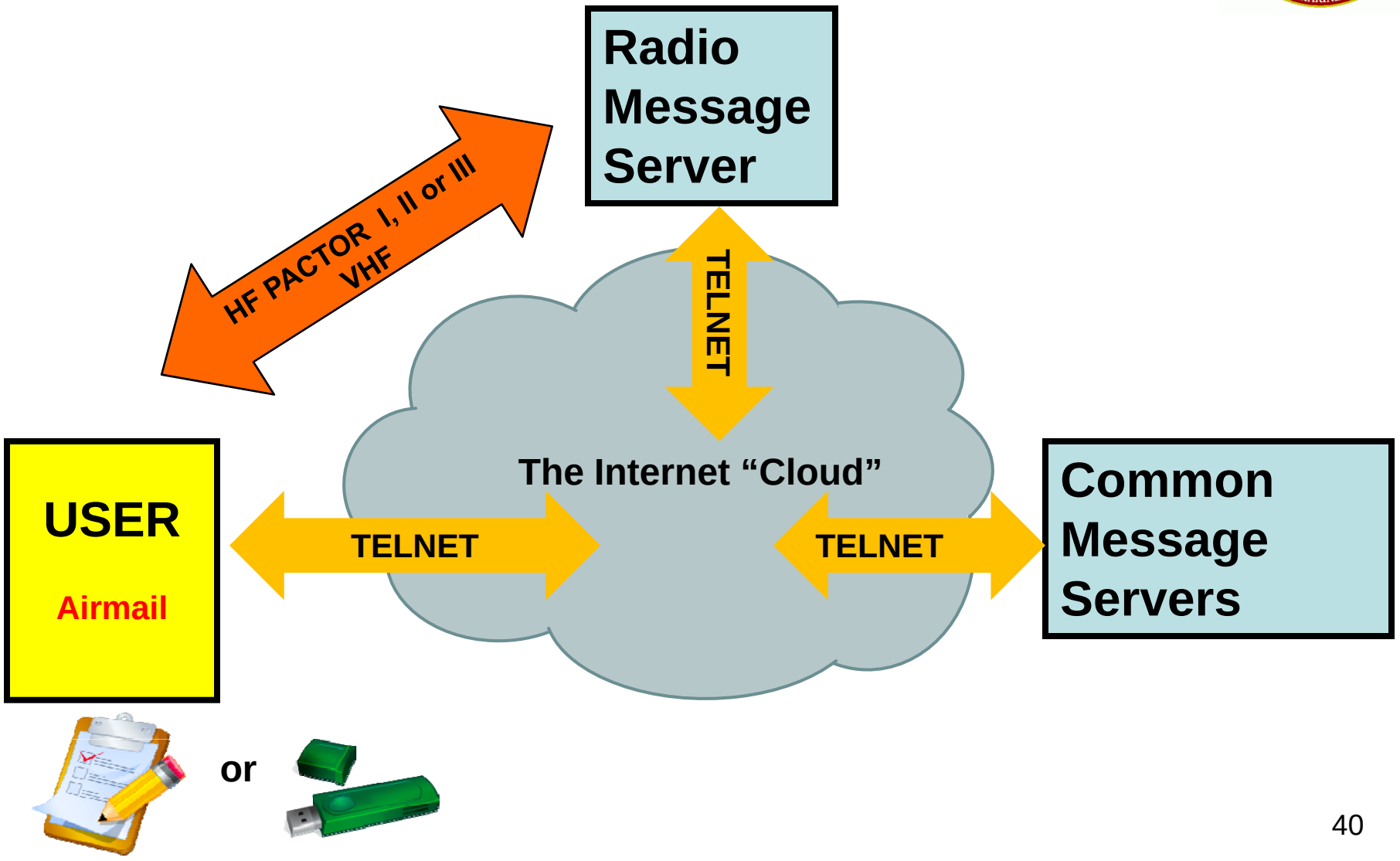


Airmail

Transaction receiving messages



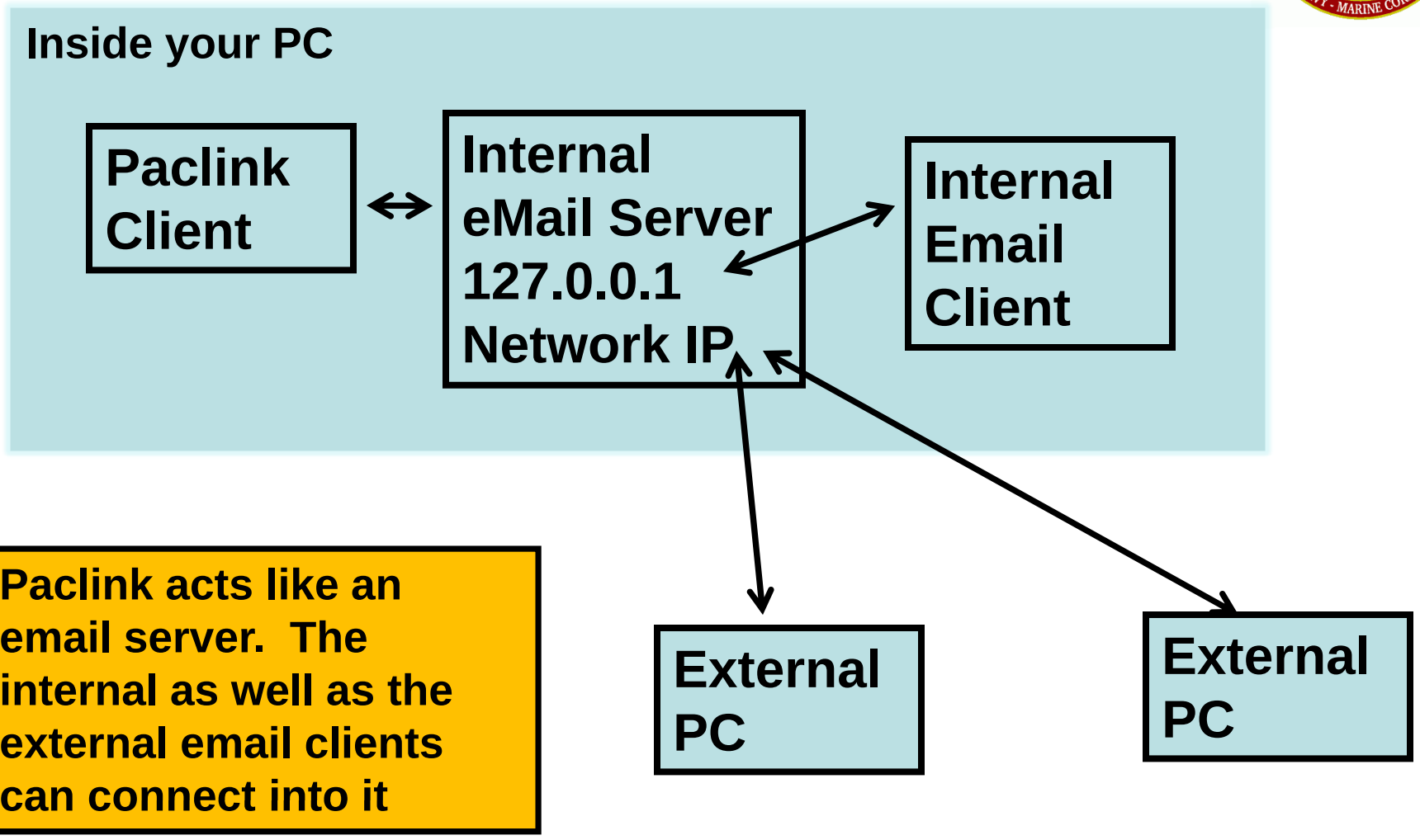
How does it work?



Paclink

- **Paclink** 
  - Required Internet connection
  - Will work with more than one account
- **PaclinkMP** **(M**ulti **P**rotocol) 
  - Can use without Internet connection
  - Replaced by Paclink 3.0
- **PaclinkW** (**W**INMOR) 
  - Can use without internet connection
  - **WINMORE** embedded as additional capability

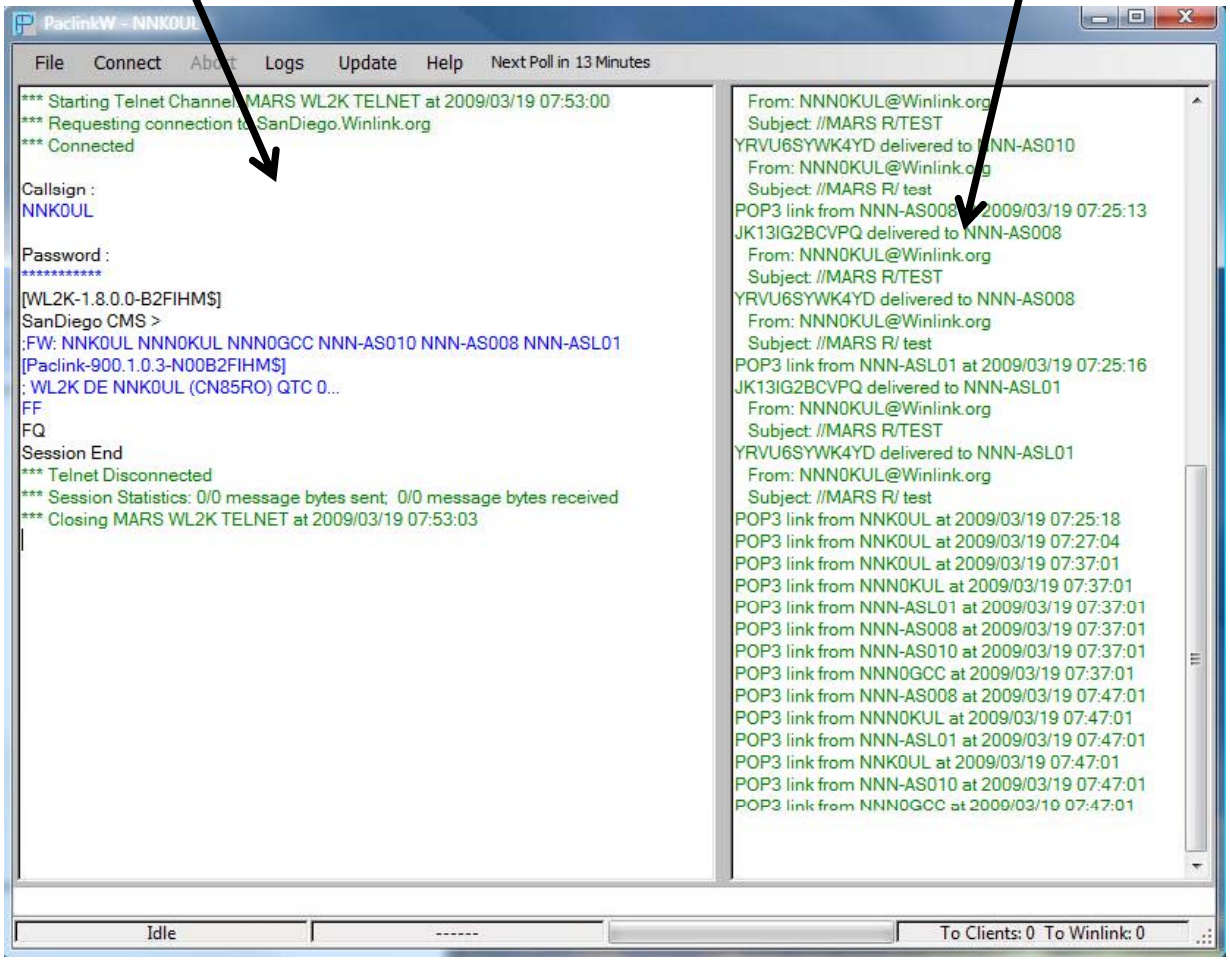
Paclink


Inside your PC
Paclink Client
Internal eMail Server 127.0.0.1 Network IP
Internal Email Client
External PC
External PC
Paclink acts like an email server. The internal as well as the external email clients can connect into it

Paclink

Radio/TELNET window

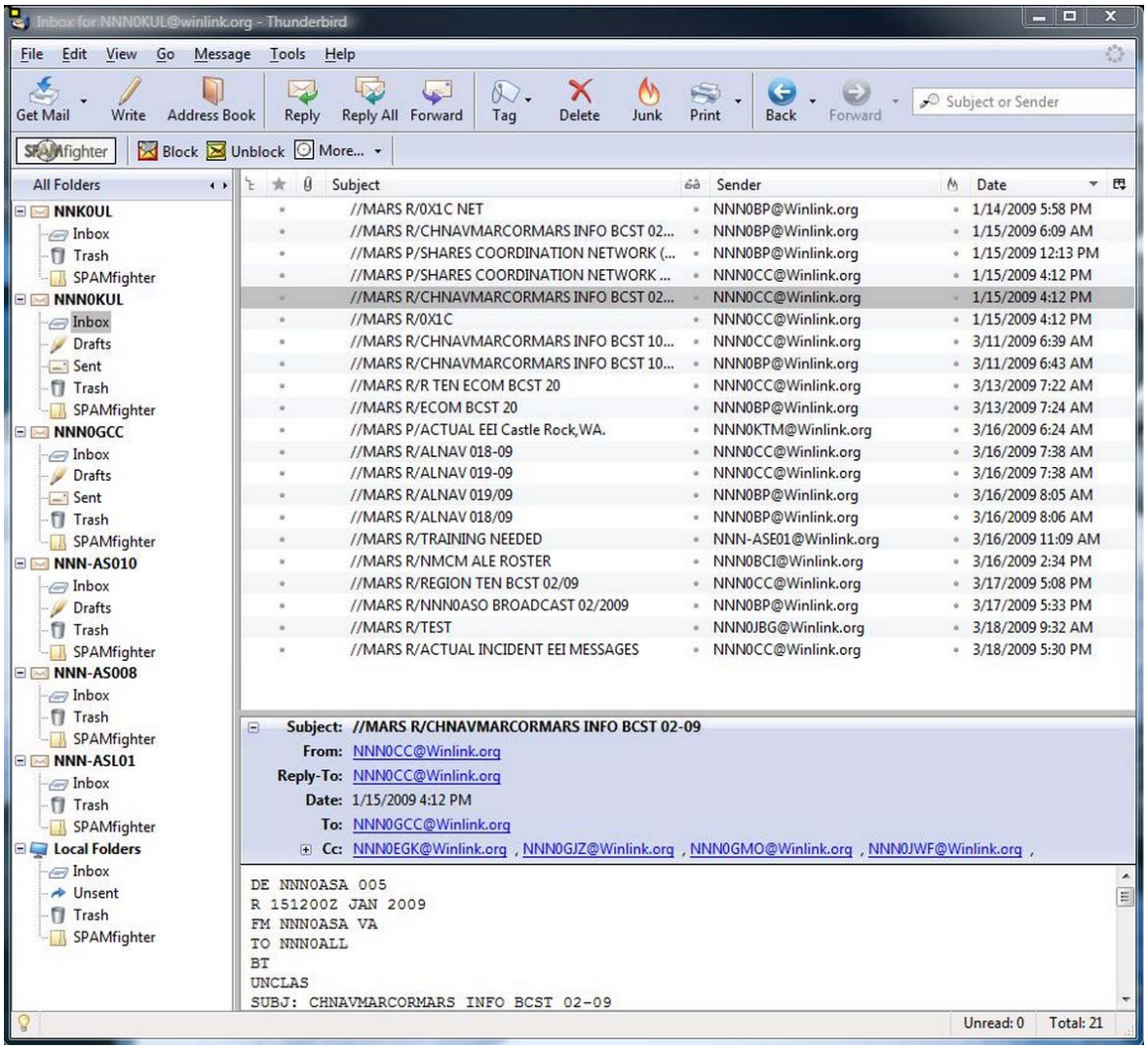
Message Server window



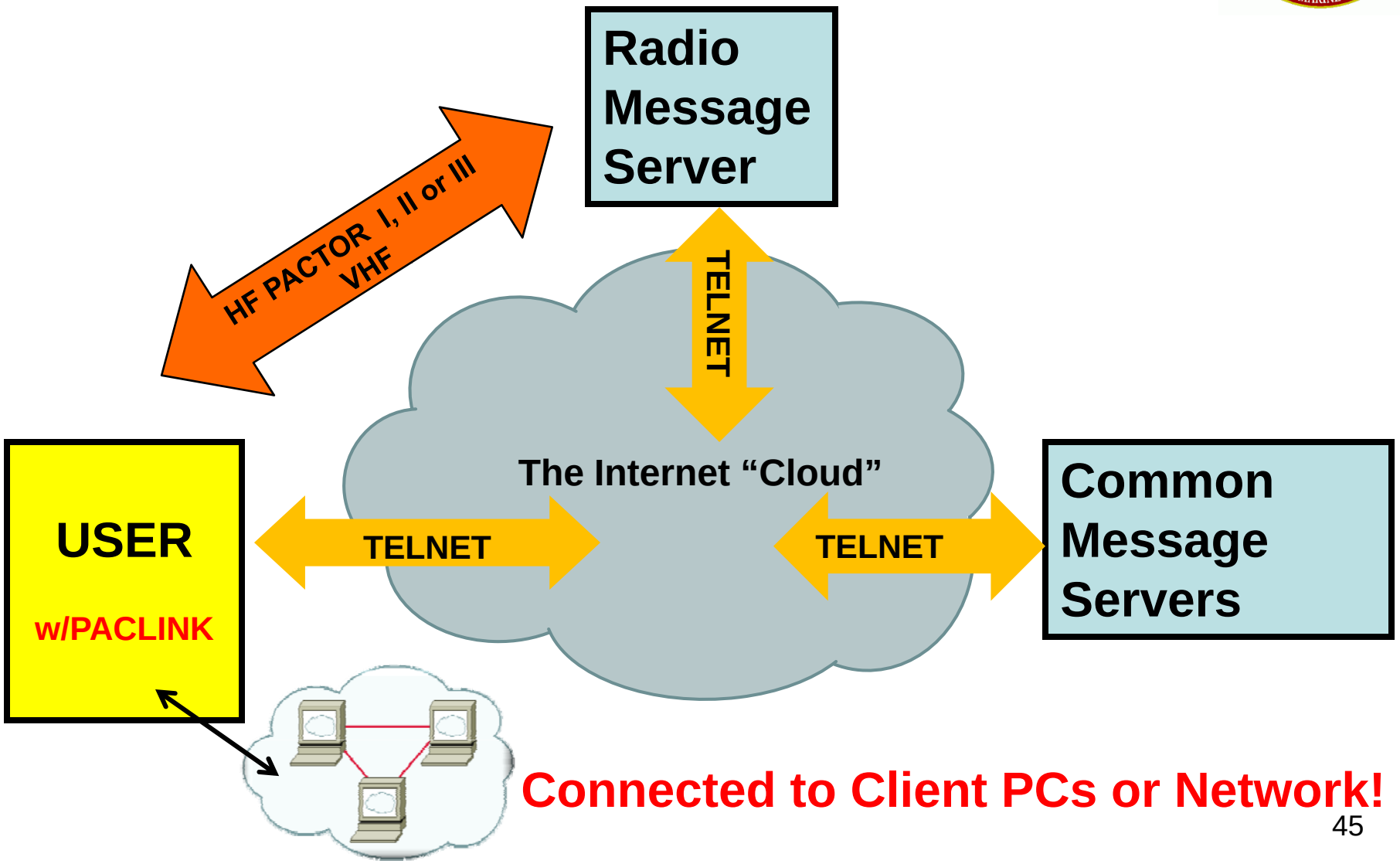
Paclink

Using Paclink w/Thunderbird - 6 MARS WL2K accounts

1
2
3
4
5
6



How does it work?

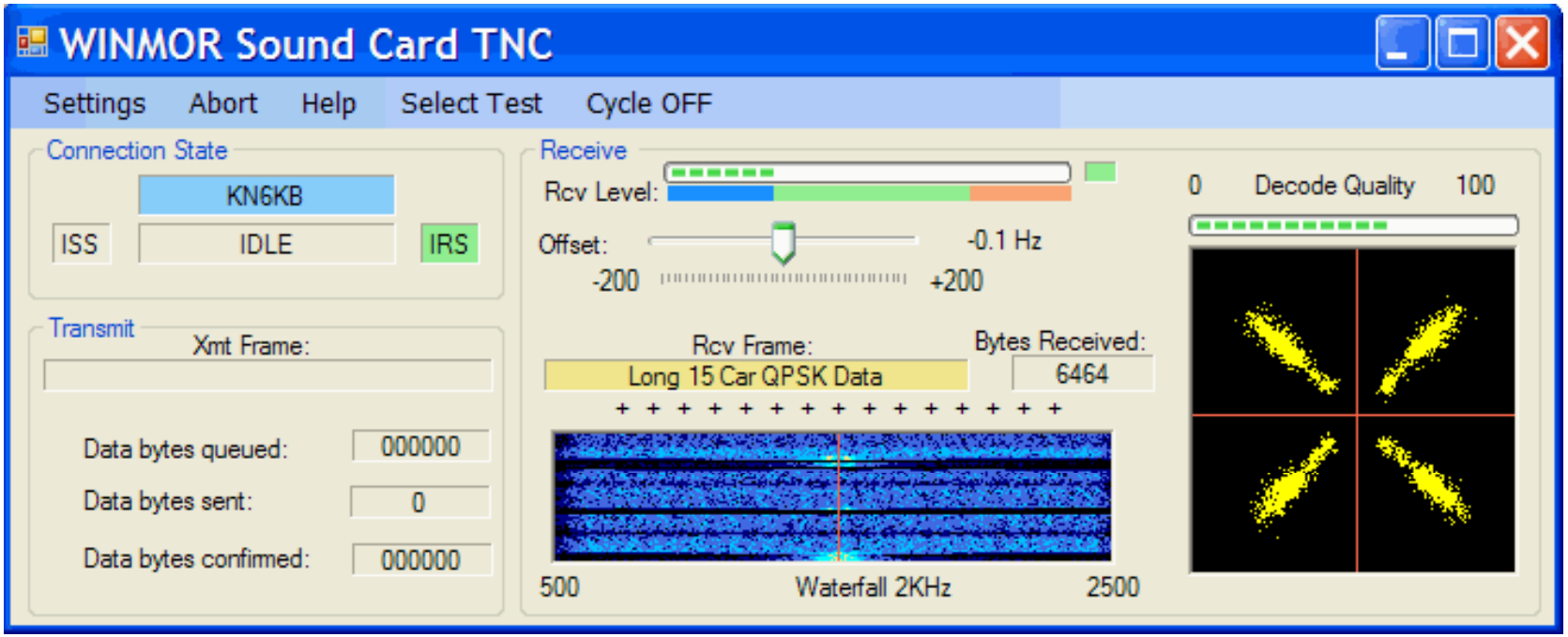


WINMOR

- Rick Muething, KN6KB, is lead coding PaclinkW and RMS HF software
- PC Soundcard ARQ mode for WL2K Digital Messaging
- No external TNC required
- Not a replacement for PACTOR 1, 2 or 3
- This is an additional HF mode for WL2K
- Speed expected to be between P2 and P3
- PaclinkW in Beta ‘desktop’ testing
- Limited HF RMS testing next step
- To be fully deployed in ???

WINMOR

- Picture of WINMOR client



WL2K at work…

“The Real World,” does it really work?

Example of agency use:

- **Hurricanes, Typhoons**
- **“The” AsianTsunami**
- **Failure of IntelSat 804**
- **Forest Fires (US, Australia)**
- **Humanitarian Missions**
- **Health Mercy Missions**
- **Research Missions**
- **Missing/distressed vessels (continual)**
- **Agency EmComm**

-----Original Message-----
From: Hennigan, Joe
Sent: Friday, March 09, 2007 11:13 AM
To: Chief, Army MARS

Subject: The Department of Homeland Security Sponsorship of Winlink 2000.

The Department of Homeland Security (DHS), Operations Coordination Directorate (OPS) has made great strides over the last 3 months in support of the Military Affiliate Radio System (MARS). In cooperation with Army MARS, and DHS Transportation Security Agency, DHS Operations Coordination Directorate (OC) has installed a WinLink 2000 system, to include hosting one of four redundant, mirror image, Common Message Server (CMS) Hubs, a Radio Message Server (RMS,) and end-user client applications for HF Operations.

WinLink 2000 is a COTS application suite, allowing users the ability to extend an e-mail capability and GPS Positioning data between an HF Radio and the internet. DHS has the capability to literally pass data from anywhere in the world, no matter how austere. DHS is one of many Government Agencies with HF radio capabilities, but this particular solution provides DHS with a unique set of extended capabilities.

The WinLink 2000 system consists of many different components, making it very stable and reliable in times of need. WinLink 2000 is utilized by many Emergency Response Agencies, including the Department of Defense (DoD). The MARS Winlink 2000 radio messaging system can both be contacted through this application via conventional HF/VHF/UHF radio communications, or via standard e-mail through the MARS Winlink 2000 radio e-mail system, to any number of operators throughout the world to get messages promptly delivered where normal standard e-mail does not exist. This is critical to any emergency response requirement.

This capability is proof positive of the DHS's commitment to enhancing emergency communications.

Best regards,

Joe Hennigan,
Director, Technology Support
Operations Coordination Directorate
Department of Homeland Security

URLs of Interest

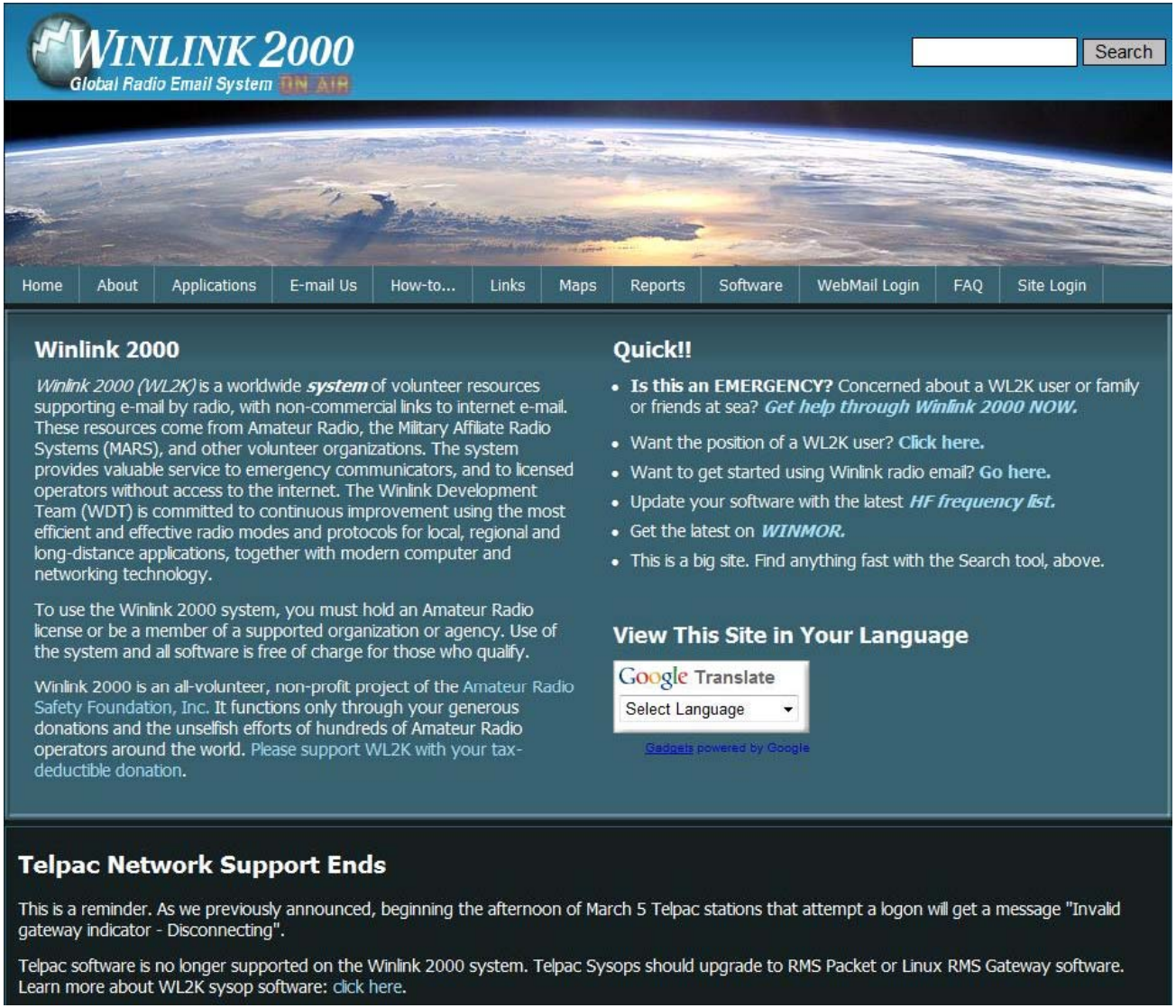
Winlink 200 Website:

- http:/www.Winlink.org

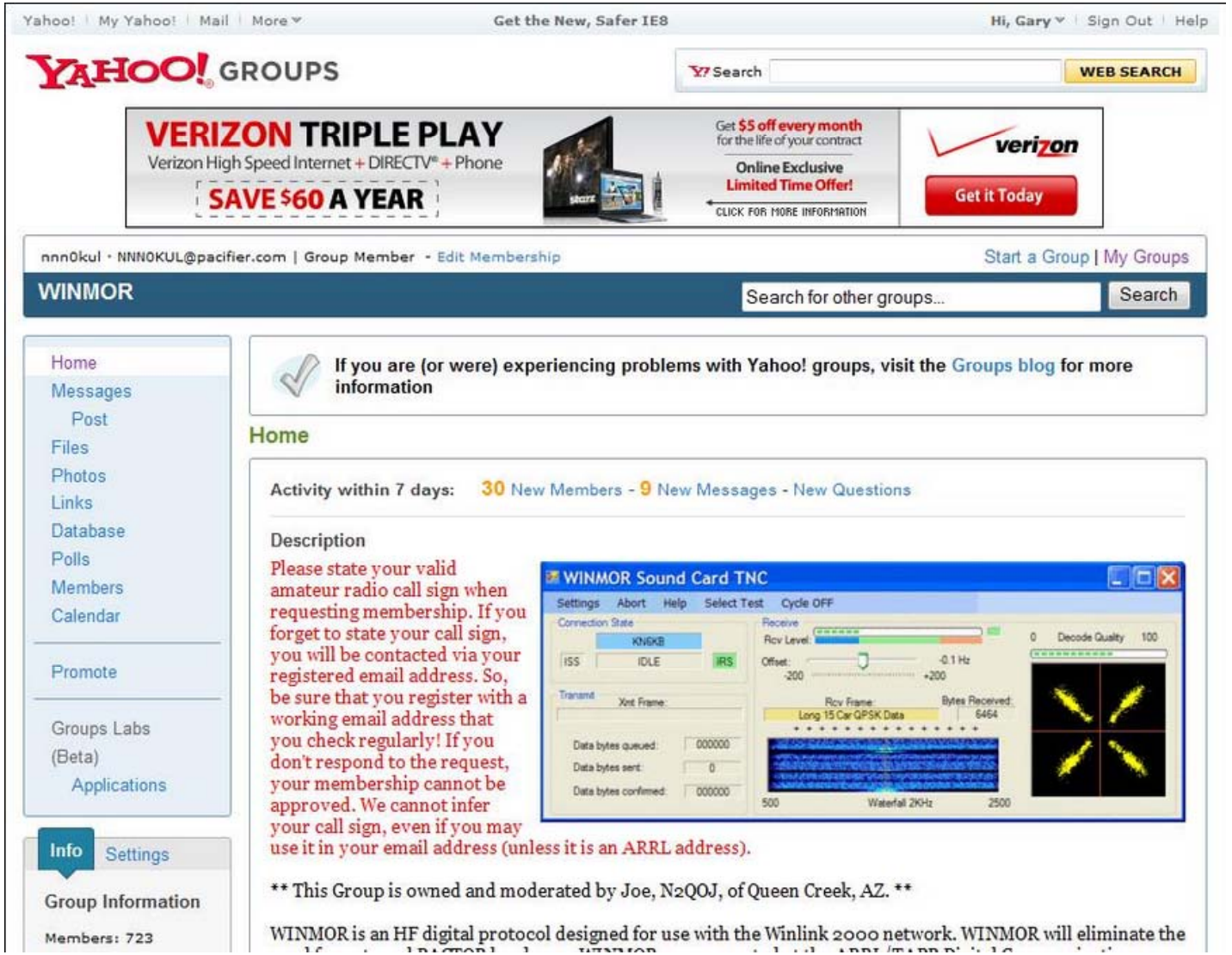
Yahoo Groups:

- http://groups.yahoo.com/group/wl2kemcomm Winlink
- http://groups.yahoo.com/group/airmail2000 Airmail
- http://groups.yahoo.com/group/WINMOR WINMOR
- http://groups.yahoo.com/group/LOADING_WL2K_USER_PROGRAMS *For the 'Digitally Challenged'*

Winlink2000.org Website



Yahoo Group Website

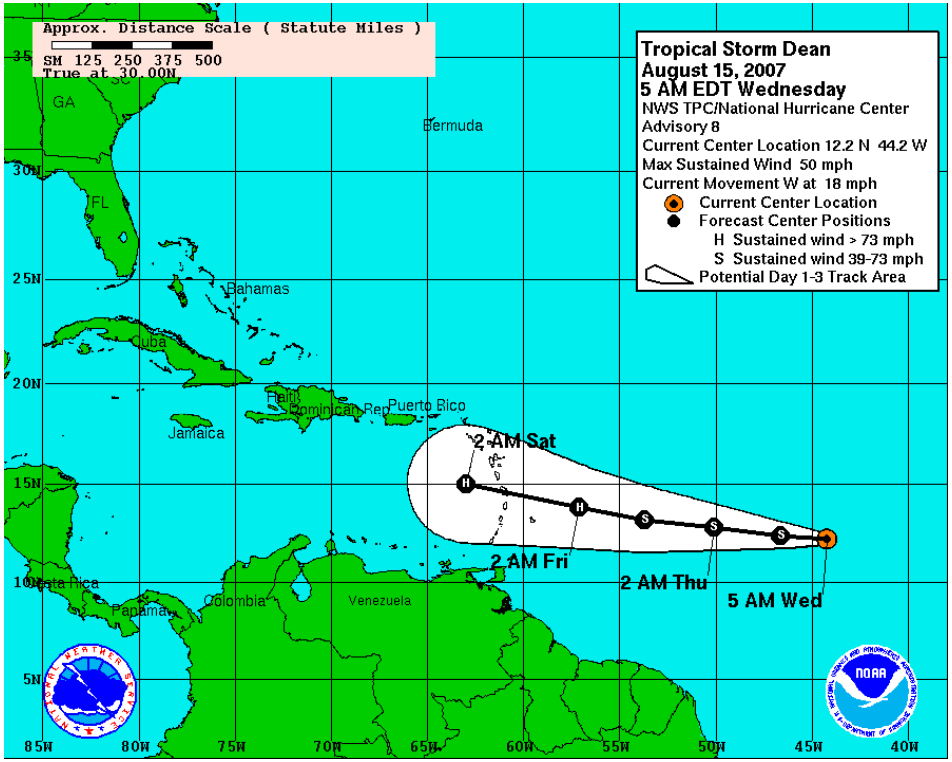


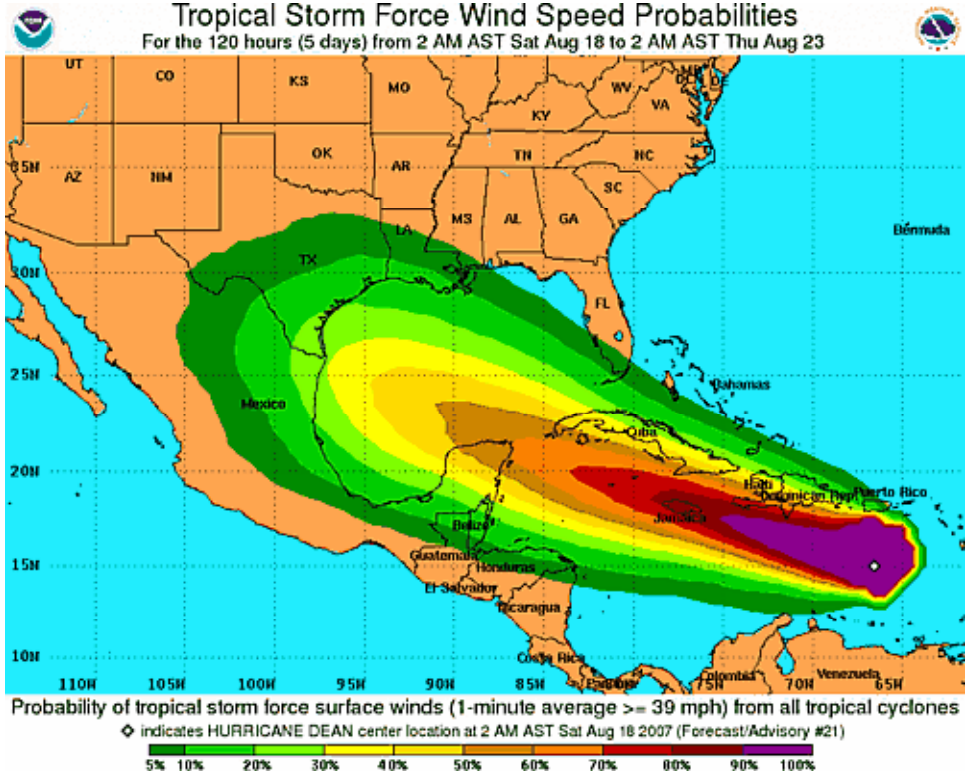
WL2K for Dummies

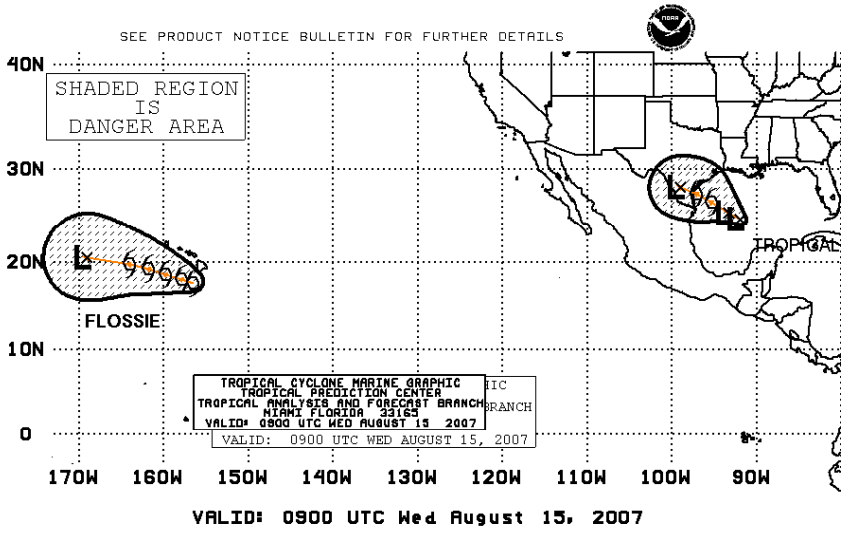
Credits…

Much of the information contained herein provided by:

- Steve Waterman, K4CJX
  - Winlink 2000 Network Administrator,
  - Winlink 2000 Development Team
- The www.Winlink.org website
- Experience…!







It is just a matter of time..

Are we ready?


Mobile HF rig and antenna: $1,200...
PACTOR III Modem: $1,000...
Ability to send email when commercial communications systems fail: Priceless
http://www.winlink.org

Questions?

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