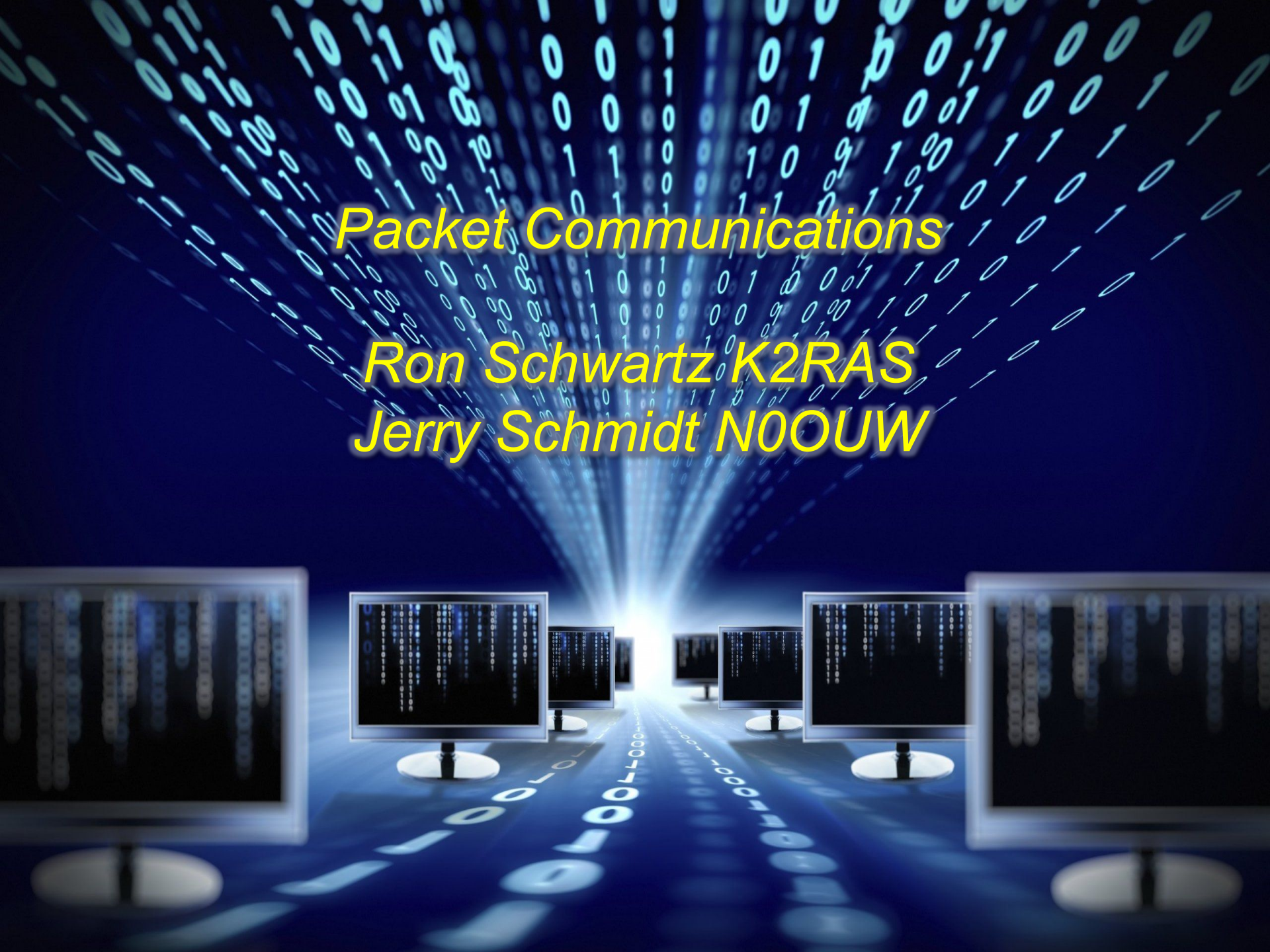

Packet Communications
Ron Schwartz K2RAS
Jerry Schmidt N0OUW

The Internet and the power have just gone down, down, down…

How can YOU stay in touch with others, even if they do not have a radio?

# Agenda

- What is Packet?
- Using Packet for simple messaging
- Using Winlink to send email and files
- Setting up your system to use Packet
- Overview of ARRL National Traffic System (NTS)
- Live demonstration

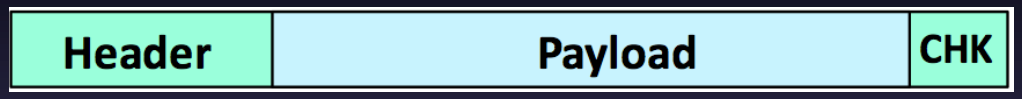
# What can Packet do?

- Live keyboard to keyboard chat
- Bulletin Board messaging
- Email messaging and document transfer
- Automatic Packet Reporting System (APRS) GPS positioning

*And it can do all this without local Internet or telephone connections. With auxiliary power, the power grid could also be down, and Packet Radio would still be usable…*

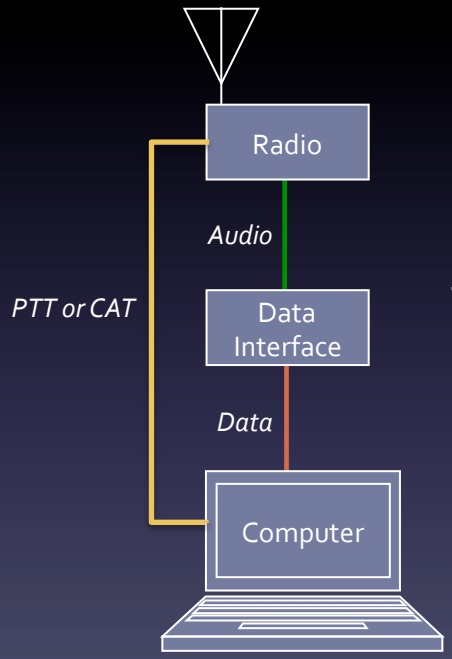
# How Packet Radio Works

- Packet Radio uses the AX.25 protocol
- Sends packets (an 'envelope' containing a payload)




  - Envelope contains the header at the beginning and a checksum at end
  - Header contains addressing information (to, from)
  - Modulation is usually Frequency Shift Keying (FSK)
  - Checksum determines if packet is ***error-free***
  - Payload contains the data to be sent

# Hardware Setup




Radio with data and audio-out connections

Terminal Node Controller (TNC) (Kantronics) or
Soundcard with Audio and PTT (or CAT) modem (SignaLink)

Software: Telnet or RCWinPacket (BBS), Winlink Express for email**

*** Software other than Winlink Express may have limited capabilities*
*Winlink Express was previously called RMS Express*

# Using Packet for Simple Messaging

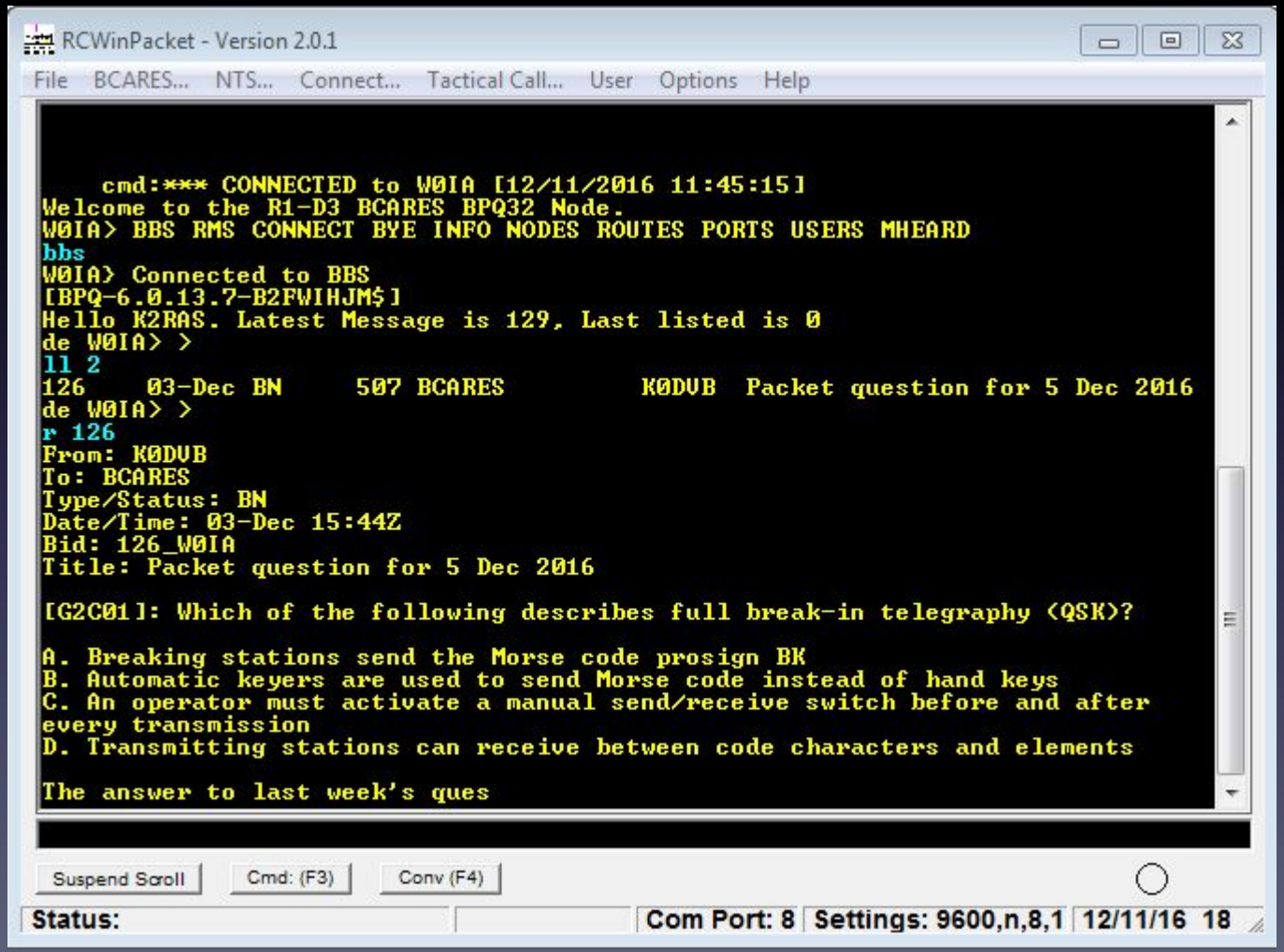
- Live keyboard-to-keyboard chat with another radio
- Bulletin Board Systems
  - BBS software is on a PC or a connected device to a radio
  - Stores and forwards messages
  - Delayed pickup (doesn't require your radio to be on when message message is sent)
  - Supports both personal or group mailboxes
  - BBS can also be connected to the Internet

# BBS Example

Connect to BBS

List last 2 messages

Read message 126

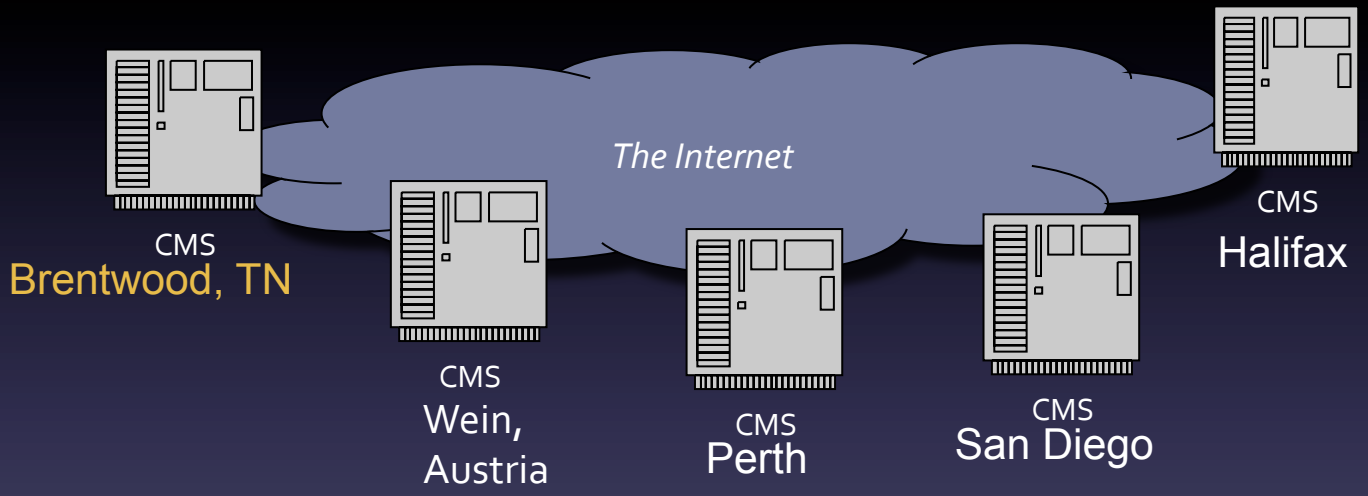


# Sending Email and Files using Packet

- WinLink is an worldwide system of resources which enables *email and file transmission* over Ham radio
  - Email and data files can be sent direct to the Internet, when avail
  - Email and data files can be sent peer-to-peer to another radio
  - Email and data files can be relayed globally using radio servers
- PC software is Winlink Express (Mac requires virtual machine)

*WinLink uses ham e-mail addresses like w4usa@winlink.org*

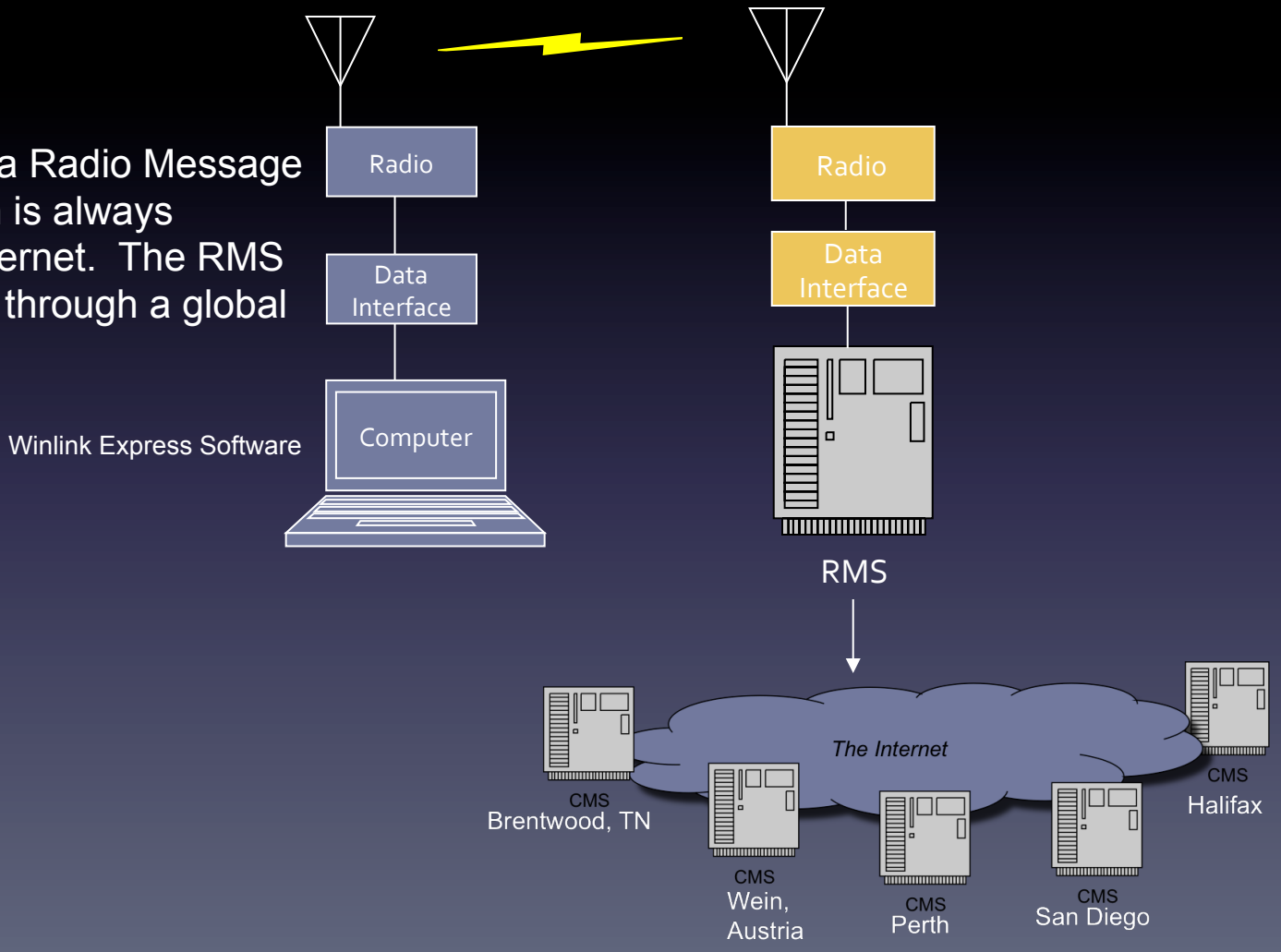
# How does Winlink Work?



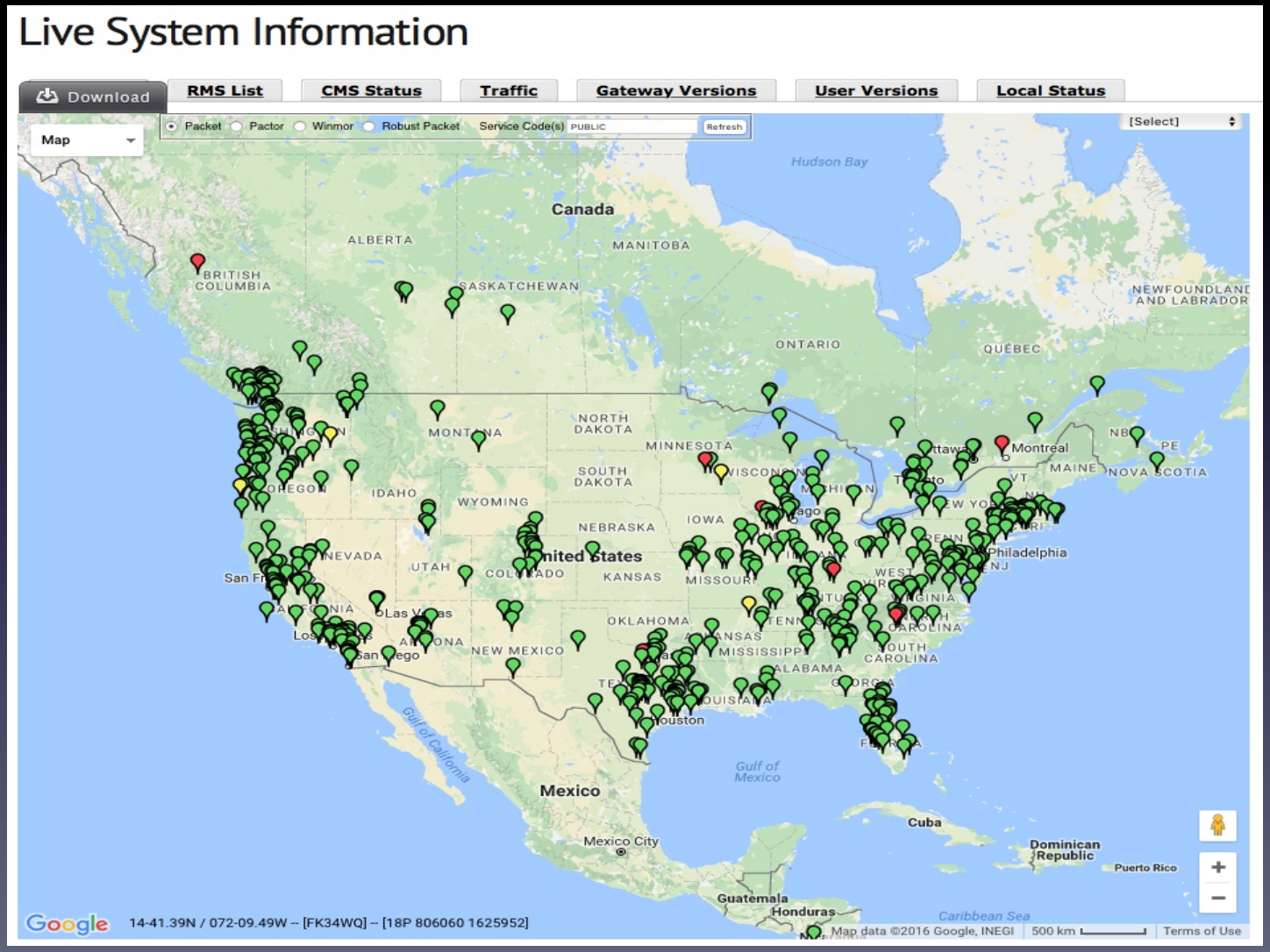

Five computers are located around the world and function as a *Common Message Server* (or CMS). They organize, synchronize and manage WinLink e-mail traffic. All CMSs have the same (e.g. redundant) information and individually can run the entire system.

# Your gateway to a CMS is called a Radio Message Server, or “RMS”.

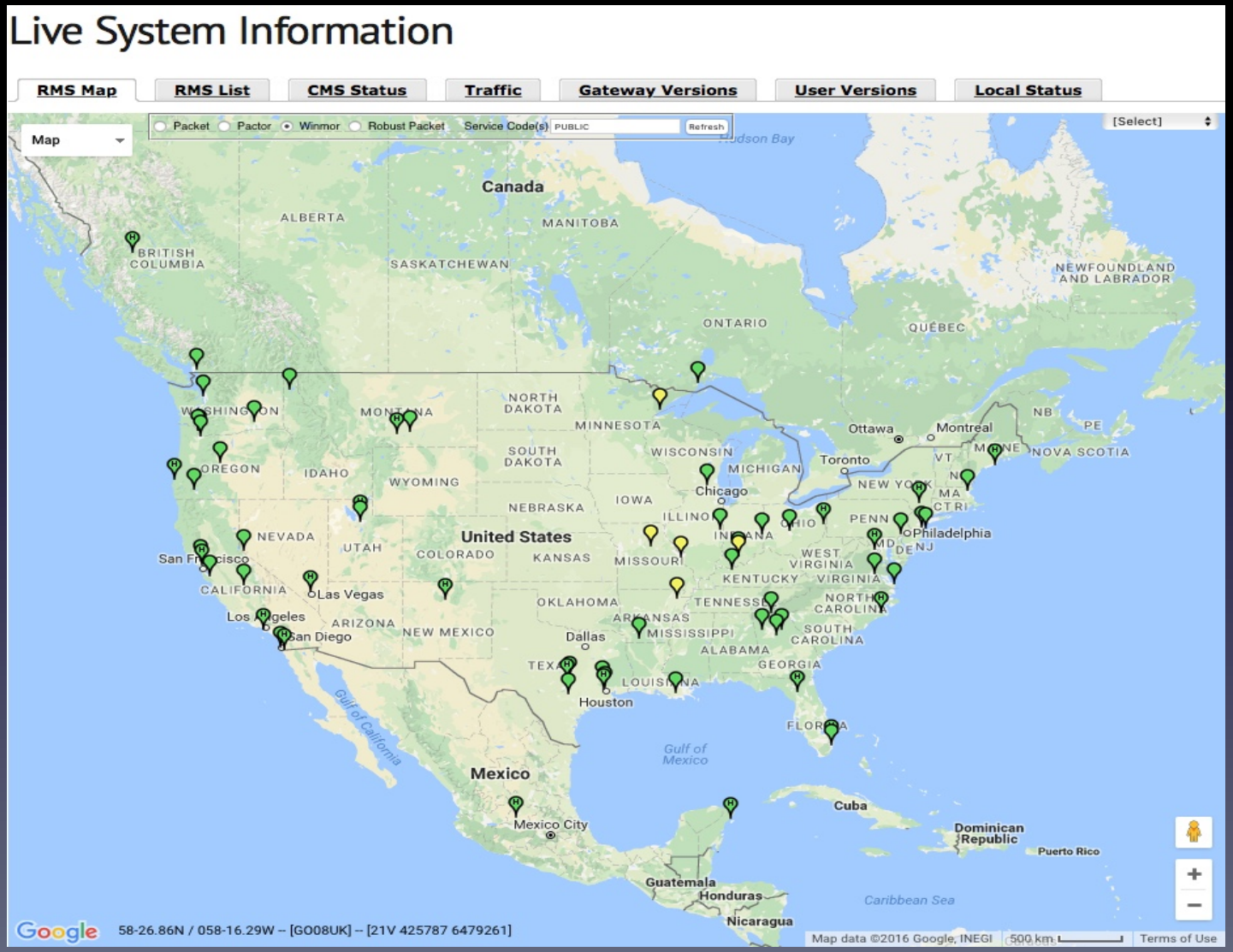
Stations connect to a Radio Message Server (RMS) which is always connected to the Internet. The RMS transfers messages through a global CMS.



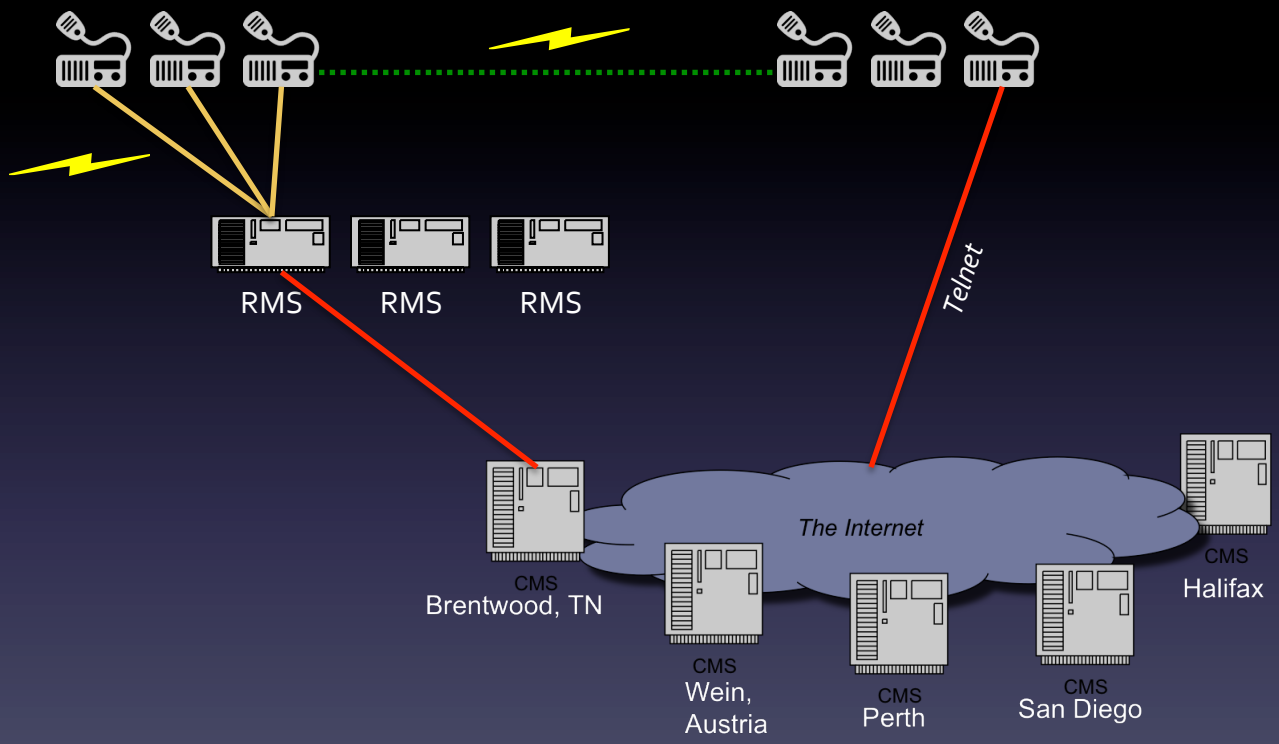
# VHF/UHF RMS Winlink Sites in US



# HF RMS Winmor Sites in US



# How does Conventional Winlink work?




Email can be sent direct radio-to-radio. Individual radios can also connect to Radio Message Servers (RMS). The RMS serves as a hub to send messages to and from CMSs. *Email can follow a radio path until it finds a point where there is Internet service…*

# Alternative Winlink Modes

- ✔ Conventional Winlink mode
  - Uses RMS and CMS 'backbone' servers with connection to the Internet
  - Provides 'last-mile' Internet access for messaging
- ✔ Peer-to-peer Winlink mode
  - Direct connection between client radios
- What about when the Internet goes down??
  - *Hybrid Winlink* mode (radio-only automatic Mesh Network)

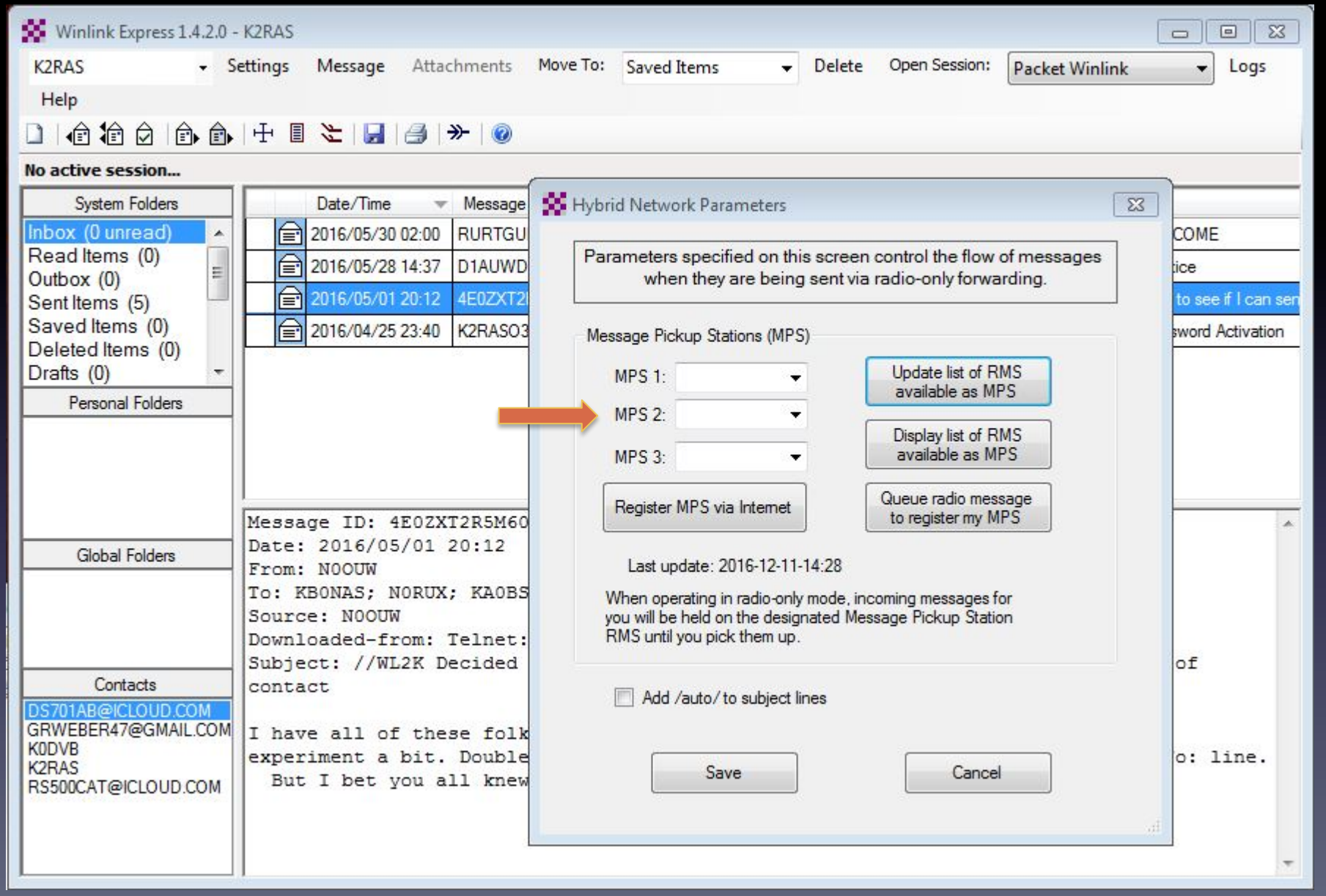
# Hybrid Winlink Mode

- Wide-area, MESH network using HF forwarding
- Message routing is dynamic and fully automatic
- Radio Message Servers (RMSs) run in normal Winlink Internet mode and switch automatically to radio-only network mode to forward *radio-only messages*
- Currently provides nation-wide e-mail support for MARS, SHARES and civil agencies
- Uses standard Winlink client email programs
- Supports standard email with file attachments
- Hybrid mode supports Winmor (HF), or Pactor (NOT VHF PACKET)
- Pactor is used for backbone links between RMSs

# Hybrid Winlink Mode

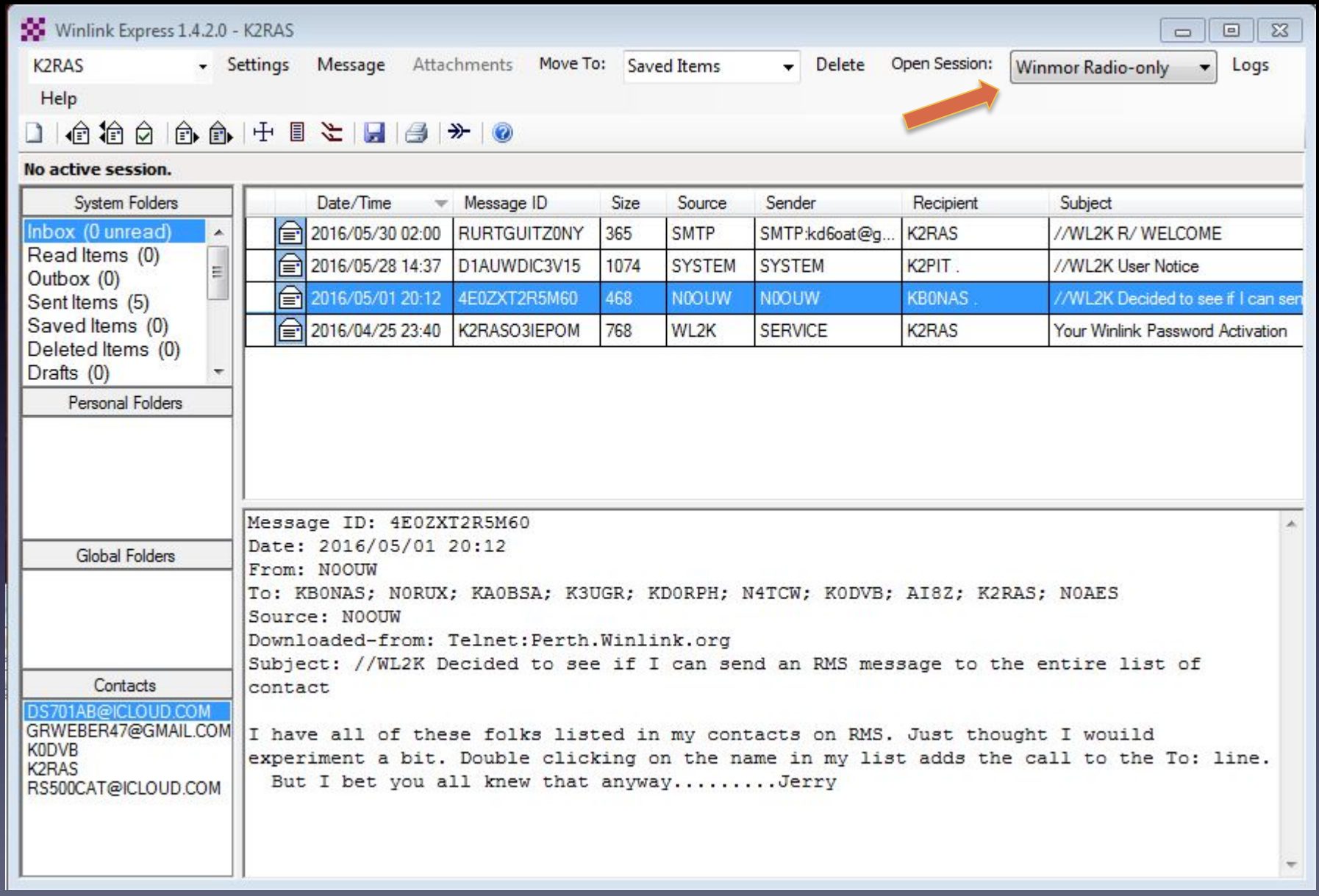
During radio-only (no Internet) operation, messages sent to you will be stored on the RMS(s) you select as your Message Pickup Stations (MPS).

- Can select up to 3 MPS, but to reduce network traffic, it is recommended that only 2 MPS be used.
- A duplicate copy of each message is delivered to each MPS, and you can pick up your messages from either MPS.
- Once a message has been downloaded from one MPS, Winlink Express will not download the same message from another MPS.
- You can register MPS using Winlink Express using an Internet connection or a radio message.


Winlink Express 1.4.2.0 - K2RAS
K2RAS
Settings
Message
Attachments
Move To:
Saved Items
Delete
Open Session:
Packet Winlink
Logs
Help
No active session...
System Folders
Inbox (0 unread)
Read Items (0)
Outbox (0)
Sent Items (5)
Saved Items (0)
Deleted Items (0)
Drafts (0)
Personal Folders
Global Folders
Contacts
DS701AB@ICLOUD.COM
GRWEBER47@GMAIL.COM
K0DVB
K2RAS
RS500CAT@ICLOUD.COM
Date/Time
Message
2016/05/30 02:00
RURTGU
2016/05/28 14:37
D1AUWD
2016/05/01 20:12
4E0ZXT2
2016/04/25 23:40
K2RASO3
Message ID: 4E0ZXT2R5M60
Date: 2016/05/01 20:12
From: N0OUW
To: KB0NAS; N0RUX; KA0BS
Source: N0OUW
Downloaded-from: Telnet:
Subject: //WL2K Decided
contact
I have all of these folk
experiment a bit. Double
But I bet you all knew
Hybrid Network Parameters
Parameters specified on this screen control the flow of messages when they are being sent via radio-only forwarding.
Message Pickup Stations (MPS)
MPS 1:
MPS 2:
MPS 3:
Update list of RMS available as MPS
Display list of RMS available as MPS
Register MPS via Internet
Queue radio message to register my MPS
Last update: 2016-12-11-14:28
When operating in radio-only mode, incoming messages for you will be held on the designated Message Pickup Station RMS until you pick them up.
Add /auto/ to subject lines
Save
Cancel

# Hybrid Adaptive Routing

- Fully automatic, adaptive MESH network routing.
- If a direct link is not available to the destination MPS, intermediate RMS will relay the message.
- The optimum path is computed by each RMS based on HF propagation estimates, time of day, Pactor speed, message size and other factors.
- Adaptive Routing.
  - Each intermediate RMS recomputes the optimum path.
  - If a RMS is unavailable, the system will route around it.
  - Busy RMS are tried a few times and then routed around.
  - Radio messages can be relayed through RMS that are or are not connected to the Internet.


Winlink Express 1.4.2.0 - K2RAS
K2RAS
Settings
Message
Attachments
Move To:
Saved Items
Delete
Open Session:
Winmor Radio-only
Logs
Help
No active session.
System Folders
Inbox (0 unread)
Read Items (0)
Outbox (0)
Sent Items (5)
Saved Items (0)
Deleted Items (0)
Drafts (0)
Personal Folders
Global Folders
Contacts
DS701AB@ICLOUD.COM
GRWEBER47@GMAIL.COM
K0DVB
K2RAS
RS500CAT@ICLOUD.COM
Date/Time
Message ID
Size
Source
Sender
Recipient
Subject
2016/05/30 02:00
RURTGUITZ0NY
365
SMTP
SMTP:kd6oat@g...
K2RAS
//WL2K R/ WELCOME
2016/05/28 14:37
D1AUWDIC3V15
1074
SYSTEM
SYSTEM
K2PIT .
//WL2K User Notice
2016/05/01 20:12
4E0ZXT2R5M60
468
N0OUW
N0OUW
KB0NAS .
//WL2K Decided to see if I can sen
2016/04/25 23:40
K2RASO3IEPOM
768
WL2K
SERVICE
K2RAS
Your Winlink Password Activation
Message ID: 4E0ZXT2R5M60
Date: 2016/05/01 20:12
From: N0OUW
To: KB0NAS; N0RUX; KA0BSA; K3UGR; KD0RPH; N4TCW; K0DVB; AI8Z; K2RAS; N0AES
Source: N0OUW
Downloaded-from: Telnet:Perth.Winlink.org
Subject: //WL2K Decided to see if I can send an RMS message to the entire list of contact
I have all of these folks listed in my contacts on RMS. Just thought I would experiment a bit. Double clicking on the name in my list adds the call to the To: line.
But I bet you all knew that anyway.....Jerry

# Hybrid Winlink Nodes

Winlink VHF RMS Internet-connected local nodes

| | | |
|---|---|---|
| WØIA-10 | 145.090 | Boulder |
| WØNED-10 | 145.070 | Nederland |
| KØNTS-10 | 145.050 | Denver (Squaw) |
| NVØN-10 | 145.030 | Longmont (north) |
| KAØBSA-10 | 144.930 | Broomfield |

Winlink HF RMS Internet-connected nodes

| | | |
|---|---|---|
| KD6OAT | 14.110 | Sandy, UT |
| N5TW | 14.110 | Austin, TX (Hybrid) |
| XE1CRG | 14.085 | Irapuato, Mexico (Hybrid) |
| K5AEA | 14.097.5 | Austin, TX (Hybrid) |
| K5AEA | 7.100 | Austin, TX (Hybrid) |
| N5TW | 7.091.5 | Austin, TX (Hybrid) |
| K7DAV | 3.597 | Ogden, UT (Hybrid) |
| W5PDO | 3.592 | Santa Fe, NM (Hybrid) |
| KE7XO | 3.587 | Las Vegas, NV (Hybrid) |
| K6JGL | 3.595 | Los Angeles, CA (Hybrid) |
| N5TW | 3.596 | Austin, TX (Hybrid) |
| KB5HCD | 3.595 | Houston, TX (Hybrid) |
| KC8YJJ | 3.589.5 | Pittsburgh, PA (Hybrid) |

*Orange locations use Hybrid Mesh forwarding*

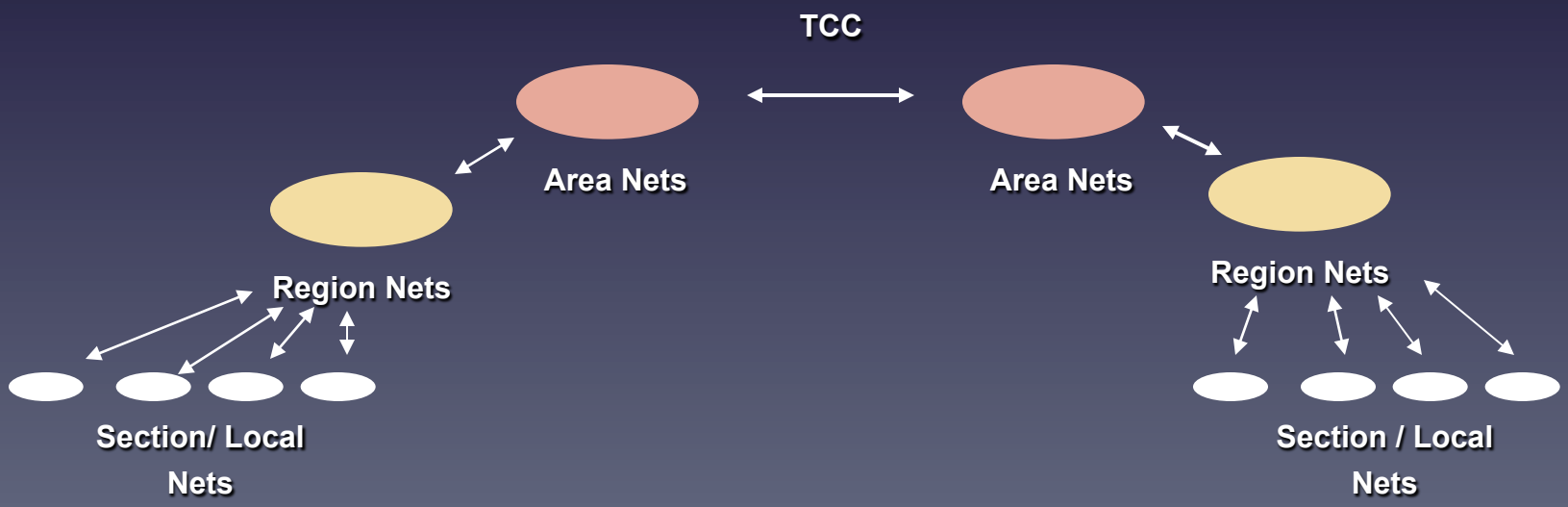
# ARRL National Traffic System (NTS)

- The "RELAY" in American Radio Relay League (ARRL)
- Started in 1915 as the formal ARRL system to relay messages around the country
- NTS messages sent using voice and/or CW
- *NTS Digital* supplements voice and CW by using packet
- Complementary to Winlink
- Delivery to any end-user even if not a Ham
- When all else fails…

# ARRL National Traffic System

# ARRL National Traffic System

- US and Canada organized into Area, Region, and Local Nets
  - 3 Areas
  - 12 Regions



# ARRL National Traffic System

The American Radio Relay League

RADIOGRAM

Via Amateur Radio

| Number | Precedence | HX | Station of Origin | Check | Place of Origin | Time Filed | Date |
|---|---|---|---|---|---|---|---|
| 704 | R | C | N2GS | 14 | CHESTER NJ | 1830 | JUL 2 |

To:

JOE SMITH KC2XXY
1234 SECOND ST
SUMMIT NJ 07901

This Radio Message was received at:

Amateur Station_____ Date_____
Name_____
Street Address_____
City, State, Zip_____

Telephone Number: 650-123-4567

| | | | | |
|---|---|---|---|---|
| THIS | IS | THE | ARRL | RADIOGRAM |
| FORM | XRAY | DETAIL | TO | FOLLOW |
| XRAY | HAVE | FUN | 73 | |

GREG SZPUNAR N2GS

| From | Date | Time | To | Date | Time |
|---|---|---|---|---|---|
| REC'D | | | SENT Qustin AK2US | 7/2/03 | 2112 EDT |

A licensed Amateur Radio Operator, whose address is shown above, handled this message free of charge. As such messages are handled solely for the pleasure of operating, a "Ham" Operator can accept no compensation. A return message may be filed with the "Ham" delivering this message to you. Further information on Amateur Radio may be obtained from ARRL Headquarters, 225, Main Street, Newington, CT 06111.

The American Radio Relay League, Inc. is the National Membership Society of licensed radio amateurs and the publisher of *QST* Magazine. One of its functions is promotion of public service communication among Amateur Operators. To that end, The League has organized the National Traffic System for daily nationwide message handling.

# ARRL National Traffic System

- Preferred delivery is via telephone.
- Okay to leave on voicemail or answering machine IF you are comfortable you reached the right person.
- Radiogram postcard if cannot reach by phone.
- Final station must inform if cannot deliver, or if originating station requested confirmation

# On to the demonstration…

References

http://www.winlink.org
http://bouldercountyares.org/training/packet/ (ReWinPacket software)
http://www.winlink.org/WinlinkExpress

http://www.winlink.org/content/e_mail_or_without_internet
http://www.kantronics.com/products/kpc3.html
http://www.tigertronics.com/slusbmain.htm (signalink modem)

http://www.arrl.org/files/file/Public%20Service/MPG604A.pdf (ARRL NTSD Procedures)
http://nts-digital.net/mw/index.php/Main_Page (DTN Digital Traffic Net)