

The Last Mile



Sending a lot of information, without voice, accurately, error free to the ones that need it to help others:

Digital Amateur Radio communications where it matters

Hosted by and special thanks to: Joyce Pearson,
Director, Office of Hospital Emergency Preparedness
MS Hospital Association Health, Research & Education
Foundation

W5DIX & WX5H

ARRL/ARES Mississippi Section

Special Thanks to KS4JU
for the foundation of the presentation

What is the Last Mile ?

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



Agenda:

1. Presenters
2. Who is the ARRL
3. Who is ARES
4. Lessons Learned – Katrina
5. Letters from Katrina
6. Why Digital (UHF/VHF/HF)
7. Key Equipment
 1. Antenna's
 2. Radio's
 3. Computers
 4. Sound Card Interfaces
8. Digital Overview (NBEMS)
 1. FLDIGI
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 3. BPQ32
9. Software Functional Demo
 1. FLDIGI
 2. Winlink
 1. RMS
 2. BPQ
10. How is it deployed
11. Mobility
12. Effectiveness
13. Develop a Plan

ARRL/ARES Mississippi Section

Presenters:

Mike Dancy, WX5H, CHSP, CHEP Director, Security & Facility Safety at Merit Health River Oaks Hospital and Woman's Hospital Flowood, MS . Assistant Emergency Coordinator, Rankin County ARES

Mark Williams, W5DIX, Mississippi Deputy ASEC NBEMS/Digital. FEMA -ICS/NIMS/ NWS Skywarn, ARES Volunteer Communications Officer, MS State Department of Health Emergency Services, Madison County EMA Volunteer Coordinator, Madison County ARES

ARRL/ARES Mississippi Section

Who is the ARRL

ARRL is the national association for Amateur Radio in the US. Founded in 1914 by Hiram Percy Maxim as The American Radio Relay League, ARRL is a noncommercial organization of radio amateurs. ARRL numbers within its ranks the vast majority of active radio amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs. ARRL's underpinnings as Amateur Radio's witness, partner and forum are defined by five pillars: Public Service, Advocacy, Education, Technology, and Membership.

We Serve the Community

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What is ARES

The Amateur Radio Emergency Service® (ARES) consists of licensed amateurs who have voluntarily registered their qualifications and equipment, with their local ARES leadership, for communications duty in the public service when disaster strikes.

Duty may include volunteering with organizations such as MEMA, FEMA, County EMA's, Hospitals etc...anywhere under the ICS system, logistics/communication needs may arise.

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Why Digital Ham Radio?



- **Lessons Learned**

- **70% of all cell towers in the affected area after Katrina were down/inoperable**
- **Repeater towers both commercial and Amateur were affected**
 - Only one repeater was in operation in Greater New Orleans after Katrina
 - EMA repeaters, all communications in general in the affected area were completely wiped out.
- **Dependence on Satellite**
 - Multiple agencies connecting to creating a significant reduction in speeds i.e. bottlenecks
- **Amateur Radio Both Voice and Digital – “What went Right”**
 - The Federal Response To Hurricane Katrina Lessons Learned report submitted by the FCC to the President of the United States.
- **FEMA CERT instructional guide lists Amateur Radio as “Very Reliable, Many Modes, Range, Interoperability & More Simultaneous Conversations ability”.**

Why Ham Radio?



- Letters from Katrina – (Excerpts Handout)
 - Gregory Sarratt, W4OZK
 - On September 3rd I arrived at the American red cross disaster relief headquarters in Montgomery, Alabama and immediately established an amateur radio operations post in this center. The Montgomery amateur radio club was Instrumental in providing a radio station and local support throughout this operation. The next day began a 37 day effort that Would ultimately result in over 200 amateur radio operators from 35 states and Canada being processed and deployed to the devastated region through the Montgomery center. Amateurs were deployed to multiple Mississippi counties and towns To set up at kitchens, shelters, emergency operation centers, distribution centers, warehouses and various command and control centers. “
 - In each town we set up a High Frequency (HF) amateur radio station to communicate out of the area to Montgomery and the outside world. We also set up a communications network connecting every Red Cross facility in a town on a local short range radio frequency. Our network included fixed and mobile disaster vehicle stations.

Why Ham Radio?



- Letters from Katrina – (Excerpts Handout)
 - Richard Webb, NF5B
 - I served LSU medical centers, known as Charity and University hospitals in New Orleans, as a radio communicator during Katrina in 2005, along with my spouse. Before Katrina we participated frequently in hospital drills and other programs to educate ourselves about the hospital and its needs. We were well prepared with backup battery power and spares, both antennas and radios, to get on the air during a hurricane or other disaster. We deployed to the University hospital campus 36 hours before Katrina hit New Orleans, so we were able to make sure everything was operating correctly.
 - Without HF communications capability that week we spent on "hospital island" we would have been severely handicapped in our efforts to provide for the needs of hospital staff and patients. Although we had VHF and UHF FM capabilities we found ourselves using HF assets more because VHF/UHF frequencies did not give us reliable, timely communications with those we needed to reach. However, some UHF repeaters stood up to the challenge and were used by search and rescue, as well as others, but we were not effectively served by VHF and UHF circuits. HF SSB was our primary lifeline to the outside world.

Why Digital Radio?



- More Robust
 - Works better in noisy RF environments
 - Built in filtering or data redundancy improve communications
 - Much More efficient with less power and smaller antennas.
- Greater Connectivity
 - Some modes can be linked over the Internet to reach more potential users
- Communicate More Efficiently
 - Greater bandwidth capability for more information
 - Potential for sending documents, photos and other attachments.
 - Provides more accurate communications

Key Equipment



- Antenna's
 - 2 Meter/VHF (144.000 MHz – 146.000 MHz)
 - Short Range – 50 Miles/50% reliability
 - Smooth Earth philosophy
 - Used to communicate to local repeaters
- Cost - \$100 to \$500



- Con's. If repeater is down, max range is limited (Simplex)
- Pro's Better range than 70CM/440 Mhz UHF.

Key Equipment



- Antenna's
 - 70CM/440 Meter/UHF (430.000 MHz – 440.000 MHz)
 - Much Shorter Range than 2 meter
 - Typically 1/3 the range of 2 meter
 - Used to communicate to local repeaters
- Cost - \$100 to \$500 (Same Antenna can be used))

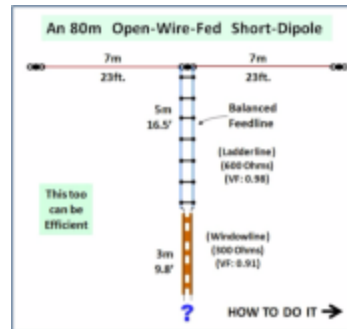


- Con's. If repeater is down, max range is limited (Simplex)

Digital Helpers – HF

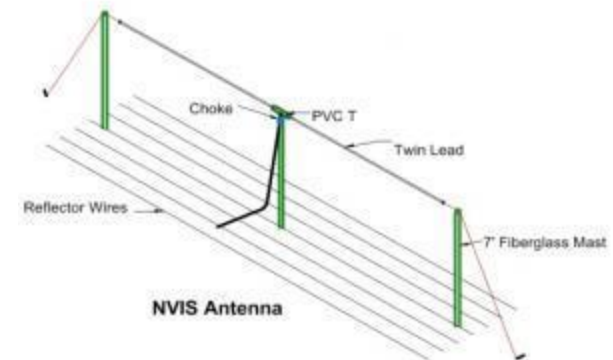
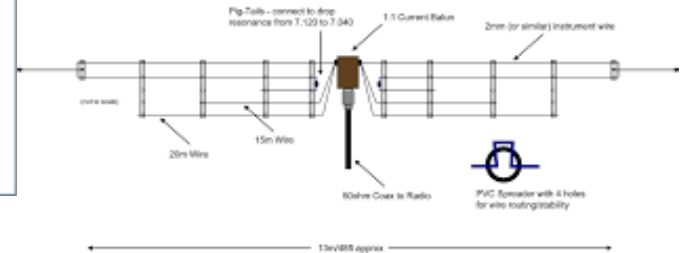


- The right Antenna – Recommendations
 - Dipole
 - Fan Dipole
- NVIS – Why its make the last mile and more.
 - High signal-to-noise ratio inherent to NVIS is ideal for [QRP](#) because there is less interference for weak transmissions to compete with. A QRP station can make efficient use of the few watts it has and sound a lot more powerful than it actually is. ARES uses NVIS for emcomm, because it is the **ONLY WAY** to blanket the entire state with a transmission, without there being any skipped over zones close to the transmitting station.



Multiband *Fan-Dipole*
aka: The Ramsay Dipole

Just under 1mm/2in and is used: 40m Linear-Loaded Elements - with CW/Date "signals"
Plus 20m and 15m Wires
* This is not an end-all solution on the 40m wire, 100W



Digital Helpers – HF Portability



- The right Antenna – HF Recommendations
 - Magnetic Loop
 - Gaining Popularity amongst Apartment Dwellers and HOA/Zoning concerns
 - Perfect for Quick Deployment or Permanent Placement
 - Great for Served Agencies who have assets they need to keep mobile
 - Short and Long Range **3.5-29.7 MHz**
 - NVIS – Why its make the last mile and more.
 - Long range and Short Range
 - Alpha Antenna - <https://www.alphaantenna.com/>
 - Chameleon Antenna - <http://chameleonantenna.com>



Radio



- HF or VHF Radio
 - Most radios will work
 - Computer control interface can be useful, but not necessary
 - Compact low power capable radios can be used for field work and can run more efficiently on emergency power supplies.



Computer



- Most digital amateur radio software have very modest computer hardware requirements
- Laptops are more useful in emergency operations.
 - Portable
 - Self contained power supply
 - Low power requirements for emergency power.
 - Be sure to look into battery efficient laptops for emergency use



Computer / Radio Interface



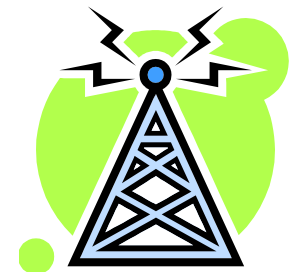
- Interface needs to be made between the computer sound card and radio for Olivia, PSK31, Winlink, (AGW Packet Engine or UZ7HO Soundmodem).
 - Sound card out to Radio mike input
 - Sound card input to Radio speaker / headphone output
 - Computer serial or usb port to Radio PTT
- Interfaces can be made or purchased
 - Vendors
 - **Signalink USB (Standardized ARES)** <http://www.tigertronics.com/slusbmain.htm>
 - **Others:**
 - Rigblaster - West Mountain Radio www.westmountainradio.com
 - MFJ www.mfjenterprises.com
 - Saratoga Amateur Radio Parts - www.saratogaham.com/ezpsk/



Digital Radio Tools



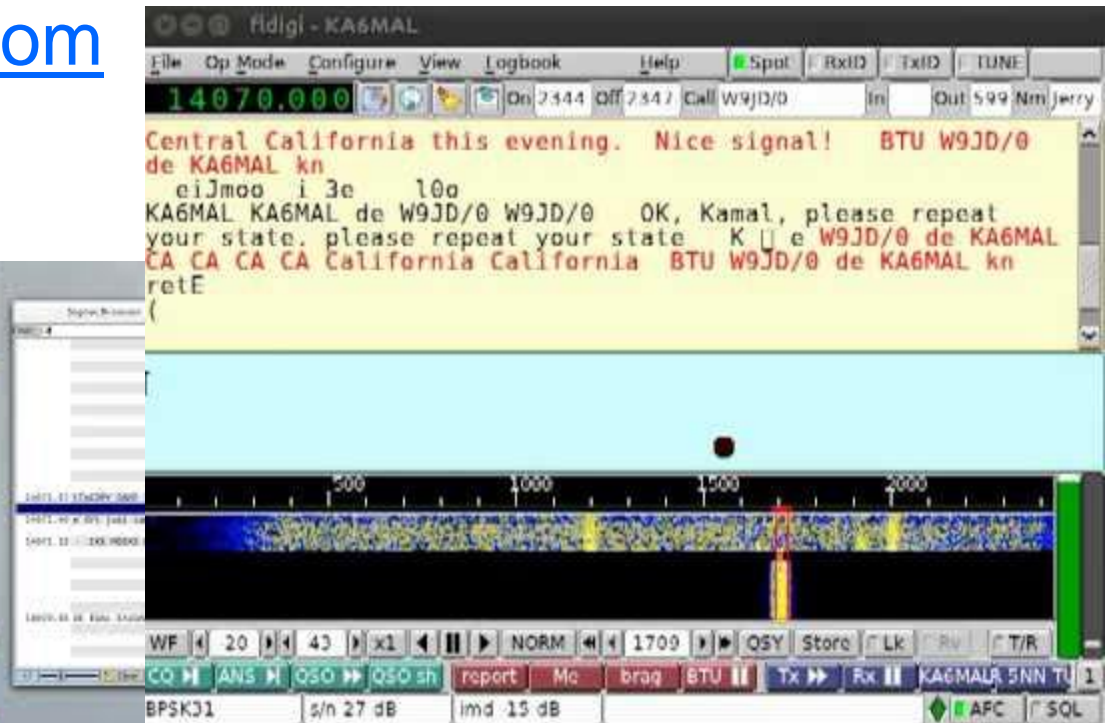
- HF NBEMS (Narrow Band Emergency Messaging Software – FLDigi, FLMsg, FIamp among others)
 - (Primary) Olivia – HF high redundancy Forward Error Correction mode. Primary Mode The mode works equally well on VHF and HF and has good sensitivity, and is best used for fixed schedules (MS NBEMS).
 - Others
 - MT- 63: Forward Error Correction system which contributes to its legendary robustness in the face of interference and fading. Great for NTS messaging on 2 meter when acoustic coupling is used due to lack of an interface.
 - MFSK62: is for sending photos on HF
 - Contestia : Forward Error Correction system The mode works well on poor HF paths and has good sensitivity.
- Winlink
 - HF
 - VHF/UHF
 - Internet



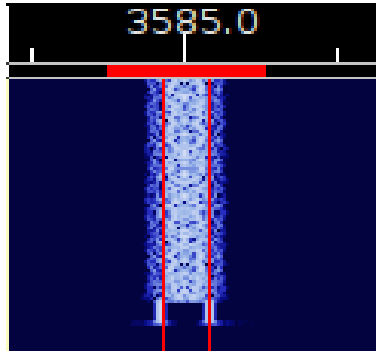
Software



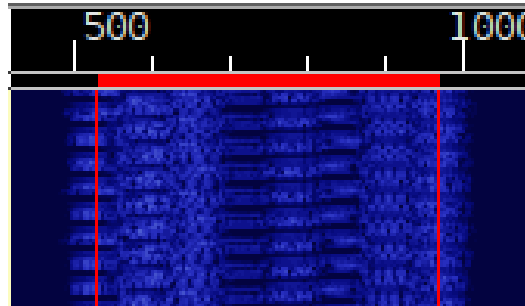
- Usually low cost or free – FLDIGI (Free)
 - www.w1hkj.com



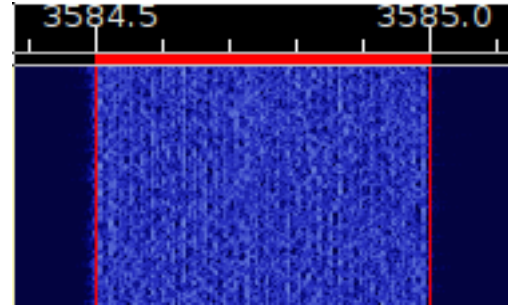
Bandwidth Utilization Sight's and Sounds



PSK31



Olivia 8/500



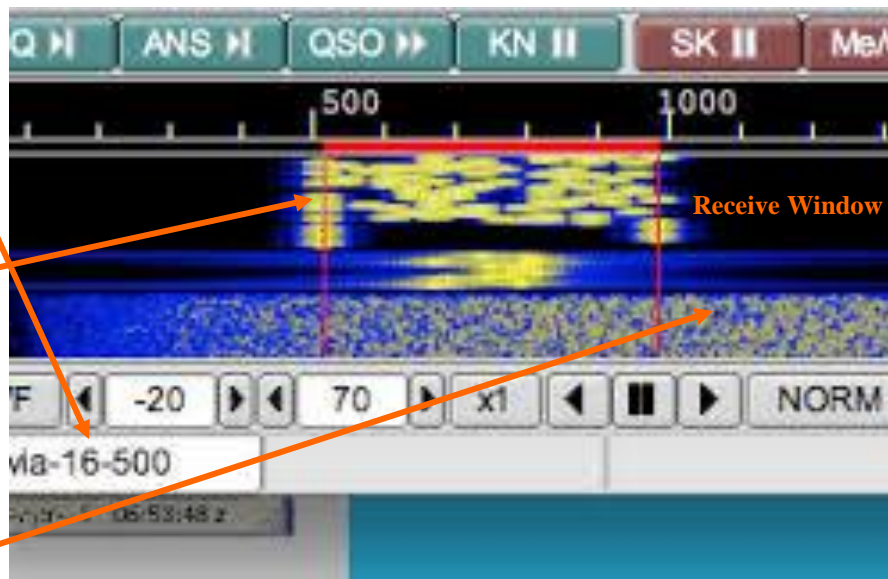
MT-63 1K

- PSK-31- Most popular, poorer reception and difficult tuning. However, very little power is usually required.
- Olivia 8/500 - high redundancy Forward Error Correction system. The mode works well on poor HF paths (ARES Preferred)
- MT-63 1K - Forward Error Correction system which contributes to its legendary robustness in the face of interference and fading. Great for NTS messaging. (ARES Preferred, Large file and information forwarding)

Tuning in a Olivia signal



- Turn on the equipment
- Run your digi software
- Select the waterfall display mode
- Use the mouse to place the cursor on a signal
- Adjust the squelch until text appears in receive window



FLDIGI at Work



FLDIGI Receiving and transmitting video
and Demo

Digital Modes



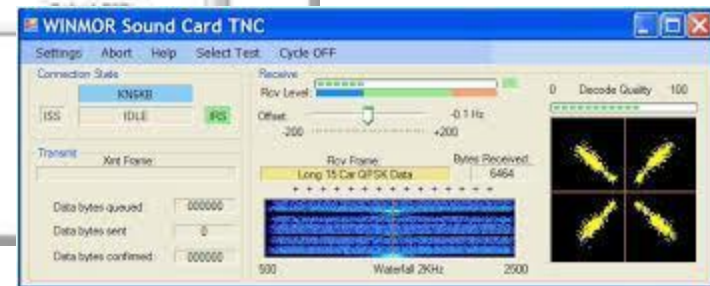
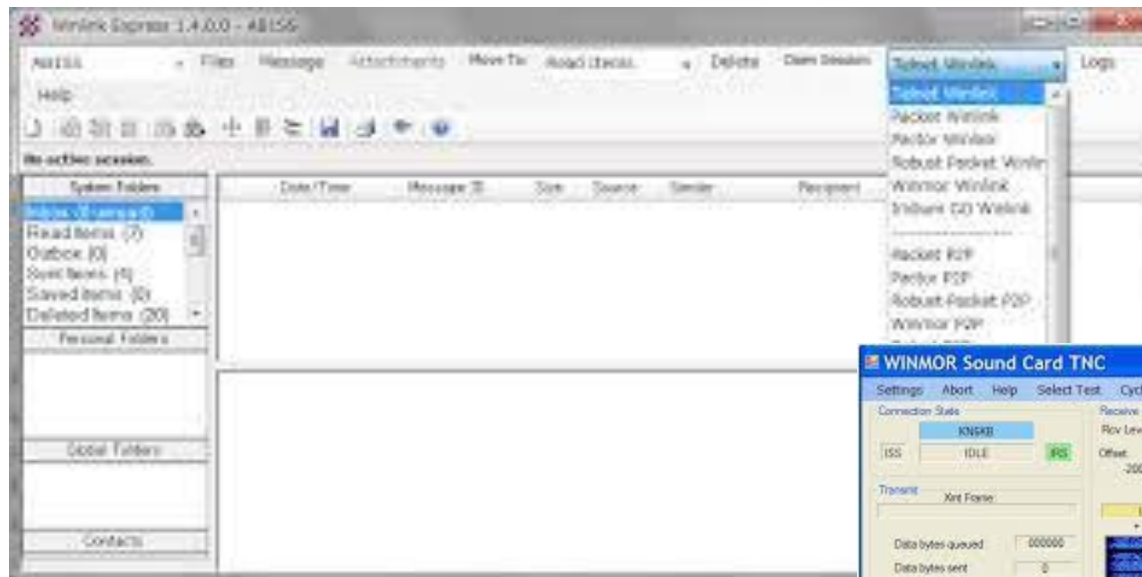
- Advantages
 - Very easy to deploy in an emergency
 - Modest equipment requirements
 - Laptop, Radio Interface, HF Transceiver, Antenna, and Power Supply
 - This can include a low power HF transceiver, portable power supply, and portable antenna.
 - Very Robust
 - Can provide long range communications using HF in noisy conditions.
 - Can provide keyboard contact over long distances as well as short bulletins.
 - Does not rely on other technologies to work.
 - Possibly the best (or only choice) during a widespread communications outage.
 - Large amounts of information can be relayed accurately.
 - Can be used locally and short range
- Disadvantages
 - Transfer of information slow (low bandwidth)
 - Can be affected by HF conditions (Propagation)

Recommended Software for Digital



- WinLink

- <ftp://autoupdate.winlink.org/>



Winlink



- Advantages to Served Agencies
 - Modest equipment requirements for VHF access – VHF radio, computer, interface, MS Outlook Express, AGW Packet Engine, and Paclink Post Office can be used
 - Based on SMTP E-mail
 - Most emergency agencies rely on email for information transfer
 - Can send attachments for photos and documents
 - Redundant network utilizing radio and internet connectivity
 - Was proven very effective for “Last Mile Communications” in the Hurricane Katrina aftermath
- Disadvantages
 - HF links can be costly because of the requirement for a proprietary Pactor 3 modem unless using soundcard modem.
 - Can be more complex to set up

Why Winlink



- Our traditional methods ***fail*** for complex message handling in today's agency environment!
 - Need for delivering written procedures, lists, graphics, images, and Pre-defined, formatted, documents to multiple recipients!
 - Multiple recipient ***e-mail*** with ***binary attachments*** is the de facto standard to carry written information.
 - Hand-written message forms are seldom used, and are *not transparent* to normal operations!
- 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..

RMS Winlink at Work



Run Winlink Video

Digital Traffic Options – BPQ32



- What is BPQ32? BPQ32 is a versatile suite of programs for radio networking. It allows a computer running under Microsoft Windows® to act as a Node in a NET/ROM compatible AX25 network, and to support a multiuser Mailbox, or other similar applications. Similar to a MESH Net.

The screenshot shows the BPQ32 Node GM8BPQ-2 web interface in a browser window. The browser address bar shows the URL 127.0.0.1/Node/NodeMenu.html. The page title is "BPQ32 Node GM8BPQ-2". Below the title are navigation links: Routes, Nodes, Ports, Links, Users, Stats, Terminal (Requires user and password), and APRS Pages. The main content area is divided into two panes. The left pane shows a list of nodes with "GM8BPQ" selected. Below the list are configuration options for the selected node, including checkboxes for PMS, Sysop, Expert, Excluded, Hold Messages, and Include SYSOP msgs in LM. A "Last Listed" field shows "869". Below these are statistics for connects, messages, and bytes. The right pane shows a terminal window with a text-based interface for the BPQ32 Node, displaying various status messages and commands.

Remote Client interface:
Winlink Express.
Allows routing of traffic via small medium or large multi – user groups.

BPQ32 Advantages



In states like Main, Arkansas, Oklahoma, Missouri these BPQ32 Nodes perform Critical functions:

- The BPQ 32 BBS is for ARES/Emcomm use and access is restricted to hams who are involved with emergency communications (ARES/RACES). Registration is required. (Between Hospitals, Agencies etc)
- The Winlink RMS is public and is open to all ham Winlink system users. It operates in accordance with the Winlink/Amateur Radio Safety Foundation RMS guidelines for 24/7 operation.
- ***BPQ32 can act as a Node in a NET/ROM compatible AX25 network, and/or to support a multiuser Mailbox for EMCOMM mailbox use via RMS Winlink Winmor.***

Digital - RMS Winlink & FLDIGI Where they shine



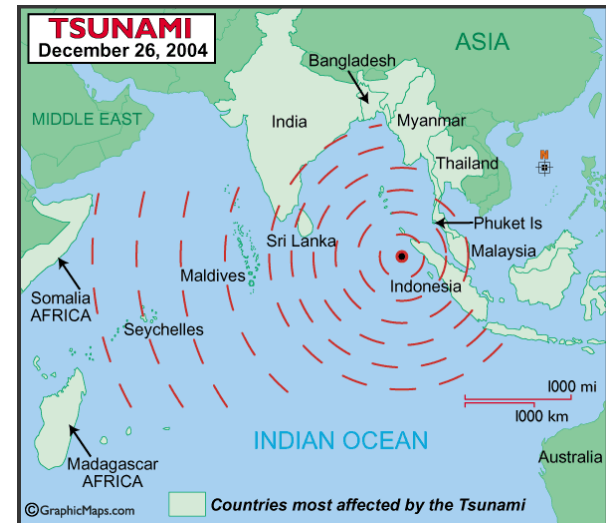
Local?



Regional?



Global?



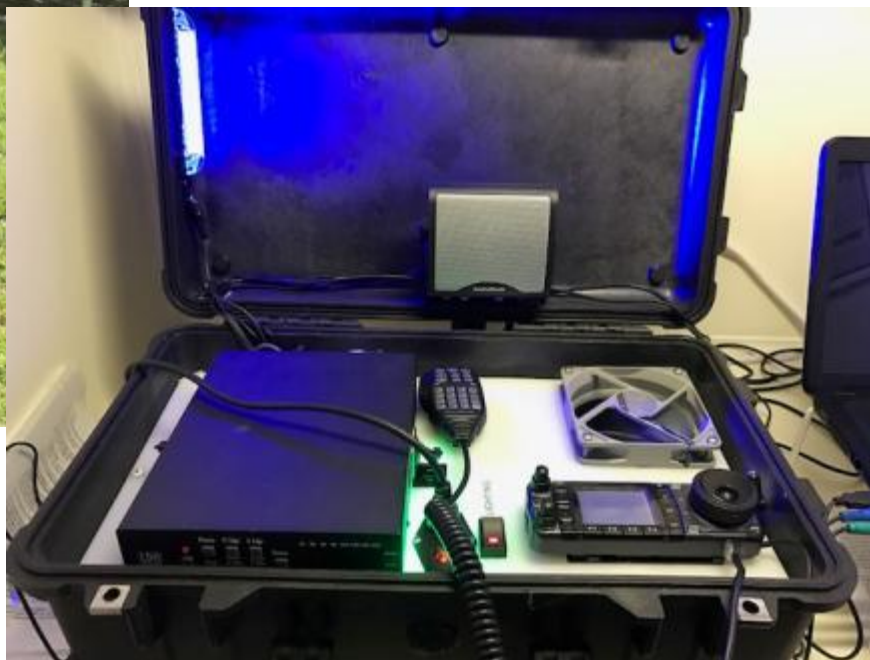
2016 SET – Digital Winlink/Fldigi



2017 SMART – Digital Winlink/Fldigi



“Saturday Morning Amateur
Radio Time” Strawberry Park,
Madison MS, April 1, 2017



“Digital Portability”

Digital Working Group Projects & Promotion



•Established/Working & Available (Current)

- **MISSISSIPPI ARRL/ARES NBEMS – Mondays at 7:30PM – 3594.4 Mhz, USB - Olivia 8-500**
- **BPQ32 System Bruce Rushton KB5ROZ. EC Columbia County Magnolia, AR Available through Winlink Winmor. 3595 Mhz USB (Instead of using KC5OAS- 10, to get to BPQ32 node you would use KC5OAS).**
- **BPQ32 System, Mississippi – AD5O-1- BPQ32 & AD5O-10 RMS Winlink Node, 3586 Mhz**

Locally: AG5CL, who lives in Brandon, is going to try to set up a BPQ BBS on HF by July 1st, and allow ARES, RACES, and SKYWARN leaders (and any interested ham) to set up mail boxes on it. He has already set up and has running a BPQ BBS on 2 meters (using a raspberry pi)

Devise a Plan!



- Ensure that there is ***no duplication of efforts*** in your “last mile” coverage area.
- Set up an strategy for implementation with your local ARRL ARES® or RACES organization. Set up a time-line for each task.
 - Coordinate efforts with the Winlink 2000 Development Team, EC’s, SECs, DEC’s/SM, etc.
 - Ask other ARES® communities for assistance.
 - **Set up personnel responsibilities with Time-lines!**
 - **Handle the finances.** “How much will it actually cost”? Who should pay?
 - **Involve and commit the end-user. They are the one’s to benefit!**
- Implement the plan in stages.
- Test it, and Test it again.
- Provide a presentation and demo for your served agencies.
- Continue to promote your capabilities.

Madison County ARES



The Amateur Radio Emergency Service® (ARES) of Madison County is brand new and growing and it consists of licensed amateurs who have voluntarily registered their qualifications and equipment, with their local & state ARES leadership, for communications duty in the public service when disaster strikes.

Look us up on Face Book. Madison County MS, ARES Group



Questions?

