Hurricane Shelter WIFI Ham Radio Information Prototype System

by Gordon Gibby KX4Z

How This Started—The Problem Statement

Local ARES/GARS hams who served as backup radio comms volunteers during Hurricane IRMA were invited to the EOC After-Action Review. I was surprised and intrigued when the head of the shelter services group pointed out their huge difficulty with simply getting information and announcements out to the thousands of people huddled in their hurriedly-deployed shelters --- over a dozen of them. Families were bedding down in classroom after classroom in schools and other buildings all over town, and over-worked shelter managers and helper just didn't have a very good way to disseminate information.

On Feb 1, 2018, the official Alachua County After Action Report and Improvement Plan was released (http://qsl.net/nf4rc/2018/AlachuaCountyHurricaneIrmaAfterActionReport.pdf) and included 3 improvement plan requirements related to this:

SHLT-007 Shelters were in a situational awareness sile, limiting the information know to the shelter staff and the shelterees.

SHLT-007.1 Develop a strategy to increase situational awareness to shelters

SHLT-007.2 Explore the possibility of equipping each shelter with a smartphone to increase situational awareness and more easily share information.

SHLT-007.3 Increase the amount of information shared with the amateur radio operators to ensure greater situational awareness at the shelters.

Conceptual Solution

Over half of the truly historic number of shelters opened by Alachua County during Hurricane IRMA were staffed with a ham radio volunteer. Thus information flow was possible even if power, cell, and internet were cut off. The EOC was staffed with a very capable crew of ham radio operators who interface well with EOC officials.

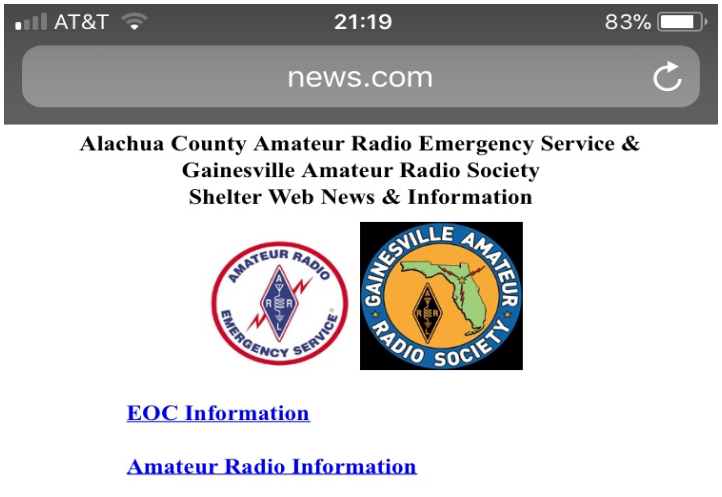
How to move information from the EOC / Ham radio volunteers to the hundreds of citizens in each shelter? In retrospect, the answer seems simple: almost every resident has a CELL PHONE and even in the loss of power and cell towers, these can connect to a WIFI router and access information – if we had a simple web server populated with important information for a storm shelter, and updated with weather information and press releases from the EOC.

An elegant solution to this soon emerged, with an inexpensive Raspberry Pi providing an Apache Web Server to any cheap consumer WIFI router. The Raspberry Pi is easy to set up so that it acts like an Internet Service Provider, dispensing all the dhcp ip numbers, nameservices and web server output required to feed information to any shelteree.

The consumer WIFI router is given a self-explanatory SSID similar to "SHELTER-SERVER." Selecting it with a smartphone or computer gives the occupant immediate access via "hamradioband.com," an actual DNS name which I purchased (to avoid any conflicts). All ARES groups are officially welcome to use this name (on private systems like this), as it isn't served on the "real" internet.

A very large area can be covered by using wifi extenders, or simply by plugging in additional WIFI routers (using different WIFI channels)! The Raspberry Pi is configured to handle dozens of wifi routers, and will dutifully issue each of them an IP number. The wifi routers then use network address translation to provide the well-known private 192.168.1.X numbers to their users.

This system was quickly put together using a free Apache web server, free DNS and DHCP server (`dnsmasq`) and free firewall and security solutions. It works great! (Pages of technical details can be accessed here: http://arrl-nfl.org/wp-content/uploads/2018/03/ShelterWebServerTechnicalDetails.pdf) The micro-SD can can easily be copied for other shelters, or for other groups to use (see later).



CONTENT

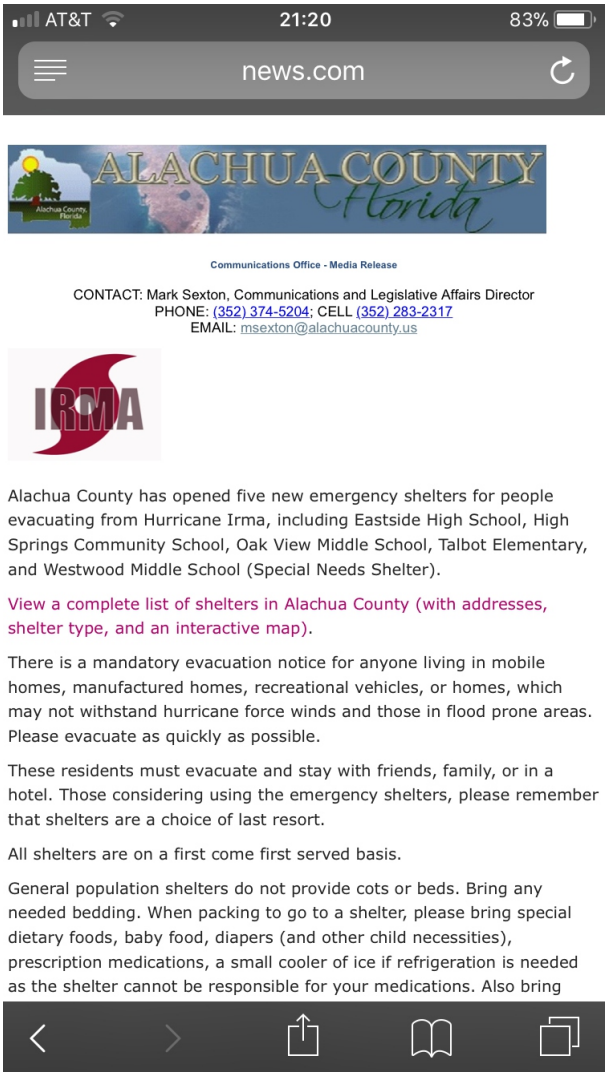
As originally envisioned, an opening screen allows the user to select official announcements and information from the EOC, or to access the "ham radio" pages.

Official announcements from the EOC can include weather updates, road information, fuel availability information, damage reports, information on how to apply for aid, debris pickup schedules, and other governmental information of importance to people sitting out a storm. Much of this can be "pre-loaded" into the Raspberry Pi's (and chips can be replicated so that all the servers have the same information).

We do not have this set up to attempt to pass the real internet along to the shelter residents (while it is still available). They would pick that up from their cell provider or from a capable school-based wifi system. Our little Raspberry doesn't have the horsepower to handle hundreds of bandwidth-hungry movie-watchers!

However, it should be able to auto-update its "official" content using cron-based ftp captures for as long as the Internet holds up. The EOC would need to make content available for capture for this purpose.

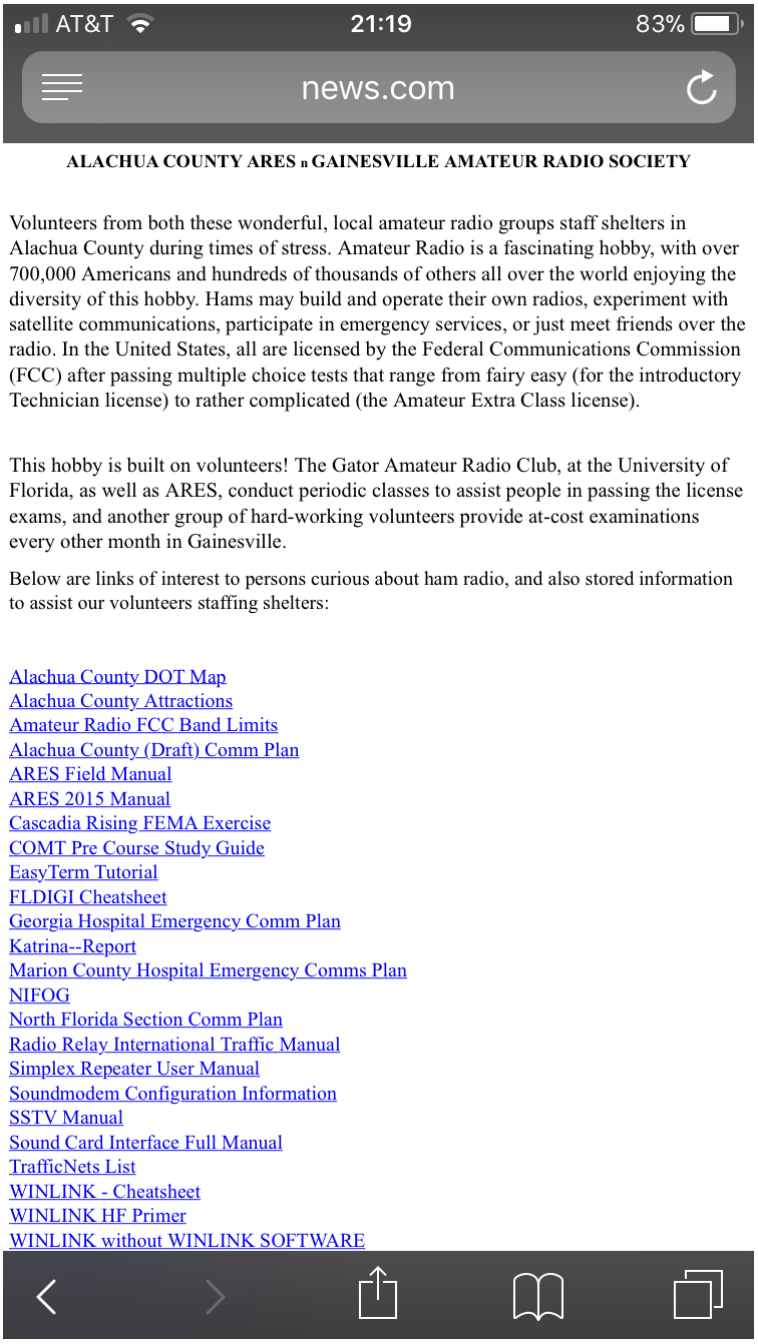
When the Internet is GONE is when the hams come into active play. Updating of the system with official bulletins is quite possible because our ham group has the ability to transmit computer files faultlessly by not one, but several methods! 1) WINLINK provides a way to send email to all the shelter volunteers including attachments, and is error-free. 2) Packet radio provides the error-free file transfer protocol YAPP that even accepts files in an unattended ham radio station if so configured. 3) The NBEMS FLDIGI-based system also includes error-corrected methods for file transfers. Once the update weather and other announcements are received from the EOC, it is easy to transfer them (over WIFI) to the little wifi server, using either a .bat batch file, or free point-and-click FTP client software such as Coffee Cup FTP (https://www.coffeecup.com/free-ftp/). The little Raspberry Pi has all the passwords and firewall and other security to make it a secure and reliable system.



SIMULATED CONTENT

<u>HAM RADIO CONTENT</u>

Shelter residents quickly become BORED. On the amateur radio page, store all the ARES, radiogram, procedures and instructions you wish, but also put some entertaining & educational information on ham radio, how to get into the hobby, and maybe even put in some tutorials to get people started toward getting their first license!! The little Raspberry Pi server probably can't handle streaming many videos, but you could easily have several simple educational slide shows etc. One of our members is exploring a way to download the entire Wikipedia and serve it!



How To Implement This In Your County

If you would like information on how to get a free working copy of the entire Raspberry-Pi software, contact the author at docvacuumtubes@gmail.com. I can copy onto your microSD card. Simply plug into any Raspberry Pi version 3, and then connect a wifi router. As you'd expect, there are no guarantees or warranties and the author cannot accept responsibility for any untoward events, and you will have to learn a bit about transferring files over ham radio, but this looks like a very useful solution that can help amateurs better serve their communities.