A Primer on Store/Forward (BBS) Radio Systems
Steve KB1TCE

Most of the communications methods used by hams are real-time one-to-many. For example, if you have a QSO with another ham using voice, cw or a keyboard-to-keyboard mode like PSK31, Olivia or Contestia, anyone who happens to be on frequency and on the correct mode at that particular time can listen in on the conversation.

ARQ (Automatic Repeat reQuest) modes such as the Winlink Development Group's Winmor sound card TNC offer a different way of having a QSO in that the two stations involved have to be "connected" to each other. This means that each packet of information that is sent is checked by the receiving software to be sure that there are no errors. If there are, the receiving station sends a request to repeat the failed packet. The process goes back and forth until a completed, perfectly correct message is transferred. This is strictly a 2 station process: depending on the mode, some other stations may be able to monitor the exchange but they can't participate.

Winmor P2P (peer to peer) messaging using the RMS Express client software is an example of this one to one kind of communication.

Store and forward, on the other hand, is like internet email. A sends a message to B. The message first gets saved on an email server. Whenever B wants to view his email, he connects to the server and retrieves the message. It's not dependent upon A and B being at their computers at the same time.

The Winlink email system is an example of radio store/forward. It's simply email where there are either one or two HF or VHF connections in the circuit. All messages ultimately have to go through the internet. The primary advantage is that if you happen to be without internet (on a boat, at a remote camp or where the internet is experiencing a local or regional outage), you can send email messages as long as the internet is working somewhere in the world.

This article will address store/forward "packet" systems that have no dependence on the internet. I'll start with the simple VHF/UHF "Personal Bulletin Board System" (PBBS) and then move on to the more complex HF/VHF multi-node networked "full service" bulletin board systems. This article is not a "how to" but will merely attempt to explain how these systems work and how they can be very advantageous to the prepared communicator.

The VHF Packet PBBS

This type of system is very simple and is useful in relatively small areas. The main components are a radio with a 1200 baud packet TNC that has an internal mailbox for message storage. A great TNC for a PBBS is the Kantronics KPC-3P (about $200 new) with expanded memory capacity ($20 for the IC from Digikey or Jameco). Each station that desires to connect with the PBBS will also need a radio and TNC plus a computer. The client TNC doesn't have to be one with an internal mailbox – a simple $100 KISS TNC-X will suffice or even a sound card TNC such as the one developed by UZ7HO.

Note that I didn't include a computer with the station having the PBBS. The KPC-3P is self-contained and doesn't need a computer to operate once it's been set up. It can be accessed remotely by radio or locally via a computer. For example, you can put the PBBS in a remote, high up location with a solar panel and battery. The system operator (sysop) can manage the PBBS (change settings, etc.) from the comfort of his QTH.

The diagram below shows a simple PBBS set up. Once the PBBS has been configured by the sysop, a station, say Client 1 (C1) can connect to the PBBS. Once connected, he can type a message directly or upload a prepared message. The message can be one of two types. The first is a personal message or p-mail. P-mail is addressed to one or more specific people (call signs). The second is a bulletin. A bulletin will go to everyone. Bulletins are organized by topical categories e.g. EVENTS, WALDO, etc.
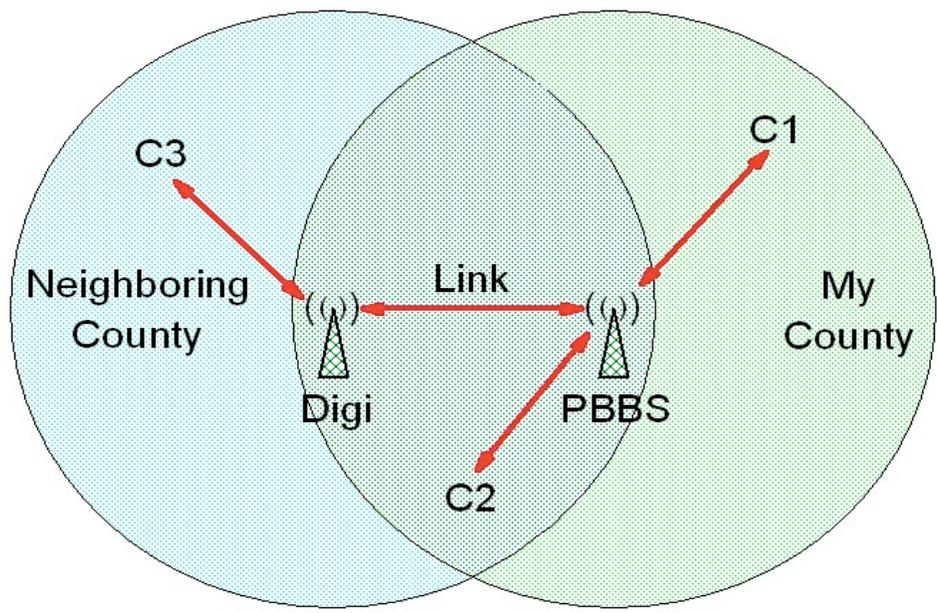
Let's say C1 addressed his message to C2. The message will be stored on the PBBS until C2 connects to the PBBS and downloads his message.

Looking at C3, she is out of the transmitting range of the PBBS - she can't directly connect to the mailbox. However, if a digipeater (often called a "digi") is installed at an intermediate location, C3 can connect to the digi and then connect to the PBBS. The connection process can be manually performed or programmed in client packet software such as Outpost (http://outpostpm.org). Digitpeaters are like voice repeaters except that they briefly save and then transmit packets on the same frequency. Most TNCs can be set up to perform as digipeaters.

Many areas have established digipeater networks. In Maine, the standard 2 meter packet frequency is 145.010 MHz.

One great thing about packet is that simultaneous connects can be handled by the digipeater and PBBS TNC. Simultaneous connects will slow things down but everyone gets served and you don't have to wait for an opening. The maximum number of connects can be programmed into the TNC. A common number is five.

PBBSes are simple to set up and relatively easy to maintain. An ordinary human with some computer skills can quickly get a PBBS or digipeater into operation. A great guide for setting up a portable PBBS and/or digipeater is at http://outpostpm.org/docs/Appnote-0901-KPC3P-BBS-in-a-Box.pdf.

The "Full Service" BBS

If you are serious about having a multi-mode BBS with HF and VHF and even internet linking, you need to use a PC-based full service BBS. These systems were developed before the internet was popular and some have continued the migration from DOS to Windows, Linux, Mac and one is usable with the tiny Raspberry Pi. The software goes by such names as JNOS, FBB and BPQ. I use BPQ as G8BPQ and a small team of programmers actively supports it. BPQ is available for Windows (BPQ32), Linux (LinBPQ) and the Raspberry Pi (PiLinBPQ).

Learning these systems is anything but trivial. The language used by sysops is sort of a blend of TCP/IP and traditional packet lingo. Set up instructions include explanations like:

"Only Level 2 calls are possible. It can't be used for NETROM Node<>Node links. Note that Calls to the VHF port use the normal BPQ connect format - C PORT CALL, You don't have to ATTACH."

For the rest of this I'll ignore these gritty details of programming and will get into the overall functionality of BPQ.

First off, BPQ will work with many modes. It will support HF and VHF packet using hardware and software packet modems, Winmor, Robust HF Packet, Pactor 1-4, V4, Clover, ALE400 and many more. BPQ will interface with the internet for access and linking. It can also be set up to work through a wired or wireless LAN that is divorced from the internet. This is great for a group that is in close geographical proximity.

Each type of connection is set up via a rather complex configuration file. This file manages the connections (ports), frequency and mode control for the radios, etc. For example, Port 1 might be 2 meter packet, Port 2 could be 6 meter packet. Port 5 might be the SignaLink connection for the Winmor virtual TNC, Port 6 might be the robust packet TNC, Port 7 could be for a Pactor TNC and Port 9 would be for local or remote telnet/internet connections.

Winlink (radio email) connections can also be supported for any one of the modes via an internet connection to the Winlink Central Message Server (CMS) network.

A good selection of modes consists of those that can be used with the Winlink client program RMS Express. With this software, all of the BBS users can use one program for sending and receiving messages. This makes using the BBS almost (but not quite) trivial as opposed to the more complex operation of a server. While RMS Express is made for Winlink email, it can be "adjusted" by using specific addressing and set up commands to work with a BBS. RMS Express works with packet, Winmor, robust packet and all flavors of Pactor. It would also be your program for Winlink email and P2P QSOs.

For message routing, full service BBSes use hierarchical addressing (HA). This simply means that any user has an address that identifies him by call sign and location (state/country/continent). This is key to being able to forward messages through a network of BBS servers. Also, each user is assigned a "home BBS" as part of the HA. This is the server that the client can most reliably connect to (with HF, it might not necessarily be the closest). A client can connect with non-home servers but may not get some services. For example, he won't get his p-mail.

The figure below shows the architecture of a 2-node HF BBS. S1 and S2 are the two server stations

(aka nodes). They operate on the HF bands and have nominal coverage areas shown by the colored circles. Needless to say, the servers need to be able to communicate with each other reliably on some sort of regular basis.
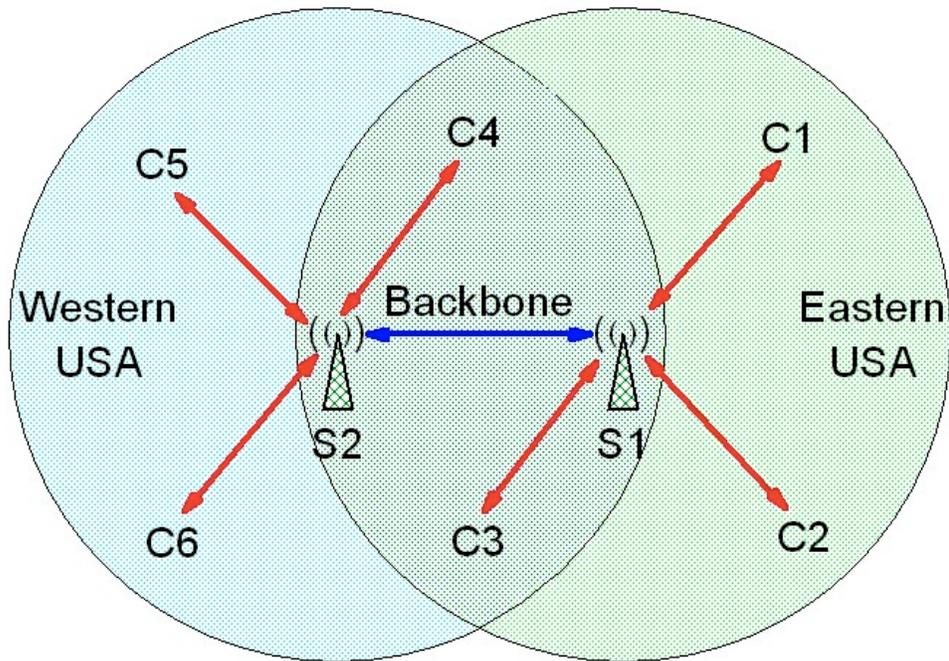
Each of the clients C1-C6 has their information entered into each of the servers. This includes name, call, location and home BBS.

Let's say that C1 wants to send a message to C5. All that C1 has to do is compose a message to C5's call sign. The message gets transferred to S1. The Mail Server part of BPQ knows that C5 has S2 as his home server so the message gets put into a forwarding queue.

Periodically (this is HF in the USA so it's a manual process), S1 connects to S2 or vice versa. When that happens, all of the messages in the forwarding queues get transferred. Now the message for C5 is on server S2. The next time that C5 connects to S2, he'll get the message. This process is call forwarding.

The set of forwarding links between servers is commonly called the network backbone. In a mult-inode network it has to have a decent transfer rate because of the volume of traffic. A client who sends or receives a few messages a day can get along quite well with slower modes such as Winmor. The backbone can also use Winmor but is better served with faster, more reliable modes such as Pactor 3 (or 4 when/if it becomes legal in the USA).

Another complication is the fact the HF connections are one at a time. If S1 is busy on the 20 meters, a person trying to get in on 80 meters will be out of luck until the BBS is ready to take another connection. This is where VHF packet has an advantage. A BPQ BBS with HF and packet can take multiple packet connections at the same time as an HF connection is in progress (assuming that separate VHF and HF radios are being used).

BBS networks can be very reliable but, unlike email, one cannot expect near instantaneous transmissions of messages. The sysops have to be on top of the message forwarding queue and also check on messages that might be misaddressed due (generally) to typos or a syntax error. One of the failings of HF BBS networks is the failure of a sysop to be attentive to his or her piece of the system.

Another problem is the user that doesn't access the system regularly. This will result in dozens of messages getting stacked up. When that user does connect, he can tie up the server for an hour or more. This is just not being polite. The sysops' defense is to set up "housekeeping" rules. An example is the automatic purging of messages that have aged more than a set number of days.

Summary

Store/forward bulletin board systems are a very useful component of an emergency communications system. They work 24/7 and aren't dependent upon coordinated schedules. HF BBS systems typically scan multiple bands. This helps to ensure that a user can make a connection almost any time of day.

A lot of people get the idea that they can be a BBS sysop and this has caused the downfall of many BBS networks. While a PBBS is not too difficult to set up, it still requires time and resources to keep one going. The PC-based full service BBS is in another category. The set up is difficult enough. Maintaining one takes constant attention and a missing sysop can create a shipwreck if he's not attentive. Daily if not hourly duties include making sure that the system is operating properly, keeping records up to date, performing regular forwarding, helping users get set up and fixing their occasional addressing goofs. Finally they have to explain to errant users why they are being suspended or booted from the system.

Then there are the financial considerations. The dedicated radio and antenna are just the first steps. Add a dedicated computer that is kept off of the internet, the willingness to upgrade the small stack of TNCs (a SignaLink is one thing, you'll also need a $300 robust packet modem and a $1400 Pactor modem), back up power and spares for just about everything.

Participating in a BBS is something else. Radio, copy of RMS Express from http://winlink.org, SignaLink and a computer and you are good to go once you read the BBS instructions and do some set up. That's the place to start. Get on the network and participate.