Formation of local standards in North Jersey Packet group

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The successful introduction of digital packet communications to amateur radio depends not only upon the technical standards of the hardware and software of the packet interface, but also upon the resources and needs of the local amateur community. The planning of a local packet network requires examination of factors such as the available engineering talent, financial resources of both individuals and the packet group as a whole, and pre-existing user equipment.

The introduction of new modes of communication to amateur radio is not without its history of birth-pains and trauma. The most common difficulty is redundancy with pre-existing modes. Single side band was in direct competition with AM for HF activity. Similarly, FM operation was at first rejected by those using AM on thr VHF bands. Today, NBVM lacks broad support because *it* has only marginal advantage over the existing, successful ... . Highly specialized modes such as ATV have no counterpart, and are assured continuity despite their cost of entry. Amateur rate1 1 ite activity, EME, meteor scatter, aurora1 propagation, and microwave operations are currently pursued by most amateurs on the basis of the challenge they pose rather than their value as a means of communication. Extrapolating this comparison, packet radio communication augments, but is nonetheless in direct competition with RTTY as well as with the phone and CW traffic networks. In this approach to the formation of a local packet network, we will take advantage of the user support of these modes rather than attempt to compete with them directly.

Packet radio could probably survive at its present level of activity without participation of non-technical users. If this is to be the case, it is unlikely that we will see the introduction of high-quality commercial packet radio transceivers. On the other hand, by making it possible for the largest number of users to get started in digital communications, it would be possible to support the cost of sophisticated host equipment in much the same way as FM repeaters are currently supported by their members.

The development of local packet network standards presented here is founded upon the needs of the non-technical user rather than those of the avid experimenter. This network is designed from the bottom-up (end user) rather than from the top-down (state-of-the-art technology).

We will start this design cycle by examining the minimum equipment necessary for digital radio communications. These are: a modem, a CRT or printing terminal (preferably ASCII), and a radio transceiver. According to the recent ARRL-sponsored survey (4), approximately 11 percent of radio amateurs are currently active in personal computing, and 4 percent are active in RTTY. Those with personal computers either have or can easily emulate a terminal. The RTTY users already have terminals, but require special consideration because of their use of Baudot rather than ASCII encoding. Note that I have deliberately left out the requirement for a protocol controller because some of the features of packet communications (storage and forwarding of messages) can be implemented on the host system on a single-user-at-a--time basis.

In an attempt to include non-technical users as well as experimenters in local packet radio activity, we have chosen a multi-layered approach to the network. The entry level to packet radio must be as simple and inexpensive as possible, and should use pre-existing equipment. The lowest level must use the host machine as the protocol controller. we call this entry level the "DUMBNET" because it is friendly to users having a "dumb terminal" and a 300 baud modem capable of half-duplex operation. DUMBNET will utilize asynchronous transmission format with no error checking, and will be similar to the now popular computer bulletin board (CBB). Several ports will be available into DUMBNET; these are: dial-up and one or more VHF or UHF FM repeater channels. In addition, by interfacing one of the host's radio frequency ports to accept Baudot code and 170 Hz shift, those amateurs with existing RTTY equipment could access the net.

With the host acting as controller, traffic originating from these ports could be passed to other DUMBNET users, or to the more sophisticated true packet network users who operate off the same host, but on different frequencies. Message traffic on the net could be conveyed down to all DUMBNET users by means of a periodic role call. This role call, running perhaps once every 5 minutes, would list the amateur call signs of all stations having pending messages. Retrieval of messages from the host would be activated merely by sending one's call letters. In this way, those amateurs with dumb terminals will have an efficient way of visually "filtering" the

presence of messages bearing their station as the destination.

The next level up on the network, still using the same host as DUMBNET, is "SLOWNET". Using true packet protocols, ALOHA fashion, SLOWNET will interface more sophisticated users at minimal cost. SLOWNET will appeal primarily to those amateurs who have personal computers and can write or obtain software necessary to implement a simple protocol. Minimum equipment must also include, as in DUMBNET, a 300 baud modem capable of half-duplex operation. In addition, the user must provide a computer interface for controlling the transmit/receive function of his radio equipment. This does not represent major surgery to most personal computers or to the radio equipment. The modem transmit tones and T/R switching functions can be connected to the FM transceiver via the microphone cable, and the received tones can be obtained from an auxiliary speaker (or headphone) jack; in most cases, there will be no "cosmetic" changes to the user's transceiver. The packets will be in asynchronous ASCII format with an appended error-detection code.

Functionally, SLOWNET will not provide rapid communication for even a small number of simultaneous users. It will however provide excellent service for unattended message handling. The ability to send and receive personal messages and club bulletins will be the most attractive feature of this level of operation.

Still using the common host computer, but operating at much higher speeds, will be FASTNET. This portion of the network has not been worked out in detail, but will probably conform more closely with standards developed elsewhere (1,2,3). FASTNET will use synchronous ASCII format with error-detection codes. Because of its speed, 1200 baud or higher, FASTNET will be a challenge to amateur technology and ingenuity insofar as design of the radio interface and modem. It is likely that existing commercial high-level protocol controller boards will be used for the digital portion of the user interface. It is hoped that FASTNET users will be able to dedicate their equipment full-time to the net. If this is possible, then perhaps each user could eventually serve as a node in the net (all this transparent to the user).

The design goal of FASTNET is to provide rapid switching of a large volume of traffic over a limited coverage area. At this level, "packet-ragchewing" could be a reality.

Highest on the network scale is the interface for packet messages entering and leaving the area of local coverage. On this level, compatibility with other packet systems will be essential. This interface (OUTNET?) may connect to amateur satellite transponders, HF (low-speed) packet nets, or to similar host machines on VHF through microwave, thus extending coverage to other areas. The choice of protocols, baud rate, frequencies, and modulation schemes will depend upon the de-facto standards that will arise from today's experimentation.

In conclusion, this multi-layered approach was chosen not only because it reaches the greatest number of users, but also because it contains a chronological sequence for painlessly bootstrapping up an operational packet network. The multi-port host described here does not yet exist. On-the-air tests will be necessary to find out if a small (8-bit) microcomputer will be adequate for real-time response to all inputs, or if a larger computer or a distributed processing system will eventually be necessary. Since the host computer will define the character of the local packet radio network, the greatest development efforts will be placed here.

I do not present this approach for use as a "standard" for local networking, but rather as an encouragement to individual approaches that best suit the local user community. Of course, standards will be necessary for packet communication outside the local region, but to prematurely set standards for thre individual user may discourage experimentation and is contrary to the amateur spirit.

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