Packet Radio Development - 1985

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Abstract

A review of packet growth since the Third ARRL Networking Conference is followed by a discussion of anticipated expansion of packet activity during the next year.

A framework for orderly *growth is presen*ted, based on the above observations.

1984

Orwellian associations not withstanding, 1984 was a year which saw tremendous growth in Amateur packet radio in the United States as well as the rest of the world. This growth included technical advancement in addition to a vastly swelled user base.

On March 1st, UoSAT/OSCAR-11 blasted into orbit, carrying a PACSAT-like prototype Digital Communications Experiment (DCE). The DCE was publicly demonstrated at the Pacific Telecommunications Conference in Hawaii in January, 1985, via a store-and-forward technique. Communications were supported between England, California and Hawaii during this operational test.

In mid-summer, the 23rd Olympiad was hosted in *Los* Angeles. The Football games were held in Stanford, near San Francisco, and Amateur packet radio was used to carry hundreds of messages related to the Stanford events.

HF packet has been used on 40, 30 and 20 meters to provide a primitive linking capability between Arizona, Massachusetts Washington, D.C., and other areas.

Meteor scatter techniques were tested on 6-meters, resulting in reliable, if slow, data transfer between Iowa and Washington, D.C.

The WORLI bulletin board/message forwarding system has gained widespread acceptance in the packet community, furthering the "networks without networking" experimentation.

The sheer number of packet radio participants has increased between four-and ten-fold, depending on whose figures you believe. TAPR alone placed in excess of 100 TNCs per month during calendar 2984, and the rate has not slackened as of this writing.

The ARRL Ad Hoc Digital *Committee,* working with in&rested packet groups, has been sponsoring a lively debate and results-oriented "contest" between the two major viewpoints for Networking -- Virtual Circuits and Datagrams, the former represented by the AX.25 Level Three approach *and* the latter by TCP/IP.

Early 1985

1985 has opened with a "bang" for packet radio. The two fronts of packet expansion, technical advancement and marketing, have been addressed, and rather dramatically.

Stave Goode, K9NG, of the Chicago Area Packet Radio Association, has developed a 9600 bps modem capable of working within a 20- to 40-kHz bandwidth using straightforward direct FSK techniques. Steve's work opens the door for widespread use of 9600 bps (and faster) packet data channels through the virtues of simplicity and economy. In conjunction with this effort, TAPR is dedicating significant resources to the development of an integrated modem/rf deck for 9600 bps packet operation on the 220-MHz Amateur band.

On the marketing front, a major manuafacturer of Amateur radio equipment, Heathkit, has entered the packet fray. Unveiled at the Miami Tropical Hamboree, *and* later at the TAPR Annual Meeting, both in February, 1985, Heath has produced a "TAPR-clone" TNC kit to sell for under $300.

Heath has indicated that a major share of their current revenues are generated by their computer product line, and packet is a logical way to link the computer and amateur radio markets. While this may seem obvious to most packeteers, Heath is the first manufacturer with a significant presence in both markets (and perhaps the only manufacturer in that category!) to commit resources *to the* packet marketplace.

There are indications that other manufacturers may be entering the Amateur packet radio arena; at the least, it seems reasonable to expect innovative, alternative packet hardware and software to become available during 1985.

What Does AU This Mean?

Packet information available to TAPR suggests that there is starting a considerable influx of newcomers to Amateur packet radio. Many of these people are non-technically oriented. Their interests range from traffic handling, through emergency communications, to simple curiosity.

As equipment becomes available that is easy to integrate in the average ham shack, and documentation is written to make packet operation easy to understand, the influx of less technical members of the Amateur community to packet radio will likely increase. In many areas of the country, local packet activity has seemed to reach a critical mass, with newcomers appearing on a weekly, sometimes daily, basis.

These people want to operate packet, not develop it. They aren't interested in a network that doesn't exist, or potential that is untapped. An organizational structure not unlike the present VHF and UHF repeater system may emerge, however, with a user community willing to assist in funding a communications system from which they will derive direct benefit.

We are reaching *a* point in time that will require packet radio to deliver on its promises.

Thus, we *forsee a* significant impact on Amateur packet activities from the operational standpoint.

On the technical front, we find that many areas, particularly those areas that make extensive use of the digipeating facilities offered by the AX.25 Level 2 protocol, are experiencing saturation. This results in long delays, multiple retrys and other assorted negative factors.

While 1200 bps is *a* significant advance over other widely used Amateur digital signalling rates, it is unreasonable to expect this sort of bandwidth to accomodate a large population, especially if confined to one or a few channels.

Further, as initial Network Level protocols are implemented and more packet stations *are* able to access the facilities offered on these networks, congestion is bound to increase.

Thus, we see a significant impact on Amateur packet operation from a technical standpoint.

A Plan For Growth

We are familiar with much of the potential of *packet.* When multiple, medium- to high-speed links blanket the continent, we will be able to dump megabytes' worth of data with ease and confidence. Real-time video, inter-computer communications -- the sky's the limit.

But this is only potential. If we invoke this vision too often to the uninitiated, they will begin to believe we are speaking of the present, not some (hopefully not distant) future scenario. Disallusionment can only feed the fires of the scoffers and detractors.

The problem at hand is how to build to this kind of a system in manageable steps, each step taking us closer to our eventual goals, yet with the efforts having long-term usefulness as well as near-term effectiveness. And of course, the bill to develop and produce these evolutionary goals must be small enough to be absorbed by the packet community existent at the time the step is taken.

We do not presently have the manpower, technical experience nor money to put up a blanket-the-nation high-speed network. We don't even have protocols tested in the Amateur environment upon which to build such a system. A suggested course of action is:

1) Make a decision on Network Level protocol. Work together to implement this protocol, prefereably on standardized hardware that is both capable of supporting Network and Transport decisions and doing so on multiple channels running at 9.6 kbps to 56 kbps.

2) Design rf decks that are easily built and adjusted, low in cost, and capable of operating with existing packet radio controller equipment at 9.6 kbps.

3) Get multiple channels coordinated and operational between metropolitan areas that have packet communities to support them, Such channels should operate at a data rate of at least 9.6 kbps. Future operation at 56 kbps should be planned. Eventual operation at 256 kbps to 2 Mbps should be anticipated.

4) Establish HF gateways in major area8 of packet operation. 300 bps/200 Hz shift has become standard on 40/30/20 meters in the US. Petitioning of regulatory bodies to allow operation at 1200 bps should be done at the earliest practical date, and waivers to allow technican-class licensees digital traffic to be "linked" on HF frequencies should be requested.

5) As regional networking occurs, *a* simultaneous national effort should be undertaken to develop and fund sites that do not have the packet population to support a local network node, but which lie on a route that will benefit a majority of packeteers by providing a backbone service.

For example, there is a sufficient level of activity in Dallas, Little Rock, Oklahoma City and St. Louis to support network nodes, but insufficient activity between these regions to support linking them together. Yet, if they were linked, a major segment of a transcontinental backbone would be in place. Thus, it is to the long-term benefit of packeteers in, say, Florida (for example) to see this link established. A mechanism to fund such development should be examined. TAPR is currently looking at some schemes to accomplish this.

The point here is that parochialism must be set aside for the long-term benefits of all concerned.

6) As technical development continues, the slower-speed systems (9.6 kbps to 56 kbps) used for linking can be replaced by higher-speed nodes, with the retired equipment pressed into feeder service in the larger metropolitan nodes. This suggest3 that a form of contribution to the national effort may be as equipment "loans" for temgorsary service in remote areas.

Assuming such a scenario or one broadly similar, becomes fact: the near-term technical goals that appear achievable are:

1) Development of an integrated 9.6 kbps, low-cost 220 MHz radio/modem. Such a system is currently under active development by TAPR, in coordination with regional groups across the US. Expect something to be in the testing stage *during* the summer of 1985, with general availability as soon as testing is *'completed" (is any technical project really completed?).

2) Development of a multi-ported Network Node Controller capable of establishing Levels Two, Three and some subset of Four. A minimum capability of two ports (for a remote Location that is simply part of a backbone> and a possible expansion to as many as eight ports may be a reasonable goal.

Mike Brock, WB6HHV, has done extensive research and development of a multiple Z80-based system capable of reaching these goals. This project has been put on temporary hold pending the outcome of a decision for a Networking Protocol.

With the many new microprocessors now becoming available, and for which extensive development tools exist, this design will be undoubtedly be revised in the coming months. Again, TAPR has identified such a controller as 8 high-priority project, to be worked on in parallel with rf and modem advances.

On the non-technical front, newcomers to the packet field must be encouraged and instructed in the proper operation of Amateur packet radio. Operating procedures must be tailored to the environment as it exists today.

For example, it is a waste of channel resources to have all stations turn on their CW ID function on VHF. Beacons every few minutes telling the world you will be out of town for the next two weeks similarly have no place. Dumping 100k bytes of files during prime operating *hours* on an otherwise busy channel is similarly hard to justify.

While such abuses of common operating courtesy may seem absurd, these and other practices like them occur all too frequently on our existing, embryonic networks.

We must all work together to educate newcomers and encourage the use of proper packet operating procedure.

Conclusion

1984 was a year of tremendous growth in Amateur packet radio. 1985 has started off with even more promise of growth, injecting into our ranks a large number of non-technically oriented Amateurs.

Network protocols must be agreed upon and implemented. Hardware to support wider bandwidths, especially in the areas of rf decks and modems, must be designed and made easily available.

A coherent plan to establish regional and an eventual first national network must be determined and implemented.

Parochial interests must be moderated with recognition of the needs of the packet community as a whole.

Growth must be planned for, newcomers educated and proper packet procedures encouraged for the maximum benefit of all packetesrs while we develop the technical resources to handle our exploding operational requirements.