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PACKET
STATUS
REGISTER

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TUCSON AMATEUR PACKET RADIO CORPORATION

PRESIDENT'S CORNER

de WA7GXD

Tucson Amateur Packet Radio is turning a corner.

Three years ago there was only one source of Amateur packet equipment, and it was oriented for the dedicated experimenters in our ranks. TAPR's Beta test of 1983 proved that packet had appeal to the mainstream of Amateur radio operators. The demand for Beta boards led to the TNC 1 kit later that same year.

Within a few months, AEA and later Heath began marketing clones of the TNC 1. GLB began selling their innovative PK-1 TNC. Soon, Kantronics, Packeterm and others were partcipating in the Amateur market. Recognizing the need for a low-cost, highly functional TNC, TAPR introduced the TNC 2 in mid-1985.

And then we changed our course. Turned the corner I mentioned above.

Until this year, most of TAPR's income was through sales of TNC kits. Membership dues played a very minor role in financing the services and development efforts that many of you have come to expect from us.

Now, we are undertaking two large and difficult tasks. The Network Node Controller, or NNC, project is completing digital hardware development and is heading out to the software coders. And a higher-speed modem/rf deck project is being actively pursued. Time, energy and money will be absorbed by these projects in increasing amounts as the year wears on.

But our main source of revenue, TNC sales, is curtailed.

We are attacking the financial constraints in two ways.

The first, is by more carefully using the money we have. Several cost-cutting measures have been put in place.

The office is now open only four days a week, Tuesday through Friday. This saves us a few thousand dollars on an annual basis.

Continued on next page.

TAPR GOALS - 1986

What's a TAPR? What does TAPR do? Why does TAPR exist? Why should I join?

At its February Board meeting, the following three goals were set for Tucson Amateur Packet Radio.

1) Tucson Amateur Packet Radio will take an active role in participating in the FCC rule making process on issues relating to Amateur packet radio. Further, TAPR will coordinate such activities with other Amateur organizations.

2) Tucson Amateur Packet Radio will seek better and faster ways of providing information to the Amateur packet community.

3) Tucson Amateur Packet Radio will encourage and support hardware and software projects to advance the state of the art in Amateur packet communications.

How are we doing in these areas of activity?

The Board established a committee for regulatory matters, and that committee responded very rapidly to a very urgent matter.

The FCC Report and Order on Docket 85-105 would have enforced a very strict, and we believe somewhat oudated, definition of third party traffic. The intent of the Docket was to support packet operation, legitimizing many operating practices by allowing automatic unattended digital operation above 50 MHz. The third party clause, however, would have been very detrimental to Amateur packet radio development.

TAPR filed a fairly lengthy Petition for Reconsideration, along with other concerned Amateurs and Amateur organizations.

Happily, the FCC has responded to these Petitions, as well as a Petition for Extraordinary Relief filed by the ARRL, and we are now allowed to operate digipeaters and PBBSes with third party traffic while the FCC digests the comments of the petitioners.

See elsewhere in this PSRQ for the text of TAPR's filing and the FCC's amended rules.

Continued on page 4.

President's Corner Continued

We are reducing the number of people we send to conventions. For example, this year TAPR is only sending three "official" representitives to Dayton, although we will have a booth there.

We are applying for a second-class postage permit to reduce the cost of mailing your PSR Quarterly, while still providing nearly first-class handling and service by the Postal Service. Foreign subscriptions will continue to be sent Air Mail, however.

(Speaking of PSRQ, this issue is being printed and mailed by the gang at Colorado Springs, headed up by Andy Freeborn, NOCCZ. This helps relieve some of the pressure in Tucson, and I certainly want to thank Andy for the assistance!)

In the past, projects were "hatched" by an impromptu arrangement, without budgeting of any type. Now, the Board has established a Projects Committee. This allows anyone to submit a project proposal to TAPR for review. It also establishes controls, and involves the Board directly in the approval cycle.

Elsewhere in the PSR you will find an article providing guidelines for submitting a project proposal to TAPR.

And, if you read the minutes, you will note that the Board is inviting non-Board members of TAPR to participate in Project definition, approval and execution.

One very positive aspect of all this is the chance for greater and more meaningful participation in the advances in packet radio by the general membership of TAPR. In other words, you!

The other side of the financial health of the organization relates to income. It is fine to control expenses, but only if you have something to spend!

The first and perhaps largest step taken was in the restructuring of the OEM licensing agreement for TNC 2.

You may recall that TNC 1 licenses cost only $500 on a one-time basis.

The TNC 2 license costs $5,000 plus royalties stretching over two years. Thus, while we are not actively in the TNC marketplace, our income is still closely tied to the marketplace.

If you or a friend is on the fence about which TNC to buy, you might consider that every TNC 2 licensed product sold provides a small amount to TAPR for continued development of networking and other resources that will help transform packet from a mode of high potential to a mode of great achievement.

Finally, I ask that you look at your address label. If your membership is about to expire, please renew quickly. We have never had a dues increase since our inception in 1981. Packet radio wouldn't be where it is today without your support. And please encourage others to join and help support the Packet Revolution!

ELIMINATING POOP FROM PACKET

Peter Eaton, WB9FLW, and Lyle Johnson, WA7GXD

(Note: this material is being printed in PSRQ by popular demand. It may be considered offensive by some, to whom we apologize in advance. The message it contains, however, is very timely. Ed.)

Overview

A lot of POOP has been discovered on packet frequencies across the nation and around the world! Indeed, in addition to its health and welfare implications, POOP is both unnecessary and oftentimes offensive.

While other four-letter acronyms have been used to describe the characteristics of POOP, it is hoped that POOP is sufficiently recognizable by packeteers to eliminate the need to express the others!

What, exactly, is POOP? How does one eliminate it? How can one help others to cause it to not be propogated? The answers to these questions form the basis of this paper.

POOP - What is it?

POOP is simply an acronym for Poor Operating On Packet. While it may evoke other thoughts in one's mind, the relationship between those other thoughts and poor operating practices is probably pretty clear and will not be further elaborated upon.

POOP - How does one eliminate it?

In order to eliminate POOP, one must simply not generate it. If it is generated, it will be passed onto packet channels, needlessly clogging them.

While there are many varieties of POOP, and it would be impossible to describe them all in this paper, several of the more obnoxious and prevalent forms of it are described.

Frog POOP

If you have ever been around a pond, you have undoubtedly heard the loud and constant noise put on by frogs. It seems amazing that so small a creature can make such a disturbance!

If you have ever monitored a busy packet channel, you have probably seen plenty of beacon messages. Here again, a large disturbance may be caused.

Beacon features were included in TNC software in the early days of packet when stations were few and far between. Like the frog on the pond, the noises were made to attract attention of like species -- in this case, other packet stations. Unlike the frog, who settles down after he gets what he was looking for, many packeteers continue to send beacons, often on crowded channels.

Some packeteers contrive clever beacons, to sound bells, clear screens, or print multi-line declarations on the screens of all who can decode the beacon.

The proper rules governing beacons are simple:

1) Determine why you need to beacon.

Beacons declaring that you are unavailable, or on vacation, are perfectly useless and mark you as a real POOPer. If the information you are attempting to convey is important, perhaps leaving it as a message addressed to all on the nearest packet bulletin board station (PBBS) is a better alternative.

On the other hand, if you are living in tornado alley and see a funnel, an urgent beacon may be appropriate.

(In-search-of POOP)

If the purpose of your beacon is to let folks know you are around and want to connect, it may be better to just turn on the radio and let your TNC decode a few packets from other stations. This way you can see who is on and then simply send a connect request rather than a beacon.

Many new TNC software releases include an MHEARD function, allowing you to see the contents of a buffer containing the last several packet stations heard by your station.

If you are convinced that you must transmit without listening for a few minutes (or if the channel really does appear dead), dropping into UNPROTO mode (CONVERSE mode from COMMAND mode without first connecting) and typing a short CQ message (which may be as simple as a carriage return if UNPROTO is set to CQ) is preferable to beaconing one.

2) Compose the briefest possible beacon text.

Cute beacons that fill a screen, sound bells, or clear screens will only mark your station as obnoxious. It is a classic way to lose friends and increase your count of enemies!

3) Use the BEACON AFTER mode rather than BEACON EVERY.

If the channel is busy, one-way broadcasts (which is, after all, what a beacon really is) are not welcome. It's bad enough to try and maintain a connection through a digipeater or two without having having a channel clogged by transmissions from unattended stations that come on the air every few minutes. Beacon AFTER with a value of thirty minutes will assure that you do not add to busy channel bedlam.

4) Don't send beacons more often than every thirty minutes, preferably less frequently. (TNC 1 and TNC 2 users, B A 180 is the recommended setting.)

5) Digipeat beacons with care!

Digipeating may cause a large number of local packeteers to be subjected to screens full of your beacon text. This may be desireable. Then again, it may not. Consider your motive and objective for your particular beacon, then set up the path.

Squid POOP

As Amateurs, we admit to occasional spelling errors. We meant Scwid (Sending CWID)...

Sending a CWID is somewhat akin to using class B (spark) transmissions on the lower end of 20 meters when the band is open. It's annoying and serves no useful function.

The CWID feature was included in earlier TNCs to help the uninitiated masses of Amateurs identify a station that was making "packet racket." The decoder of the CW would (hopefully) contact the station sending the CWID and inform him of the strange noises eminating from his radio, upon which the proud packeteer would politely inform the bearer of the bad tidings that the noise was intentional. In the ensuing conversation and demonstration, another convert would then be won over to the new way of communicating.

Besides, the FCC once required a CWID every ten minutes or so!

Nowadays, the FCC has recognized our heretical behavior, packet is state-sponsored and CWID is no longer required of packet stations.

As a final note, most packet operation occurs on VHF, and everybody knows that most folks on VHF can't copy code anyway!

Bull POOP

Try entering a field containing a bull. While many bulls are mild mannered, some are very territorial and will chase you away.

The same is true of a packet BULLetin board station. Many are mild mannered, aware of other packet stations on the channel and content to share the channel with them.

Others, however, are not. They will chase you away unless you came to feed them.

They do it quite simply, and often are ignorant of their ferocity.

A skilled matador, however, can soon tame a ferocious bull. So can the operator of a PBBS tame his BULL.

The keys are TNC setup files. Most PBBS software contains a file (or files) describing the characteristics of the TNC(s) attached to the computer serial port(s). The magic commands are PACLEN, MAXFRAME and DWAIT.

If a PBBS is operating on HF, PACLEN should be fairly short, perhaps 40 or so. Since this parameter describes the length of the information field, not the header and control bytes, a setting in excess of 80 (the length of one line on most computer displays) is probably the longest needed.

MAXFRAME can be the cause of a lot of useful bandwidth reduction. If the PBBS is on a channel shared by other users, MAXFRAME 1 is reasonable. We have heard PBBS's sending packets of many frames to stations that were having a hard time decoding anything, and the channel was reduced to uselessness for other stations. Similarly, we have often heard PBBS's on HF sending long packets of multiple long frames, getting an ACK on the first one only (if any), and repeating the process over and over. Computers are infinitely patient, but humans wanting to use the channel may not be!

DWAIT is perhaps the strongest medicine to apply to an overly possessive BULL. PBBS stations should set DWAIT to 320 milliseconds. For a TAPR TNC 1 running 3.X software, this corresponds to DWAIT 8; for a TNC 2 it is DWAIT 32.

If you are not the owner of a BULL, but venture into territory where one lives, you can help tame the beast! The following suggestions are highly recommended:

1) DO NOT DX A PBBS! In this case, DX means multi-hop digipeating to a PBBS on VHF.

2) Don't send the PBBS a command before it has responded to your previous command!

Hitting a key twice (or hitting it harder!) WILL NOT improve your chances of getting through! The nature of a packet system is that the message gets through accurately, or not at all. Sometimes it may take a while, especially if a digipeater or HF link is involved, but it will get through. If not, you will get a
*** DISCONNECTED message.

Untimely POOP

POOP can't easily be made timely, but TNCs can! And TNC's that aren't timely can sure contribute to the level of POOP on a packet channel!

In the January, 1986 issue of PSR Quarterly, Tom Clark, W3IWI, made a convincing argument for the setting of the DWAIT parameter for all packet operations. His recommendations are:

User type	Time mSec	TNC 1 DWAIT	TNC 2 DWAIT
Digipeaters	0	0	0
Keyboard users	160	4	16
PBBS, Hosts	320	8	32
File Transfer	480	12	48

Digipeaters wind up with the highest priority. Since these stations are the most susceptible to collisions, and generate the most congestion on a retry, they deserve first shot at an empty time slot.

Keyboard users, operating in a keyboard-to-keyboard QSO, generate little traffic. After all, one can only type so fast! They get the next priority.

PBBS and host stations generally produce a fair amount of data out for a little data in. Thus, the keyboarder has priority getting into the PBBS, but the PBBS waits for other keyboard users before dumping what will probably be a longer packet onto the channel.

File transfers, generating the most data and hence requiring the most bandwidth, are requested to be more polite and give other users a fair shot at the shared channel. Thus, they are held off the longest.

Wide adoption of this scheme may not significantly reduce congestion on a channel, but it should help the channel operate on a fairer basis than otherwise.

Snake POOP

A snake has a fairly unique characteristic. A snake has no ears!

Too many packeteers seem to have the impression that, by connecting a TNC to the speaker jack on their radio, they don't have to have a speaker connected!

The results can often be observed. Excessive retries on a channel because the antenna isn't oriented properly, leading to multipath and poor reception. The other end of the link simply "goes away" for no apparent reason (unless you are listening!). The other station is over-deviating, or another user on another mode, or... And, on a shared-mode channel (or shared repeater), packet can get a bad name in a hurry!

Kangaroo POOP

A kangaroo jumps around. If you have long files to transfer, you should jump around, too!

A busy channel during the early evening hours is not the place for file transfers, automatic message forwarding or similar bandwidth-hungry procedures. What can you do? Jump off to another frequency, perhaps. If this is not feasible, set your alarm for 3 AM and jump to another time, eating up the channel then.

POOP - the final scoop

The ultimate means to eliminate POOP is to SCOOP! By means of the SCOOP, no one will ever be able to detect packet POOP emanating from your station!

SCOOP means Setting COrrect Operating Parameters. If you heed the advice to avoid POOP given above, this final measure will permit you to have a full clean-air rating!

Happy packeting!

TAPR Goals - 1986 Continued from page 1

Expect other positive action from this committee. And remember, they need your input! Write to the TAPR office, and mark the envelope ATTN: REGULATORY COMMITTEE.

Item 2, finding faster and better ways to communicate with the Amateur packet committee, led to another committee! This one is looking into, among other things, locating an economical electronic messaging service that can be accessed easily.

DRNET is one possibility. It has proved invaluable for coordination among the TAPR Board and Officers. The TNC 2 would not have happened without DRNET. And, while "free" accounts are limited, subscription accounts seem to be available.

The GENIE network, sponsored by General Electric, is also being investigated. Hopefully, the next PSRQ will contain details on the selected option.

Packet development issues, addressed by point three, led to the creation of the projects committee. Elsewhere in this PSRQ is an article containing guidelines for project submission.

Meanwhile, the NNC and high-speed radio/modem projects are underway. An HF tuning indicator semi-kit should be available at Dayton, based on the article by Dan Vester in the Ocotber PSRQ.

Got an idea? Let us know!

BBS NEWS 'N VIEWS

Tom Clark, W3IWI

IBM-PC BBS

Well, a lot has happened since our last report. Let's start out on the IBM-PC front. Jeff Jacobsen, WA7MBL released his version 2.04 "RLI clone" BBS and it has gotten rave reviews. Here at W3IWI I retired the old Xerox 820 BBS system in early March after a year and a half of faithful service, replacing it with an IBM-PC clone. The configuration in use here is a Mitsubishi/Leading Edge "Model M" with 640 kbytes of RAM, a 20 Meg "brand X" hard disk, IBM's PC-DOS 3.1 and two TNC2's. I am amazed at how reliable this system has been; with the exception of a problem related to DoubleDOS (more on this later), the system hasn't given any trouble at all; it's so reliable that it is boring!

There are several features in the 'MBL software have made my life a lot easier. In the original WORLI version, Hank kept all the "alive" mail in one long disk file. This file was structured as a disk-based linked list with the pointer "threads" embedded in the same file. When the mail file grew to more than about 50 messages, and when there had been a lot of message deletions, this linked-list became very tangled and disk access times slowed waaaaayyyyyyyyyy down. Hank provided the UNTANGLE.COM utility in the early versions, and incorporated this function into the "G" command in later versions. SYSOPs at busy systems like W3IWI, AI2Q, WORLI, etc. found it necessary to "G" once or twice per day. The linked list was rather vulnerable to isolated bad disk sectors. I dare say there is probably not a single WORLI system that hasn't had the MAIL.DAT file crashed at least once!

In the WA7MBL code, the text of each message is maintained as a separate file. Two supporting files contain the message headers and message indexing information. These files are updated continuously and there is no "untangle" necessary. I figure that this alone has saved me 15-30 minutes each day since I made the change to the PC.

The other nice new feature is that Jeff has written his code so that it can be started from the DOS AUTOEXEC.BAT file. If you have a hardware clock in your PC which sets the software clock, then you can be immune from the effects of power failures. In fact, my instructions to my wife in case the system has to be reset when I'm away on a trip are "turn the power off, then on again".

The typical user notices little difference between the 'RLI and 'MBL software when it comes to messages posted on the BBS. The big change concerns the accessing of files. Jeff's code supports the use of multiple directories which can have descriptive names rather than the cryptic "B:" of CP/M. If the user merely types "W" he sees the names of all the available directories plus any files that are in the "root" directory. Here at W3IWI, the only "root" file is called FILEINFO which tells about what is in all the other directories. This architecture, coupled with the large volume of storage afforded by a hard disk gives the users access to a lot of information (probably more than he can ever hope to digest!).

I have seen a number of other BBS systems change over from Xerox 820's to IBM-PC clones in the past couple of months and I am continually deluged with requests for disks. A couple of comments on software distribution seem in order. Jeff has asked Wes Morris, K7PYK to serve as his "official" distribution channel. Several others have tried to help out too; software seems to spread thru the community like a growth of mold. Jeff has asked repeatedly that he not be deluged with requests. He can either answer the requests, or work on new code, but not both at the same time. We are all much better off if he is allowed to be creative!

Jeff's code for the PC has only been around for a few months and yet it has already made a remarkable impact on packet radio. Jeff has shown that an isolated individual can make a significant contribution from the "backwoods" of Ogden Utah. I hope this serves as a model of what YOU can do for your hobby!

XEROX 820

It may be surprising, but it is only two years since Hank Oredson, WORLI set out to make his contribution. Hank's efforts on the 820's got packet radio moving. It gave us our first real "network". With the release of WORLI version 11.2 in early February, Hank made the decision to move on to newer, more challenging tasks. I know I speak for all the packeteers in telling Hank "Thanks for a job well done!".

Hank threw the gauntlet down on the table and challenged someone else to pick it up. Well, a new knight has emerged in Ed Picchetti, K3RLI (we can't seem to get 'RLI out of this!). Ed has now made available his version 11.4 which adds a couple of enhancements to the (other) 'RLI's 11.2. One of the enhancements was already available in the 'MBL code: the ability to specify a maximum number of digipeaters for local users which can be over-ridden by other BBS's for mail forwarding. Ed also added another neat feature (not yet supported by 'MBL) which allows a bulletin to be forwarded to a number of other BBS systems in one operation.

When I saw Ed last week, he made a plea: "Don't consider the 820's as being dead. They still have a lot of life left in them." I have to agree with Ed; even though I "retired" my 820 from the main BBS, I still have it in active use as a 221.01/145.05 Gateway.

FCC 85-105

Another big event has been all the activity associated with the FCC's Report and Order 85-105. This came in response to the earlier RM-4879 Notice of Proposed Rule Making (NPRM). As it came out from the FCC, 85-105 was an unmitigated disaster! All of us who read the document were appalled at how little the Commission knew about what we were already doing. Had 85-105 taken force, the effect would have been to shut down virtually all packet radio BBS and networking activities. The problem lay in the definition of third-party traffic and the FCC's apparent paranoia that unlicensed hackers and commercial users would gain uncontrolled access to packet radio resources.

After 85-105 hit the street, TAPR, the ARRL and a number of individuals submitted strongly worded Petitions for Reconsideration. The ARRL worked very hard and succeeded in obtaining temporary relief while the matter is reconsidered.

Although we are temporarily "saved" let us not rest on our laurels. This matter will be coming up again. When the original NPRM was in front of us for comments, less than two dozen individuals and organizations took the time to submit our comments. Our own complacency almost did us in. The TAPRites who have been charged with lobbying to try to improve our image in these matters are NK6K, WA7GXD, W3VS and W3IWI. Please let us know your thoughts. And this time, when we flash the bulletins that it is time to write the FCC again, DO IT! Don't assume that someone else will carry the ball.

Unrelated to 85-105, but hitting at the same time, is the FCC's overt decision to clamp down on HF BBS/Gateway/linking. The bombshell hit in late January when K4TKU was cited by the FCC monitoring station in Maine for unattended operation of an automatic BBS. Since then, HF activity has taken a noticeable nosedive. The HF BBS SYSOPs are more circumspect about leaving their systems on during the daytime when they are away at work. This has led to a greater emphasis on evening HF activity, and with 20 meters suffering from a lack of solar activity, 40 meter activity has been picking up.

The FCC's 85-105 comments on international 3rd party traffic has also put a bind on some interesting HF developments. A number of Europeans (particularly LA and DL) had been using U.S. BBS stations for intra- European forwarding. European countries have historically forbidden third-party traffic, but apparently they don't interpret amateur-to- amateur communications (even involving an intermediary) as involving a third-party. No one has asked for a ruling on this dilemma (Please don't! The answer is likely to be what you don't want to hear!) and as a result thermodynamics applies and entropy increases. My advice to the HFers would be to be very cautious about allowing any BBS traffic not involving countries which permit third-party traffic.

NEW SOFTWARE RELEASE FOR TNC-2

A new software release is now available for the TNC 2 and clones (PK-80, TNC-2A, TNC-200, MFJ-1270).

Release 1.1.3 corrects the full-duplex bug in 1.1.2 and provides two new features.

RXBLOCK allows the TNC to pass information from the packet channel in a format more suitable for BBS and other automated operations.

A number of counters are grouped under the HEALTH command, providing status on the link and the TNC's performance.

If you wish to upgrade you may send your old 27C256 EPROM to TAPR, inserted in anti-static foam and mailed in a small carton. Enclose $1.00 (one dollar) and return postage. Your EPROM will be erased, reprogrammed and returned to you. (If the EPROM is improperly packaged or damaged, it will NOT be reprogrammed.)

Alternatively, you may purchase a new, programmed EPROM from TAPR for $10 postpaid.

Please mark all requests with "TNC 2 Software Update" on the outside of the carton or envelope. This will help us process your order faster.

Thank you!

DIGIPEATERS, NETWORKING and BBS FORWARDING

We are now starting to see rudimentary "Level 3" networks being tested on the air in several locations. Until these get running, we have only two types of networking available: digipeaters and BBS linking. With the large influx of new packeteers, multi-hop digipeater links are becoming impossible to use. This is easy to understand -- it is due to QRM; our packet radio channels are becoming very congested. Although up to 8 digipeaters are "legally" permitted in AX.25, pragmatism would say that any more than two are unworkable. This can be shown to be the case mathematically. If N digipeaters are used in your point-to-point link, then there are 2*(N+1) separate transmissions (counting the required ACK). If the probability of a packet getting thru on any one of those one-way links is P, then the overall probability of a packet making it thru the link and the ACK coming back is Po = P ** [2*N+1)].

The overall probability Po of making it is tabulated below for all the permitted numbers of digipeaters and different quality links:

	----- Per Hop Link Probability -----				
# Digis	0.5	0.7	0.8	0.9	0.95
0	0.25	0.49	0.64	0.81	0.90
1	0.06	0.24	0.41	0.66	0.81
2	0.16	0.12	0.26	0.53	0.73
3	0.004	0.06	0.17	0.43	0.66
4	0.001	0.003	0.11	0.35	0.60
5	-	0.001	0.07	0.28	0.54
6	-	-	0.04	0.23	0.49
7	-	-	0.03	0.18	0.44
8	-	-	0.02	0.15	0.40

Admittedly, a model which has all hops with equal probabilities is only an approximation but the conclusions still seem valid. First, if you have a total Po of 0.25, then on average you will require 1/0.25 = 4 retries to get you packets thru. My experience would indicate that a lot of paths have per hop reliabilities of 0.7 and less. Anyone attempting to use multiple digipeaters under such conditions should be immediately branded a PLID (Packet LID). The 0.8 column seems to fit east-coast experience for 145.01 at about 8PM in the evening. By about midnite, 0.9 seems to to be the case on 145.01. Most of our localized LANs (like 145.05 in the Balto/Wash area, where most people hear everybody else) also seem to be around 0.9. High quality links on 145.01 at 3AM approach the 0.95 case.

My assertion is that packet activity comes to a grinding halt, users start cursing each other and delays seem interminable when the overall probabilities get below about 0.5. Therefore I conclude that (except for the exceptional case of 0.95 quality links), using any more than 2 digipeaters is a waste of time. Of course the reasons that this is true are twofold: (1) LAN Users are operating on the same frequencies as used for inter-LAN communications, and (2) Digipeaters are DO NOT constitute a "real" network.

The former will be solved by developing and implementing dual- or multi- port network nodes (that's what the Xerox 820 & TNC2 Dual-port digipeaters, the TAPR NNC, etc. are all about). The second requires the concurrent development of real networking software and protocols (and that's what "Level 3" is all about). Both of these activities

require a lot of hard work to do the development, and then will require a sizeable financial investment to implement. You can help out by supporting groups like TAPR (to develop the NNC) and your local packet organization (to implement new systems to bring these capabilities to your area).

Until that time, the closest thing we have to a network is the ad hoc group of linked BBSs. This is a non-real-time network that forwards your messages towards their final destination, rather like the Pony Express. In the northeast, we now have reliable links extending from Richmond VA north to Ottawa, from Maine west to Ohio. The norm is for mail deposited in Washington in the evening to be in Boston the following morning. To the south, a similar network exists covering Florida, Georgia, Alabama and South Carolina. The northeast and southeast still have to relay on HF packet activity to bridge the gap since we still haven't established suitable links thru southern Virginia and North Carolina. Similar stories can be told in other areas.

This network "works" because there are enough compatible BBSs to blanket the map, and these individual BBSs are only one or two digipeaters away from their nearest neighbor.

DOUBLE DEALING WITH DOUBLEDOS

As a final topic, I would like to return to the IBM-PC (and clone) world and the WA7MBL software. Many of us had hoped to use our PC's for tasks other than running the BBS; these tasks include such mundane but necessary activities as file maintenance and perhaps even a little off- line computing. One interesting possibility that struck several of us at about the same time was a $50 software package called DoubleDOS, published by SoftLogic Solutions in Manchester NH. Others that have been discussed are DESQview, MS Windows, Concurrent PC-DOS, etc.

Several of us started running the 'MBL code with DoubleDOS and have had mixed results. While WB2MNF reports having had no problems, both K1OJH and I found that some sort of "worm" was eating our disk files, rendering lost clusters that had to be reclaimed with CHKDSK or Norton Utilities. I suffered on catastrophic DoubleDOS "worm" which "ate" my entire user data file and rendered several mail messages unusable. K1OJH reported similar tales of woe. When DoubleDOS was killed, the problem went away. I contacted the folks at SoftLogic and found them to be helpful. While they never would admit that their program could be "hungry", they allowed as how the latest release of DoubleDOS, Revision U, might solve my problem. They told me that if I would send them a blank disk, they would send out their latest "Revision U" code to me right away. I installed the new software and (knock on wood!) the problem seems to have gone away. After a couple of weeks of use, the only time I had any problem was when I had both partitions writing to the same file -- this is definitely a forbidden thing. But used with care, DoubleDOS does seem to work with the 'MBL 2.04 code, at least for me. Caveat emptor!

To get the Rev. U update disk from SoftLogic (registered, legit owners only!), send a blank disk and return mailer to:

Mr. Silver
SoftLogic Solutions
530 Chestnut St.
Manchester NH 03101

---------- 01001001 de W3IWI ----------

TAPR AND THE FCC
PR Docket No. 85-105

Harold Price

TAPR and its members have been actively supporting all areas of packet development since the early days. As we've seen, this involves far more than just hardware and software development. We produced extensive documentation. We spread the word with articles in Ham Radio, 73, and QST. We supplied speakers at ham gatherings large and small. The only area we had neglected was the regulatory arena. Although members of TAPR have always been on the ARRL Ad Hoc Digital Communications Committee, we had never presented our opinions directly to the FCC as the countries largest packet specialty group. At the board meeting in February, the directors resolved to become more active in this area.

The following is our first efforts in this area, a petition to the FCC for reconsideration of proposed new language in the amateur rules that prohibits automatic retransmission of 3rd party traffic. We will continue to participate in this and other regulatory actions that effect the future growth of amateur digital communications. Members are invited to make their views known by sending comments in to the TAPR office or to any director via packet or Compuserve's HAMNET.

Before the
Federal Communications Commission
Washington, DC 20554

In the matter of Amendment of Part 97 of the Commission's Rules to permit automatic control of amateur radio stations.	) PR Docket No. 85-105) RM-4879

PETITION FOR RECONSIDERATION

Filed by:
Tucson Amateur Packet Radio
P.O. Box 22888
Tucson, Arizona 85734

To the Commission:

Tucson Amateur Packet Radio, a club with international membership consisting of 1400 amateur packet radio enthusiasts which has coordinated the volunteer development of many of the major building blocks of the existing amateur packet network, and whose members have contributed since 1981 in the development of packet radio hardware, software, and operating procedures, hereby submits this petition for reconsideration of the report and order on PR docket No. 85-105. Our comments are limited to activities and operation above 50 MHz, as 85-105 only addresses these frequencies.

Our reasons for requesting a reconsideration are:

1) The inclusion of third-party traffic limitations, given the current definition of third-party traffic, puts severe constraints on the design and utilization of the developing packet radio network.

The questions that arise in the amateur packet community over this issue are mainly semantic

ones, caused by attempting to force new technologies to fit the old definitions supplied by 97.3. The FCC has stated both at amateur gatherings and in the comments associated with several recent actions that it is interested in promoting computer assisted amateur communications and what is commonly referred to as Computer-Based-Message-Systems (CBMS), or Bulletin Board Systems (BBS). Bulletin Boards are central repositories of messages sent between two or more parties. The messages are stored for indefinite periods of time on the bulletin board until they have been read by all parties concerned. The messages are seldom sent on behalf of the control operator of the BBS itself, and that's where the third-party rules begin to cloud the issue.

By strict application of the current definition of third party traffic :

> 97.3(v) Third party Traffic. Amateur radio communication by or under the supervision of the control operator at an amateur radio station on behalf of anyone other than the control operator.

A digital BBS system under automatic control could not transmit messages stored on it that are not originated by or destined for the control operator of that BBS. This makes illegal the major purpose of the bulletin board system.

During the early development and on the air testing of packet radio message systems, amateurs have viewed the message relay device as a repeater. A repeater, as defined by 97.3(l), is a device that automatically retransmits the radio signals of other amateur radio stations. Part 97 does not specify a minimum length for the time delay between receipt of the radio signal and its retransmission.

Repeaters, as commonly used, can pass traffic between two amateurs, neither of whom are control operators of the repeater, with out having that traffic defined as third-party. Repeaters have regulatory limitations of their own, however, and the development of more complex message systems and other packet switching devices will soon pass beyond the limits of the current definition of "repeater".

Existing amateur BBS systems are already handling large numbers of messages. Recent statistics reported by east coast stations show counts of more than 1000 messages per month at each of several sites. These systems are developing more sophisticated methods of automatically forwarding messages from site to site.

To review, the language specified by 85-105, makes the BBS function, desired by both the amateur population and the FCC, illegal unless the BBS is classed as a repeater. Imminent developments in packet radio will make this classification invalid for some devices under the current definitions. Therefore, 85-105, while attempting to permit continued experimentation, actually inhibits it.

A fix for this problem could be to include language in part 97 that specifically states that traffic originated by an amateur station on behalf of an amateur and destined for an amateur is not third-party traffic. This would make the permitted activities of automatic control digital devices, serving in a relay capacity but not classified as repeaters under the current definitions, match the permitted activities of classic repeaters. We note that several countries which prohibit third party messages (including West Germany, Norway, Japan and New Zealand) have chosen the interpretation that amateur-to-amateur messages passed thru packet radio BBS networks do not constitute third party traffic.

2) The inclusion of third-party traffic restrictions, for traffic of a character not discussed in 1) above, will severely limit the utility of packet radio networks for public service applications.

The following discussion presumes the acceptance of the above argument, and that the type of third-party traffic discussed is traffic on behalf of someone other than the control operator of the origination or destination station.

The FCC has done much to promote the use of high speed digital communications in the amateur service. The constant growth of experimentation in packet radio began when the use of the ASCII code at speeds of 300 bps and more were permitted. The majority of digital communications currently takes place at 1200 bps. 9600 bps is in limited use now, with 56kbps devices under construction.

A requirement that third-party traffic be monitored at each relay point in the network will limit the speed of the network to that of the reading speed of the slowest control operator. It would probably force the construction of two parallel networks, one at low speed for third-party traffic, and one at high speed for non-third-party traffic. This is undesirable.

The requirement to monitor the traffic at each relay point in the network also places severe constraints on the design and implementation of the network. In most of the networks now under discussion, the message is only guaranteed to appear in its entirety at its entry to the network, and at its exit. While the message is in the network, it is broken into many small pieces. They may be out of sequence as they pass a relay point. Some parts of the message may take a different path through the network.

With such message fragmentation, a control operator at an intermediate relay point may not have sufficient information as to the content of the message being relayed to correctly judge whether the character of the message is that of third-party traffic or not.

On the other hand, TAPR and its members share the FCC's concern over potential abuse of the network by commercial interests. The problem then becomes one of making sure the amateur regulations are followed, while at the same time making it possible to build the network.

We believe that it is possible to meet both of these goals. The key is in treating the packet radio network, consisting of an unspecified number of relay stations, as a "pipe". The pipe has an input and an output. At the entrance and exit to the pipe are non-automated control operators, who are ensuring compliance with the rules. Once a message has been placed in the pipe by a control operator, it need not be rechecked by an operator at each relay point that makes up the pipe. The message is again checked by a control operator at the end of the pipe if it is destined for a third-party. The amateur who was the control operator at

the origination point of the message is responsible for ensuring compliance with the rules.

We cite as an example: Assume that a network exists between San Francisco and Los Angeles. There are two parallel paths in this network, one that runs down the coast at 9600 bps on 221.95 MHz, and a second that runs via Sacramento through the central valley. An earthquake simulation is taking place between the Red Cross in San Francisco and the State Office of Emergency Services (OES) in Los Angeles. The Red Cross has entered a series of damage reports and hospital bed estimates into a hand-held computer. There are 40,000 characters of data involved. They hand the computer to an amateur to transmit the data to Los Angeles over the amateur packet network. This is obviously third-party traffic. It is also obviously something that could not have been sent using voice, Morse code, or other slow data rate modes, in less than five hours.

The amateur in San Francisco reviews the data and determines that it meets the amateur rules and regulations. He then, as control operator of a station attached to the entry point of the network, (the pipe), enters the data into the network. It now flows through the pipe toward Los Angeles. Also in the pipe, simultaneously, are perhaps 20 other two way conversations. Monitoring of the messages while in transit through the pipe is difficult to do as it flows at high speed through two different paths. Part of the messages may even be automatically stored on disk at an intermediate point if the Los Angeles end of the network is down or congested. Once the message traffic is in Los Angeles, the control operator of the station at the final destination reviews them before passing them to the third-party.

A question that will certainly be raised at this point is, "Is this actually likely to occur in the near future?" Yes. The predecessor to the network above exists now. There are 5 relay points along the coast between Los Angeles and San Francisco operating on 145.01 MHz at 1200 baud. There are 4 relay points that go up the central valley on 145.05 MHz at 1200 baud. During an exercise with the State OES, amateurs were handed a disk from an Apple II computer which contained simulated third-party traffic. This traffic was relayed through the network to an attended BBS system in San Francisco where it was stored and later transmitted through a second network to Sacramento. Similar networks and public service drills exist in other areas of the country. Large networks exist in the New England area, the Mid-Atlantic States, and in Florida.

The only thing missing between the imaginary scenario and the actual one is higher baud rates and an increased level of automatic control. Both of those elements will be required if the amateur network is to provide a high level of service and reliability in time of need.

To review, we suggest that the network be viewed as a pipe, and that control operators at the input and the output to the pipe are sufficient to ensure compliance with third party traffic regulations.

At no time do we recommend that the third parties themselves be given direct access to the network.

The question of unauthorized, i.e. commercial, access to the network must be discussed. Since the regulations for traditional non-digital repeaters do not require constant monitoring, neither should the elements of a digital network. The only monitoring required for repeaters under automatic control is when third-party traffic is involved, this topic is discussed above. Monitoring does go on, however, in the course of daily amateur activities.

Policing of the amateur frequencies to keep intruders out has always had a great deal of support in the amateur community, and high speed digital communications will be no different. Although the same things that make it hard to monitor third-party traffic "in the pipe" will also affect an intruder watch, the intruder must still use the same pipe input as everyone else. Here, monitoring is easy. In fact, at its simplest level, packet radio is the embodiment of the FCC's underlying requirements for automatic control, "devices must be installed and procedures must be implemented...". The network entry and exit points are rigidly controlled by the protocols inherent in packet radio. Although the particular procedures will change as the network evolves, their attributes will remain the same. The originating and destination station are readily discernible. Activity is easily monitored and tracked by a computer. The devices necessary to do this monitoring will be readily available, since they are the same devices used by the general amateur population for access to the network. The prices of such devices have fallen from $500 to $99.00 in three years as the number of amateurs using the mode rose from 200 to 14,000.

In summary for point 2), we believe that a requirement to monitor third-party traffic at each relay point in the network places such severe constraints on the design and implementation of the network as to bring the feasibility of construction of such a network into question. The alternative of making the network off-limits to third-party traffic would be to fall far short of the requirements of 97.1(a).

We believe that this problem can be fixed by adding a clause to the new 97.80(b) as follows:

> [(b) No amateur station may be operated under automatic control while transmitting third-party traffic]
>
> , unless that station is serving in a relay role in a network of digital stations where the traffic was originated at a station not under automatic control.

and elsewhere when third-party traffic is discussed.

TAPR wishes to thank the FCC staff for their obvious interest in amateur packet radio and its continuing development.

/s/

Dr. Thomas A. Clark, W3IWI, Director
for Lyle Johnson, WA7GXD, President
Tucson Amateur Packet Radio
P.O. Box 22888
Tucson, Arizona 85734

MINUTES OF THE TAPR BOARD OF DIRECTORS MEETING

Sunday, 09 February, 1986

The following Board members were present:
Mike Brock, WB6HHV, Tom Clark, W3IWI, Peter Eaton, WB9FLW, Andy Freeborn, NOCCZ, Steve Goode, K9NG, Eric Gustafson, N7CL, Skip Hansen, WB6YMH, Lyle Johnson, WA7GXD, Harold Price, NK6K, Scott Loftesness, W3VS, Dan Morrison, KV7B, Margaret Morrison, KV7D, Bill Reed, WD0ETZ, Gwyn Reedy, W1BEL, Pat Snyder, WA0TTW.

The following observers were present by invitation:
Mark Baker, Heather Johnson, Terry Price.

The meeting was called to order at 0836 hrs by Lyle Johnson.

OLD BUSINESS

1) Terry Price distributed the financial report.

2) Andy Freeborn moved that the financial report be accepted. Tom Clark seconded and the motion carried unanimously.

3) The El Paso shuttle project was explained. A letter will be written to attempt to recover some of the cost.

4) Tom Clark moved the Board express its thanks to Terry for her work in preparing the TAPR financial reports and assisting in developing procedures for the office. Andy Freeborn seconded and the motion was carried unanimously.

5) Lyle Johnson raised the question of the timing of future financial reports to the Board, monthly or quarterly. Bill Reed moved the reports be provided monthly. Pete Eaton seconded and the motion carried unanimously.

6) Harold Price questioned the level of capital equipment and suggested a reduction by means of selling excess items. The results of the discussions were:

   Xerox 820 board, power supply, disk drives and Yaesu radio will be integrated by Eric Gustafson for a mailbox facility in Tucson for NNC and other experimentation.

   The Radio Shack Color Computer system and VIC-20 will be disposed of.

NEW BUSINESS

7) Nominations were opened for officers to serve until February, 1987.Andy Freeborn nominated Lyle Johnson for President. Dan Morrison nominated Pete Eaton for Executive Vice President. Tom Clark nominated Heather Johnson for Secretary. Tom Clark nominated Terry Price for Treasurer. All nominated were elected unanimously.

8) Lyle Johnson polled all Board members to state their impressions, and asked what goals TAPR should focus on. The discussions that followed included the perception of TAPR by others. The results of the poll were threefold. TAPR should take a stand on regulatory issues; direct attention to matters of information dissemination; and support projects to advance the state of the art in Amateur packet communications.

9) The meeting adjourned for a 10-minute coffee break at 1040 hrs.

10) The meeting resumed at 1050 hrs.

11) Tom Clark proposed the goal of improved information dissemination be served in part through setting up a "TAPR Special Interest Group" on a commercial computer information system to provide:
   a) electronic mail/messaging services;
   b) software exchange;
   c) "real-time" publications;

   with the eventual goal that such service be moved to packet radio as fast as practical.

   A committee consisting of Tom Clark, Pete Eaton and Scott Loftesness was formed to investigate this and report back to the Board in the next thirty days.

12) A general discussion then ensued regarding budgets and fixed costs. Action was tabled until after the lunch recess.

13) The Board adjourned for lunch at 1145 hrs.

14) The Board reconvened at 1315 hrs.

15) Scott Loftesness proposed that the Board create committees and suggested technical, regulatory and administrative be formed. The Board approved of a Regulatory/Coordinating Committee. Scott Loftesness, Dan Morrison, Tom Clark and Harold Price volunteered to serve initially.

16) A discussion followed on the establishment of a Project Review Committee to review and recommend projects for Board approval of funding. Pete Eaton suggested that the committee be made up of Board members and TAPR members-at-large to help open the project cycle to a wide range of views. Creation of this committee was tabled until later in the meeting.

17) Scott Loftesness moved the Board provides the President with discretionary spending authority not to exceed $1,000 per occurrance without prior approval by the Board. Tom Clark seconded and the motion failed: the vote was 1 for and 14 opposed.

18) Harold Price moved that the Officers have thirty days to propose an operating budget to the Board.Scott Loftesness seconded and the motion carried unanimously.

19) Tom Clark moved the Board constitute itself as a standing committee of the whole to use electronic mail for the purpose of voting with a seven day response period after a question is called. Gwyn Reedy seconded and the motion carried unanimously.

20) A discussion followed regarding conflict-of-interest concerns.

21) A ten-minute break was called at 1515 hrs. Director Loftesness left for the airport.

22) The Board reconvened in camera at 1525 hrs with Director Reedy absent at the Board's request.

23) Director Reedy and non Board members returned to the meeting. The Board announced that "In the matter of a conflict of interest of a TNC manufacturer serving on the Board of Directors of TAPR, the following resolution was voted on: 'The Board expresses confidence in Gwyn and takes no further action.' The resolution was passed by secret ballot, 7 to 6.

24) Pete Eaton discussed the AMRAD PC-PAD project and reported a cost of approximately $2,000 would be incurred to bring the project to prototype stage.

25) Tom Clark moved the Board allocate $2,000 to fund the AMRAD PC-PAD project to the prototype stage. The motion was seconded and failed to pass; the vote was 1 for and 13 opposed. The Board suggested the project be submitted via the proposed Project Review Committee to further assess the need for such a device by the packet radio community and to determine if sufficient resources are available to ensure the successful completion of the project.

26) Tom Clark and Lyle Johnson briefly reviewed the SAREX 2 project to carry packet radio aboard the Space Shuttle. Total expenses to date are $885.

27) Harold Price moved the Board establish a Project Review Committee be established to evaluate new project proposals and submit them to the Board for approval. Gwyn Reedy seconded and the motion carried unanimously. Harold Price, Lyle Johnson and Tom Clark volunteered to serve on the committee. The Board also directed that the committee be made up of members-at-large, said members to be temporarily appointed for review of projects in their area of expertise.

28) Harold Price moved no new projects be established without Project Committee approval. Mike Brock seconded and the motion was carried unanimously.

29) Gwyn Reedy moved the Board accepts the SAREX 2 project with a total budget of $1,000. Pete Eaton seconded and the motion carried unanimously.

30) Lyle Johnson explained the present status of the TNC tuning indicator project. Lyle volunteered to be project manager and the Board directed him to make a proposal and submit it to the Project Committee.

31) Steve Goode discussed a possible 9600 baud/56 kilobaud radio project. Tom Clark moved the Board accepts Steve's presentation at the Annual Meeting as the framework for a proposal to develop a 9600 baud RF deck and approves interim spending authority for $1,000. Pete Eaton seconded and the motion carried unanimously.

32) Tom Clark raised the issue of a Packet Software Exchange. It could:
   a) provide a coordinated channel of packet software to the public;
   b) address the costs of development and distribution;
   c) provide some sort of subscription basis for rapidly evolving software;
   d) require a project manager to coordinate activites of cloners and developers;
   e) provide focus of activities;
   f) minimize dilution of effort;
   g) provide limited funds to reimburse software developers for real out-of-pocket costs.

   In the discussion that followed, the Board determined that the idea was a good one with excellent possibilities. It further determined to table the issue for the time being and continue discussion on electronic mail over the next month.

33) Pete Eaton advised a local volunteer, Gene Piety, had offered to assist in the office. The Board requested Pete contact Gene and accept his offer.

34) Lyle Johnson asked if the office lease should be renewed for six months or one year. The Board voted for a one year renewal.

35) Pete Eaton read a letter from Gene Piety proposing that TAPR purchase a repeater from Wes Morris, give up the coordinated frequency pair of the repeater, convert the repeater to a digipeater operating on 145.01 MHz and turn the site into a beta test site for the NNC project. The Board restated that TAPR is an organization with international membership and cannot be involved with direct support of local RF sites. TAPR will continue to do development of packet radio.

36) The Board determined that requests for loaner gear for development projects (eg, software development) need to be submitted to the proposed Project Review Committee on a case-by-case basis. The Board further directed that any loaner gear should have a tag identifying it as TAPR property, and that the borrower should sign a receipt for the gear.

37) Dan Morrison and Eric Gustafson reported they are undertaking a project to develop an optimized 300 baud HF modem utilizing a digital signal processor, working in conjunction with Mike Parker, at no cost to TAPR. They will write an article in PSR about it.

38) Lyle Johnson mentioned discussions with SkyLink Corporation regarding a high-speed, high spectral-efficiency modem for packet use. Steve Goode excused himself from the discussion for conflict-of-interest reasons.The Board directed Lyle to proceed with discussions with SkyLink.

39) The existing 9600 baud modem project was discussed. A poll should be taken on DRNET to see if more boards are needed.

40) The FAD board was discussed. The Board authorized an additional 50 boards be fabricated.

41) RUDAK and JAS-1 modems were discussed. No cost information was available and the projects were referred to the Projects Committee.

42) Lyle reported on the NNC project.The NNC Project will be written up and submitted to the Board via the Projects Committee.

Continued on page 15.

PROJECT PROPOSAL GUIDE

Have a good idea that will be useful to the packet community? Perhaps you want to develop some specialized applications software, or a better modem?

If so, TAPR is interested in helping you!

The Board of Directors set up a Projects Committee to provide a channel to assist you in presenting your ideas to TAPR for various packet-related projects.

The following may be used as a guide for preparing a project proposal for TAPR. Please follow these guidelines, and submit any proposal with at least three copies in addition to the original. You may send your proposal to :

TAPR
PO Box 22888
Tucson AZ 85734-2888
Attn: Projects Committee

Thank you!

ooo

Date: Self-explanatory.

Title: Provide a descriptive name for the project or proposal. For example, "HF Tuning Indicator", or "Ten-Dollar TNC", etc.

Purpose: Provide a brief statment of the primary goal (or goals) of the project.

Project Manager:

Give the name, call, address and telephone number of the person who will be responsible for overall project.

Estimated development cost to prototype(s):

Most projects invovle some sort of cash outlay to get started. Printed Circuit boards may need to be layed out and fabricated, or parts purchased, or special equipment rented to obtain some data. Indicate also how many prototypes may be needed to verify the operation of the final unit or device or program.

Estimated direct cost per unit:

In the event multiple units are expected to be produced (such as a tuning indicator or digital radio), provide a fairly close idea of the cost for parts and outside services that may have to be purchased or contracted.

Estimated time to develop prototype:

If the project is accepted for TAPR sponsorship, how many weeks will elapse before a prototype is available to test?

Estimated time from prototype to distributable "product":

If the project is something to be produced for sale (such as a tuning indicator), rather than an investigation (developing an algorithm to measure channel efficiency, for example) how many weeks should it take to test and debug the unit to the point that it can be made available to other packeteers?

Estimated overall demand:

Again, in the case of a device intended to be distributed (this includes software, for example), how many devices may be reasonably expected to be produced? Will; this benefit a small number of packeteers, or a large cross-section of the Amateur packet community?

Estimated rate of distribution:

Again, in the case of something to be generally in demand, at what rate should we expect to produce them? One hundred a month, or one a day, or ???

Estimated cost to go from prototype to initial stock:

Please include such things as startup costs, testing, packaging, level of initial stock, printing, and other details that require monetary resources.

Detailed Project Description:

Provide a fairly detailed description of the project in terms of its proposed implementation. Optional features and their relative merit versus cost to develop and/or produce, etc., should be spelled out. Explain why the proposed project will be interesting to a packeteer.

Also include a specific statement as to how this project meets TAPR's stated goal "to advance the state of the art in Amateur packet communications"? (In other words, why should TAPR fund it?)

Detailed Project Budget:

How much will it cost, line item expenses for parts (broken down by part category or finer), expenses for startup, and the like.

Detailed Project Timeline:

Here include financial milestones, development milestones (including written material for project support, etc.) and any other time-related functions you think are applicable.

Other comments:

Here is your chance to cover issues not specifically required above.

Submitted by: _____ Date: _____

_____

BEGINNER'S CORNER: STATE MACHINES, PART 1

Lyle Johnson, WA7GXD

"I read in my TNC 2 manual that a State Machine is used to convert NRZI to NRZ! What is NRZI, why should it be converted, and what sort of states does this thing machine, anyhow?"

I have been asked many times to explain what a state machine is and how it works, so with this issue of PSRQ I will give you some background. Next time, I will attempt to explain the inner workings of a state machine in non-technical terms.

The best place to begin is at the beginning, so here goes!

The AX.25 protocol (rules of operation) declare that packets will use a coding scheme called Non-Return to Zero - Inverted (NRZI, pronounced "nur`-zee"). This is no big deal, except most serial (a bit at a time, like Morse code) communications devices speak in a format called Non-Return to Zero (NRZ, not pronounced!), and the two forms are not compatible.

The first generally used packet controller, developed by the Vancouver Amateur Digital Communications Group (VADCG, often pronounced "vad`-kig"), used an Intel 8273 chip in the radio port circuitry, and this chip spoke NRZI rather fluently. The TAPR Beta board and TNC 1 used a Western Digital 1933 chip for its radio port, which also happened to speak NRZI quite well.

As it turns out, NRZI-speaking chips also happened to be quite expensive in those pioneering days of 1979-1982. This led to the rise of the "software approach" crowd, which decried the use of such expensive bits of plastic and sand. Instead, they programmed their microcomputers to speak NRZI, and all the rest of what happens in a packet protocol.

When TAPR set out to design the TNC 2, one issue was quite clear - the new TNC had to be very inexpensive. Another thing was equally clear - the new unit had to support radios and modems that could run at least eight times faster than the standard 1200 baud radios and modems in common use. In this way, the TNC would remain useful as packet matured. No software approach systems with the power to do this seemed available within the constraints of the budget.

Now, you may have heard the term HDLC - it means High-level Data Link Control, and it is also a part of AX.25. Fortunately, there are lots of chips around which support HDLC, and are very inexpensive. Unfortunately, they don't also speak NRZI. Thus, we were faced with a dilemna. We wanted a hardware controller for speed and flexibility, but we weren't willing to pay more than three or four dollars for it. (The 8273 sells for about $30 and the 1933 for about $20.)

As it turned out, Zilog made a chip called the SIO. This chip speaks HDLC, and it also speaks regular old asynchronous to boot! By asynchronous, or async, I mean the normal sort of start-stop characters that a computer or terminal uses. We use this means to communicate between the TNC and the computer in a typical packet station. For four bucks we had replaced two chips needed in earlier TNC designs!

Ah, but how to make this beast speak and understand NRZI instead of NRZ?

Paul Newland, AD7I, came up with the solution used in the TNC 2. He used a simple flip-flop to change NRZ to NRZI, and a state-machine to go the other way, from NRZI to NRZ for receiving. As usual, it is easier to generate this stuff than to decode it!

(Now, to be fair, Jon Bloom, KE3Z, had developed a similar state machine to use with the Xerox 820 board for packet use, as had Skip Hansen, WB6YMH. The technique isn't particularly new, but it is not widespread either.)

Let's take a look at the difference bewteen NRZ and NRZI. Perhaps this will give us a clue as to how to convert between them. (If it doesn't now, it probably will later...)

With NRZ encoding, a logical level corresponds to a value of "1" or "0" (in digital things, only a one or a zero is allowed). This is like the old mark and space of RTTY. In the case of a radio signal, a high pitched tone means one value, and a lower-pitched tone means the other value. Simple, eh?

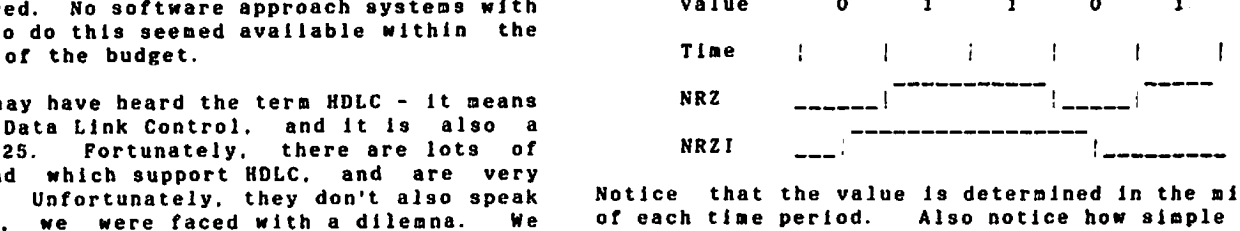
Too simple. For reasons that may be the subject of another article (slipped that one by, I did), NRZI was conceived.

During the time that a "bit" (a binary one or zero) is sent, NRZI decrees that a change in levels (or tones, in the case of our present packet gear) means a "0" and no change means a "1".

Say what?

In other words, if the tone stays low for a certain amount of time, a one was sent. Or if the tone stays high, a one was sent. On the other hand, if the tone switches (high-to-low or low-to-high, it doesn't matter), a zero was sent!

Clear as mud? Maybe the illustration below will help. It shows the sequence "0" "1" "1" "0" "1" in NRZ and NRZI. Remember, we are talking about sending information one bit at a time, so a time reference is also shown.



Notice that the value is determined in the middle of each time period. Also notice how simple NRZ is, and how confusing NRZI appears at first glance!

However, NRZI has clocking information built into it, and this turns out to be a very important factor.

With async data, a start bit is inserted before each character sent, and a stop bit is added after each character. This is no big deal is you are opnly sending a few characters, but if you are sending a lot of information, you add about 25% to the time it would take if the start and stop bits weren't needed. This is how RTTY is sent.

With packet, the assumption is made that a lot of data will be sent. This means an extra character or two will be needed to "frame" each packet, and it turns out that we occasionally add a bit to help with the clocking and to maintain something we call "transparency." Doing things in this manner is called synchronous communications.

It turns out that if you are sending about 10 characters or more, synchronous communications is more efficient than async. Thus, we don't use async in packet these days.

To change NRZ to NRZI for transmitting, we connect up a flip-flop (a simple logic element that takes up about 1/2 of a 20 cents chip) to our outgoing data and a clock of 1200 Hz (to send data at 1200 baud, our most common speed in packet). At each clock time, we look at our data. If it is a zero, we flip the flop (or flop the flip, depending on your perspective), while if it is a one, we don't flip or flop. This lets us change or NRZ to NRZI and mix the clock information into the data in a certain way.

As I mentioned above, generating it NRZI is pretty easy - and in this case adds less than 20 cents to our four dollar circuit.

Now, before I explain how a state machine could be used to recover our data (and clock, by the way!), I need to cover just a bit on the difference between synchronous and asynchronous logic.

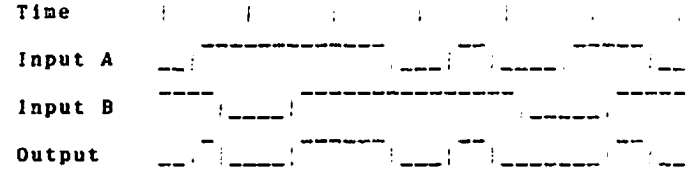
I expect most of you reading this article have seen a schematic of a logic gate, say an OR gate. A two-input OR gate has tow incoming signal lines and a single outgoing line. It's functionality can be described by means of a truth table.

INPUT A	INPUT B	OUTPUT
0	0	0
0	1	1
1	0	1
1	1	1

Notice that there is no reference in the table to time? If both of my inputs are at a low, or zero level, my output is low. However, if either (or both) of my inputs changes to a one, the output will also change to a one INSTANTANEOUSLY! (Yes, I know nothing happens instantly, but in this case it might as well be instant.)

This is an example of asynchronous logic. It cares nothing for time and its operation isn't related to the operation of anything except its two inputs.

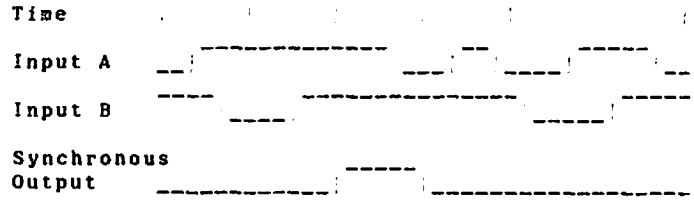
Let's look at this behavior in another way. Below we have the two inputs connected to random signals, and we have a plot of the output. Time marks have been added for reference.



Again, notice that the output changes in response to the input signals only; the time refernece has nothing to do with anything in this example.

Now, let's change our logic gate. Let's add an input related to the time signals. We'll design our circuit so that the gate only looks at the inputs at the time ticks. We call this "strobing" or "latching." The timing signals are then based on our "sampling rate."

Here is the same pattern as before, but now we only "sample" at the time ticks. Notice what happens to the output.



Looks a bit different, doesn't it? It turns out that we have to sample things faster than the changes at the inputs occur if we want to be able to approximate the old, non-synchronous output. It turns out that the sampling clock has to run at least twice as fast as the fastest event if we are to be certain of capturing every event.

This is a pretty important concept.

Another important concept is that of "state." For our purposes, we can say that the conditions of all the inputs of a logic circuit, at a given instant in time, define the state of that logic circuit. I know that may seem confusing, but stick with me!

Consider the truth table for the OR gate. It has two inputs. There are only four definite conditions that those two inputs can take. We say it can have four states.

If you ever studied music, you know there are eight notes in an octave. A trumpet has only three valves, yet those three valves, acting as inputs, can define any of the eight notes! (Of course, unless the trumpet player knows his stuff, you may get a different set of eight than you anticipated!) The point is that the inputs determine the state.

Well, I've run out of space for this PSRQ. Next issue, we'll add some memory to our gate so we can remember past states, then we'll see how a state machine is built and how it can recover our clock and NRZ data from the NRZI signal we use on packet. 73 for now!

Continued from page 11.

43) A point was made that only thoroughly tested information should be printed in the PSR; it is imperative that the PSR be accurate.

44) Andy Freeborn agreed to produce an index of articles written in PSR.

45) Which Hamfests TAPR should be present at was discussed. It was agreed that priorities need to be set and the Executive Committee will prepare a budget in the next thrity days.

46) Gwyn Reedy wanted to know what constitutes a TNC 2 for royalty purposes.After discussion, Harold Price moved, and Eric Gustafson seconded, a PC board is the unit upon which the royalty is based. The motion was carried. A letter will be sent out to existing OEMs clarifying this position.

47) Bill Reed moved TAPR provide an assembled and tested TNC to Jeff Bishop, N7FDS, to assist him in developing packet software for the blind. Harold Price seconded and the motion carried unanimously.

48) Lyle Johnson reported that the lawyer retained by TAPR has moved into government work and is no longer representing TAPR. Lyle was instructed to locate another lawyer.

49) The subject of publications was raised along with membership benefits. Electronic systems were targeted for information dissemination. PSR should contain TAPR news, TNC support information, TAPR projects and regulatory issues.Merging with PRM was discussed. It was noted that PSR contains no advertising (PRM does). Problems with overlapping membership were also mentioned, as were the issues of identity and control. It was decided to continue the discussion by electronic means.

50) The Board expressed it thanks to Modular Mining Systems for its continued support of TAPR and Amateur packet radio development.

51) The Board directed the minutes be published in the form of a report in the next issue of PSR.

52) The meeting was adjourned at 2120 hrs.

EDITOR'S NOTE

This issue of the PSRQ is the smallest of recent issues and it is over one month late. Both of these situations are entirely due to your editor not applying sufficient time to get the job done right, and are the fault of no one else. I apologize for the problems with this issue.

It is already time to begin collecting material for the July issue. Please send your contributions in early, especially if there are any schematics or drawings involved. The preferred form for text is via electronic mail (DRNET (2975), Compuserve (76576,2003), People/Link (W1BEL), or by MS-DOS/ PC-DOS diskette. Other disk formats can be read here only with some difficulty. Last choice is typewritten or printed input. Keyboarding a long article is time consuming, but that's better than not getting your contribution.

Thanks. Gwyn, W1BEL.

NOTICE TO ALL TAPR/CLONE HF PACKET USERS

Recently Eric Gustafson, N7CL, and I re-examined the 300 baud HF modem demodulator circuit and concluded that the main reason people have difficulty tuning in HF packet with the standard 300 baud modem is that it tunes too critically. We have come up with what we think should be very close to the optimal performance of the 2211 demodulator circuit.

To change the standard 300 baud demodulator circuit to this improved version, locate header U34 on TNC1 and U19 on TNC2. The standard 300 baud version of this header contains a 226K resistor and a 510K resistor. These should be replaced by 180K and 750K, respectively. The result of these changes is that the tuning range should open up from about 10 Hz to around 50 Hz. Thus, you should experience reliable demodulation when the frequency tuned is within plus or minus 20 Hz or so of the true signal frequency.

We urge all HF packeteers using TAPR TNCs (original or clone boards) to make these changes as soon as possible. We also remind everyone that HF is becoming alarmingly crowded, and that unless sensible operating practice is followed, the channel will be useless. Some suggestions concerning HF operation are:

1. Try to keep all packets below 80 characters in length.

2. Set MAXFRAME to 1. This will minimize transmission time.

3. Avoid multiple connections and digipeated packet operation.

4. QSY away from the standard calling frequencies as soon as possible.

5. Set FRACK to a sensibly long value.

We hope these modifications improve matters on HF, and would VERY GREATLY appreciate hearing from any of you who make this modification and are able to compare the new behavior to the previous behavior.

73,

Dan Morrison, KV7B
Eric Gustafson, N7CL

Two amateurs have been successfully operating packet on 160 meters. The following report is from Steve Hall, WM6P:

WK6K, Jerry in Camarillo, CA and I have begun tests on 160 meter packet. Results: Excellent. 100% retry free data exchange at 300 bauds. Signal levels over the path were 59+ without fading.

160 meters appears to provide a unique capability to link reliably over 100 to 500 mile paths, single hop groundwave, 24 hours a day. VHF covers the shorter paths if prime mountaintop locations are available. 80, 40, and 20 meters provide longer paths (>500 mi).

Interested? Contact Steve Hall at 664 Bristol Ave, Simi Valley, CA 93065, (805) 526-1120.

MEMBERSHIP APPLICATION

Tucson Amateur Packet Radio Corporation
P.O. Box 22888, Tucson, AZ 85734

Name:_____

Callsign:_____ License Class:_____

Address:_____

City &
State:_____ ZIP:_____

Home Phone:_____ Work Phone:_____

If you wish to have any of the above information not be published in a membership list, indicate the items you wish supressed:_____

I hereby apply for membership in Tucson Amateur Packet Radio Corporation. I enclose $12.00 for one year's membership dues. I understand that $8.00 of my dues are for subscription to the Packet Status Register Quarterly (PSRQ). My signature indicates that I desire to subscribe to PSRQ and become a TAPR member.

Signature:_____ Date:_____

The Tucson Amateur Packet Radio Corporation is a nonprofit scientific research and development corporation. The corporation is licensed in the state of Arizona for the purpose of designing and developing new systems for packet radio communication in the Amateur Radio Service, and for freely disseminating information acquired during and obtained from such research.

The officers of the Tucson Amateur Packet Radio Corporation are:

Lyle Johnson, WA7GXD	President
Pete Eaton, WB9FLW	Executive VP
Heather Johnson	Secretary
Terry Price	Treasurer

The Packet Status Register is published quarterly for $8.00 by the Tucson Amateur Packet Radio Corporation. Second-class postage paid at Tucson, AZ and additional mailing offices. **POSTMASTER**: Send address changes to TAPR, P.O. Box 22888, Tucson, AZ 85734.

TAPR membership and PSR subscription mailing address:

Tucson Amateur Packet Radio Corp.
P.O. Box 22888
Tucson, AZ 85734
(602) 746-1166

PSR editorial submission address:

PSR Editor, Gwyn Reedy, W1BEL
812 Childers Loop
Brandon, FL 33511
(813) 689-3355

PACKET STATUS REGISTER QUARTERLY

TUCSON AMATEUR PACKET RADIO CORPORATION
P. O. BOX 22888
TUCSON, AZ 85734

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Check your address label for membership expiration date.

TAPR Membership Questionaire

The TAPR Board of Directors wants to hear from you! There are a few issues that we are faced with at this time that may have a significant, long-term effect on your organization. In an effort to better serve you, as well as make it easier for you to communicate your thoughts to us, we have prepared this questionaire. Please take a few moments to respond and mail in the completed form. A generous space has been left at the bottom for your comments. Thank you!

Please remember that TAPR officers, Directors and other people that make things happen are amateur volunteers just like yourself. They do packet things after dinner until they struggle to bed at 3AM. TAPR is not a commercial entity, but rather a fragile confederation of persons who band together because they can do more as a team than they can as individuals. They have jobs and families to take care of, too. Anyone/everyone is welcome to become directly involved in TAPR activities. All you have to do is volunteer the necessary time and skills... In a nutshell: TAPR is all of us!

PUBLICATIONS - TAPR publishes the PSR Quarterly four times a year and sends it to all members. The Board has been discussing the idea of merging with the monthly publication, Packet Radio Magazine (PRM) to be in more frequent communication with the membership. Merging MAY require us to raise dues. PRM is included as a membership benefit in many regional packet organizations already. PSR has never accepted any advertising from anyone at anytime. PRM is supported by advertising. Please help us decide on this issue!

1) I joined TAPR to ( ) receive PSRQ ( ) support packet development ( ) both.

2) I already receive PRM ( ) yes ( ) no.

3) If PSRQ were to merge with PRM, I would remain a TAPR member ( ) yes ( ) no.

4) I would be willing to pay higher dues of $_____ to receive PRM with my TAPR membership.

5) I view the information TAPR publishes in PSRQ as ( ) important ( ) unimportant.

6) I would remain a member of TAPR if there were no newsletter at all ( ) yes ( ) no.

7) I would remain a member of TAPR if there were no newsletter, but at a reduced dues rate ( ) yes ( ) no.

8) I plan on renewing my membership in TAPR if things remain as they are ( ) yes ( ) no.

9) PSRQ should merge with PRM ( ) yes ( ) no.

10) Advertising in PRM should be an issue in deciding whether to merge ( ) yes ( ) no.

MEMBERSHIP BENEFITS - There has been discussion that TAPR should become a central point for distributing packet software developed by non-commercial parties. Programs such as bulletin board software (WORLI, WA7MBL, etc.), terminal programs for various computers and the like would probably head the list. What do you think?

11) TAPR should establish a software exchange for non-commercial packet software ( ) yes ( ) no.

There has been some mention of TAPR establishing a presence on a major telephone-accessed database for easy conferencing and discussion among members. Such a method may provide a more direct pipeline to your Board and Officers. Of course, such services cost money and access would not be free! Please tell us your opinions.

12) TAPR should institute a packet conference on one of the major databases ( ) yes ( ) no.

If you answered yes to the above, please answer the following three questions.

13) The database should be ( ) CompuServe ( ) The Source ( ) PeopleLink ( ) GENIE ( ) DRNET ( ) other _____.

14) TAPR members only should be allowed access to this service ( ) yes ( ) no.

15) TAPR members should get a discount or credit towards this database conference ( ) yes ( ) no.

TAPR has never released its membership list to any commercial entity. We have been asked for it from time to time, however. Also, some members have expressed an interest in getting a list to help find others in their area. Please advise us on this issue.

16) TAPR should publish the membership list on a regular basis ( ) yes ( ) no.

17) TAPR should sell the membership list in the form of labels for interested advertisers ( ) yes ( ) no.

KITS - TAPR has always provided packet equipment in the form of complete kits. The HF tuning indicator is available as a partial kit. The NNC is pretty complex, and the high-speed radios may be tricky to assemble and align without proper test equipment. On the other hand, licensing the TNC 2 to various manufacturers has resulted in being able to better focus on packet development while reaping some benefits from TNC sales in the form of a small royalty. Again, we are looking for your inputs!

18) When TAPR makes a kit, it should be a complete kit ( ) yes ( ) no.

19) Simpler devices and accessories should be available in kit form from TAPR ( ) yes ( ) no.

20) Complex devices are better left to the manufacturers to produce ( ) yes ( ) no.

21) TAPR should do R and D in packet technology, but stay out of the production business ( ) yes ( ) no.

22) Having very similar equipemnt produced by many manufacturers is confusing. TAPR should license its technology on an exclusive basis only ( ) yes ( ) no.

23) Similar equipment from many manufacturers increases competition and TAPR should continue its policy of non-exclusive licensing to anyone who meets the terms ( ) yes ( ) no.

A NEW NAME - Some members have expressed the thought that belonging to a "Tucson" organization seems a little strange. TAPR has obvious national roles and some international influence and should change its name to reflect this.

24) Tucson Amateur Packet Radio is too regional. Change the name ( ) yes ( ) no.

25) If the name changes, the initials TAPR should remain ( ) yes ( ) no.

If you think the name should change, what do you suggest? _____.

ARE WE FINISHED? - There has been some discussion that TAPR has served its purpose, packet is here to stay, and we should close the doors. The manufacturers will provide the advanced technology and leadership in the packet arena. What do you think?

26) TAPR is an organization whose time is past. We should close the doors ( ) yes ( ) no.

27) TAPR is vital to the continued growth and future of packet radio development and should stay in existence ( ) yes ( ) no.

28) I believe that TAPR should be active in petitioning the FCC on actions which directly affect Packet Radio, e.g. the automatic digital control docket] ( ) yes ( ) no.

29) I believe that TAPR should be active in petitioning the FCC on actions which peripherally affect Packet Radio, e.g. the Novice Enhancement or Repeater Coordination dockets] ( ) yes ( ) no.

At its February Board meeting, the following three goals were set for TAPR. Please rate the goals using the following code: 1=strongly disagree, 2=disagree, 3=no opinion, 4=agree 5=strongly agree

A) Tucson Amateur Packet Radio will take an active role in participating in the FCC rulemaking process on issues relating to Amateur packet radio. Further, TAPR will coordinate such activities with other Amateur organizations.
Goal #1: 1 2 3 4 5

B) Tucson Amateur Packet Radio will seek better and faster ways of providing information to the Amateur packet community.
Goal #2: 1 2 3 4 5

C) Tucson Amateur Packet Radio will encourage and support hardware and software projects to advance the state of the art in Amateur packet communications.
Goal #3: 1 2 3 4 5

FINAL COMMENTS - Please use the remaining space to offer us any suggestions you may have regarding TAPR, its role in Amateur packet radio, how it may better serve your needs, etc. Thank you very much!
[NOTE: This form is designed to be folded in thirds and mailed without an envelope. Do not forget to apply postage.]

_____

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