# NCPA Downlink

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# The SanJose TCP/IP Switch: What it can do for you!

*W. E. (Weo) Moerner, WN6I*

Whether you are new to TCP/IP, or a seasoned veteran, the SanJose TCP/IP switch has several features to help you!

First of all, if you are unfamiliar with TCP/IP, but want to "get connected" to the growing network of hams using TCP/IP, here's what you should do first, before this article will make much sense. If you have an IBM PC or compatible, send two 5 1/4" 360 kB diskettes or one 3 1/2" 720 kB diskette to W. E. Moerner, 1003 Belder Drive, San Jose, CA 95120-3302 in a mailer with return postage. I will make copies of the "newuser" diskette and the documentation diskette and mail them back to you. If you are a Mac user, the Mac code is available from Doug Thom, N6OYU, (408) 253-1306, 1405 Graywood Drive, San Jose, CA 95129-4778. After reading the documentation and trying out the program, you too can start profiting from the port of the powerful Internet networking protocols to amateur radio, and you can help in the development of this new network. But be patient! We all agree that the documentation is not perfect yet, but it is improving.

Now assuming you are familiar with the basics of TCP/IP, what is the SanJose switch? It is one of the nodes on the local TCP/IP network, located at address [44.4.0.96], with AX.25 callsign WN6I-7. The station is composed of an IBM AT running recent versions of the TCP/IP software called NOS that are hopefully mostly bug-free. SanJose currently has two ports, one on 145.75 MHz at 1200 baud, and one on the 433 MHz band also at 1200 baud that serves as a backbone to other areas like SantaRosa and to a 9600 baud subnet on 145.71 MHz. The station is located at an elevation of 1000 feet on the peak of the Santa Teresa foothills at the IBM Almaden Research Center in south San Jose; it has a line-of-site path to most of the central and southern Bay area. At times, depending upon propagation, SanJose can even communicate with the SantaRosa switch, n6gn-6! I am the sysop for the SanJose switch, and David Singer, N6TFX, and Dave Palmer, N6KL, serve as assistant/alternate sysops.

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# The President's Letter

*Eric Williams, WD6CMU*
*NCPA President*

Well, it's almost the end of the year again. No, not the calendar year, but the NCPA year. Unlike some other organizations, our memberships all expire at the same time, namely March 31st, which is why everyone receives the back issues for the year when they join. This also means that this is the last Downlink you will receive unless you renew your membership, so don't delay—you wouldn't want to miss a single issue of this fine publication, would you? We didn't think so, so we included a renewal form inside this issue for your convenience. (We've also included space for change-of-address information. If you've moved since you joined, please drop us a note with your new address.)

*Continued on page 5*

# Editorial

*Mike Chepponis, K3MC*

Greetings again! I trust your holiday season went well, and that Santa has brought you all the packet gear you'll need, so cozy up and check out our Winter '90 edition of *The NCPA Downlink!*

This time I think we've outdone ourselves. In addition to our usual crop of excellence (WB9LOZ, N6QMY, N6VUW, KB6TKL, KA6ETB, and K6RAU), we've also got what may be a first for a primarily-local newsletter: A remote correspondent! Marcello Soliven, KJ6QA/4, an NCPA member unfortunately stranded in Palm Beach, Florida, begins a regular column. The first one is a neat packet application for people on the go, but still want to feel as if they are at home. We expect more amazing adventures from our Field Corrspondent!

Dewayne Hendricks, WA8DZP, begins another regular column, this one at my request. He tackles the up and coming networking protocols TCP/IP. This issue, Dewayne give us a gentle overview of the TCP/IP protocol suite. Be sure to catch the related Book Review by N6QMY! The other TCP/IP article is a beautiful one describing the SanJose TCP/IP switch, by Weo Moerner, WN6I - check it out!

This issue is also packed with info for folks just wiring up that first TNC and getting on the air. For a wonderful, gentle, introduction, please see the article by Rich Bono, NM1D. For those of you more advanced, you'll enjoy our NCPA Education Coordinator's article (from Larry Kenney, WB9LOZ) about how NET/ROM nodes work, and how to use them.

Fred Silveira, K6RAU, implores us to use Hierarchial Addressing on the BBSs, and gives us some pointers why we should do this. Ron Bardarson, N6VUW, that ever-energetic proponent for 9600 baud packet, does his usual excellent job of keeping us abreast of latest developments. And, in what I hope will become a regular column, Travis Wise, KB8FOU, writes for younger hams - you know, the kind we used to be before we needed to pay taxes? Now that nocode is a reality, we're going to need the contagious enthusiasm that folks like Travis display - and to help Elmer new digital Techs into packet radio! Be sure to tell 'em about the NCPA...

And I would be remiss not to mention a great ARRL Computer Networking Conference report by our own WA8DZP, and a brief report on SAREX and DXPSN by Jay O'Brien, W6GO, and KA6ETB's Emergency Coordinator Column, and KB6TKL's NCXPN notes. In addition, Russ Mackey, NW6U, reviews what may be the pinnacle of packet achievement!

Finally, this is my last newsletter as Editor. I have requested that the board find another editor for next year. When I took on this job, I promised that I would be Newsletter Editor for a year. With his issue, I have fulfilled my commitment! I intend to be on the newsletter staff next year, and maybe even run for the board come election time, but I think it is time to pass the reigns along. It's been great, working with the people on this newsletter team! Let's pass along our support for a new NCPA Downlink editor!

From the Bay Area, the best place in the world for Packet Radio,

73!
Mike Chepponis, K3MC @ K3MC.#nocal.ca.usa.na


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# The SanJose TCP/IP Switch: What it can do for you!

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The system provides three main services at the present time:

1. An IP switch location covering San Jose and the South Bay. This means that if you can hear SanJose reliably, you should consider using it for a "default route". Your default route operates whenever you try to reach a station that is not in your routing table. Your station doesn't know how to reach the new station, so your station tries to send the traffic to the station specified in your default route. Thus, your default route should be set to a relatively high-level station that knows routes to other pieces of the network or where to find them.

The SanJose switch maintains a routing table that includes entries for the Bay Area, north to SantaRosa and beyond, and to Sacramento via SantaRosa. You can use SanJose for your default route by adding the statement "route add default ax0 SanJose" in your autoexec.net file.

In the near future, SanJose will begin running a new service, RSPF, which is the beginnings of a smart router. When this happens, the routing table at SanJose should be even more current, so go ahead and use it!

2. SMTP Mail forwarding. One of the nicest aspects of TCP/IP is that many of the boring things you used to do on the early AX.25 packet network are now done automatically by computers. For example, you used to have to log on to your BBS to get your mail, which often meant waiting for the BBS to be free. This is not true anymore with TCP/IP, and you don't have to leave your system on all the time, either.

If you have a good rf path to SanJose, SanJose can store SMTP mail for you, and then send it to you when you turn your system on. By telling me that you want this service, I will enter your hostname (callsign) into the SanJose alias file to start this service. To utilize this facility, you should have your TCP/IP mail addressed to "callsign@SanJose". Then when you turn your system on, the most you might have to do is to "kick" your mail at SanJose by typing "remote SanJose kick".

3. Public file area for uploads and downloads. There is a public subdirectory available on SanJose for anon or anonymous ftp with a variety of file categories. To use this capability, just execute "ftp SanJose" followed by a logon as a user with the name "anon" or "anonymous". You then can list the files available with "dir", change directories using "cd", and download whatever interests you. For example, in /public/hostable, the TCP/IP address coordinator, N6OYU, places the latest versions of hosts.net and domain.txt whenever these files are changed — you should download these files every month or two. As interest permits, more file storage categories can be added. Just let us know! In the box below is an index of the subdirectories available today.

In addition to these TCP/IP-related services, there are several services that help the AX.25 user start to utilize the TCP/IP network. If you connect to SanJose as an AX.25 user and enter one blank line, you gain access to the TCP/IP mailbox as if you had done an anonymous telnet to SanJose. From this mailbox, you can telnet out into the TCP/IP network as if you were running a TCP/IP station. Or you can use the gateway function to connect out via another port on the SanJose switch. Or you can download files from the /public directories as if you were using FTP directly. This is the same BBS-like mailbox that is accessed whenever you do a direct telnet to SanJose, and its features will be enhanced in the future as the capabilities of the code improve.

By the way, at present there are at least two gateway stations that allow mail to flow back and forth between the AX.25 BBS and the TCP/IP networks, K3MC in Fremont, and N6TFX in Los Gatos. To send SMTP mail out to the BBS network, use either "call%bbscall@K3MC", or you can also try "call%bbscall.st@N6TFX". You can also receive your BBS mail directly at your TCP/IP station by registering as a user of the K3MC AX.25 mailbox. K3MC is running some special gateway code that converts your AX.25 BBS incoming mail into smtp mail and sends it on to you. In the future, the new NOS will allow the gateway function to occur more easily, and N6TFX is currently experimenting with the NOS mailbox reverse forwarding.

Other new services are planned for the future: for example, NNTP, for network news transfer protocol, allows you to scan bulletin categories of interest to you and to only send those you really want across the network. An NNTP client is built-in to the newer versions of NOS.

So welcome to the SanJose switch and to TCP/IP! Have fun!

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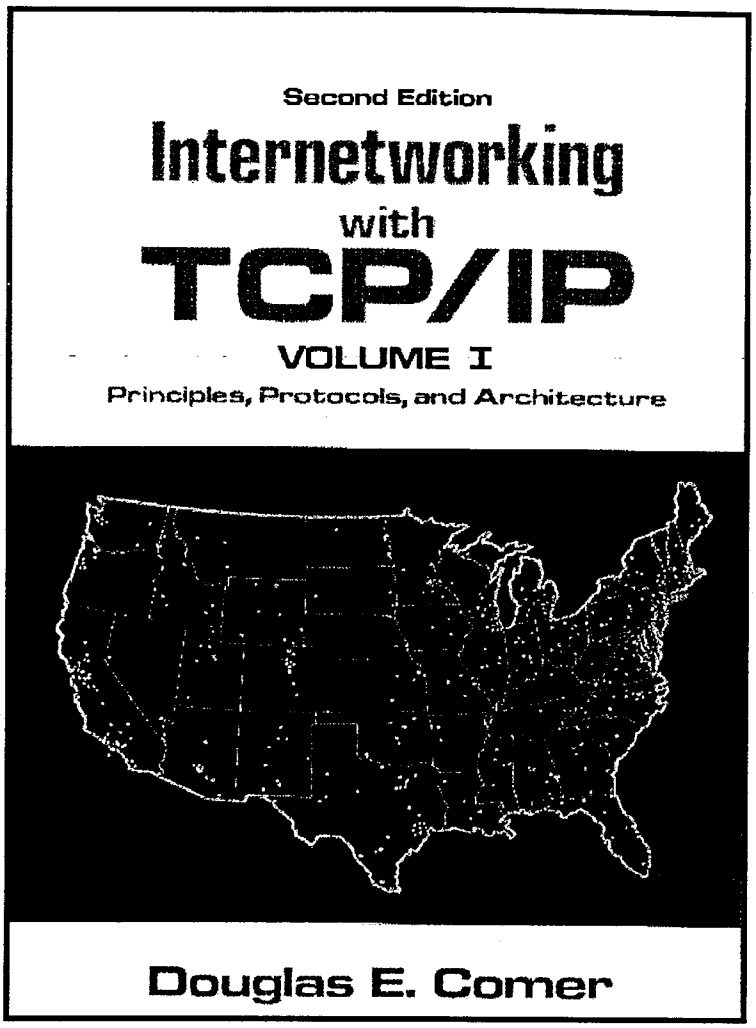
## Public File Areas Available at SanJose Switch

| | |
|---|---|
| **HOSTABLE** | Latest HOST tables in standard and short (SHRTxxxx) versions (also DOMAIN.TXT formats for NOS users. These files are updated regularly by N6OYU) |
| **NETCODE** | KA9Q's et. al's programs (Also file uncompressors PK*.*) |
| **NOSCODE** | NOS version of NET in various incarnations |
| **NETHELP** | DOCumentation files for NET / NOS / SMTP, etc. |
| **TNC2** | KISS downloadable code for TNC-2 |
| **ARESDATA** | WN6I/N6KL's packet database program |
| **AMSAT** | NASA Orbit Predictions / etc. |
| **FCC** | FCC news and NPRMs |
| **MISC** | whatever else |
| **ARES** | ARES files — shift supervisor's manual, etc. |
| **QUAKE** | Latest USGS Quake Summaries |

# Book Review

*Patrick Mulrooney, N6QMY*

Internetworking With TCP/IP
Principles, Protocols, and Architecture
By Douglas E. Comer
Second Edition, ©1991
Published by Prentice-Hall, Inc.,
Englewood Cliffs, NJ 07632
Hardcover price: $50
Computer Literacy Bookstores




I am going to start this review out with a disclaimer: This book is not for everyone. It is written as both a college text and a professional reference. It does not even directly relate to Amateur Radio. In fact, I could not find a single reference to Amateur Radio in the entire book! *(Editor's note: it does talk about "Karn's Algorithm," which Phil Karn, KA9Q, discovered while implementing his ham TCP/IP package, however.)*

So why am I reviewing it? Because this book is the one to read to get started on understanding the TCP/IP suite of protocols. And with higher speed packet links just around the corner *(Editor's note: Real Soon Now...)*, TCP/IP may finally come into widespread use in the Amateur community by providing the network for linking BBSs, Keyboard Nodes, DX Packet ClusterNodes, and, of course, individual user nodes, as well as other ideas that have only been a dream, so far.

For an excellent overview of TCP/IP, refer to the article by Dewayne Hendricks, WA8DZP, in issue number 1 of *The NCPA Downlink.*

But for an in-depth look at TCP/IP, this is the book to read! Douglas Comer has taken what can be the very dry subject of computer communications protocols, and made a very readable and easy to understand book. He covers general principles of computer communications, specific examples from the TCP/IP protocol suite, then combines this with real-life examples from the national backbones ARPANET and NFSnet.

What makes this book so exciting for Amateur Radio is the concept of Internetworking. Internetworking should allow us to hide the details of the network from the end users or computers, and still provide the connectivity we all want. This is a wonderful concept for the Amateur world! No more complaints from your local BBS sysop when you try and send a 43K file! It provides the ability to send program files to your friends without all the conversion programs you have to use now. Of course, this particular ability is available with the KA9Q TCP/IP package (available from TAPR, for example), right now! It's just that there is no real "network" yet.

So what does this book cover? I think a partial listing off the back cover covers some of the highlights:

- Compares the ISO 7-layer reference model to the TCP/IP 5 layer-model.
- Presents routing architectures for large internets and describes their gateways: EGP, RIP, and OSPF.
- Explains the TCP transport services: - sliding windows and window management - reliable stream service - end-to-end acknowledgement - flow control and encapsulation
- Examines application services: - electronic mail (SMTP) - file transfer and access (FTP,TFTP, NSF) - remote logon (ALNET, Rlogin) - network management protocols (SNMP, ASN.1, CMOT)

Now, this may not sound like it makes light reading, and it doesn't. But, I had a hard time putting this book down! I became very involved with the clear examples Douglas Comers provides throughout the book.

Each chapter ends with summary, exercises (the college text part) and where to go for further study or more information. I stated at the beginning that this book is not for everyone. So who is this book for? It is for anyone who is interested in understanding the TCP/IP suite of protocols and where Amateur Packet Radio may be headed.

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# Product Review

*Russ Mackey, NW6U @ KI6EH*

Bulletin Board - Bulletin Software
From Packet Inn Software

Bulletin Software (BS) is a major advance in packet terminal programs. BS is equally at home on all TNC-1s and TNC-2s and clones, all varieties of Apples and Commodores. No longer will changing your computer/TNC combo mean learning a new terminal program - the lowest common denominator in packet is here and it is BS!

The name Bulletin Software is apt; in addition to all of the buffer, disk, and macro capabilities found in lesser packages, BS really shines at automating your repetitive bulletin chores. We will look at a few examples of BS automation in this review. The "Sale Handling And Records Kernel" (SHARK) takes the drudgery out of posting SALE items on the local BBS - and more. Let's say you have 3 items to sell that you picked-up at Foothill for these cash outlays: a VFO ($10), an HT ($100) and a Monitor ($30). BS automagically determines your "true cost" for each item by adding to the cash outlay your valid expenses: transport $10.00 (40 miles @ 25 cents per mile), and forgone wages $50.00 (2 hours @ $25). Thus the amateur sell prices (not-for-profit) are: VFO= $70 ($10 + $10 mileage + $50 wages), HT = $160, and Monitor = $90. The program clearly details that proper accounting, according to generally accepted principles, requires that the "overhead expenses" be added to each item, as you have no assurance that all items will sell - while most sellers using BBSs know this already, BS ensures compliance with part 97.

This is just the start of how BS and SHARK programs can assist you. All you need do is enter the items, and the overhead parameters; BS writes and posts the SALE bulletins! Until you notify BS, your bulletin will be posted again, daily, on any board(s) of your choosing. The Records Kernel will automatically scan all new messages when you log on, notify you if similar merchandise is listed by other parties, and report price differences. Should an identical item be listed at a higher price, BS suggests you raise your price to reflect true cost, as you have obviously made an error in your entry.

Some BBSers will save *hours* each and every week by using this program, and seekers of cost-priced equipment will be grateful for BS. Operation of the "Special Language And Subject Handler" (SLASH) will be intuitive for many users - there is no thought-provoking learning curve. You enter key words related to subjects you care and know, and SLASH parses all new bulletins for those key words. If anyone has spoken to YOUR topic, the subject handler will respond with a personal reply to the sender, enlightening him, and post a bulletin to ALL @ USA clearly stating your position, and explaining the shortcomings in the other party's bulletin. This is truly freedom of speech as it was meant to be; a real demonstration of the value of BS!

The last feature to be described here is so advanced that you will not be using it for 12 to 18 months! BS may never be obsolete: the REALHAM program will take your message and convert the letters into a series of stops and hyphens. This way you can be assured that your messages will be read by REALHAMS and not some johnny-come-latelys!

—• • •— —,
—• ——— ••——••

BS ships April 1, 1991, but is available on many BBSs now!

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# The President's Letter

*Continued from page 1*

Alternatively, you could show up and renew your membership at the annual General Membership meeting, at which time people who join will be given the first issue of the Downlink for the new year. Exactly when and where this meeting will be has yet to be determined, but our tentative plans are to hold it March 31st at the Contra Costa County Water District. You will be notified by postcard of the exact time and place.

The General Meeting is the only regular time during the year that the general membership votes on NCPA issues, the most important of which is the election of directors for the following year. This year, KA6ETB, WA8DZP, KB6OWT, WB9LOZ and yours truly have all expressed a willingness to continue as board members, which means that at least two new members have to be found that are willing to serve on the board.

This is your call to action! If you are the kind of person who likes to make things happen instead of being merely a spectator, we need you! Technical ability is not necessary, but an apptitude towards dealing with people and seeing the job through are the qualities we require. If you fit this description or know someone who does, drop a note to chairman of the nominating committee — me! (Who else?)

Any other subject to be voted on at the General Meeting must be printed and distributed to the membership before that meeting. February 15th is your deadline for submitting items for vote. You must send your items in writing, preferably with some background as to why you think it is important, to the NCPA PO box address. These will be printed and sent to all members with the meeting announcement.

The most important piece of business for the existing board during the next few months is the non-profit incorporation of the NCPA. Unfortunately, our treasurer, N6QMY, has not been able to make significant progress on this. If you have some knowledge of this procedure, drop Pat a note and let him have the benefit of your experience. It's either that or we start using part of your membership dues to pay taxes!

The coming year promises to be an exciting one for the NCPA. What looks like the impending loss of 220-222MHz will require the relocation of our BBS forwarding backbone and hopefully we can upgrade the links to high-speed at the same time. We will be holding packet seminars at Pacificon again, and there is a 90% chance that the NCPA will be hosting the ARRL Computer Networking Conference for 1991!

The easiest way to get involed in all of this is to show up at the board of directors' meetings, which are held approximately every 3 months, and see how we operate. The next meeting will be held in mid- to late-January — watch your local BBS for the announcement.

73, eric

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# TCP/IP Column

*Dewayne Hendricks WA8DZP*

This issue marks the beginning of a new column to be written by yours truly on amateur packet radio use of TCP/IP. The editor felt that a column on this subject would be in order as TCP/IP is one of the most poorly understood topics in amateur packet radio today. It will be the goal of this column to attempt to clear up some of this confusion in the minds and our readers and show you why you should use TCP/IP for packet radio and how to use it to your best advantage.

First, lets start with a few words on the why of TCP/IP. I'm going to throw in a few quotes from an excellent reference work on TCP/IP by Doug Comer. The book is called "Internetworking with TCP/IP, Volume I: Principles, Protocols, and Architecture" by Douglas E. Comer and is available from Prentice-Hall. If you are interested in both a general overview to TCP/IP and a very good description (in English, not Techie) of its various services and protocols, I suggest that you pick up a copy at your favorite "book barn."

Notice the word "internetwork" in the title of Comer's book. Let's go into that a bit as I think that he will help you understand the "why" of TCP/IP.

Let me quote the following from Comer:

> "Recently, however, a new technology has emerged that makes it possible to interconnect many disparate physical networks and make them function as a coordinated unit. The new technology, called internetworking, or internetting, accommodates multiple, diverse underlying hardware technologies by adding both physical connections and a new set of conventions. The internet technology hides the details of network hardware and permits computers to communicate independent of their physical network connections.
>
> "The internet technology described in this book is an example of open system interconnection. It is called an open system because, unlike proprietary communication systems available from one specific vendor, the specifications are publicly available. Thus, anyone can build the software needed to communicate across an internet. More important, the entire technology has been designed to foster communications between machines with diverse hardware architectures, to use almost any packet switched network hardware, and to accommodate multiple computer operating systems.
>
> "To appreciate internet technology, think of how it affects research. Imagine for a minute the effects of interconnecting all the computers used by scientists. Any scientist would be able to exchange data resulting from an experiment with any other scientist. It would be possible to establish national data centers to collect data from natural phenomena and make the data available to all scientists. Computer services and programs available at one location could be used by scientists at other locations. As a result, the speed with which scientific investigations proceed would increase. In short, the changes would be dramatic."

This is a rather long quote from Comer's book above, but I think that it expresses the point I wish to make much better then I can. If you re-read the passage above, but this time substitute the word "radio amateur" for scientist, then I think that you will start to have an idea of what I am attempting to point out as the real advantage of TCP/IP for the amateur packet radio community.

Since the TCP/IP protocols were developed in the early 1970's, they are now in use world-wide by a very large community. A recent report on the Internet ( the common name for the world-wide TCP/IP network) stated that there were currently about 1000 separate networks connected to make up the Internet, with a total of about 10,000 computers. This is expected to grow to about 10,000 networks and 10,000,000,000 computers by 1995! Given those numbers, think of the possibilities that amateurs will have if they can connect their own computer via packet radio to a network of computer of this size!

With this possibility in mind back in 1985, at the Fourth ARRL Computer Networking Conference, Phil Karn KA9Q proposed the adoption of the ARPANET Internet Protocols, Internet Protocol (IP) and Transmission Control Protocol (TCP) as the standard (a la OSI) level 3 (network layer) and level 4 (transport layer) protocols for amateur packet radio. Level 2 functions (link layer) would continue to be served by AX.25 (the amateur radio version of the X.25 protocol).

IP is the fundamental protocol of the family and handles routing datagrams based on destination address. It allows for the interconnection of multiple networks by routing datagrams across network boundaries when necessary. Datagrams can get routed through Ethernet segments, serial lines, phone lines, or radio and satellite links

IP is often referred to as a connectionless delivery system because IP routes each datagram separately. When IP receives a sequence of datagrams from a higher-level protocol, IP routes each datagram in the sequence individually. That is, each datagram in the sequence may, or may not, travel over the same path to the same destination. The IP service makes a best-effort attempt to deliver all datagrams, but if some datagrams get lost due to network hardware problems or resources that are overloaded, higher-level protocols, not IP, will retransmit the datagrams

Connectionless can also describe the logical view of an IP internet. Hosts and gateways on the internet all operate autonomously, routing and delivering datagrams without any coordination with the original sender. Though nodes on the internet are connected physically in various ways, users see the internet as a single virtualnetwork where the physical connections are irrelevant

IP also defines the format of a datagram. The general format is a datagram header, followed by a data area. The header includes such fields as version of the IP protocol, length of the header, checksum for the header, total length of the datagram, and the source and destination IP addresses.

Three fields in the datagram header control fragmentation and reassembly of datagrams. IP can be used with many different physical network implementations, each of which can specify a dif-

ferent maximum size for physical data frames. On some physical networks, IP datagrams must be fragmented to fit into one physical data frame. IP handles fragmenting and reassembly of datagrams, using data in the fragmentation fields of the header.

The time to live (TTL) field in the IP header controls how long a datagram is allowed to remain in the internet system. The sender of a datagram sets this field. Each gateway along the path from source to destination checks the time remaining and discards the datagram when the TTL value reaches zero. This feature prevents datagrams from travelling around the internet forever, should the routing tables be temporarily corrupted.

The data portion of an IP datagram is used by IP to forward information passed to it from higher-level protocols, such as the TCP header and data. One field in the IP header specifies which protocol is used in the data portion of the IP datagram.

TCP ensures reliable stream-oriented communications between cooperating processes. Because TCP calls on IP's services, these processes can exist on machines on different networks. In keeping with the layered approach to networking, most systems that support TCP/IP provide a software interface to the TCP functions, allowing application programs to set up sessions with cooperating processes, listen for requests for sessions, send and receive data, and close sessions. The Application Program Interface (API) to TCP varies from machine to machine.

Once a session has been established, the upper-level application channels continuous streams of data through TCP for delivery to its peer process. TCP puts this data along with any necessary control and addressing data into units called segments, and then passes the segments to a lower level protocol, usually, but not necessarily IP. (TCP is flexible enough to handle a variety of underlying delivery systems.)

IP puts the segments into datagrams and sends them across the internetwork. TCP, on the other end, checks for errors, acknowledges error-free segments, and reassembles the segments for delivery to upper-level applications. TCP maintains data transmission reliability by using a positive acknowledgement with re-transmission (PAR) mechanism. A sending TCP re-transmits a segment at timed intervals until a positive acknowledgement is received. TCP uses a checksum to detect segments that may have been damaged in transit. Damaged segments are discarded without being acknowledged. (Note, TCP and IP have separate checksums. TCP's checksum verifies segments; IP's checksum verifies its header.)

To maximize reliability and efficiency, TCP uses a concept known as a sliding window. With a simple PAR mechanism, there will be a delay in sending a new packet until an acknowledgement for the previous packet has been received. To avoid this delay, sliding window protocols allow the sender to transmit multiple packets before waiting for an acknowledgement. As each acknowledgement for each packet sent is received, the window moves forward and a new packet can be sent. The maximum number of packets that can be sent before an acknowledgement has been received is called the window size.

To further enhance reliability, TCP has a flow control mechanism that allows the receiving end to specify how much data it can receive at the present time. When the receiving end sends an acknowledgement, it also advertises how much data it is prepared to accept on the next transmission. The sending node's window size may vary based on how much data the receiving end can accept.

If all of the above sounds complicated, well it is. Real networking is not an easy task to accomplish as the people involved with the ARPANET have learned over the years. Karn wanted to bring the benefit of such experience to amateur radio so that we all would not have to reinvent the wheel all over again. He was a bit late though, because that's just what NET/ROM is, a reinvented "square" wheel.

Karn developed his program first on the IBM PC. It was a major challenge for him to put all of the protocols in such a small system. Up to the time he did it, the only other implementations of the protocols were on minicomputers and high-performance workstations.

Today the KA9Q Internet Package is currently the most common TCP/IP implementation in use in amateur radio today. The software supports the IBM PC and its clones, the Apple Macintosh, the Commodore Amiga, and both the BSD and System V UNIX. The package supports all of the common TCP/IP applications: FTP,SMTP and TELNET.

File Transfer Protocol (FTP) allows you to transfer files to or from another computer system. The files can contain any type of data, so there is no limitation such as ASCII only data as is the case with much of the software used today in amateur packet radio.

Simple Mail Transport Protocol (SMTP) provides a message-forwarding capability. You use a program called BM to compose your msg which is then turned over to SMTP which automatically attempts to establish a connection with your destination and send the message.

TELNET (no acronym for anything I am aware) provides a user-to-user "chat" session (also known as keyboard-to-keyboard in some circles) with a live user at a remote station. All of this probably sounds familiar.

The neat thing about the Karn package is that in addition to the communications functions, it has the ability to multitask these applications so that you can use them all at the same time and have as many copies of each going as you wish!

All an amateur radio operator needs to run the KA9Q Internet Package besides a PC supported by the package is a TNC which supports KISS mode. Most commercial TNC's available on the market today support KISS mode. KISS stands for "Keep it simple, stupid" and is a very simple protocol for computer to TNC communication which was developed by Mike Chepponis K3MC and Phil Karn KA9Q. Instead of all of the software for packet communication residing in the TNC as it does for most amateur applications today, KISS allows those functions to be moved back into the computer where it really belongs. Its easier to change the software then it is to blow new EPROMs!

For its use in Amateur Radio, the challenge will be to integrate TCP/IP with the existing packet radio services such as the PBBS network. For the next few years, however, we hope that TCP/IP will enjoy continued acceptance in the amateur radio packet community as the most solid approach to packet communications. Will it win the battle for that "great network in the sky"? Well, only time will tell,but as they say, "time waits for no man(ham)..."

In my next column we will discuss the "how" of TCP/IP and how you can get started given the type of personal computer which you have. If you have any questions on this column and just questions on TCP/IP in general, I can be reached at WA8DZP @ K3MC or 75210.10@compuserve.com on the Internet. Be seeing you! EOF

# "Home is where your TNC is..."

## A unique packet application for users on the go alot

*Marcello Soliven, KJ6QA/4*

*(Editor's note: Marcello is an NCPA member who is unfortunately stranded in Florida at the moment. He is our longest-distance correspondent, by far! This is the first of Marcello's regular columns for the NCPA Downlink. Welcome aboard!)*

As a frequent business and pleasure traveler based in Silicon Valley and now in Palm Beach, FL, I felt "disconnected" when I couldn't check into my regular BBS, have kbd/kbd QSO's with friends, or just simply play. I always carried a Model-100 and used its convenient (yet slow) built-in modem for communicating with my company and managed to occasionally drag an HK-21 and an HT to explore the local traffic in new areas. I managed to send packet messages through the network, however I usually arrived back home long before the message propagated through...often in time to tell the addressee that a message was on the way.

To solve this self-imposed dilemma, a telephone linked system was devised. The basic solution was to tie an auto-answering modem back-to-back with the TNC in the shack. I could then dial the auxiliary phone number at home from anywhere and use the packet system as if actually there. The technique afforded more freedom and spontaneity and was a lot of fun. As the system was being assembled and configured, various parameters and conditions were found that tended to optimize the system as well as its use and safety. I'd like to share these findings in the following notes.

First of all, a 300 baud auto-answer was chosen. This speed was adequate for most of the anticipated exchanges and provided a reliable link. At 1200 baud more lost data was experienced mostly due to lack of error correction between modems. The slower speed was an acceptable trade-off for this simplified system.

### Configuring the Modem

Use a terminal or computer to set-up the modem.

- Set the auto-answer parameter(s). Eight (8) rings was chosen. This helped to discourage all or most erroneous calls.
- If possible, disable any "RING" or "INCOMING" annunciators that the modem may send when detecting an incoming call.
- Disable any echo features.
- Just before exiting the modem set-up session, make sure that the serial com parameters match those of the TNC.

### Configuring the TNC

Using a terminal or computer set the parameters in the TNC to the desired "default" values. The following settings have been found to be useful in averting potential problems during non-linked periods:

**CONOK OFF** Avoids reverse access to your phone line from the radio side when using a modem with auto-dial features.

**BEACON 0** No beacon.

**ECHO OFF** Helps to avoid choking the serial ports with excess characters.

**MSTAMP ON** Log the most recent MHEARD stations.

**MONITOR OFF** Helps to keep modem from getting choked, especially with control sequences from netnode interchanges.

### Connecting the TNC/Modem

Connecting the TNC and Modem is accomplished with a "NULL MODEM" connection between the serial ports since both devices are DCE (in most cases). Connect your phone line and radio and your ready to go.

After you make a link to your TNC through the modem, you can set CONOK ON and ECHO ON for normal operation. Setting MONITOR ON is not always recommended when occupying busy packet channels. At 300 baud buffers take a while to clear. At this point you'll be controlling your TNC as if you were sitting in your shack. You may want to incorporate battery back-up operation to both TNC and MODEM to avoid problems should power be interrupted. When exiting a modem linked session set MONITOR OFF, BEACON 0, then ECHO OFF. Just before hanging up, send a Cntrl "C" and carriage return to make sure the TNC is left in the command mode.

There are obviously other techniques and features that can be incorporated and it is left up to you to custom design your own system. You may also find other parameters relative to your particular TNC that require attention.

The system has been used as described above with a great deal of pleasure and a minimum of problems while in California. It was even used in emergency training exercises during the hurricane season in So. Florida this year. I had an opportunity to experiment with the system while on a speaking engagement in London two years ago and was successful. Not bad DX, mate.

A data base is being compiled that lists operating notes and parameters for various systems. If you'd like to share ideas, enhancements, etc., I'd like to hear from you.

Look for other unusual packet applications in future issues. Happy packeting wherever you may be.

73,
Marcello Soliven, KJ6QA (in exile)
KJ6QA @ N4JOA.#WPBFL.FL

EOF

# USA → ALLUS

Starting January 1st, the Northern California BBSs will be changing the nation-wide bulletin designator from @ USA to @ ALLUS in order to be more compatible with most other networks. Please keep this in mind if you are sending bulletins. Also remember to use @ ALLUS with discretion. Make sure the information you are sending is of nation-wide importance and will not be rendered obsolete by the delays of up to several days that these messages often experience when relayed over the HF networks.

# Young Folks and Ham Packet Radio

*Travis Wise KB8FOU*

*(Editor's note: Travis is an active 15-year old ham who is working hard to encourage other young people to check out Ham Radio. You may have seen him on a recent TV news broadcast that reported on the Shuttle Columbia contact (WA4SIR) made by the Children's Discovery Museum, or maybe you've seen his packet notes that he distributes on the packet BBSs. We expect great things from Travis!)*

My interest in packet started two years in Ohio when a friend handed me a copy of WB9LOZ's "Introduction to Packet Radio." Before reading that, packet was some ham activity that made those wierd noises on 145.05, but after reading that, I was all ready to get on packet! So the UPS man had just pulled away, and I sat in the driveway unpacking my TNC. There it was! That clean white KAM! But wait, these wires.. Larry didn't say much about this...

I put my TNC on top of my computer, plugged it in as well as I could, but I had to leave those 4 wires (the ones that connect to the radio) alone, because I didn't know what to do with them. One year later, I moved to San Jose, and I bought a book called "Packet Users Notebook." Amazingly, there was the diagram of how to connect those wires! I got the necessary resistors, wired 'em up, and then I was on packet. That was a wonderful day!

My dad (who lives in Ohio, and is now the SysOp of the N8LJX BBS) and I started using packet to communicate. Messages took about a week to get there, but we didn't mind the wait.

Six months ago, I sent out a message to the entire country to see if there were any other young hams on packet. I got about five responses. In August, 1990, I sent out another such message. I got an overwhelming response, and one young ham suggested that I publish a newsletter about young hams. I thought about this for a while, and started gathering articles for the first edition of "The Packet Racket," which I sent out in September. It was a big success! I got replies from all over the country telling me that it was about time someone started a newsletter for young hams. I have continued to receive input for the newsletter, and I have continued to send it out once a month to YOUTH @ ALLUS. Unfortunately, I have been told that some BBS SysOps kill ALLUS messages, so it doesn't reach some parts of the country, but it does seem to be getting very wide distribution.

Over the past few months, you may have noticed messages from teachers requesting "Packet Pals," a kind of electronic pen pal, for their students (some licensed, some not). I have counted (so far) seven such schools. I have been corosponding with about fifteen other young hams nationwide also. As several older hams have pointed out to me, these young hams are the future of ham radio, packet radio included. Taking this into consideration, I am puzzled as to why I have gotten messages from SysOps (only two so far) telling me that packet radio is not the place to be sending out a newsletter for young hams who are on packet. Is this logical? *(Editor again: I know of no BBSs in the Bay Area that block this young ham newsletter!)*

I think it is absolutely terrific that we have ham radio stations (packet stations in particular) in schools and in childrens' museums. I hope this activity will not be stopped by SysOps who think that ALLUS bulletins should be banned, or think that packet radio is not the forum for a youth bulletin.

Well, I'm having a lot of fun with packet radio! I mostly just sit back and "read the mail" when I'm not checking into the N6IIU BBS *(Editor's note: Oh No, not another N6IIU user...)*. I mostly am a "BBS user," but I also enjoy sending messages to friends via their private mailboxes.

In the near future, I hope to get on 9600 baud, and maybe TCP/IP.

Until next time,
73 de Travis KB8FOU
@ N6IIU.#NOCAL.CA.USA.NA

EOF

# Why Hierarchical Addressing?

*Fred Silveira K6RAU*

Several years ago I received a letter from a former elementary school student addressed:

Mr. Sylvra *[not correct spelling]*
Mitchel *[real name Mitchell School]*
Atwater, C *[Atwater, CA 95301]*

I still marvel at the imagination, ingenuity, and dedication of the postal employees who were able to find the correct routing for that letter from its point of origination in Idaho to its destination at Atwater, California.

Unfortunately, computers are not that forgiving and lacking the element of human intuition, using heirachical addressing in message forwarding becomes necessary. Back in the "old days" for a message to forward, generally the callsign of the destination bbs had to be in the forwarding files of the originating bbs.

A new innovation has since come about named "hierarchical" addressing. This allows the bbs forwarding files which once may have been as large as 40 to 50k to be compressed down to about 2k. More than that, the address tells the computer (through the auspices of the software, of course) where to send the message.

In the hierarchical string of "SP KC4MDC @ KB4FO.#SUNFL.FL.USA.NA" the originating system needs only know what bbs within the Lan to forward all Florida messages since it has only to read "FL" within its forwarding files. No longer does the callsign of KB4FO nor any other Florida bulletin board system for that matter need be listed within the forwarding file.

The bottom line then is to use hierachical addressing if there is to be some general guarantee the message will forward. Otherwise, the likelihood is your message will sit at the point of origination until the sysop edits the header.

It becomes self evident—to put "zip" in your forwarding, use **Hierarchical** addressing!

EOF

# The Packet Node Network

*Larry Kenney, WB9LOZ*
*NCPA Education Coordinator*

As I monitor the local packet frequencies, I observe a lot of activity that is simply a waste of the users' time. I see stations attempting to connect direct to nodes or BBSs that are on a different frequency than the one they're using, using paths that are poor when a better path is available, or attempting to connect to a distant node that is impossible to reach. Much of this activity involves the use of the node network, so let's take a close look at ways to improve your node operating skills and help make operating more enjoyable for you.

### Your Local Node

NET/ROM, TheNet and G8BPQ Packet Switch are all names that refer to a packet node, and all are very much alike in the way you use them. KA-Nodes are also available, but their operation is somewhat different and they won't be discussed here at this time.

You use a node by connecting to it, rather than using it in the connect path as you would with a digipeater. First, you need to determine what nodes are located close to you. You can do this by monitoring and watching for an ID or by watching to see what other stations in your area are using. You should always connect to a node that is near enough to you to give you a good quality signal.

To connect to a node, you may use either the alias or the callsign assigned to it, but not both. For example, to connect to the SF:WB9LOZ-2 node, you may enter "C SF" or "C WB9LOZ-2", but NOT "C SF:WB9LOZ-2".

When you connect to a node, your TNC automatically switches to converse mode, just like when you connect to any packet station. Anything you now type is sent to the node as a packet, and the node acknowledges each packet back to your TNC. For the remainder of your connection your TNC works only with this one node.

### The Node Commands

There are several commands available to you once you're connected to a node. The NODES command is one of them. Entering "NODES" or "N", followed by a carriage return, will give you a list of other nodes that you can reach on the network from the node you're using. You'll note that the node list will vary in length and in the calls listed as you move from node to node, since all frequencies are not linked together. Don't attempt to connect to a node that's not in the node list. You'll just be wasting your time. The list gives both an alias ID and a callsign for each node. The alias ID often gives you a hint as to where the node is located, but not always. To find out for sure where a node is located you'll need to get a copy of the descriptive node listings that are available on most packet bulletin board systems. These complete lists give the alias, callsign, location, frequency and other information on each node in the network.

The ROUTES command (abbreviated as R) will give you a list of the nodes seen directly by the node you're using. In this list, the number preceding the callsign is either the type of port or a port number. On NET/ROM and TheNet nodes it indicates the type of port: a 0 is an HDLC port; a 1 is an RS-232 port. On G8BPQ nodes it indicates the frequency port the node is available on. The number following the callsign is the QUALITY of the route. 255 is the best possible quality and means a direct connect via hard wire to a coexisting node at the same site; zero is the worst, and means that the route is locked out. 192 is about the best over the air quality you'll find, and it usually means that the node is only one hop away. If you see a quality of less than 80, you'll probably have a difficult time getting any information through via that route. The last number is the number of other nodes available to you via that route. Any route marked with an exclamation point (!) means that the route values have been entered manually by the owner of the node and usually means that the route is not reliable for regular use.

The USERS command (which can be abbreviated as U) will show you the calls of all the stations using the node you're connected to at that time. There are four descriptions used by the node to describe how users are connected:

**UPLINK:** The station indicated is connected directly to the node.

**DOWNLINK:** The node has made a connection at the request of the first station indicated to the second station indicated. Example: DOWNLINK (K9AT-15 N6UWK) would mean that the node connected to N6UWK at the request of K9AT.

**CIRCUIT:** Indicates that the station has connected using another node. It shows the alias and call of the other node prior to the user's call. Example: Circuit (SFW:W6PW-1 WA6DDM) would mean that WA6DDM is using this node, but he connected to it from the SFW:W6PW-1 node.

**HOST:** The user is connected directly from the node terminal. This is seen when the owner of the node is a user, or the BBS associated with the node is using it to forward messages.

### Connecting to a Local Station

To use the node network to connect to another local station, you connect to your local node and then simply enter a connect request for the station you want reach, such as "C K9AT". It's just as though you were connecting directly from your TNC. The node will then retransmit your connect request and you'll receive one of three responses: "Connected to (callsign)", "Busy from (callsign)" or "Failure with (callsign)". Once you're connected you hold your QSO just as if you had connected direct or via a digipeater. When you're finished, go to command mode on your TNC (Control-C) and enter D <CR> and you will be disconnected from the node and the station you were working.

(NOTE: If the node you're using is a G8BPQ packet switch, it might have several frequency ports. If it does, you'll have to enter a port number between the C and the callsign in your connect request to indicate the frequency you want to use, such as "C 2 K9AT". Enter "PORTS" for a list of frequencies available.)

### Connecting to a "Non-Local" Station

To connect to a station in another area using the node network you first have to know which node is closest to the

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# An Amateur Packet Radio Overview

*Rich Bono (NM1D)*

The following is the result of a non-amateur asking some basic questions about amateur packet radio. Several of us thought that this information would be useful to others who are interested in amateur packet operations. Thanks to Tim Dayger for asking the right questions, and to Patty Winter (N6BIS) for her editing skills. I hope that this will be of help to many others. You may reproduce and distribute this as long as my credits remain.

Our potential amateur packet radio operator asks:

*I've used networks, on-line services, and bulletin board systems (BBS) for years, but I've never really paid much attention to amateur packet radio. I'm starting from scratch, and need to have some idea of where to begin. Just what is amateur packet radio?*

Amateur packet radio is (yet another) digital transmission method available for use via amateur radio. It provides "error free" transmission and reception of messages (information/data/etc.) between two stations. This error-free capability is a prime consideration. Error free in this context does not mean that your typing or spelling mistakes will be fixed, but that all transmitted "data" will be received 100% intact, as sent. In fact, if the data cannot be delivered 100% intact, the transmission is eventually aborted and the user is informed that there is no longer a connection between the two stations.

The "packet" in "packet radio" comes from the method of transmitting your information over the air. Your data is broken up into packets (or blocks) that are transmitted. Each packet contains the sending and the receiving station callsigns and some optional routing information. A packet can contain from 0 to 256 data (or information) bytes. The users normally do not need to be concerned with this "packetizing" of their messages. Each packet is sent and then acknowledged by the receiver when received. If a packet is not received correctly, then it is automatically re-transmitted (up to a maximum number of times). You normally don't have to know about all this to use packet radio. The "packetizing" happens automatically, without any thought or actions required by you.

One of the more popular protocols used for amateur packet radio is known as AX.25. This is somewhat similar to the commercial X.25 standard. There is also a growing TCP/IP user base. If you are not network oriented, then the details of these protocols are not important to you as an operator of a packet radio station.

Be aware that most packet radio operation at this time is at 1200 baud. This will seem slow when compared to what it happening on networks, and on telephone BBSs.... but what is gained is world-wide access, for NO COST. Once you have your equipment, and your license, there are no fees (except for the electricity that your computer and other equipment use). There are a growing number of amateurs who are experimenting with 2400 and even 9600 (or higher) baud operation, so it shouldn't be too long before these faster rates become very popular!

*What kind of equipment do I need, and how do I use it with my PC?*

Since you own a PC, you already own the most expensive part of an amateur packet radio station. The other piece of equipment that you need is the TNC (terminal node controller). The TNC contains all the software and special hardware that you need. It actually contains the modem (to interface with your radio) and (usually) a microprocessor with the packet software contained in EPROM. You interface your PC (or even a simple dumb ASCII terminal) with the TNC via serial RS-232. Use your favorite terminal emulation software on your PC (the same software that you use with your telephone modem will probably work fine). This is just as easy as connecting your computer to a modem. If you don't want to use the serial port of your computer, there are TNCs available that will plug directly into the bus.

If you don't have a PC (personal computer), then almost any RS-232 ASCII terminal will work with most of today's TNCs.

The most popular packet frequencies in the USA are in the two-meter band (144-148 MHz). Check out the following frequencies (they may be different in your area; ask a local amateur if you don't hear anything). Even the typical "police scanner" can be used to listen to these frequencies: 145.01, 145.03, 145.05, 145.07, 145.09 MHz

If the above are busy, many areas also use: 144.91, 144.93, 144.95, 144.97, 144.99 MHz

Yes, this is with an average FM transceiver set for SIMPLEX operation (transmitting and receiving on the same frequency).

If there are packet radio transmissions you should hear a sound like:

***BBBBbbbbbbrrrrraaaaaaapppppppp***

*How much technical or hardware proficiency is required to use a packet radio system?*

If you can plug an RS-232 cable into a modem, and wire the TNC to your radio, then you have all the ability that you need. I am sure that there are hams in your area who would be glad to help you if you are not comfortable with wiring a microphone connector. Most TNCs connect to the microphone plug of an FM transceiver, normally only needing push-to-talk and transmit audio connections, and a connection to the speaker audio output from the FM receiver. This consists of about five wires, and can usually be done without removing the covers of the radio (these are normally external connections).

Installation really is very simple, and once it is done, there is virtually no maintenance. Just plug in your TNC in place of your microphone and external speaker, and you're on the air... to return to voice operation, plug in your microphone. If you like, build a simple switch box to allow easy changing between your TNC and voice operation. I don't recommend it, but some people wire the TNC and microphone in parallel, so that they don't need to change the plugs, or switch anything at all.

*What's out there for me to access via packet radio and what potential is there for growth?*

This is the interesting part! I believe that packet radio is still in its infancy. It seems like every day a new application for packet radio is announced... some are good ideas... others not. By the time you read this, a lot of the information presented here will probably be out of date; yes this technology is progressing!!!

*Continued on page 13*

# The Packet Node Network

*Continued from page 10*

station you want to work and, of course, the other station's TNC and radio must be on with the radio tuned to the frequency that the distant node operates on. You'll have to get this information from the station you want to connect to, perhaps by message through your local BBS. Once you have this information, you first have to see if the distant node is available from the node you're using. Use the NODES (N) command to get the list of available nodes. If the node you want to reach is listed, you can connect to it. If it's not listed, you can't connect from the node you're using, so don't waste your time trying.

For demonstration purposes, let's say you want to connect to N6XYZ. He's told you he uses the the FRESNO:W6ZFN-2 node, so you check the node list to see if it's listed. You find that it is, so while connected to your local node, you connect to the distant node by sending a normal connect request, in this case C FRESNO or C W6ZFN-2. Your TNC will send this as a packet to your local node and your local node will acknowledge it. The network will then go to work for you and find the best path between your local node and the one you're trying to reach. You might have to be a little patient here, as it sometimes takes a few minutes for the connection to be completed. You'll then see one of two responses: "Connected to FRESNO:W6ZFN-2" OR "Failure with FRESNO:W6ZFN-2". If it can't connect for some reason, try again later. It could be that the node is temporarily off the air or the path has decayed and is no longer available.

Once you're connected to the distant node you then connect to the station you wanted to reach. In this case you'd enter "C N6XYZ". Again, your TNC will send this as a packet to your local node and the local node will acknowledge it and send it down the path to W6ZFN-2. W6ZFN-2 will then attempt to connect to N6XYZ. Here you'll get one of the three responses: "Connected to N6XYZ", "Busy from N6XYZ" or "Failure with N6XYZ". If you get connected, you hold your QSO just as you normally would, but there's one BIG difference -- your TNC is receiving acknowledgements from your local node, and N6XYZ is receiving acknowledgements from W6ZFN-2. The acknowledgements do not have to travel the entire distance between the two end stations as they do when using a string of digipeaters. Each node in the path handles the acknowledgement with the next node in line. Because of this, retries are greatly reduced, and your packets get through much faster.

When you're finished with the QSO, you disconnect in the normal manner — go to Command Mode on your TNC and enter D <CR>. The entire path will then disconnect automatically for you.

### Determining Route Quality

I often see stations attempting to connect to distant nodes that aren't accessible or trying to use nodes that really aren't usable due to a poor path. This not only wastes the user's time, it adds unnecessary congestion to the network.

Let's look at a feature offered by the nodes that gives you a simple way to find out if a node is accessible and usable and, if it is, the best route to use to reach it. After you connect to your local node, it's easy to make a quick check of the route quality to any other node. All you need to do is enter N followed by either the alias or callsign of the node that you want to reach, such as:

```
N FRESNO
   or
N W6ZFN-2
```

You'll receive a report showing up to three routes to the node you asked about, how good these routes are and how up to date the information is. If there is no information available, you will receive either "Not found" or the complete node list, depending on the type of node you're using.

Let's take a look at a typical report you would receive after entering N FRESNO. If you were connected to a NET/ROM or TheNet node the report would look like this:

```
SFW:W6PW-1} Routes to: FRESNO:W6ZFN-2
> 105  6  0 WB9LOZ-2
  78  6  0 AL7IN-3
  61  5  0 WA8DRZ-7
```

If you were connected to a G8BPQ node you would see one less column in the report and it would look like this:

```
SF:WB9LOZ-2} Routes to: FRESNO:W6ZFN-2
> 126  6 W6PW-10
  61  3 AL7IN-3
  60  4 W6PW-1
```

Each line shown is a route to the node you asked about. The symbol '>' indicates a route that's in use. The first number is the quality of the route, as previously explained under the ROUTES command, and the second number is the obsolescence count. This number is a 6 when the information for this route is less than an hour old. For each hour that an update on the route is not received, this number is decreased by one. A 5 means the information is an hour old, a 4 means that it's two hours old, and so on. The third number, shown only on NET/ROM or TheNet nodes, is the type of port as explained under the ROUTES command. The callsign is that of the neighboring node that's next in line on the route. Digipeaters are shown if any are used to reach this neighboring node.

This quick check on a node that you want to reach can save you a lot of time. You'll know immediately whether or not the node is available, and if it is, how good the available routes are to it. You then won't have to spend time trying to connect to a node that isn't available or is of poor quality. If you find that there's a decent route to the node you want to reach, it's best to let the network make the connection for you. Simply enter a connect request to the alias or callsign you want. If a route exists but the quality is not very good, you might want to connect to the neighboring node shown for the best route, then do another quality check, repeating this procedure until you find a route with decent quality. You can actually get through to some distant nodes using this method if you have the time and patience to work on it.

EOF

# An Amateur Packet Radio Overview

*Continued from page 11*

Here is a "simple" list that barely highlights some of the available uses of amateur packet radio.. I am SURE that I have forgotten something and left it off the list:

**EMAIL:** At this time we have world-wide email (electronic mail) distribution. I personally have received email from a few continents, and from all over the USA. Of course, this is limited by the amateur radio rules and regulations, so there cannot be any commercial messages.

**Local networks:** Here in New England we have connectivity over most of the region. I can connect to other stations from the following areas consistently: Canada (Montreal), Vermont, New Hampshire, Maine, Connecticut, Massachusetts, Rhode Island and New York. I should note that I am located about 10 miles north of the MA/NH border (in Derry, NH).

Of course, on the HF (high frequency) bands there can be world-wide connectivity, depending on many factors.

**PacketCluster-DX spotting:** This is a specialized system that allows a couple of hundred users to be connected to the same system at one time. It is used by those amateur operators who seek contacts with rare stations throughout the world. When any one user 'finds' a rare station on the air, he simply types the information (call-sign, frequency and mode) into his terminal, and within a minute or so, all of the other users are informed of the rare station!!! So-called "DXers (people who like to hunt these rare stations) LOVE this system. These users can be spread over a wide area. Our local packet cluster system has connectees from Maine to New York.

**DOSGATE:** A system that allows you to execute programs remotely. A DOSGATE system may have many programs for you to use over the air. You don't need to download the programs to use them; you are actually running programs remotely. DOSGATE allows those who don't have a computer to run programs via packet radio.

For example, my DOSGATE system has the following programs available for use by remote packet users:

**AUTOEXAM:** Take sample amateur exams from Novice to Extra. You can use AUTOEXAM as a study guide, or to see if you are ready for a certain license exam.

**SeeSats:** Real time satellite tracking. Informs you of where the current OSCAR (and other) satellites are located.

**AUTOCALL:** On-line amateur radio USA call-sign lookup database. Simply enter the call-sign of any amateur radio operator in the USA and it will print out the name, address, license class and previous call-sign (if any).

**Games:** Several adventure-style games that can be played on-line.

**Repeater database:** A database of many of the repeaters in the area.

**Gateways:** Even though you may not own any HF or UHF equipment (many packet radio operators only use a simple hand-held VHF transceiver), you can gain access to other bands and operating modes by using a gateway. A gateway allows connectivity between two normally non-connectable communication technologies.

In many areas not only are there major BBSs on the standard two- meter Technician class frequencies and the 222 MHz Novice class sub-band, but there are cross-band gateways available as well. A Novice on the 222 MHz band can connect to a station on the 145 MHz band by going through a gateway and be able to communicate with many other amateurs.

**Public Service:** Many packet stations are used to help out with sending messages during disasters. Amateur radio operators help out whenever they can, and many hams have their packet stations ready for portable operation to help when needed. There are many training exercises during each year to help practice and test the readiness of the emergency stations.

**OSCAR Satellites:** OSCAR stands for Orbital Satellites Carrying Amateur Radio. We have our OWN satellites in orbit that are dedicated for amateur radio use. There are some satellites that are dedicated to packet radio (sometimes called "PACSATS"). These are for 'store-and-forward' operations to help distribute packet traffic around the world.

**Bulletin boards:** These carry postings similar to the stuff on Usenet (or telephone BBSs) and often have archives of useful files (such as local ham license testing sites). These are usually the same packet nodes that transport email.

**File transfers:** Better at 56 Kbaud (as some hams are doing), but feasible at 1200 baud. On TCP/IP, you just start it and forget it, so you can do it overnight or at some other time when you don't care whether it takes a while.

**Databases:** In some areas there are HAZMAT (hazardous materials), call-sign, and repeater databases accessible via the network.

**Station-Station:** I almost forgot.. many people simply enjoy chatting with their neighbors.... This could be with people across the street... or in the next state... or half-way around the world!

I am sure that I have missed something. You asked about potential... as I mentioned at the beginning, we are just getting started!!! Many people are just finding out about packet radio. I believe that the only limitation is our imagination!! We could have a world-wide network (we do currently have a 'slow-speed' world-wide network) in the near future... It just takes a little imagination...

*How much will a packet radio set-up cost me? How cost effective is packet radio?*

Well, if you own the PC already... TNCs can be purchased from about $120.00 on up. There are a few for less money, and several that provide for operating on many digital modes in addition to packet radio (i.e., the Kantronix KAM will provide for packet (HF:300 baud/VHF:1200 baud), AMTOR, RTTY, ASCII, NAVTEX, WEFAX, CW (Morse code),...).

If you already own an amateur FM transceiver (or an HF SSB transceiver) then you have all the equipment needed. If not, a two-meter FM transceiver can be purchased for used from $100-250.00, new from $300.00 on up.

Cost effective.... Hmmm, well first be aware that amateur radio cannot be used for any commercial or business purposes... But where else can one get hours (years) of enjoyment and service out of $470.00 ($350 for a radio and $120 for a

*Continued on page 15*

# Report on the 9th ARRL Computer Networking Conference

*Dewayne Hendricks, WA8DZP*

I had the pleasure to attend the annual ARRL Computer Networking Conference which this year was in London, Ontario, Canada. This was the ninth such yearly conference and the number of attendees and papers submitted has grown each year.

The conference this year was jointly sponsored by the ARRL and the Canadian Radio Relay League (CRRL) and took place a very nice site, the London Regional Art Gallery and Museum. This year there were about 140 people in attendance with most of those who were there this year from the Canadian province of Ontario.

This year there were quite a few people in attendance to present their papers. Of the total of 35 papers which were printed in the proceedings, about 25 of the authors were in attendance. Last year's conference had a total of 29 papers submitted. The initial list of speakers in the morning showed only 14 speakers and the schedule had to be adjusted to include time for those who had been dropped from the speakers list. Each speaker was given a total of twenty minutes in which to present their paper. It is safe to say that if the growth in the number of papers submitted continues next year, then the conference will no longer be able to be a single day affair.

The papers were grouped into four subject areas: Satellites, Future Systems, HF and Networking. I will provide brief comments below on the speakers that made the most impression on me. For a complete set of the papers presented at the conference you can get a copy of the proceedings from ARRL HQ for $12.

## Satellites

Harold Price NK6K, presented a summary of the five papers which Jeff Ward K8KA and he submitted on the PACSAT project. The papers describe their solution for the long standing problem of an efficient broadcast protocol which can be used for amateur packet satellites. This protocol is currently being used on UoSAT-14.

Bob McGwier N4HY presented Hanspeter Kuhlen DK1YQ's paper on the upcoming RUDAK II satellite. This effort is all the more interesting as it is a joint effort between Russian and German amateurs. Bob had made a trip to Germany recently to visit the team there and gave an overview of the current RUDAK II design and showed a number of slides of RUDAK II under construction and some of the people involved.

Keith Sproul WU2Z, discussed the work of his brother Mark KB2ICI and himself on long distance packet mail-forwarding via satellite. He discussed his plans to use satellites for the forwarding of PBBS mail over long distances instead of the current HF links.

## Future Systems

Glenn Elmore N6GN who lives here in NORCAL gave an overview of his ideas on how the amateur packet community has been utilizing bandwidth to date and the need to move to higher speed links and how that could and should be done. Kevin Rowett N6RCE, who has been working with Glenn and also lives in the NORCAL area, followed up with a discussion on the HubMaster scheme which they have developed as a possible solution of how high speed networks could be done. They hope to have such a network in operation in NORCAL sometime in '91.

Jon Bloom KE3Z of ARRL HQ presented his thoughts on the future of digital networking in amateur radio. Jon expressed his concerns as to how we are currently making use of the radio spectrum which we have and how we can try to hang on to it in the future. He presented some ideas on what the network of the future will look like and the likelihood that it will be a voice/data network or something else. He pointed out that if amateurs themselves do not address these issues and soon, it will make it that much easier for competing interests to take the spectrum which we now have away from us. This I felt was a very important paper and I recommend that anyone interested pick up a copy of the proceedings and give it a read!

Witt Kinsner VE4WK, presented two papers. One was with a student of his who is not a ham, Mr. A. Langi on a system called Code-Excited Linear Predictive (CELP) which is a coding scheme they developed to aid in the performance of high-quality speech transmission over packet radio. Witt then presented a very good paper on a scheme he has developed for forward error-correction protocols and their application to packet radio when speech is being transmitted. Don Lemley N4PCR, presented his views on the problems associated with current amateur packet radio networks and the need for faster DIGITAL networking hardware and software. As Don has started a commercial venture to pursue offering his solution to amateurs, his remarks centered on the PackeTen System packet switch which his new company now markets.

Phil Anderson W0XI, of Kantronics spoke on three papers which were submitted which present the recent goings on at Kantronics. They now have a 9600 bps system solution on the market and the first paper discussed this in some detail. The next paper was on a new product which should be available in '91. This will be a 19.2 kbps system for operation on 70cm. Finally, Phil discussed the inner workings of the BPQ Node software and its use in packet networks.

## HF

Tom Clark W3IWI, discussed four papers which he submitted on various aspects of HF packet. Tom addressed the future of HF operations and some of the new solutions which will be available soon to enhance these operations. In particular, Tom feels that the future solutions will be digital signal processing (DSP) based. DSPs when in wide use will permit the use of different encoding and modulation schemes which will result in better HF digital operations. Next, Tom discussed the inadequacy of the current message transfer protocols and how they have been causing massive amounts of congestion. He presented a new file transfer protocol which provides a more efficient and robust method for data transfer on HR. Finally, Tom concluded with a discussion of BULLPRO, his proposed protocol for the broadcasting of bulletins on VHF packet.

## Networking

I gave a presentation on my paper which describes the current status of the KA9Q Package for the Apple Macintosh. The current version is based upon the NET version of the code. There are no plans to port NOS to the Macintosh. In-

stead we plan to put out a new system for the Macintosh which will interoperate with the NOS based versions of the KA9Q code. This new Macintosh version will be based upon the new function available in the System 7.0 software to be available from Apple next year.

Phil Karn KA9Q, gave his yearly update on the status of the KA9Q Internet Protocol Package. He gave information on the latest status for NOS and his work to improve its performance at higher speeds. Phil's system at home runs NOS at 56 Kbps. Phil also discussed another paper he presented on a Multiple Access Collision Avoidance (MACA) link layer protocol which he just invented. He hopes that this new protocol will remedy some of the problems which we now see on packet with the use of CSMA.

James Geier, a non-ham, discussed the work that is being done at the Air Force Institute of Technology (AFIT) on automatic routing of packets on HF packet networks.

Frank Warren KB4CYC, ended the day with his discussion of his work on a set of tools which can be used by packet operators involved in handling NTS traffic.

### Conclusions and Observations

After the sessions, we all met later and had a group dinner at one of the local eateries. This was an exercise in uncontrolled chaos! It did give us US citizens a chance to learn what the current exchange rate was for the US Dollar in Canada.

After dinner it was back to the hotel for an evening of informal discussions. A number of people had set up hospitality suites (CRRL and Kantronics, etc.) and there was a lot of neat things on display. I had a chance to see some Ottawa hams running my Macintosh code at 56 Kbps on a Macintosh Plus with the WA4DSY modem, something that I did not think was possible! Bob McGwier N4HY was talking about the latest news on various DSP projects (TAPR and AEA). He was displaying AEA's new DSP-232 box and the TAPR-AMSAT DSP board. The AEA unit will be a standalone unit which will be shipped with over 40 different modems in firmware. It is based on the Motorola 560001 DSP processor and its design allows users to upload new code to the unit as they wish to support new applications. You will no longer have to go to AEA for new EPROMs. Software development tools will be provided for people to write their own applications on the box. The TAPR-AMSAT board is and IBM PC/XT/AT plug-in card that is based on the TI TMS320C25 DSP processor. It will have software similar to that which will be available on AEA's DSP product.

It looks like there is a good deal of activity going on in packet radio these days. As I said earlier, get a copy of the proceedings from the ARRL and dig in. Hope to see you at the next CNC!

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# An Amateur Packet Radio Overview

*Continued from page 13*

TNC, assuming you already have the computer or terminal). Note: This stuff can be contagious.... be forewarned!!

*What legal issues do I need to consider regarding packet radio? Do I need a license?*

Yes, you need a valid amateur radio license. There is (in the southern New Hampshire area) packet radio activity on the Novice bands. But if you want access to the mainstream of packet radio, you will want at least a Technician amateur radio license. (Although, as mentioned earlier, some areas have an active packet radio network that is accessible with the Novice amateur radio license.)

*I've tried reading about amateur packet radio, but a lot of it is Greek to me. Please suggest some reading materials such as books and magazines that my campus or local libraries might carry.*

There are a few books, etc... but I have found that most assume that you already know about amateur radio. You need to find what we call (ready for another term?) an "Elmer." An "Elmer" is a friendly, helping amateur radio operator who will take you under his/her wing to help and guide you as much as you need. I hope that you can find someone to help you... it takes a special kind of person to be an "Elmer." (Gosh, I hate that term.)

Good luck with your packet radio activities. If you find this information helpful, I would be glad to hear from you... How? Simply send me a message via the amateur packet network, NM1D@WB1DSW.NH.USA.NA from anywhere in the world!

EOF

## To All NCPA Members

**The NCPA is in the process of becoming an affiliated organization of the ARRL. As part of this process, we need to know how many of our members are also members of the ARRL. Could those of you who are both ARRL members and members of the NCPA please send me a short note attesting to this via packet or the NCPA PO box address.**

**Thanks and Happy Holidays!!**

**Dewayne Hendricks**
**NCPA Secretary**
**WA8DZP @ K3MC**

# 9600 Baud Packet

*Ron, N6VUW*

The 9600 bps frequency, 145.71 MHz, has been approved by NCPA for "experimental" BBS usage. What that means is that there is only a single 9600 baud frequency available, so BBS operations, TCP/IP operations, etc. will all share the frequency with no operation dominant. When additional frequencies are allocated, there will be dedicated frequencies for each type of operation. To hear what 9600 bps operation "sounds like," tune to 145.71 MHz and listen.....you may be surprised!

### QRV BBSs

WA8DRZ has added a 9600 bps port in Redwood City, joining N6LDL and KA6JLT on 145.71 MHz. Craig has an amplifier and is clearly heard in much of the South Bay. Additional SYSOPS have expressed interest, inquire at your home BBS. There are currently a dozen stations active, which will more than triple when the G3RUH modems have been assembled from the bulk purchase(s) in the next few months.

### G3RUH Modem bulk purchase

The first bulk purchase has been completed, with 19 boards ordered. A second effort is underway, thanks to KB6JZM in the North Bay. There will probably still be openings when you read this (or for a third group buy). The G3RUH modem is available from Pac-Comm and Kantronics (for the Data Engine), or you can build your own for fewer dollars. I can supply the DACs and EPROMs, or if you have your own sources, I program the EPROMs for shipping expenses. Contact me via packet or at the mailing address if interested. Parts may be obtained from several sources in the Bay Area (or from me if you have trouble). Total Cost, complete, is $86.70

### Radio Modifications

There are three hams; WB6QZL, W6PZA and WA6VJY modifying rigs for 9600 bps operation. These are all crystal rigs, while I have received FT-726 or FT-736 modification information from G3RUH. A future column will cover modification details or contact me via packet for immediate information.

### Background

A copy of a 6+ page tutorial describing wiring a 9600 baud packet station can be obtained by sending an 8-1/2" x 11" SASE (2 stamps or a green stamp) to R. Bardarson N6VUW, 9600 Tutorial, P. O. Box 4031, Santa Clara, CA 95054. This is a revised copy of a talk presented to the Project Oscar Seminar. Additional information is available in the bi-weekly bulletins I release, which N6QMY maintains in a file section on his BBS. Drop me a note if you wish to be added to the distribution list. Finally, you can reach me via packet N6VUW @ K3MC.#NOCAL.CA and I'll be glad to assist you in setting up a station. My 9600 baud packet station is portable and can be used to help others getting on the air. Send comments, questions, or column requests to N6VUW @ K3MC.#NOCAL.CA,

faster bits de ron.

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# SAREX and DXers share 144.95

*Jay O'Brien, W6GO*

The SAREX STS-35 mission is now history. There were no reported instances of harmful interference to any PacketCluster™ operations on 144.95. Reports from Northern California, the East and the South all agree. For instance, the K6LLK node reported as many as 23 stations calling WA4SIR during a shuttle pass. There were no negative effects on the PacketCluster node or its users. Fortunately, the shuttle passes were all during periods of very low PacketCluster activity.

AMSAT requested the DX PacketCluster nodes to remain operational on 144.95 and collect data on interference received from SAREX, as part of the SAREX experiment. To make the "experiment" meaningful, PacketClusters would have had to simulate the high levels of activity experienced during a major activity, such as an International DX Contest, distributing a DX spot packet every minute to 32 connected users. As artificially stimulated DX spotting activity during SAREX could have caused interference to those attempting to contact the shuttle, a controlled test was used to determine PacketCluster's susceptibility to interference from SAREX callers.

Six of the twelve Northern California and Nevada DX PacketCluster nodes share 144.95. They commissioned a "simulated SAREX" test in November at their San Jose area node. With only six stations calling SAREX for exactly ten minutes during a period of simulated high activity, the node was paralyzed, disconnecting two-thirds of its users. The high level of DX spotting activity which was simulated for the test only occurs a half-dozen or so times each year, during the major contests for which the PacketCluster nodes were designed and installed to support.

STS-35, however, showed that during periods of low activity on PacketCluster networks, PacketCluster can share the frequency with SAREX missions of the STS-35 type that impact any one node for a half-hour at a time or less.

SAREX callers received guidance from local AMSAT representatives, ARRL bulletins and the Amateur news media which reminded them that PacketClusters were using 144.95. As a result, their activity was concentrated during the 10 minute shuttle passes, thus minimizing interference to PacketCluster.

Based on the San Jose test and on the STS-35 mission, it appears possible to work out a plan with the SAREX organization that will satisfy the needs of both DX PacketCluster and SAREX. One where PacketCluster operations are not stimulated during space missions, and where space missions do not use 144.95 during major contest weekends.

We have been attempting to establish a dialog with ARRL, AMSAT and SAREX which could result in such an agreement. Perhaps now that STS-35 is behind us, we will see a breakthrough in our efforts to get support from the ARRL in carving out a meaningful agreement with AMSAT, to whom the ARRL has delegated the responsibility to make the frequency selection and usage decisions for the next mission, STS-37.

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# NCXPN

## Northern California AX.25 Packet Network

*Phil Marcelis, KB6TKL*
*NCXPN Director*

I'd like to extend my thanks, once again, to those who attended the NCXPN meeting. I think the meeting went rather smoothly and was fairly productive. It was good to get some discussion going and from the discussion a few good points were brought up.

Jeff (KH6JUZ) expressed his desire to make people think about looking into higher baud rates and higher frequencies. 9600 baud is getting cheaper every day, while the existing frequencies allocated for 1200 baud are getting increasingly crowded.

Some concern was also expressed at the fact that there are currently no user frequencies allocated in the 220 MHz Novice band.

Fred (K6RAU) stressed the fact that, at 1200 baud, based on the number of BBSs currently operating on the allocated frequencies, the addition of more BBSs will seriously impede the throughput of our LANs. As Roy (AA4RE) has pointed out, new frequencies are nearly impossible to allocate to packet, so the solution would seem to be to increase the baud rate. Something to think about, anyway.

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# NCXPN meeting notes

## December 2, 1990

The meeting took place at the Apple Computer facility in Fremont at 10:30am.

In attendance were: KB6TKL, KC6PKZ, N0ARY, N6QMY, K6RAU, KH6JUZ, KE6LW, WB9LOZ, KB8FOU, W6ZRJ, N6LDL, WD6CMU, and KC6PKW.

Larry (WB6LOZ) brought up the topic of Route Coordination and Forwarding. There's been lots of inefficiency noticed in the paths chosen for routing messages. A general note was brought up reminding us that although there are many paths to any one place, messages should follow the paths that everyone has agreed upon. All other paths are to be used in emergencies that require them.

On the topic of evening out the distribution of BBSs on SBAY, NBAY, etc., it was mentioned that DRZ and JLT might be moving to SBAY. N6IIU has been doing some tests on coverage, and other BBSs might be moving, also. The issue of LAN loading was eased a little with this news.

Walter (N6LDL) commented that the LAN gateway plan should be followed more closely. Too much forwarding on the user ports is creating unacceptable delays and is discouraging users. The idea of having Gateways initiate all forwarding was brought up. A need for alternate gateways in each LAN was expressed.

Fred (K6RAU) proposed to withhold new sanctions from BBSs that do not have separate user ports and forwarding ports (on frequencies coordinated for those specific purposes) after January 1, 1991. This proposal passed unanimously. It was requested that the frequency coordinator should send the bandplan in the form of a bulletin to NCXPN @ NCPA at the same time that it's published in the NCPA Downlink. Eric (WD6CMU) agreed to contact Roy (AA4RE), the NCPA Frequency Coordinator.

A motion to change #NOCAL hierarchical designator to #NOCA, or more regional LAN selections like #SBAY, #NBAY, etc., died due to lack of a second.

A motion to change USA to ALLUS effective Jan 1st was accepted and passed.

Some people have noticed mysterious changing of forwarding designators. Barry (KE6LW) is in process of investigating this. Barry has experienced some disconcerting messages due to the fact that EMail meant for the local Sacramento area has been ending up at ALLCAN.

WD6CMU proposed that SysOp guidelines be amended to suggest keeping log files for at least one month. Barry, as BBS Standards Coordinator, agreed to incorporate this suggestion into his BBS Operation Guidelines.

There was a brief discussion about the status of the network, ie - what's connected to what, how users can find out about the links; K6RAU reported that the AMT forwarding chain will be going down soon.

The meeting ended around 12:30pm, and another productive NCXPN meeting in the bag! EOF

# NCPA Emergency Coordinator Column

*Steve Harding, KA6ETB @ N6LDL*
*NCPA Emergency Coordinator*

At a recent BoD meeting (see the minutes in this issue), NCPA appointed an emergency coordinator. When asked for volunteers for this position, I tripped when everybody else took one step back.

The job description for this position is vague. I think the best description is to find ways that the digital radio community can best serve in an emergency situation, such as the Loma Prieta earthquake.

The issues I hope to address are:

- Better ways of handling H&W traffic.
- Helping ARES/RACES groups take best advantage of amateur digital radio.
- Working with local, regional, and state agencies to define communication issues, and find ways in which the various NCPA "special interest groups" can help. During the aftermath of the earthquake packeteers did an exceptional and admirable job of keeping the traffic moving. Each of the special interest groups worked hard, but there was little, if any, communications among the group.

So, as I see it, as the newly appointed emergency coordinator for NCPA, one of my duties is to devise a plan that will take the best advantage of the various packet disciplines (BBSs, keyboard to keyboard, DX spotting clusters, TCP/IP, and even ApLink). For this I need your help. If you have any ideas on how to best take advantage of your favorite digital mode, I'd like to hear them. If you have any ideas on how we can pass traffic from one mode to another, I'd like to hear that, too. EOF

# NCPA Board Meeting Minutes

*Dewayne Hendricks, WA8DZP*
*NCPA Secretary*

NCPA Board of Directors Meeting Minutes Meeting of October 21, 1990

The NCPA BofD met on October 21, 1990 at the Apple Computer plant in Fremont. Present at this meeting were the following board members:

WA8DZP WD6CMU KA6ETB KB6OWT WB9LOZ

Also in attendance were:

KC6AND N6VUW N0ARY N6XIB N6LDL K3MC K6RAU KB6TKL KH6JUZ W6ZRJ KD6AZ

## Business

1. W6ZRJ announced that Fred K6RAU had been appointed Assistant Director for Packet Radio for the ARRL Pacific Division.

2. WA8DZP proposed the all future BoD meetings have an open session and a closed session for board members only to discuss organizational issues as might be necessary. This motion passed unanimously.

2. K3MC announced that the next newsletter editorial meeting will be on Dec. 2nd. The next issue of the newsletter is slated to hit the press in January.

3. WA8DZP reported that Pacificon was a smashing success for NCPA. We signed up 65 new members and raised $752. NCPA sponsored two sessions on packet radio at the convention and they were all well attended.

4. The board discussed the possibility of putting on a packet radio seminar for amateurs in NORCAL next year. WB9LOZ was tasked with organizing this seminar and reported back to the board at its next meeting.

5. The board discussed the printing and distribution of WB9LOZ's paper "Introduction to Packet Radio" to raise funds for NCPA. The board agreed to print the paper and distribute it to all interested parties. NCPA members will get no discount on the cost. The board also agreed to have the officers look for other suitable material which could also be published by NCPA.

6. The next ARRL Computer Networking Conference was supposed to be in Washington, D.C., but for some reason that fell through. The NCPA has been asked if they would be interested in sponsoring and arranging the conference. The board passed a motion to make an attempt to win the conference for the Bay Area.

7. The board passed a motion to make the NCPA an affiliated organization of the ARRL. WA8DZP was instructed to contact the ARRL and make the necessary arrangements.

8. K3MC reported to the board on the last NARCC meeting which he attended. He stated that the NARCC constitution has been changed to allow only holders of repeater sanctions will be able to vote at general meetings. The board discussed the relationship of NCPA to NARCC and decided that there was a good deal of confusion as to how our roles currently overlap. The board voted to send a letter to the BofD of NARCC to propose a joint meeting between the two organizations with the purpose of clarifying our relationship.

9. The board passed a motion to have the NCPA Freq. Coordinator (AA4RE) develop proposed 220 MHz band plan to accommodate the loss of 220-222 MHz and present it to the board at their next meeting.

10. The board passed a motion to allow coordinated BBSs operating at 9600 bps on 145.71 MHz but with a footnote to the listing stating that this status was for experimental purposes only.

11. The board authorized the use of 223.56 in the Monterey Bay area for shared keyboard-to-keyboard use and forwarding.

12. WD6CMU appointed KA6ETB as the NCPA Emergency Coordinator. KA6ETB is to organize a committee of technically knowledgeable packet radio experts to assist emergency organization, public service, marathons, etc. on packet technology and its applications.

13. The board accepted the resignation of Bob Snaders WA7JCW from the board.

At this point the open session of the board ended given the new rules voted in today and the board meet in closed session.

# Kantronics Digital Seminar

*Eric Williams WD6CMU*

Kantronics will be holding a free digital seminar on May 19th at the Holliday Inn Crowne Plaza, 600 Airport Bl., Burlingame. This is a beginner's forum, taking you from an introduction to packet technology, all the way through hooking up your TNC and making your first packet QSO. At each of the four sessions, a drawing from the list of registrants will be made for Kantronics digital products. Contact Kantronics at 913-842-7745 for more information.

## Schedule

| | |
|---|---|
| 9:30am - 9am | Registration for Session 1 |
| 9am - 10:30am | Session 1: Overview of Packet Radio |
| 10:30am - 11am | Registration for Session 2 |
| 11am - 12:30pm | Session 2: Connecting Your Equipment |
| 12:30pm - 1:30pm | Lunch break, Registration for Session 3 |
| 1:30pm - 3pm | Session 3: Getting On The Air |
| 3pm - 3:30pm | Registration for Session 4 |
| 3:30pm - 5pm | Session 4: Open Forum |

## NCPA Directors

Eric Williams, WD6CMU
WD6CMU @ WD6CMU

Chris Marley, N6RAL
N6RAL @ N6IIU

Michael Bothe, KB6OWT
KB6OWT @ K3MC

Steve Harding, KA6ETB
KA6ETB @ N6LDL

Patrick Mulrooney, N6QMY
N6QMY @ N6QMY

Dewayne Hendricks, WA8DZP
WA8DZP @ K3MC

Larry Kenny, WB9LOZ
WB9LOZ @ W6PW

Tom Wood N6IXX
N6IXX @ KA6FUB

## NCPA Officers

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Eric Williams, WD6CMU
WD6CMU @ WD6CMU

Vice-President:
Michael Bothe, KB6OWT
KB6OWT @ K3MC

Secretary:
Dewayne Hendricks, WA8DZP
WA8DZP @ K3MC

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Patrick Mulrooney, N6QMY
N6QMY @ N6QMY

Newsletter Editor:
Mike Chepponis, K3MC
K3MC @ K3MC

Frequency Coordinator:
Roy Engehausen, AA4RE
AA4RE @ AA4RE

# Where to Find a BBS

| | | |
|---|---|---|
| N0ARY-1 | Sunnyvale | 144.93 |
| KE6BX | Hollister | 144.93 |
| KJ6FY-1 | Benicia | 144.93 |
| KI6YK | Danville | 144.93 |
| WD6CMU | Richmond | 144.97 |
| N6EEG | Berkeley | 144.97 |
| W6FGC-2 | Twain Harte | 144.97 |
| WW7G-1 | Del Rey Oaks | 144.97 |
| N6LDL | Los Gatos | 144.97, 145.71[1] |
| KI6WE | Pleasant Hill | 144.97 |
| KD6XZ-1 | Sacramento | 144.97, 441.50 |
| AA4RE-1 | Gilroy | 144.99 |
| KA6FUB | Martinez | 144.99 |
| KB6DUI | Boulder Creek | 144.99 |
| N6MPW | Ben Lomond | 144.99 |
| N6OA | Lemoore | 144.99 |
| W6PW-3 | San Francisco | 144.99 |
| WA6RDH | Dixon | 145.01 |
| KG6EE | Santa Cruz | 145.07 |
| KI6EH | Santa Cruz | 145.07 |
| N6IIU-1 | Palo Alto | 145.07, 223.56 |
| KE6LW-1 | Yuba City | 145.07 |
| KG6XX-1 | Carmichael | 145.07, 441.50 |
| W6CUS-1 | Richmond | 145.09 |
| N6ECP | Redding | 145.09 |
| KB6IRS | Soquel | 145.09 |
| N6IYA-2 | Felton | 145.09 |
| K3MC | Fremont | 145.09 |
| WA6NWE-1 | North Highlands | 145.09, 441.50 |
| K6RAU-1 | Merced | 145.09 |
| WA6YHJ-1 | Livermore | 145.09 |
| W8GEC | Boulder Creek | 145.73 |
| WA6HAM | Pittsburg | 145.73 |
| KB5IC | San Jose | 145.73 |
| KA6JLT-2 | Menlo Park | 145.73, 145.71[1] |
| WB6ODZ-1 | Lake Isabella | 145.79 |
| N6QMY-1 | Fremont | 145.79 |
| N6REB-2 | Modesto | 145.79 |

[1]Experimental 9600 baud port, subject to change

# The Band Plan

**50MHz**

| | |
|---|---|
| 51.12 | SOCAL backbone |
| 51.14 | Experimental |
| 51.16 | Kybd to Kybd |
| 51.18 | Experimental |

**144MHz**

| | |
|---|---|
| 144.91 | keybpard-to-keyboard |
| 144.93 | LAN[1] |
| 144.95 | DX Spotting Network |
| 144.97 | LAN |
| 144.99 | LAN |
| 145.01 | keyboard-to-keyboard |
| 145.03 | keyboard-to-keyboard |
| 145.05 | keyboard-to-keyboard |
| 145.07 | LAN |
| 145.09 | LAN |
| 145.71 | 9600 baud TAPR compatible |
| 145.73 | LAN |
| 145.75 | TCP/IP |
| 145.77 | DX Spotting Network[2] |
| 145.79 | LAN |
| 146.58 | DX Spotting Network |

[1]Used by TCP/IP in the Sacramento area

[2]WO6Y remains on 145.77 as DXPSN/BBS liaison

**220 MHz**

| | |
|---|---|
| 220.80-220.89 | Experimental |
| 220.90 | Superbackbone |
| 220.91-221.00 | Experimental |
| 221.04 | DX Backbone |
| 223.42 | node uplink (SBAY) |
| 223.52 | node uplink (NBAY) |
| 223.54 | node uplink (EBAY) |
| 223.56 | keyboard-to-keyboard[1] |
| 223.58 | node uplink ("Other") |
| 223.60 | node uplink (SACVAL) |

[1]Shared with BBS forwarding in Monterey Bay area

**430 MHz**

**100KHz-wide channels**

| | |
|---|---|
| 433.05 | TCP/IP |
| 433.15 | NET/ROM backbone |
| 433.25 | DXPSN backbone |

**20KHz-wide channels**

| | |
|---|---|
| 443.31 | backbone |
| 443.33 | backbone |
| 433.35 | backbone |
| 433.37 | backbone |
| 433.39 | backbone |
| 433.41 | LAN interlink |
| 433.43 | 9600 baud TAPR compatible (pending) |
| 433.45 | digital experimental & backbone |
| 433.47 | NET/ROM interlink, keyboard |
| 433.49 | TCP/IP |
| 441.50 | all |

**No channelization has been done for these bands. Some activity is present.**

903-905 Mhz
915-917 Mhz
1248-1252 Mhz

## What is NCPA?

NCPA, the Northern California Packet Association, is an organization formed to foster the Digital Communications modes of Amateur Radio. So far, we have defined our goals as:

- Education
- Coordination

Education means making information available about various Digital modes, and this newsletter is but one part of that education process.

Coordination activities include frequency coordination (NCPA is recognized by NARCC as the official packet radio frequency coordinator) as well as coordinating people and their various uses of packet radio, be they DX Cluster, BBS, TCP/IP, keyboard-to-keyboard, NET/ROM, Traffic/NTS, Emergency uses of packet, or even experimenting with new frontiers of various digital modes.

We in NCPA believe that the next revolution in Ham Radio will come about in Digital Communications Technology, and in the beneficial coordination among all users of ham Digital Communications Technologies.

We invite you to join NCPA! Become part of the most dynamic group of packet folks in Northern California!

NCPA *Downlink*

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**First Class Mail**