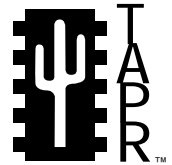




PACKET STATUS REGISTER



TUCSON AMATEUR PACKET RADIO CORPORATION

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President's Corner by John Ackermann, N8UR



Who Am Us, Anyway

What is TAPR? Actually, the question should be “who is TAPR?” because this isn’t some faceless, distant organization. Instead, TAPR is several thousand people who share a common interest in the technical side of Amateur Radio. They support this organization because they believe in what it — we — can do. They are still thrilled by idea of doing something new with ham radio

That’s the great part about being one of TAPR’s leaders. I hear from people all over the world who want to do cool stuff with Amateur Radio. I get to see new ideas batted around on the TAPR mailing lists, knowing that some of them will turn into new products, projects, and protocols for the ham community. This interaction convinces me that ham radio is a vibrant thing; those who think it is an obsolescent hobby just haven’t looked in the right places.

The not-so-great part about sitting in the driver’s seat is seeing that we, the Amateur Radio community in general and TAPR specifically, have problems. We live in a world where people are busier than they’ve ever been

Tucson Amateur Packet Radio Corporation *Packet Status Register* Newsletter

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Submission Guidelines for *PSR*:

TAPR is always interested in receiving information and articles for publication. If you have an idea for an article you would like to see, or you, or someone you know, is doing something that would interest digital communications, please contact the editor (psr@tapr.org) so that your work can be shared with the Amateur Radio community. If you feel uncomfortable or otherwise unable to write an article yourself, please contact the editor for assistance. Preferred format for articles is plain ASCII text (Microsoft Word is acceptable, please save the document as Rich Text Format - .RTF). Preferred graphic formats are PS/EPS/TIFF (diagrams, black and white photographs), or TIFF/JPEG/GIF (color photographs). Please submit graphics at a minimum of 300 DPI.

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Continued from page 1

and where free time is a precious commodity. Volunteering can be tough when you're already busy with other commitments every day and most evenings. Ham radio organizations and hobby organizations in general have seen difficult times recently, at least in part due to the competition for leisure time.

TAPR is a volunteer organization. We have no full-time staff. The compensation that office manager Laura Koster receives for giving up a large chunk of her home and her time to TAPR doesn't come close to matching the value she provides. No one else in the organization receives any compensation at all; the bags full of parts you receive in a TAPR kit were ordered, inventoried and packed by volunteer hands.

I mention this because sometimes I think we've done too well at presenting a professional image to the community. We don't have a staff of operators standing by to take your call, and we don't have a huge shipping department

loading 747s with PIC-E kits. We do have a very dedicated group of volunteers who run the office, do their best to answer your questions, and work like mad to put kits and other products into your hands. I'm very proud of this team who volunteer their time to keep TAPR running, and as members, you should be proud of them too. But sometimes we're not able to be as responsive as a "real" company.

We do the best we can, but ask for your understanding if we're not able to answer your email or process your order as quickly as we'd like. We are working on improving our processes so that we can be more responsive, and we hope that you'll see improvement in the future. But please remember that the person at the other end of the line is a volunteer who is there because they love this hobby.

Another common misconception is that TAPR has a group of engineers in white lab coats just waiting to turn your idea into a kit. We get quite a few emails from people saying, "You should offer this product..." Unfortunately, all of our products also pass through purely volunteer hands between conception and production. TAPR has a great strength in its ability to provide the last 25% of the effort needed to turn a working prototype into a kit or product ready for sale. We have folks who can help with PCB layout, documentation writing, component gathering, and beta testing. In short, our strength is turning a working design into a reproducible and supportable product.

However, we have to rely on you to do that first 75% — having the great idea, designing the circuit, lashing together a prototype, debugging it, and doing basic documentation (i.e., readable schematics and notes). Anyone who brings us a prototype in that stage of readiness has a really good chance of finding TAPR willing to take it from there (assuming, of course, that a reasonable number of folks are likely to be interested in it).

We'd love to see more members bringing more projects to TAPR. We want to continue offering "enabling technology" products in both simple and complex forms. But we need you to understand the constraints of a volunteer organization. By the way, we're always looking for volunteers to help us expand our ability to bring new products forward. If you'd like to help, please let us know.

Hamvention

With luck, you'll be reading this just before Hamvention. TAPR will be there in force. We have the TAPR Digital Forum on Friday morning, starting at 10:00 in Room 1. The annual "Digital BASH" dinner will be held Friday evening. We're very pleased to have Bdale Garbee, KBOG, as the keynote speaker for the BASH this year. Bdale is a longtime TAPR supporter, and was just elected Project Leader of the open source Debian Linux distribution. Bdale's talk will touch on many of the neat things he's done both in the radio and computer communities, and promises to be one of our best ever. If you're going to attend Hamvention, you shouldn't miss this year's BASH.

There's more information about both the BASH and the Digital Forum elsewhere in this issue of *PSR*.

Speaking of Volunteers...

I mentioned above the role that volunteers play in TAPR. Those volunteers are responsible for some of the most demanding tasks in the organization, and now I want to give special thanks to one

of TAPR's unsung heroes. Joe Borovetz, WA5VMS, is our "parts guy." Joe manages TAPR's inventory of tens of thousands of parts of all shapes and sizes. He pulls the parts required for each kit and makes sure that we have adequate quantities on hand. He knows the order folks at Digikey, Jameco and many other suppliers by first name. Mention a component type and value, and Joe will know whether we have it, where to get it, and whether we have something else "that just might work."

Running the parts room is a tough job, requiring meticulous attention to detail and offering few opportunities for glory. Joe has done this job for five years now, and TAPR — and everyone who's bought a TAPR kit — owes him big time for his hard work. Thanks, Joe!

That's it for now. If you make it to Hamvention, please stop by and say hello. And don't forget about the DCC coming up this September in Denver.

73, John N8UR

Call for TAPR Board of Directors Nominations

The current members of the TAPR Board of Directors and the expiration dates of their three-year terms are on page 2 of this newsletter. Nominations are now open for seats expiring this year (N7HPR, N2GDE, and K4HG).

The responsibilities of a board member include:

- 1) Attendance at both board meetings each year. (One is held at the Dayton Hamvention in May, the other at the Digital Communications Conference in September.)
- 2) Regular participation with the continuous board session, which is conducted over the Internet.

To place a person in nomination, please remember that he or she must be a member of TAPR. Also, confirm that the individual is willing to have his or her name placed in nomination. Send that person's name (or your own if you wish to nominate yourself), call sign, mailing address, Internet address, phone number(s) and a biographical sketch to the TAPR office no later than June 15th, 2002. Ballots will be mailed to TAPR members in late July.

Show that you are a member! Get a mug and help support TAPR.



TAPR Project Status

by Steve Bible, N7HPR

DSP-10

The first kitting of the W7PUA DSP-10 is sold out. One hundred fifty kits have found new homes and we are seeing more activity on the DSP-10 list. We are planning a second kitting. No time line has been set. If you are interested in a DSP-10 kit, send email to n7hpr@tapr.org.

EasyTrak and EasyTrak Jr.

Very little progress has been made on EasyTrak and EasyTrak Jr. N7HPR has been busy with his new career and move. But things are starting to settle down and his workshop is very close to being completed. So, we hope to see more activity on this popular project.

Digital Voice

A new digital voice web page has been constructed. See <http://www.tapr.org/tapr/dv/digitalvoice.html>. A new project manager has taken over the reigns of the VOCODER project. Brad Noblet, WA8WDQ, is organizing and planning. Keep an eye on the new digital voice web pages for status updates on this exciting project.

Precision Timing

There is a lot of interest in precision timing in ham radio. Everything from accurate time to accurate frequency generation for local oscillators in radios like the DSP-10. TAPR is looking at potential projects in this area including a web page filled with information.

Do You Have a New Project?

Do you have a project that you would like see become a kit? How about a project that you would like to write about and share with the amateur community? TAPR is always actively looking for project managers to champion projects and kit designs. We will help you get your idea out. Be prepared, it is a lot of work to bring a project out as a kit to the masses. But it is a unique experience. Contact N7HPR@tapr.org if you are interested.

Using Computers In Harsh Conditions

Article by Don Rotolo, N2IRZ

Still today, the primary mode of operation for Amateur data networks in North America is Packet. The TNC-2 still serves many sites, although most sites do not rely upon unintelligent hubs (such as a diode matrix) for interconnection. With the massive price drops in PC hardware these past years, a '486 is now obsolete and a Pentium can probably be had for free. These PCs, though now considered ancient, serve Amateur Radio as intelligent routers, switches and even plain old hubs.

A Pentium running Linux or DOS (or even Windows!) is more than powerful enough for network service. And, even though most of the network sites I'm acquainted with are located in someone's house, occasionally we have the use of a fantastic remote site. Whether it's high upon a hill, or deep in a building, access to the site may be limited, and conditions less than hospitable to your run-of-the-mill computer.

The solid-state electronics in a computer don't really fail unless subjected to extremes. It turns out that it is the mechanical components, which have the lowest MTBF (mean time between failure). If we eliminate the mechanical components, and then take actions to stabilize the environment, it is possible to have a computer deemed worthless provide excellent Amateur Network service for years.

First, let's rid ourselves of the mechanical components, then we can discuss thermal management.

Before we get started, let's revisit the basic premise: mechanical components are the weak point of a remote computer. Well, yes, they are, but not nearly as weak as you might think. The three biggies in a computer are the power supply fan, the CPU fan and the hard disk. All three have MTBFs measured in the tens or hundreds of thousands of hours, maybe more. Since there's about 8760 hours in a year, if you can live with a failure every few years or so, then you probably don't even need a hardened PC.



Figure 1: The mountaintop site of the Ramapo Mountain ARC, WA2SNA. This cabinet has AC power and is easily accessible, even in winter. Some node sites aren't as lucky. One of the computers runs the FlexNet node, the other runs NOS. Neither computer is modified for outdoor operation, and both have survived for a few years without problems.

While the temperature extremes in a small metal cabinet high upon a mountain in winter might seem the worst possible environment for electronic gear, cold is not nearly as foul an enemy as is heat. The cold can be driven away by a small electric heater, such as a light bulb, or even by the CPU's own waste heat. A very hot environment, however, is difficult to cool down below the ambient temperature. Of course, the MTBF of just about everything drops rather quickly as temperature rises, so you need to control the heat effectively to avoid having to visit the site frequently. More on that in a moment.

First, the power supply fan. Yes, you can just let it keep running, and when it fails, it fails. That's my suggestion, but if you really don't want to let that fan spin... If you use a relatively large power supply - say, 300 watts - and run it at a small fraction of that - like 80 watts - you won't have serious heat problems. The power supply can get quite hot before it starts acting funny, or suffers a reduction in reliability, so disabling the fan isn't a problem. I also have seen fanless power supplies, which cost a bit more. I don't recommend going inside the power supply and adding heat sinks, just because of the chance of creating a dangerous situation.

To reduce load on the power supply, take out everything you don't need, and run the CPU at a much slower clock speed than designed. For example, a 133-MHz Pentium at 25 MHz will run with just a heat sink - no CPU fan - and remain just barely warm to the touch. Not only does it consume less power, you can eliminate the CPU fan, mechanical item #2. Also, pull out any unnecessary cards - modem, sound card, CD ROM adapters and so on. Just a video card, and a cheap VGA one at that. Runs cooler, less power too.



Figure 2: The TAPR CompactFlash Adapter Card, with a 10-Mbyte Kodak CompactFlash card. The adapter card turns the CompactFlash card into a 100% IDE compatible solid-state hard disk, able to operate from -25(C to +75(C, perfect for those cold mountaintops and hot deserts.

Last is the hard drive. If you're in an area where condensing humidity isn't a big problem, you can boot off a floppy drive and just run RAMDISK, but that's not always practical. The slower the hard disk (RPMs), the cooler it tends to run. Hard disks become very unhappy above about 125F (51C), so if you expect temperatures at or above that range, you need a strategy.

One strategy is to force air across the HDD to help maintain temperature. You should expect a temperature at the HDD case of about 20F above ambient (I haven't measured this, though), so in places where it can get over 100F in the shade, you need to do more. And, of course, you've just introduced a new fan into the picture. Assuming air conditioning isn't possible, you need another strategy.

Peltier devices might help bring a marginal situation back into the green, but this won't work in Nevada in the summer. A Peltier device is a solid-state heat pump, which can move a dozen watts or so over a few inches. Give it 12 volts, and one side of a 1.5" square flat plate gets cool and the other side gets hot. You need either a huge heat sink or (oh no!) a fan to remove the heat, or the device will self-destruct. Personally, my experience with these has been less than stellar.

Another possibility is to use a solid-state hard disk. Being a TAPR member, surely you've heard of the CompactFlash Adapter Card. This is a passive adapter, which uses commonly available CompactFlash modules to create a solid-state hard disk, which is 100% IDE compatible. This means that as long as you set the parameters in the computer's BIOS correctly, it is a hard disk, plain and simple. The size is limited only by your available cash. CompactFlash cards are used in many devices, particularly digital cameras, as an alternative to floppy disks or other storage media, and \$100 buys tens of Megabytes.

Nothing could be simpler to use, either. After setting the drive's parameters in BIOS (a table of parameters is included in the instruction manual), you connect the card like any other IDE drive, plug in the power connector, and boot the PC from a floppy. Then, you run FDISK to create a DOS partition and make it bootable, format it, and load all the necessary software. The adapter card is small, so it will fit anywhere, and draws very little power. For details, browse <http://www.tapr.org/tapr/html/cfa.html>.

In discussions, the question of the CompactFlash (CF) card's longevity was brought up. Like all solid-state nonvolatile storage devices, it has a definite lifetime in terms of read/write cycles. For those running FlexNet, which updates the HEARD.FPR file every minute or so, how long can we expect a CF card to last? I asked that question of Bill Frank, a technical representative at the CompactFlash Association, an industry group dedicated to promoting CF technology. <http://www.compactflash.org>.

It turns out that each memory cell in a CF card has a lifetime of hundreds of thousands of cycles, and CF cards use intelligent wear leveling routines, which ensure that no particular area of the CF card is worn out prematurely. The lifetime depends upon the percentage of the CF card that is rewritten each time, so writing a 500-kbyte file to a 48-Mbyte CF card once a minute would result in a lifetime of about 36 years, and this number increases as the file size decreases. In other words, for a 10-kbyte Heard file, the card would easily outlast the CPU.

The TAPR adapter card costs \$49 for members and \$59 for nonmembers, plus shipping and handling.

The idea is to boot off the CompactFlash card and then use RAMDISK for your working disk. Yes, you do have the risk of losing everything if the power fails, since RAMDISK uses volatile system RAM, but you ARE running everything off a UPS, right? OK, at least some 12-volt gel cells and a cheap power inverter...

To set up the RAMDISK in DOS, you load RAMDRIVE.SYS with a DEVICE command in the CONFIG.SYS file. Assuming you want to run RAMDRIVE in extended memory (memory above the 1-Mbyte level), you first have to run HIMEM.SYS, then RAMDRIVE.SYS. As an example, use the following line somewhere after HIMEM.SYS in the CONFIG.SYS file:

```
DEVICE=RAMDRIVE.SYS 4096 /E
```

The 4096 is the size of the disk in kilobytes, and the /E switch causes it to be placed into extended memory. For much greater detail on RAMDRIVE.SYS, use the on-line help utility provided with MS DOS: From the C:> prompt, simply type HELP RAMDRIVE.

Lastly, we have some thermal management tips. Foam insulation is a great way to manage heat. It typically has an R-value of 10 per inch, so a little goes a long way. A 4' x 8' sheet of 1" thick material is under \$30 at the local Home Depot. First, get yourself a pair of cheap thermostats, the old mechanical kind with the bimetallic spring. Be sure the contacts are rated for 110 VAC or 220 VAC, whatever voltage you have available. (Yes, you CAN do all this with 12 volts DC, but it takes ten times the amperage.). One of the thermostats should be for heating, the other for cooling; that is, one set of contacts closes on temperature rise, one on temperature drop. It is possible to find a thermostat that does both.

For cold weather, wire up one or more incandescent lamps to generate heat. Set the thermostat to keep everything at about 55F, and you're done. Take some temperature measurements on a very cold day to verify you have both enough insulation and enough heat-generating capacity.

For hot weather, there's little you can do to keep the hardware below ambient. Fans are about the only option for most locations. Hook one or more fans to the cooling thermostat, and set it for 90 or 100F. Put a coarse dust filter over the intake port(s). Remember you can duct intake air with flexible tubing to right where it is needed (like to CPU or power supply). Pull the air out the top, to let natural convection help do the job. Paint the cabinet white to reflect heat, and let the insulation help keep cabinet heat from getting inside. Again, temperature measurements under worst case conditions will tell you if you have enough air volume (CFM) to keep the hardware cool.

In closing, most of us don't have to worry about the weather conditions for our computers. But, if you're one of those few who do, there is something you can do. The easiest is to just let the parts fail, since they probably won't do so often. If that sounds cavalier, then you can oversize your parts and run them slow to keep them cool, remembering that heat is much worse than cold. Solid-state disk drives, such as the CompactFlash Adapter, can eliminate a weak link in the system, the hard disk. Thermal management can get you further still. In real extremes, however, you may need to resort to extreme solutions, like a small air conditioner to move lots of heat rapidly.

The Seattle Software Radio

Article by Steve Stroh, N8GNJ

The group of Amateur Radio Operators in the Seattle, Washington area that I call the "Puget Sound Amateur Radio TCP/IP Group" (many prefer to call it the WetNET Group) operate four (currently - several more are in work or conversion) 9600-baud bit regenerative repeaters in the Seattle area. The repeaters are on various bands - three are on UHF, one on 222 MHz that may eventually be converted to 9600 baud, and on 2m.

For this reason, the group as a whole has an ongoing interest in 9600-baud capability and at least one of each new radio claiming 9600-baud capability is purchased by someone in the extended group. The year of 2001 saw the introduction of a new line of radios (manufacturer deliberately left unspecified) with 9600-baud capability. We were severely disappointed with this line of radios due to their excessively long RX/TX turnaround time.

Ken Koster, N7IPB, and Dennis Rosenauer, AC7FT/VE7BPE, two of the most knowledgeable members of the group began speculating about what it would take to design a 9600-baud data radio that would work well. Of course, this opened the floodgates - 9600 baud is too slow to bother, cheap should be the goal, why not add additional features like Forward Error Correction, etc.

The discussion devolved (good humouredly) from there... but then reconvened after the ideas had been allowed to digest for a week or so.

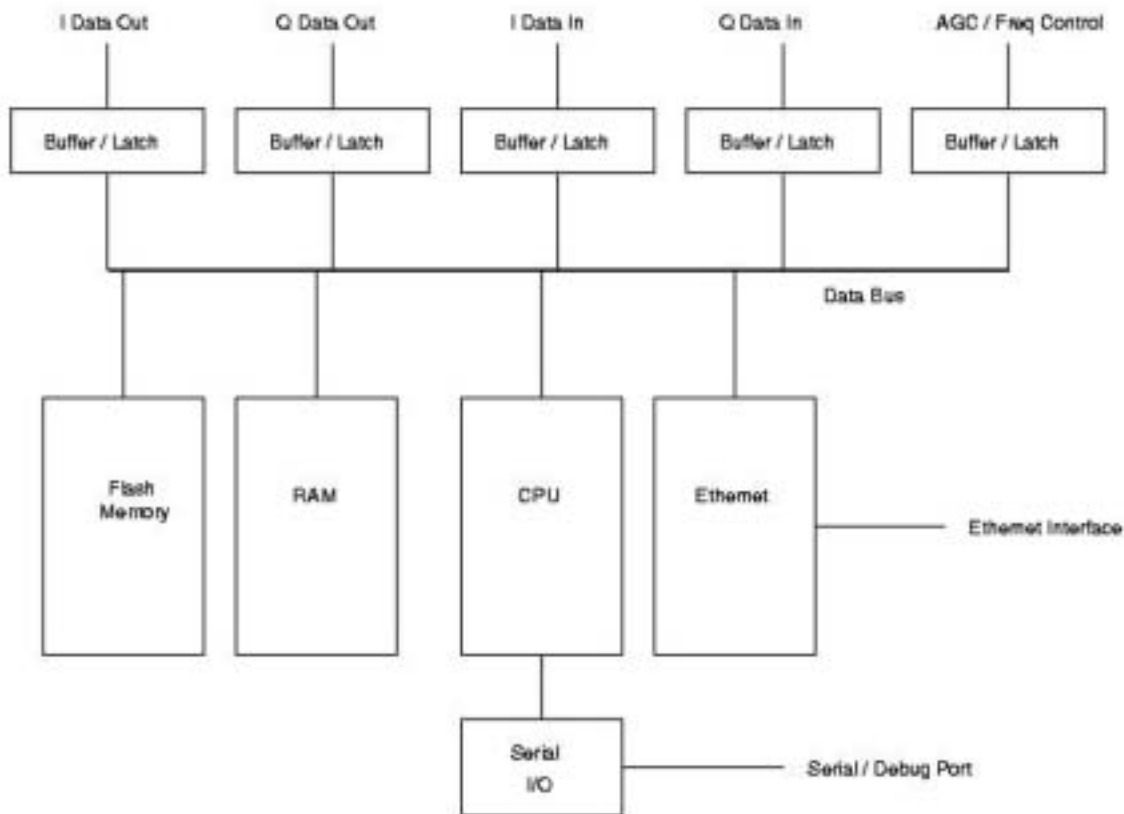
What ended up being proposed was a data-oriented Software Defined Radio (SDR) that would use a PC to handle the Digital Signal Processing (DSP) and Networking / Protocol chores

Linux PC <— —> Ethernet <— —> Radio*

The RF portion would be minimal; a basic radio front end and Digital to Analog (D/A) and Analog to Digital (A/D) conversion resulting in I and Q signals. The A/D and D/A stages of the radio would be managed by a micro controller, which would communicate with the PC over Ethernet, likely sending and receiving User Datagram Protocol (UDP) packets.

The inspiration to this approach was the phenomenal success of Amateur Radio DSP development being done with PC sound cards. However, it was felt that this approach was limited in how much could be accomplished due to the limited nature of the sound card hardware.

* There are two "logical" PCs - the DSP processing is done in background, and the demodulated data is passed internally to the networking code.



Seattle Software Radio Functional Block Diagram

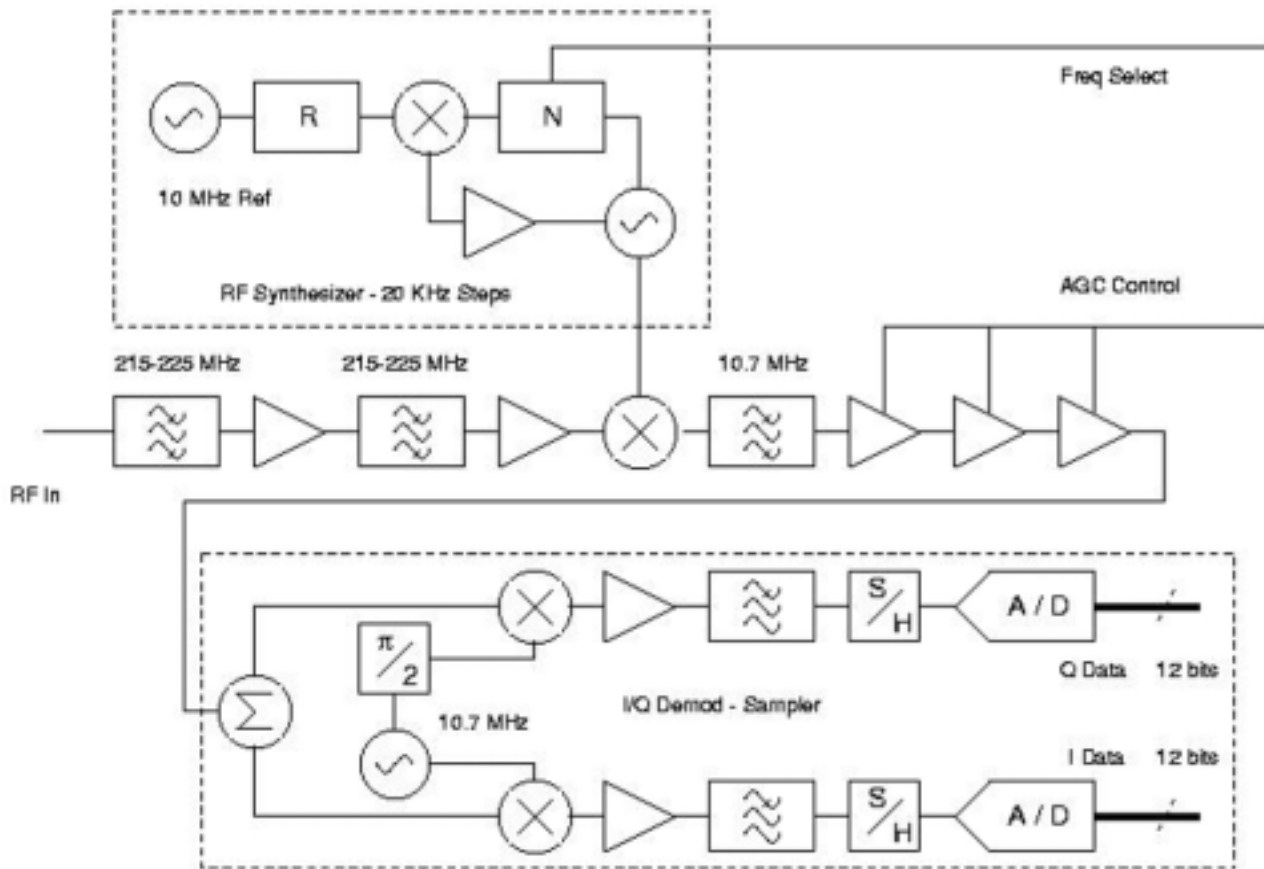
The “hard” work had been done - the DSP routines... what if those DSP routines could be combined with DSP hardware more suited for the task at hand than PC sound cards?

The other primary observation was that PC processors and memory, including laptops, were advancing at a phenomenal rate, and that it seemed perfectly possible in a 2002-era PC, even a modest one, to have sufficient bandwidth to perform considerable DSP work in the background as well as run other tasks.

Linux was chosen as the development Operating System (OS) of choice because it has all the required (open source) networking, it very efficiently multitasks, development tools are all available free, and there is a well-established library of DSP sound card routines available.

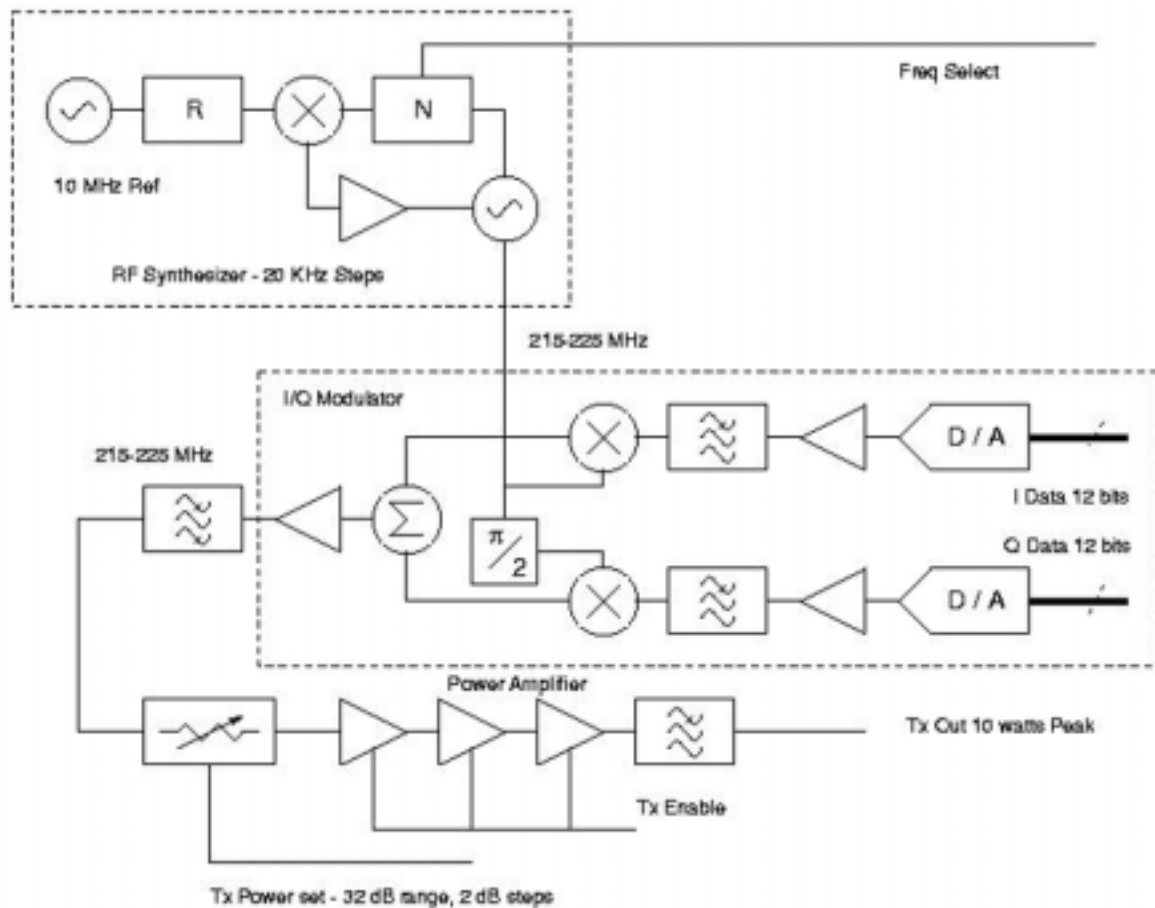
This approach satisfies many of the requirements / wish list items:

- Because the RF hardware will be relatively modest, it should be inexpensive and relatively easy to develop
- 222 MHz was chosen because it is the most “experimentation friendly” of Amateur Radio’s available VHF/UHF bands; parts are readily available and layout is easier than at higher frequencies



Receiver Functional Block Diagram

- Using a 20-kHz (standard VHF / UHF band plan) channel, it may well be possible to achieve speeds considerably faster than 9600 baud. To date, faster Amateur Radio data communications using simple 2-state Frequency Shift Keying (FSK) have required channels wider than 20 kHz. It may well be possible to achieve 80k bit/s using 16 QAM (Quadrature Amplitude Modulation), and after adding minimal Forward Error Correction (FEC), end up with 56k bit/s... again, in a 20-kHz channel. For comparison, the long-established WA4DSY 56K modem requires a 100-kHz channel.
- No need to reinvent or port networking code
- Linux's advanced networking capabilities (including support for Internet Protocol version 6 [IPv6] offers the possibility of advanced networking development
- Use of a well-supported and common interface - Ethernet, insures that the computing platform is not restricted to PCs
- Multiple radios can be supported (physically) with the addition of an Ethernet hub and can even be separated physically from the computer and each other



Transmitter Functional Block Diagram

The Ongoing Project

From the beginning, the entire project was envisioned as operating as Open Source, with software distributed under the GNU Public License and the hardware intellectual property (schematics, board layouts, etc.) also being made available as Open Source, possibly using the OpenIPCore Hardware General Public License.

Documentation of the project is the automatic archiving on the project's mailing list (see below). Because of the mix of "platform preferences," diagrams, etc. will be built with UNIX open-source tools... such as xfig.

There is need for some specific skills, especially as the project evolves past the design stage, but for the moment, the ongoing project is envisioned as largely local to the Seattle area.

If you wish to monitor the progress of the project, it is being documented on the group's (actively being revised) web page at <http://www.seatcp.net>, follow the Projects link.

You can also monitor the progress of the project via the Soft Radio mailing list. To subscribe to the list via web, go to http://wetnet.seatcp.net/mail_lists/, or send an email message to: majordomo@seatcp.net and put "subscribe sofrad" in the body of the message.

Seattle Software Radio

Specifications version 0.1 per AC7FT

Receiver	
Freq Range:	215-225 MHz
Continuous tuning range:	3 MHz
Step size:	20 kHz
IF bandwidth:	20 kHz nominal
Noise Figure:	10 dB
Sensitivity:	120 dBm for 1.0 V pp out on A/D
Sample Rate:	20 kHz I and Q (probably closer to 24)
Resolution:	12 bits I and Q
AGC Range:	80 dB
Transmitter	
Freq Range:	215-225 MHz
Continuous tuning range:	3 MHz
Step Size:	20 kHz
Modulation Bandwidth:	20 kHz min
Output Power:	10 watts peak
IMD:	25 dBc two tone at 5 watts
Tx Gain Control Range	32 dB in 2 dB steps
Sample Rate:	20 kHz I and Q
Resolution:	12 bits I and Q
Processor	
Flash:	8 kbytes min
RAM:	32 kbytes min
Clock speed:	TBD
Ethernet I/F:	10BASET 10 M bit/s

New High-Speed Digital Working Group Chairman

The American Radio Relay League, Inc. (ARRL), the national association of radio amateurs, is pleased to announce the appointment of Dr. John Champa - K8OCL, a senior telecommunications engineer with Unisys, as the Chairman of the organization's High-Speed Digital and Multimedia Working Group. Under the direction of the ARRL Technology Group, the purpose of the working group is to:

- * Note the existing amateur digital network, particularly higher speeds
- * Study amateur experimentation at higher speeds
- * Consider higher speed digital and multimedia systems developed by industry
- * Prepare a vision statement for amateur high-speed digital and multimedia systems
- * Promote experimentation involving digital and microwave experimenters
- * Develop standards

The ARRL encourages all licensed Radio Amateurs to consider working with the group to bring this technology to a reality in every day activity in the amateur service. Contact John at k8ocl@arrl.net.

TAPR Digital Voice Project

by Brad Noblet, WA8WDQ

Greetings and welcome to the brave new world of Digital Voice.

My name is Brad Noblet, WA8WDQ. I am the newly appointed project manager for the TAPR Digital Voice project. The primary goal of the Digital Voice project is to put this exciting technology within reach of all radio amateurs. I volunteered to take on this task as a direct reflection of my excitement about this technology and the potential I see (and hope all of you share) that Digital Voice can change the face of Amateur Radio forever!

TAPR is building upon the pioneering digital HF voice experiments of Charles Brain, G4GUO, with the intention of providing a complete solution kit that includes the Vocoder (voice compression engine), companion DSP modem and an enclosure that integrates these components into one package.

Leading the development charge is Dennis Silage, K3DS, from Temple University.

Dennis has laid out a high-level architecture that positions the DSP modem as a motherboard upon which a Vocoder daughterboard can be placed. Lessons learned from previous "vendor evaluation board" based projects have shown the wisdom for creating our own DSP platform. By providing a generic DSP engine and daughter card interface, this platform has applicability to many other TAPR designs beyond this program.

The Vocoder is an updated version of Charles' original AMBE based design, the heart of which is the DVSI AMBE-2020. This device is coupled with the Analog Devices AD73331 16-bit linear codec, Ubicom SX28 control processor and associated components to form the complete Vocoder.

Dennis' current DSP selection for the motherboard design is the Analog Devices Sharc processor. By defining a generic hardware interface (most likely serial) for the daughter card, those who choose to "roll their own" DSP platform can still take advantage of the Vocoder design.

I will be giving a brief project overview and update on our progress at the Dayton Hamvention for those fortunate (or crazy) enough to attend. By the next issue of *Packet Status Register*, we should be able to share much of the detailed design.

In the meantime, a more detailed examination of the architecture and developing design as well as Charles' original design info can be found by browsing TAPR's Digital Voice Web page (<http://www.tapr.org/tapr/dv/digitalvoice.html>).

TAPR Activities at Dayton 2002



TAPR will again be at the Dayton Hamvention, which is celebrating their 50th year and their 51st show on May 17-19, 2002.

TAPR Digital Packet Forum

The TAPR Digital Packet Forum will be in Room #1 of the Hara Arena from 10:00 AM to 12:30 PM on Friday, May 17. TAPR President, John Ackermann, N8UR, moderates the forum, which will include the following speakers:

John Ackermann, N8UR: Introduction and the State of TAPR (10:00 to 10:20 AM)

Brad Noblet, WA8WDQ: Digital Voice Developments (10:20 to 10:40 AM)

Mike Musick, N0QBF: Shine Micro SM2496 TNC (10:40 to 11:00 AM)

TAPR Project Gang: TAPR Kit & Project Updates (11:00 to 11:30 AM)

Steve Dimse, K4HG, and Michael Cai, KF6ZDM: APRS Forum Part 2 (11:30 AM to 12:00 PM)

John Ackermann, N8UR and Steve Bible, N7PHR: Precision Timing Projects (12:00 to 12:30 PM)

TAPR Digital BASH

The annual Digital*BASH sponsored by TAPR and the Miami Valley FM Association to be held on Friday, May 17, 2002!

For reservations, please contact the TAPR office as described below.

What?

An event for the digitally-inclined ham, featuring:

- * Buffet dinner (Prime Rib, Chicken, and Pasta)
- * Keynote Address by Bdale Garbee, KB0G
- * TAPR special interest group meetings
- * "Birds of a Feather" gatherings

When?

Friday evening, May 17, 2002

Doors open at 7:00 PM; dinner served at 7:30 PM

Speaker and meetings after dinner

Where?

Kohler's Banquet Center, 4548 Presidential Way, Kettering (39 40.75N, 84 08.43W), about 6 miles SE of downtown Dayton, just off of East David Road. Detailed directions and maps are available on the TAPR web site (<http://www.tapr.org/tapr/html/Fdayton.maps.html>) or at the TAPR booth.

How?

Dinner requires advance registration and payment through TAPR. Tickets will be available at the TAPR booth on Friday, though we strongly encourage registration before Hamvention. The cost is \$25.00 per person, tax and tip included.

All amateurs are welcome to attend, enjoy the speaker, and participate in the meetings, although only those purchasing a dinner can eat.

To register...

Contact:

Digital*BASH

c/o TAPR

8987-309 E. Tanque Verde Road #337

Tucson, AZ 85749-9399

Phone: 972-671-TAPR (8277)

Fax: 972-671-8716

Email: tapr@tapr.org

Visa/Mastercard Accepted

Who?

Digital*BASH is cosponsored by TAPR, Tucson Amateur Packet Radio, the national leader in digital communication and the Miami Valley FM Association, Dayton's packet radio club.

For more information (including maps), go to <http://www.tapr.org/tapr/html/dayton.html#packetbash>, or send email to: tapr@tapr.org.

APRS

For information concerning APRS activities at the Dayton Hamvention, be sure to check the 2002 Dayton APRS Web page at <http://www.tapr.org/~wa1lou/2002/2002.html>.

The TNC3

Article by by Don Rotolo, N2IRZ

The SYMEK TNC3S is a modern high-speed TNC produced in Europe. It has the ability to accept two high-speed modems (three if you're willing to give up the RS-232 serial port). By high-speed, we're talking up to 614,400 baud per channel! The hardware is powerful: an MC68000 based MPU at 15 MHz with three RISC Serial Communications Controllers, a 16-bit data bus and 24-bit address bus, and six DMA channels. This piece of hardware is truly deserving of the name TNC3.

The base TNC, without modems, is 251 Euro. With an exchange rate near the end of April of 1.13 Euro to the US Dollar, that comes to about US\$222. A wide selection of modems is available, from a 1200-baud AFSK modem (Euro 39) to that hopped-up G3RUH FSM modem at 614,400 baud (Euro 120). My personal favorite is the 307,200-baud G3RUH, for only Euro 100. What a great network that would make, if only there was a radio that could handle it. Umm, did you say FHSS?

SYMEK also sells a nifty high-speed radio for data rates up to 156,300 baud (that modem also goes for Euro 100) known as the TRX4S. While this could be the heart of a really super packet network, it is a little costly at Euro 936 (about US\$828). The standard radio tunes to selectable channels in the 430 to 440-MHz range in 12.5-kHz increments, and stores 16 of them. For Euro 1250, SYMEK will put your radio on any other frequency you want in the 100 to 560-MHz range.

For end users, the TNC31S has all the capabilities of the TNC3S, with only a single radio port, for a reasonable Euro 249, including modem and 128k RAM+ROM. You can even get the TNC3S and 31S with a split baud rate modem (9,600/38,400) for satellite work.

For networking applications, the TNC3S supports a number of applications, including it's own TNC3 Turbo Firmware (W8DED Host mode, mailbox, DAMA, SMACK KISS, SLIP for TCP/IP connections, and Hayes AT commands. There is also an advanced networking system from (X)Net, which combines support for (X)Net, TheNET, FlexNet and a TCP/IP router!

There is just too much to list here. Anyone contemplating a real high-speed (>ISDN/fractional T1) network should visit the SYMEK web page at <http://www.symek.com> and click on the "English Language" link to the upper left.

NOAA Environmental Hero Award to K4HG

by Russ Chadwick, KB0TVJ

Each year NOAA (National Oceanic and Atmospheric Administration) gives a number of Environmental Hero Awards to people who do not work for NOAA, but have contributed a great deal to NOAA's ongoing job of providing environmental services to the citizens of the United States. This year, NOAA's Oceanic and Atmospheric Research Office gave five of these awards and one of them went to an Amateur Radio operator deeply involved in APRS: Steve Dimse, K4HG.

On April 6, the office of David Evans, the Associate Administrator of NOAA in charge of research sent out an email with this statement, "I am pleased to announce the NOAA Research winners of NOAA's Environmental Hero Award. This award is for 'real people' outside of NOAA who have volunteered their time or who have worked closely with NOAA through their respective organizations. Please join me in extending congratulations to the winners."

Each of the winners will receive a signed letter of appreciation from the NOAA Administrator.

Steve Dimse has been instrumental in developing the network of citizen and ham radio weather observers who send in their data to <http://www.findu.com>. Presently there are about 570 registered stations and about 350 to 390 are contributing data at any one time.

The contributed data are used for numerical weather prediction research at NOAA's Forecast Systems Laboratory (FSL) and for training and research at the National Center for Atmospheric Research (NCAR), both in Boulder, CO. The data are sent to the National Center for Environmental Prediction (NCEP) in Camp Springs, MD. In Florida, the data are used by NWS Weather Forecast Offices for local area weather prediction. They are also used at Kennedy Space Center (KSC) for weather prediction in support of launch operations. The data are also used by the Long Island Railroad for weather monitoring along their routes. This summer the data will be used for a major temperature and air quality study in the New England area.

Congratulations to Steve for his award and thanks to all of you who go to the trouble and expense of setting up a weather station and sending your data to <http://www.findu.com>. All of your weather data are being put to good use. What better way to do the type of citizen public service that President Bush recently called for.

21st Annual ARRL & TAPR Digital Communications Conference

September 13-15, 2002

Denver, Colorado

Mark your calendar and start making plans to attend the premier technical conference of the year, the 21st Annual ARRL and TAPR Digital Communications Conference to be held September 13-15, 2002 in Denver, Colorado. The conference location is the Denver Marriott Southeast Hotel, 6363 E. Hampden Ave., Denver, CO 80222. Conference registration details and updates are available at <http://www.tapr.org/dcc>.

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs to meet, publish their work, and present new ideas and techniques. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results and practical applications. Topics include, but are not limited to

- Software defined radio (SDR)
- Digital voice
- Digital satellite communications
- Global position system
- Precise Timing
- Automatic Position Reporting System (APRS)
- Short messaging (a mode of APRS)
- Digital Signal Processing (DSP)
- HF digital modes
- Internet interoperability with Amateur Radio networks
- Spread spectrum
- Amateur Radio use of 802.11 technologies
- Using TCP/IP networking over Amateur Radio
- Mesh and peer-to-peer wireless networking
- Emergency and Homeland Defense backup digital communications
- Using Linux in Amateur Radio
- Updates on AX.25 and other wireless networking protocols

The ARRL and TAPR Digital Communications Conference is for all levels of technical experience, not just for the expert. Not only is the conference technically stimulating, it is a weekend of fun for all who have more than a casual interest in any aspect of amateur digital communications.

This is a must attend conference for technically inclined amateurs. Now, more than ever, Amateur Radio needs this great meeting of the minds to demonstrate a continued need for our current frequency allocations by pushing forward and documenting our achievements. The ARRL and TAPR Digital Communications Conference is the best way to record our accomplishments and challenge each other to do more.

Call for Papers

Technical papers are solicited for presentation at the 21st Annual ARRL and TAPR Digital Communications Conference to be held September 13-15, 2002 in Denver, Colorado, and publication in the Conference Proceedings. Annual conference proceedings are published by the ARRL. Presentation at the conference is not required for publication. Submission of papers are **due by August 5th, 2002** and should be submitted to

Maty Weinberg, ARRL

225 Main Street

Newington, CT 06111

or via the Internet to

maty@arrl.org

Information on paper submission guidelines are available on-line at **<http://www.tapr.org/dcc/>**.

Conference presentations, meetings, and seminars will be held at the **Denver Marriott Southeast Hotel**. Contact the hotel at:

Denver Marriott Southeast Hotel

6363 E. Hampden Ave.

Denver, CO 80222

Phone: (303) 758-7000- Fax: (303) 691-3418

<http://www.marriotthotels.com/DENSO>

Denver Marriott, Southeast

6363 Hampden Avenue

Denver, CO 80222 USA

Phone: 1-303-758-7000 Fax: 1-303-691-3418



Attractions & Landmarks

- * Coors Brewery (18 mi)
- * Denver Art Museum (10 mi)
- * Denver Botanic Gardens (9 mi)
- * Denver Zoo (9 mi)
- * Museum of Natural History (9 mi)
- * Park Meadows Shopping (5 mi)
- * Red Rocks Park & Amphitheater (20 mi)
- * The Denver Mint (10 mi)

Hotel Information

- * 11 Floors, 590 Rooms, 19 Suites
- * Mobil Travel Guide Stars: 3
- * AAA Diamonds: 3
- * Check-in: 3:00 PM; Check-out: 12:00 PM
- * Express Check-in, Express Check-out
- * Pets permitted (charges may apply, call hotel for details)
- * Complimentary parking



DStar System at the Dayton Hamvention

by John Gibbs

ICOM will be showing a "concept product" for the DStar system at the Dayton Hamvention. (A concept product is like a concept car, it may never make it into production in the current form.)

DStar was shown in Japan last summer by the JARL and we posted a translation of the Japanese CQ magazine article on the Digital Voice Web site. The JARL intends to make the DStar system the standard for VHF/UHF digital voice and data in Japan.

The DStar system includes digital repeaters for voice and data. These are currently being used in tests in Japan to determine the viability of the entire system. The system also includes digital microwave links between repeater sites.

The ICOM concept product that supports the DStar standard is called the ID-1. It is a 1.2-GHz 10W rig with data, digital voice and analog FM modes.

There is an Ethernet connection on the back of the radio! The link is GMSK with Internet Protocol at 128k baud. This means that you can hook a mobile PC Ethernet port to this radio and connect to the Internet at least four times faster than you can over a phone line.