TAPR #92 SUMMER 2004

PACKET STATUS REGISTER

In this issue...

The President's Corner

VNA/Linux, TAPR.ORG, SDR and DCC News

By John Ackermann, N8UR, n8ur@tapr.org

TAPR Vector Network Analyzer — A Software Challenge

The last issue of *PSR* mentioned our newest project, Tom McDermott and Karl Ireland's Vector Network Analyzer. The VNA was the cover story in the latest issue of *QEX*, and I can tell you from personal experience that it is a great piece of hardware that will be a "must have" for any ham who is interested in RF experimentation.

N5EG has graciously made the source code for the VNA available under the open source GPL license. He wrote the code for Windows using *Microsoft C++ .NET*. Some of us (me!!!) would really like to see a Linux version of this software, so TAPR is issuing a "bounty" — the first person to deliver a working Linux port of the software will get a free VNA unit. If you're interested in this challenge, please contact me at **n8ur@tapr.org** for further details (we'll also be posting this challenge on a few mailing lists where known Linux-RF hackers hang out).

TAPR.ORG Upgrades

It's been a long, slow process, but we're well on the way to modernizing and enhancing TAPR's Internet presence. We've acquired a new server at a commercial hosting company (our previous free hosting was in jeopardy due to organizational restructuring) and we've now migrated the TAPR mailing list system from the much-hated *Lyris* to an open-source system called *Mailman* that seems to be working very well.

Although *Lyris* was a pain for users, it had features that made it low- maintenance for the system administrators, and in a volunteer world, that's important. Fortunately, the current version of *Mailman* is designed to make both users' and administrators' lives easy. We hope you like it.

We've also added spam and virus filtering on all mail running through the new system,

including the mailing lists. These tools seem to be working well and the several layers of protection we now have should make it very hard for spam to make it through our system. However, no filter is perfect and you still need to keep your own anti-virus and spam software up to date.

By the way, if you see spams that appear to originate from TAPR (i.e., they have "tapr.org" in the sender's address), the messages almost certainly *don't* come from us. Most of the worms (or viruses or whatever you want to call them) out there today hide themselves by forging addresses found in the infected computer's address book and other files. So, if your address and a TAPR address happen to be found on an infected machine, it's quite likely you'll get a spam/worm/virus that looks like it came from us — and we may get one that looks like it came from you!

And speaking of spam, many of you are aware that the searchable archives of several TAPR mailing lists are polluted with huge amounts of spam. That was the result of an architectural weakness in the old system that we've now rectified. We hope that we can rebuild the missing archives so that we'll once again have a complete set of messages.

SDR Developments

Although TAPR has no commercial connection with Flex-Radio Systems, we've been strong supporters of the SDR-1000 software defined radio because it's a superb example of enabling technology -- a hardware device that represents the beginning, not the end, of the experimentation process.

Gerald, AC5OG, has a great line in his presentation about the SDR-1000. He asks the audience, "How many of you have a radio that's better today than it was when you bought it?" His point, of course, is that an SDR isn't frozen by its hardware, and an "upgrade" can involve no more than downloading a new version of the software.

The SDR-1000 has really shown the benefits of that approach. The original software was written in *Visual Basic* and worked surprisingly well. It's licensed under the GPL and numerous folks contributed improvements to the code, making it a much better radio over the course of the last year.

Now, the software has taken another leap, with a complete rewrite in a new language (Microsoft's C#) *and* the imminent arrival of a Linux-based version that will incorporate the same DSP code, but have a uniquely-Linux user interface. The new software promises even more performance improvement.

An interesting sidelight is that the radio's hardware keeps getting better, too. Gerald designed the SDR-1000 as a modular unit, and he's now added another board to the original three-board stack that dramatically improves the receiver's performance. He also has a power amplifier and internal antenna tuner in the works, and a 2-meter transverter is available now. (And that's not to mention the fact that the other piece of hardware in the system — a PC sound card — can also be swapped out with better ones as they become available.)

Congratulations to Gerald for showing by a great example how hams can continue to advance the state of the radio art.

DCC — See You in Des Moines

The DCC is fast approaching, and it looks like it will be another great conference. We have had some excellent papers submitted for the Proceedings, have some wonderful speakers lined up, and the show-and-tell room should have some fun toys to play with.

Time is running out to book rooms at the special conference rate, so don't delay! More information can be found on page 3 in this issue of *PSR*, or at the web site: **http://www.tapr.org/DCC**.

73,

John, N8UR

###

Digital Communications Conference: September in Des Moines

By Steve Bible, N7HPR, n7hpr@tapr.org

The American Radio Relay League (ARRL, the world's oldest association of FCC-licensed Radio Amateurs, or "ham radio" operators), and the Tucson Amateur Packet Radio (TAPR) association, will be co-hosting the annual Digital Communications Conference (DCC) this fall.

The 23rd Annual ARRL and TAPR DCC are scheduled for September 10-12, 2004 in Des Moines, Iowa. The conference will be held at the Holiday Inn Des Moines - Airport & Conference Center, 6111 Fleur Drive, Des Moines, Iowa 50321.

Industry Notable To Give Keynote

TAPR is proud to announce that noted engineer, entrepreneur, and Radio Amateur, Ken Kaplan, N0GZ, will be the guest speaker at the DCC's banquet.

In 1977, Ken and a colleague from Drake University started Microware Systems, a small company capitalizing on the then relatively rare know-how of designing microprocessor-based products.

Microware soon developed real-time operating system called OS-9, especially designed for microprocessor-controlled embedded products. Microware also offered software development tools as part of its standard product line, and provided professional services for contract research and development.

Ken served as the President and CEO of Microware until its acquisition by Radisys Corporation. He was Vice President and General Manager, Microware Division of Radisys Corporation until his retirement in 2002.

Under his guidance, the company worked with major corporations around the world, developing many ground-breaking products.

Some notable products and customers include:

* General Motors Corp. — First car trip computer for Cadillac Division (1978)

* Tandy Corp. — TRS-80 Color Computer (1982)

* Sony Corp. and Philips Electronics — Development of an industry-standard specification for, and the first prototype of, the multimedia CD-ROM (1984)

* Philips Electronics and Matsushita Electric — First GPS-based car navigation systems (1990)

* Motorola, Inc. — ReFlex, the first 2-way pager system and the Pagewriter 2-way pager (1994)

* IBM Corp. — First digital TV set-top box (1995)

* Motorola, Inc. (1995) — Development of the iDEN (Nextel) cellular telephone handset

* Sun Microsystems — First Java virtual machine for embedded products (1999)

The Ham Radio Connection

Ken is an avid Radio Amateur, holding the FCC's highest class of license, the Amateur Extra Class. He received his beginner's Novice license in 1967 while in high school.

Today, Ken is still active in many aspects of ham radio. His favorite activities involve the use of UHF communications, and he enjoys building his own equipment.

For More Information

Conference registration details and updates are available on the web at **http://www.tapr.org/dcc**.

Or, contact conference organizer Steven Bible. E-mail: **n7hpr@tapr.org**

###

APRS on a Tandem Bicycle

By Geoffrey Dick, WA4IKQ, wa4ikq@nevets.oau.org

I have been running APRS on a bicycle for a number of years, experimenting with TT2, TT3, a full KPC3+ with an HT-202, and most recently, a Kenwood THD7A(G). I understand the payload and air resistance issues very well, having toured on events 25 to 50 miles in length. If you want to run APRS on a bicycle, consider the following:

Antenna

Through experimentation, I have found a rubber duck on an HT is not very effective, if not held in the hand so one's body can act as a counterpoise. Mounted to your handlebars, the best a 5-watt radio on flat land can do is 3 miles. One can try to increase the effectiveness with a 19.5-inch tiger tail to the antenna ground, but most likely, it will still only reach a home RELAY station. To reach a DIGI, your signal will be in competition with stronger stations, having better antenna systems at higher altitude.

Replacing the original rubber duck, with a larger antenna will be a big help. There are a variety of 15-inch dual band antennas commercially available. A flexible thin type will give your radio less strain at the SMA connector in 15 to 25 mph winds. For better performance, I have found that a 2M Hamstick, mounted to a rear metal carrier platform works the best. That will put 54.5 inches of antenna in the air to get your signal out. I use a Ham stick with 4 feet of coax to a right-angle SMA connector to the radio on a tandem bike. I wrap several turns of coax around a steel handlebar to decouple and fine-tune the SWR (see Figures 1-4).

Batteries

I have never had very good luck with sealed battery packs that come with most commercial handhelds. They work okay when new, but after a few months, the cells become unbalanced in the way they hold a charge and will give less life.

I have had best results using an exterior battery pack that accepts individually charged AA NI-MH cells. I charge my cells in a Lehar Mach I speed charger, that individually pulse-charges them in less than an hour, without overheating them like most chargers. My standard battery pack holds 8 cells for a half day of operation. I can augment it with another 10-cell pack that will run the TH-D7A(G) all day.

Powering A TH-D7A(G) From A Battery Pack

I use a homemade false back on the TH-D7AG made from 1/4 inch plastic, machined with a Dremel tool to engage the same holes as the battery pack. I drilled two holes and looped a piece of solid wire through the plastic to provide power connections. It engages the two power spring clips nicely.

Radio Mount

I made from sheet aluminum, a clamp to fasten around the handlebars that holds a 4-inch platform to anchor radio at a good angle for viewing the screen. The battery pack is counter-weighted from the same clamp (see Figures 7 and 8).

Using A TinyTrak

A TinyTrak running on a 9-volt alkaline will work well all day beaconing, but you will not know if your signal is getting out without some sort of monitoring system. Choose a good radio with 5 watts or better output. Make sure the interface cable works properly with the radio chosen. Don't wait for the day of the event to check things out.

Kenwood TNC Radios and Path

I set my TH-D7A(G) radio to "beep" on my heard packet. This is great confirmation your signal is being heard. On long trips, I have found a need to change my path. RELAY does not always work and many home stations are not setting up their alias. Some DIGIs do not accept WIDEn-n format. One year, our local group tried to set up an event so we would RELAY each other on a long rural highway, but discovered too late that TH-D7's *will not digipaet*. A TM-D700 will DIGI, but one may find it hard to turn off that function later.

Two examples of my bicycle track riding with the Florida Freewheelers was recovered from **http://www.findu.com/cgi-bin/track.cgi?call=wa4ikq-4&start=60&length=1000&degree=.05** ###

Figure 1.

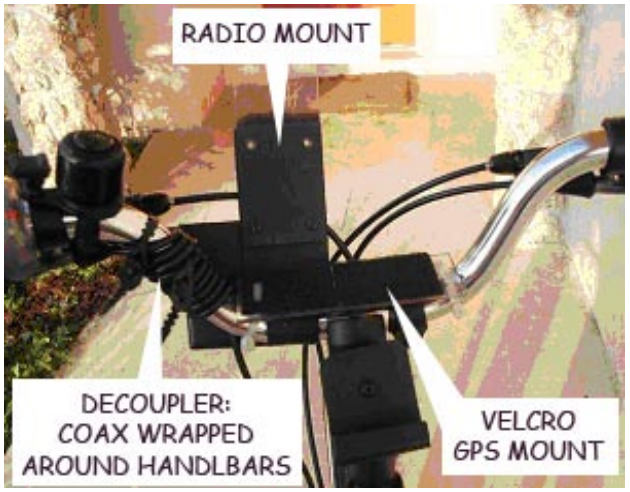


Figure 2.

Figure 3. Hamstick mounted to rear carrier with angle bracket.

Figure 4.

Figure 5. Captain Geoff (WA4IKQ) and Stoker Ruth (YL)

Figure 6.

Figures 7 and 8. A sheet metal battery pack holder counterbalances the radio on the handlebars.

Figure 9. Garmin GPS III with Kenwood TH-D7A(G)

Figure 10. The Battery pack shown in this top view

Figure 11.

Figure 12. Battery pack, cables, Radio, GPS and homemade radio back plate

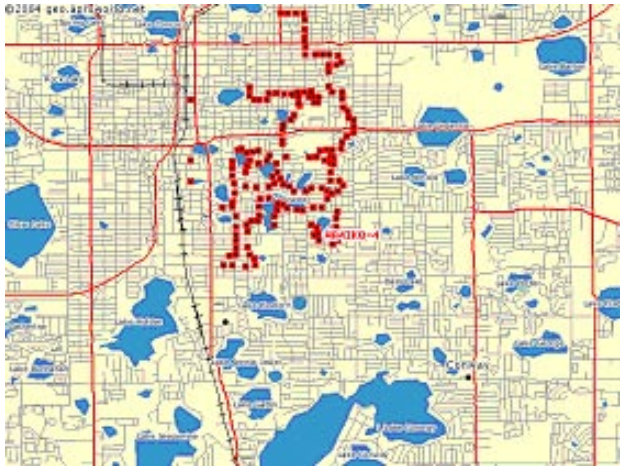


Figure 13. Florida Freewheelers Ride through Old Orlando

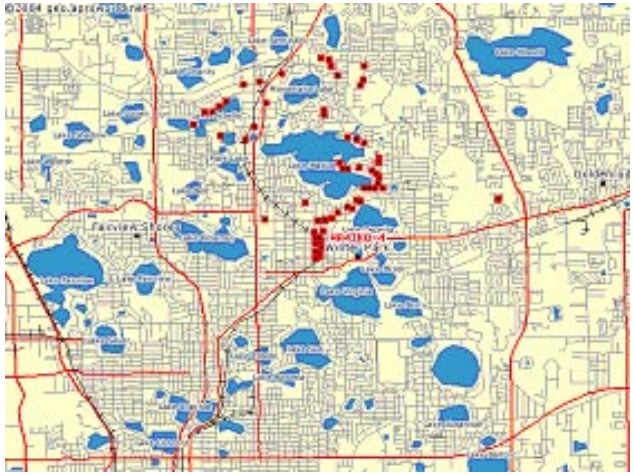


Figure 14. Bicycle track through Winter Park and Maitland

Roger Barker, G4IDE, Receives TAPR Lifetime Achievement Award

By Darryl Smith, VK2TDS, vk2tds@tapr.org

TAPR is pleased to award a Lifetime Achievement Award to Roger Barker, G4IDE, of Lincolnshire, UK. Roger has worked tirelessly for many years to provide quality software for Amateur Radio operators, allowing them to operate advanced digital modes without the difficulties once associated with these operations.

His *UI-View* software is the benchmark by which all other APRS raster-mapping software is compared to.

While writing excellent software, Roger has also ensured that users are able to experiment with his software by allowing access to the internal features of his software through an extensive application program interface (API). Once the software was written, he ensured that the software would be extensively supported, so he started mailing lists to provide such support. To date, one of these lists has had 35,000 messages with Roger reading each one and replying to a significant number of them.

These are just some of the reasons that TAPR is proud to present a Lifetime Achievement Award to Roger Barker, G4IDE, for his services to digital communications.

###

Introducing the OpenTracker

An Upgradable, Open Source APRS Tracker

By Scott Miller, N1VG, scott@n1vg.net

Background

Last year, I wrote an article for the *PSR* describing the OpenTRAC project ("A New Tactical Reporting Protocol," *PSR* #87, Spring 2003). From the beginning of that project, it was apparent that an inexpensive hardware platform for experimentation with the protocol was needed. Byon Garrabrant, N6BG, offered his help in developing a variant of his TinyTrak3 for that purpose, but the PIC16F628 processor used in the device presented too many limitations. Most importantly, it wouldn't hold both APRS and OpenTRAC code at the same time and it had no ability to be reprogrammed without the use of an external programmer circuit. I decided a device built from scratch would better meet the specific needs of the project.

The very first version of the tracker actually started out as a GPS data logger I'd built for my paraglider. The processor used was a Motorola (now Freescale) MC68HC908KX8. After a bit of programming work, the device was sending KISS frames to an old KPC-3 TNC rather than logging them to memory.

From there, things got a bit more difficult. To eliminate the TNC, it was necessary for the micro controller to handle both the AX.25 protocol implementation and generation of the modem tones. The first prototype used a four-bit resistor ladder for digital to analog conversion, but to reduce the component count and I/O pin usage, later versions used pulse width modulation instead.

It took many hours of coding and debugging, but it finally worked – and I learned more than I ever wanted to know about AX.25, HDLC, and Bell 202 modulation in the process. But with that done, it was time to move on to the fun stuff.

Features

The most notable feature, seeing as the device was created as a platform for the OpenTRAC protocol, is APRS support. In fact, the vast majority of these trackers in use today are transmitting only in APRS format. While it's still valuable as a test platform for OpenTRAC, this article will only cover features relevant to APRS.

Physically, the standard OpenTracker board is almost exactly the same size as the TinyTrak3, fits in the same case, and shares the same connector pin-outs. To save on power consumption, space, and component cost, the OpenTracker uses a single LED to indicate its status — a single blink for normal operation, a double blink for invalid GPS data, rapid blinking to indicate that the channel is in use, and lit solid while transmitting.

Other differences include a crystal oscillator to eliminate the need for frequency calibration, an on-board LM335Z temperature sensor, a voltage divider to measure battery voltage, and a single 10-pin header to consolidate all jumpers and accessory connections.

Briefly, some of the other notable features of the OpenTracker are:

Flash Updates — The firmware can be upgraded by the user with nothing more than the configuration program and a null modem cable. If an Internet connection is available, the configuration program can obtain a list of available firmware programs and download them straight from the server to the tracker.

Open Source — Full source code for both the firmware and configuration program is

available under the Modified BSD license.

Telemetry — Board temperature and battery voltage can be reported in the APRS comment field, with about 0.1 volt and 1 degree C accuracy.

SmartBeaconing™ — Adjusts the beacon rate based on your speed and cornering.

Compressed Format Support — Allows shorter position reports and one-foot resolution, but it's not supported by all APRS clients.

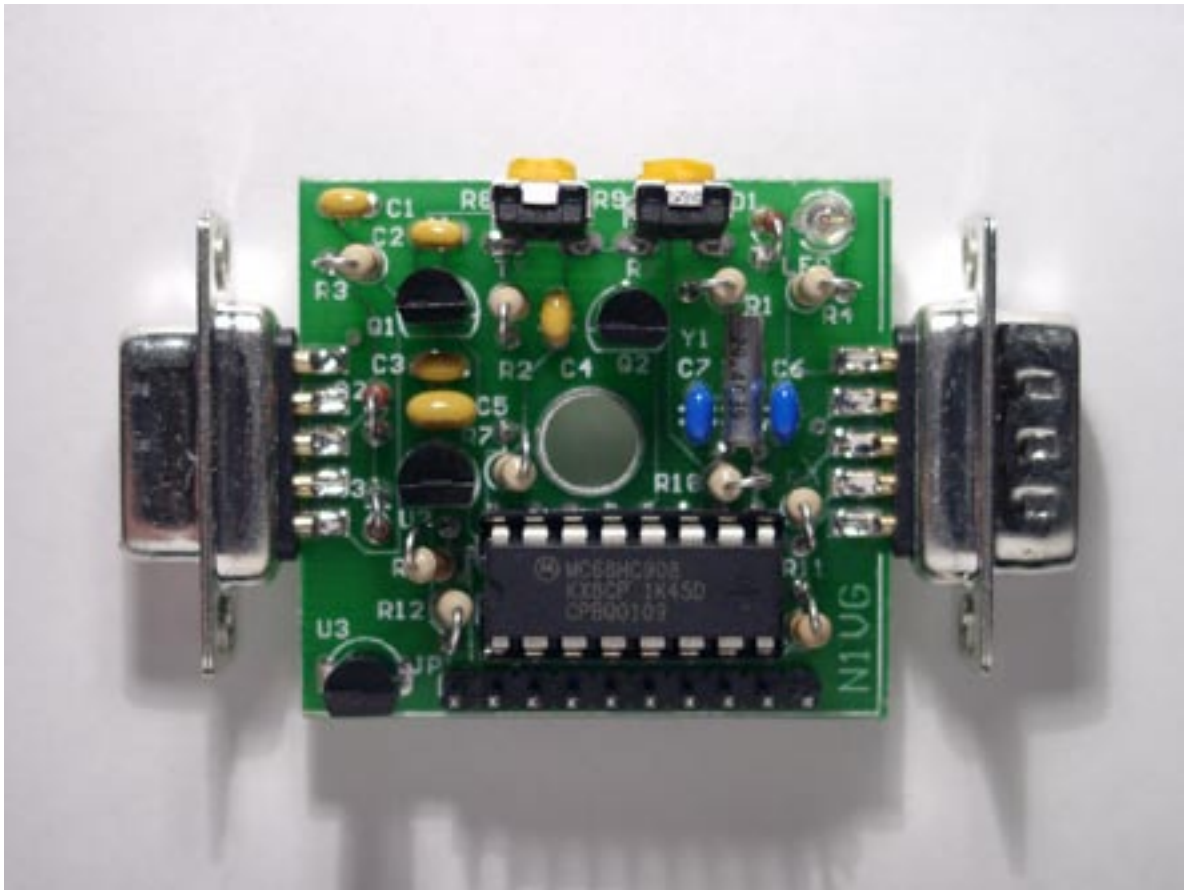
300-baud Support — The standard for HF operation.

Power Control — Connect an external relay to control power to the radio and the tracker will turn it on only when needed to save battery power.

Dual Configuration Profiles — The active profile can be selected based on a combination of jumper setting, altitude, speed, temperature, and battery voltage.

Fixed Location Option — Transmit without a GPS attached – useful for monitoring battery voltage at a repeater site, for example.

1-Wire Weather Station Support —Still in testing, this firmware version will allow the tracker to be connected to the inexpensive, low-power Dallas/AAG 1-Wire Weather Station.



PSK31 Support —Also still in testing, this firmware version will provide position and telemetry information using PSK31's BPSK mode. Support for PropNET-style checksums is planned.

One of the most useful — and often overlooked — features is the profile switching system. By default, the OpenTracker behaves more or less like a TinyTrak3, switching profiles based on a jumper setting. However, it's also possible to set up more complicated

conditions. A high-altitude balloon experiment might use a wide path at low altitude and then switch to a direct path at high altitude to avoid tying up digipeaters. Conditions can be combined, and they may be asymmetrical — for example, the tracker could be set to switch to profile 2 when the jumper is set and the temperature is greater than 80 degrees and to switch back to profile 1 and transmit immediately when the voltage drops below 12 volts or the jumper is removed.

If the existing firmware programs don't meet your needs, you're free to write your own. Metrowerks offers a free version of their CodeWarrior HC08 C compiler. While it's limited to 4k of code and won't compile the complete 8k OpenTracker firmware, the modular structure of the code makes it reasonably easy to remove the portions that aren't needed and a fair amount of programming can be done within that 4k limit.

Getting One

Schematics, source code, documentation, and CAD files are available free at **http://n1vg.net/opentracker**. Kits and assembled units can be purchased through the site, but you're welcome to build your own. You'll either need an appropriate programmer to write the boot loader code to the chip, or you can buy a pre-programmed chip from the website. The parts list includes Digi-Key part numbers, but with a few exceptions the parts are common ones available from any distributor.

Future Plans

A surface-mount version of the OpenTracker is currently in testing. All connections are made through a 12-pin header, which makes it easy to integrate the tracker into other boards. If there's sufficient interest in this version, it may be available by the end of the summer.

As noted above, support for the Dallas/AAG 1-Wire Weather Station is almost complete. With just a single external resistor, the 1-wire bus can be connected to the OpenTracker for a complete, low-cost weather station. Combine that with the power control feature, and you've got something perfectly suited to solar operation.

Another feature that should be available in the coming weeks is PSK31 support. This started out as an experiment, just to see if the hardware was capable of generating a BPSK signal. Because this mode lacks the error detection found in AX.25, it'll use the checksum format developed by the PropNET folks and will in fact be able to operate as a standalone PSK31 probe.

Acknowledgements

I'd like to thank Byon Garrabrant, N6BG, for the TinyTrak design that served as the OpenTracker's inspiration, John Hansen, W2FS, for his GPS-E code and words of advice, Tony Arnerich, KD7TA, and Steve Bragg, KA9MVA, for the SmartBeaconing™ algorithm, Brian Riley, N1BQ, and Keri Morgret, N6TME, for their help with the manual, Bob Bruninga, WB4APR, for creating this wonderful mess we call APRS, all of my beta testers, and of course, everyone who's supported this project with their kit purchases. It's been a lot of work, but the response has been great.

More features are on the way for the OpenTracker, and more ambitious hardware designs are in the works. Keep an eye on the web site at **http://n1vg.net/opentracker** for the latest news.

###

OP-ED: Reconstituting the Packet Network

By John Clifford, KD7KGX

(Originally published in *QST*, March 2004; reprinted here with permission from the ARRL.)

Emergency communications is often presented as the primary reason for the existence of the Amateur Radio Service and our exclusive access to reserved frequencies. Especially in this day and age, when terrorism has replaced the various natural disasters as the primary threat in our lives, the ability 'of Amateur Radio to supplement our regular means of communications in the event of a major calamity is a real benefit that we provide to our fellow citizens. However, in the past decade we have let one of our primary assets, the packet radio network, waste away to a point where it is more of a plaything than a valuable nationwide communications network. I believe that we need to change this, and reconstitute the amateur packet radio network quickly... and make it better than it ever was.

Killing Two Birds with One Stone

The ARRL has realized that without new hams, Amateur Radio's days are numbered. While there are more hams now than ever before, the majority of today's licensees are Technicians without HF privileges and many let their licenses lapse after the initial 10-year period. In order to increase the number of new hams and to get younger people involved in Amateur Radio as a lifelong activity, the ARRL has created the Amateur Radio Education and Technology Program. (Note 1) Also known as "The Big Project," its purpose is to encourage teachers to use Amateur Radio as a tool in the classroom.

The "Stations in Schools" program is a key part of The Big Project. Qualifying schools are provided with complete Amateur Radio stations at no charge. Here's where we can kill two birds with one stone. Provide a complete 9600-baud packet radio node to each Station in Schools participant that is set up and ready-to-go out of the box. Imagine how quickly the packet radio network could be re-established if one school in each community had a packet radio node!

Fixing Packet Radio

Of course, we need to look at more than just sheer availability of nodes to reconstitute the packet radio network. Our goal should be to create a national network of packet radio nodes that allows transferring messages between every community in the country without using non-Amateur Radio infrastructure (like the Internet). We had a network before and it withered away from lack of use. So, how do we change things so that this doesn't happen again?

First, we need to increase the rate at which data is transferred. After using the Internet at 56k or running DSL, the current VHF-based 1200-baud packet radio network is excruciatingly slow. However, being text-based, it doesn't have to be that much faster to feel a whole lot faster. How fast is fast enough? Fast enough so that text appears on your screen at a faster rate than you can read. If the packet radio network ran at 9600 baud (960 characters per second) that would be fast enough. So... we go with 9600-baud modems, which are widely available at inexpensive prices (Note 2) so current packet radio operators can easily upgrade. One benefit: 9600-baud FSK packet radio modems are slightly more spectrum-efficient than 1200-baud AFSK moderns, resulting in less interference to others.

Second, we need to increase the number of amateur stations that are equipped to run 9600 baud packet radio. One way might be to require ARES organizations to establish 9600 baud packet radio nets and run them on a weekly basis, perhaps after the traditional

VHF voice repeater-based net. Another might be to award significant bonus points to Field Day stations with 9600-baud packet radio stations that make contact with at least one EOC. Perhaps the ARRL can create an award for receiving a message via 9600-baud packet from each state, a Packet Radio Worked All States (PWAS) award — no Internet forwarding allowed! And, special recognition should be given to each 9600-baud packet radio node that can send a message to the ARRL's WlAW 9600-baud packet radio node without having to piggyback that message onto the Internet.

Third, we need to better integrate packet radio with our computers. Although the new network will not be the Internet, that this is so should be relatively invisible to us as users. We need to develop the necessary software to allow common e-mail programs like Microsoft's *Outlook Express* and *Outlook*, and Qualcomm's *Eudora*, to send and receive e-mail via packet radio. We also need to develop the necessary software to allow us to read and post packet radio bulletins, and upload and download files, via our web browsers. We should also create a chat tool that automatically determines the routing from our station to a desired node and then establishes the link so that chatting with users a long distance apart is much easier.

Summary

Let's fast-forward to the near future, when the High Speed Amateur Packet Radio Network is fully functional. A hurricane devastates south Florida... but amateurs are quickly on the air and the new network quickly and efficiently relays health and welfare messages. A massive earthquake rocks the Pacific Northwest knocking out phone communications and closing highways... but amateurs are able to communicate from emergency shelters via the new network, sending long lists of shelter residents, detailed requests for food and medicine, and health and welfare messages. A combination of computer viruses and physical attacks from terrorists manage to destroy several crucial Internet backbone sites and shut down the Internet, but the new network allows Homeland Security agencies to utilize ARES and RACES organizations and transfer important information.

I fervently hope that as amateurs we are never required to use any of our resources for emergencies, but "stuff happens" is an unfortunate truth. Wouldn't an Amateur Radio-based alternative to the Internet be an enjoyable resource for us, and a valuable tool for our country? Let's build it now!

John Clifford Jr, KD7KGX, has been licensed since August 2000. His main interests are in HF QRP CW and the various digital modes. He's worked at a variety of development and management positions at several startup and established companies since the early 1980s. He retired from the software industry in 1994 to try his hand at entrepreneurialism. You can reach the author at 12727 NE 32nd St, Bellevue WA 98005; **kd7kgx@arrl.net.**

Notes:

1 - **www.arrl.org/FandES/tbp/faq.html**

2 - *9600 Baud Packet Handbook*, Mike Curtis, WD6WHR, at **www.tapr.org/tapr/html/pktf.html**

###

2004 DCC Proceedings

Here is a list of the Proceedings that will be published for the 2004 installment of the DCC. Some, but not all of the Proceedings authors will present their papers at the DCC.

All DCC attendees will receive a copy of the Proceedings. Copies of the Proceedings will be available after the DCC from the ARRL web site, **www.arrl.org**.

"A General Format for Data Compression" by Hank Java and Mike Fulton

"A Practical Evaluation and Comparison of Some Modern Data Modes" by Steve Richards, G4HPE

"A Systems Approach to Amateur Radio Communications" by Peleg Lapid, 4X1GP

"Anatomy of an APRS-IS Server" by Pete Loveall, AE5PL

"Capture" by Ed Sack, W3NRG

"Continuing the KF6XA/W3NRG Propnet Experiment Non Reciprocal Beacon

"Design and Implementation of Receiver System for Suppressing Radio Frequency Interference Using Adaptive Filters" by K. Jeeva Priya

"Digital Chat Modes" by Patrick Lindecker, F6CTE

"Digital Messaging for ARES, A Progress Report" by Victor Poor, W5SMM

"D-STAR: Digitally Modulated Voice and High Speed Data" by Matthew F. Yellen, KB7TSE

"DttSP: An SDR Core in C" by Frank Brickle, AB2KT, and Bob McGwier, N4HY

"KidCQ: A Prototype System for Direction Finding Abducted Children" by

"Overview of Dynamic Forward Routing" by Edwin Brownrigg

"PSKFEC31 and PSK63F" by Patrick Lindecker, F6TCE

"SCAMP (Sound Card Amateur Message Protocol)" by Rick Muething, KN6KB

"Spread Spectrum Power Control" by Darryl Smith, VK2TDS

"The Micro908 Antenna Analyst" by George Heron, N2APB, and Joe Everhart, N2CX

"Update on the TAPR VNA Project" by Tom McDermott, N5EG

Caroline Guay, VA3WYZ, Mike Kennedy, VA3TEC, and Brian Neill, VA3BPN

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Packet Status Register

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TAPR is a community that provides leadership and resources to radio amateurs for the purpose of advancing the radio art.

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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 TAPR, please contact the editor **(wa1lou@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). 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.

Production / Distribution:

Packet Status Register is exported as Adobe *Acrobat* version 5 and distributed electronically at **www.tapr.org**

PSR *Packet Status Register* Editor:

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TAPR MEMBERSHIP	Price	Member Price	Qty	Total	Kit Code
New		$20.00			0
Renewal, Enter Membershp Number here:		$20.00			0
KITS					
DSP-10 2-Meter Transceiver	$329.00	$299.00			56
KK7P DSPx DSP Module	$99.00	$99.00			16
KK7P DSP10 Adapter Kit	$39.00	$39.00			16
PIC-E(ncoder)	$65.00	$58.50			16
Motorola EVM56002 Interface	$150.00	$135.00			16
Compact FlashCard Adapter (FlashCard not included)	$49.00	$39.00			16
DAS (DTMF Accessory Squelch) (as seen in December 1995 *QST*)	$68.00	$61.20			8
Bit Regenerator (for regenerative repeater operation)	$10.00	$9.00			1
Clock Option (for regenerative repeater operation)	$5.00	$4.50			1
PK-232 Modem Disconnect (to simplify external modem connection)	$20.00	$18.00			2
PK-232MBX Installation Kit (for 9600-bit/s modem installation)	$20.00	$18.00			2
XR2211 DCD Modification	$20.00	$18.00			2
State Machine DCD Modification	$20.00	$18.00			2
State Machine DCD Modification with Internal Clock (for KPC-2)	$25.00	$22.50			2
-					
-					
FIRMWARE					
TNC2 Version 1.1.9 with KISS EPROM (includes command booklet)	$15.00	$13.50			4
TNC2 Version 1.1.9 command booklet	$8.00	$7.20			2
TNC2 WA8DED EPROM (ARES/Data standard 8-connection version)	$12.00	$10.80			2
TNC1 WA8DED EPROM	$12.00	$10.80			2
TNC2 KISS EPROM	$12.00	$10.80			2
TNC1 KISS EPROM	$12.00	$10.80			2
PK-87 WA8DED EPROM	$12.00	$10.80			2
TrackBox EPROM	$15.00	$15.00			2
MX-614 Modem IC	$8.00	$8.00			2
PUBLICATIONS					
Digital Communications Conference (DCC) Proceedings					
2002 DCC No. 21 (printed copy)	$20.00	$18.00			8
2001 DCC No. 20 (printed copy)	$10.00	$9.00			8
2000 DCC No. 19 (printed copy)	$15.00	$13.50			8
1999 DCC No. 18 (printed copy)	$15.00	$13.50			8
1998-2000 DCC Nos. 17-19 (CD & available printed copies)	$50.00	$45.00			4
1998-2000 DCC Nos. 17-19 (CD only)	$33.00	$30.00			4
1992-1997 DCC Nos. 11-16 (CD & available printed copies)	$33.00	$30.00			4
1981-1991 DCC Nos. 1-10 (CD & available printed copies)	$33.00	$30.00			4
Earlier DCC Proceedings (printed copies):					
Circle desired nos.: 1-4 5 6 7 8 9	$6.00 ea.	$5.40 ea.			8
Circle desired nos.: 10 11 12 13 14 15 16 17	$6.00 ea.	$5.40 ea.			8
TAPR Spread Spectrum Update	$18.00	$15.30			16
TAPR Software Library CD	$20.00	$18.00			4
Wireless Digital Communications	$39.99	$36.00			28
Packet Radio: What? Why? How?	$12.00	$10.80			8
BBS SYSOP Guide	$9.00	$8.10			8
Packet Status Register Vo. 1 (Nos. 1-17, 1982-85)	$20.00	$18.00			16
Packet Status Register Vo. 2 (Nos. 18-36, 1986-89)	$20.00	$18.00			16
Packet Status Register Vo. 3 (Nos. 37-52, 1990-93)	$20.00	$18.00			16
Packet Status Register Vo. 4 (Nos. 53-68, 1993-97)	$35.00	$31.50			16
OTHER					
TAPR Badge with Name and Call Sign	$10.00	$10.00			0
TAPR 11-oz. Coffee Mug	$11.00	$10.00			
GPS EQUIPMENT					
TAC-32 Software Registration	$55.00	$55.00			0
Garmin GPS-25 with Data Cable	$150.00	$135.00			28
Garmin GPS-20/25 Interface/Power Kit	$40.00	$36.00			8
Garmin GPS-20/25 Data Cable	$15.00	$15.00			2
Garmin GA-27 GPS Antenna (w/MCX conn., mag. & suction mounts)	$75.00	$67.50			8
Oncore UT+ GPS	$169.00	$149.00			28
Oncore VP Interface/Power Kit	$40.00	$36.00			8
Oncore GT+ GPS	$149.00	$129.00			28
Motorola Antenna 97 (w/BNC connector and magnetic mount)	$65.00	$58.50			8
MCX Right-Angle Connector with Coaxial Pigtail	$15.00	$15.00			2

TAPR Order Form

TAPR Business Office
P.O. Box 852754
Richardson, TX 75085-2754

Phone (972) 671-8277

Fax (972) 671-8716

Internet tapr@tapr.org
www.tapr.org

Subtotal _____ _____

Sales Tax (Texas residents only, 8.25%) _____

Shipping _____

Total Order Amount _____

1-7 Kit Code Points: $6.00
8-15 Kit Code Points: $7.00
16-27 Kit Code Points: $8.00
28-55 Kit Code Points: $9.00
55 or more Points, contact TAPR

Name _____
Call Sign _____
Street Address _____
City - State - ZIP Code _____
Country _____
Phone Number _____
E-mail Address _____

Check Enclosed ☐ or Charge My Credit Card: VISA ☐ MasterCard ☐
Account Number _____
Expiration Date _____
Signature _____