

# PACKET STATUS REGISTER

**PSR #87 SPRING 2003**

president's corner

## Dayton, Directors and the DCC

By John Ackermann, N8UR (n8ur@tapr.org)



As I write this, it's just two more weeks to Hamvention. TAPR will be there in force, but in a slightly different space this year. We've expanded from two booth spots to three, and moved over one aisle and down the row a bit from our old space. We're in the same room in Hara Arena as usual, so you shouldn't have much trouble finding us. Our new booth numbers are 607, 608, and 615.

Our Friday evening Digital BASH should be especially good this year, with a presentation by Gerald Youngblood, AC5OG, and (hopefully) a hands-on demonstration of his SDR-1000 software defined radio, a DC to 60-MHz receiver, with 1 watt transmit power in the ham bands, that uses a PC sound card for all filtering/modulation/demodulation.

The SDR-1000 is just one of the exciting things going in the SDR world. The GNU Radio project ([www.gnu.org/software/gnuradio/gnuradio.html](http://www.gnu.org/software/gnuradio/gnuradio.html)) is making a lot of progress, with activity going on to support several varieties of hardware, including the SDR-1000. They've now demonstrated software demodulation of HDTV signals, though the processing power isn't yet available to view HDTV in real time.

### New Director Appointed

This is one of those good news, bad news stories. The bad news is that Mel Whitten, K0PFX, longtime TAPR Board member and even longer-time TAPR supporter (he was involved in beta testing the original TNC-1!) has decided to resign from the TAPR Board. Mel has been a tremendous con-

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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 digital communications, please contact the editor ([psr@tapr.org](mailto: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

tributor and his wisdom was something we all relied on. Fortunately, Mel has agreed to stay involved with TAPR, and he'll be in the booth as usual at Hamvention this year (and hopefully for many years to come!).

The good news is that Brad Noblet, WA8WDQ, has agreed to join the Board to fill out Mel's term. Brad is a longtime ham with a strong background in the tech industry, IT in the educational world, and wireless communication technology. Brad has a special interest in 802.11 and other wireless protocols, and gave a presentation on the guts of 802.11b at last year's Digital Communications Conference. Brad's agreed to take on responsibility for marketing TAPR to our members and to the world. This is an area where we've been sadly lacking, and I'm looking forward to Brad to improve our visibility. In particular, I'm hoping that he and Darryl, VK2TDS, our membership director, will be able to significantly grow TAPR's membership.

### DCC (No, It's Not Too Soon!)

Just a reminder that this year's DCC, being held in Hartford, Connecticut on September 19-21, 2003, is shaping up to be a great show. In addition to great technical presentations and discussions, the setting should also be great for some leaf-gazing, so make a family event of it. We'll see you there.



## Announcing N2YGK's Linux aprsdigi Version 2.4.3

By Alan Crosswell, N2YGK ([n2ygk@weca.org](mailto:n2ygk@weca.org))

Release 2.4.3 of N2YGK's advanced APRS digipeater is now available for free under the terms of the GNU Public License (GPL) at <ftp://ftp.tapr.org/aprssig/linux/aprsdigi-2.4.3.tgz>.

This release has the following new features:

- UDP/IP (v4 and v6) unicast and multicast (ASM) support. Useful for connecting aprsdigi's over the Internet, WLANs, etc. (Note: this is \*not\* TCP support as used by APRS-IS, aprsd, etc.) Both transparent and "3rd party" tunneling are supported.
- Budlist to permit/deny digipeating of traffic for individuals or groups of AX.25 and IP sources. IP budlists are helpful when using IP multicast!
- Interfaces may be set to transmit- or receive-only.
- Interfaces may be set to disable retransmission of received packets on the same interface (one-armed routing).
- Unix FIFO supported as an interface type. Mostly useful for debugging.
- Bug fixed that caused aprsdigi to crash upon TRACEn-n call sign insertion when the digipeater list was full.

As well as these existing features:

- Digipeater callsign substitution (e.g. RELAY replaced w/N0CLU-12).
- WIDE, WIDEn-n, TRACE, and TRACEn-n.
- As many radio interfaces as you can plug into your Linux machine with flexible gatewaying between them.
- Special handling for Mic-Encoder, Kenwood TH-D7, and TheNet X1J4, including SSID-based digipeating.
- Suppression of duplicate and looping packets.
- Works with Linux 2.4 kernel AX.25 network stack. This means any AX.25 interface supported by the kernel will work, not just a TNC2 clone. Examples include all the BAYCOM interfaces (BAYPAC, PICPAR, PICSER, etc.), sound cards, 8530 SCC cards, any serial port KISS TNC, etc.



## Real Networking:

# Is It the Key to Keeping and Reviving Packet?

By Ron Sauer, K9RKI (K9RKI@aol.com)

I am a relative newcomer to packet only involved for about eight years. I have been an Amateur some forty years, involved in emergency services for about as long, and PSP Sysop for the last 5. Since 9-11 there appears to be a reviving interest in packet. Part of it can be attributed to emergency services organizations looking for more secure communications. Part of it is also attributed to the large number of new Amateurs. In general, it appears that packet is having a revival, a small one. But, still a revival.

For many Amateurs this is new. Just like anyone with something new, they will play with it and see how far they can get and who they can talk to. Live keyboard to keyboard will raise the blood pressure a bit. So just how far can the average user get? They soon find out that the average packet network doesn't go very far- about the size of their local area (big or small) . Is it possible that the West Coast can keyboard to keyboard to the East Coast? What about 100, 200 miles away? I guess the answer is yes, if one has a complete table of all the routings.

The average Ham doesn't find that having to work hard at packet an enjoyable experience and soon quits. And the brings the long downturn in packet. I have found that there are levels that packet people fall into: DIGITERS, TECHETERS, PACKETERS, USERS.

These are my pet names for them. There is a 5th one that should be included, but doesn't seem to be around. I get to that in a moment. Here is my definition:

**USERS:** This should be the largest group of people in packet. They are the group that has gone and continues to go away. They are not concerned with protocols, speeds, etc. They just want to be able to plug and play and talk live to a friend or another Ham.

**PACKETERS:** This is the enthusiastic group who run the Packet Service Providers (PSP), or as we still call them by the archaic name of BBS (Why do we do that-another topic to discuss), NODEs, DIGIs, etc. and do their best to promote packet and gain new users. Some may be very good while others are lucky to get a simple system running. But, they are enthusiastic.

**TECHETERS:** This group are the technically oriented persons. They are technical in everything they do. They put together the large complex systems and and if you don't play by their game rules then you don't play.

**DIGITERS:** This is the group that loves to experiment, develop programs, modify existing ones, is concerned about protocols, etc. They have a knowledge that most USERS and PACKETERS either wish they had or want nothing to do with. That may sound strange, but ask around.

It's hard not notice that there is a pretty low number of enthusiasts and users. When the subject does come up it is usually blamed on the Internet or lack of technical knowledge by today's Amateurs. In my attempts to increase

the packet numbers, I talked to former operators, including those who recently started and were very enthused, and had quit. What I heard at the top of list was the same thing over and over. And, I suspect if you take the time to listen you will hear it also.

So what is the big reason that the people I talked to got out of packet - no one to talk to outside of the local area. They saw or talked to the same people on almost a daily basis and simply ran out of things to say. Occasionally there would be the message to leave in the mailbox, but they can do that on Internet or voice mail. There wasn't any new people to talk to and it stopped being fun.

This brings me to the point of all the this rambling. The packet network system is a hodgepodge of whatever the local BBSs (ugh) could put together. Don't get me wrong, a very good system for getting messages from place to place has generally emerged. But, it left out something. Not by intention, but because it was not able to provide for it. Then, as now, no group existed which was dedicated to developing, improving, and maintaining a packet network that could support keyboard to keyboard. Without a network that can support keyboard, it won't matter what new developments and higher speeds come along, packet will surge and then drop off deeply for the same reason as it did before-no one to talk to.

A 5th level of packet person needs to emerge-the NETWORKETER. A person who is concerned with developing the programs and building the area, state, regional, and a national network capable of supporting BBSs and keyboard operations AND be available to every USER. Is it possible that a National Organization could develop dedicated solely to a network that could support keyboard operations by packet users. I am not talking about a SIG or mail list. I am talking about a real live organization dedicated to physically developing, building, improving, and maintaining an independent network structure. One that would be available to every BBS without regard to who likes or dislikes who or who was on top of the power/political structure. Perhaps then we might be able to finally go modern and call our BBSs by name they should have: PSPS (PACKET SERVICE PROVIDERS).

What a wonderful dream that will never see the light of day. It didn't happen before and I haven't seen anything to indicate this omission is in the process of being corrected. Perhaps it's time that the ARRL and TAPR step in and take the initiative in forming a working organization, if nothing else but to give the USERS a way to use all the new ways being developed. Past history has provided a warning for the present and the future. Whatever the new toys are, they aren't going to be popular for very long if people can't talk to each other. To be sure there will always be the Digiters, Techeters, some Packeters, and even some Users. But, is the idea that the packet world is really just for the Digiters and Techeters? I sure hope not.



# Revitalizing "Plain" Packet

By Jim Wagner, KA7EHK (wagnerj@proaxis.com)

Recently, I checked into our local packet BBS for the first time in maybe a year and was really dismayed. There were few messages and a significant fraction seemed to part of "flame war" about the relative merits or demerits of forwarding packet messages via Internet. It seemed like I had been caught in a time-warp; this was going on several years ago when I became interested in APRS. But, it got me thinking, and that might (or might not) be a good thing. Hang on a bit because I really am going "somewhere" with this.

A Question to Myself: The first question I asked myself is "Why has Internet cut into packet so much?" After all, that really seems to be the motivation behind attempts to dissuade message transport via Internet - that the Internet presents an "easy" way around deteriorating networks and without incentive, the packet networks won't be improved. But, to me, the answer is pretty clear. The Internet has done almost everything regular packet used to do, but better. Here are some examples:

Speed - even with a minimal phone modem, Internet is fast compared to packet. And, when you start talking about things over a distance, the speed becomes orders of magnitude slower on packet compared to Internet.

Message handling - dare I say "e-mail"? And, fast - half way around the world, literally, in a few seconds. On top of this, I can send and receive e-mail messages from home, from work, on the road, and many other places.

QSOs - chat-rooms and "Instant Messengers" are so much easier to use (and near real-time). In comparison, the converse servers are a real challenge. Local QSOs with more than two participants involve either "stream-switching" or running "unconnected" and either is a challenge to most users.

Easy - Internet simple enough that my granny could do it, even if she were still alive and 110 years old. There is nothing like Netscape for packet!

Access to information - "to Google" has become a verb in the language, even. Lots of information can be accessed, in many places, without concern about where it is. Just try to find out what is in a BBS archive when that BBS is one you are somewhat familiar with, then try the same thing at a BBS of another flavor. Here is mess!

Relatively low cost - "vanilla" phone modems can be had for under \$100 (maybe under \$50) and a connection costs you \$10 to \$20 per month for Internet. You don't have to come up with a radio or an antenna or any of the other packet "stuff" when you use Internet.

Networks - Networks are arcane. Navigating them is difficult. They are fractured and there are several grossly different architectures. Internet users don't have to deal with the structure of networks!

My conclusion is that these things that Internet has co-opted from packet probably can never really be surmounted. Many of these "problem points" can certainly be improved, however. On the other hand, there probably are some things that packet COULD do that

Internet doesn't or won't. My hunch is that if we can find some of these special things (services) and figure out how to do them well (plus improve some of the problem points), we will probably get (some) ham interest back.

Another Question To Myself: So, my second question to myself was "OK, what could we do that would improve things and maybe even 'beat' Internet?"

Emergency Communications - yes but... emergencies don't come along very often and its difficult to maintain interest in-between times. But there has long been a problem, at least in Oregon, and probably elsewhere. Local ARES groups participate in SETs, and

they would really like to practice message handling to/from the state EOC. Local served agencies want to see some demonstration that we really are able to deliver messages to The State and that some response is provided. But, state EOC never seems to be "open" for SETs. Maybe they aren't interested or see no use. So, why not have a SURROGATE EOCBBS that behaves as if it was the state EOC and could receive (practice) emergency traffic and perhaps even respond (even if it is just a canned message)?

There is this thing called APRS (which, of course, is just packet by another name) and there is this thing on the Internet called "FindU" that allows you to find the location of a specific APRS station. This happens because APRS "gateways" send copies of all of the messages they hear to FindU. But, FindU has a problem. You have to ask for the location of a specific call. Then, you can ask it to show you the stations within so many miles of that call's location. But, there is no way to ask for the locations of stations in the vicinity of "Pinedale, Wyoming", lets say. And, to get going, you have to know a call to ask for. Why not have "APRS to packet gateways" that send location information, not over Internet, but to another packet frequency that behaves, perhaps, like a BBS? There, a user could download a text file structured like an APRS log. When played through an APRS program, it would then show the location of local APRS stations. Now you have "Local FindU", called, perhaps, a "APRS Location Server."

Complexity is another thing that CAN be improved. This, unfortunately, means software. But, here is an example. I have tried to connect several times with a local ham. He is using PaKeT. I can't find out HOW to leave a message, I've searched the Internet, I've poked on BBSs, I've tried all sorts of things on his station with no success. LanLink isn't much better. Even the ordinary TNC mailbox has too many obscure things. And, just try to find archived information on a BBS! After the likes of Google, it is a pain. There needs to be an effort to streamline all these things! No, this is not something that packet can ever "beat" Internet, but we do need to do much better than we are. How about a "packet search engine"?

When it comes to packet messages, we will probably never beat the speed of the Internet. But, one of the long-standing problems with packet messaging is the "away from home" situation. With Internet, I can connect to any number of Internet sites (Yahoo comes to mind) and tell it to fetch my mail from my home e-mail account, no matter where I am in the world. But, on packet, try going from Portland to San Francisco for 5 days and getting a message sent to you from your home territory - its a mess! Why not have something that you can send a message to your home BBS, and tell it forward all of your personal messages (resident on the BBS at the time of the request) to a specific BBS. Of course, there would have to be some sort of quasi-password system, but it should work.

The user "interface" is another big problem. DOS is simply not acceptable for most newer users. After an experience with any of the Internet browsers, the thing I hear is "why bother?" (with packet). Virtually every message system identifies itself with a type and version string. Why not make a common user interface that recognizes these strings and presents a common view to the user? Let the browser deal with conversations, converse servers, BBSs, mailboxes, packet search engines, APRS Location Servers, various network architectures and routing, TNCs, and the like.

Because speed of packet radio will never be competitive with Internet (at a cost most hams are willing to pay), we need to develop strategies to sidestep this. An example might be local or regional "search engines" that are able to catalog what is available on local BBSs and provide "links" (usable by packet browsers) to the information. The search engines could, over some region, share the catalog information among themselves and provide a mechanism for retrieving the information without the user needing to navigate an obtuse network.

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What Isn't The Solution: Now, standing on the "real" soapbox, I would like to suggest what I believe won't help.

I, personally, do not believe that segregating packet radio from the Internet (particularly for message forwarding) will make one iota of difference. Local BBSs are certainly welcome to establish their own policies, but barring mail forwarded over the Internet is not going to bring packet users back, and that is what, I believe, is going to drive the reconstruction of our networks. Of course, using Internet for message forwarding makes it easy to live with fractured networks, but I really do think that we will have network reconstruction when there are people really interested in doing it. And, those people, again in my opinion, are people who are generally not involved with packet today!

I don't believe that TCP/IP is the answer, either. It is just another network protocol and message forwarding mechanism. Of course, something like a browser would be easier with such a common underlying structure, but I don't believe that it is necessary. It might make things easier, but not necessary.

I also do not believe that a uniform network system is necessary. It should be possible to deal with TexNet, Rose, NetRom, FlexNet, and TCP/IP transparently to the user. Again, it would be nice to have one single structure, but it won't happen.

High speed packet for the user is also not the solution in my estimation. Networks are one thing and almost everyone agrees that the speed makes everything work much better. But, I don't believe that users will pay the price for 9600 baud or anything higher. Again, as nice as it might be, experience has shown that it just won't happen. It has been offered, over and over, and few, if any, ever take the step. Instead, as I previously argued, I think we need to concentrate on being smart so that speed is not so important!

Making packet into a single-service medium, such as dedicated emergency communication, also won't solve packet's problems. There simply aren't enough people with enough energy to give it vigor. Vigor really requires many people with diverse interests and single-service does not provide that.

Saying that "users can learn" (about BBSs, about networks, about arcane software) won't work either. The response you will almost invariably get is "why bother." That is a simple fact of life!

Conclusions: After thinking about these things, and realizing that there are probably LOTS more points, I began to wonder "What can I do? What can 'we' do?" Certainly, one thing is to identify, clearly, what the significant problem points are, as I attempted to do as part of my first question. Then, another is to identify what the improvements, solutions, and "we can do better than" items as I tried in my second question. There is a third, step, however, that I really can't do - decide HOW to do these things, and to form recommendations to achieve them.

It is quite clear that software plays a huge role in many of the suggestions I've made. We need a new generation of programmers to step up to the plate and tackle this job. It could be very rewarding (maybe not in the financial sense). But, software could make a huge difference.

I really do believe that we could see a New Renaissance in packet radio. All of this will take many heads and many experiences from many places. I see it as a significant role that TAPR could play in the revitalization of packet radio.



# TAPR Membership

By Darryl Smith, VK2TDS ([darryl@radio-active.net.au](mailto:darryl@radio-active.net.au))

Running TAPR takes resources, and as a nonprofit organization we rely on members for part of our funding. If you support the work that TAPR is doing, we would welcome your membership of the organization. You can join by clicking on [www.tapr.org/tapr/html/orgf.html](http://www.tapr.org/tapr/html/orgf.html) . We have also been listening to members requesting that we support electronic commerce. TAPR are currently testing the use of PayPal in association with the current ordering system on the Web. We will post a message on the WWW site as soon as this is available.

Until then you can still join. Just fill out the electronic form as normal, and state in the comments that you want to pay with PayPal when it is available.

## Digital Communications Conference

This years DCC will take place at the Hartford/Windsor Marriott Airport Hotel in Windsor, Connecticut, on the weekend of September 19-21, 2003. The hotel is 6 miles south of Bradley International Airport (BDL) and 13 miles north of ARRL Headquarters in Newington. Information will soon be available on [www.tapr.org/tapr/html/conf.html](http://www.tapr.org/tapr/html/conf.html). Until then you can find more information in the PSR at [ftp://ftp.tapr.org/psr/Winter\\_86\\_2003.pdf](ftp://ftp.tapr.org/psr/Winter_86_2003.pdf)

We issued a call for papers for this event. Have a think about what you want to write about and start your paper now. If you are unable to come up with a subject, it is often possible to find friends with something to write about, but who don't have the time. You can help your friend and the Ham community by writing the paper on their behalf. There will be two popular discussion points at the conference - Software Defined Radios and 802.11 networks.

## Electronic Distribution of Packet Status Register (PSR) Magazine

Listening to members we have found that many people are concerned about missing out on the PSR now that it has gone electronic. We recognize this as an issue, and we have come up with a solution to make things a bit easier in this digital age. We have created two mailing lists to assist you with keeping up to date with the quarterly magazine. They are

PSR-Announce

PSR-PDF

PSR-Announce is designed to advise the availability of the PDF file for download. We recognize that many people are on slow Internet connections at home, or in fact have to pay for their bandwidth. So we have created a mailing list just to tell you when the magazine comes out, and to let you know how to get it. You can subscribe by visiting [www.tapr.org/cgi-bin/lyris.pl?enter=psr-announce&text\\_mode=0](http://www.tapr.org/cgi-bin/lyris.pl?enter=psr-announce&text_mode=0)

PSR-PDF is designed for people who have a faster Internet connection, or who know that they will never get to read it unless it is sent directly to them. Since PSR often contains graphics, the file can be over one mByte. You can subscribe by clicking [www.tapr.org/cgi-bin/lyris.pl?enter=psr-pdf&text\\_mode=0](http://www.tapr.org/cgi-bin/lyris.pl?enter=psr-pdf&text_mode=0)

### 802.11 Mailing List

Whilst we are on the subject of mailing list, TAPR have started a mailing list for 802.11 'Wireless Internet' operations. It seems that every community has a mailing list dedicated to 802.11. So how is the TAPR one different? It is dedicated to 802.11 use in ham radio. The list contains active members of the entire range of technical ability - from the most basic understanding of how radio works, to the deep internals of this equipment. Such a broad range that everyone is sure to fit in. You can join by visiting [www.tapr.org/cgi-bin/lyris.pl?enter=ham-80211&text\\_mode=0](http://www.tapr.org/cgi-bin/lyris.pl?enter=ham-80211&text_mode=0)

### GNU Radio Receives HDTV

Matt Etus and the other people at the GNU Radio project have announced that they have managed to decode the HDTV data stream on their PC's and have published the source code on-line. This is an amazing feat by Matt and the team. They are not quite to the stage of real time HDTV decoding on a PC, but are close.

### Write for PSR!!!

PSR needs articles, and we would love to publish lots more in the PSR magazine. PSR is a great place to publish articles on everything from local operating practices to deep technical papers. And since the last issue TAPR is now rewarding those people who are helping others by writing articles for the magazine. Following the last issue, six people had their memberships extended by three months. This is just a small thank you from us at TAPR to those people who help us out. More details on PSR can be found on [www.tapr.org](http://www.tapr.org).

### Conclusion

I hope you have found this document informative and useful. TAPR is always looking for new things to do and how to improve what it is already doing. If you have any ideas or concerns, please e-mail me on [darryl@radio-active.net.au](mailto:darryl@radio-active.net.au)



## **TAPR at the Dayton Hamvention, May 16-18**

- > **Visit our new booths (607, 608, 615) in the Hara Arena**
- > **See the TAPR Forum, Friday, 9:45 to 12 AM in Room 1 in the Hara Arena**
- > **Attend the TAPR Digital Bash on Friday evening at Kohler's Banquet Center, where you will find good food, good people, and an excellent talk by Gerald Youngblood, AC5OG, on "A Software Defined Radio for the Masses." (Purchase your Bash tickets at the TAPR booth.)**

# A New Tactical Reporting Protocol

By Scott Miller, N1VG (Scott.Miller@vandenberg.af.mil)

Over the past decade, Bob Bruninga's APRS™ has grown by leaps and bounds, from its humble beginnings as an experimental position reporting system to an interconnected worldwide data network. Today it's one of the leading areas of experimentation in Amateur Radio, constantly evolving to meet new challenges and provide new services. Its growth, however, hasn't been without difficulty.

Many of the limitations in the APRS™ message protocol actually arise from the same features that allowed such widespread adoption of the system – in particular, the use of a plethora of incompatible message formats. Early trackers were devised by simply having a TNC transmit NMEA sentences directly from a GPS receiver. Multiple proprietary reporting formats to support different vendors' weather stations were added. Today, a client program must be able to interpret all of these formats, which remain in wide use despite the availability of relatively inexpensive trackers and format translators.

Proper parsing of an APRS™ message is a programmer's nightmare. Destination address fields are overloaded – depending on the context, the field may contain a map symbol, the client software version, or Mic-E position data. In addition to the proprietary 'raw' weather formats mentioned above, you've got 'positionless weather data,' 'weather report with position,' 'weather report with position and time stamp,' 'weather report with compressed position,' 'weather report with compressed position and time stamp,' 'weather report with object and position,' and so on. Add to this a number of data extensions for items like course and speed, station power/height/gain, and radio range, and you can see that decoding a message is a decidedly nontrivial task. For a low-cost embedded system, it borders on impossible.

The rather arbitrary selection of message formats severely limits the protocol's extensibility. Someone recently asked on the SIG how you might include telemetry, position, and a bulletin in the same message. The short answer is that you can't. You have the choice of either transmitting multiple messages, creating a new message format that client programs must be updated to support, or attempting to devise an extension to an existing format that doesn't introduce compatibility problems with other clients. None of these is a particularly attractive option for someone who just wants to transmit telemetry, position, and a bulletin.

It was because of these limitations that I started work on the OpenTRAC protocol. OpenTRAC stands for Open Tactical Reporting and Communication. It has essentially the same design goals as APRS™, but builds on the lessons learned over the past decade of APRS™ use.

The most obvious difference is the fact that OpenTRAC uses an 8-bit binary format, as opposed to the 7-bit printable ASCII used in APRS™. The ASCII limitation is another feature that eased adoption of APRS™, but has since led to inefficiency and ugly work-arounds like Base-91 notation. Instead of a fixed set of message formats, OpenTRAC specifies a rich vocabulary of individual message elements that may be assembled in any order to build a message.

Each OpenTRAC element starts with a length byte and 8- or 16-bit element identifier. The length byte makes separating a message into its component elements simple, and allows clients to skip over un-

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ported element types. And while OpenTRAC is designed with AX.25 UI frames in mind and has its own Protocol ID (0x77), there's nothing in the protocol that ties it to a particular transport. Elements are provided to carry information like the originating call sign and digipeater path within the message stream. Additional elements help prevent routing loops and identify the most recent message from a station.

While the protocol specification is still far from finished, most of the APRS™ equivalent functionality has been defined, if not necessarily finalized. A new hierarchical symbol table provides the majority of the APRS™ symbols, and many new ones, in a structure that allows for logical and consistent expansion of the set. Generic measurement elements currently allow reporting of values in 28 different SI units. Special-purpose elements include a hazardous materials inventory, river flow gauges, and a GPS data quality report. Another element in development will allow repeaters to automatically advertise their input and output frequencies, CTCSS tones, and other capabilities. Another will provide access information for 802.11 nodes.

The list of planned elements is still much longer than the list of implemented elements, but developers can start writing code with the knowledge that once they've written a parser for the position element, they'll be able to decode position from 'position with time stamp', 'position with telemetry', and 'position with telemetry, weather, Spam, Spam, baked beans, and Spam' messages without changing any code.

The element headers do add a certain amount of overhead to the messages, but in many cases the added efficiency from the use of a true binary format more than makes up for it. For example, a report with position, altitude, course, and speed occupies 18 bytes, with resolution down to a couple of centimeters for position, one centimeter for altitude, one degree for course, and 0.072 km/h for speed. This is comparable to the Mic-E format in size, but with far greater resolution, and vastly simplified decoding.

One more aspect of OpenTRAC that deserves attention is the 'Open' part. The specification is being released with no usage, distribution, or licensing limitations. And while software and hardware developers are encouraged to be open with their creations, it's certainly not required. The standard Linux AX.25 'listen' utility now includes the first publicly released OpenTRAC parser – distributed under the Modified BSD license specifically to allow inclusion in closed source projects.

Besides the 'listen' utility, a number of OpenTRAC projects are in the works. A KISS-based NMEA tracker has already been demonstrated, with a standalone TinyTrak-style tracker on the way. Several existing APRS™ programs should have experimental OpenTRAC support to some degree in the next few months.

The project hasn't been without its detractors, but while it's true that maybe OpenTRAC will never take over the world, at the very least it gives us a playground in which to experiment with what APRS™ *could* be. Will OpenTRAC be displacing APRS™ on 144.39? Probably not any time soon. But rather than listing all the reasons it won't work or isn't needed, why not visit the home page at [www.opentrac.org](http://www.opentrac.org) and share your ideas for building the ideal tactical reporting system? The time to get involved is now. Development is moving fast and portions of the specification are being finalized daily. And to those who would still be naysayers, I'd just like to say that too many of us are having too much fun to quit now.



# Portable Tactical Digital Communications

## Using Off-the-Shelf Consumer Components

By Ed Carp, N7EKG (erc@pobox.com)

### Abstract

This paper describes a tactical digital communications system for low speed ad-hoc networks using inexpensive, readily available off-the-shelf components that offers a true plug-and-play solution. The system is designed to provide local tactical digital communications in disaster or search-and-rescue scenarios, but can also be used in any tactical or even theatre-wide venue where rapid deployment of zero-configuration digital communication networking is desired.

### Introduction

Tactical digital communications systems have traditionally been expensive, proprietary, limited to a single vendor, and difficult to maintain in the field. They have also been traditionally difficult and time-consuming to deploy in the field, due to the nature of shipping, setting up, configuring, and deploying proprietary systems.

With the advent of sophisticated communications needs of mass disaster care, it has been found that traditional methods of communications - cellular telephones, two-way 800 MHz cellular trunking radios, and the like are almost useless in a disaster, due to the inherent inefficiencies of voice communications and the inability of cellular phones and trunking systems to readily communicate point-to-point if a cell site or trunking station becomes inoperative. For example, local California officials found themselves without communications after the Northridge earthquake, because of reliance on commercial cellular equipment that became inoperative after a cellular tower was rendered inoperative because of the effects of the earthquake.

Amateur radio operators ("hams") have traditionally been pressed into service when such disasters strike, and while hams have often been invaluable during times of disaster, ham radio suffers again from the traditional inefficiencies of voice communications, and while digital messaging has been developed (called "packet radio"), it has traditionally been deployed on laptops, which are notoriously unreliable and difficult to deploy in the field quickly.

We present a solution that takes advantage of the efficiencies of amateur packet radio, but deploys it on an inexpensive, widely available handheld platform. The solution implements the APRS messaging protocol developed by Bob Bruninga, but does not implement the position reporting aspects of the protocol. The result is a lightweight, flexible, inexpensive, and durable system that can be used with almost any off-the-shelf terminal node controller, handheld radio, and handheld computer based on the Palm OS or Windows CE operating system.

Additionally, compression and/or encryption can be implemented when authorized or allowed by law. The software delivers to the TNC messages in plain ASCII text, and can be encrypted at that point.

Commercial radios can be used, and almost any type of TNC can be used. The system is designed to be flexible, and meet the needs of amateur, commercial, and military planners.

### The System

The system as prototyped is designed around a Palm Pilot Professional with 2 MB of RAM, a serial sync cable, a Kenwood TH-D7A data-ready VHF/UHF Amateur Radio, and an interface cable to connect the Palm Pilot to the radio. The internal terminal node controller ("TNC") is controlled completely by software in the standard command line interface (as opposed to controlling

the TNC in so-called “KISS mode”). The software running on the Palm Pilot is completely user-configurable. Messages can be pre-programmed and assigned to soft buttons on the Palm Pilot screen, or the user can type in his own message.

### **The Software**

The software is written in NS-BASIC, which has a small footprint on the Palm Pilot and runs reasonable fast when compiled. NS-BASIC can also be compiled for the Windows CE operating system.

The software retrieves the call sign of the operator from the TNC, then broadcasts its presence to the network. Any similarly-equipped radio within range that hears the activation of the radio will respond if it has any messages to send to that station. Additionally, every station sends out pending messages periodically, so that stations that have moved into range without announcing themselves can have pending messages delivered to them.

### **The Radio**

The radio used in a Kenwood TH-D7A, chosen because it has a TNC built into the radio itself, but almost any radio/TNC combination can be used.

### **The TNC**

We have also tested the software with an outboard TNC (a Kantronics KPC-3 TNC), which works fine with the application.

#### **Software Installation**

The software is installed on the Palm Pilot via a hot-sync operation. No special configuration is needed to run the software.

### **Operation**

When the software is first run, it talks to the TNC via the serial port, obtains the call sign programmed into the TNC, then sets certain parameters so that it can hear all packets on the network. Any packet that does not conform to the APRS messaging standard is ignored, except that the heard station call sign is saved. The software then sends any pending messages, then waits for user input.

Once a minute, the software resends any pending messages. If it hears a message intended for another station, it will rebroadcast that message, so that messages will propagate throughout a network of stations, unless that message has been sent out within the last minute. This prevents messages from “ping-ponging” throughout the network and rapidly causing network congestion.

If an operator wishes to send a message, he first either selects a call sign to send to via drop-down box or can enter a call sign manually. Then, he either taps on a particular message button or types in a message manually. The message can be edited at this point, so that one can start out with a “canned” message and modify it instead of having to type in custom messages from scratch.

### **Shutdown**

When a station wants to shut down, the operator taps the “Exit” button. The software tries one more time to send pending messages, then broadcasts a message indicating it is shutting down, then exits.

### **Enhancements**

Planned enhancements are (1) the ability to upload the soft key configurations to another Palm Pilot via infrared, and (2) the ability to program the soft key database on a PC before hot sync. This would allow batches of Palm Pilots to be programmed with the same messages all at once.

### **Implementation**

Most of the software is already implemented and is operational. Some of the programmable button code isn't finished, and the message “beam to” code isn't finished.

### **Screen Shots**

I have included several screen shots to illustrate the software in operation.



## 802.11b Used in Ham's Shuttle Recovery Efforts

By Doug Kilgore, KD5OUG (kd5oug@arrl.net)

An 802.11b high speed Internet link was used by hams in Nacogdoches, TX during the Shuttle Recovery efforts. The equipment for the link was provided by Michael Willett, KD5MFM from McKinney, Texas and Omni Computer Systems of Nacogdoches, to link Net Control in Nacogdoches with the Internet. The system was installed by Michael and several local Nacogdoches hams, including Robert Judy, KD5FEE, James McLaughlin, KD5POY, and Tim Lewallen, KD5ING, on Saturday, one week after the shuttle disaster.

The link utilized a mix of directional antennas to provide a robust link through the intense radio traffic in the area. Spanning a highway, and approximately a quarter-mile distance, the link was comprised of Aironet devices (now Cisco Systems). The equipment used included a BR-500 standalone bridge-router connected into the LAN / Internet cloud at the R&K Distributors, and a PCI card in a tower-style PC in the ForeTravel recreational vehicle located on the Expo Center grounds. The PC in the RV ran Windows 2000. Along with the radio card, the PC also included a standard Ethernet card, and was configured by James to run as a DHCP host and router, allowing several PCs to connect to the Internet via a local hub in the ForeTravel RV.

The radio cards were set to produce 100 mw of power and utilize the Direct Sequence Spread Spectrum encoding / modulation technique with a center frequency of 2437 MHz (US channel 6). At the Budweiser distribution center, a 24 inch parabolic dish made by David Clingerman, W6OAL, at Old Antenna Labs in Parker, Colorado, was connected to approximately 50 feet of LMR-400 coax terminated on-site with N connectors. The dish was mounted on a wooden 2x2, cross-braced by two more wood 2x2s held to a plywood pallet by lag screws.

The pallet was placed on the roof by the local fire department that arrived at the Budweiser Distribution Center with a hook & ladder fire truck to help with access to the roof. On the Expo Center side, an 11 element shrouded Cushcraft antenna was mounted on a temporary mast held secure to the RV with a radiator hose style pipe clamp.

Net Control utilized the link for looking up call signs, communicating quickly with e-mail, and monitoring weather radar, as rain tracked across the area often during the week after the shuttle event.

This application and installation of the 802.11b link was one of many examples demonstrating the extensive capabilities of Volunteer Ham Operators, government authorities and local businesses teaming together to help during a crisis event.

Pictures of the link as well as other operations may be seen at [www.k5rwk.org/Shuttle/index.html](http://www.k5rwk.org/Shuttle/index.html).

Many thanks to the Budweiser Distribution Center for their network and open facility generosity and support, the Nacogdoches fire department for the lift, Tim Lewallen for materials, support and the volunteer fire department truck and ladder, Robert for running wires and planning, James for the hub and his configuration assistance!



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## WA8WDQ Replaces KOPFX on TAPR Board

In early March, longtime TAPR board member Mel Whitten, KOPFX, resigned from his position on the board after serving for six years. In his place, TAPR President John Ackermann, N8UR, appointed Brad Noblet, WA8WDQ, who will serve out the remainder of KOPFX's term.



# APRS IP Mobile in a Non-Dynamic Wireless Environment or 802.11 APRS

By Darryl Smith, VK2TDS ([vk2tds@tapr.org](mailto:vk2tds@tapr.org))

## Introduction

The APRS Internet Service is a wonderful concept for a highly distributed GIS system for connecting hardwired users to the worldwide collection of APRS gateways. However, the world is moving away from the idea of hardwired connections, and moving towards the situation where users are wishing to access the data of the iGate system whilst mobile.

While services such as FINDU.COM have the capability to send data to mobile devices such as laptops, PDAs and cell phones, this transmission of data is not necessarily bandwidth efficient – particularly when the maps are available already on the mobile device. Once colleague received a bill for about US\$300 for his PDA for the month, with the majority from when he left FindU.COM running one night.

Whilst many of these devices allow a TCP/IP connection from the mobile device direct to the APRS Internet System (APRS-IS), the user is left with intermittent connections to the server – connections that are remade when each new base station is encountered

## Types of Networks

Two types of networks come to mind with the issue of changing IP addresses. The first is the GPRS network operated by the telcos, and the second is the 802.11 hot spots that are being installed world wide.

The GPRS networks based on the GSM telephone system are essentially classic TCP/IP using NAT and DHCP most commonly. When a user attaches to a new base station often a new NAT proxy will be used, and a new IP address will be assigned.

Alternately, consider the situation of a mobile 802.11 station driving through a city. The mobile will associate with a base station, and be assigned an IP address. The unit can then initiate a connection to the Internet until the signal drops out. After some period of time, another access point is found, and a new connection is initiated and the cycle repeats

## Downloading Data to the Mobile Unit: The Issue

In many networks, each separate base station or set of base stations are allocated some permanent IP addresses, and then use DHCP and NAT to assign private addresses to the user for use within range of that base station. When a user moves from one area to another, a new address is assigned, and a new connection to the APRS-IS must be established.

There are a number of consequences of this:

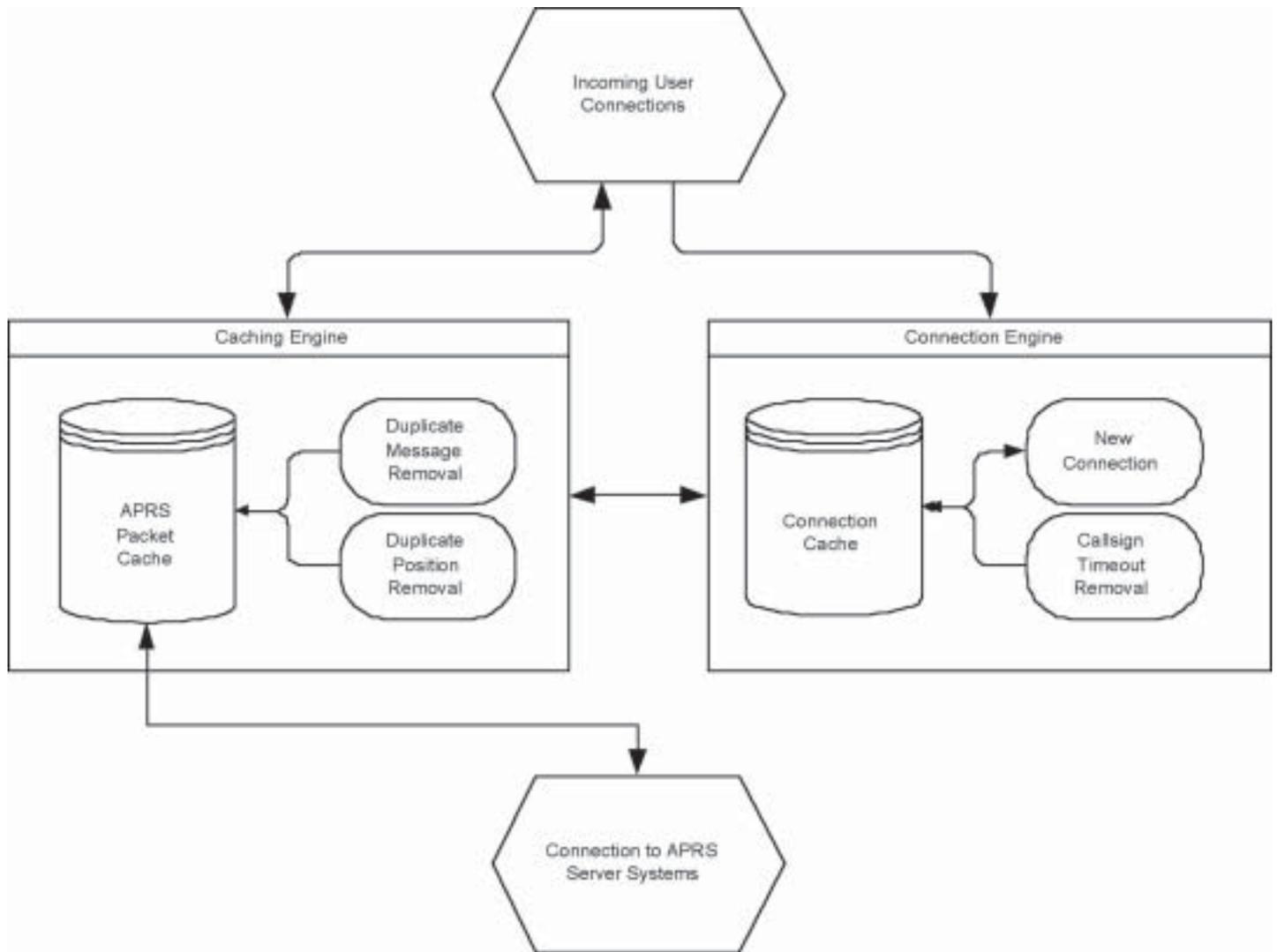
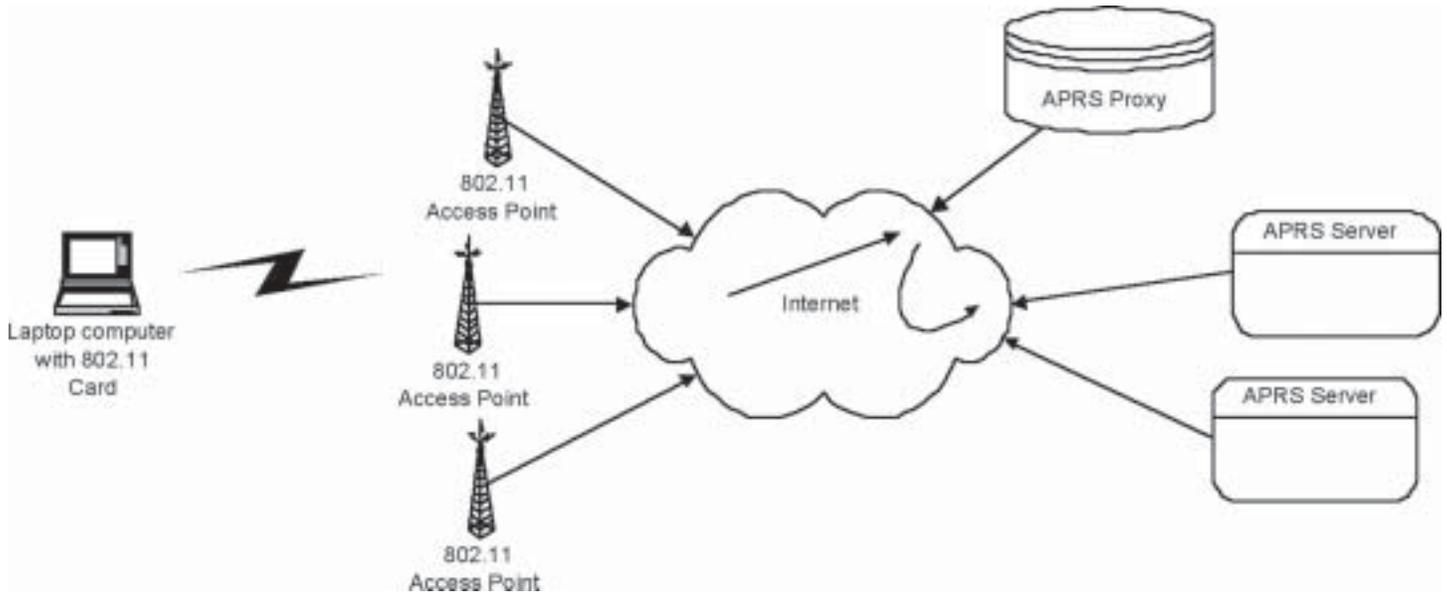
- Any packets during the transition are lost if no history dump is sent
- If a history dump is used, a large amount of data is sent, which may have already been sent.

Neither situation is ideal

## Downloading Data to the Mobile Unit: The Solution

In the ideal world, Mobile-IP would be used. This, however, relies on some coordination between base stations in order to operate. In our case this will not happen since all the base stations that we are using are out of our control. In the case of 802.11, some base stations may be under our control if operating under Part 97 rules.

The solution is to use an APRS caching proxy that acts as an interface between roaming clients and the APRS-IS; an interface that caches information between connections and sends a history report.



## Technical Detail

### 1. Caching engine

The caching engine records all packets coming through and stores them into a FIFO buffer, each with a local time stamp. The size of the FIFO buffer will be a trade-off between history length and memory utilization.

#### a. Duplicate Message Removal

When a new packet comes into the caching engine, a search is made to determine if other message packets can be removed from the cache. These would be duplicate message retries.

#### b. Duplicate Positions Removal

This is similar to the Duplicate Message Removal, but is for position reports. Implementation is optional since there are cases where it is useful for history purposes to be able to plot the positions of other stations over time.

### 2. Connection Engine

When a connection is made from a client, the call sign is stored in a list. Whenever a packet is sent to that client, a serial number is also stored next to that call sign.

#### a. Call Sign Time-out

After a period of time, the caching engine will no longer hold all the packets that a particular user requires when they reconnect. When this happens the connection entry should be removed from the connection list.

#### b. New Connections

When a new connection comes in, a normal APRS login string will be sent containing the call sign of the user.

If the call sign is listed in the connection list, all the packets that are stored in the cache since the last connection are sent to the user. Once the TCP/IP status on the connection indicates that the data has transferred correctly, the serial number is to point to the top of the stack.

The New Connections function also closes any previous connection from the particular call sign. This is to solve the issue that is predominantly present with GPRS, but can also be present with 802.11 that connections may remain persistent when the mobile unit leaves the range of the base station.

## Uploading Data

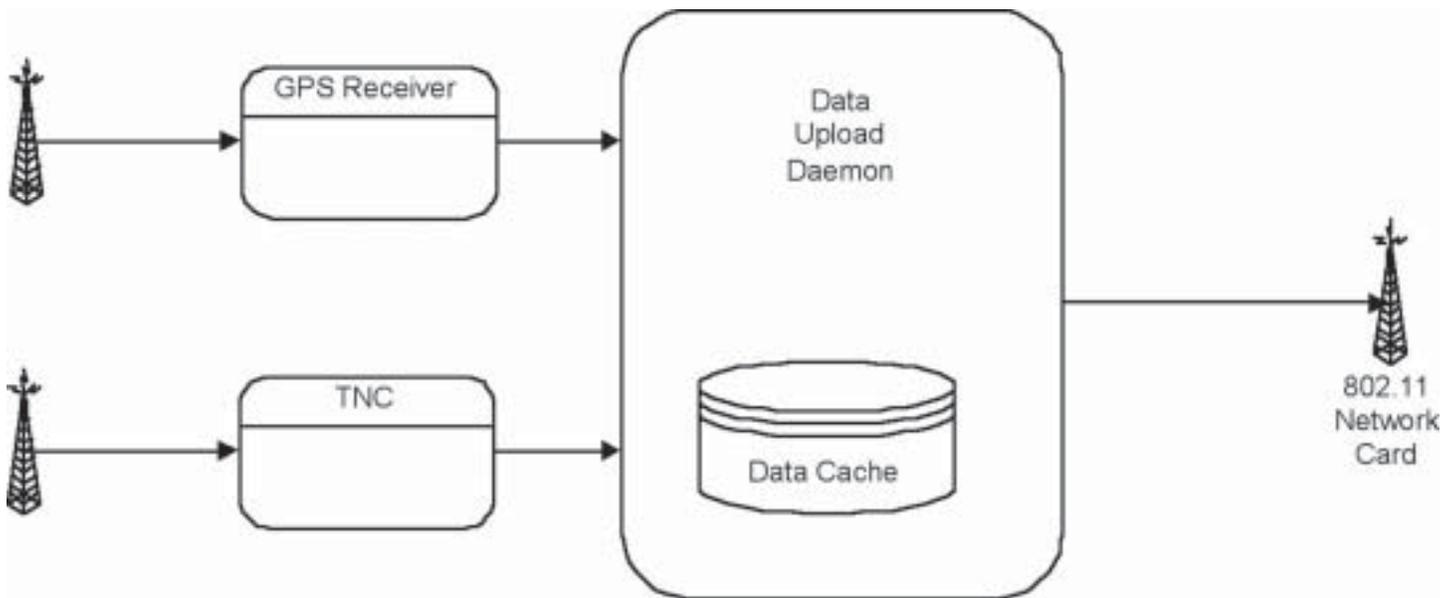
In most cases where existing software (such as UI-View) is used to upload data to the APRS-IS, beacons will be made whenever a TCP/IP connection is available. But this will only include the latest GPS position, and may not include other information that may need to be uploaded.

However in many cases there is a desire for tracking from a PDA without a requirement for displaying the positions of stations or for mapping. A small GPS daemon program could be written for a PDA or laptop to collect relevant data and upload it when network access is available.

The information that could be uploaded includes

- Real time position reports
- Position reports since the last successful upload to an access point. This is useful for where the intermediate positions are needed such as when an Radio Direction Finding (RDF) exercise is taking place
- Packets heard by a Mobile digipeater.

Since this is a dedicated application the software can be quite aggressive in reestablishing connections



to upload data.

### Intermediate Position Reports

One issue with this type of software is what should be done with intermediate position reports and other packets – information that would normally be discarded when more up to date information is presented. There are cases where the intermediate information may be required for historical purposes.

The recommendation is therefore to add the option for the user to be able to upload intermediate reports in chronological order as soon as a connection with the Internet is reestablished.

For packets that are time stamped, the issue of the currency of the data is self evident. Where no time stamps are included in the packet, I am recommending that a NMEA string with time stamp is uploaded at the same time as the encoded packets.

### Conclusion

What we have seen is that there are some ways to allow the APRS system to be used in a highly mobile IP environment without resorting to Mobile IP protocols. Some of the caveats have been identified, and some areas for experimentation have been identified.



# Welcome to Jeannie, The House That Listens

By Don Marquardt, K9SOA ([kyham@k9soa.net](mailto:kyham@k9soa.net))

## Home Automation

Those two words bring to mind many different things to people. From homes that go mad and attack their owners to very expensive installations only affordable to the rich. In reality, Home Automation can be both very useful and affordable to even the modest home owner. You can start small and add functions as you get time and money.

For the beginner, just adding a couple of wall switches or lamp modules, and a plug-in controller can make things easier around the home. Most the equipment needed is available from your local Radio Shack or through many sites on the Internet at very reasonable prices. By simply placing a lamp module between a lamp and the wall outlet, you are then able to turn the light on or off using a controller that can be located anywhere in the home. The lamp module also gives you the ability to dim the lights instead of just being able to turn them on or off. Add a motion detector and a small hand held X-10 remote and your are on the way to automating your home or apartment.

As someone who has been a tinkerer all my life, home automation was just another thing to play with. In my first home automation project, I installed wall switches in the bathrooms that turned the lights on when someone walked in and then off after the room had been empty for about 5 minutes. Very simple but effective. I got so used to not turning lights on or off, it was a real hassle when I moved into a new (to me) home.

One nice thing about using these devices is they can be moved from home to home if you ever move. Your investment is not lost. Just simply replace the switches with standard ones and take the old ones to the new home or apartment. They do not require any additional wiring since they use the existing 120 volt power cable that is already in your home. Some of the switches are wireless so they can be mounted anywhere with double side sticky tape. Great when you want to add a new switch without having to hire an electrician.

The devices I am referring to use a protocol called X-10 and use the existing 120v wiring already in your home. No additional wiring is required for their use. They are made and sold by X-10, Radio Shack, Leviton, and many others. A good source for home automation equipment and devices is Worthington Distribution ([www.worthdist.com](http://www.worthdist.com)).

I am in the never ending process of automating my third home and did most of the wiring before the walls went up. That is the easy way and gives you more options. This additional wiring was to provide for features not supported by X10 such as phones, computer connections, audio and video distribution. House #1 had a few motion detectors, lamp modules, and wall switches. Not much as far as automation is concerned but then again, very low cost for what I was able to accomplish. House #2 of course had more of the same plus some additional functions that were more in the automation and "Fun Things" area.

I added a computer and a software program named HAL2000 from Home Automated Living ([www.automatedliving.com](http://www.automatedliving.com)), that gives me Voice Control of all the X10 devices and also includes using voice control for all of the video and audio equipment. Now instead of pushing a button, I was able to say "Computer, turn on kitchen light" or "Computer, turn on the TV, turn to channel 5" and it was all done. No remotes to carry or lose. That was great. I have a motion detector at the start of the 400' driveway that notifies me of someone coming up the drive by making an announcement that "We have company coming up the driveway, master".

JEANNIE has appeared twice on the home automation information site [www.hometoys.com](http://www.hometoys.com)

HGTV's Dream Builder program heard about what I had done and came out in June 1999 to tape a segment for their show covering home automation. The show was broadcast in November 1999 but unfortunately the house burned down due to a faulty furnace, just one month before the show. I am now finished with the replacement home and had the ability to plan ahead of time all the things I would like to be able to do.

The new home has appeared as the Featured Home of the Month in the March 2002 issue of *Home Automation Magazine*, and in the Gateway Computer's magazine.

It is currently scheduled to be featured in the May 2003 issue of *Kentucky Living* magazine that is sent to the owner/customers of Kentucky Electric Cooperatives.

My home is located about 20 miles south of Louisville Kentucky, on just over 4 acres on the top of a hill with a great view. This picture was taken in Dec at the start of the new construction and shows the view after the leaves had fallen. The white stuff on the ground is gravel not snow.



This is an early picture of the house. The home has only 5 windows. One in each bathroom, one in the dining area, and two in the kitchen. Every room has a walkout sliding patio door for access to the deck that will surround the house on 3 sides. The side and back decks are already complete. The back deck is 10 X 78 while the side is 8 X 45. I will be adding a 20' X 78' deck with a hot tub and fire pit along the front of the house. The home has just over 2300 square feet of living area on the main floor that includes 4 bedrooms, kitchen, dining area, entertainment area and 2 full baths. There is another 2300 square feet in the soon to be finished basement that contains a 12 X 24 ham radio and automation room, utility room, a 30 x 50 activity room, another full bath, and a wiring room. There will be almost 3000 square feet deck area when the front deck is finished.



One requirement I had for construction was that every step was photographed. If I ever have a question on what is behind any wall I just have to check the pictures. I figured that this would be my last home that I would automate so I really went overboard when running the wires. When the walls finally went up, I had installed over 1° miles of Cat5 wire for the computer and phone connections, ½ mile of RG6 cable for the whole house video distribution, another ½ mile of wire for the security and motion detectors, and almost ° mile of wire just for speakers and microphones in every room. The builder just





laughed every time I showed up with one or two MORE reels of wire. The electrician just shook his head.

Every electrical outlet has a minimum of 4 outlets, some outlets that were where I planned to put entertainment or computer equipment have 8 outlets. Every wall has at least one set and any wall longer than 8' has two. I also applied the same rule for the computer, phone, and video cables. Each box contains wire for up to 4 phone lines, 2 Cat5 cables, and one RG6 video or TV signal line. They were spaced similar to the electric outlets. I ended up with over 100 cables running to the basement wiring closet. I will probably never use all of them but I now have the ability to put a computer, phone, or TV on any wall, in any room, with no connecting wire or power cord longer than 5 feet.

All the audio and video equipment (VCR, DVD, CD, Satellite, surveillance cameras) is available on TV's and speakers throughout the house. This is one of the 12 outside security color video cameras along side a door key to give you an idea on the actual size.

Each video device is set up to have its own private TV channel. That way anyone can select any unit from any location all at the same time. Each room has it's own audio speakers, volume control, device

selection and remote control to the main components.

Another hobby is ham radio and I have a complete Amateur Radio station set up in the basement. In my spare time, I usually spend it there, talking to other ham operators all around the world.

I have a motor driven tower that goes from 23 feet to 55 feet high. When fully extended, the very tip of the top antenna is almost 90' high. The tower can be operated using the voice control system just by saying

“JEANNIE, raise tower” or “JEANNIE, lower tower”.

If the tower is extended and the wind gets over 15 mph, the automation system will automatically lower the tower to minimum height. This reduces the chance for damage. This is done even if I am not at home so if I forget to lower it, it is protected.

Antennas from the top down are:

Comet GP9 144/440 vertical, A270-6S 144/440-MHz vertical beam, A148-10S 144-MHz beam, A50-6S 50-MHz beam, X7 10-15-20m beam. All beam antennas are Cushcraft. Next is the local TV antenna, and an Arrow 144/440 J-pole on the left side arm. There is also a G5RV going out North/South just below the TV antenna. All the



beam antennas at the top of the tower are turned by a Yaesu G-800S rotator.

The tower is a motor driven U S Tower TX455.

The white pipe at the right side base of the tower is the 4" feed pipe for all the antenna and rotor cables going into the basement ham radio room.

There is also a Davis Weather Monitor II on the tower that feeds the weather map at the web site.

Temperature, Humidity, Rain fall, Wind speed and direction are sent to the web site every 15 minutes.

I named my automation computer "JEANNIE" after the TV show, I DREAM OF JEANNIE starring Barbara Eden, that was popular many years ago.

Instead of saying "Computer", I say "JEANNIE". Just to add a little levity to the home, I have the computer reply "Yes, master" when I request it to do something.

I have a couple of .wav files of Barbara Eden saying the phrase so it is in her voice. When I want to watch TV I just ask "JEANNIE, turn on TV", she replies "Yes, master, what channel would you like to watch?". I then just say "Wave3". She then turns on the TV, selects the channel and if I have lights turned on, dims them for best viewing.

One of my other pursuits is genealogy. So far I have over 4000 names and go back to 1115. Having a little problem in my search to include JEANNIE. Not too many records go back that far.

I just completed installation of a 120" front projection system along with two 301 disk jukebox DVD/CD players so I have my entire DVD and CD collection loaded and am able to just say, "JEANNIE, play Reba" and have the correct disk selected, and the audio system turned on.

The 120" screen displays a picture 6' high and 8' wide. The projector could display up to a 300" picture if I had the room. That would be a 15' X 20' picture. Talk about a big screen TV.

When I say "JEANNIE, play Neil Diamond concert" the system selects the DVD, the projector turns on, the lights dim and the drapes close as needed. All I have to do is just sit down, relax and enjoy the show. Oh, but I *still* have to make the popcorn!

This is the seating area for the home





theater system. The projector is on the shelf above the seating area. Rear speakers for the audio system are on each end of the shelf. One of the 301 disk CD/DVD players is the unit on top of the cabinet on the left. All 8 of the remotes on the table are being replaced by just one, just in case JEANNIE is taking a little nap.

The kitchen currently is very low on automation. I still haven't been able to figure out how to have JEANNIE load the dishwasher or fix dinner yet. In the upper right corner you can see two of

the room motion detectors. There is one in every room and hall.

Some of the functions that I have automated in the home are:

- Bathroom lights go on and off when anyone enters or leaves. Between midnight and dawn, the lights are turned on at 10% so you are not blinded.
- The same applies to the hall leading from the bedrooms. Makes getting up in the middle of the night a lot easier on the eyes but enough so you can see where you are going.
- As soon as anyone opens the door leading to the basement, the stair and basement lights are turned on. They stay on until no motion has been detected for 30 minutes.
- When any of the outside access doors are open for longer than 5 minutes, the heating or air conditioning is turned off. Don't want to try and cool or heat the outside. Great when the grandkids are visiting. As soon as all outside doors are closed, the heating or air conditioning is turned on again.
- Open any outside door after dark and the lights inside the room turn on for 10 minutes.
- The outside lights are turned on at dusk and then off at 1 am.
- All lights can be controlled using hand held remotes, multiple controllers located around the home, or by voice control. There are built-in microphones in every room.
- At bedtime, all lights and audio/video equipment can be turned off by pressing one button on a controller on the master bedroom headboard or just asking JEANNIE to shut down for the night. No more having to get up to turn off that one light you forgot.
- When the alarm system is set to away or vacation, the heating and cooling are automatically set to extended ranges to reduce power requirements. The water heater is also turned off to reduce resource usage even more.
- When anyone starts up the driveway, JEANNIE announces "We have company coming up the driveway, master."

Being out in the "country", I need water delivered when the well doesn't keep up with use. When the storage tank gets down to a certain level, JEANNIE automatically calls the water delivery company and schedules a delivery. That was a funny experience the first time. I had forgotten to notify them that JEANNIE would be calling to order. Since they knew I was single, they wanted to make sure that the "lady" that called for delivery was allowed to do that.

I am currently in the process of setting up the security video cameras to save a video clip every 5 minutes and put them on a web site so I can check to see what is happening while I am out on the road. I still have a little more work to finish that part.

JEANNIE handles all the phones. She answers calls, takes messages, and when I do extensive travel, she sends an e-mail to me when I get more than 2 messages. The voice messages are attached to the e-mails.

When I want to make a call to family or friends, I just say "JEANNIE call Lynn at home" or "JEANNIE, call Bishop Realtor" and the call is made. All I have to do is pick up the phone when it is answered. There is a speakerphone function so I wouldn't even have to do that but I really dislike them myself so I never use it.

JEANNIE screens and sends messages from blocked callers to a separate mailbox and doesn't count them as requiring a prompt reply.

When any family member or friend calls, she replies using their name by recognizing the phone number. This allows me to create a special message for each number in my directory that is played only to that person.

JEANNIE connects to the Internet once a day and gets the current weather forecast, today's TV listings, e-mails, news headlines, and stock market quotes. I then can ask her to read any of the information to me. I just say "JEANNIE" what is on TV at 8 pm, and she replies with the programs for 5 of the stations I have selected as favorites. The TV listings can be retrieved for your area as well as for Direct TV, and Dish Network. If I have e-mails, I just ask her to read them to me. I can then either save or delete them. These same functions are available to me while I am traveling as well as when at home. I also have the ability to control almost every device in the home by using any phone. This gives me the opportunity to request that the VCR be started for channel 3 at 8 pm on Wednesday while I am out of town.

It is also just as simple to request that the living room lights be turned on at 8:30 pm for 3 hours on Monday, Wednesday, and Friday. On those days, the lights will be turned on at 8:30 pm and off at 11:30 pm.

My automated X-10 dog, Rex, lets me know when anyone is in the area by barking and sounds an alarm chime when any of the outside motion detectors see anything. He barks at a lot of deer and an occasional squirrel or bird that flies right in front of the detector.



This is what Rex sounds like



This is what Rex actually looks like



My other dog, Butch is not as big or mean sounding.

He is just a little pussycat.

He walks around the house like he is the boss. He likes to get pats on the head once in a while. If you ignore him, he starts to whimper. After a while if you don't pay any attention to him, he takes a nap and even snores. Sounds or lights coming on wakes him up and he starts barking to let everyone know he is around and wants some attention.

The nice thing about my two dogs is that they don't need to be taken care of. No feeding, taking for walks, cleaning up after.

Couldn't be any easier pets to have.

At night, the outside lights where motion is detected are turned on and a VCR is automatically started. Most of the time I just get some nice videos of the deer having a late night snack or raccoons on the porch finishing up the cat food. In some areas I have infrared illuminators that come on so the B&W cameras can really see in the dark. Most of the cameras are color. The B&W cameras are only where I want to be able to see in very low light or use the IR flood light so I don't announce the camera usage. The IR flood lights are not visible by people or animals. All cameras are connected to a 16 input controller. All cameras can be displayed on any TV in the home and when a detector is tripped, that specific camera is routed to a VCR which records at standard speed as long as the detector remains tripped. If more than one camera is tripped, the controller rotates the view between each tripped area. After all trip conditions have reset, the VCR switches back to time lapse mode and records for another hour at 1 frame per second and then stops until the next trip condition. That way a standard 8 hour tape can last almost 25 days.

The newest automation addition is my car now talks to the Internet.

As I drive, a ham radio transmitter in the car passes on the information from a GPS receiver as to where the car is located, direction of travel, speed, and height above sea level once every minute. This is a system called APRS and is used by ham radio operators all over the world. My daughter uses it to see where I am during the 4-5 hour drive to and from her home in northwest IN. The system keeps a history of up to 3 months so you can see where I have been driving. Talk about Big Brother watching. This would be it nice if the car is ever stolen since it will always indicate the last location of the car. You can see how this works by visiting my web site and click on the links for Where Have I Been for the last day or week.

K9SOA-9 is the location indicator for my car.

I hope this little tour of my home has been of interest.

Keep in mind that being single,

I like to add a little humor so don't take anything too seriously.

I'm sitting at my ham radio station setup K9SOA

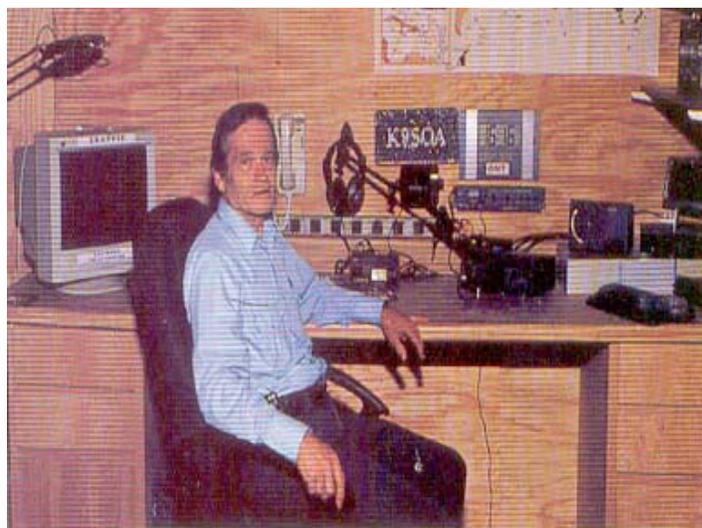
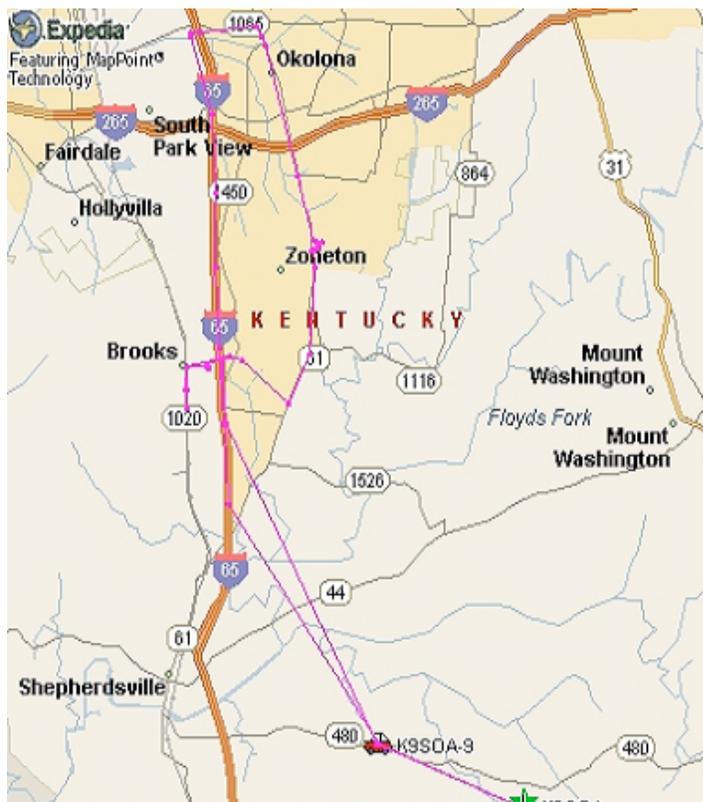
Equipment shown includes Yaesu FT-847, FT-2600

Operating HF through 440 MHz

APRS, APRS digipeater/I-Gate

If you have any questions or comments about JEANNIE, you can contact me at [kyham@k9soa.net](mailto:kyham@k9soa.net) or visit JEANNIE on-line at [www.k9soa.net](http://www.k9soa.net)

Your Wish Is My Command!



	Price	Member Price	Qty	Total	Kit Code
<b>TAPR MEMBERSHIP</b>					
New		\$20.00			0
Renewal, Enter Membership Number here:		\$20.00			0
<b>KITS</b>					
PIC-E(ncoder)	\$65.00	\$58.50			16
Motorola EVM56002 Interface	\$150.00	\$135.00			16
Compact FlashCard Adapter (FlashCard not included)	\$59.00	\$49.00			16
T-238 Weather Station	\$134.00	\$120.60			16
TAC-2 (Totally Accurate Clock) (requires a GPS receiver to operate)	\$139.00	\$125.00			16
Differential GPS (requires a GPS receiver to operate)	\$199.00	\$179.00			16
DAS (DTMF Accessory Squelch) (as seen in December 1995 QST )	\$68.00	\$61.20			8
TAPR 9600 bit/s Modem	\$80.00	\$72.00			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
<b>FIRMWARE</b>					
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
<b>PUBLICATIONS</b>					
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	\$17.10			16
TAPR Software Library CD	\$20.00	\$18.00			4
Wireless Digital Communications	\$39.99	\$38.79			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
<b>OTHER</b>					
TAPR Badge with Name and Call Sign	\$10.00	\$10.00			0
TAPR 11-oz. Coffee Mug	\$11.00	\$10.00			4
TAPR Shirt (go to www.tapr.org for details)					
<b>GPS EQUIPMENT</b>					
TAC-32 Software Registration	\$10.00	\$10.00			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

All prices subject to change without notice and are payable in U.S. funds. Allow 6 to 8 weeks for your order.



# TAPR Order Form

TAPR  
Tucson Amateur Packet Radio  
8987-309 E. Tanque Verde Rd. #337  
Tucson, AZ 85749-9399

Phone (972) 671-8277

Fax (972) 671-8716

Internet [tapr@tapr.org](mailto:tapr@tapr.org)  
[www.tapr.org](http://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 \_\_\_\_\_

ARRL and TAPR 22nd Annual  
**Digital Communications Conference**  
September 19-21, 2003 • Hartford, Connecticut



## Information

Mark your calendar and start making plans to attend the premier technical conference of the year, the **22nd Annual ARRL and TAPR Digital Communications Conference** to be held **September 19-21, 2003**, in **Hartford, Connecticut**. The conference location is the **Marriott Hartford Windsor Airport** hotel. Updated conference information is 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 (GPS), precision 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, IEEE 802.11 and other Part 15 license-exempt systems adaptable for Amateur Radio, 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.

## Introductory and Technical Sessions

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. Introductory sessions are scheduled throughout the DCC to introduce new technical topics for beginners and experts alike. Here are some of the introductory seminars scheduled:

**Intro to WSJT by Del Schier, K1UHF**

**Intro to EchoLink and VoIP by Jon Taylor, K1RFD**

**Intro to PSK31 by Steve Ford, WB8IMY**

**Intro to APRS by Stan Horzepa, WA1LOU**

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 22nd Annual ARRL and TAPR Digital Communications Conference to be held September 19-21, 2003 in Hartford, Connecticut, 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, 2003** 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/>

## Guest Speaker

**Alex Mendelsohn, AI2Q**  
**ChipCenter Senior Technology Editor**

For almost his entire career, Alex Mendelsohn has been involved with engineering and editing. Following a stint with Uncle Sam's Signal Corps in the mid-1960's, he earned his undergraduate degree at Long Island's Hofstra University. Working his way through school, Alex wrote technical manuals for military and commercial systems. He got these jobs because he was able to write a description of a schematic he was handed during the job interview. Ham radio came to the rescue! The circuit was something he had been poring over in the ARRL Handbook. Since then Alex has served as Chief Editor of Portable Design magazine, Editor-in-Chief of Integrated Circuits Magazine, and Chief Editor and bottle washer at EE Product News. You've also seen his byline in Computer Design Magazine, Electronics Magazine, Personal Engineering Magazine, ASIC and EDA Magazine, and Computer Language, to name a few.

# Two-Day Conference, Saturday Banquet, and Sunday Seminar

**Friday** –Technical and introductory sessions will be presented all day Friday and Saturday. The DCC will also host the *Seventh Annual APRS National Symposium* with expanded coverage both days. APRS enthusiasts are highly encouraged to submit their presentations to be printed in the annual DCC proceedings.

**Friday Evening Social** – Join us for a Friday evening social get together.

**Saturday** – Technical and introductory sessions continue throughout the day.

**Saturday Evening Banquet** – Banquet with guest speaker Alex Mendelsohn, AI2Q. Concluding the evening will be a small awards presentation and prize drawing.

**Sunday Seminar** –The ever-popular “Sunday Seminar” topic is Software Defined Radio by Matt Ettus, N2MJI.

## Hotel

Conference presentations, meetings, and seminars will be held at the **Marriott Hartford Windsor Airport**. It is highly recommended that you book your room prior to arriving. A special DCC room rate of **\$99/single** and **\$99/double** per night has been blocked for 50 rooms and is available until September 1<sup>st</sup>, 2003. Once the 50 rooms have been reserved, room rates will increase. So be sure to book your rooms early! Transportation to and from the hotel is via shuttle. Please contact the hotel to arrange specific transportation needs.

### Marriott Hartford Windsor Airport Hotel

28 Day Hill Road  
Windsor, CT 06095

Phone: 1 860-688-7500 Fax: 1 860-688-7509

(<http://www.marriott.com/dpp/PropertyPage.asp?MarshaCode=BDLAP>)

## Area Attractions

W1AW and ARRL headquarters (Newington, 15 miles), USS Nautilus and Submarine Museum (Groton, 45 mi), Cigna (8 mi), CT Expo Center (4 mi), Downtown Hartford (6 mi), Foxwoods & Mohegan Sun Casinos (45 mi), Int'l Skating Center of CT (8 mi), Konica (1 mi), Mark Twain House (9 mi), Mystic Seaport and Aquarium (45 mi), Nat'l Basketball Hall Of Fame (20 mi), Six Flags New England (20 mi), Traditions of Windsor Golf Course (1 mi), University Of Connecticut (20 mi), Wadsworth Athenaeum (6 mi)

## What you can expect at DCC 2003

There are few activities where your participation can be **so much fun and important!** What a great way to share and renew your enthusiasm for digital amateur radio! A get-together with colleagues and bringing each other up to date on your latest work – all this, and more, for an unforgettable weekend of amateur radio and digital communications.

### Tucson Amateur Packet Radio

Phone: (972) 671-TAPR (8277)

Fax: (972) 671-8716

Email: [tapr@tapr.org](mailto:tapr@tapr.org)

Web: <http://www.tapr.org/dcc>

## Registration Form

Contact the TAPR office by Phone (972)-671-TAPR (8277), Fax (972)-671-8716, or Internet: <http://www.tapr.org> and [tapr@tapr.org](mailto:tapr@tapr.org) to register or for additional information.

**Student pricing** (17 yrs and under)

**50% off regular price**

**Two-Day Conference** (includes proceedings)

Pre-Registration (before Sep. 1<sup>st</sup>)

**\$70.00** \_\_\_\_\_

Registration (after Sep. 1<sup>st</sup>) or at door

**\$80.00** \_\_\_\_\_

**Single Day (Fri. or Sat.)** (includes proceedings)

Pre-Registration (before Sep. 1<sup>st</sup>)

**\$40.00** \_\_\_\_\_

Registration (after Sep. 1<sup>st</sup>) or at door

**\$50.00** \_\_\_\_\_

**Saturday Banquet**

Dinner with Guest Speaker

Prize Drawing

**\$30.00** \_\_\_\_\_

**Sunday Seminar**

Software Defined Radio by Matt Ettus, N2MJI

Sunday, 8:00 am – 12:00 pm. **\$25.00** \_\_\_\_\_

**TOTAL** \_\_\_\_\_

Name/Call: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Country: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Email: \_\_\_\_\_

Charge my credit card (circle one):

VISA    MasterCard

Acct. No.: \_\_\_\_\_

Expiration Date: \_\_\_\_\_

Name on card: \_\_\_\_\_

Signature: \_\_\_\_\_

Mail completed registration form with payment (Credit card or Check) to:

**TAPR**

**8987-309 E Tanque Verde Rd #3378**

**Tucson, AZ 85749-9399**

Or check <http://www.tapr.org/dcc> for an on-line registration form.

A registration packet will be mailed in September upon receipt of registration form and payment.