

1. Introduction

Last time we went through the basics of APRS[1] and how it works, now lets take a look at some of the more advanced features.

2. APRS & IRLP

As anyone can write software to interact with the APRS system someone wrote a piece of software that will send a status message of any IRLP node out onto the APRS system for anyone to pick up. EI8JA and I integrated this software into the IRLP node, and then I configured the APRS Internet Gateway software to broadcast this information out on the RF. This would be of most use to a visitor to the area, unaware of the existence of the IRLP node, yet having APRS capability, would be informed of the frequency, offset and status of the node.

3. Voice Alert

Let us briefly return to the idea of "Voice Alert"[2]. I mentioned before that 100Hz is most commonly used in the USA. It seems that a CTCSS tone 136.5Hz was previously recommended for use in Europe. I have set a 'Bulletin' to be broadcast from EI3RCW-2 once every few hours to inform mobile stations of this.

What started Voice Alert was the frustration of driving down the road, out in the middle of nowhere and seeing a passing APRS tracker and having no means whatsoever to contact him/her. Voice Alert means that you do not turn the volume on the radio down, but leave it up and then set a 136.5Hz CTCSS tone to mute the speaker. This way you will not hear any packets, but anyone can call you by voice by setting a matching CTCSS transmit tone, then you can both QSY for your chat, and when finished you can return to your APRS configuration. This really only applies to mobile stations as a fixed station transmitting a 136Hz tone would cause serious annoyance to every mobile station within range.

This is very useful in the Kenwood TM-D700E as it allows the otherwise 'wasted' (on APRS) A side of the radio to function as almost a 'pager'. It also allows an otherwise dedicated mobile 'tracker' to have a function as a 'pager' almost. If you have a modern mobile rig capable of CTCSS decoding, why not put 144.8 with a 136.5Hz CtCSS tone in a memory channel. You might come across someone else on the road and it could help shorten the journey for both of you.

4. Traffic Reporting

This feature is documented in [3]. It allows you to place an object on the APRS system to alert other drivers of traffic problems. This really only applies to the Kenwood APRS radios (would be possible with tinytracker/opentracker also). Simply put, you change your callsign to TRAFFC (or some other name) and then send a few packets to let others know the position of the object (note your callsign has to appear in the packet status text in order to identify the sending station). In the kenwood radios, this configuration can easily be saved to a memory for quick retrieval.

5. APRS Messaging

Along with being able to send position updates and status messages, its possible to exchange short messages with other suitably equipped stations. This would include the Kenwood TM-D700E, TH-D7E, and pretty much all APRS Software applications. With the use of the APRS-IS[4], this effectively means that one can exchange a short message with an APRS user anywhere in the world. Some enterprising folk have built on top of APRS messaging some very interesting features.

5.1 DIGI_NED

5.1.1 Overview

DIGI_NED[5] is a very powerful, open source based, software digipeater (Digipeater from the Netherlands). As well as supporting all the latest digipeater functionality it also has several more advanced features which are of interest including:

- Can act as a "tiny-web-server" with configurable messages and pinpointing of interesting locations in the area
- Generates DX messages and keeps DX lists for directly heard stations
- Generates telemetry messages, input via a LPT(parallel) port
- Remote control output via LPT port
- Satellite tracking activated by queries, transmits the requested satellites by means of so called Objects, displays when the satellite raises above the horizon or when in view shows the bearing and azymuth.
- Ability to send data recieved over a serial line from a GPS, weatherstation or other serial device. The data is sent without modification.

This makes it a very powerful piece of software as it exploits APRS messaging for increased functionality. Currently the WIT Amateur Radio Society don't have anything hooked up for remote control, though one thing that immediately springs to mind was remote reboot of the node itself (in case of software hang) or remote power switches for any other device in the shack.

Pretty much all of the information in these sections comes from the DIGI_NED Manual.

5.1.2 Advanced Messaging - Tiny-Web-Pages

As a APRS user you can ask DIGI_NED (EI3RCW-2) some questions through APRS messages. This is similar functionality as the Tiny-Web-Pages suggested by Bob Bruninga, WB4APR.

In DIGI_NED the query mechanism works with normal standardised APRS messages. To start with DIGI_NED responds to the ?APRS? broadcast message; DIGI_NED will transmit all its beacons. All other messages must be addressed to DIGI_NED (EI3RCW-2). Most of the responses have to be acknowledged by the receiver. DIGI_NED repeats responses up to 10 times, doubling the interval at each attempt. Of course these retransmissions cease when a acknowledgment has been received.

The following are some commands are recognized by DIGI_NED:

- ?help - shows a short overview of all commands
- ?id - shows the own call and the call of the DIGI_NED owner
- ?ver - shows version and date and time of compilation
- ?up - shows date and time of the last restart
- ?aprsd - shows directly heard stations, maximal 5, no ack
- ?mheard - shows help for the mheard command
- ?mheard 1 - shows heard stations on port 1
- ?mheard ei7ig-1 - shows when ei7ig was last heard, with port number
- ?mh... - just like mheard, only shorter
- ?dx - shows help for the dx command
- ?dx 1 - shows best dx on port 1, all history, last 24h and last hour
- ?dx gw6teo - shows distance and bearing to gw6two

?ping? - shows the path of the requester to the digipeater, no ack
?aprrm - retransmits all unacknowledged messages for the requester
?aprst - same as ?ping?
?aprs - makes DIGI_NED send all frames specified with the beacon variable

Note that some commands cause beacon transmissions or transmission of object data and item locations instead of a return message. Commands like "?aprrm" do not return anything if there are no pending messages for you. "?ping" and "?aprst" send messages which do not need to be acknowledged. If reception fails you will not see an answer either.

A specific command from a user is only accepted once in 900 (default) seconds. When a user sends the same command within this time again then DIGI_NED will not respond, only acknowledge the message.

This means for example that a user cannot send two "?info" commands to DIGI_NED within this time, on the second command DIGI_NED will not respond and only acknowledge the message. If the user tries the "?info" command again after 900 seconds then the user will get a normal response on the "?info" command. After sending a command a user can send any other command without any problems. The reason for this behavior is to avoid problems when two auto-responding systems are starting to respond to each other, this will continue forever if nothing is done about it, hence the time limit.

5.1.3 DX Functions

DIGI_NED has a DX function build in. First of all you can get distance information through queries. This works with the command ?DX. It works like ?MH - with port number or callsign. It uses the entries in the MHEARD list, so when the MHEARD list is small the DX will also not give much.

DX with port number 1 (only one port on EI3RCW-2) returns three messages;

- Distance to the best DX station with callsign, and the callsign of the second best DX station
- Distance to the best DX station with callsign, and the callsign of the second best DX station heard in the last 24 hours
- Distance to the best DX station with callsign, and the callsign of the second best DX station heard in the last hour

If there is no second best DX station then only one call is shown.

When a station is received which is the 'best DX' over a period of time then it will be announced by means of a DX bulletin which can be caught by a TH-D7 or TM-D700 radio for example. There is a threshold value defined in the configuration file, which specifies the minimum distance for DX. I have this currently set at 100km. Distances below this value are never considered DX.

Even in a AX25 environment where transmission failures don't exist. It is possible to have errors in the DIGI_NED DX-list. Stations that are local can appear as thousands of kilometers away due to incorrect position information.

5.1.4 Satellite Tracking

Satellite tracking was donated to the DIGI_NED project by Alex Krist, KG4ECV. Alex presented his implementation of satellite tracking in DIGI_NED at the Charleston, SC Hamfest February 3, 2001. Most of the information in this section is taken from his documentation.

The objective of the Satellite Tracking module in DIGI_NED is to give APRS users a tool to track satellites on APRS without having to invest time and/or money in satellite tracking software. APRS users can use their APRS client software to obtain satellite-tracking information. The only requirement on the client side is that the APRS client must be able to send regular APRS messages.

To minimize channel load, the module has been implemented in such a way that tracking is only done on demand. No bandwidth is wasted by loading the channel with information that no one requested (Currently have EI3RCW-2 configured to 'automatically' track AO-51, ISS, VO-52, AO-16 and AO-27).

The tracking module has three main functions. These are,

- Satellite Inquiry,
- Satellite Tracking
- Updating of the Satellite Information Database.

Satellite Inquiry

An APRS user can ask DIGI_NED for information about a particular satellite by sending a message query to EI3RCW-2. The satellite-tracking module in DIGI_NED uses the 4 position Amsat designator to specify satellites (i.e. Sunsat is so35). Such a query could look like:

```
sat ao40
```

Upon reception of this message, DIGI_NED will send back a message informing the user whether or not the satellite is in range, and an object containing information about the satellite. This object will be displayed by the APRS client software on a map. The status text of the object will contain AOS (Acquisition Of Signal) information if the satellite is not in range. For example:

```
AOS@3-2 12:00 LOC
```

This means that the next pass will be at 12 noon on February third, local time. The time can also be indicated in UTC, and is configurable by the digi owner. If the satellite is in range, the status text will contain information necessary to track the satellite. For example:

```
U145.823 7D435.398 1 E71 A123 MB
```

This status text informs the user of the doppler-corrected uplink and downlink frequencies (U145.823 D435.398), the elevation angle (E71), the azimuth (A123) and in which mode the satellite is operating (MB, Mode B). The extra 7 and 1 in the status text are for display purposes only on a Kenwood TH-D7A(G)/E. This allows for display of elevation and azimuth together on the first screen of the object information display on this particular radio. In case the satellite does not exist or if the query is not correctly formulated, DIGI_NED will send an appropriate error message back to the APRS user.

Satellite Tracking

Satellite Tracking is actually very similar to Satellite Inquiry. An example of a tracking query is:

trk ao40

The main difference between inquiry and tracking is that after sending the initial in range/out of range message and initial object, DIGI_NED will be put in tracking mode. This means that DIGI_NED will continuously transmit objects with updated satellite information up to a maximum allowed time set by the digi owner. The interval between the transmission of objects depends on whether or not the satellite is in range. If the satellite is out of range, an object is only transmitted every 15 minutes.

As soon as the satellite comes in range DIGI_NED will transmit a new object every minute. When the satellite disappears below the horizon again, DIGI_NED will resume transmitting objects at the long interval (15 mins). These intervals are configurable. The information in the status text of the object changes dynamically also. While the satellite is out of range it will contain AOS information, and tracking information when the satellite is in range.

Updating Satellite Information

In order for Satellite Inquiry and Satellite Tracking to be meaningful, the satellite database containing the kepler elements of each satellite needs to stay current. This I do roughly once a month.

5.2 APRS Email

APRS Email has been around a while, Keith Sproul WU2Z has a server that will accept any APRS message that has its destination set to "EMAIL" and with the recipient's email address as the first "word" of the message. You may only send one line messages (of 67 characters maximum).

javAPRSEmail is new and was written by Pete, AE5PL, to provide the amateur radio APRS community a simple, but effective, email server for APRS-IS. It provides a multi-platform application tuned to present cleanly formatted packets to the APRS-IS feed and to the Internet email system. This has been deployed on the node in Waterford I.T. as EI3RCW-EM

As well as supporting the standard EMAIL method of having the email address as the first word, javAPRSEmail also supports callsign specific shortcuts.

For instance, if I send a message to EI3RCW-EM like so

me johnronan@ironan.com

then I can use "me" as a shortcut, in place of my full email address, from any of my stations. i.e.

I then send a message to EI3RCW-EM like so

me This is a test

This will send me an email.
I can list all my shortcuts by sending

me l

Upper or lower case L is fine. This will cause an email with all of my shortcuts

To remove the "me" shortcut I would send

me r

Shortcuts are associated with the callsign of each amateur, each can have their own shortcuts and they are case sensitive. Please only include use alphanumerics.

Now, the cool thing is that this is bi-directional. Yes, you can now receive emails direct to your radio ("Whats this got to do with radio?" I hear someone cry). Once you have a shortcut set up. This person can also send you emails to your radio.

I have configured an email address on ei3rcw.wit.ie that all emails are sent from and received into. Every 5 minutes the javAPRSEmail server checks this mailbox for emails, checks that the sender is authorised, and if they are, it will attempt to send them to the user

As an example, I send an email to

aprsmail@ei3rcw.wit.ie

In the Subject Field, I put the destination callsign and the message i.e.

EI7IG-9: this is a test message

In the body of the email then I have to put my userid i.e

userid:me: < - This is the authenticator, the server checks this against the "from" address in the email against the previously stored shortcut. If they do not correspond, the email is rejected.

If they do, the email is queued for delivery, and when it is finally delivered you will receive back a confirmation message to say that it was delivered.

6. Conclusion

That covers most of it I think, if you have any questions feel free to give me a shout on the SEARG Repeater Network if you hear me on, drop me a packet message at EI3DIB's BBS or drop me an email ironan at tssg dot org. Many thanks to the various Departments in WIT for helping me get it all set up. APRS is a registered trademark of Bob Bruninga, WB4APR. Now, where is my Morse key?

References

- [1] Automatic Packet/Position Reporting System, <http://web.usna.navy.mil/~bruninga/APRS-docs/APRS.TXT>
- [2] Voice Alert, <http://nwp.ampr2.net/nwaps/VoiceAlert>
- [3] GREAT APRS SETUPS FOR THE TM-D700 MOBILE <http://web.usna.navy.mil/~bruninga/d700-faq.txt>, 6 June 2005
- [4] Automatic Packet Reporting System - Internet Service, <http://www.aprs-is.net>
- [5] The DIGI-NED owner manual, http://www.qsl.net/digi_ned/html/doc/d_n-owner-manual/d_n-owner-manual.htm
- [6] APRS Email, <http://www.aprs-is.net/email.htm>