Automatic Weather Bulletins via APRS®

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Background:

This project was an outgrowth of a Pascal-based weather parser located at the Collier County Florida Emergency Operations Center called WXSVR, which stood for Weather Server or Weather Severe. Data from the GTE Weather Wire service was broken into products and made available on the local packet BBS, with hurricane data sent to the statewide network. In February 1997 I met Keith Sproul at the National Hurricane Center during the annual Amateur Radio Conference. I started communication with him and Mark Sproul concerning the use of WinAPRS™ for hurricane information display and dissemination. An interface protocol was agreed upon to allow the development of a parser as a possible plug-in to the MacAPRS™/ WinAPRS™ software. The Parser was originally for hurricanes only, but subsequently was developed for all types of weather bulletins.

Weather parser:

Weather text data is available via Satellite from the GTE and EMWIN feeds, and via the internet. E-mail versions of the products are also available on a less timely basis for testing and backup. The parser is written in 'C' programming language with the input module able to handle any of the available sources with identical output. This can be file based, or as in the case of the GTE Weather Wire , a serial input. The output of the parser is a formatted packet ready for transmission. Output is sent to the retransmission engine as if it were received off air.

Retransmission engine:

One of the hardest nuts to crack in this whole scheme is the problem of when and how often to retransmit data to assure it has made it through the system to the desired destination. A standard decay or a rhythmic retransmission does not address the fact that too much data can be dumped blindly into a local system at the very time the system is needed to relay information to the NWS. Also each area will have a different set of priorities for its weather data. Rather than having a central parser for the entire country

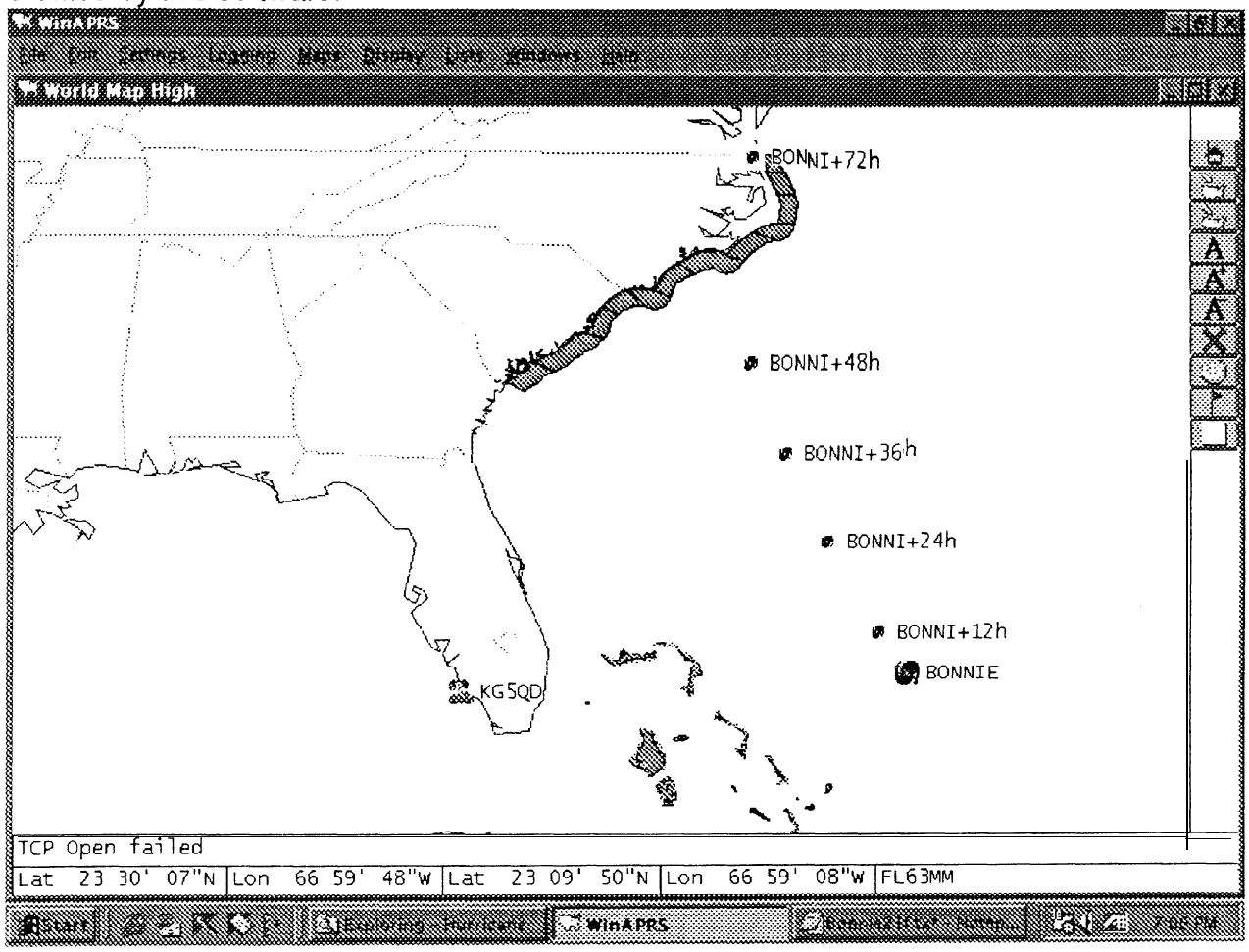
determining these matters, a decentralized approach seems more appropriate. The priorities are assessed before every transmission to determine what is the most important data present, when was the last time transmitted, and by what path it should be sent. Since the retransmission engine is written to accept input from the parser or from any path available, the system is redundant and not reliant on any one input source.

Hurricane Parsing:

The Hurricane Center produces a package of bulletins for a tropical cyclone (generic name for hurricanes, tropical depressions, tropical storms etc.). The **forecast\advisory** has an array of present and predicted positions, along with wind and windfield data. The protocol developed by Sob Briuninga, WB4APR, for hurricane plotting allows the most vital information concerning a tropical cyclone to be transmitted in packets of 65 characters or less. It was realized quickly that while the packets generated left the parser in a coherent fashion, the APRS system could cause the packets to become confused with reference to time and order. A naming convention along with a **sequence tag** was developed to allow display software to reconstitute the data into a uniquely definable whole. This was done in line with the already existing message format and numbering protocols.

Subsequent updates for the tropical cyclone will have objects with the same names, but with different sequence tags. This allows old data still in the APRS data stream to be suppressed. Because one of the items parsed is the time of the next scheduled update, it is possible to set the duration of the retransmission of the data and assure only timely data is being transmitted. This requires that the objects parsed not be handled in the normal decaying fashion common to other APRS objects.

Display seen from WinAPRS created by the hurricane data and coastal zone alerts created by this software.



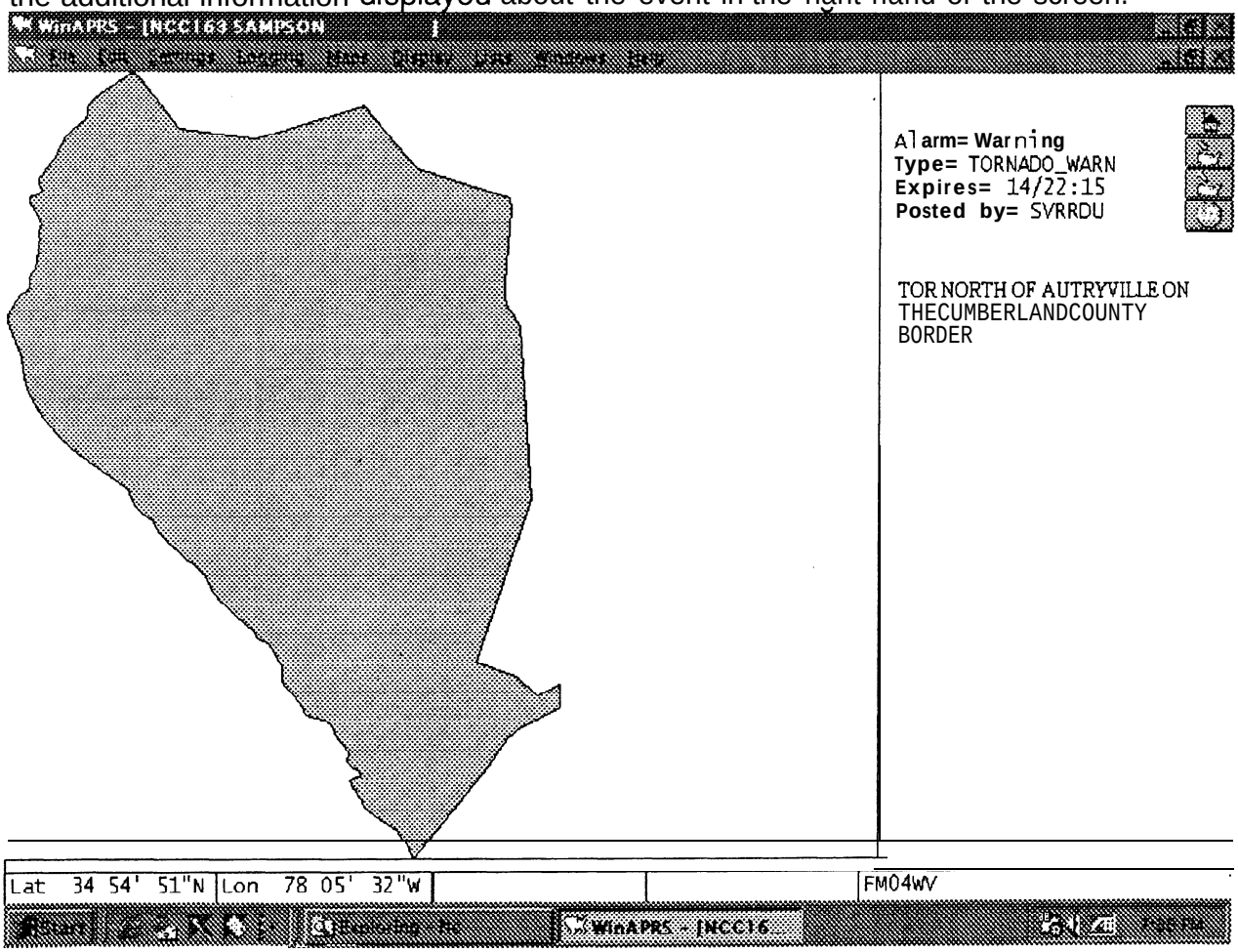
Weather Bulletins:

The Sproul Brothers developed a manual mechanism for issuing weather alarms, warnings and watches via a graphical display based on county outlines. This system causes the counties to high-light in different colors, depending on the type of watch/warning etc. This system caught on very quickly and is being used all across the country for issuing county wide weather watches and warnings. There are approximately 3100 counties in the US and all of these files are currently available to the WinAPRS/ MacAPRS/ X-APRS user. APRSdos displays these watches and warnings slightly differently, but it does display the data.

We have now taken this concept and created another 3500 inland and marine zones based on National Weather Service shape files. These area files are what the automatic weather parser issues its warnings and watches for. The nice thing about this is the APRS user only has to get new 'county' files and does not have to get a new version of software to make this work. Therefore it is fully backwards compatible for the last couple of years.

In addition to the NWS bulletin that causes the appropriate county or ZONE to be high-lighted, the additional information now gets 'associated' with this event and will come up on the information screen if you double click on the high-lighted county.

Weather Warning screen displayed when you double click on a high-lighted county. Note the additional information displayed about the event in the right hand of the screen.



It has been determined that in order to associate packets (which may arrive in any order) and assure that there is no ambiguity in this association, each packet needs to contain the following:

1. National Weather Office that issued the bulletin
2. Type of bulletin
3. Time the bulletin was issued

In practical terms some compression of this data was needed, as the length of packets are limited to 65 to 75 characters. Each NWS office has responsibility for a County Warning Area (CWA), which has a unique three letter code. This code is embedded in the packet header. This allows the packets to be steered to the appropriate area of the country using a built-in feature of I-gates. A single character type of bulletin along with a three character code denoting time-of-origin and a single character line number is added after a curly brace character to each packet. This is fully compatible with the message numbering system already in place in the APRS system.

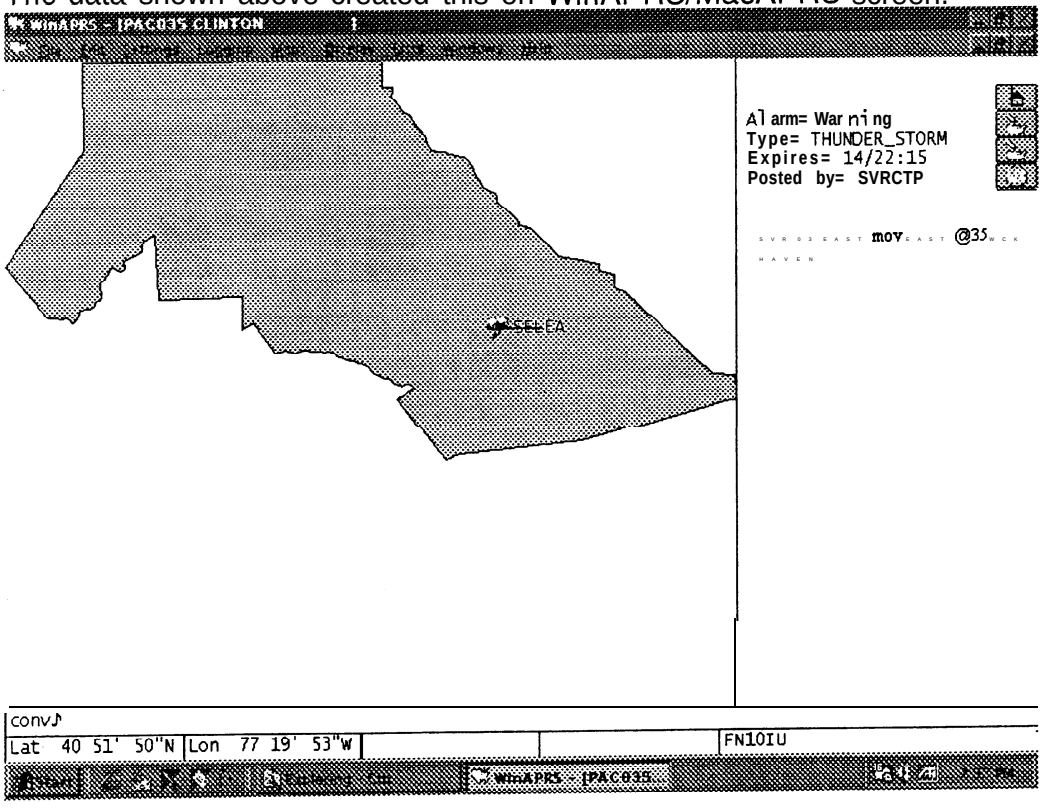
Location Information:

In the process of parsing what the NWS calls **short fuse** warnings, which are tornado, severe thunderstorm and the like, it was discovered that most of the time the text concerning the actual location of the storm could be reduced to a single name, offset, course, and speed. This makes it feasible to display the data on a Kenwood TH-D7A handheld. Furthermore, it is possible to plot the actual location of the storm as a regular APRS object due to the fact that the names used for locations by the NWS are from a known database.

Actual data transmitted over the air

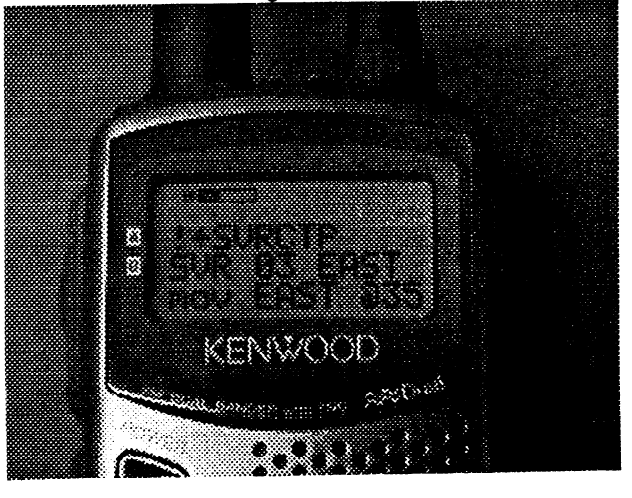
```
SVRCTP>WX:NWS-WARN   :142215z,THUNDER STORM,PA_ C035,  {SELEA
SVRCTP>WX:NWS-SELEC:SVR   03  EAST mov EAST @35  LOCK HAVEN
```

The data shown above created this on WinAPRS/MacAPRS screen.

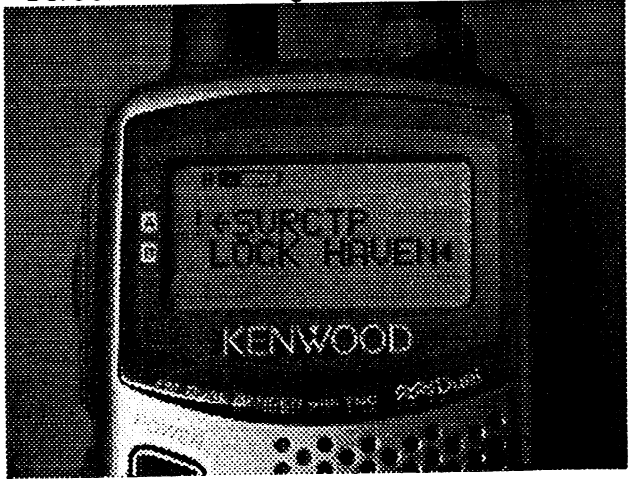


The same data created this on the Kenwood TH-D7A.

Screen 1 of message



Screen 2 of messaae



Conclusion

APRS has developed into a very useful weather tool. We also now have the ability to have data from many different sources fed into APRS and this data can be redistributed out to those that need it in a timely manor. This addition to APRS is providing the ability to take the complex information from the National Weather Service and strip it down to what is really needed in the field. This information can be displayed in a useful manor on computer screens and also on the new generation of portable APRS stations such as the Kenwood TH-D7A.