AUTOMATED TRAFFIC HANDLING ASSISTANCE

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Packet radio presents an opportunity to improve speed and accuracy of message handling. Speed is often limited by the typing speed of the operators. The accuracy is assured during transmission, but is only useful if the message is correctly entered into the message handling system. The normal limits to message handling include a lack of fully qualified operators, and inability to use untrained people during special situations such as disaster events. A method I have used to improve both of these is keystroke reduction.

Fill in the blank programs are useful to assist newcomers in preparing traffic. These help if they keep inaccurate messages from entering the system, and if they allow professional typists to do high speed preparation of traffic off line. This traffic would be handled by a smaller number of amateurs operating the radios. This method has been used without keystroke reduction. With it, a smaller number of off line operators is needed to keep the traffic circuit busy. The radio operators should only spend about ten seconds per message sending and confirming receipt of "prepared messages." The normal pace of message handling by a good CW operator is one per minute. We should be designing and testing for a six fold increase in speed.

The most basic method of automating this process is to save fields that do not change over several messages. For a large operation this includes, precedence, handling instructions, station and place of origin, and date. In some cases, much of the text may be the same also. These can either be filled in and transmitted clear test, or "booked" and sent once at the start of each book.

Automatic sequence numbering is normally tried next. This works fine if only one computer is used for text entry. If two or more are used for off line for text entry, then a method to prevent duplication of message numbers must be included. I used a limiter, which allow each operator to start at a specific message umber, assigned by a single coordinator, and only enter ten messages. In this way, several operators will not use the same number over. I expect ten messages to take five minutes for typing.

The best timesaver of all is automatic word counting. I implemented this in both basic and in 8080 assembly language. It counted letter groups separated by spaces. This seems to match the rules used by the ARRL in counting words. One special case had to be handled, the last word at the end of a line. The assembly language version had to take special care to treat non printing characters properly. Delete characters did not break words, and neither did backspaces. Carriage returns, however, were similar to spaces and I included both as "word delimiters." The basic version counted about 20 characters a second, using an interpreted version of BASIC. The assembly language version has been to fast to bother with timing. .A further benefit of this module is that is the text can be located in the received message, it can be counted and compared with the "check" field, further saving time for the receiving operator.

None of this is any value unless the implementation allows a typist to back up and correct text in error. One version, from N5EZM, allowed the preamble to be reviewed and changed when first entered. No further correction was provided. after the last field was complete. If anything was wrong, the message had to be fixed with a text editor. This slows down the whole process, and discourages the correction of small errors. Error correction must be included in the message creation package.

Tests were not useful because only one computer was used for both text entry and on air operation. Also, we have not had an event present enough traffic to reach the planned rate of message handling, over sixty messages per hour.

The PACGRAM application allows all parts of an ARRL radiogram to be identified by a computer by delimiting each field.

This allows routing of messages by city/state, and automatic word counting at receive points to check for flow control problems. While PACGRAM creates long frames, operation with PACLEN set to smaller values can be used to improve operation on marginal paths. The PACGRAM definition is included as an attachment.

Automatic message assistance applications have potential. They will be most useful where large volumes of similar traffic are generated, or when fast liaison with the NTS is required. Official traffic for disaster relief agencies is not likely to benefit as much from these developments.

> > > > > > > > > > Pacgram Protocol Definition < < < < < < < < < <
(Versions 1.5.0 and later)

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PACGRAM is an application software package that runs on the host computer connected to a TNC. The PACGRAM software is responsible for prompting the operator for the proper Radiogram information one field at a time and forms a PACGRAM message from this. The message can then be sent to the TNC for transmission into the network.

On the receiving end, PACGRAM decodes the data stream from the TNC for the starting characters of a PACGRAM. When it finds these characters it receives the rest of the message and can later decode it back into the Radiogram format for display on the console, or as printed on the printer. Received PACGRAMS are stored in buffer space and/or disk files and maybe later retransmitted for forwarded to other stations in the network.

Special characters are used within the PACGRAM to signal the start of the PACGRAM message, the end of the PACGRAM message, and to separate the fields of information within the PACGRAM message.

These control characters and the protocol are described in the following definition.

--> PACGRAM CONTROL CHARACTER and PROTOCOL DEFINITION

The control characters, and character sequences, used in PACGRAM were based on the unlikelihood that they would ever appear in part of a normal Radiogram. Consideration of the CW traffic nets that will handle message traffic generated with PACGRAM was also taken into account since many characters cannot be sent using CW.

For those stations not possessing PACGRAM software, these control characters were selected so that a PACGRAM can be read directly from a terminal and written back into the standard Radiogram form very easily by hand. A Formsmode has been added to the protocol to allow the sending of a directly printable PACGRAM. This enables any station to receive a PACGRAM already formatted to be printed on hardcopy. This form of PACGRAM uses its own starting sequence that can be easily detected by a small computer running BASIC. Once the start sequence is detected, it can then route all output to the printer. The standard end of PACGRAM character is used to indicate the end of the print so that the output can then be routed back to the console.

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--> The START of a PACGRAM shall be a pound sign '#' followed by asterisk '*'.

The purpose of this character sequence is to signal the start of a PACGRAM and differentiate it from any other data sent by the TNC to the host computer. Such as other communications data or commands and responses from the TNC.

The start of the PACGRAM sequence has been altered since the first release of this protocol in an effort to avoid false starts caused by WORLI like PBBS's that use the # character in their data.

--> The DELINEATION character shall be an asterisk '*'.

This character is present in the PACGRAM to delineate the standard Radiogram fields from one another. The absence of data in any one of the fields will cause two consecutive asterisks to appear within the PACGRAM. No filler characters are placed between the asterisks of an empty field.

--> The FIELD ORDER of a PACGRM is as follows.

NUMBER / PRECEDENCE / HANDLING INSTRUCTIONS / STATION OF ORIGIN
CHECK / PLACE OF ORIGIN / TIME FILED / DATE FILED

NAME TO / NUMBER & STREET / CITY / STATE / ZIP / PHONE NUMBER

TEXT OF THE MESSAGE

SIGNATURE / TITLE OF SIGNEE

Note: The CITY and STATE fields have been separated into two individual fields in this version of the protocol. This allows for automated routing based on the destination City and State.

--> FIELD LENGTHS and TYPES within the PACGRAM.

The Number field will be limited to 8 characters maximum.
The Check field will be limited to 2 characters maximum.
(This may be expanded to handle ARL type checks)
The Text field is limited to a maximum of 1024 characters.
All other fields are limited to 60 characters.

Field types may be either alphabetic or numeric but characters that cannot be sent using CW will not be allowed.

--> The END or a PACGRAM shall be the ampre sign '&'.

The purpose of this character is to signal the end of the PACGRAM.

--> The START of a FORMSMODE PACGRAM shall be '#PAC&' followed by a carriage return.

The purpose of this starting sequence (including the carriage return) is to signal the start of a PACGRAM in the FORMSMODE. A small computer running a BASIC program can trap this starting sequence and then direct all its output to a printer.

--> The END of a FORMSMODE PACGRAM shall be an ampre sign '&' followed by a carriage return.

The purpose of the end of FORMSMODE sequence is to signal the end of a FORMSMODE PACGRAM. A small computer running a BASIC program can trap this sequence and then direct its output back to the console.

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As a Radiogram has well defined fields in a specific order, so does the PACGRAM. The order in which the fields occur in the Radiogram is the exact order that they will appear in the PACGRAM. For example, here is a sample Radiogram followed by its equivalent data stream in PACGRAM form.

NUMBER: 126 ROUTINE WB8TKL CHECK: 5 ANN ARBOR MI 14302 MAY 21
TO: MIKE NUGENT
123 HOLLYWOOD AVE
HOLLYWOOD, CAL 54321
(818)555-1234
TEXT: HOW IS THE WEATHER X
SIGNED: JAY

and the equivalent in PACGRAM form would be:

#*126*R**WB8TKL*5*ANN ARBOR MI*1430Z*0521*MIKE NUGENT*123 HOLLYWOOD AVE*HOLLYWOOD*CAL*54321*(818)555-1234*HOW IS THE WEATHER X*JAY**&

As you can see, the length is well within 256 bytes, the maximum AX.25 packet length. Even with the Paclen set to 256, a single packet could contain a fairly large text field. You can see the benefits of using PACGRAMs over the voice or CW methods of sending traffic. This packet can be sent in just a fraction over one second at 12 bps, an enormous improvement over existing amateur traffic systems.

Also notice that in my example, since I left the fields for Handling Instructions and Title blank, that PACGRAM simply put no data between the two asterisks. This is necessary to maintain the field count for decoding of the PACGRAM at the receiving end and also wastes as little of the transmission bandwidth as possible.

Happy Packeting -WB8TKL