By Neil Sablatzky,* K8IT

Communicating Voice, Video, and Data with Amateur Radio

Is All Data Acceptable Data?

If I sent a data packet from my computer to yours via a legally identified transmission according to the Amateur Radio FCC Part 97 rules and regulations, would the data packet be legal? This column will explore this question and many related issues. First let's start by reading a letter.

Correspondence

The following was sent to me by Ken Patterson, N5EQT:

While on the way home from Ham-Com 2003, my sons (Aaron, KC5TEF, age 19; Joshua, KC5TEG, age 18; and Michael, KC5TEH, age 20) and I discussed Gerry Creager, N5JXS's HSMM presentation and came up with an interesting idea. During the presentation, Gerry mentioned that interactive games could be one use of HSMM. My sons and I think this application could give HSMM and amateur radio in general a real boost in interest and activity. Let me explain.

Players of multiplayer and First Person Shooter (FPS) games such as CounterStrike <http://www.counter-strike.net> and EverQuest <http://everquest.station.sony. com> desire the lowest transmission latency (pings) possible. Currently, cable-modem and DSL users have a 25- to 30-millisecond ping. If the same multiplayer games were played via HSMM, the pings would drop to about 6 milliseconds. This reduction in latency is very significant. It could easily make the difference in a player's ability to win.

A ping is a command that initiates an Internet Control Message Protocol (ICMP) Echo Request and Echo Reply message. These messages must travel to their destination and return to their sender, where the time required for the round-trip is measured by the originating sender. Think of an Internet ping much like the sonar pings used for decades by submarine crews to measure objects within their path.

Low pings are good. High pings are bad.

When a person is playing over the Internet using a client/server-based system, data flows from the server to the individual client (user). Anything the client does has to register with the server before it can happen in-game. For instance, if player A and player B in a First Person Shooter game were to fire at each other at the same time, the player with the lowest ping would hit the target first simply because that player's data registered with the server first. As you can tell, this is an obvious advantage in a game. The difference between winning and losing a game can come down to which player fired—or whose data actually reached the server—first.

Multiplayer games such as CounterStrike utilize User Datagram Protocol (UDP) transmissions. This protocol is a connectionless IP datagram service that guarantees neither delivery nor correct sequencing of delivered packets. The use of UDP by games such as CounterStrike is verified every time the user joins a CounterStrike server to play a game. UDP transmissions are most commonly used by streaming multi-media services, such as Microsoft's NetMeeting.

It would seem to me that the ARRL would be interested in pursuing an alliance with one of the top multiplayer manufacturers. This alliance would have the goal of incorporating HSMM into an existing game or a new game. The ARRL's role would be to promote the education of this new breed of amateur radio operators.

I have not quite worked out the logistics nor the pros and cons of such an alliance. Perhaps there is a list of problems larger than even I realize. However, I believe such a proposal is deserving of a public discussion by the amateur community. —*N5EQT*

First I would like to thank Ken for submitting this letter with such an interesting concept. Ken has a key point in that many gamers go to great expense simply to win. It's "speed." The fastest response to a command in an interactive game typically will prevail. However, is sending such data packets over an amateur link legal?

§97.309 RTTY and Data Emission Codes

(a) Where authorized by §97.305(c) and 97.307(f) of this Part of the FCC Rules, an amateur station may transmit an RTTY or data emission using the following specified digital codes:

(1) The 5-unit, start-stop, International Telegraph Alphabet No. 2, code defined in International Telegraph and Telephone Consultative Committee Recommendation F.1, Division C (commonly known as Baudot).

(2) The 7-unit code, specified in International Radio Consultative Committee Recommendation CCIR 476-2 (1978), 476-3 (1982), 476-4 (1986), or 625 (1986) (commonly known as AMTOR).

(3) The 7-unit code defined in American National Standards Institute X3.4-1977 or International Alphabet No. 5 defined in International Telegraph and Telephone Consultative Committee Recommendation T.50 or in International Organization for Standardization, International Standard ISO 646 (1983), and extensions as provided for in CCITT Recommendation T.61 (Malaga-Torremolinos, 1984) (commonly known as ASCII).

(4) An amateur station transmitting an RTTY or data emission using a digital code specified in this paragraph may use any technique whose technical characteristics have been documented publicly, such as CLOVER, G-TOR, or PacTOR, for the purpose of facilitating communications.

(b) Where authorized by §§97.305(c) and 97.307(f) of this Part, a station may transmit an RTTY or data emission using an unspecified digital code, except to a station in a country with which the United States does not have an agreement permitting the code to be used. RTTY and data emissions using unspecified digital codes must not be transmitted for the purpose of obscuring the meaning of any communication. When deemed necessary by an EIC to assure compliance with the FCC Rules, a station must:

(1) Cease the transmission using the unspecified digital code;

(2) Restrict transmissions of any digital code to the extent instructed;

(3) Maintain a record, convertible to the original information, of all digital communications transmitted.

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HSMM Trivia Q&A

The following question, submitted by Darryl Smith, VK2TDS, was posed in the Summer 2003 issue of *CQ VHF:*

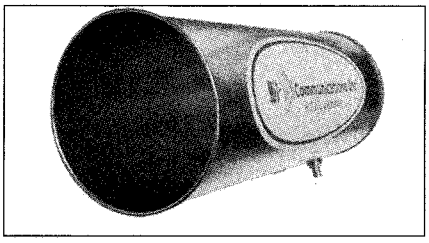
There is an antenna that performed the worst in our tests. What is the name of that antenna, and which company made the chips container for it?

Answer: The Pringles® Can Antenna, Pringles Potato Chips.

Shown here is a picture from the WI-Sys Communications Inc. website, <http://www. wi-sys.com>, showing a correctly engineered 2.4-GHz RF antenna which resembles a Pringle® Can Antenna. However, this antenna works!

Features

- VSWR 1.5 max.
- 8 dBi gain
- Linear polarization
- SMA female connector
- 9 inch length
- Standard 1/4-20 thread insert
- Optional tripod and clamp available



I suppose the question here is whether we have obscured the meaning of any communication and if the data code has been specified publicly. Well, it is true that all the data bytes transmitted are represented in binary format. The meaning of each binary byte can be found on multiple "gamer" Internet web pages. Therefore, we can say that the format of the data can be decoded based on available public information. However, have we obscured the meaning of the data? I think the intent of "obscure" comes to play here. Instead of transmitting a long ASCII command such as "FIRE PLAYER #1 GUN," we have transmitted, say, a single byte of binary data that carries the same meaning. The definition can be found on a website, and we did not purposely try to mislead or hide the intent of the data. In fact, we used a form of compression which facilitates data exchange. This maximizes the use of the frequency by sending the smallest amount of data possible and is legal under the rules.

In summary, keep a log of your activity, making sure you maintain in your log book a printout of the data bytes and their meaning, the websites where such data was obtained, the time, the frequency, the mode, and the station playing such games, etc. It's always safer to be documented.

I do have one caution: If you cannot find a respectable public website that states the game format data stream to be transmitted and each data byte's meaning, do not play this game over the amateur link. Why? Because the meaning of the data cannot be defined per the rules.

This brings up another question. If the data stream represented financial data and the binary bytes could be documented, would the data be legal on a Part 97 link? Each data byte would meet the test by itself. However, the intent is what matters. Amateur radio regulations specifically exclude any communication in any form for the purpose of making money.

Network Architecture

It has come to my attention that we need to invent a way to route data packets in a worldwide network. Some proposals have suggested using the 44.XXX.XXX.XXX block of IP addresses. This has a number of issues, the biggest being the FCC does not issue an IP address with an associated callsign. In fact, the FCC requires the callsign to be used. How do we route traffic from K8IT to W1ABC? Another issue we have is configurable routing, based on changes of nodes and band conditions. We need some kind of smart configurable routing that does not broadcast to every possible node to locate a blind station. If any reader has a suggestion or a desire to submit a paper to address this need, please e-mail your thoughts to me.

Please keep in mind that as our amateur ranks tighten our associations with emergency management agencies, the need for this network routing will increase dramatically.

In other considerations, the ARRL TTF HSMM Working Group is investigating the type of medium that such a network will use. Current proposals being evaluated include a satellite link and high-speed, low-frequency networks. Other possibilities include a series of linked 6-meter nodes.

73, de Neil, K8IT