Packet Radio Basics

John Ackermann, N8UR
jra@febo.com   http://www.febo.com
What Is Packet Radio?

- Using radios to transmit and receive computer data
  - Same concept as a telephone modem: turn digital signals into analog ones, and back again
- Unique characteristics for ham use:
  - Data sent in bursts
  - Error detection/retransmission
  - Many users can share channel
Some Terms

- Packet -- a package of bits that includes:
  - addresses of sender, recipient, and digipeaters
  - user data
  - control and error detection information
- TNC -- “Terminal Node Controller”
  - builds and decodes packets
  - turns digital signals to analog (and back again)
- AX.25 -- the protocol that defines packet format, and how stations send and receive packets
- Baud -- the speed at which packets are transmitted (bits per second)
Some Terms (continued)

- **Digipeater** -- a single frequency “Digital Repeater” that relays packets it hears
- **Node** -- a packet radio network access point, typically connecting users to a “NetROM” style network that allows users to reach remote stations
- **Alias** -- TNCs are programmed with the user’s callsign, but they can also respond to an “alias” callsign (like “MVFMA”)

Some Terms (continued)

- PBBS -- “Packet Bulletin Board System” -- software to send and receive email-like messages via packet radio
  - W0RLI and F6FBB are common PBBS programs
- PacketCluster (or “DX Cluster”) -- a program used to report DX spots via packet radio
- APRS -- “Amateur Position Reporting System” -- a graphical mapping system using packet radio
- TCP/IP -- a computer networking protocol that can be used over packet radio to provide advanced services
  - NOS, JNOS, and TNOS are commonly used TCP/IP programs
How Does Packet Radio Work?

TNC:
1. Wraps Data in Packets, Adding Address and Control Info
2. Converts Data to Audio Tones

Radio Converts Audio Tones to FM Signal on Desired Frequency

Digital Signal via RS-232 Serial Cable

TNC

101010

RADIO

How Does Packet Radio Work?

How Does Packet Radio Work?
A Closer Look at a Packet

Frame Type and Number

Error Check

01111110

DATA (up to 256 bytes)

01111110

N8UR  KE8TQ  DIGI1  DIGI2  ...  DIGI8
Source  Destination  Digipeaters
The Packet Protocol

- Packets are sent as bursts of data that last only a few seconds
- Each packet carries the call of both the sender and the recipient, as well as digipeaters
- Stations wait until the channel is clear before transmitting
- If the receiving station detects an error in a packet, it requests a retransmission
- The sending station automatically retransmits if the other station doesn’t acknowledge the packet within a specified time
What This All Means

- Many stations can share the channel without interfering
- Received data is known to be accurate
- Packets can be routed to distant destinations via digipeaters or nodes
- There’s robustness against (some) QRM
- Packet is primarily a point-to-point protocol; it doesn’t lend itself easily to “roundtables” (though there are workarounds)
Using a TNC

- Most TNCs have similar commands, though there are some differences
- You can use any terminal program (like “Hyperterm” that comes with Windows 95) to communicate with the TNC
- Follow TNC manual to set serial port speed and get computer and TNC talking to each other
- To enter TNC’s command mode, press control-C; you should see a `cmd: prompt`
  - If TNC understands and executes a command, it responds with `OK` or the new value of the parameter; if not, it will say `Eh`?
- Set the “mycall” command: `mycall N8UR`
Making a Contact

- Enter command mode with control-C
- To connect to a station, enter “c <callsign>“ and press return: **cmd: KE8TQ**
- You should see lights flash on the TNC…
- When connected, you’ll see a message like *** CONNECTED TO KE8TQ***
- TNC will go into “converse” mode and whatever you type will be sent to the other station. Whatever the other station sends will appear on your screen
Making a Contact (continued)

- Remember that each transmission may be split into several packets. It’s best to indicate that you’re finished typing by ending with something like “over” or “K”
- You don’t need to type your or the other station’s callsign as part of your transmission -- the TNC does that automatically
- A note on etiquette: TNCs allow you have a “beacon” message that’s transmitted automatically at an interval you set. Don’t overdo this -- a beacon once every ten or fifteen minutes is plenty
Ending a Contact

- Don’t just shut off the computer!
- If you initiate disconnect, press control-C to enter command mode; then type **D** or **disc** to disconnect
  - You should see LEDs blink, stations will gracefully close the connection, and you should see ***DISCONNECTED*** on your screen
  - If the other station has gone away and doesn’t respond to the disconnect message after several seconds, you can enter **D** or **disc** again to force an immediate disconnection
    - This isn’t polite, but it may be necessary...
Where to get more information

- TAPR web site: http://www.tapr.org
- ARRL Handbook and Operating Manual
- elmer@febo.com