Packet Radio 101

Wait, that still exists?
Topics

- What is Packet
- How does it work
- What value does it have in an emergency
- What is this statewide network I have heard about?
- What do I need to get started?
- What the heck is a Direwolf?
What is Packet - History

- May 31, 1978 - First ASCII transmission over the amateur bands in Montreal
- March 1980 - FCC approves ASCII on the amateur bands
- December 1980 - KA6M put up possibly the first digipeater on 2M
- 1981 - Groups across the US formed to develop hardware, standards, and protocols
- 1981-1983 - These groups adapted the commercial X25 protocol to amateur use creating AX.25 by adding support for callsigns and unconnected operation.
- November 1983 - TAPR releases the first AX.25 TNC as a kit
- 1984 - Experimentation continues, BBS software is developed, and the mode takes off

http://www.choisser.com/packet/part01.html
What is Packet Radio in 2021

- Primarily used as a protocol for other applications on top of it.
- Two modes of operation - Connected and Connectionless
- 3 common speeds - 300 baud on HF, 1200 and 9600 baud on VHF/UHF
  - HF activity concentrated on “Net105” 14.105MHz LSB, and “Net40” 7.104MHz LSB
  - VHF/UHF activity in this area can be found on 145.670, 145.030, and 145.010MHz at 1200 baud
- NOTE: Packet on HF uses LSB
- AX.25 packets can also be sent over the internet using AXUDP.
- Packet is the ultimate mode for remote operation
Unconnected Packet (Datagrams)

- Commonly used to call CQ and for station ID
- Most frequently used for APRS
- Often referred to as unproto
Connected Packet - IP Connections

- Can be used for TCP/IP (computer network) connections, but it is very slow.
- IP and TCP protocols have headers to allow traffic routing. This further decreases the amount of information contained in a packet.
Connected Packet - Digipeaters

- Look for their own callsign and retransmit the packet if it is addressed to it.
- There is an acknowledgement for each hop or each time a packet is digipeated.
- This can cause congestion
Several types exist - KA-Node, NET/ROM, BPQ, and others
Keep track of other nodes and heard stations in a network.
Users can connect to a node, then connect through the network to distant nodes maintaining a single connection and reducing acknowledgement traffic.
• BBS systems run as an application on a node.
• Users exchange personal messages similar to email.
• Bulletins (messages of general interest) can be posted to be read by all users.
• BBSs can be interconnected and there is a network of BBSs using HF, VHF, and AXUDP connections that permit the exchange of messages and bulletins with other hams worldwide.
Connected Packet - Chat

- Another node-based application
- Keyboard-to-keyboard chat with other hams
- Chat servers can be connected across nodes
- Chats are organized by topic
Connected Packet - Winlink

- Regular email over the air.
- Uses VHF packet among other protocols.
- Other modes are available on HF and VHF.
- Popular in emergency communication and disaster response.
- Clients available for several platforms, including Android.
Packet in Emcomm

- Winlink seems to be the preferred tool for disaster response over the past few hurricane seasons.
- BBS systems can be used to coordinate volunteers, pass traffic, or post bulletins relating to the emergency or public service event.
- Chat can be used for real-time communications
- Public service events - database of injuries, etc...
- According to the 145.670 network managers, the Minnesota Department of Health is “not Impressed” with 1917-era radiogram forms.
145.670 Network

- Statewide network of KA-Node nodes (Kantronics).
- Installed after the Sept. 11 attacks.
- Primary focus seems to be emergency and event communications.
- Used during the Super Bowl in 2018.
- Nearest node is in Rochester (MNROC2).
- This network does *NOT* pass BBS traffic.
Other regional packet activity - 145.030MHz

Map created by W9GM of nodes his node has a route to.
What do I need to get started?

1. A radio and antenna
2. A TNC (Terminal Node Controller)
3. A terminal (Computer)
4. The mode also lends itself to remote station use.
Getting Started - Radio

- You probably already have one that will work.
- For a dedicated station, used monobanders and surplus commercial radios are an inexpensive choice.
- 9600 baud requires a discriminator tap.
  - VHF/UHF radios with a “data” or “9600” mini-din port support this
  - Many commercial radios have a discriminator output.
- Avoid Baofeng UV5R-based HTs and KT-8900-type mobile radios.
  - They do not switch from tx back to rx fast enough, and they miss reply packets in connected mode.
Getting Started - Common types of TNC

- Full featured TNCs
- KISS TNCs
- TNCs built in to the radio
- Software TNCs
Full Featured TNCs

- Only require a “dumb” serial terminal or terminal emulator to operate.
- All packet operations are handled by the TNC.
- They often have a PBBS or Mailbox for messages.
- Often support other modes including PACTOR, RTTY, and CW.
KISS TNCs

- KISS TNCs only convert audio tones to data and data to audio tones.
- Connection handling, packet generation, etc... is handled by computer software.
- Less expensive than a full featured TNC - can be built from junk box parts.
- Full featured TNCs can also run in KISS mode.
- Many sold as kits.
Software TNCs

- Most common examples are Direwolf and SoundModem.
- Computer generates audio tones and sends them over a soundcard interface.
- They can emulate a KISS TNC for compatibility.
- Most complicated option in terms of PC setup.
- Least expensive option overall.
- Best decoding performance in adverse conditions.
Built-in TNCs

- Radios with built-in APRS have a TNC on-board
- Not all radios expose the TNC to the user (check your manual).
- Built-in TNCs run in KISS mode.
Terminal or PC

- Any terminal or terminal emulator will work with a full-featured TNC.
- If using a KISS TNC or Software TNC, dedicated packet software is required.
  - EasyTerm by UZ7HO is a popular choice on Windows.
  - LinPac is a good option on Linux.
- APRS apps, Winlink, and others support KISS TNCs out of the box.
Questions?