Packet Radio Basics

John Ackermann, N8UR
jra@febo.com   http://www.febo.com

What Is Packet Radio?

λ Using radios to transmit and receive computer data

– Same concept as a telephone modem: turn digital signals into analog ones, and back again

λ Unique characteristics for ham use:

– Data sent in bursts

– Error detection/retransmission

– Many users can share channel

Some Terms

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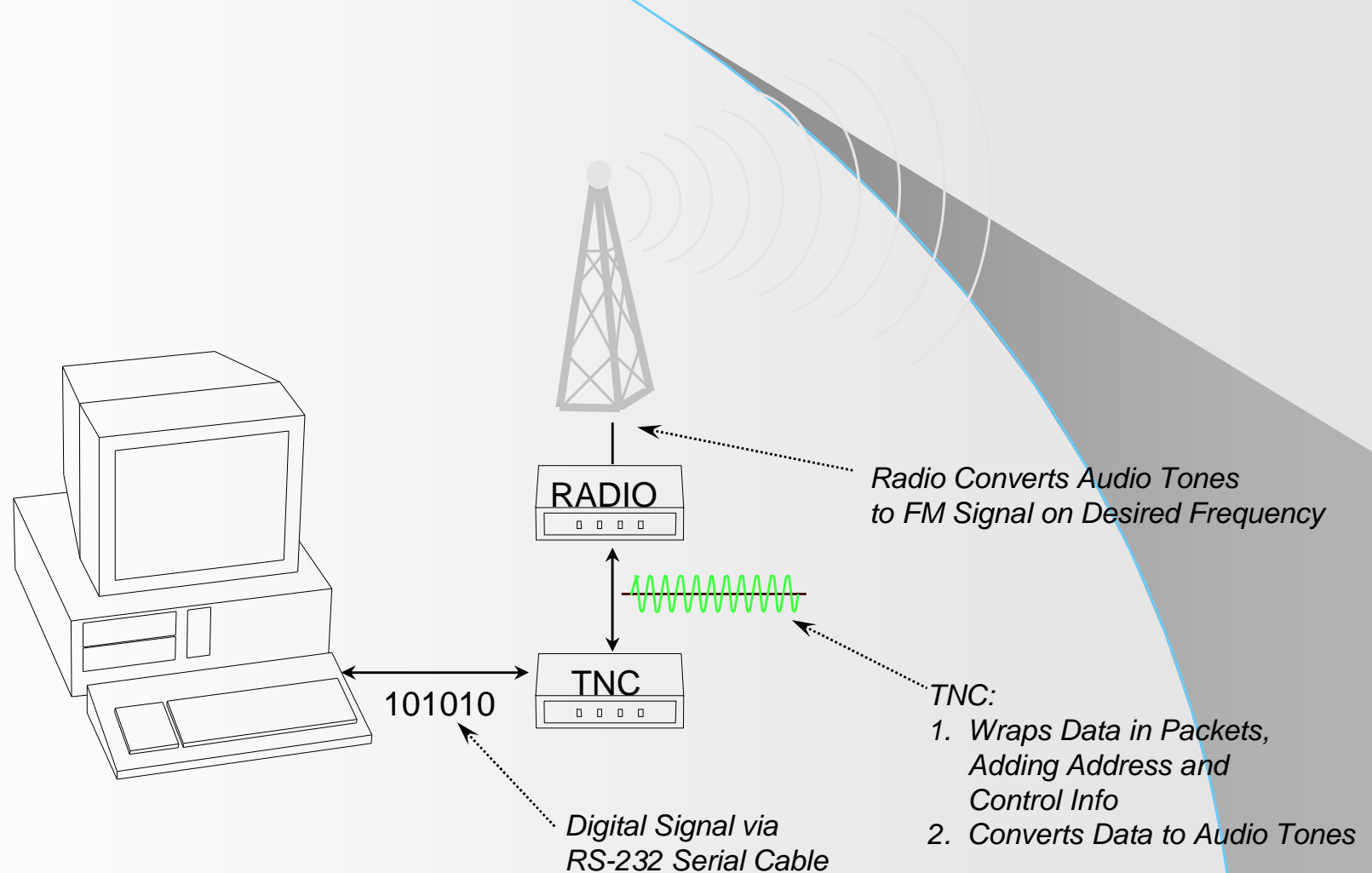- λ Baud -- the speed at which packets are transmitted (bits per second)

Some Terms (continued)

λ Digipeater -- a single frequency "Digital Repeater" that relays packets it hears

λ Node -- a packet radio network access point, typically connecting users to a "NetROM" style network that allows users to reach remote stations

λ Alias -- TNCs are programmed with the user's callsign, but they can also respond to an "alias" callsign (like "MVFMA")
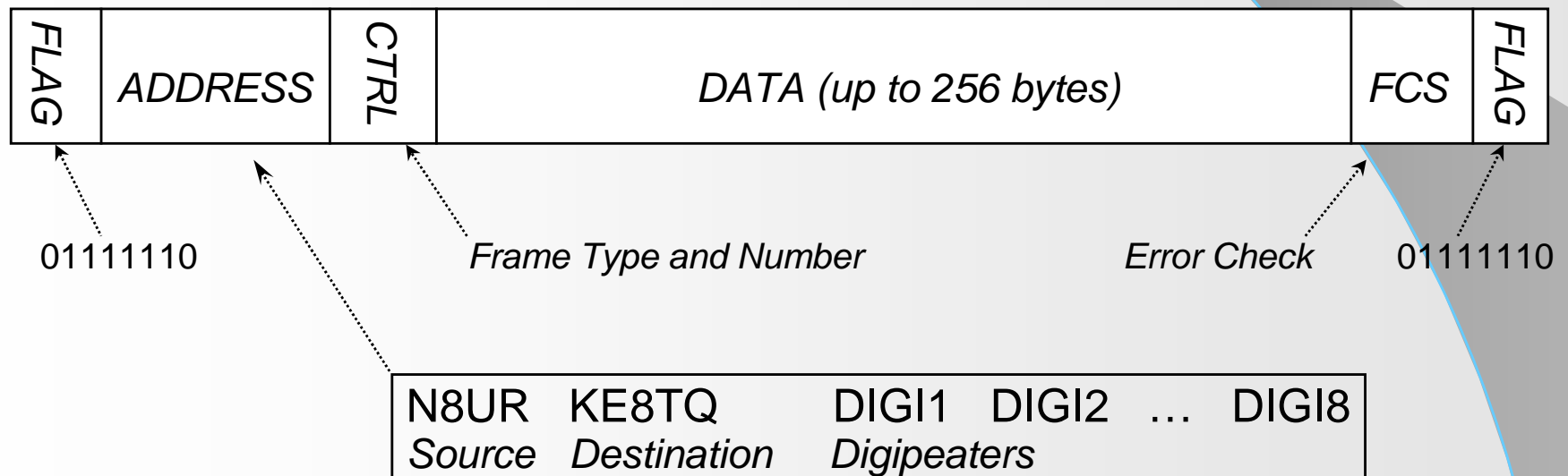
Some Terms (continued)

- λ PBBS -- "Packet Bulletin Board System" -- software to send and receive email-like messages via packet radio
    - W0RLI and F6FBB are common PBBS programs
- λ PacketCluster (or "DX Cluster") -- a program used to report DX spots via packet radio
- λ APRS -- "Amateur Position Reporting System" -- a graphical mapping system using packet radio
- λ 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?

RADIO

Radio Converts Audio Tones to FM Signal on Desired Frequency

TNC

101010

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

Digital Signal via RS-232 Serial Cable

A Closer Look at a Packet

FLAG	ADDRESS	CTRL	DATA (up to 256 bytes)	FCS	FLAG

01111110   *Frame Type and Number*   *Error Check*   01111110

N8UR	KE8TQ	DIGI1 DIGI2 … DIGI8
Source	*Destination*	*Digipeaters*

The Packet Protocol

λ   Packets are sent as bursts of data that last only a few seconds

λ   Each packet carries the call of both the sender and the recipient, as well as digipeaters

λ   Stations wait until the channel is clear before transmitting

λ   If the receiving station detects an error in a packet, it requests a retransmission

λ   The sending station automatically retransmits if the other station doesn't acknowledge the packet within a specified time

What This All Means

λ   Many stations can share the channel without interfering

λ   Received data is known to be accurate

λ   Packets can be routed to distant destinations via digipeaters or nodes

λ   There's robustness against (some) QRM

λ   Packet is primarily a point-to-point protocol; it doesn't lend itself easily to "roundtables" (though there are workarounds)

Using a TNC

λ   Most TNCs have similar commands, though there are some differences

λ   You can use any terminal program (like "Hyperterm" that comes with Windows 95) to communicate with the TNC

λ   Follow TNC manual to set serial port speed and get computer and TNC talking to each other

λ   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?**

λ   Set the "mycall" command: **mycall N8UR**

Making a Contact

λ Enter command mode with control-C

λ To connect to a station, enter "c <callsign>" and press return: **cmd: KE8TQ**

λ You should see lights flash on the TNC…

λ When connected, you'll see a message like
   *** CONNECTED TO KE8TQ

λ 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)

- λ 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"

- λ You don't need to type your or the other station's callsign as part of your transmission -- the TNC does that automatically

- λ 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

λ Don't just shut off the computer!

λ 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

  λ This isn't polite, but it may be necessary...

Where to get more information

λ TAPR web site: http://www.tapr.org

λ *Packet Radio: What? Why? How? (from TAPR)*

λ ARRL *Handbook* and *Operating Manual*

λ elmer@febo.com