DIGITAL TRANSCEIVER CHAT APPLICATION

PREREQUISITES

In addition to the Digital Transceiver for the Raspberry Pi, you'll need these components:

- Raspberry Pi 3 Model B+, Raspberry Pi 3 Model B, or Raspberry Pi 2 Model B. The Digital Transceiver for the Raspberry Pi will likely work with more recent Raspberry Pi models as they are released. Check the support page at https://www.brandenburgtech.com for information on using the Digital Transceiver for the Raspberry Pi with new Raspberry Pi models. Visit https://www.raspberrypi.org/products/ for more information on Raspberry Pi models.
- Power supply capable of delivering at least 2.5 amps. Visit the Raspberry Pi Foundation page at https://www.raspberrypi.org/learning/hardware-guide/components/power-supply/ for information on power supplies. While the page indicates a 2-amp supply is required, a little more power is desirable.
- 16 GB or larger micro SD card. Be sure to acquire a high-quality card. The Raspberry Pi Foundation page at https://www.raspberrypi.org/learning/hardware-guide/components/noobs-card/ has a link to a recommended card. This card already has software, called NOOBS, loaded. You can use NOOBS to install Raspbian or install Raspbian on your own SD card. This Raspbian installation is discussed below.
- Some way to work with the Raspberry Pi. This is often a monitor with HDMI cable, USB keyboard, and USB mouse all connected to the Raspberry Pi.

CONFIGURE THE RASPBERRY PI

If you haven't already done so, please perform the steps described in the following sections of "Getting Started with the Digital Transceiver for the Raspberry Pi":

- Install Raspbian
- Update Raspbian
- Configure Raspbian
- Configure I2C
- Access the Temperature Sensor
- Access the Digital Transceiver

BUILD THE DIGITAL TRANSCEIVER CHAT APPLICATION

If you performed the steps to configure the Raspberry Pi, the Digital Transceiver Chat Application source code is already available on the Raspberry Pi and needs to be compiled into an application.

```
cd ~/src/DigitalTxRxRPi
make rebuild
```

The sample applications will build including an executable named radiochat.

RUN THE DIGITAL TRANSCEIVER CHAT APPLICATION

Run the Digital Transceiver Chat Application on more than one Raspberry Pi by executing radiochat.

```
./radiochat
```

On either Raspberry Pi, type messages followed by <enter>.

```
INFO: Found and initialized AX5043
Please enter your message, up to 192 characters
   (empty message to terminate the program):
Hello World!
This is a chat application communicating over a digital radio frequency
protocol
```

The other Raspberry Pi will display the messages.

```
Pkt Len: 18 Pkt Num: 1 Msg Len: 13 Hello World! (Chksum: 34016)
Pkt Len: 86 Pkt Num: 2 Msg Len: 81 This is a chat application communicating
over a digital radio frequency protocol (Chksum: 25326)
```

The output contains:

- Pkt Len: The overall packet length. The packet consists of:
  - 1 byte for the packet length field
  - 2 bytes for the packet number field
  - The message, including the newline that terminates each line of text
  - 2 bytes for the checksum
- Pkt Num: An incrementing counter of the packets sent by this Raspberry Pi, starting at 1.
- Msg Len: The length of the text message, including the newline that terminates each line of text.
- Message: The line of text typed into the Raspberry Pi.
- Chksum: a CRC checksum of the packet.

TERMINATE THE DIGITAL TRANSCEIVER CHAT APPLICATION

To terminate the Digital Transceiver Chat Application, hit <enter> without entering a message.

EXPLANATION

The Digital Transceiver Chat Application performs the following sequence of steps

1. Initialize the SPI bus to communicate with the Digital Transceiver board.
2. Initialize the AX5043 transceiver on the Digital Transceiver board.
3. Spawn a thread to receive messages from other Digital Transceiver boards.
4. Spawn a thread to accept messages from the user and transmit to other Digital Transceiver boards.
5. Wait for the user to indicate the application should be terminated.
6. The receive thread…
   a. If the AX5043 is not already in receive mode, switch the AX5043 into receive mode.
   b. Receive a packet containing a chat message. This is done using a state machine to build the packet containing the chat message.
   c. Print the chat message and information about the packet containing the chat message.
   d. Give the transmit thread a chance to transmit a message, if the user has entered a message.
   e. Go back to Step 6a.

7. The transmit thread…
    a. Allocate a buffer to hold the message entered by the user.
    b. Obtain the message entered by the user.
    c. Add the packet number and the message length to the buffer.
    d. If the AX5043 is not already in transmit mode, switch the AX5043 into transmit mode.
    e. Go back to Step 7b until the user hits <enter> without entering a message.

The Digital Transceiver Chat Application spends most of the time waiting to receive a message from another Digital Transceiver board. The Digital Transceiver Chat Application momentarily switches to transmit mode to send a message only after the user supplies one.