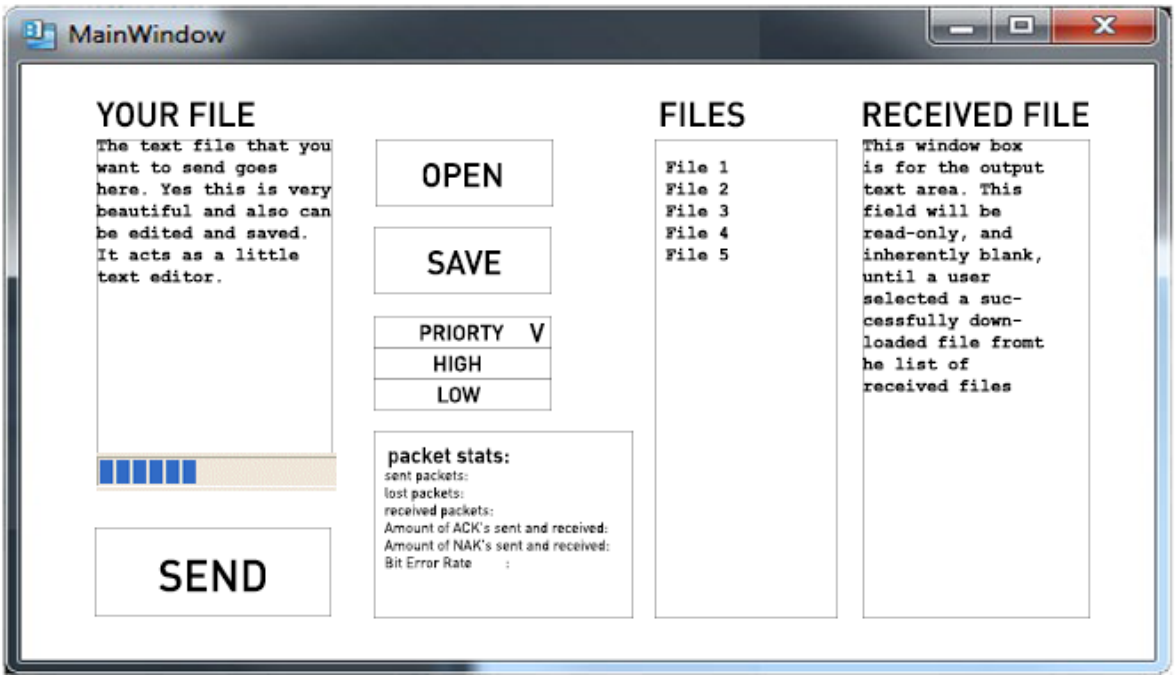
TEAM OSCAR

COMP 3980 Wireless Protocol



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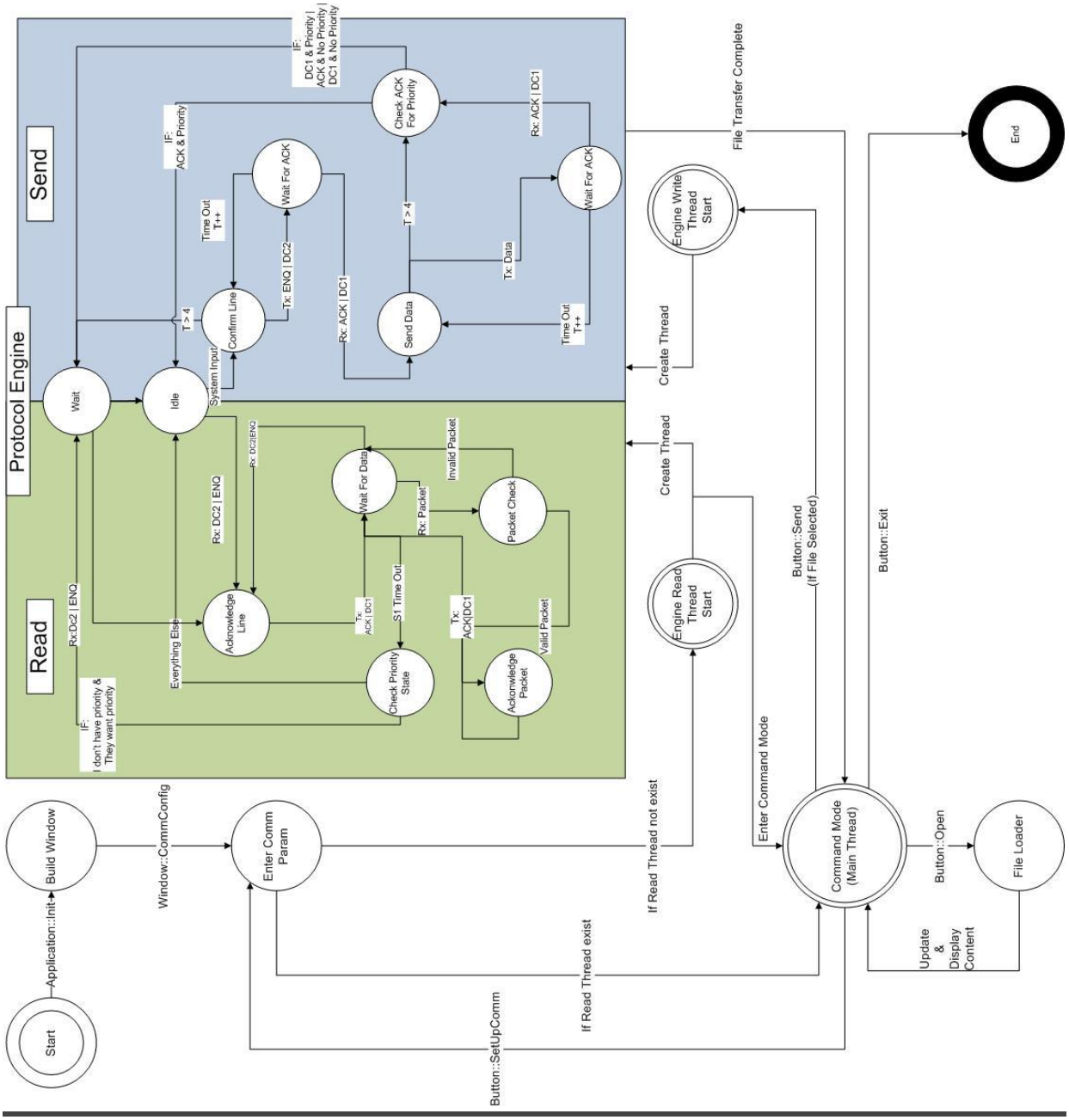
Contents

Driver Pseudocode 2
BuildWindow – **WinMain** 3
Enter Comm Param 3
Command Mode – **WndProc** 3
File Loader 3
Packetize Data 4
Engine Write Thread Start 4
Engine Read Thread Start 4
Idle 5
Read Thread – **Forever loop** 6
Acknowledge Line 6
Wait for data 6
Packet Check 6
Acknowledge Package 7
Receiver side: Check Priority State 7
..... **Error! Bookmark not defined.**
Send Thread – **Ends when file transfer complete** 7
Confirm Line 7
Wait for ACK 7
Send Data 8
Wait for Packet ACK 8
Sender side: Check Priority State 8
GUI Implementation 9


Protocol Engine
Send
Read
Wait
Idle
Confirm Line
Wait For ACK
Check ACK For Priority
Send Data
Wait For ACK
Wait For Data
Packet Check
Acknowledge Line
Check Priority State
Acknowledge Packet
IF: DC1 & Priority | ACK & No Priority | DC1 & No Priority
IF: ACK & Priority
Time Out T++
T > 4
System Input
Tx: ENQ | DC2
Rx: ACK | DC1
Tx: Data
Rx: ACK | DC1
Time Out T++
Rx: DC2 | ENQ
Rx: DC2|ENQ
Invalid Packet
Rx: Packet
Rx:Dc2 | ENQ
Everything Else
Tx: ACK | DC1
S1 Time Out
Tx: ACK|DC1
Valid Packet
IF: I don't have priority & They want priority
Create Thread
Engine Write Thread Start
Create Thread
Engine Read Thread Start
File Transfer Complete
End
Button::Send (If File Selected)
Button::Exit
Enter Command Mode
Application::Init
Build Window
Window::CommConfig
Enter Comm Param
If Read Thread not exist
Command Mode (Main Thread)
Button::Open
File Loader
Update & Display Content
If Read Thread exist
Button::SetUpComm
Start

Driver Pseudocode

BuildWindow – WinMain

```
Initialize window
Set window dimensions
Populate window with the several items:
      File loader open button
      Send button
      Save Button
      Priority Hierarchy Checkbox
      Editable text areas for files to be sent
      Non-editable text areas for files received
      List view box that displays files received
      Progress bar to keep track of the files received
      Non-editable text area for statistics of each file
Define file opener structure
Assign file opener structure a parent window
Transition to Enter Comm Param
```

Enter Comm Param

```
Bring up dialog box to allow user to set communication parameters
When user clicks OK
      Get the parameters from the comm dialog
      Set the parameters for the wireless modem
      if read thread not started
            transition to Engine Read Thread Start
      else
            transition to Command Mode
```

Command Mode – WndProc

```
Waits for user inputs, such as button presses
If user selects high priority on PriorityCheckBox
      Set weHavePriority to true
Else
      Set weHavePriority to false
If user presses Open button
      transition to File Loader
If user presses Send
      if user has selected a file to send
            transition to Engine Write Thread Start
      else
            prompt user to select a file first
```

File Loader

```
User can select a file to send
if user selects and file and presses OK
```

Create a file loader thread
Parse through the file and put each lines onto the screen
update and display content in GUI
transition to **Command Mode**

Packetize Data

Check the size of the file that was passed in
Set buffer size to 516 bytes
Loop: Iterate through file to packetize:
    Set first byte in buffer to **SOH**(**0x01**)
    Set second byte in buffer to **0 (0x30)** or **1 (0x31)** (alternating sync bit)
    Set 2-byte checksum to third and fourth byte in buffer
    if remaining file data is larger than 512 bytes
        loop from buffer index 0+4 to 516
            add each char to buffer
    else
        loop from buffer index 0+4 to size of data
            add each char to buffer
        add **EOT** (**0x04**) after the last char in buffer
    store packet into buffer
Transition to **Engine Write Thread Start**

Engine Write Thread Start

*Note: **Packet array** is stored as a global variable*
Create thread handle
Initialize the write thread
Inside Write Thread:
    Loop: Iterate through ***packet array***, pass in each packet to the protocol engine, until no packets are left
    Transition to **Command Mode**

Engine Read Thread Start

Create thread handle
Initialize the read thread
Inside Read Thread:
    Handles **Reading** state in the protocol engine until program terminates
Transition to **Command Mode** to allow user input

Idle

Set communication mask to EV_RXCHAR

Loop:

```
Wait for event
If ENQ or DC2 is received
      transition to Acknowledge Line
If Send button pressed
      transition to confirm line
```

Read Thread – Forever loop

Acknowledge Line

```
Note: senderHasPriority is stored as a global
If DC2 received
      set senderHasPriority to true
if ENQ is received
      set senderHasPriority to false
if weHavePriority is true
      transmit DC1
if weHavePriority is false
      transmit ACK1
set reading to true
transition to Wait For Data state
```

Wait for data

```
Set communication mask to EV_RXCHAR
Initialize a total variable to keep track characters successfully
read
Wait for the event to occur on the serial port
If timeout is greater than defined timeout constant
      Break
While total < 516
      Read from serial port
      append character read into a buffer
      If total is >= 516 or EOT detected
            Return the buffer that stores all the characters read
            Transition to Packet Check state
```

Packet Check

```
Note: Previous sync byte is stored as a global
Check the previous sync byte
      if sync byte is different
            perform checksum and if checksum passes
                  loop through the packet from 4 to end (message
      portion)
                        append each character onto a global buffer
                        if an EOT has been found
                              print out the global buffer
                              break
                  transition to Acknowledge Packet, passing in the
                  packet as a parameter

      else sync byte is the same
            drop packet
            Transition to Wait for Data
```

Acknowledge Packet

```
Receives packet from Packet Check
if weHavePriority is true
      transmit DC1
if weHavePriority is false
      transmit ACK1
loop through the packet to check for EOT
if EOT found
      set reading to false (specifies File Transfer Complete)
transition to Receiver Side: Check Priority State
```

Receiver side: Check Priority State

```
If senderHasPriority is true AND weHavePriority is false
      transition to wait state
else
      transition to idle state
```

Send Thread – Ends when file transfer complete

Confirm Line

```
Note: close the read thread, make sure only 1 thread is operating on
the serial at one time
if number of tries >= 5
      transition to Wait
if weHavePriority is true
      transmit DC2
if weHavePriority is false
      transmit ENQ
transition to Wait for ACK
```

Wait for ACK

```
Note: Number of tries is a counter
Set communication event for EV_RXCHAR
Wait for Event
Set timeout to 5ms
if timeout > 5ms
      increment number of tries
      transition to Confirm Line
else read from serial port
      if get ACK or DC1
            transition to Send Data
```

Send Data

Lock the thread using mutex

```
Send the packet through serial port
      If the send failed
            If overlapped object is busy
                  Wait for the operation to complete
Increment send packets
Release the thread
transition to Wait for Packet ACK
```

Wait for Packet ACK

```
Note: timeouts are globally set
set listener for ACK and DC1
Wait for Event
if timeout (elapsed time since packet sent) > 5ms
      increment number of tries
      transition to Send Data
if get ACK or DC1 (packet transfer was successful)
      flip header sync bit (1->0, or 0->1)
      transition to Sender side: Check Priority State
```

Sender side: Check Priority State

```
      if weHavePriority is true and theyHavePriority is false
            transition to Idle state
      else
            transition to Wait state
```

GUI Implementation

Open button:

This button opens a file opener dialog which allows the user to select a file from their computer by easily browsing through the filesystem. (Upon triggering this button within WndProc, a new thread will be created, constructing the window.)

Send Button:

This button will send the loaded information on the left pane of the window (our loaded file), to receiving end.

Save Button:

This button will save the text on the right to a new file. This file will be specified by user input through a file opener dialog.

Priority Hierarchy Checkbox:

This checkbox will tell the receiver that it is requesting a higher priority over the transmission than the receiver. If they are both requesting higher priority, they will share the line.

Input text area:

The input text area will display a blank area, which may be loaded with an existing file via the open button. The user also has the option to click on the field and edit it themselves.

Output text area:

This field will allow the user to see a received file from their sender. This field will be read-only, and inherently blank, until a user selected a successfully downloaded file from the list of received files.

Received File ComboBox:

This ComboBox will be a list of all received files. When a user clicks on the ComboBox, it will display the loaded file into the output text area window.

Information about the transmissions will also be displayed as:

- Sending progress bar

  The sending progress bar will display the progress on how much of the current file has been sent, and how much left there is to send.

- Statistics area

  The statistics area will include several text fields which display information about the transmissions. The information will include:

  1. Sent packets
  2. Lost packets
  3. Received Packets
  4. Corrupted Packets Received
  5. Amount of ACK's sent and received
  6. Amount of NAK's sent and received
  7. Bit Error Rate