PROGRAMMING ASSIGNMENT

Pre-requisites:

Install gcc for C program compiler

Steps:

1. Copy the files 'client.c', 'server.c' and 'packet_payload.txt' to the desired location.

2. Run the below commands to compile the C programs:

   gcc server.c -o server

   gcc client.c -o client

3. First the server should be started. To start the server, run:
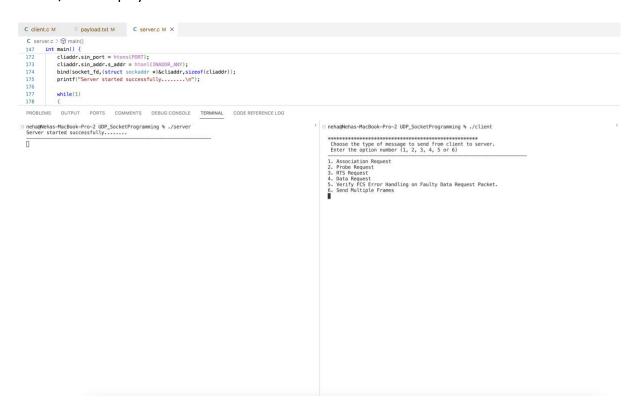
   ./server

4. In a new terminal window, run below for running the client program:

   ./client

5. Packets would start transmitting and output would be visible

At the client side, a user menu with options for different type of packets to be sent to server/AP is displayed.

Then as per the options selected, the client sends a packet to the server and the server responds accordingly.

Neha Raj [W1642731]

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1. Association Request and Response

2. Probe Request and Response

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3. RTS and CTS

4. Data Packet and ACK

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5. FCS Error Handling
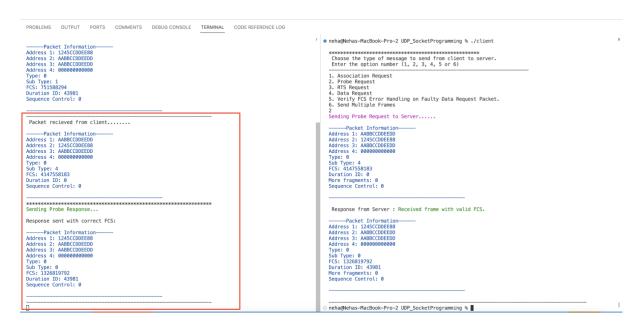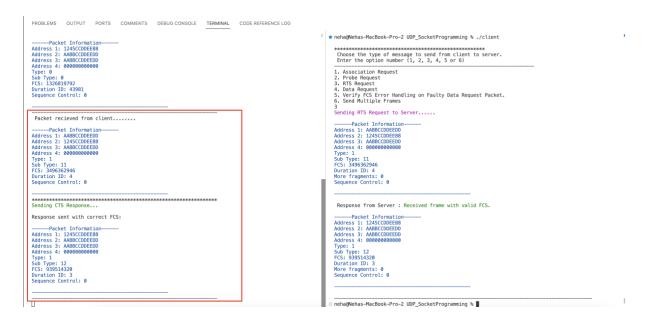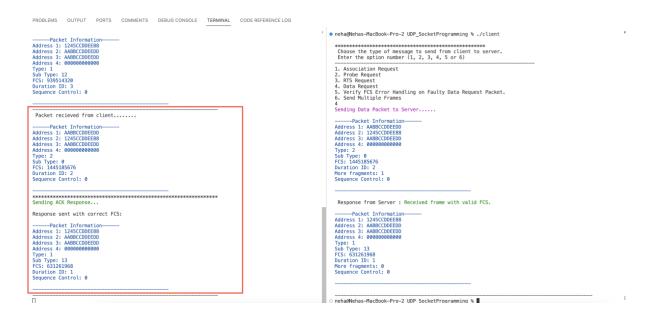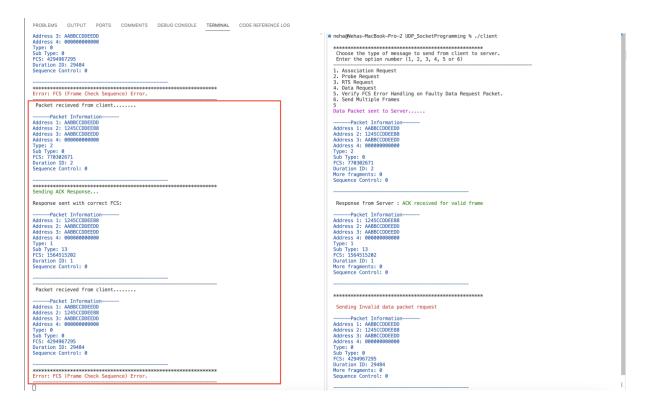
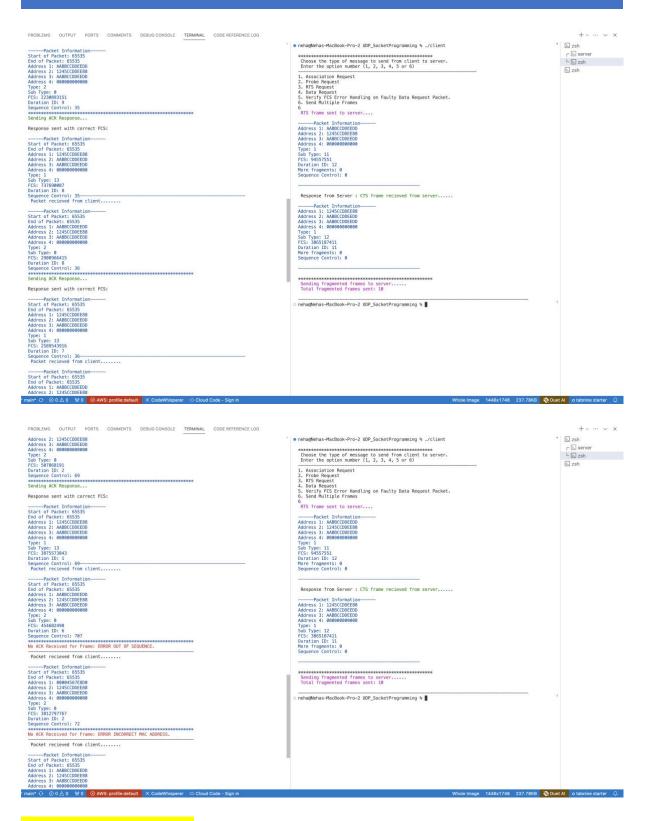

6. Sending multiple fragmented frames

Neha Raj [W1642731]

PROBLEMS   OUTPUT   PORTS   COMMENTS   DEBUG CONSOLE   **TERMINAL**   CODE REFERENCE LOG

```
neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./server
Server started successfully........
------------------------------------------------------------
  Packet recieved from client........

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 11
  FCS: 94557551
  Duration ID: 12
  Sequence Control: 0
  **************************************************************
  Sending CTS Response...

  Response sent with correct FCS:

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 12
  FCS: 3865187411
  Duration ID: 11
  Sequence Control: 0----------------------------------------------
  Packet recieved from client........

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 2
  Sub Type: 0
  FCS: 36243714677
  Duration ID: 12
  Sequence Control: 32
  **************************************************************
  Sending ACK Response...

  Response sent with correct FCS:

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 13
  FCS: 507102265
  Duration ID: 11
  Sequence Control: 32----------------------------------------------
  Packet recieved from client........
```

```
neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./client
*****************************************************
  Choose the type of message to send from client to server.
  Enter the option number (1, 2, 3, 4, 5 or 6)
  --------------------------------------------------
  1. Association Request
  2. Probe Request
  3. RTS Request
  4. Data Request
  5. Verify FCS Error Handling on Faulty Data Request Packet.
  6. Send Multiple Frames
  6
  RTS frame sent to server....

  ------Packet Information------
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 11
  FCS: 94557551
  Duration ID: 12
  More fragments: 0
  Sequence Control: 0

  --------------------------------------------------

  Response from Server : CTS frame recieved from server......

  ------Packet Information------
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 12
  FCS: 3865187411
  Duration ID: 11
  More fragments: 0
  Sequence Control: 0

  --------------------------------------------------

  *****************************************************
  Sending fragmented frames to server......
  Total fragmented frames sent: 10

  --------------------------------------------------
neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % 
```

PROBLEMS   OUTPUT   PORTS   COMMENTS   DEBUG CONSOLE   **TERMINAL**   CODE REFERENCE LOG

```
  Packet recieved from client........

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 2
  Sub Type: 0
  FCS: 2467664744
  Duration ID: 11
  Sequence Control: 33
  **************************************************************
  Sending ACK Response...

  Response sent with correct FCS:

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 13
  FCS: 518849119
  Duration ID: 10
  Sequence Control: 33----------------------------------------------
  Packet recieved from client........

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 2
  Sub Type: 0
  FCS: 1048485255
  Duration ID: 10
  Sequence Control: 34
  **************************************************************
  Sending ACK Response...

  Response sent with correct FCS:

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 13
  FCS: 492322793
  Duration ID: 9
  Sequence Control: 34----------------------------------------------
  Packet recieved from client........

  ------Packet Information------
  Start of Packet: 65535
  End of Packet: 65535
  Address 1: AABBCCDDEEDD
```

```
neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./client
*****************************************************
  Choose the type of message to send from client to server.
  Enter the option number (1, 2, 3, 4, 5 or 6)
  --------------------------------------------------
  1. Association Request
  2. Probe Request
  3. RTS Request
  4. Data Request
  5. Verify FCS Error Handling on Faulty Data Request Packet.
  6. Send Multiple Frames
  6
  RTS frame sent to server....

  ------Packet Information------
  Address 1: AABBCCDDEEDD
  Address 2: 1245CCDDEE88
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 11
  FCS: 94557551
  Duration ID: 12
  More fragments: 0
  Sequence Control: 0

  --------------------------------------------------

  Response from Server : CTS frame recieved from server......

  ------Packet Information------
  Address 1: 1245CCDDEE88
  Address 2: AABBCCDDEEDD
  Address 3: AABBCCDDEEDD
  Address 4: 000000000000
  Type: 1
  Sub Type: 12
  FCS: 3865187411
  Duration ID: 11
  More fragments: 0
  Sequence Control: 0

  --------------------------------------------------

  *****************************************************
  Sending fragmented frames to server......
  Total fragmented frames sent: 10

  --------------------------------------------------
neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % 
```

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Neha Raj [W1642731]

4 error fragmented frames

Neha Raj [W1642731]

PROBLEMS   OUTPUT   PORTS   COMMENTS   DEBUG CONSOLE   **TERMINAL**   CODE REFERENCE LOG

```
------Packet Information------
Start of Packet: 65535
End of Packet: 65535
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 2871177440
Duration ID: 6
Sequence Control: 707
******************************************************
No ACK Received for Frame: ERROR OUT OF SEQUENCE.
------------------------------------------------------
 Packet recieved from client........

------Packet Information------
Start of Packet: 65535
End of Packet: 65535
Address 1: 00004567E8D0
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 3812797767
Duration ID: 2
Sequence Control: 72
******************************************************
No ACK Received for Frame: ERROR INCORRECT MAC ADDRESS.
------------------------------------------------------
 Packet recieved from client........

------Packet Information------
Start of Packet: 65535
End of Packet: 65535
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 1478994553
Duration ID: 4
Sequence Control: 707
******************************************************
No ACK Received for Frame: ERROR DUPLICATE FRAME.
------------------------------------------------------
 Packet recieved from client........

------Packet Information------
Start of Packet: 65535
End of Packet: 0
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 1002697968
Duration ID: 2
Sequence Control: 74
******************************************************
 No ACK Received for Frame: ERROR END OF PACKET MISSING.
------------------------------------------------------
```
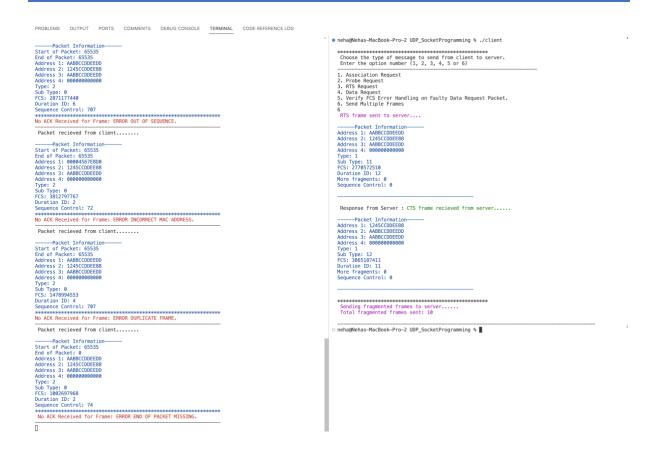
```
● neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./client
******************************************************
 Choose the type of message to send from client to server.
 Enter the option number (1, 2, 3, 4, 5 or 6)
------------------------------------------------------
1. Association Request
2. Probe Request
3. RTS Request
4. Data Request
5. Verify FCS Error Handling on Faulty Data Request Packet.
6. Send Multiple Frames
6
 RTS frame sent to server....

------Packet Information------
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 1
Sub Type: 11
FCS: 2770572510
Duration ID: 12
More fragments: 0
Sequence Control: 0
------------------------------------------------------

 Response from Server : CTS frame recieved from server......

------Packet Information------
Address 1: 1245CCDDEE88
Address 2: AABBCCDDEEDD
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 1
Sub Type: 12
FCS: 3865187411
Duration ID: 11
More fragments: 0
Sequence Control: 0
------------------------------------------------------

******************************************************
 Sending fragmented frames to server......
 Total fragmented frames sent: 10
------------------------------------------------------
○ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % █
```

==After ack_timer and retry_counter runs out, error message is displayed:==

Neha Raj [W1642731]

PROBLEMS   OUTPUT   PORTS   COMMENTS   DEBUG CONSOLE   **TERMINAL**   CODE REFERENCE LOG

```
○ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % []
```

```
1. Association Request
2. Probe Request
3. RTS Request
4. Data Request
5. Verify FCS Error Handling on Faulty Data Request Packet.
6. Send Multiple Frames
4
Sending Data Packet to Server......

------Packet Information------
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 3311318129
Duration ID: 2
More fragments: 0
Sequence Control: 0

_____

 Response from Server : ERROR  Server does not respond

 Sending Packet Again.............
Sending Data Packet to Server......

------Packet Information------
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 3311318129
Duration ID: 2
More fragments: 0
Sequence Control: 0

_____

 Response from Server : ERROR  Server does not respond

 Sending Packet Again.............
Sending Data Packet to Server......

------Packet Information------
Address 1: AABBCCDDEEDD
Address 2: 1245CCDDEE88
Address 3: AABBCCDDEEDD
Address 4: 000000000000
Type: 2
Sub Type: 0
FCS: 3311318129
Duration ID: 2
More fragments: 0
Sequence Control: 0

_____

 Response from Server : ERROR  Server does not respond

 Sending Packet Again.............

 ERROR : No ACK received from AP
○ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % []
```

If user enters a wrong option, the client throws and error and exits.

PROBLEMS   OUTPUT   PORTS   COMMENTS   DEBUG CONSOLE   **TERMINAL**   CODE REFERENCE LOG

```
○ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./server
Server started successfully........
_____

[]
```

```
◉ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % ./client

****************************************************
 Choose the type of message to send from client to server.
 Enter the option number (1, 2, 3, 4, 5 or 6)
_____
1. Association Request
2. Probe Request
3. RTS Request
4. Data Request
5. Verify FCS Error Handling on Faulty Data Request Packet.
6. Send Multiple Frames
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 ERROR Retry again with correct option
○ neha@Nehas-MacBook-Pro-2 UDP_SocketProgramming % █
```

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