Team 7 – Musketeers
Team Members:
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Adham Ismail 55-8911
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Sender

```
    def get_checksum(data):
```

Calculate the checksum for outgoing data

param data: one and only one character

return: the ASCII code of the character, for example ASCII('A') = 65   """

```
checksum = ord(data)
```

the checksum variable represents the value of the ascii code of the data character input to the function using the ord method and then the function returns the checksum variable that represents the ascii value

```
        return checksum


def is_corrupted(reply):
```

Check if the received reply from receiver is corrupted or not

param reply: a python dictionary represent a reply sent by the receiver

return: True -> if the reply is corrupted | False -> if the reply is NOT corrupted

here we check that the reply checksum value of the reply’s acknowledgement is = to the ascii value of the acknowledgement of the reply to make sure that the acknowledgement is not corrupted

```
        if (ord(reply['ack']) == reply['checksum']):
            return False
        else:
            return True


        pass
```

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```
def rdt_send(self, process_buffer):
        for data in process_buffer:
            print(f'Sender Expecting: seq:{self.sequence}')
            checksum = RDTSender.get_checksum(data)
            pkt = RDTSender.make_pkt(self.sequence, data, checksum)
            clone =RDTSender.clone_packet(pkt)
            print(f'Sender sent: msg={pkt}')
            reply = self.net_srv.udt_send(pkt)
            while(RDTSender.is_corrupted(reply) or RDTSender.is_expected_seq(reply,
self.sequence) == False):
                pkt = clone
                clone = RDTSender.clone_packet(pkt)
                print(f'Sender out: msg={pkt}')
                reply = self.net_srv.udt_send(pkt)
            if(self.sequence=='0'):
                self.sequence='1'
            else:
                self.sequence='0'
        print("Sender Done!")
        return
```

In our implementation to the function (rdt_send), we carried out a “for loop” that checks on each character that we need to send (as a sender). We start the loop with the condition that there are ‘data’ in our buffer that are to be sent, our first edit to perform our implementation was to add a print statement to give detail (sequence number) about the character that is currently in the buffer and is in the process of being sent. Our following set of steps were initializing the checksum, creating the packet itself, creating a clone to the packet, displaying the packet, sending it to the network. Within the “for loop”, we nested a “While loop”. The objective of the while loop is to make sure that the packet sent was a. Not corrupted. b. Had the correct sequence number. If any of those two conditions was not met, we would enter the loop to make sure that we correct the fault that occurred (that of points a or b). Upon entering the loop, we wrote a few statements. To start off, we made sure that the packet that would be resent(pkt) would have the value and information of the clone we created beforehand so that our initial packet would not get corrupted. We then clone the packet (pkt) to make sure we still have the original packet unharmed. Afterwards, we print the packet we are sending then actually send it to the network. After each packet is sent successfully, we flip the sequence so that we can keep track of any further corruption or messed up sequence number in following packets. Finally, we have sent the whole message and announce that the sender is done.

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```
  def is_expected_seq(reply, exp_seq):
       Check if the received reply from receiver has the expected sequence number
      param reply: a python dictionary represent a reply sent by the receiver
      param exp_seq: the sender expected sequence number '0' or '1' represented as a character
      :return: True -> if ack in the reply match the   expected sequence number otherwise False
 if (reply['ack']==exp_seq):
        return True
      else:
        return False
      pass
```

Here we check that the reply's acknowledgement is = to the expected sequence number

Receiver

```
 def is_corrupted(packet):
       Check if the received packet from sender is corrupted or not
        param packet: a python dictionary represent a packet received from the sender
        return: True -> if the reply is corrupted | False ->  if the reply is NOT corrupted
      if (ord(packet['data']) == packet['checksum']):
        return False
      else:
        return True
      pass
```

Here we are checking that the ascii value of the data using the ord function of the packet input is = to checksum value of the sent packet. If they are = then the packet is not corrupted other wise means that it is corrupted

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```
def is_expected_seq(rcv_pkt, exp_seq):
     Check if the received reply from receiver has the expected sequence number
     param rcv_pkt: a python dictionary represent a packet received by the receiver
     param exp_seq: the receiver expected sequence number '0' or '1' represented as a character
     return: True -> if ack in the reply match the   expected sequence number otherwise False


    if (rcv_pkt['sequence_number']==exp_seq):
      return True
    else:
      return False
    pass
```

Here we are checking that received packet sequence number is = to expected sequence number

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```
 def rdt_rcv(self, rcv_pkt):

   Implement the RDT v2.2 for the receiver

    param rcv_pkt: a packet delivered by the network layer 'udt_send()' to the receiver

    return: the reply packet

    print(f'Reciever Expecting: seq:{self.sequence}') here printing the expected sequence
number

    if(RDTReceiver.is_corrupted(rcv_pkt)==True or
RDTReceiver.is_expected_seq(rcv_pkt,self.sequence)==False ):

checking if the message is corrupted or has a different sequence number than the expected

        print(f'Corruption Occured: msg={rcv_pkt}') saying that the message is corrupted and
listing the message

        if(self.sequence == '0'):

            reply_pkt = RDTReceiver.make_reply_pkt('1',ord('1'))

        else:

            reply_pkt = RDTReceiver.make_reply_pkt('0',ord('0'))

 else:

          print(f'Recieved: msg={rcv_pkt}')

    # deliver the data to the process in the application layer

          ReceiverProcess.deliver_data(rcv_pkt['data'])

          reply_pkt = RDTReceiver.make_reply_pkt(self.sequence, ord(self.sequence))

          if(self.sequence=='0'):

              self.sequence='1'

              #return reply_pkt

          else:

              self.sequence='0'

              #return reply_pkt

    return reply_pkt
```

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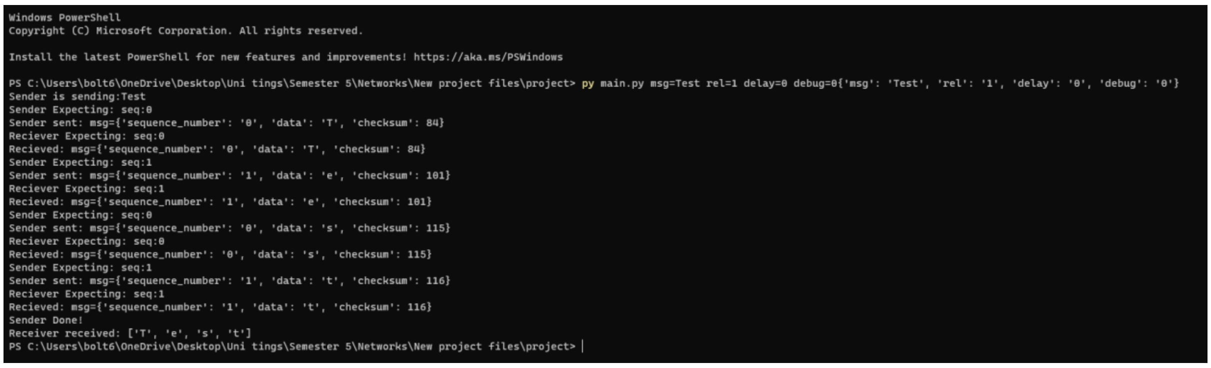
Here checking that if the expected sequence number =0 we reply and send the reply with acknowledgement of 1 and ascii value of it as checksum and the opposite other wise at the end of the method if the message is not corrupted and sequence number as expected then we print the message and deliver the data inside the packet to the application layer and replying with the sequence number as acknowledgment and it's ascii value as checksum and then changing the sequence number of the self if it's one then 0 and the opposite and return the reply to the sender.

Terminal when reliability = 1.0

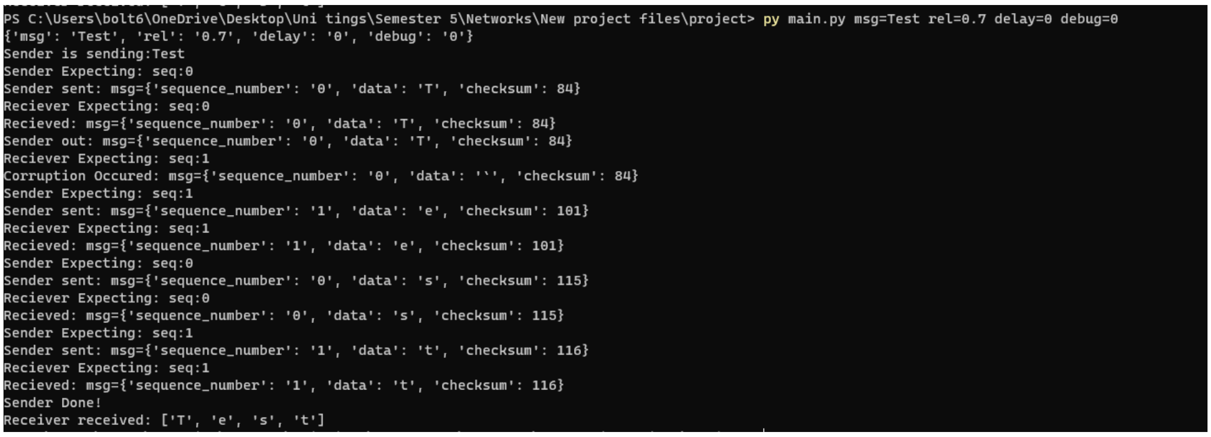


```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\bolt6\OneDrive\Desktop\Uni tings\Semester 5\Networks\New project files\project> py main.py msg=Test rel=1 delay=0 debug=0{'msg': 'Test', 'rel': '1', 'delay': '0', 'debug': '0'}
Sender is sending:Test
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Sender Done!
Receiver received: ['T', 'e', 's', 't']
PS C:\Users\bolt6\OneDrive\Desktop\Uni tings\Semester 5\Networks\New project files\project> |
```

Terminal when reliability = 0.7



```
PS C:\Users\bolt6\OneDrive\Desktop\Uni tings\Semester 5\Networks\New project files\project> py main.py msg=Test rel=0.7 delay=0 debug=0
{'msg': 'Test', 'rel': '0.7', 'delay': '0', 'debug': '0'}
Sender is sending:Test
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Sender out: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '0', 'data': '`', 'checksum': 84}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Sender Done!
Receiver received: ['T', 'e', 's', 't']
```

Terminal when reliability = 0.4

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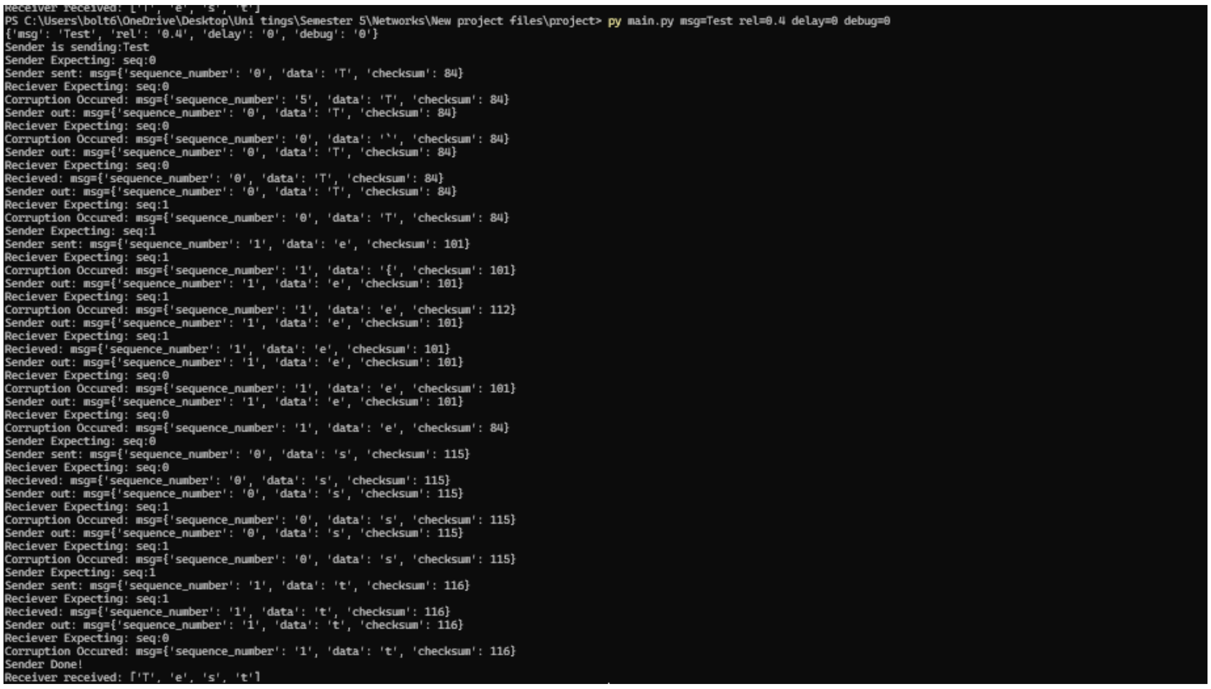
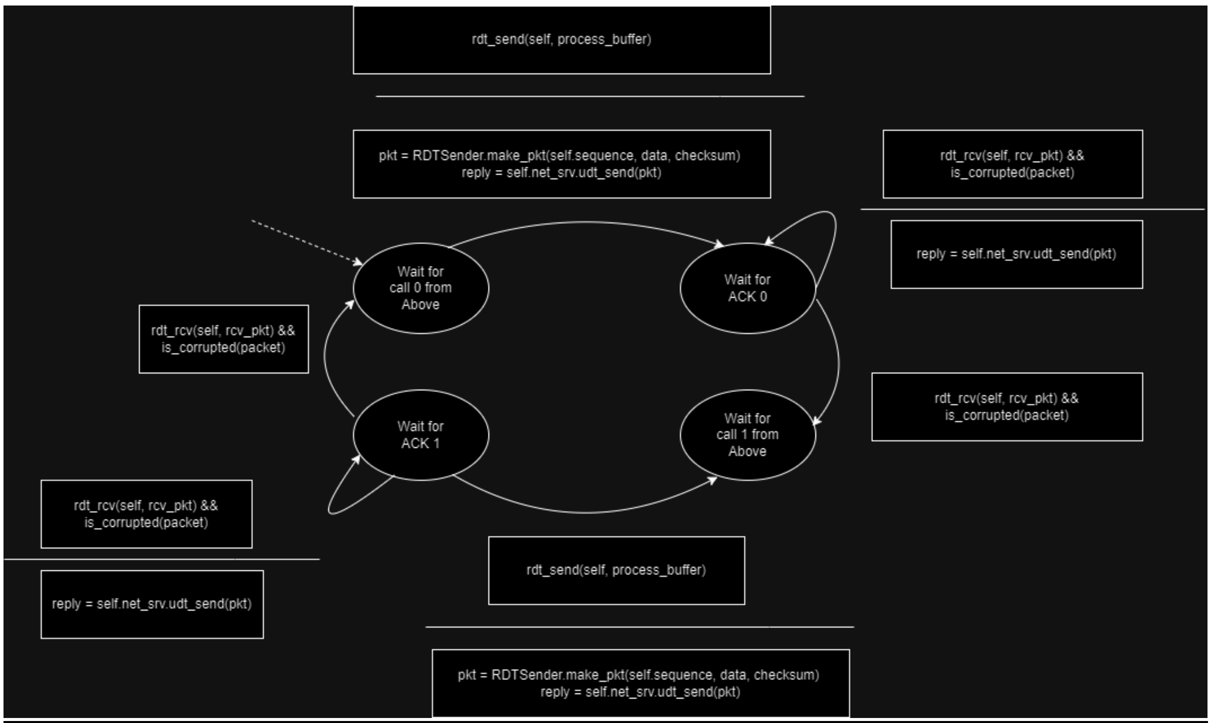


```
Receiver received: ['T', 'e', 's', 't']
PS C:\Users\bolt6\OneDrive\Desktop\Uni tings\Semester 5\Networks\New project files\project> py main.py msg=Test rel=0.4 delay=0 debug=0
{'msg': 'Test', 'rel': '0.4', 'delay': '0', 'debug': '0'}
Sender is sending:Test
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:0
Corruption Occured: msg={'sequence_number': '5', 'data': 'T', 'checksum': 84}
Sender out: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:0
Corruption Occured: msg={'sequence_number': '0', 'data': '`', 'checksum': 84}
Sender out: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Sender out: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '0', 'data': 'T', 'checksum': 84}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '1', 'data': '{', 'checksum': 101}
Sender out: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '1', 'data': 'e', 'checksum': 112}
Sender out: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Sender out: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:0
Corruption Occured: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Sender out: msg={'sequence_number': '1', 'data': 'e', 'checksum': 101}
Reciever Expecting: seq:0
Corruption Occured: msg={'sequence_number': '1', 'data': 'e', 'checksum': 84}
Sender Expecting: seq:0
Sender sent: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Reciever Expecting: seq:0
Recieved: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Sender out: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Sender out: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Reciever Expecting: seq:1
Corruption Occured: msg={'sequence_number': '0', 'data': 's', 'checksum': 115}
Sender Expecting: seq:1
Sender sent: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Reciever Expecting: seq:1
Recieved: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Sender out: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Reciever Expecting: seq:0
Corruption Occured: msg={'sequence_number': '1', 'data': 't', 'checksum': 116}
Sender Done!
Receiver received: ['T', 'e', 's', 't']
```

FSM

Sender


rdt_send(self, process_buffer)
pkt = RDTSender.make_pkt(self.sequence, data, checksum)
reply = self.net_srv.udt_send(pkt)
rdt_rcv(self, rcv_pkt) && is_corrupted(packet)
reply = self.net_srv.udt_send(pkt)
Wait for call 0 from Above
Wait for ACK 0
rdt_rcv(self, rcv_pkt) && is_corrupted(packet)
rdt_rcv(self, rcv_pkt) && is_corrupted(packet)
Wait for ACK 1
Wait for call 1 from Above
rdt_rcv(self, rcv_pkt) && is_corrupted(packet)
reply = self.net_srv.udt_send(pkt)
rdt_send(self, process_buffer)
pkt = RDTSender.make_pkt(self.sequence, data, checksum)
reply = self.net_srv.udt_send(pkt)

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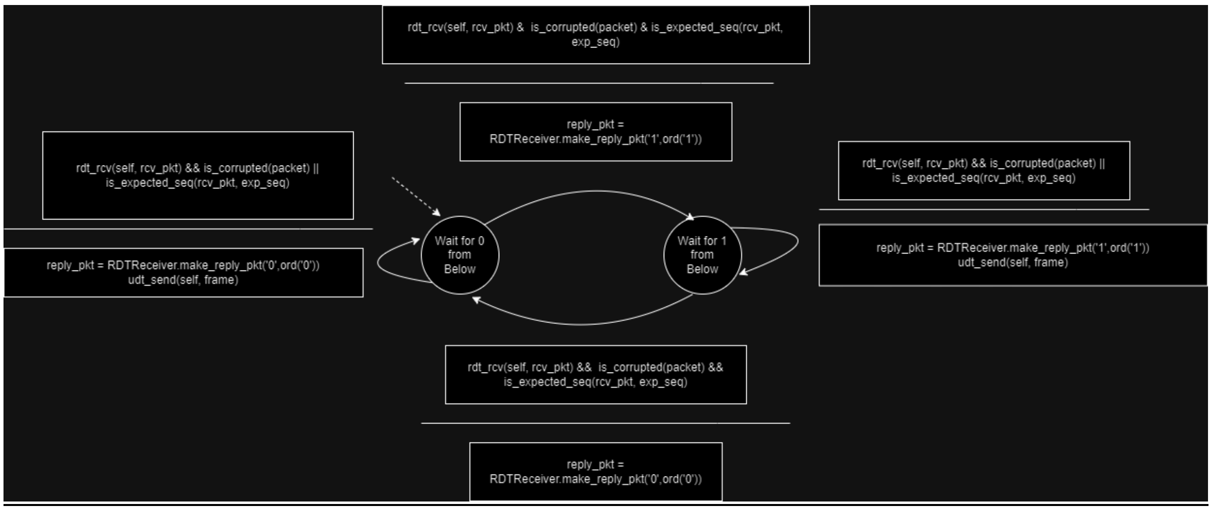
Receiver


rdt_rcv(self, rcv_pkt) & is_corrupted(packet) & is_expected_seq(rcv_pkt, exp_seq)
reply_pkt = RDTReceiver.make_reply_pkt('1',ord('1'))
rdt_rcv(self, rcv_pkt) && is_corrupted(packet) || is_expected_seq(rcv_pkt, exp_seq)
reply_pkt = RDTReceiver.make_reply_pkt('0',ord('0')) udt_send(self, frame)
Wait for 0 from Below
Wait for 1 from Below
rdt_rcv(self, rcv_pkt) && is_corrupted(packet) || is_expected_seq(rcv_pkt, exp_seq)
reply_pkt = RDTReceiver.make_reply_pkt('1',ord('1')) udt_send(self, frame)
rdt_rcv(self, rcv_pkt) && is_corrupted(packet) && is_expected_seq(rcv_pkt, exp_seq)
reply_pkt = RDTReceiver.make_reply_pkt('0',ord('0'))