RDTv2.2 Implementation Report

1.Team Members

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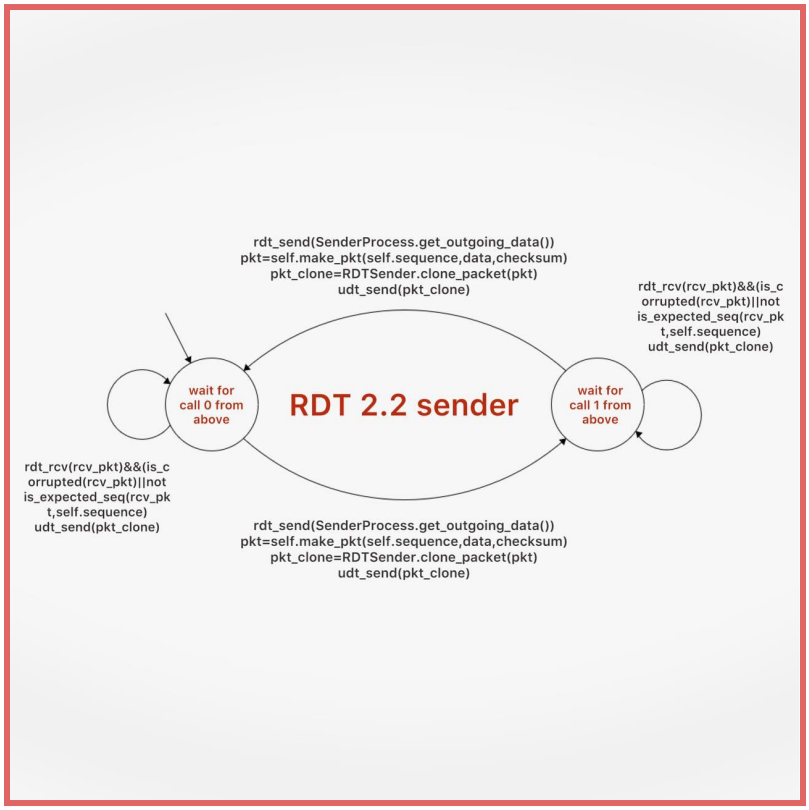
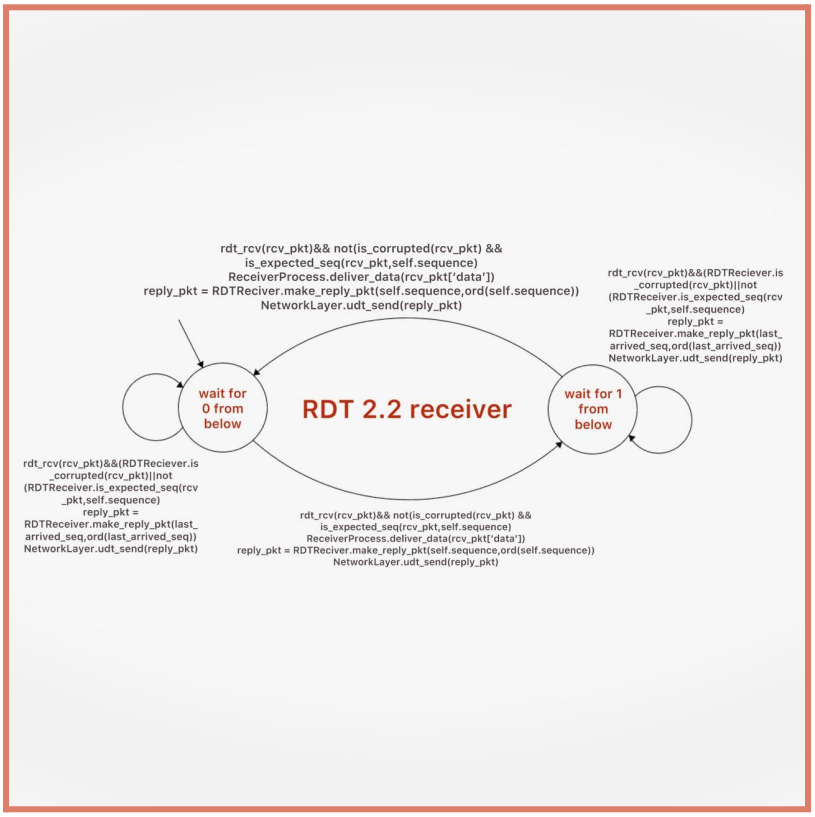
Contribution:

The team contributed equally in both the sender and receiver classes, the FSM and the report.

2. The FSM :


rdt_send(SenderProcess.get_outgoing_data())
pkt=self.make_pkt(self.sequence,data,checksum)
pkt_clone=RDTSender.clone_packet(pkt)
udt_send(pkt_clone)
rdt_rcv(rcv_pkt)&&(is_corrupted(rcv_pkt)||not is_expected_seq(rcv_pkt,self.sequence)
udt_send(pkt_clone)
wait for call 0 from above
RDT 2.2 sender
wait for call 1 from above
rdt_rcv(rcv_pkt)&&(is_corrupted(rcv_pkt)||not is_expected_seq(rcv_pkt,self.sequence)
udt_send(pkt_clone)
rdt_send(SenderProcess.get_outgoing_data())
pkt=self.make_pkt(self.sequence,data,checksum)
pkt_clone=RDTSender.clone_packet(pkt)
udt_send(pkt_clone)


rdt_rcv(rcv_pkt)&& not(is_corrupted(rcv_pkt) && is_expected_seq(rcv_pkt,self.sequence)
ReceiverProcess.deliver_data(rcv_pkt['data'])
reply_pkt = RDTReciver.make_reply_pkt(self.sequence,ord(self.sequence))
NetworkLayer.udt_send(reply_pkt)
rdt_rcv(rcv_pkt)&&(RDTReciever.is_corrupted(rcv_pkt)||not (RDTReceiver.is_expected_seq(rcv_pkt,self.sequence)
reply_pkt = RDTReceiver.make_reply_pkt(last_arrived_seq,ord(last_arrived_seq))
NetworkLayer.udt_send(reply_pkt)
wait for 0 from below
RDT 2.2 receiver
wait for 1 from below
rdt_rcv(rcv_pkt)&&(RDTReciever.is_corrupted(rcv_pkt)||not (RDTReceiver.is_expected_seq(rcv_pkt,self.sequence)
reply_pkt = RDTReceiver.make_reply_pkt(last_arrived_seq,ord(last_arrived_seq))
NetworkLayer.udt_send(reply_pkt)
rdt_rcv(rcv_pkt)&& not(is_corrupted(rcv_pkt) && is_expected_seq(rcv_pkt,self.sequence)
ReceiverProcess.deliver_data(rcv_pkt['data'])
reply_pkt = RDTReciver.make_reply_pkt(self.sequence,ord(self.sequence))
NetworkLayer.udt_send(reply_pkt)

3 . Pseudocode for sender RDT :

```
class SenderProcess:
  __buffer = list()

  function set_outgoing_data(buffer):
    Store buffer in SenderProcess.__buffer

    function get_outgoing_data():
    Return SenderProcess.__buffer


class RDTSender:

  function __init__(net_srv):
    Set self.sequence to '0'
    Set self.net_srv to net_srv


  function get_checksum(data):
    Return ASCII code of data


  function clone_packet(packet):
    Create a copy of packet and return it


  function is_corrupted(reply):
    expected_checksum = calculate_expected_checksum(reply)
    msg_checksum = extract_checksum_from_reply(reply)

    if expected_checksum does not match msg_checksum:
      return True
    else:
      return False

  function is_expected_seq(reply, exp_seq):
    msg_seq = extract_sequence_number_from_reply(reply)

    if msg_seq matches exp_seq:
      return True
    else:
      return False
```

```
function make_pkt(seq, data, checksum):
    Create a packet with sequence number, data, and checksum

function rdt_send(process_buffer):
    for each data in process_buffer:
        Calculate checksum for data
        Create a packet with sequence number, data, and checksum
        Clone the packet for transmission
        Send the packet over the network and receive a reply


        Print expected sequence number
        Print packet details (sequence number, data, checksum)
        Print received reply (sequence number, checksum)


        while reply is corrupted or sequence number mismatch:
            Clone the packet for retransmission
            Send the packet again and receive a new reply
            Print expected sequence number
            Print packet details (sequence number, data, checksum)
            Print received reply (sequence number, checksum)


        Update sequence number

    Print "Sender Done!"
```

Pseudocode for receiver RDT :

```
class ReceiverProcess:
    __buffer = empty list

    function deliver_data(data):
        Append the 'data' received from the RDT receiver to __buffer
        return

    function get_buffer():
        Return the entire __buffer containing the received message
        return __buffer
```

```
class RDTReceiver:
sequence = Initialize sequence number to '0'

  function is_corrupted(packet):
    Calculate the ASCII value of the packet's data and compare it with the provided checksum
    If the checksum doesn't match the ASCII value of the data:
      Return True (indicating corruption)
    Else:
      Return False (indicating no corruption)
    return

  function is_expected_seq(rcv_pkt, exp_seq):
    Retrieve the sequence number from the received packet and compare it with the expected sequence
    If the received sequence matches the expected sequence:
      Return True (indicating correct sequence)
    Else:
      Return False (indicating incorrect sequence)
    return

  function make_reply_pkt(seq, checksum):
    Create a reply packet with 'ack' and 'checksum' fields
    Set the 'ack' field to the provided sequence number
    Set the 'checksum' field to the ASCII value of the sequence number
    Return the created reply packet
    return

  function rdt_rcv(rcv_pkt):
    Print the expected sequence number
    Check if the received packet's sequence matches the expected sequence and if it's not corrupted
      If both conditions are met:
        Create a reply packet and switch the sequence number for the next expected packet
        Deliver the data to the application layer
      Else:
        Create a reply packet with the last acknowledged sequence number
    Print the reply packet
    Deliver the reply packet to the sender
    return the reply packet
```

4. Changes made to the skeleton code:

For the sender:

Changes Made in SenderProcess Class:

get_checksum Method Update:

Change: Previously contained a placeholder statement.

Effect: Now calculates the checksum using ord() to enhance data integrity.

rdt_send Method Update:

Change: Originally lacked handling for packet corruption or sequence number mismatch.

Effect: Adds logic to compute checksum for each data character, sends packets, and expects receiver acknowledgment. Implements retransmission if acknowledgment is incorrect or corrupted, updating sequence numbers for successful communication.

Changes Made in RDTSender Class:

get_checksum Method Update:

Change: No significant change; remains a static method.

Effect: Computes the ASCII value of the data character using ord().

is_corrupted Method Update:

Change: Previously had a placeholder statement.

Effect: Checks the acknowledgment's checksum against the expected checksum. Returns True if corrupted; False otherwise.

is_expected_seq Method Update:

Change: Originally had a placeholder statement.

Effect: Compares acknowledgement sequence number with the expected sequence number. Returns True for a match; False otherwise.

rdt_send Method Update:

Change: No significant change in method structure.

Effect: Implements a reliable data transfer mechanism, verifying acknowledgment integrity and sequence number matching. Retransmits packets until an uncorrupted acknowledgment with a matching sequence number is received.

Overall Effects Summary:

Enhanced Data Integrity Checks: Updated methods ensure accurate checksum calculations and rigorous validation of acknowledgments, mitigating data corruption risks during transmission.
Improved Reliable Data Transfer: The sender now waits for valid acknowledgments before proceeding, reducing the likelihood of data loss or incorrect transmissions.

For the receiver:

is_corrupted Method:
changes:
The is_corrupted method implementation was added.
The method checks if the received packet from the sender is corrupted by comparing the packet's checksum and the calculated data checksum.

is_expected_seq Method:
changes:
The implementation of is_expected_seq was added
It checks if the received reply from the receiver has the expected sequence number by comparing the sequence number in the packet and the expected sequence number.

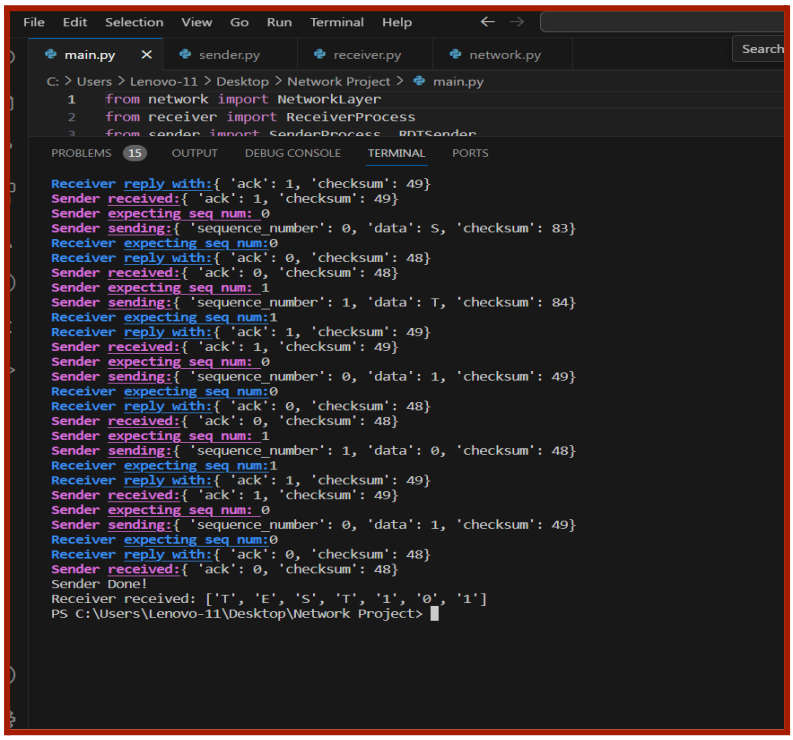
Effects:
The added methods in the ReceiverProcess class enhance the reliability of the receiver's operations by verifying the integrity of the received data packets (is_corrupted) and checking if the sequence number of the received packet matches the expected sequence (is_expected_seq).

rdt_rcv Method:
changes:
The rdt_rcv method was updated significantly.
Added functionality to print the expected sequence number before processing.
Implemented checks for whether the received packet matches the expected sequence and is not corrupted.
Generates an appropriate reply packet based on the correctness of the received packet.
Updates the sequence number accordingly.
Delivers data to the application layer.

Effects:
The modified rdt_rcv method in the RDTReceiver class integrates the newly added methods (is_corrupted and is_expected_seq) to ensure received packets' integrity and correct sequence before processing them. It also manages the sequence number and delivers data appropriately.

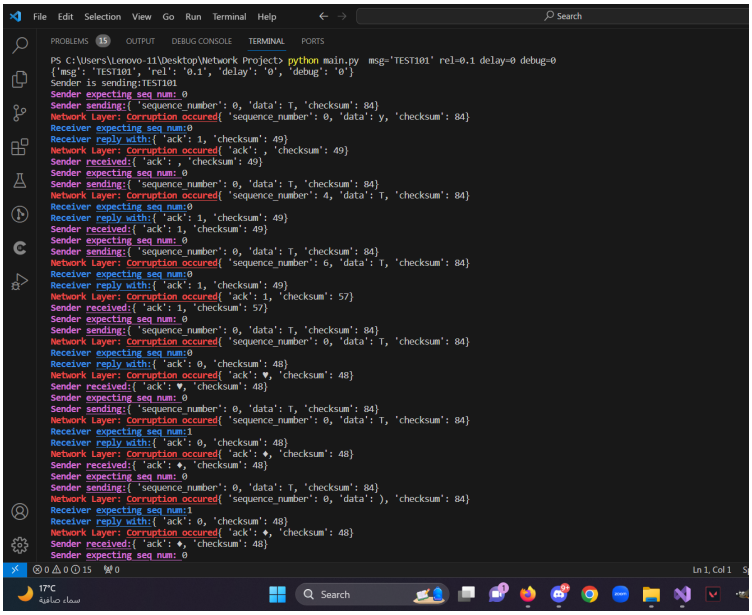
5-Test cases:

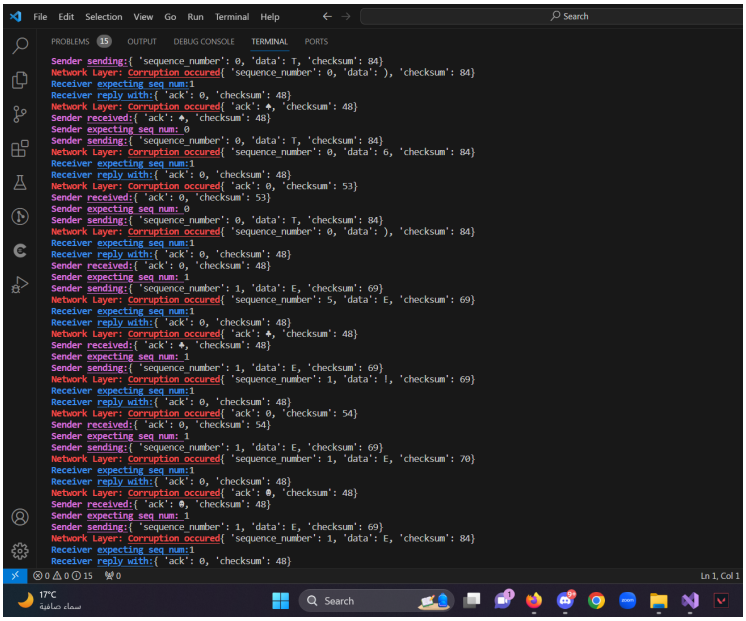
Test 1 with reliabilty = 1

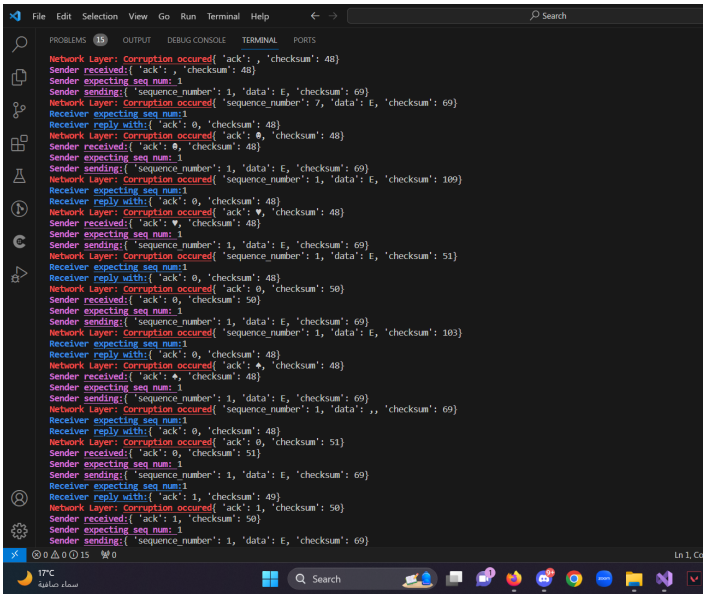


data arrived successfully!!

Test 2 with reliability <1






File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Network Layer: Corruption occured{ 'sequence_number': 7, 'data': E, 'checksum': 69}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': E, 'checksum': 109}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': E, 'checksum': 51}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 50}
Sender received:{ 'ack': 0, 'checksum': 50}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': E, 'checksum': 103}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': ,, 'checksum': 69}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 51}
Sender received:{ 'ack': 0, 'checksum': 51}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 50}
Sender received:{ 'ack': 1, 'checksum': 50}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': E, 'checksum': 69}
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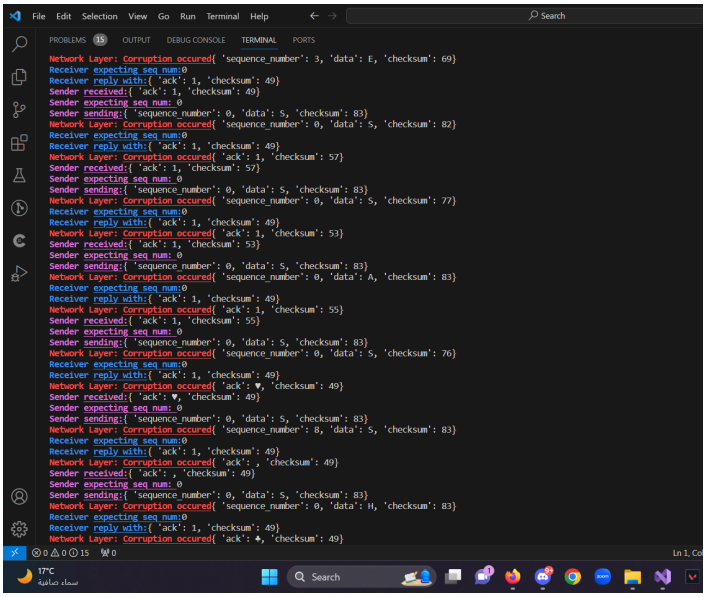
File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': E, 'checksum': 69}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Sender received:{ 'ack': 1, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 82}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 57}
Sender received:{ 'ack': 1, 'checksum': 57}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 77}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 53}
Sender received:{ 'ack': 1, 'checksum': 53}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': A, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 55}
Sender received:{ 'ack': 1, 'checksum': 55}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 76}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 8, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': H, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
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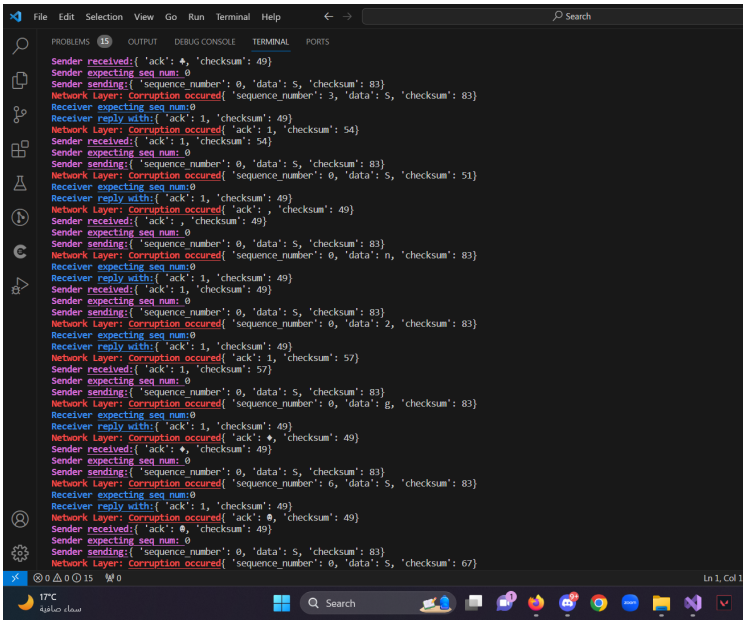
Search


File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Sender received:{ 'ack': ♣, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 54}
Sender received:{ 'ack': 1, 'checksum': 54}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 51}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': n, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Sender received:{ 'ack': 1, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 2, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 57}
Sender received:{ 'ack': 1, 'checksum': 57}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': g, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♦, 'checksum': 49}
Sender received:{ 'ack': ♦, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 6, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 49}
Sender received:{ 'ack': 0, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 67}
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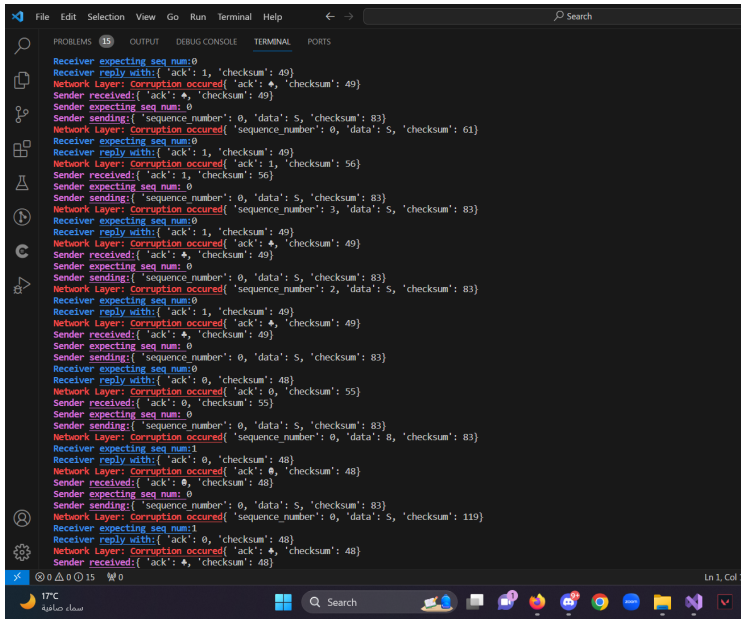
File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 49}
Sender received:{ 'ack': ♣, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 61}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 56}
Sender received:{ 'ack': 1, 'checksum': 56}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 49}
Sender received:{ 'ack': ♣, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 2, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 49}
Sender received:{ 'ack': ♣, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 55}
Sender received:{ 'ack': 0, 'checksum': 55}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 8, 'checksum': 83}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': S, 'checksum': 119}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
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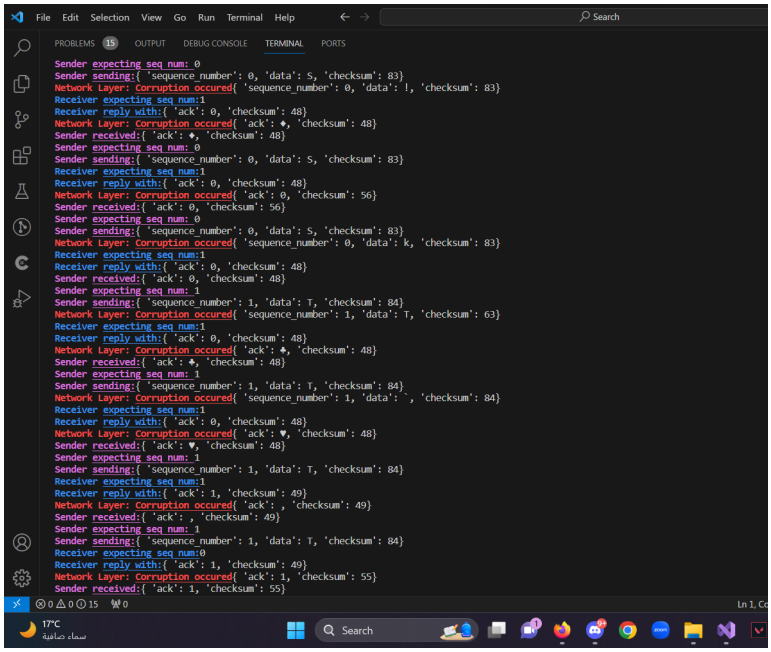
Search


File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': !, 'checksum': 83}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♦, 'checksum': 48}
Sender received:{ 'ack': ♦, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 56}
Sender received:{ 'ack': 0, 'checksum': 56}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': S, 'checksum': 83}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': k, 'checksum': 83}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': T, 'checksum': 63}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': `, 'checksum': 84}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♥, 'checksum': 48}
Sender received:{ 'ack': ♥, 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 55}
Sender received:{ 'ack': 1, 'checksum': 55}
17°C
سماء صافية
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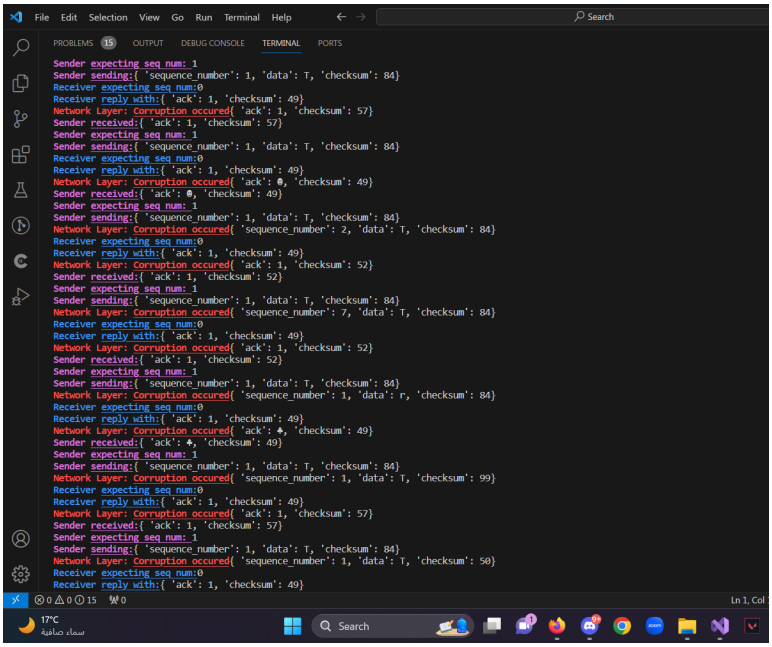
File Edit Selection View Go Run Terminal Help
Search
PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 57}
Sender received:{ 'ack': 1, 'checksum': 57}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 49}
Sender received:{ 'ack': 0, 'checksum': 49}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 2, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 52}
Sender received:{ 'ack': 1, 'checksum': 52}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 7, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 52}
Sender received:{ 'ack': 1, 'checksum': 52}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': r, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 49}
Sender received:{ 'ack': ♣, 'checksum': 49}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': T, 'checksum': 99}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 57}
Sender received:{ 'ack': 1, 'checksum': 57}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': T, 'checksum': 50}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
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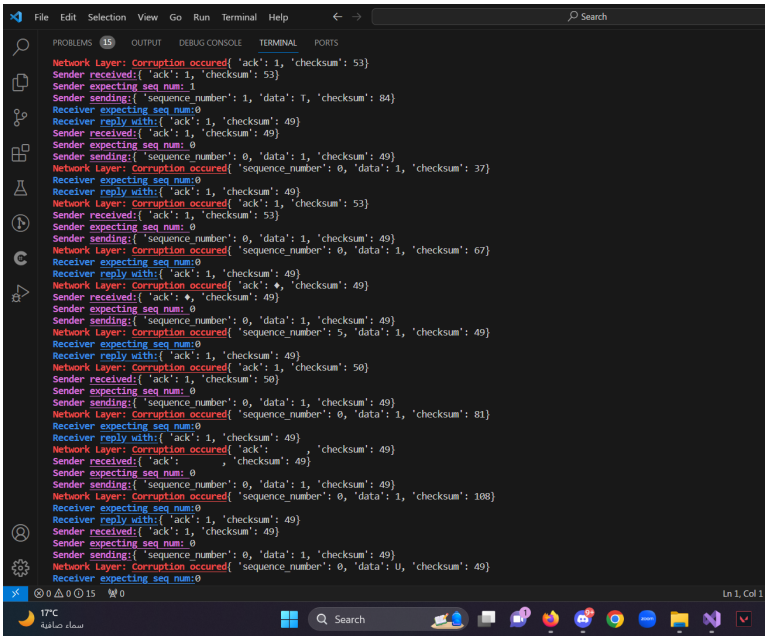
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 53}
Sender received:{ 'ack': 1, 'checksum': 53}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': T, 'checksum': 84}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Sender received:{ 'ack': 1, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 37}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 53}
Sender received:{ 'ack': 1, 'checksum': 53}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 67}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♦, 'checksum': 49}
Sender received:{ 'ack': ♦, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 5, 'data': 1, 'checksum': 49}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 50}
Sender received:{ 'ack': 1, 'checksum': 50}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 81}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 108}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Sender received:{ 'ack': 1, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': U, 'checksum': 49}
Receiver expecting seq num:0
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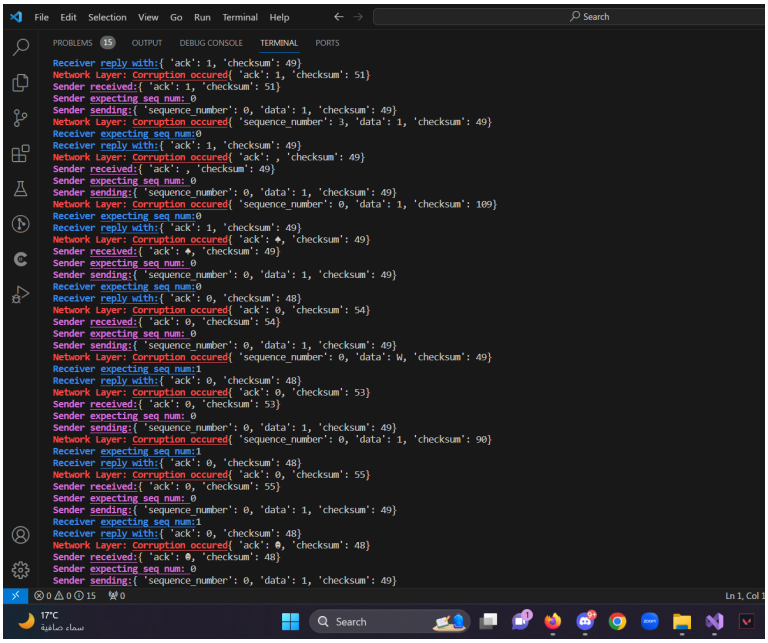
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 51}
Sender received:{ 'ack': 1, 'checksum': 51}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': 1, 'checksum': 49}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 109}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♠, 'checksum': 49}
Sender received:{ 'ack': ♦, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 54}
Sender received:{ 'ack': 0, 'checksum': 54}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': W, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 53}
Sender received:{ 'ack': 0, 'checksum': 53}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 90}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 55}
Sender received:{ 'ack': 0, 'checksum': 55}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
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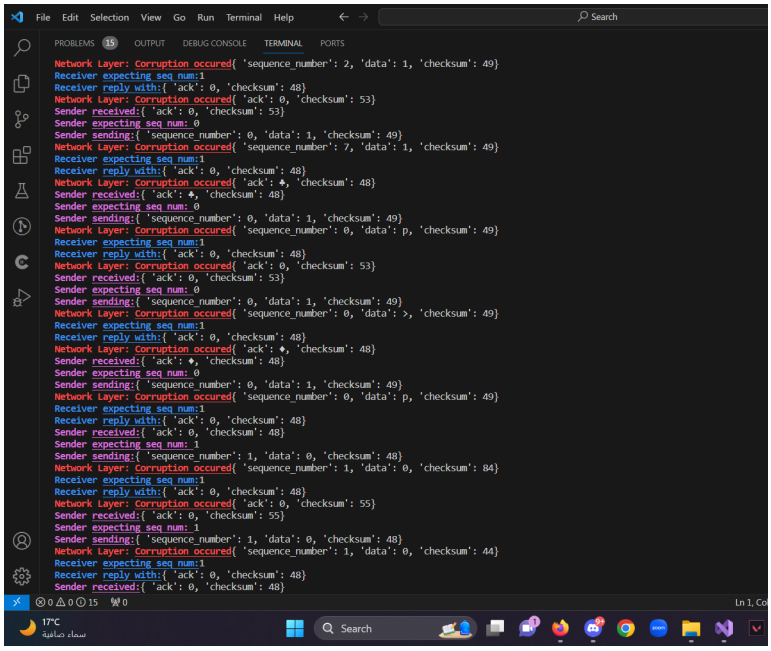
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Network Layer: Corruption occured{ 'sequence_number': 2, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 53}
Sender received:{ 'ack': 0, 'checksum': 53}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 7, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': p, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 53}
Sender received:{ 'ack': 0, 'checksum': 53}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': >, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♦, 'checksum': 48}
Sender received:{ 'ack': ♦, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': p, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 0, 'checksum': 84}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 55}
Sender received:{ 'ack': 0, 'checksum': 55}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 0, 'checksum': 44}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
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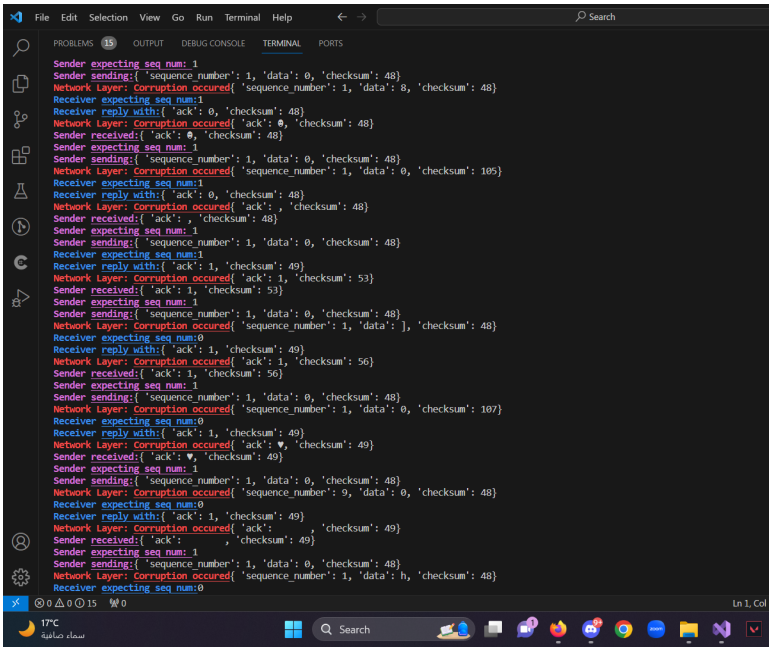
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 8, 'checksum': 48}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 0, 'checksum': 105}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 53}
Sender received:{ 'ack': 1, 'checksum': 53}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data':], 'checksum': 48}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 56}
Sender received:{ 'ack': 1, 'checksum': 56}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 0, 'checksum': 107}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': ♥, 'checksum': 49}
Sender received:{ 'ack': ♥, 'checksum': 49}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 9, 'data': 0, 'checksum': 48}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': , 'checksum': 49}
Sender received:{ 'ack': , 'checksum': 49}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': h, 'checksum': 48}
Receiver expecting seq num:0
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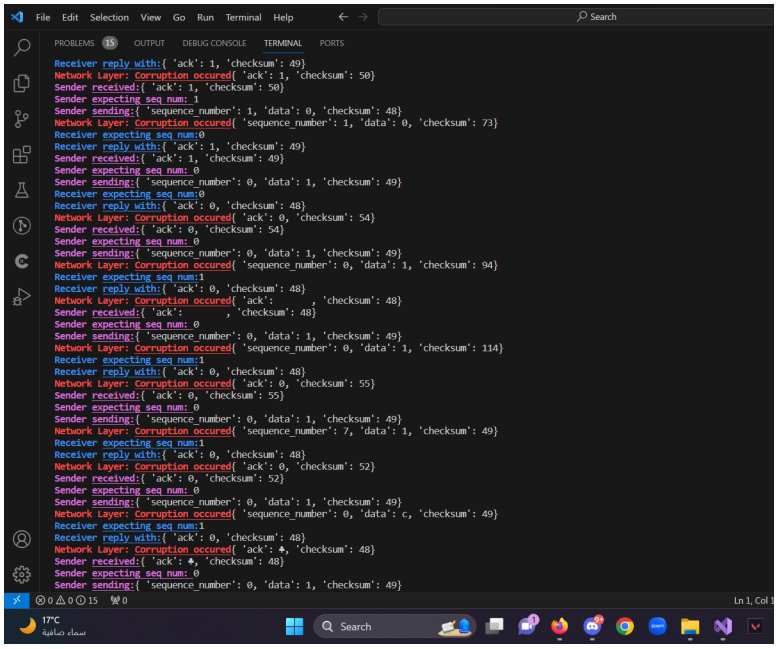
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'ack': 1, 'checksum': 50}
Sender received:{ 'ack': 1, 'checksum': 50}
Sender expecting seq num: 1
Sender sending:{ 'sequence_number': 1, 'data': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'sequence_number': 1, 'data': 0, 'checksum': 73}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 1, 'checksum': 49}
Sender received:{ 'ack': 1, 'checksum': 49}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Receiver expecting seq num:0
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 54}
Sender received:{ 'ack': 0, 'checksum': 54}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 94}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': , 'checksum': 48}
Sender received:{ 'ack': , 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 114}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 55}
Sender received:{ 'ack': 0, 'checksum': 55}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 7, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 52}
Sender received:{ 'ack': 0, 'checksum': 52}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': c, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
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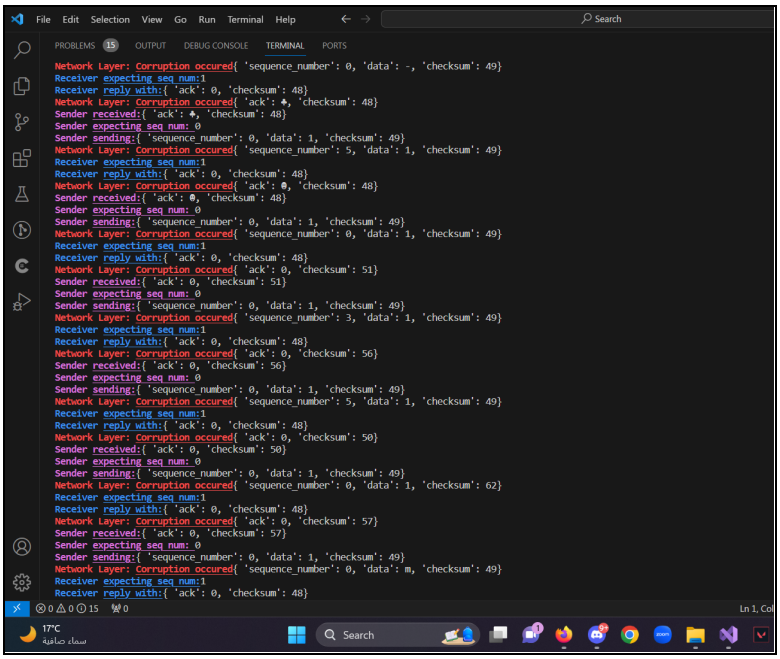
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': -, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 5, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 51}
Sender received:{ 'ack': 0, 'checksum': 51}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 56}
Sender received:{ 'ack': 0, 'checksum': 56}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 5, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 50}
Sender received:{ 'ack': 0, 'checksum': 50}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 62}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 57}
Sender received:{ 'ack': 0, 'checksum': 57}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': m, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
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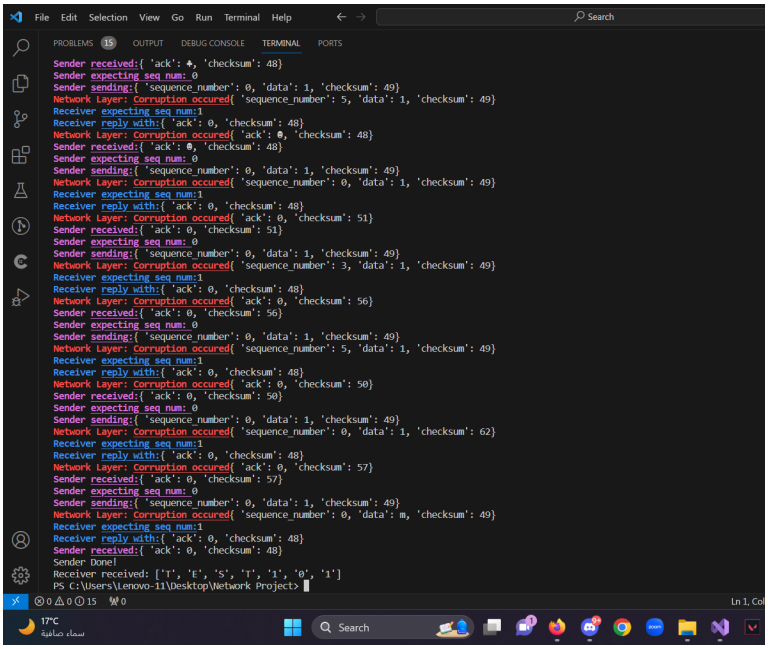
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PROBLEMS 15 OUTPUT DEBUG CONSOLE TERMINAL PORTS
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 5, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': ♣, 'checksum': 48}
Sender received:{ 'ack': ♣, 'checksum': 48}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 51}
Sender received:{ 'ack': 0, 'checksum': 51}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 3, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 56}
Sender received:{ 'ack': 0, 'checksum': 56}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 5, 'data': 1, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 50}
Sender received:{ 'ack': 0, 'checksum': 50}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': 1, 'checksum': 62}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Network Layer: Corruption occured{ 'ack': 0, 'checksum': 57}
Sender received:{ 'ack': 0, 'checksum': 57}
Sender expecting seq num: 0
Sender sending:{ 'sequence_number': 0, 'data': 1, 'checksum': 49}
Network Layer: Corruption occured{ 'sequence_number': 0, 'data': m, 'checksum': 49}
Receiver expecting seq num:1
Receiver reply with:{ 'ack': 0, 'checksum': 48}
Sender received:{ 'ack': 0, 'checksum': 48}
Sender Done!
Receiver received: ['T', 'E', 'S', 'T', '1', '0', '1']
PS C:\Users\Lenovo-11\Desktop\Network Project>
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yay!!!