Project Report

CSE351, Course Name

Name: Mostafa Lotfy Mostafa ID: 18P6000

Implementation of reliable transfer protocols

Date: 28 / 1 / 2022

Alternating bit protocol

Function	Description
calculate_checksum	This function calculate the checksum of a given message by adding the asci code of the characters, the ack number and seq number of packet and returns it
make_packet	this function takes a sequence number, message and checksum and converts it to a packet then returns it
is_acknoweldged	this function takes a packet and a state number it compares the ack number of the packet to the state number it returns false if they are not equal otherwise returns true
is_notCorrupted	this function takes a packet it recalculates the checksum of the given packet it compare the checksum of the packet with the recalculated checksum if they are equal it returns true otherwise returns false
print	this function takes a string and the size of the string then prints it
A_output	This function receives a message from layer5 It drops the message if there is a message already

	being transmitted otherwise it makes a packet of the message and sends it to layer3 to be sent to B
A_input	This function receives ack packets from “B” via layer3 if the packet is not corrupted and the acknum is correct it will change the seqnum of the sender otherwise it will do nothing
A_timerinterrupt	This function will be called when a timeout happen it will retransmit the current package then restart the timer
A_init	This function will initialise all the variable in the “sender” needed by “A”
B_input	This function receives packets from layer3 if the received packet is not corrupted and if it has the right sequence number it will send acknowledgement to “A” and send the message to layer5 otherwise it will send negative acknowledgment to the “A”
B_init	This function will initialise all the variable in the “receiver” needed by “B”

Output 1

```
mostafa@mostafa:~/college/semster7/Networks/Reliable-Transport-Protocols$ ./abp.out
-----  Stop and Wait Network Simulator Version 1.1 --------

Enter the number of messages to simulate: 10
Enter  packet loss probability [enter 0.0 for no loss]:0
Enter packet corruption probability [0.0 for no corruption]:0
Enter average time between messages from sender's layer5 [ > 0.0]:5
Enter TRACE:0
[A] send[aaaaaaaaaaaaaaaaaaa] (seq = 0)
[B] receieve [aaaaaaaaaaaaaaaaaaa]
[B] send Ack 0
[A] drop [bbbbbbbbbbbbbbbbbbb]
[A] ack 0
[A] send[ccccccccccccccccccc] (seq = 1)
[A] drop [ddddddddddddddddddd]
[B] receieve [ccccccccccccccccccc]
[B] send Ack 1
[A] drop [eeeeeeeeeeeeeeeeeee]
[A] drop [fffffffffffffffffff]
[A] ack 1
[A] send[ggggggggggggggggggg] (seq = 0)
[A] drop [hhhhhhhhhhhhhhhhhhh]
[B] receieve [ggggggggggggggggggg]
[B] send Ack 0
[A] ack 0
[A] send[iiiiiiiiiiiiiiiiiii] (seq = 1)
[A] drop [jjjjjjjjjjjjjjjjjjj]
 Simulator terminated at time 58.583252
 after sending 10 msgs from layer5
```

Output 2

```
[B] receive [jjjjjjjjjjjjjjjjjjj]
[B] send Ack 1
[A] ack 1
[A] send[lllllllllllllllllll] (seq = 0)
[B] receive [lllllllllllllllllll]
[B] send Ack 0
[A] ack 0
[A] send[mmmmmmmmmmmmmmmmmmm] (seq = 1)
[B] receive [mmmmmmmmmmmmmmmmmmm]
[B] send Ack 1
[A] drop [nnnnnnnnnnnnnnnnnnn]
[A] ack 1
[A] send[ooooooooooooooooooo] (seq = 0)
[B] receive [ooooooooooooooooooo]
[B] send Ack 0
[A] drop [pppppppppppppppppppp]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[A] drop [qqqqqqqqqqqqqqqqqqqq]
[A] drop [rrrrrrrrrrrrrrrrrrr]
[A] drop [sssssssssssssssssss]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[A] drop [ttttttttttttttttttt]
[A] drop [uuuuuuuuuuuuuuuuuuu]
[A] drop [vvvvvvvvvvvvvvvvvvv]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[B] received duplicate [ooooooooooooooooooo]
[B] send Ack 0
[A] drop [wwwwwwwwwwwwwwwwwww]
[A] drop [xxxxxxxxxxxxxxxxxxx]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[B] corrupt message
[B] send nack 0
[A] drop [yyyyyyyyyyyyyyyyyyy]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[A] drop [zzzzzzzzzzzzzzzzzzz]
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[A] drop [aaaaaaaaaaaaaaaaaaa]
```

```
[A] timer_interrupt
[A] resend [ooooooooooooooooooo] (seq = 0)
[A] drop [aaaaaaaaaaaaaaaaaaaa]
[A] drop [bbbbbbbbbbbbbbbbbbbb]
[B] corrupt message
[B] send nack 0
[A] ack 0
[A] send[ccccccccccccccccccc] (seq = 1)
[B] receive [ccccccccccccccccccc]
[B] send Ack 1
[A] drop [ddddddddddddddddddddd]
[A] ack 1
[A] send[eeeeeeeeeeeeeeeeeeee] (seq = 0)
[A] drop [fffffffffffffffffff]
[A] timer_interrupt
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 0)
[A] drop [gggggggggggggggggggg]
[A] drop [hhhhhhhhhhhhhhhhhhh]
[B] receive [eeeeeeeeeeeeeeeeeee]
[B] send Ack 0
[A] ack 0
[A] send[iiiiiiiiiiiiiiiiiii] (seq = 1)
[B] receive [iiiiiiiiiiiiiiiiiii]
[B] send Ack 1
[A] ack 1
[A] send[jjjjjjjjjjjjjjjjjjj] (seq = 0)
[A] drop [kkkkkkkkkkkkkkkkkk]
[B] receive [jjjjjjjjjjjjjjjjjjj]
[B] send Ack 0
[A] ack 0
[A] send[lllllllllllllllllll] (seq = 1)
[B] receive [lllllllllllllllllll]
[B] send Ack 1
[A] drop [mmmmmmmmmmmmmmmmmm]
[A] drop [nnnnnnnnnnnnnnnnnnn]
[A] drop [ooooooooooooooooooo]
[A] drop [pppppppppppppppppppp]
[A] timer_interrupt
[A] resend [lllllllllllllllllll] (seq = 1)
[A] drop [qqqqqqqqqqqqqqqqqqqq]
[A] drop [rrrrrrrrrrrrrrrrrrr]
[A] timer_interrupt
[A] resend [lllllllllllllllllll] (seq = 1)
```

```
[A] drop [rrrrrrrrrrrrrrrrrrrr]
[A] timer_interrupt
[A] resend [lllllllllllllllllll] (seq = 1)
[B] received duplicate [lllllllllllllllllll]
[B] send Ack 1
[A] ack 1
[A] send[ssssssssssssssssssss] (seq = 0)
[B] receive [ssssssssssssssssssss]
[B] send Ack 0
[A] ack 0
[A] send[ttttttttttttttttttt] (seq = 1)
[B] receive [ttttttttttttttttttt]
[B] send Ack 1
[A] drop [uuuuuuuuuuuuuuuuuuu]
[A] drop [vvvvvvvvvvvvvvvvvvv]
[A] timer_interrupt
[A] resend [ttttttttttttttttttt] (seq = 1)
[A] drop [wwwwwwwwwwwwwwwwwwww]
[A] timer_interrupt
[A] resend [ttttttttttttttttttt] (seq = 1)
[A] drop [xxxxxxxxxxxxxxxxxxxx]
 Simulator terminated at time 504.264252
 after sending 50 msgs from layer5
```

Output3

```
-----  Stop and Wait Network Simulator Version 1.1 --------

Enter the number of messages to simulate: 10
Enter  packet loss probability [enter 0.0 for no loss]:0
Enter packet corruption probability [0.0 for no corruption]:0.3
Enter average time between messages from sender's layer5 [ > 0.0]:10
Enter TRACE:0
[A] send[aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[B] corrupt message
[B] send nack 1
[A] nack 1
[A] drop [bbbbbbbbbbbbbbbbbbbb]
[A] drop [ccccccccccccccccccccc]
[A] timer_interrupt
[A] resend [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[A] drop [ddddddddddddddddddddd]
[A] drop [eeeeeeeeeeeeeeeeeeee]
[B] receive [aaaaaaaaaaaaaaaaaaaa]
[B] send Ack 0
[A] drop [fffffffffffffffffff]
[A] ack 0
[A] send[gggggggggggggggggggg] (seq = 1)
[B] receive [gggggggggggggggggggg]
[B] send Ack 1
[A] ack 1
[A] send[hhhhhhhhhhhhhhhhhhhh] (seq = 0)
[B] receive [hhhhhhhhhhhhhhhhhhhh]
[B] send Ack 0
[A] ack 0
[A] send[iiiiiiiiiiiiiiiiiii] (seq = 1)
[B] corrupt message
[B] send nack 0
[A] nack 0
[A] drop [jjjjjjjjjjjjjjjjjjj]
 Simulator terminated at time 97.512535
 after sending 10 msgs from layer5
```

Go back N

Function	Description
calculate_checksum	This function calculate the checksum of a given message by adding the asci code of the characters, the ack number and seq number of packet and returns it
make_packet	this function takes a sequence number, message and checksum and converts it to a packet then returns it
is_acknoweldged	this function takes a packet and a state number it compares the ack number of the packet to the state number it returns false if they are not equal otherwise returns true
is_notCorrupted	this function takes a packet it recalculates the checksum of the given packet it compare the checksum of the packet with the recalculated checksum if they are equal it returns true otherwise returns false
print	this function takes a string and the size of the string then prints it
A_output	This function receives a message from layer5 If the window is not full it will send the message to “B” otherwise it will store the message into a buffer to be sent later
A_input	This function receives ack packets from “B” via layer3 if the packet is not corrupted then it will increment the base of the window
A_timerinterrupt	This function will be called when a timeout happen it will retransmit packets to “B” starting from the base of the window and ending at last packet sent by “A”
A_init	This function will initialise all the variable in the “sender” needed by “A”
B_input	This function receives packets from layer3 if the received packet is not corrupted and if it has the right sequence number it will send an acknowledgement to “A” and send the message to

	layer5
B_init	This function will initialise all the variable in the “receiver” needed by “B”

Output 1

```
mostafa@mostafa:/mnt/windows/college/semster7/Networks/Reliable-Transport-Protocols$ ./gbn.out
-----  Stop and Wait Network Simulator Version 1.1 --------

Enter the number of messages to simulate: 10
Enter  packet loss probability [enter 0.0 for no loss]:0
Enter packet corruption probability [0.0 for no corruption]:0
Enter average time between messages from sender's layer5 [ > 0.0]:5
Enter TRACE:0
[A] send [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[B] receive [aaaaaaaaaaaaaaaaaaaa]
[B] send Ack 0
[A] send [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[B] receive [bbbbbbbbbbbbbbbbbbbb]
[B] send Ack 1
[A] ack 0
[A] ack 1
[A] send [cccccccccccccccccccc] (seq = 2)
[A] send [dddddddddddddddddddd] (seq = 3)
[B] receive [cccccccccccccccccccc]
[B] send Ack 2
[A] send [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[B] receive [dddddddddddddddddddd]
[B] send Ack 3
[A] ack 2
[B] receive [eeeeeeeeeeeeeeeeeeee]
[B] send Ack 4
[A] ack 3
[A] send [ffffffffffffffffffff] (seq = 5)
[A] timer_interrupt resend from packet 4
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [ffffffffffffffffffff] (seq = 5)
[B] receive [ffffffffffffffffffff]
[B] send Ack 5
[A] ack 4
[A] ack 5
[A] send [gggggggggggggggggggg] (seq = 6)
[A] send [hhhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] send [iiiiiiiiiiiiiiiiiiii] (seq = 8)
[B] receive [gggggggggggggggggggg]
[B] send Ack 6
[A] send [jjjjjjjjjjjjjjjjjjjj] (seq = 9)
 Simulator terminated at time 67.104355
 after sending 10 msgs from layer5
mostafa@mostafa:/mnt/windows/college/semster7/Networks/Reliable-Transport-Protocols$ =
```

Output 2

```
mostafa@mostafa:/mnt/windows/college/semster7/Networks/Reliable-Transport-Protocols$ ./gbn.out
-----  Stop and Wait Network Simulator Version 1.1 --------

Enter the number of messages to simulate: 50
Enter  packet loss probability [enter 0.0 for no loss]:0.3
Enter packet corruption probability [0.0 for no corruption]:0
Enter average time between messages from sender's layer5 [ > 0.0]:10
Enter TRACE:0
[A] send [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[B] receive [aaaaaaaaaaaaaaaaaaaa]
[B] send Ack 0
[A] ack 0
[A] send [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] send [cccccccccccccccccccc] (seq = 2)
[A] send [dddddddddddddddddddd] (seq = 3)
[A] send [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] timer_interrupt resend from packet 1
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [cccccccccccccccccccc] (seq = 2)
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] send [ffffffffffffffffffff] (seq = 5)
[A] timer_interrupt resend from packet 1
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [cccccccccccccccccccc] (seq = 2)
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [ffffffffffffffffffff] (seq = 5)
[B] receive [bbbbbbbbbbbbbbbbbbbb]
[B] send Ack 1
[A] send [gggggggggggggggggggg] (seq = 6)
[B] receive [cccccccccccccccccccc]
[B] send Ack 2
[B] receive [dddddddddddddddddddd]
[B] send Ack 3
[B] receive [eeeeeeeeeeeeeeeeeeee]
[B] send Ack 4
[A] ack 2
[B] receive [ffffffffffffffffffff]
[B] send Ack 5
[A] send [hhhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] timer_interrupt resend from packet 3
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [ffffffffffffffffffff] (seq = 5)
[A] resend [gggggggggggggggggggg] (seq = 6)
[A] resend [hhhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] send [iiiiiiiiiiiiiiiiiiii] (seq = 8)
[A] ack 5
```

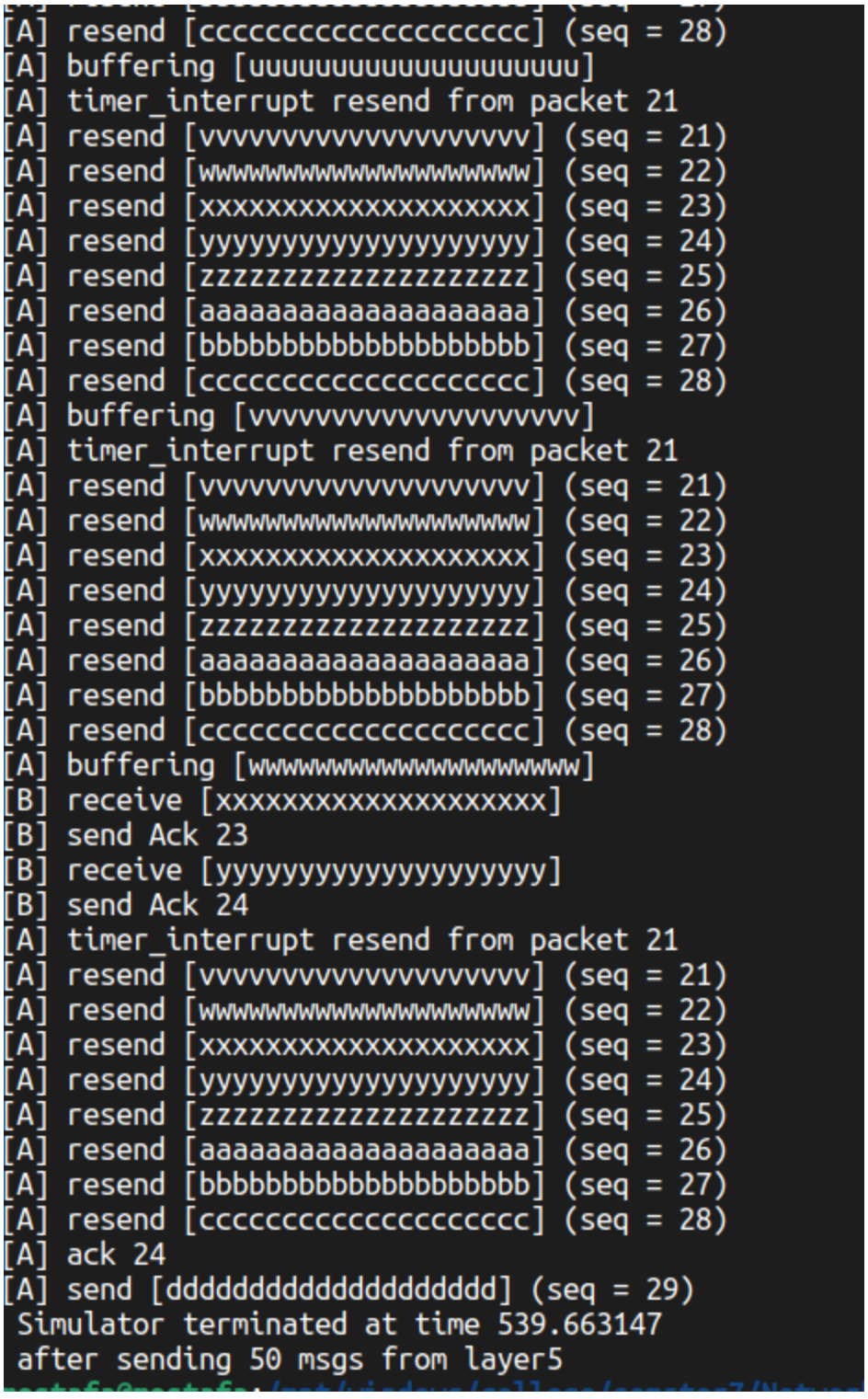
```
[A] send [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] ack 5
[A] send [jjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] send [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] send [lllllllllllllllllll] (seq = 11)
[A] timer_interrupt resend from packet 6
[A] resend [gggggggggggggggggggg] (seq = 6)
[A] resend [hhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] resend [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] resend [jjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] resend [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] resend [lllllllllllllllllll] (seq = 11)
[A] send [mmmmmmmmmmmmmmmmmmmm] (seq = 12)
[B] receive [gggggggggggggggggggg]
[B] send Ack 6
[A] ack 6
[A] send [nnnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] timer_interrupt resend from packet 7
[A] resend [hhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] resend [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] resend [jjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] resend [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnnn] (seq = 13)
[B] receive [hhhhhhhhhhhhhhhhhhh]
[B] send Ack 7
[A] send [oooooooooooooooooooo] (seq = 14)
[A] timer_interrupt resend from packet 7
[A] resend [hhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] resend [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] resend [jjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] resend [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] resend [oooooooooooooooooooo] (seq = 14)
[A] buffering [pppppppppppppppppppp]
[A] buffering [qqqqqqqqqqqqqqqqqqqq]
[A] buffering [rrrrrrrrrrrrrrrrrrrr]
[A] timer_interrupt resend from packet 7
[A] resend [hhhhhhhhhhhhhhhhhhh] (seq = 7)
[A] resend [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] resend [jjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] resend [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] resend [oooooooooooooooooooo] (seq = 14)
[A] buffering [ssssssssssssssssssss]
```

```
[A] resend [oooooooooooooooooo] (seq = 14)
[A] buffering [ssssssssssssssssssss]
[B] receive [iiiiiiiiiiiiiiiiiii]
[B] send Ack 8
[A] ack 8
[A] send [pppppppppppppppppppp] (seq = 15)
[A] timer_interrupt resend from packet 9
[A] resend [jjjjjjjjjjjjjjjjjjjj] (seq = 9)
[A] resend [kkkkkkkkkkkkkkkkkkk] (seq = 10)
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] resend [ooooooooooooooooooo] (seq = 14)
[A] resend [pppppppppppppppppppp] (seq = 15)
[B] receive [jjjjjjjjjjjjjjjjjjjj]
[B] send Ack 9
[A] ack 9
[A] send [qqqqqqqqqqqqqqqqqqqq] (seq = 16)
[B] receive [kkkkkkkkkkkkkkkkkkk]
[B] send Ack 10
[A] ack 10
[A] send [rrrrrrrrrrrrrrrrrrr] (seq = 17)
[A] timer_interrupt resend from packet 11
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] resend [ooooooooooooooooooo] (seq = 14)
[A] resend [pppppppppppppppppppp] (seq = 15)
[A] resend [qqqqqqqqqqqqqqqqqqqq] (seq = 16)
[A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
[A] send [ssssssssssssssssssss] (seq = 18)
[A] buffering [xxxxxxxxxxxxxxxxxxx]
[A] buffering [yyyyyyyyyyyyyyyyyyy]
[A] timer_interrupt resend from packet 11
[A] resend [lllllllllllllllllll] (seq = 11)
[A] resend [mmmmmmmmmmmmmmmmmm] (seq = 12)
[A] resend [nnnnnnnnnnnnnnnnnnn] (seq = 13)
[A] resend [ooooooooooooooooooo] (seq = 14)
[A] resend [pppppppppppppppppppp] (seq = 15)
[A] resend [qqqqqqqqqqqqqqqqqqqq] (seq = 16)
[A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
[A] resend [ssssssssssssssssssss] (seq = 18)
[B] receive [lllllllllllllllllll]
[B] send Ack 11
[B] receive [mmmmmmmmmmmmmmmmmm]
[B] send Ack 12
[B] receive [nnnnnnnnnnnnnnnnnnn]
[B] send Ack 13
[A] buffering [zzzzzzzzzzzzzzzzzzz]
[A] ack 12
```

```
B] send Ack 13
A] buffering [zzzzzzzzzzzzzzzzzzz]
A] ack 12
A] send [ttttttttttttttttttt] (seq = 19)
A] ack 13
A] timer_interrupt resend from packet 14
A] resend [ooooooooooooooooooo] (seq = 14)
A] resend [ppppppppppppppppppp] (seq = 15)
A] resend [qqqqqqqqqqqqqqqqqqq] (seq = 16)
A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
A] resend [sssssssssssssssssss] (seq = 18)
A] resend [ttttttttttttttttttt] (seq = 19)
A] send [uuuuuuuuuuuuuuuuuuu] (seq = 20)
A] timer_interrupt resend from packet 14
A] resend [ooooooooooooooooooo] (seq = 14)
A] resend [ppppppppppppppppppp] (seq = 15)
A] resend [qqqqqqqqqqqqqqqqqqq] (seq = 16)
A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
A] resend [sssssssssssssssssss] (seq = 18)
A] resend [ttttttttttttttttttt] (seq = 19)
A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
A] send [vvvvvvvvvvvvvvvvvvv] (seq = 21)
B] receive [ooooooooooooooooooo]
B] send Ack 14
B] receive [ppppppppppppppppppp]
B] send Ack 15
A] buffering [ddddddddddddddddddd]
A] ack 14
A] ack 15
A] timer_interrupt resend from packet 16
A] resend [qqqqqqqqqqqqqqqqqqq] (seq = 16)
A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
A] resend [sssssssssssssssssss] (seq = 18)
A] resend [ttttttttttttttttttt] (seq = 19)
A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
A] send [wwwwwwwwwwwwwwwwwww] (seq = 22)
A] send [xxxxxxxxxxxxxxxxxxx] (seq = 23)
A] timer_interrupt resend from packet 16
A] resend [qqqqqqqqqqqqqqqqqqq] (seq = 16)
A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
A] resend [sssssssssssssssssss] (seq = 18)
A] resend [ttttttttttttttttttt] (seq = 19)
A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
A] buffering [ggggggggggggggggggg]
A] buffering [hhhhhhhhhhhhhhhhhhh]
A] timer_interrupt resend from packet 16
A] resend [qqqqqqqqqqqqqqqqqqq] (seq = 16)
```

```
[A] buffering [ggggggggggggggggggg]
[A] buffering [hhhhhhhhhhhhhhhhhhh]
[A] timer_interrupt resend from packet 16
[A] resend [qqqqqqqqqqqqqqqqqqqq] (seq = 16)
[A] resend [rrrrrrrrrrrrrrrrrrr] (seq = 17)
[A] resend [ssssssssssssssssssss] (seq = 18)
[A] resend [ttttttttttttttttttt] (seq = 19)
[A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[B] receive [qqqqqqqqqqqqqqqqqqqq]
[B] send Ack 16
[A] buffering [iiiiiiiiiiiiiiiiiii]
[B] receive [rrrrrrrrrrrrrrrrrrr]
[B] send Ack 17
[B] receive [ssssssssssssssssssss]
[B] send Ack 18
[A] ack 17
[B] receive [ttttttttttttttttttt]
[B] send Ack 19
[A] timer_interrupt resend from packet 18
[A] resend [ssssssssssssssssssss] (seq = 18)
[A] resend [ttttttttttttttttttt] (seq = 19)
[A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[B] receive [uuuuuuuuuuuuuuuuuuu]
[B] send Ack 20
[A] ack 18
[A] send [yyyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] ack 19
[A] timer_interrupt resend from packet 20
[A] resend [uuuuuuuuuuuuuuuuuuu] (seq = 20)
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] ack 20
[A] send [zzzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] send [aaaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] send [bbbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] send [ccccccccccccccccccc] (seq = 28)
[A] buffering [ooooooooooooooooooo]
[A] timer_interrupt resend from packet 21
```

```
[A] send [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] send [ccccccccccccccccccc] (seq = 28)
[A] buffering [ooooooooooooooooooo]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [pppppppppppppppppppp]
[A] buffering [qqqqqqqqqqqqqqqqqqqq]
[B] receive [vvvvvvvvvvvvvvvvvvv]
[B] send Ack 21
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[B] receive [wwwwwwwwwwwwwwwwwww]
[B] send Ack 22
[A] buffering [rrrrrrrrrrrrrrrrrrr]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [ssssssssssssssssssss]
[A] buffering [ttttttttttttttttttt]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [uuuuuuuuuuuuuuuuuuu]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
```


[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [uuuuuuuuuuuuuuuuuuu]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [vvvvvvvvvvvvvvvvvvv]
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] buffering [wwwwwwwwwwwwwwwwwww]
[B] receive [xxxxxxxxxxxxxxxxxxx]
[B] send Ack 23
[B] receive [yyyyyyyyyyyyyyyyyyy]
[B] send Ack 24
[A] timer_interrupt resend from packet 21
[A] resend [vvvvvvvvvvvvvvvvvvv] (seq = 21)
[A] resend [wwwwwwwwwwwwwwwwwww] (seq = 22)
[A] resend [xxxxxxxxxxxxxxxxxxx] (seq = 23)
[A] resend [yyyyyyyyyyyyyyyyyyy] (seq = 24)
[A] resend [zzzzzzzzzzzzzzzzzzz] (seq = 25)
[A] resend [aaaaaaaaaaaaaaaaaaa] (seq = 26)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 27)
[A] resend [ccccccccccccccccccc] (seq = 28)
[A] ack 24
[A] send [ddddddddddddddddddd] (seq = 29)
Simulator terminated at time 539.663147
after sending 50 msgs from layer5

Output3

```
mostafa@mostafa:/mnt/windows/college/semster7/Networks/Reliable-Transport-Protocols$ ./gbn.out
-----  Stop and Wait Network Simulator Version 1.1 --------

Enter the number of messages to simulate: 10
Enter  packet loss probability [enter 0.0 for no loss]:0
Enter packet corruption probability [0.0 for no corruption]:0.3
Enter average time between messages from sender's layer5 [ > 0.0]:10
Enter TRACE:0
[A] send [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[A] send [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] timer_interrupt resend from packet 0
[A] resend [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] send [cccccccccccccccccccc] (seq = 2)
[B] receive [aaaaaaaaaaaaaaaaaaaa]
[B] send Ack 0
[A] timer_interrupt resend from packet 0
[A] resend [aaaaaaaaaaaaaaaaaaaa] (seq = 0)
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [cccccccccccccccccccc] (seq = 2)
[A] ack 0
[A] send [dddddddddddddddddddd] (seq = 3)
[A] send [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[B] receive [bbbbbbbbbbbbbbbbbbbb]
[B] send Ack 1
[B] receive [cccccccccccccccccccc]
[B] send Ack 2
[A] timer_interrupt resend from packet 1
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [cccccccccccccccccccc] (seq = 2)
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [bbbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [cccccccccccccccccccc] (seq = 2)
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] send [ffffffffffffffffffff] (seq = 5)
[A] ack 2
[A] send [gggggggggggggggggggg] (seq = 6)
[B] receive [dddddddddddddddddddd]
[B] send Ack 3
[A] timer_interrupt resend from packet 3
[A] resend [dddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [ffffffffffffffffffff] (seq = 5)
[A] resend [gggggggggggggggggggg] (seq = 6)
[A] send [hhhhhhhhhhhhhhhhhhhh] (seq = 7)
```

```
[B] receive [ccccccccccccccccccc]
[B] send Ack 2
[A] timer_interrupt resend from packet 1
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [ccccccccccccccccccc] (seq = 2)
[A] resend [ddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [bbbbbbbbbbbbbbbbbbb] (seq = 1)
[A] resend [ccccccccccccccccccc] (seq = 2)
[A] resend [ddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeee] (seq = 4)
[A] send [fffffffffffffffffff] (seq = 5)
[A] ack 2
[A] send [ggggggggggggggggggg] (seq = 6)
[B] receive [ddddddddddddddddddd]
[B] send Ack 3
[A] timer_interrupt resend from packet 3
[A] resend [ddddddddddddddddddd] (seq = 3)
[A] resend [eeeeeeeeeeeeeeeeeee] (seq = 4)
[A] resend [fffffffffffffffffff] (seq = 5)
[A] resend [ggggggggggggggggggg] (seq = 6)
[A] send [hhhhhhhhhhhhhhhhhhh] (seq = 7)
[B] receive [eeeeeeeeeeeeeeeeeee]
[B] send Ack 4
[A] ack 3
[A] ack 4
[A] send [iiiiiiiiiiiiiiiiiii] (seq = 8)
[A] send [jjjjjjjjjjjjjjjjjjj] (seq = 9)
 Simulator terminated at time 116.781715
 after sending 10 msgs from layer5
mostafa@mostafa:/mnt/windows/college/semster7/Networks/Reliable-Transport-Protocols$
```