



Project Report

CSE351, Computer Networks

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Implementation of Go-Back-N and Alternating-Bit Protocols

Date: **24 / 01 / 2022**

Alternating-Bit Protocol

Functions' Description

Function Name	Used By	Description
calculate_checksum	A & B	This function takes a packet as input and calculates the checksum of that packet. It does so by adding all the values in the packet and then inverting the result.
set_packet_checksum	A & B	This function takes a packet pointer as input and calls calculate_checksum. The result from calculate_checksum is put in the given packet's "checksum" field.
check_packet_checksum	A & B	This function takes a packet as input and returns true if the packet's checksum is valid. It returns false otherwise.
A_init	A only	This function sets "A_next_seq" to zero and prints a newline.
A_output	A only	This function takes a message as input. The function does the following: <ol style="list-style-type: none">1. Encapsulates the given message in a packet2. Appends the packet to the linked list3. If the packet can be sent (i.e. no packet is awaiting an acknowledgement), it sends the packet to layer 3
A_input	A only	This function takes a packet as input. If the packet is invalid it is dropped and the function exits. Otherwise, it continues. If the packet's acknowledgement number is the same sequence number as the first packet in the linked list, the packet is removed from the linked list and the next packet in the list is sent and the

		timer is restarted (if the packet exists). If the linked list is empty, the timer is stopped.
A_timerinterrupt	A only	This function starts the timer again and resends the first packet in the linked list.
B_init	B only	This function sets B_next_seq to 0.
B_output	B only	This function prints an error message and exits the program.
B_input	B only	This function takes the packet as input. If the packet is invalid, it is ignored and the function returns. If the packet's sequence number is the same as the expected sequence number, it is sent to layer 5 and the expected sequence number is updated. In all cases, an acknowledgement is sent to the other side.
B_timerinterrupt	B only	This function prints an error message and exits the program.

Output

Output 1

```
$ ./alternating_bit_protocol.sh
----- 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]:0.0
Enter packet corruption probability [0.0 for no corruption]:0.0
Enter average time between messages from sender's layer5 [ > 0.0]:5.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] STOR: Packet 1
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[A] STOR: Packet 0
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 1
[B] RECV: Packet 0 [ccccccccccccccccccccc]
[B] ASND: Packet 0
[A] STOR: Packet 0
```

```
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] STOR: Packet 1
[B] RECV: Packet 1 [dddddddddddddddddddd]
[B] ASND: Packet 1
[A] STOR: Packet 0
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[B] RECV: Packet 0 [eeeeeeeeeeeeeeeeeeee]
[B] ASND: Packet 0
[A] STOR: Packet 1
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [ffffffffffffffffffffff]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [gggggggggggggggggggg]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [hhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [iiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Stop
Simulator terminated at time 107.629364
after sending 10 msgs from layer5
```

Output 2

```
$ ./alternating_bit_protocol.sh
----- 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]:0.0
Enter average time between messages from sender's layer5 [ > 0.0]:10.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Stop
[A] SEND: Packet 1
[A] TIME: Start
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] STOR: Packet 0
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [cccccccccccccccccccccc]
[B] ASND: Packet 0
[A] STOR: Packet 0
```

[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 0
[A] STOR: Packet 1
[B] DUP: Packet 0
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [dddddddddddddddddd]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 0
[A] STOR: Packet 1
[B] RECV: Packet 0 [eeeeeeeeeeeeeeeeee]
[B] ASND: Packet 0
[A] STOR: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [ffffffffffffffffffff]
[B] ASND: Packet 1

[A] STOR: Packet 1
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 1
[A] STOR: Packet 1
[A] STOR: Packet 0
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] STOR: Packet 0
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 1
[B] RECV: Packet 0 [ggggggggggggggggggggggg]
[B] ASND: Packet 0
[A] STOR: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [hhhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 1
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[B] RECV: Packet 0 [iiiiiiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [jjjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 1
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 1
[A] STOR: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1

[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [kkkkkkkkkkkkkkkkkkkk]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [lllllllllllllllllllll]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [mmmmmmmmmmmmmmmmmmmm]
[B] ASND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] DUP: Packet 0
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [nnnnnnnnnnnnnnnnnnnnn]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [ooooooooooooooooooooo]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout

[A] RSND: Packet 1
[B] RECV: Packet 1 [pppppppppppppppppppppp]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [qqqqqqqqqqqqqqqqqqqqq]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [rrrrrrrrrrrrrrrrrrrrrr]
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [ssssssssssssssssssssss]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [tttttttttttttttttttttt]
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout


```
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [uuuuuuuuuuuuuuuuuuuuuu]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [vvvvvvvvvvvvvvvvvvvvvv]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [wwwwwwwwwwwwwwwwwwwwww]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [xxxxxxxxxxxxxxxxxxxxxxxxxx]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [yyyyyyyyyyyyyyyyyyyyyy]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [zzzzzzzzzzzzzzzzzzzzzz]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbb]
```

[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [cccccccccccccccccccc]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [dddddddddddddddddd]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [eeeeeeeeeeeeeeeeeeee]
[B] ASND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] DUP: Packet 0
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [fffffffffffffffffffff]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [ggggggggggggggggggggg]
[B] ASND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] DUP: Packet 0
[B] ASND: Packet 0
[A] ACK: Packet 0

```
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [hhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [iiiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [kkkkkkkkkkkkkkkkkkkk]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [llllllllllllllllllll]
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
```

```
[B] RECV: Packet 0 [mmmmmmmmmmmmmmmmmmmm]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [nnnnnnnnnnnnnnnnnnnn]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [oooooooooooooooooooo]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [pppppppppppppppppppp]
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [qqqqqqqqqqqqqqqqqqqq]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [rrrrrrrrrrrrrrrrrrrr]
[B] ASND: Packet 1
```

```

[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [ssssssssssssssssssssss]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [ttttttttttttttttttttt]
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [uuuuuuuuuuuuuuuuuuuuuu]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [vvvvvvvvvvvvvvvvvvvvvv]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [wwwwwwwwwwwwwwwwwwwwww]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [xxxxxxxxxxxxxxxxxxxxxx]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Stop
Simulator terminated at time 2215.469727
after sending 50 msgs from layer5

```

Output 3

```
$ ./alternating_bit_protocol.sh
----- 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]:0.0
Enter packet corruption probability [0.0 for no corruption]:0.3
Enter average time between messages from sender's layer5 [ > 0.0]:10.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] DROP: Packet Invalid
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] STOR: Packet 0
[B] DROP: Packet Invalid
[A] STOR: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] STOR: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[A] STOR: Packet 1
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] DROP: Packet Invalid
[A] STOR: Packet 0
[A] STOR: Packet 1
[A] STOR: Packet 0
[A] TIME: Timeout
[A] RSND: Packet 0
[B] RECV: Packet 0 [cccccccccccccccccccc]
[B] ASND: Packet 0
[A] STOR: Packet 1
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
```

[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] RECV: Packet 1 [dddddddddddddddddd]
[B] ASND: Packet 1
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [eeeeeeeeeeeeeeeeee]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [ffffffffffffffffffff]
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [gggggggggggggggggggg]
[B] ASND: Packet 0
[A] ACK: Packet 0

[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [hhhhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 1
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Restart
[A] SEND: Packet 0
[B] RECV: Packet 0 [iiiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 1
[B] RECV: Packet 1 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 1
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 1
[B] DUP: Packet 1
[B] ASND: Packet 1
[A] ACK: Packet 1
[A] TIME: Stop


```
Simulator terminated at time 671.898438  
after sending 10 msgs from layer5
```

Go-Back-N Protocol

Functions' Description

Function Name	Used By	Description
calculate_checksum	A & B	This function takes a packet as input and calculates the checksum of that packet. It does so by adding all the values in the packet and then inverting the result.
set_packet_checksum	A & B	This function takes a packet pointer as input and calls calculate_checksum. The result from calculate_checksum is put in the given packet's "checksum" field.
check_packet_checksum	A & B	This function takes a packet as input and returns true if the packet's checksum is valid. It returns false otherwise.
A_init	A only	This function sets "A_next_seq" to zero and prints a newline.
A_output	A only	<p>This function takes a message as input. The function does the following:</p> <ol style="list-style-type: none">1. Encapsulates the given message in a packet2. Appends the packet to the linked list3. If the packet can be sent (i.e. the window is not full), it sends the packet to layer 34. If the timer is not started (i.e. the window is empty), it is started
A_input	A only	<p>This function takes a packet as input. If the packet is invalid, it is dropped and the function exits. Otherwise, it continues.</p> <p>It deletes all the packets with an acknowledgement number less than or equal the acknowledgement number in the packet. Finally, for each deleted packet, another packet is sent to layer 3 (if it exists). If no packets can be sent, the timer is stopped. Otherwise, the timer is restarted.</p>
A_timerinterrupt	A only	This function starts the timer again and resends all the packets in the packet window.
B_init	B only	This function sets B_next_seq to 0.
B_output	B only	This function prints an error message and exits the program.
B_input	B only	<p>This function takes the packet as input. If the packet is invalid, it is dropped and the function exits. Otherwise, it continues.</p> <p>If the packet's sequence number is not the expected sequence number, the packet is dropped. Otherwise, the packet is sent to layer</p>

		5. An acknowledgement packet is sent to layer 3 if the sequence number in the received packet is less than or equal the expected sequence number. The expected sequence number is updated accordingly.
B_timerinterrupt	B only	This function prints an error message and exits the program.

Output

Output 1

```
$ ./go_back_n.sh
----- 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]:0.0
Enter packet corruption probability [0.0 for no corruption]:0.0
Enter average time between messages from sender's layer5 [ > 0.0]:5.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] SEND: Packet 1
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[A] ACK: Packet 0
[A] TIME: Restart
[A] ACK: Packet 1
[A] TIME: Stop
[A] SEND: Packet 2
[A] TIME: Start
[A] SEND: Packet 3
[B] RECV: Packet 2 [ccccccccccccccccccccc]
[B] ASND: Packet 2
[A] SEND: Packet 4
[B] RECV: Packet 3 [ddddddddddddddddddddd]
[B] ASND: Packet 3
[A] ACK: Packet 2
[A] TIME: Restart
[B] RECV: Packet 4 [eeeeeeeeeeeeeeeeeeeee]
[B] ASND: Packet 4
[A] ACK: Packet 3
[A] TIME: Restart
[A] SEND: Packet 5
[B] RECV: Packet 5 [fffffffffffffffffffffff]
```

```
[B] ASND: Packet 5
[A] ACK: Packet 4
[A] TIME: Restart
[A] SEND: Packet 6
[A] SEND: Packet 7
[B] RECV: Packet 6 [ggggggggggggggggggggg]
[B] ASND: Packet 6
[A] SEND: Packet 8
[A] ACK: Packet 5
[A] TIME: Restart
[B] RECV: Packet 7 [hhhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 7
[A] SEND: Packet 9
[A] ACK: Packet 6
[A] TIME: Restart
[B] RECV: Packet 8 [iiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 8
[A] ACK: Packet 7
[A] TIME: Restart
[A] ACK: Packet 8
[A] TIME: Restart
[B] RECV: Packet 9 [jjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 9
[A] ACK: Packet 9
[A] TIME: Stop
Simulator terminated at time 70.071053
after sending 10 msgs from layer5
```

Output 2

```
$ ./go_back_n.sh
----- 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]:0.0
Enter average time between messages from sender's layer5 [ > 0.0]:10.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[A] ACK: Packet 0
[A] TIME: Stop
[A] SEND: Packet 1
[A] TIME: Start
[A] SEND: Packet 2
[A] SEND: Packet 3
[A] SEND: Packet 4
[A] TIME: Timeout
[A] RSND: Packet 1
[A] RSND: Packet 2
[A] RSND: Packet 3
[A] RSND: Packet 4
[B] DROP: Packet 2
[B] DROP: Packet 3
[B] DROP: Packet 4
[A] SEND: Packet 5
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[B] DROP: Packet 3
[A] SEND: Packet 6
[A] TIME: Timeout
[A] RSND: Packet 1
[A] RSND: Packet 2
[A] RSND: Packet 3
[A] RSND: Packet 4
[A] RSND: Packet 5
[A] RSND: Packet 6
[B] DROP: Packet 6
[B] RECV: Packet 2 [cccccccccccccccccccc]
[B] ASND: Packet 2
[A] STOR: Packet 7
[B] RECV: Packet 3 [dddddddddddddddddd]
[B] ASND: Packet 3
[B] RECV: Packet 4 [eeeeeeeeeeeeeeeeee]
```

[B] ASND: Packet 4
[A] STOR: Packet 8
[A] ACK: Packet 3
[A] TIME: Restart
[A] SEND: Packet 7
[A] SEND: Packet 8
[B] DROP: Packet 6
[B] DROP: Packet 7
[A] SEND: Packet 9
[B] DROP: Packet 8
[B] DROP: Packet 9
[A] STOR: Packet 10
[A] TIME: Timeout
[A] RSND: Packet 4
[A] RSND: Packet 5
[A] RSND: Packet 6
[A] RSND: Packet 7
[A] RSND: Packet 8
[A] RSND: Packet 9
[B] DUP: Packet 4
[B] ASND: Packet 4
[A] ACK: Packet 4
[A] TIME: Restart
[A] SEND: Packet 10
[A] STOR: Packet 11
[A] STOR: Packet 12
[A] TIME: Timeout
[A] RSND: Packet 5
[A] RSND: Packet 6
[A] RSND: Packet 7
[A] RSND: Packet 8
[A] RSND: Packet 9
[A] RSND: Packet 10
[B] RECV: Packet 5 [fffffffffffffffffffff]
[B] ASND: Packet 5
[A] STOR: Packet 13
[B] RECV: Packet 6 [ggggggggggggggggggggg]
[B] ASND: Packet 6
[A] ACK: Packet 5
[A] TIME: Restart
[A] SEND: Packet 11
[B] RECV: Packet 7 [hhhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 7
[B] RECV: Packet 8 [iiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 8
[A] ACK: Packet 7
[A] TIME: Restart
[A] SEND: Packet 12
[A] SEND: Packet 13

[A] STOR: Packet 14
[A] STOR: Packet 15
[B] RECV: Packet 9 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 9
[A] STOR: Packet 16
[A] ACK: Packet 9
[A] TIME: Restart
[A] SEND: Packet 14
[A] SEND: Packet 15
[B] RECV: Packet 10 [kkkkkkkkkkkkkkkkkkkk]
[B] ASND: Packet 10
[A] STOR: Packet 17
[B] RECV: Packet 11 [llllllllllllllllllll]
[B] ASND: Packet 11
[A] ACK: Packet 11
[A] TIME: Restart
[A] SEND: Packet 16
[A] SEND: Packet 17
[B] RECV: Packet 12 [mmmmmmmmmmmmmmmmmmmm]
[B] ASND: Packet 12
[B] DROP: Packet 14
[B] DROP: Packet 15
[B] DROP: Packet 16
[A] STOR: Packet 18
[A] STOR: Packet 19
[B] DROP: Packet 17
[A] STOR: Packet 20
[A] STOR: Packet 21
[A] TIME: Timeout
[A] RSND: Packet 12
[A] RSND: Packet 13
[A] RSND: Packet 14
[A] RSND: Packet 15
[A] RSND: Packet 16
[A] RSND: Packet 17
[B] DUP: Packet 12
[B] ASND: Packet 12
[A] STOR: Packet 22
[A] STOR: Packet 23
[B] RECV: Packet 13 [nnnnnnnnnnnnnnnnnnnn]
[B] ASND: Packet 13
[A] ACK: Packet 12
[A] TIME: Restart
[A] SEND: Packet 18
[A] ACK: Packet 13
[A] TIME: Restart
[A] SEND: Packet 19
[B] RECV: Packet 14 [oooooooooooooooooooo]
[B] ASND: Packet 14

[B] RECV: Packet 15 [pppppppppppppppppppppp]
[B] ASND: Packet 15
[A] STOR: Packet 24
[A] ACK: Packet 14
[A] TIME: Restart
[A] SEND: Packet 20
[B] RECV: Packet 16 [qqqqqqqqqqqqqqqqqqqqq]
[B] ASND: Packet 16
[A] STOR: Packet 25
[A] STOR: Packet 26
[B] RECV: Packet 17 [rrrrrrrrrrrrrrrrrrrrrr]
[B] ASND: Packet 17
[B] RECV: Packet 18 [ssssssssssssssssssssss]
[B] ASND: Packet 18
[A] STOR: Packet 27
[A] ACK: Packet 17
[A] TIME: Restart
[A] SEND: Packet 21
[A] SEND: Packet 22
[A] SEND: Packet 23
[B] RECV: Packet 19 [tttttttttttttttttttttt]
[B] ASND: Packet 19
[A] STOR: Packet 28
[B] RECV: Packet 20 [uuuuuuuuuuuuuuuuuuuuuu]
[B] ASND: Packet 20
[B] RECV: Packet 21 [vvvvvvvvvvvvvvvvvvvvvv]
[B] ASND: Packet 21
[A] ACK: Packet 20
[A] TIME: Restart
[A] SEND: Packet 24
[A] SEND: Packet 25
[A] SEND: Packet 26
[B] RECV: Packet 22 [wwwwwwwwwwwwwwwwwwwwww]
[B] ASND: Packet 22
[A] ACK: Packet 21
[A] TIME: Restart
[A] SEND: Packet 27
[B] RECV: Packet 23 [xxxxxxxxxxxxxxxxxxxxxxxxxx]
[B] ASND: Packet 23
[A] STOR: Packet 29
[B] RECV: Packet 24 [yyyyyyyyyyyyyyyyyyyyyy]
[B] ASND: Packet 24
[A] ACK: Packet 24
[A] TIME: Restart
[A] SEND: Packet 28
[A] SEND: Packet 29
[B] DROP: Packet 26
[A] SEND: Packet 30
[A] TIME: Timeout

[A] RSND: Packet 25
[A] RSND: Packet 26
[A] RSND: Packet 27
[A] RSND: Packet 28
[A] RSND: Packet 29
[A] RSND: Packet 30
[B] DROP: Packet 27
[A] STOR: Packet 31
[A] STOR: Packet 32
[B] DROP: Packet 28
[A] STOR: Packet 33
[A] STOR: Packet 34
[A] TIME: Timeout
[A] RSND: Packet 25
[A] RSND: Packet 26
[A] RSND: Packet 27
[A] RSND: Packet 28
[A] RSND: Packet 29
[A] RSND: Packet 30
[B] RECV: Packet 25 [zzzzzzzzzzzzzzzzzzzzzz]
[B] ASND: Packet 25
[B] RECV: Packet 26 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 26
[A] ACK: Packet 25
[A] TIME: Restart
[A] SEND: Packet 31
[B] RECV: Packet 27 [bbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 27
[A] ACK: Packet 26
[A] TIME: Restart
[A] SEND: Packet 32
[A] STOR: Packet 35
[B] RECV: Packet 28 [cccccccccccccccccccccc]
[B] ASND: Packet 28
[A] ACK: Packet 27
[A] TIME: Restart
[A] SEND: Packet 33
[B] RECV: Packet 29 [ddddddddddddddddddddd]
[B] ASND: Packet 29
[A] STOR: Packet 36
[A] ACK: Packet 28
[A] TIME: Restart
[A] SEND: Packet 34
[B] RECV: Packet 30 [eeeeeeeeeeeeeeeeeeeeee]
[B] ASND: Packet 30
[B] RECV: Packet 31 [ffffffffffffffffffffff]
[B] ASND: Packet 31
[B] RECV: Packet 32 [ggggggggggggggggggggg]
[B] ASND: Packet 32

[A] ACK: Packet 29
[A] TIME: Restart
[A] SEND: Packet 35
[A] STOR: Packet 37
[B] RECV: Packet 33 [hhhhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 33
[A] ACK: Packet 30
[A] TIME: Restart
[A] SEND: Packet 36
[A] ACK: Packet 31
[A] TIME: Restart
[A] SEND: Packet 37
[B] DROP: Packet 36
[A] STOR: Packet 38
[B] DROP: Packet 37
[A] ACK: Packet 32
[A] TIME: Restart
[A] SEND: Packet 38
[A] STOR: Packet 39
[A] STOR: Packet 40
[A] ACK: Packet 33
[A] TIME: Restart
[A] SEND: Packet 39
[B] DROP: Packet 39
[A] STOR: Packet 41
[A] STOR: Packet 42
[A] STOR: Packet 43
[A] STOR: Packet 44
[A] TIME: Timeout
[A] RSND: Packet 34
[A] RSND: Packet 35
[A] RSND: Packet 36
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] STOR: Packet 45
[B] RECV: Packet 34 [iiiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 34
[A] STOR: Packet 46
[B] RECV: Packet 35 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 35
[B] DROP: Packet 37
[A] ACK: Packet 35
[A] TIME: Restart
[A] SEND: Packet 40
[A] SEND: Packet 41
[A] STOR: Packet 47
[B] DROP: Packet 41
[A] STOR: Packet 48

[A] STOR: Packet 49
[A] TIME: Timeout
[A] RSND: Packet 36
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[B] DROP: Packet 37
[B] DROP: Packet 38
[B] DROP: Packet 41
[A] TIME: Timeout
[A] RSND: Packet 36
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[B] RECV: Packet 36 [kkkkkkkkkkkkkkkkkkkk]
[B] ASND: Packet 36
[B] DROP: Packet 38
[B] DROP: Packet 39
[B] DROP: Packet 41
[A] TIME: Timeout
[A] RSND: Packet 36
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[B] DUP: Packet 36
[B] ASND: Packet 36
[A] ACK: Packet 36
[A] TIME: Restart
[A] SEND: Packet 42
[B] DROP: Packet 38
[B] DROP: Packet 39
[B] DROP: Packet 41
[A] TIME: Timeout
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[A] RSND: Packet 42
[B] DROP: Packet 39
[B] DROP: Packet 40
[B] DROP: Packet 41
[B] DROP: Packet 42

[A] TIME: Timeout
[A] RSND: Packet 37
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[A] RSND: Packet 42
[B] RECV: Packet 37 [llllllllllllllllllllll]
[B] ASND: Packet 37
[B] DROP: Packet 40
[A] ACK: Packet 37
[A] TIME: Restart
[A] SEND: Packet 43
[A] TIME: Timeout
[A] RSND: Packet 38
[A] RSND: Packet 39
[A] RSND: Packet 40
[A] RSND: Packet 41
[A] RSND: Packet 42
[A] RSND: Packet 43
[B] RECV: Packet 38 [mmmmmmmmmmmmmmmmmmmmmm]
[B] ASND: Packet 38
[A] ACK: Packet 38
[A] TIME: Restart
[A] SEND: Packet 44
[B] RECV: Packet 39 [nnnnnnnnnnnnnnnnnnnnnn]
[B] ASND: Packet 39
[B] RECV: Packet 40 [oooooooooooooooooooooo]
[B] ASND: Packet 40
[A] ACK: Packet 39
[A] TIME: Restart
[A] SEND: Packet 45
[B] RECV: Packet 41 [pppppppppppppppppppppp]
[B] ASND: Packet 41
[B] RECV: Packet 42 [qqqqqqqqqqqqqqqqqqqq]
[B] ASND: Packet 42
[B] RECV: Packet 43 [rrrrrrrrrrrrrrrrrrrrrr]
[B] ASND: Packet 43
[B] RECV: Packet 44 [ssssssssssssssssssssss]
[B] ASND: Packet 44
[A] ACK: Packet 43
[A] TIME: Restart
[A] SEND: Packet 46
[A] SEND: Packet 47
[A] SEND: Packet 48
[A] SEND: Packet 49
[B] RECV: Packet 45 [tttttttttttttttttttttt]
[B] ASND: Packet 45
[A] ACK: Packet 44

```
[A] TIME: Restart
[B] RECV: Packet 46 [uuuuuuuuuuuuuuuuuuuuuu]
[B] ASND: Packet 46
[B] RECV: Packet 47 [vvvvvvvvvvvvvvvvvvvvvv]
[B] ASND: Packet 47
[A] ACK: Packet 45
[A] TIME: Restart
[B] DROP: Packet 49
[A] ACK: Packet 46
[A] TIME: Restart
[A] ACK: Packet 47
[A] TIME: Restart
[A] TIME: Timeout
[A] RSND: Packet 48
[A] RSND: Packet 49
[B] RECV: Packet 48 [wwwwwwwwwwwwwwwwwwwwww]
[B] ASND: Packet 48
[B] RECV: Packet 49 [xxxxxxxxxxxxxxxxxxxxxx]
[B] ASND: Packet 49
[A] TIME: Timeout
[A] RSND: Packet 48
[A] RSND: Packet 49
[A] TIME: Timeout
[A] RSND: Packet 48
[A] RSND: Packet 49
[B] DUP: Packet 48
[B] ASND: Packet 49
[A] ACK: Packet 49
[A] TIME: Stop
Simulator terminated at time 761.470215
after sending 50 msgsg from layer5
```

Output 3

```
$ ./go_back_n.sh
----- 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]:0.0
Enter packet corruption probability [0.0 for no corruption]:0.3
Enter average time between messages from sender's layer5 [ > 0.0]:10.0
Enter TRACE:0

[A] SEND: Packet 0
[A] TIME: Start
[B] DROP: Packet Invalid
[A] SEND: Packet 1
[A] TIME: Timeout
[A] RSND: Packet 0
[A] RSND: Packet 1
[B] DROP: Packet Invalid
[A] SEND: Packet 2
[B] RECV: Packet 0 [aaaaaaaaaaaaaaaaaaaaa]
[B] ASND: Packet 0
[B] DROP: Packet Invalid
[A] ACK: Packet 0
[A] TIME: Restart
[A] SEND: Packet 3
[B] DROP: Packet 2
[A] SEND: Packet 4
[B] DROP: Packet Invalid
[B] DROP: Packet 4
[A] SEND: Packet 5
[A] TIME: Timeout
[A] RSND: Packet 1
[A] RSND: Packet 2
[A] RSND: Packet 3
[A] RSND: Packet 4
[A] RSND: Packet 5
[B] DROP: Packet Invalid
[B] RECV: Packet 1 [bbbbbbbbbbbbbbbbbbbbbb]
[B] ASND: Packet 1
[A] SEND: Packet 6
[B] RECV: Packet 2 [cccccccccccccccccccccc]
[B] ASND: Packet 2
[A] DROP: Packet Invalid
[A] ACK: Packet 2
[A] TIME: Restart
[B] DROP: Packet Invalid
[B] DROP: Packet Invalid
[B] DROP: Packet Invalid
```

[A] SEND: Packet 7
[B] DROP: Packet 6
[B] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 3
[A] RSND: Packet 4
[A] RSND: Packet 5
[A] RSND: Packet 6
[A] RSND: Packet 7
[B] DROP: Packet Invalid
[B] DROP: Packet 4
[A] SEND: Packet 8
[B] DROP: Packet 5
[B] DROP: Packet Invalid
[B] DROP: Packet 7
[A] STOR: Packet 9
[A] TIME: Timeout
[A] RSND: Packet 3
[A] RSND: Packet 4
[A] RSND: Packet 5
[A] RSND: Packet 6
[A] RSND: Packet 7
[A] RSND: Packet 8
[B] DROP: Packet Invalid
[B] RECV: Packet 3 [dddddddddddddddddd]
[B] ASND: Packet 3
[B] RECV: Packet 4 [eeeeeeeeeeeeeeeeee]
[B] ASND: Packet 4
[A] DROP: Packet Invalid
[B] RECV: Packet 5 [ffffffffffffffffffff]
[B] ASND: Packet 5
[A] TIME: Timeout
[A] RSND: Packet 3
[A] RSND: Packet 4
[A] RSND: Packet 5
[A] RSND: Packet 6
[A] RSND: Packet 7
[A] RSND: Packet 8
[A] DROP: Packet Invalid
[B] RECV: Packet 6 [gggggggggggggggggggg]
[B] ASND: Packet 6
[B] RECV: Packet 7 [hhhhhhhhhhhhhhhhhhhh]
[B] ASND: Packet 7
[A] DROP: Packet Invalid
[B] RECV: Packet 8 [iiiiiiiiiiiiiiiiiii]
[B] ASND: Packet 8
[B] DROP: Packet Invalid
[A] ACK: Packet 6
[A] TIME: Restart

```
[A] SEND: Packet 9
[B] DUP: Packet 4
[B] ASND: Packet 8
[A] ACK: Packet 7
[A] TIME: Restart
[B] DROP: Packet Invalid
[A] ACK: Packet 8
[A] TIME: Restart
[A] ACK: Packet 8
[B] DROP: Packet Invalid
[B] DROP: Packet Invalid
[B] DROP: Packet Invalid
[B] RECV: Packet 9 [jjjjjjjjjjjjjjjjjjjj]
[B] ASND: Packet 9
[A] DROP: Packet Invalid
[A] TIME: Timeout
[A] RSND: Packet 9
[B] DUP: Packet 9
[B] ASND: Packet 9
[A] ACK: Packet 9
[A] TIME: Stop
Simulator terminated at time 229.752228
after sending 10 msgs from layer5
```