

EXPERIMENT- 22

AIM: To Simulate and to study of **Selective Repeat ARQ** protocol

SOFTWARE REQUIREMENTS:

1. NS-2 Simulator

THEORY:

Selective Repeat ARQ is a specific instance of the Automatic Repeat-reQuest (ARQ) Protocol. It may be used as a protocol for the delivery and acknowledgement of message units, or it may be used as a protocol for the delivery of subdivided message sub-units. When used as the protocol for the delivery of messages, the sending process continues to send a number of frames specified by a window size even after a frame loss. Unlike GoBack-N ARQ, the receiving process will continue to accept and acknowledge frames sent after an initial error.

The receiver process keeps track of the sequence number of the earliest frame it has not received, and sends that number with every ACK it sends. If a frame from the sender does not reach the receiver, the sender continues to send subsequent frames until it has emptied its window. The receiver continues to fill its receiving window with the subsequent frames, replying each time with an ACK containing the sequence number of the earliest missing frame. Once the sender has sent all the frames in its window, it re-sends the frame number given by the ACKs, and then continues where it left off. The size of the sending and receiving windows must be equal, and half the maximum sequence number (assuming that sequence numbers are numbered from 0 to n-1) to avoid miscommunication in all cases of packets being dropped. To understand this, consider the case when all ACKs are destroyed. If the receiving window is larger than half the maximum sequence number, some, possibly even all, of the packages that are resent after timeouts are duplicates that are not recognized as such. The sender moves its window for every packet that is acknowledged.

Advantage over Go Back N:

1. Fewer retransmissions.

Disadvantages:

1. More complexity at sender and receiver
2. Receiver may receive frames out of sequence

ALGORITHM FOR Selective Repeat ARQ

1. The source node transmits the frames continuously.
2. Each frame in the buffer has a sequence number starting from 1 and increasing up to the window size.
3. The source node has a window i.e. a buffer to store the frames. This buffer size is the number of frames to be transmitted continuously.
4. The receiver has a buffer to store the received frames. The size of the buffer depends upon the window size defined by the protocol designer.
5. The size of the window depends according to the protocol designer.
6. The source node transmits frames continuously till the window size is exhausted. If any of the frames are received with error only those frames are requested for retransmission (with a negative

acknowledgement)

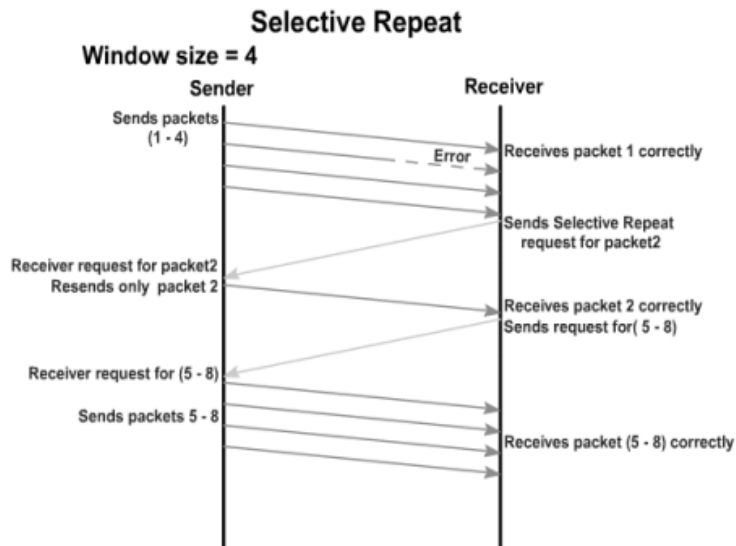
7. If all the frames are received without error, a cumulative positive acknowledgement is sent.

8. If there is an error in frame 3, an acknowledgement for the frame 2 is sent and then only Frame 3 is retransmitted. Now the window slides to get the next frames to the window.

9. If acknowledgment is transmitted with error, all the frames of window are retransmitted. Else ordinary window sliding takes place. (* In implementation part, Acknowledgment error is not considered)

10. If all the frames transmitted are errorless the next transmission is carried out for the new window.

11. This concept of repeating the transmission for the error frames only is called **Selective Repeat** transmission flow control protocol.



PROGRAM:

```
#send packets one by one
set ns [new Simulator]
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
$n0 color "red"
$n1 color "red"
$n2 color "green"
$n3 color "green"
$n4 color "black"
$n5 color "black"
$n0 shape circle ;
$n1 shape circle ;
$n2 shape circle ;
$n3 shape circle ;
$n4 shape circle ;
$n5 shape circle ;
```

```

$ns at 0.0 "$n0 label SYS1"
$ns at 0.0 "$n1 label SYS2"
$ns at 0.0 "$n2 label SYS3"
$ns at 0.0 "$n3 label SYS4"
$ns at 0.0 "$n4 label SYS5"
$ns at 0.0 "$n5 label SYS6"
set nf [open Srepeat.nam w]
$ns namtrace-all $nf
set f [open Srepeat.tr w]
$ns trace-all $f
$ns duplex-link $n0 $n2 1Mb 10ms DropTail
$ns duplex-link-op $n0 $n2 orient right-down
$ns queue-limit $n0 $n2 5
$ns duplex-link $n1 $n2 1Mb 10ms DropTail
$ns duplex-link-op $n1 $n2 orient right-up
$ns duplex-link $n2 $n3 1Mb 10ms DropTail
$ns duplex-link-op $n2 $n3 orient right
$ns duplex-link $n3 $n4 1Mb 10ms DropTail
$ns duplex-link-op $n3 $n4 orient right-up
$ns duplex-link $n3 $n5 1Mb 10ms DropTail
$ns duplex-link-op $n3 $n5 orient right-down
Agent/TCP set _nam_tracevar_true
set tcp [new Agent/TCP]
$tcp set fid 1
$ns attach-agent $n1 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n4 $sink
$ns connect $tcp $sink
set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ns at 0.05 "$ftp start"
$ns at 0.06 "$tcp set windowlnit 8"
$ns at 0.06 "$tcp set maxcwnd 8"
$ns at 0.25 "$ns queue-limit $n3 $n4 0"
$ns at 0.26 "$ns queue-limit $n3 $n4 10"
$ns at 0.30 "$tcp set windowlnit 1"
$ns at 0.30 "$tcp set maxcwnd 1"
$ns at 0.30 "$ns queue-limit $n3 $n4 10"
$ns at 0.47 "$ns detach-agent $n1 $tcp;$ns detach-agent $n4 $sink"
$ns at 1.75 "finish"
$ns at 0.0 "$ns trace-annotate \"Select and repeat\""
$ns at 0.05 "$ns trace-annotate \"FTP starts at 0.01\""
$ns at 0.06 "$ns trace-annotate \"Send 8Packets from SYS1 to SYS4\""
$ns at 0.26 "$ns trace-annotate \"Error Occurs in 4th packet\""
$ns at 0.30 "$ns trace-annotate \"Retransmit Packet_4 from SYS1 to SYS4\""
$ns at 1.5 "$ns trace-annotate \"FTP stops\""
proc finish {} {
global ns nf
$ns flush-trace
close $nf
puts "filtering..."

```

```

#exec tclsh../bin/namfilter.tcl srepeat.nam
#puts "running nam..."
exec nam Srepeat.nam &
exit 0
}
$ns run

```

OUTPUT:

