**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

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A Mini-Project Report on

# "SELECTIVE REPEAT ARQ PROTOCOL"

**Computer Graphics & Visualization Laboratory with Mini Project 18CSL68**

Submitted by


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# Certificate

This is to certify that the Mini-project work entitled **"Selective Repeat ARQ Protocol"**, is a bonafide work carried out by **Sahana B C(4VV18CS124) and Soumya Sangalad(4VV18CS139)** having completed the Computer Graphics &Visualization with Mini-project (18CSL68) during the year 2020-2021.

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## ABSTRACT

Computer graphics are pictures and films created using computers. Usually, the term refers to computer-generated image data created with the help of specialized graphical hardware and software. It is a vast and recently developed area of computer science. The phrase was coined in 1960, by computer graphics researchers Verne Hudson and William Fetter of Boeing. It is often abbreviated as CG, though sometimes erroneously referred to as computer-generated imagery (CGI). This protocol (SRP) is mostly identical to GBN protocol, except that buffers are used and the receiver, and the sender, each maintain a window of size. SRP works better when the link is very unreliable. Because in this case, retransmission tends to happen more frequently, selectively retransmitting frames is more efficient than retransmitting all of them. SRP also requires full duplex link. The backward acknowledgements are also in progress. As said, there is a window with respect to which the frames are transmitted. Once the packet or the frame is sent by the sender, the receiver in turns sends an acknowledgement or the ACK message. In case the frame is lost in between, the receiver sends the NAK message or the negative acknowledgement to the sender so that he resends the frame.

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# CHAPTER 1 INTRODUCTION

Computer Graphics become a powerful tool for the rapid and economical production of pictures. There is virtually no area in which Graphical displays cannot be used to some advantage, so it is not surprising to find the use of CG so widespread.

## 1.1 Computer Graphics

Although early application in engineering & science had to rely on expensive & cumbersome equipment, advances in computer technology have made interactive computer graphics a practical tool. Today Computer Graphics is found in a diverse area such as science, engineering, medicine, business, industry, government, art, entertainment, education and training.

Now you can answer about computer graphics as generalized tool for drawing and creating pictures and simulate the real-world situations within a small computer window.

William fetter was credited with coning the term Computer Graphics in 1960, to describe his work at Boeing. One of the first displays of computer animation was future world (1976), which included an animation of a human face and hand produced by Carmull and Fred Parkle at the University of Utah. There are several international conferences and journals where the most significant results in computer-graphics are published and are the results given by the inventors of OpenGL. The results are noticed as shown in the report.

## 1.2 OpenGL Interface

Most of our application will be designed to access OpenGL directly through functions in three libraries. Functions in the main GL (or OpenGL in windows) library have names that begin with the letters gl and are stored in a library usually referred to as GL (or OpenGL in windows). The second is the **OpenGL Utility Library** (GLU). This library uses only GL functions but contains code for creating common objects and simplifying viewing. All functions in GLU can be created from the core GL library but application programmers prefer not to write the code repeatedly. The GLU library is available in all OpenGL implementations; functions in the GLU library begin with letters glu.

To interface with the window system and to get input from external devices into our programs, there is a need of at least one more system-specific library that provides the "glue" between the window system and OpenGL. For the X window system, this library is functionality that should be expected in any modern windowing system.

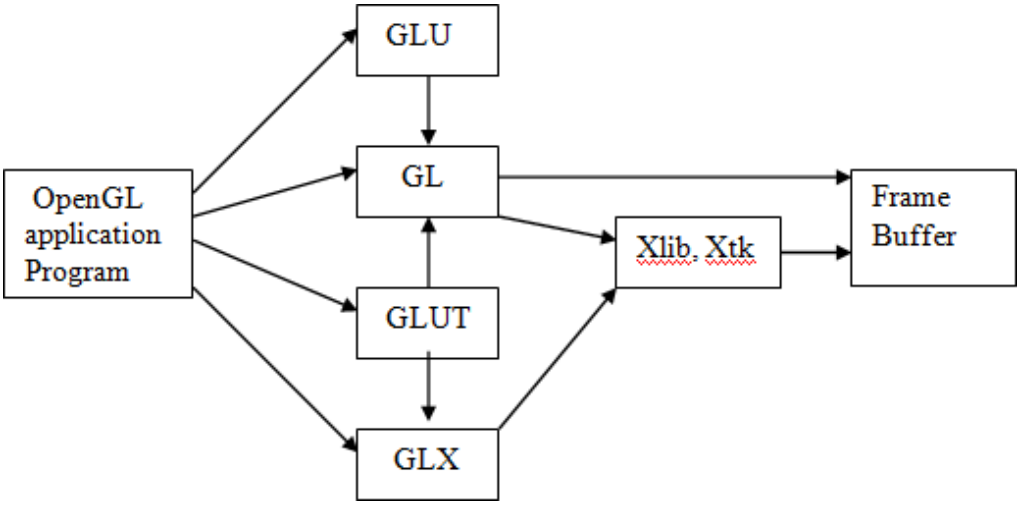


**Fig. 1.2.1 Graphic Pipeline**

## 1.3 Project description

Selective Repeat Selective Repeat is part of the automatic repeat-request (ARQ). An ARQ is an efficient scheme to obtain a reliable data transmission when the channel does not satisfy &e required quality of service [6]. Several different schemes modified by the basic ARQ strategies have been proposed in order to improve the throughput efficiency [7-11]. The key idea of this protocol is that the sender transmits new frames continuously as long as no error occurs. When the frame error occurs, the sender stops transmitting new frames [1]. The transmitter numbers the packets to be transmitted sequentially (using numbers from a finite set) and maintains a timer for each packet it transmits. The receiver accepts each error-free block and positively acknowledges it by sending an ACK message. On receipt of an erroneous block, the receiver negatively acknowledges the block by sending a NAK [3,4]. The acknowledgments follow a Selective Repeat style of approach such that they include a bitmap denoting the reception status of all the packets transmitted since the last ACK. The base station therefore only retransmits the incorrectly received packets [2]. Among ARQ schemes, the selective repeat (SR) is preferable than go-back-N since radio resource is very scarce and SR gives higher channel efficiency [5]. The different functions performed in this project are -

Packet Sending: Demo the sending of packet from source to destination.
ACK Receival: Send the ACK message, once the packets are received.
Packet Crashing: The loss and crashing of packets is demoed.
NAK Receival: Send the NAK message, once the packets are not received.
Frame Resending: Sending the frame again due to NAK receival.

# CHAPTER 2 METHODOLOGY

The methodology used here has two sides, sender side and receiver side. ACK and NAK messages are sent appropriately.

## 2.1 Functions in OpenGL

- **glClearColor:** This function call sets the present RGBA clear color used when clearing the color buffer. The RGB stands for Red, Green and Blue.
- **glFlush:** This function call forces any buffered OpenGL command to execute.
- **glutCreateWindow:** This function call creates a window on the display the string title can be used to label the window.
- **glutInitDisplayMode:** This function call request a display with the properties that are specified in m mode. The value of mode is determined by the logical OR operation of options including the color model.
- **glutDisplayFunc:** This function call registers the display function *funci.e executed when the window needs to be redrawn.
- **glutPostRedisplay:** This function call request the display call back be executed after the current call back returns.
- **glutMainLoop:** This function call causes the program to enter an event processing loop.It should be the last statement in main.
- **glLoadIdentity:** This function call sets current transformation matrix to an identity matrix.
- **glPushMatrix and glPopMatrix:** These function call pushes to and pop from the matrix stack corresponding to the current matrix mode..
- **glRotate:** This function call alter the current matrix by a rotation of angle degrees about the axis (dx,dy,dz).
- **glScale:** This function call alter the current matrix by specified scaling factor along the axis (x,y,d).

- **glTranslate:** This function call alters the current matrix by a displacement of(x,y,z).
- **glClear:** This function is used to clear the window. As the algorithm stores information depth buffer, so it necessary to clear the buffer whenever we wish to redraw the display.
- **Setfont():** It is used to tell the renderer which font is current
- **Drawstring():** It contains four arguments-x,y,z coordinates and a string,while the coordinate assumed to be the space where string to be placed and the string is the value to be display.
- **glutBitmapCharacter:** Automatically sets the **OpenGL** unpack pixel storage modes it needs appropriately and saves and restores the previous modes before returning. The generated call to glBitmap will adjust the current raster position based on the width of the character.
- **glRasterPos:** Specify the raster position for pixel operations
- **glutKeyboardFunc:** Sets the keyboard callback for the current window.
- **glutMouseFunc:**Sets the mouse callback for current window.
- **glBegin:** Delimit the vertices of a primitive or a group of like primitives.
- **glVertex:** Specify a vertex.
- **glColor:** Set the current color.

# CHAPTER 3

# RESULTS

The animation of Selective Repeat ARQ Protocol was done and the results are as follows, shown in the screenshots attached.

## 3.1 Snapshots

**First display window:** Display of the first output screen after debugging as shown in Fig. 3.1.1.

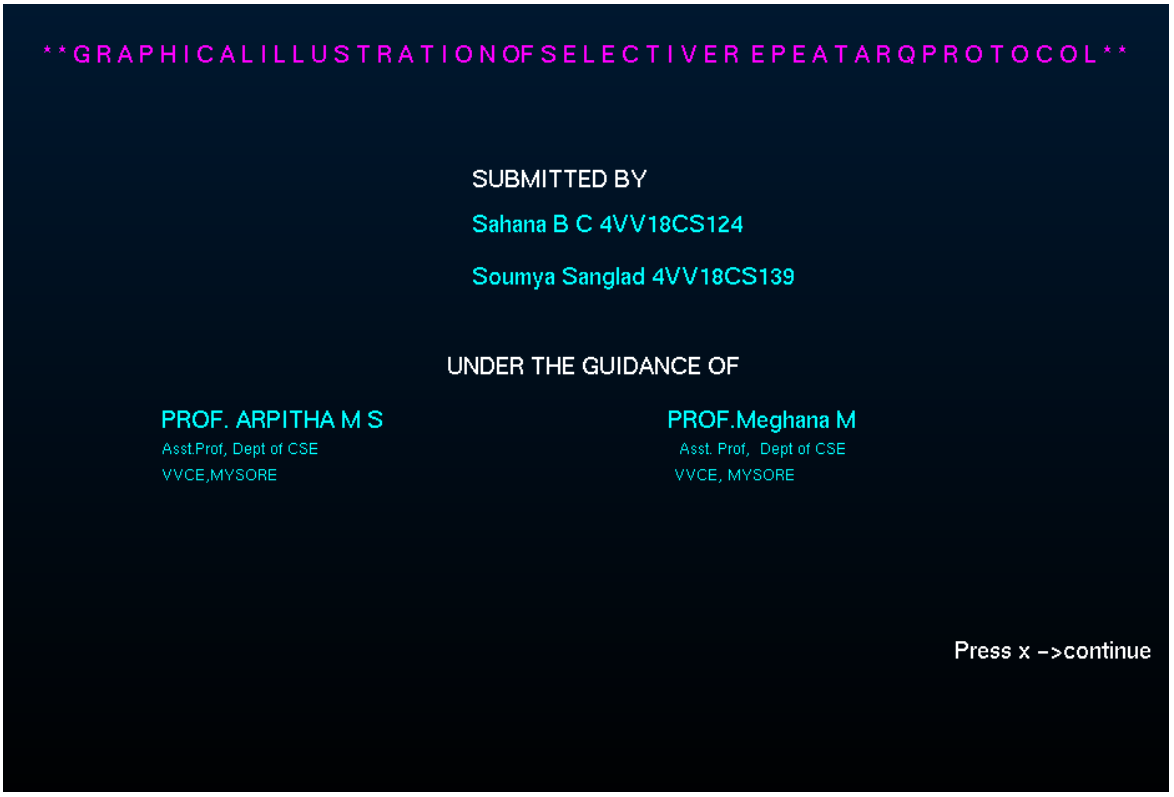


**Fig:3.1.1 Display of the first output window**

**Frame 0,1 sent** : Sending frame 0 and 1 to the receiver as shown in Fig. 3.1.2.

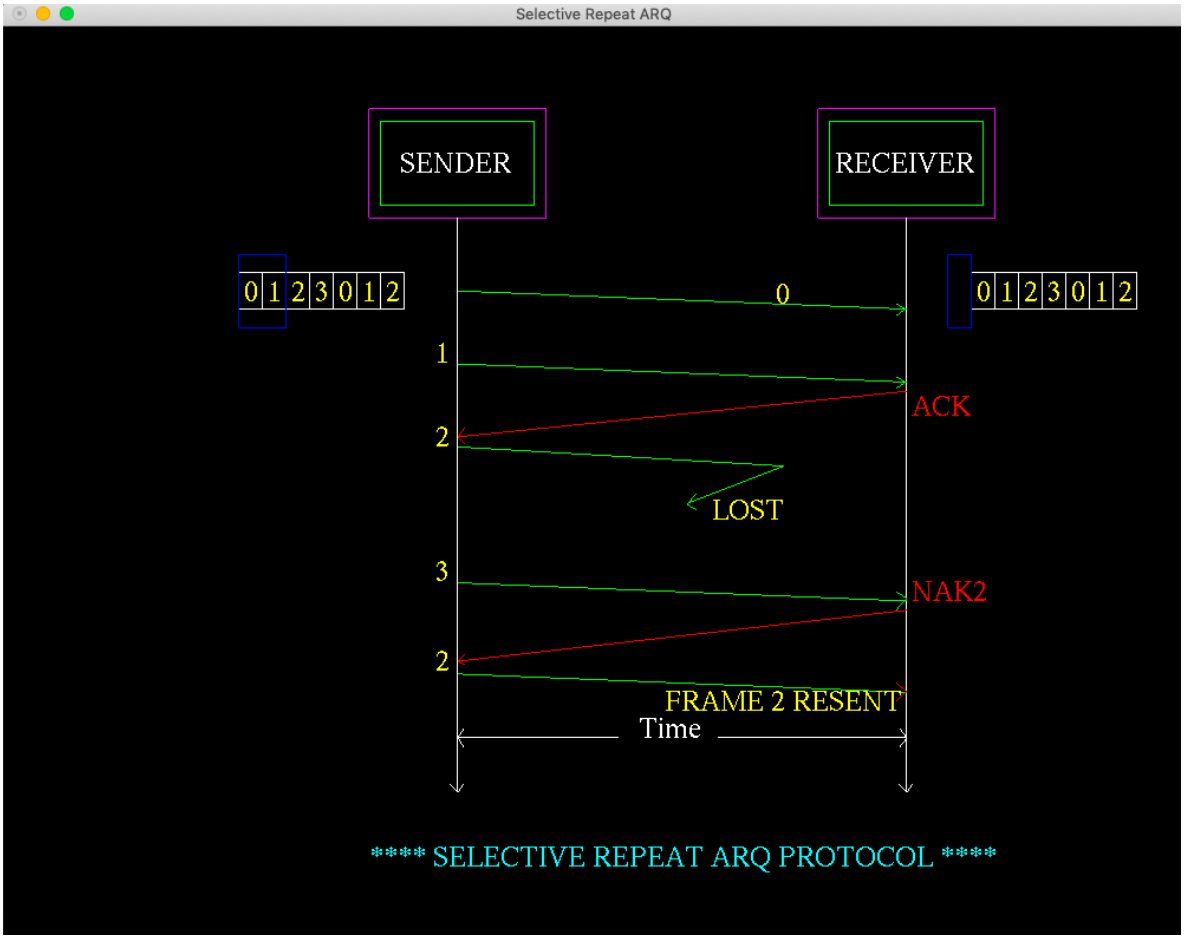


**Fig:3.1.2 Frame 0,1 sent**

**ACK message**: To receive ACK from the receiver side as shown in Fig. 3.1.3.

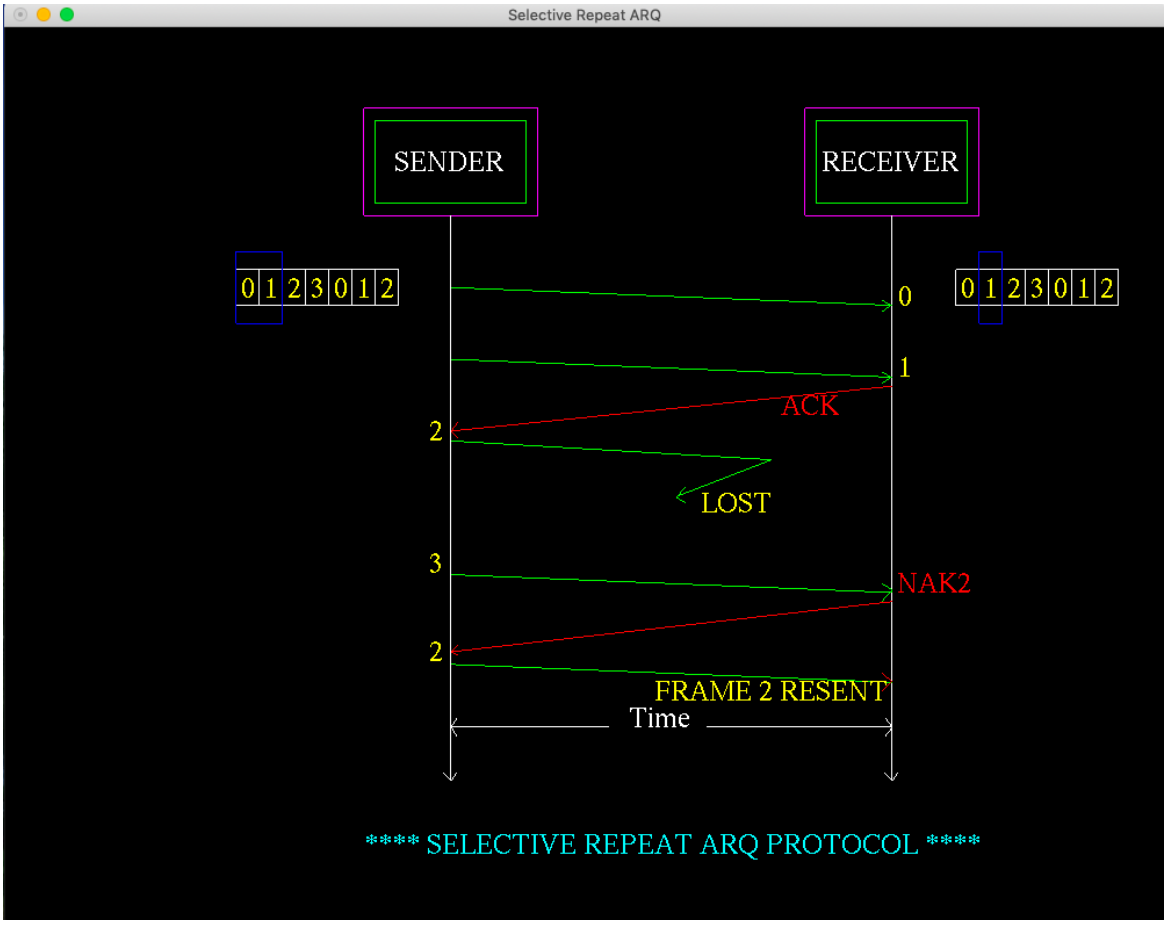


**Fig: 3.1.3 ACK to the sender**

**Packet crashing**: Lost of packets in between the process as shown in Fig. 3.1.4.

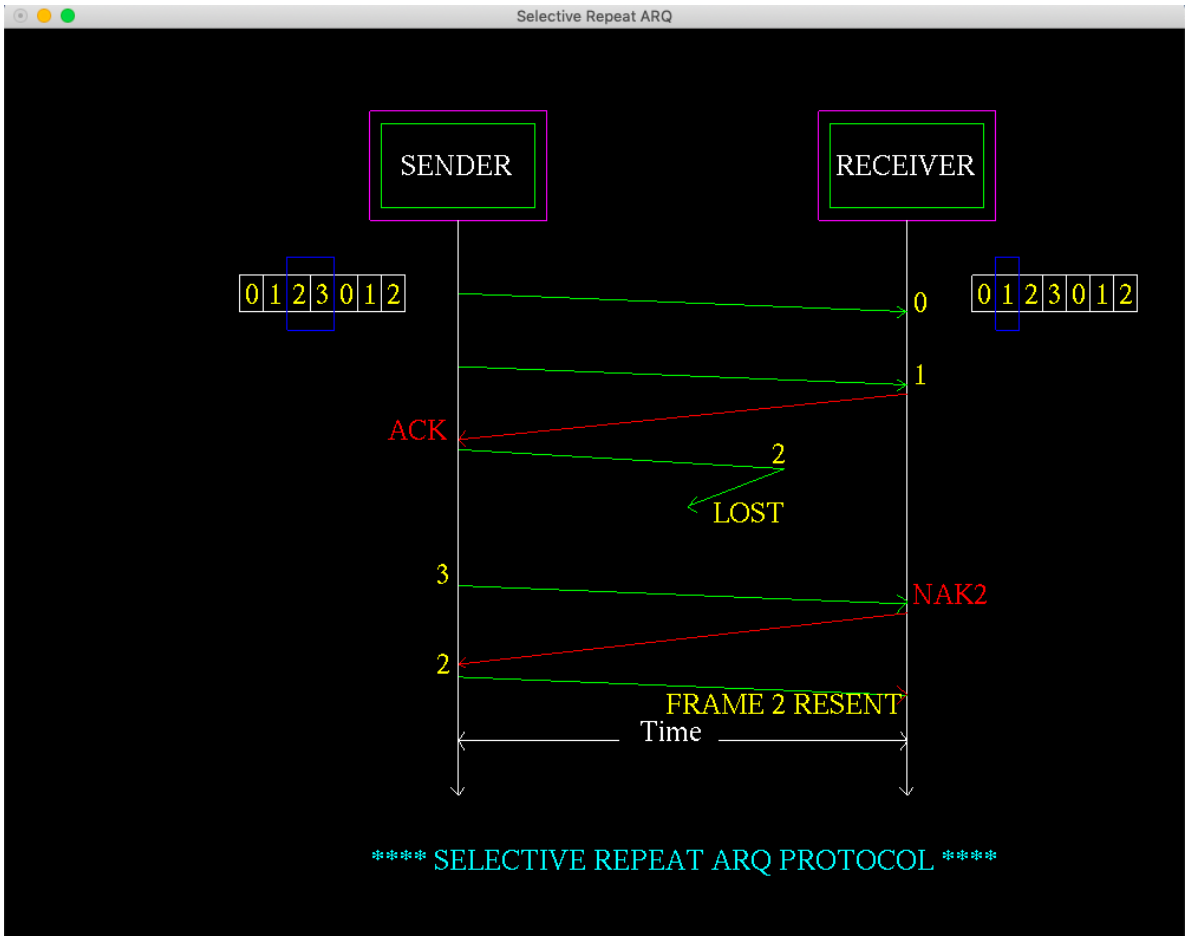


**Fig:3.1.4 Packet crashing window**

**NAK2 sent** : To send NAK2 from the receiver side as shown in Fig. 3.1.5.

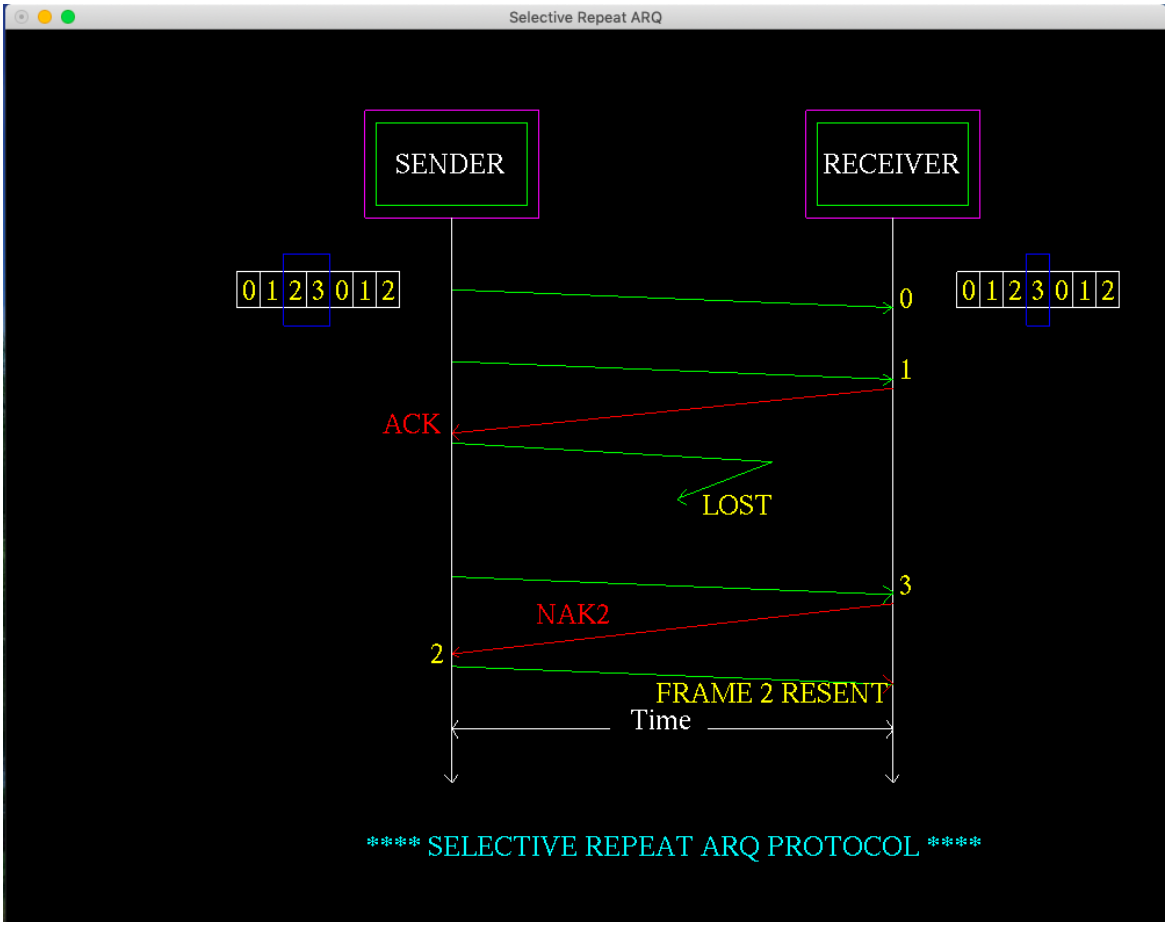


**Fig: 3.1.5 NAK2 sender**

**Frame 2 resent**: Frame 2 resent due to NAK2 received as shown in Fig. 3.1.6.

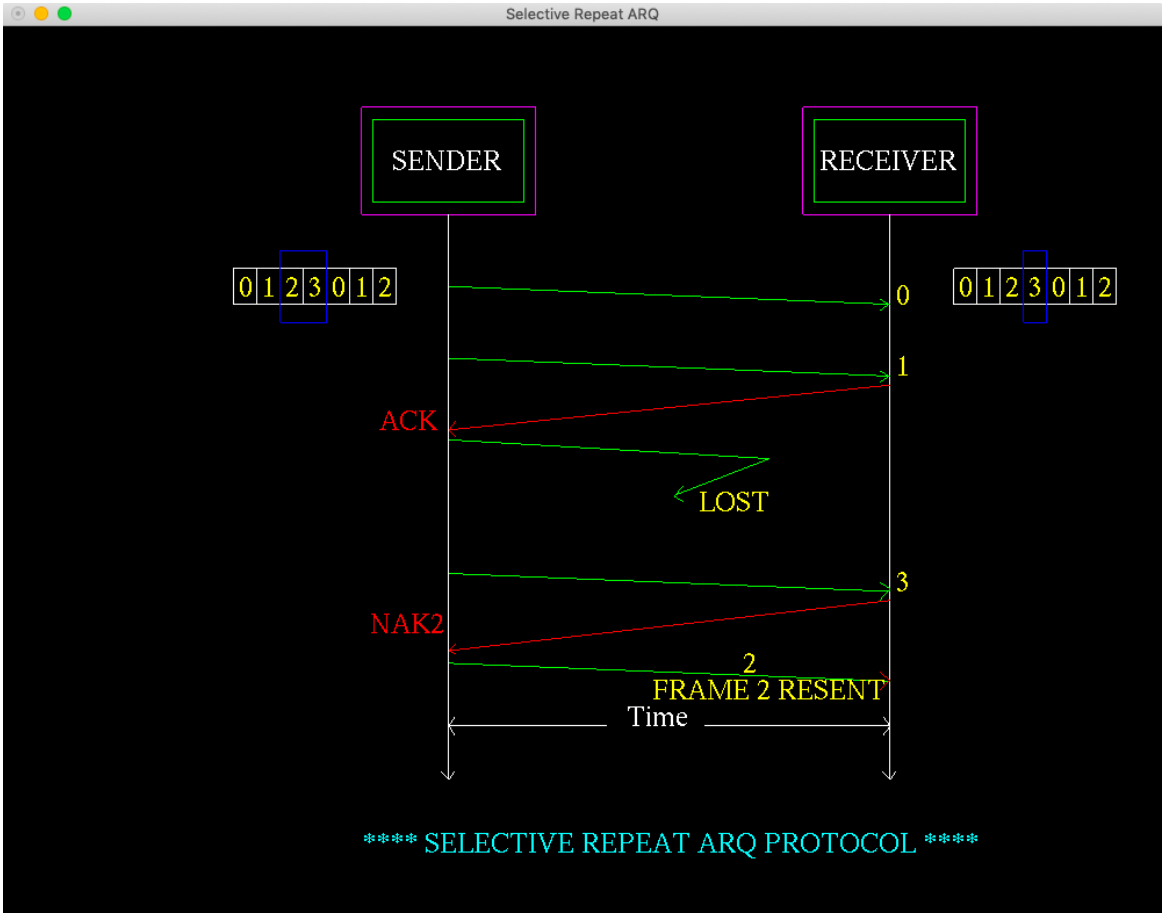


**Fig:3.1.6 Frame 2 resent**

## CHAPTER 4

# CONCLUSION

Selective repeat is combination of advantages of GO back-N and stop N wait protocol, Selective repeat is somewhat superior to other protocols. The use of packet fragmentation and selective repeat ARQ was considered for random access underwater networks are Throughput efficiency, reducing end to end latency and Energy per bit consumption. Finally, the transmission of frames between sender and receiver takes place simultaneously without the intervention at some stages and later the retransmission of frames occurs at later stages. Using graphical representation for stimulation of Selective Repeat protocol is done which depicts the transmission of frames from one point to another point with the required ACK and NAK.

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