a) STOP-AND-WAIT ARQ

SOURCE CODE:

SERVER:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <pthread.h>

#define PORT 8023
#define SIZE 100

typedef struct packet {
	int data;
	int type; // SEQ (0) or ACK (1)
	int seq; // Sequence number (0 or 1)
} packet;

void main() {
	int server_fd, client_fd;
	struct sockaddr_in address;
	int addrlen = sizeof(address);
	int arr[SIZE], k = 0;

	for(int i = 0; i < SIZE; i++)
		arr[i] = -1;

	printf("Stop and Wait ARQ\nTCP Server\n");

	if((server_fd = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
		printf("Socket creation failed!\n");
		exit(1);
	}

	address.sin_family = AF_INET;
	address.sin_addr.s_addr = INADDR_ANY;
	address.sin_port = htons(PORT);

	if(bind(server_fd, (struct sockaddr*) &address, addrlen) < 0) {
		printf("Socket binding failed!\n");
		exit(1);
	}

	if(listen(server_fd, 5) < 0) {
		printf("Listening failed!\n");
		exit(1);
	}

	if((client_fd = accept(server_fd, (struct sockaddr*) &address, (socklen_t*) &addrlen)) <
0) {
		printf("Connection failed!\n");
		exit(1);
	} else {
		printf("Connected to client.\n");
	}

	packet p;
	int flag = -1;

	while(1) {
		int status = recv(client_fd, &p, sizeof(packet), 0);

		if(status < 0) {
			printf("Receive failed!\n");
		} else if (status == 0) {
			printf("Receive completed.\nArray: ");

			for(int i = 0; arr[i] != -1; i++) {
				printf("%d ", arr[i]);
			}

			printf("\n");

			break;
		} else {
			if(flag != p.seq) {
				arr[k] = p.data;
				k++;
			}

			printf("Received: %d (SEQ %d)\n", p.data, p.seq);
			flag = p.seq;

			p.type = 1;
			p.seq = (p.seq + 1) % 2;

			if(rand() % 5 != 2) {
```

```
                                        if(send(client_fd, &p, sizeof(packet), 0) < 0) {
                                                printf("Send failed!\n");
                                        } else {
                                                printf("Sent: ACK %d\n", p.seq);
                                        }
                                } else {
                                        printf("ACK %d lost\n", p.seq);
                                }
                        }
                }

                close(server_fd);
                close(client_fd);
        }
```

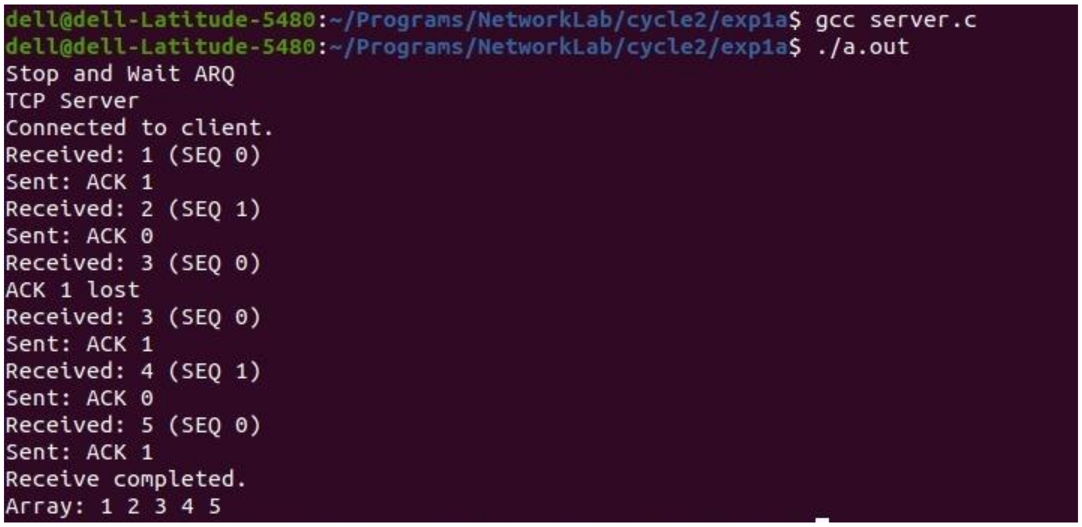
CLIENT:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <pthread.h>

#define PORT 8019

typedef struct packet {
        int data;
        int type; // SEQ (0) or ACK (1)
        int seq; // Sequence number (0 or 1)
} packet;

typedef struct data {
        int* arr;
        int* i;
        int client_fd;
        packet* p;
} data;

void* client(void* arg) {
        data d = *((data*) arg);

        d.p->type = 0;
        d.p->data = d.arr[*d.i];

        if(rand() % 5 != 2) {
```

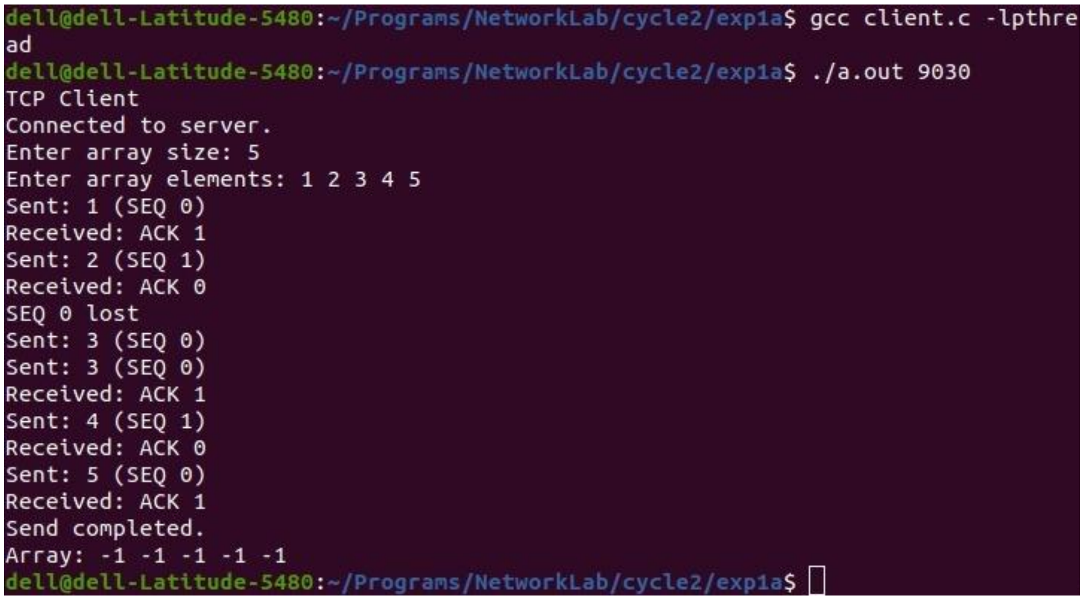
```
			if(send(d.client_fd, d.p, sizeof(packet), 0) < 0) {
				printf("Send failed!\n");
			} else {
				printf("Sent: %d (SEQ %d)\n", d.p->data, d.p->seq);

				if(recv(d.client_fd, d.p, sizeof(packet), 0) < 0) {
					printf("Receive failed!\n");
				} else {
					printf("Received: ACK %d\n", d.p->seq);

					d.arr[*d.i] = -1;

					*(d.i) = *(d.i) + 1;
				}
			}
		} else {
			printf("SEQ %d lost\n", d.p->seq);
		}
}

void* timeout(void* t) {
		sleep(1);
		pthread_t tid = *((pthread_t*) t);
		pthread_cancel(tid);
}

void main() {
		int client_fd;
		struct sockaddr_in serv_addr;

		printf("TCP Client\n");

		client_fd = socket(AF_INET, SOCK_STREAM, 0);

		if(client_fd < 0) {
			printf("Socket creation failed!\n");
			exit(1);
		}

		serv_addr.sin_family = AF_INET;
		serv_addr.sin_addr.s_addr = INADDR_ANY;
		serv_addr.sin_port = htons(PORT);

		if(connect(client_fd, (struct sockaddr*) &serv_addr, sizeof(serv_addr)) < 0) {
			printf("Connection failed!\n");
			exit(1);
```

```
	} else {
		printf("Connected to server.\n");
	}

	int n;

	printf("Enter array size: ");
	scanf("%d", &n);

	int arr[n];

	printf("Enter array elements: ");
	for(int i = 0; i < n; i++) {
		scanf("%d", &arr[i]);
	}

	int i = 0;
	packet p;
	data d;
	d.client_fd = client_fd;
	d.p = &p;
	d.arr = arr;
	d.i = &i;
	p.seq = 0;
	pthread_t tid1, tid2;

	while(1) {
		if(i == n) {
			printf("Send completed.\nArray: ");

			for(int j = 0; j < n; j++) {
				printf("%d ", arr[j]);
			}

			printf("\n");
			break;
		}
		pthread_create(&tid1, NULL, client, &d);
		pthread_create(&tid2, NULL, timeout, &tid1);
		pthread_join(tid1, NULL);
		pthread_join(tid2, NULL);
	}

	close(client_fd);

}
```

OUTPUT:



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1a$ gcc server.c
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1a$ ./a.out
Stop and Wait ARQ
TCP Server
Connected to client.
Received: 1 (SEQ 0)
Sent: ACK 1
Received: 2 (SEQ 1)
Sent: ACK 0
Received: 3 (SEQ 0)
ACK 1 lost
Received: 3 (SEQ 0)
Sent: ACK 1
Received: 4 (SEQ 1)
Sent: ACK 0
Received: 5 (SEQ 0)
Sent: ACK 1
Receive completed.
Array: 1 2 3 4 5
```



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1a$ gcc client.c -lpthre
ad
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1a$ ./a.out 9030
TCP Client
Connected to server.
Enter array size: 5
Enter array elements: 1 2 3 4 5
Sent: 1 (SEQ 0)
Received: ACK 1
Sent: 2 (SEQ 1)
Received: ACK 0
SEQ 0 lost
Sent: 3 (SEQ 0)
Sent: 3 (SEQ 0)
Received: ACK 1
Sent: 4 (SEQ 1)
Received: ACK 0
Sent: 5 (SEQ 0)
Received: ACK 1
Send completed.
Array: -1 -1 -1 -1 -1
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1a$
```

b) GO-BACK-N ARQ

SOURCE CODE:

SERVER:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
```

```
#include <arpa/inet.h>
#include <unistd.h>
#include <pthread.h>

#define PORT 8020
#define SIZE 100

typedef struct packet {
        int data;
        int type; // SEQ (0), ACK (1) or NACK(-1)
        int seq; // Sequence number
} packet;

void main() {
        int server_fd, client_fd;
        struct sockaddr_in address;
        int addrlen = sizeof(address);
        int arr[SIZE];

        for(int i = 0; i < SIZE; i++)
                arr[i] = -1;

        printf("Go-Back-N ARQ\nTCP Server\n");

        if((server_fd = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
                printf("Socket creation failed!\n");
                exit(1);
        }

        address.sin_family = AF_INET;
        address.sin_addr.s_addr = INADDR_ANY;
        address.sin_port = htons(PORT);

        if(bind(server_fd, (struct sockaddr*) &address, addrlen) < 0) {
                printf("Socket binding failed!\n");
                exit(1);
        }

        if(listen(server_fd, 5) < 0) {
                printf("Listening failed!\n");
                exit(1);
        }

        if((client_fd = accept(server_fd, (struct sockaddr*) &address, (socklen_t*) &addrlen)) <
0) {
                printf("Connection failed!\n");
```

```
		exit(1);
	} else {
		printf("Connected to client.\n");
	}

	packet p;
	int exp_seq = 0, flag = 0;

	while(1) {
		int status = recv(client_fd, &p, sizeof(packet), 0);

		if(status < 0) {
			printf("Receive failed!\n");
		} else if (status == 0) {
			printf("Receive completed.\nArray: ");

			for(int i = 0; arr[i] != -1; i++) {
				printf("%d ", arr[i]);
			}

			printf("\n");

			break;
		} else {
			if(p.seq > exp_seq) {
				if(!flag) {
					flag = 1;

					p.type = -1;

					p.seq = exp_seq;

					if(send(client_fd, &p, sizeof(packet), 0) < 0) {
						printf("Send failed!\n");
					} else {
						printf("Sent: NACK %d\n", p.seq);
					}
				}

				continue;
			} else {
				flag = 0;

				exp_seq = p.seq + 1;
			}
```

```
                    p.type = 1;

                    printf("Received: %d (SEQ %d)\n", p.data, p.seq);
                    arr[p.seq] = p.data;

                    if(rand() % 10 != 6) {
                            if(send(client_fd, &p, sizeof(packet), 0) < 0) {
                                    printf("Send failed!\n");
                            } else {
                                    printf("Sent: ACK %d\n", p.seq);
                            }
                    } else {
                            printf("ACK %d lost\n", p.seq);
                    }
            }
    }

    close(server_fd);
    close(client_fd);
}
```

CLIENT:

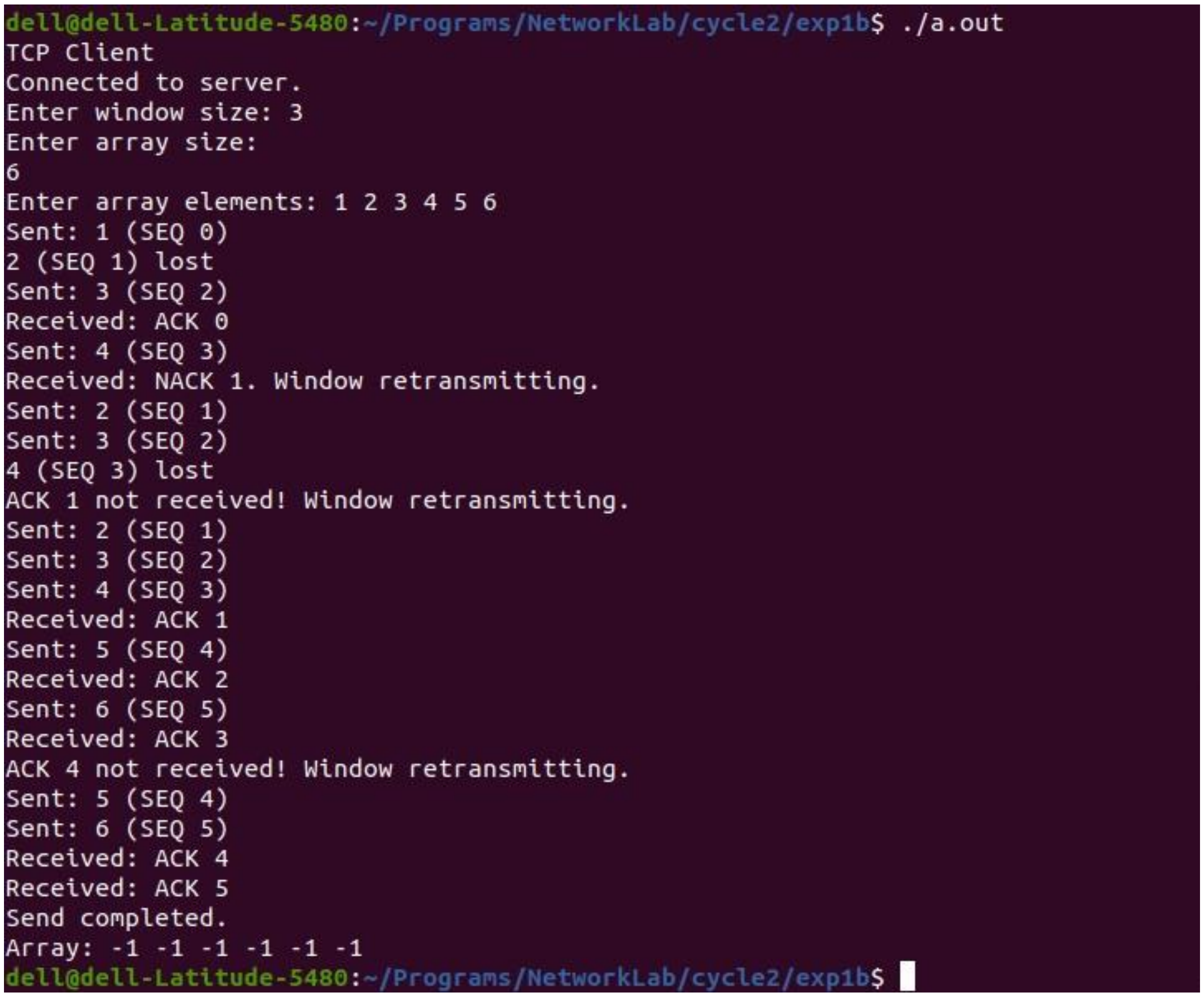
```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>

#define PORT 8020

typedef struct packet {
        int data;
        int type; // SEQ (0), ACK (1) or NACK(-1)
        int seq; // Sequence number
} packet;

typedef struct window {
        int size;
        int start;
        int end;
} window;

typedef struct data {
        int* arr;
```

```
	int n;
	int client_fd;
	int exp_seq;
	packet* p;
	window* w;
} data;

void recvAck(data d);

void sendWindow(data d) {
	d.p->seq = d.w->start;

	for(int i = d.w->start; i <= d.w->end && i < d.n; i++) {
		d.p->type = 0;
		d.p->data = d.arr[i];

		if(rand() % 10 != 6) {
			if(send(d.client_fd, d.p, sizeof(packet), 0) < 0) {
				printf("Send failed!\n");
			} else {
				printf("Sent: %d (SEQ %d)\n", d.p->data, d.p->seq);
			}
		} else {
			printf("%d (SEQ %d) lost\n", d.p->data, d.p->seq);
		}

		d.p->seq = d.p->seq + 1;
	}

	recvAck(d);
}

void sendFrame(data d) {
	d.p->type = 0;
	d.p->data = d.arr[d.w->end];

	if(rand() % 10 != 6) {
		if(send(d.client_fd, d.p, sizeof(packet), 0) < 0) {
			printf("Send failed!\n");
		} else {
			printf("Sent: %d (SEQ %d)\n", d.p->data, d.p->seq);
		}
	} else {
		printf("%d (SEQ %d) lost\n", d.p->data, d.p->seq);
	}
```

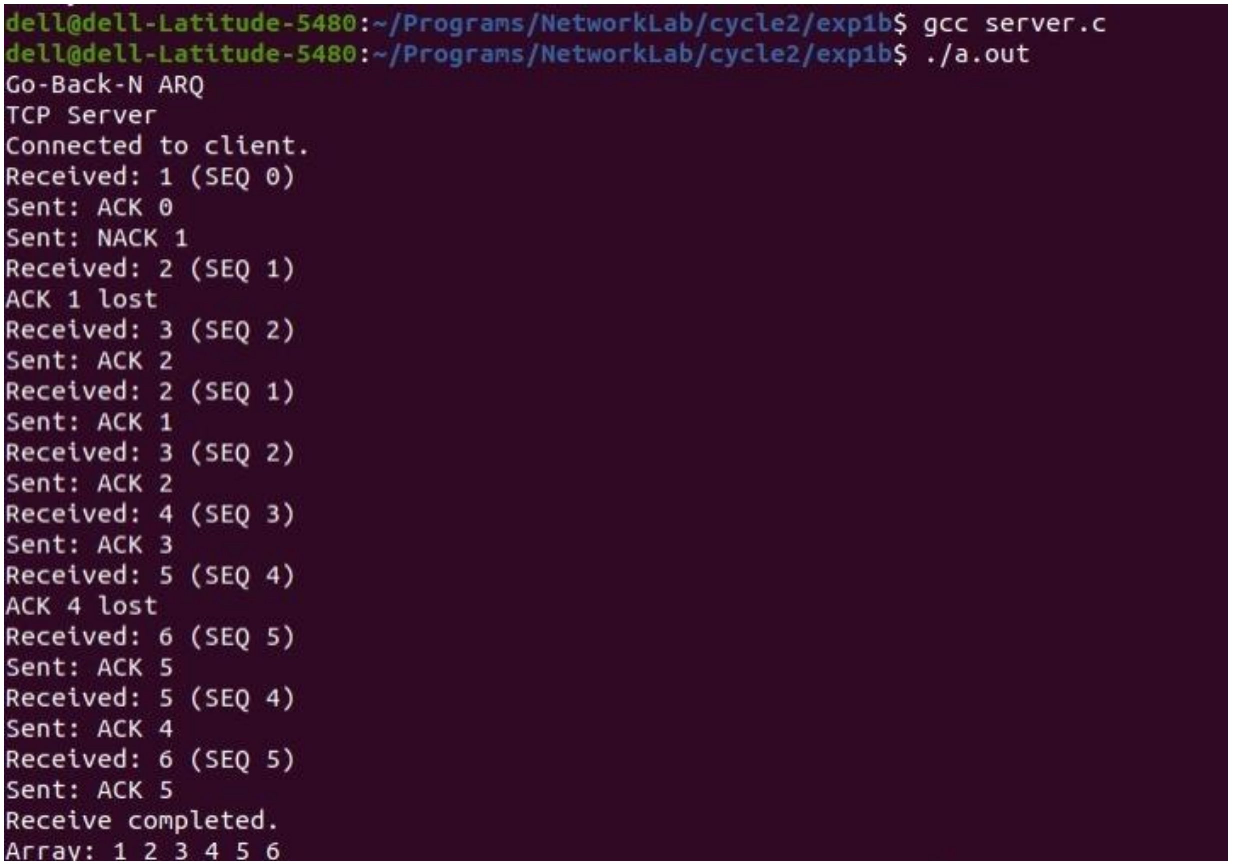
```
        d.p->seq = d.p->seq + 1;

        recvAck(d);
}

void recvAck(data d) {
        data d1;
        packet p;
        d1.p = &p;

        if(recv(d.client_fd, d1.p, sizeof(packet), 0) < 0) {
                printf("Time out! Window retransmitting.\n");
                sendWindow(d);
        } else {
                if(d1.p->seq > d.exp_seq) {
                        printf("ACK %d not received! Window retransmitting.\n", d.exp_seq);

                        while(recv(d.client_fd, d1.p, sizeof(packet), 0) > 0);

                        sendWindow(d);

                        return;
                }

                if(d1.p->type == 1) {
                        printf("Received: ACK %d\n", d1.p->seq);

                        d.arr[d1.p->seq] = -1;

                        d.w->start++;

                        if(d.w->start == d.n) {
                                printf("Send completed.\nArray: ");

                                for(int i = 0; i < d.n; i++) {
                                        printf("%d ", d.arr[i]);
                                }

                                printf("\n");

                                close(d.client_fd);
                                exit(0);
                        }

                        d.w->end++;
                d.exp_seq = d1.p->seq + 1;

                if(d.w->end < d.n)
                    sendFrame(d);
                else
                    recvAck(d);
            } else if(d1.p->type == -1) {
                printf("Received: NACK %d. Window retransmitting.\n", d1.p->seq);
                sendWindow(d);
            }
        }
}

void main() {
        int client_fd;
        struct sockaddr_in serv_addr;

        printf("TCP Client\n");

        client_fd = socket(AF_INET, SOCK_STREAM, 0);

        if(client_fd < 0) {
            printf("Socket creation failed!\n");
            exit(1);
        }

        serv_addr.sin_family = AF_INET;
        serv_addr.sin_addr.s_addr = INADDR_ANY;
        serv_addr.sin_port = htons(PORT);

        if(connect(client_fd, (struct sockaddr*) &serv_addr, sizeof(serv_addr)) < 0) {
            printf("Connection failed!\n");
            exit(1);
        } else {
            printf("Connected to server.\n");
        }

        struct timeval tv;
        tv.tv_sec = 1;
        tv.tv_usec = 0;
        setsockopt(client_fd, SOL_SOCKET, SO_RCVTIMEO, (const char*)&tv, sizeof tv);

        int n;
        window w;

        printf("Enter window size: ");
```

```
	scanf("%d", &w.size);

	w.start = 0;
	w.end = w.size - 1;

	printf("Enter array size: ");
	scanf("%d", &n);

	int arr[n];

	printf("Enter array elements: ");
	for(int i = 0; i < n; i++) {
		scanf("%d", &arr[i]);
	}

	packet p;
	data d;
	d.client_fd = client_fd;
	d.p = &p;
	d.w = &w;
	d.n = n;
	d.arr = arr;
	d.exp_seq = 0;
	p.seq = 0;

	sendWindow(d);

}
```

OUTPUT:



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1b$ ./a.out
TCP Client
Connected to server.
Enter window size: 3
Enter array size:
6
Enter array elements: 1 2 3 4 5 6
Sent: 1 (SEQ 0)
2 (SEQ 1) lost
Sent: 3 (SEQ 2)
Received: ACK 0
Sent: 4 (SEQ 3)
Received: NACK 1. Window retransmitting.
Sent: 2 (SEQ 1)
Sent: 3 (SEQ 2)
4 (SEQ 3) lost
ACK 1 not received! Window retransmitting.
Sent: 2 (SEQ 1)
Sent: 3 (SEQ 2)
Sent: 4 (SEQ 3)
Received: ACK 1
Sent: 5 (SEQ 4)
Received: ACK 2
Sent: 6 (SEQ 5)
Received: ACK 3
ACK 4 not received! Window retransmitting.
Sent: 5 (SEQ 4)
Sent: 6 (SEQ 5)
Received: ACK 4
Received: ACK 5
Send completed.
Array: -1 -1 -1 -1 -1 -1
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1b$
```



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1b$ gcc server.c
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1b$ ./a.out
Go-Back-N ARQ
TCP Server
Connected to client.
Received: 1 (SEQ 0)
Sent: ACK 0
Sent: NACK 1
Received: 2 (SEQ 1)
ACK 1 lost
Received: 3 (SEQ 2)
Sent: ACK 2
Received: 2 (SEQ 1)
Sent: ACK 1
Received: 3 (SEQ 2)
Sent: ACK 2
Received: 4 (SEQ 3)
Sent: ACK 3
Received: 5 (SEQ 4)
ACK 4 lost
Received: 6 (SEQ 5)
Sent: ACK 5
Received: 5 (SEQ 4)
Sent: ACK 4
Received: 6 (SEQ 5)
Sent: ACK 5
Receive completed.
Array: 1 2 3 4 5 6
```

c) SELECTIVE REPEAT ARQ

SOURCE CODE:

SERVER:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>
#include <pthread.h>

#define PORT 9000
#define SIZE 100

typedef struct packet {
        int data;
        int type; // SEQ (0), ACK (1) or NACK(-1)
```

```
	int seq; // Sequence number
} packet;

int add(int* arr, int key, int index) {
	int flag = -1;

	for(int i = 0; i < index; i++) {
		if(arr[i] == -1) {
			flag = i;
			break;
		}
	}

	arr[index] = key;

	return flag;
}

void main() {
	int server_fd, client_fd;
	struct sockaddr_in address;
	int addrlen = sizeof(address);

	printf("Selective Repeat ARQ\nTCP Server\n");

	if((server_fd = socket(AF_INET, SOCK_STREAM, 0)) < 0) {
		printf("Socket creation failed!\n");
		exit(1);
	}

	address.sin_family = AF_INET;
	address.sin_addr.s_addr = INADDR_ANY;
	address.sin_port = htons(PORT);

	if(bind(server_fd, (struct sockaddr*) &address, addrlen) < 0) {
		printf("Socket binding failed!\n");
		exit(1);
	}

	if(listen(server_fd, 5) < 0) {
		printf("Listening failed!\n");
		exit(1);
	}

	if((client_fd = accept(server_fd, (struct sockaddr*) &address, (socklen_t*) &addrlen)) <
0) {
		printf("Connection failed!\n");
		exit(1);
	} else {
		printf("Connected to client.\n");
	}

	packet p;

	int* arr = malloc(SIZE * sizeof(int));

	for(int i = 0; i < SIZE; i++)
		arr[i] = -1;

	while(1) {
		int status = recv(client_fd, &p, sizeof(packet), 0);

		if(status < 0) {
			printf("Receive failed!\n");
		} else if (status == 0) {
			printf("Receive completed.\nArray: ");

			for(int i = 0; arr[i] != -1; i++) {
				printf("%d ", arr[i]);
			}

			printf("\n");

			break;
		} else {
			printf("Received: %d (SEQ %d)\n", p.data, p.seq);

			int index = add(arr, p.data, p.seq);

			if(index != -1) {
				int temp = p.seq;

				p.type = -1;

				p.seq = index;

				if(rand() % 10 != 6) {
					if(send(client_fd, &p, sizeof(packet), 0) < 0) {
						printf("Send failed!\n");
					} else {
						printf("Sent: NACK %d\n", p.seq);
					}
```

```
                    } else {
                        printf("Lost: NACK %d\n", p.seq);
                    }

                    p.seq = temp;
                }

                p.type = 1;

                if(rand() % 10 != 6) {
                    if(send(client_fd, &p, sizeof(packet), 0) < 0) {
                        printf("Send failed!\n");
                    } else {
                        printf("Sent: ACK %d\n", p.seq);
                    }
                } else {
                    printf("Lost: ACK %d\n", p.seq);
                }
            }
        }

        close(server_fd);
        close(client_fd);
}
```

CLIENT:

```
#include <stdio.h>
#include <stdlib.h>
#include <sys/socket.h>
#include <arpa/inet.h>
#include <unistd.h>

#define PORT 9000

int count = 0;

typedef struct packet {
        int data;
        int type; // SEQ (0), ACK (1) or NACK(-1)
        int seq; // Sequence number
} packet;

typedef struct window {
        int size;
        int start;
        int end;
} window;

typedef struct data {
        int* arr;
        int n;
        int client_fd;
        packet* p;
        window* w;
} data;

int ackFrame(int* arr, int index) {
        int flag = -1;

        for(int i = 0; i < index; i++) {
                if(arr[i] != -1) {
                        flag = i;
                        break;
                }
        }

        arr[index] = -1;

        return flag;
}

void sendWindow(data d) {
        for(d.p->seq = d.w->start; d.p->seq <= d.w->end && d.p->seq < d.n; d.p->seq++) {
                d.p->type = 0;
                d.p->data = d.arr[d.p->seq];

                if(d.p->data == -1)
                        continue;

                if(rand() % 10 != 6) {
                        if(send(d.client_fd, d.p, sizeof(packet), 0) < 0) {
                                printf("Send failed!\n");
                        } else {
                                printf("Sent: %d (SEQ %d)\n", d.p->data, d.p->seq);
                        }
                } else {
                        printf("Lost: %d (SEQ %d)\n", d.p->data, d.p->seq);
                }
        }
}
```

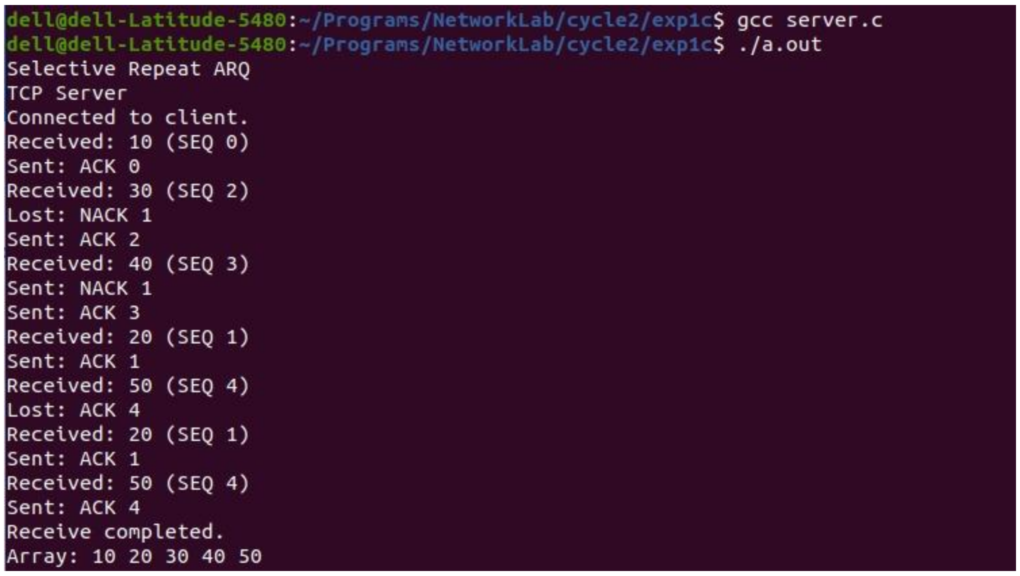
```
void sendFrame(data d, int seq) {
        d.p->type = 0;
        int temp;

        if(seq == -1)
                d.p->data = d.arr[d.w->end];
        else {
                d.p->data = d.arr[seq];
                temp = d.p->seq;
                d.p->seq = seq;
        }

        if(d.p->data == -1)
                return;

        if(rand() % 10 != 6) {
                if(send(d.client_fd, d.p, sizeof(packet), 0) < 0) {
                        printf("Send failed!\n");
                } else {
                        printf("Sent: %d (SEQ %d)\n", d.p->data, d.p->seq);
                }
        } else {
                printf("Lost: %d (SEQ %d)\n", d.p->data, d.p->seq);
        }

        if(seq == -1)
                d.p->seq = d.p->seq + 1;
        else
                d.p->seq = temp;
}

void recvAck(data d) {
        data d1;
        packet p;
        d1.p = &p;

        if(recv(d.client_fd, d1.p, sizeof(packet), 0) < 0) {
                printf("Time out! Window retransmitting.\n");
                sendWindow(d);
                recvAck(d);
        } else {
                if(d1.p->type == 1) {
                        if(d.arr[d1.p->seq] == -1) {
                                recvAck(d);
                        } else {
                                printf("Received: ACK %d\n", d1.p->seq);
```

```
                                        count++;

                                        d.w->start++;
                                        d.w->end++;

                                        int index = ackFrame(d.arr, d1.p->seq);

                                        if(index != -1) {
                                                  printf("ACK %d not received! Frame %d
retransmitting.\n", index, index);

                                                  sendFrame(d, index);
                                        }

                                        if(count == d.n) {
                                                  printf("Send completed.\nArray: ");

                                                  for(int i = 0; i < d.n; i++) {
                                                            printf("%d ", d.arr[i]);
                                                  }

                                                  printf("\n");

                                                  close(d.client_fd);
                                                  exit(0);
                                        }

                                        if(d.w->end < d.n) {
                                                  sendFrame(d, -1);

                                                  recvAck(d);
                                        }
                                        else
                                                  recvAck(d);
                              }
                    } else if(d1.p->type == -1) {
                              printf("Received: NACK %d. Frame %d retransmitting.\n", d1.p->seq,
d1.p->seq);

                              sendFrame(d, d1.p->seq);

                              recvAck(d);
                    }
          }
}
```

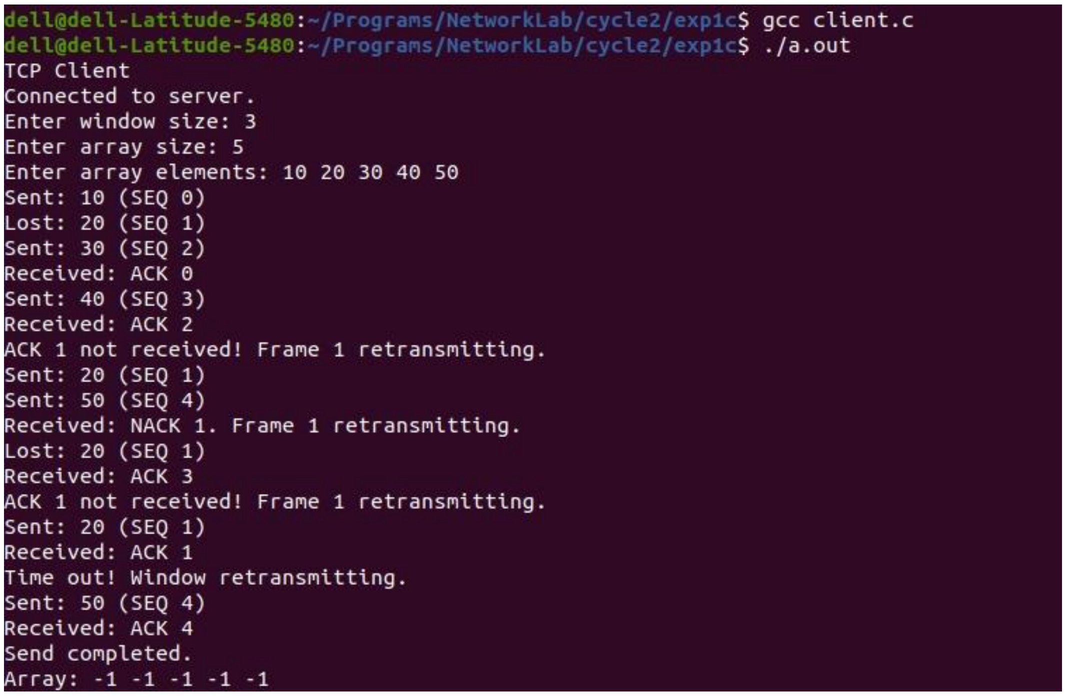
```
void main() {
	int client_fd;
	struct sockaddr_in serv_addr;

	printf("TCP Client\n");

	client_fd = socket(AF_INET, SOCK_STREAM, 0);

	if(client_fd < 0) {
		printf("Socket creation failed!\n");
		exit(1);
	}

	serv_addr.sin_family = AF_INET;
	serv_addr.sin_addr.s_addr = INADDR_ANY;
	serv_addr.sin_port = htons(PORT);

	if(connect(client_fd, (struct sockaddr*) &serv_addr, sizeof(serv_addr)) < 0) {
		printf("Connection failed!\n");
		exit(1);
	} else {
		printf("Connected to server.\n");
	}

	struct timeval tv;
	tv.tv_sec = 1;
	tv.tv_usec = 0;
	setsockopt(client_fd, SOL_SOCKET, SO_RCVTIMEO, (const char*)&tv, sizeof tv);

	int n;
	window w;

	printf("Enter window size: ");
	scanf("%d", &w.size);

	w.start = 0;
	w.end = w.size - 1;

	printf("Enter array size: ");
	scanf("%d", &n);

	int arr[n];

	printf("Enter array elements: ");
	for(int i = 0; i < n; i++) {
```

```
                scanf("%d", &arr[i]);
        }

        packet p;
        data d;
        d.client_fd = client_fd;
        d.p = &p;
        d.w = &w;
        d.n = n;
        d.arr = arr;
        p.seq = 0;

        sendWindow(d);
        recvAck(d);
}
```

OUTPUT:



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1c$ gcc server.c
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1c$ ./a.out
Selective Repeat ARQ
TCP Server
Connected to client.
Received: 10 (SEQ 0)
Sent: ACK 0
Received: 30 (SEQ 2)
Lost: NACK 1
Sent: ACK 2
Received: 40 (SEQ 3)
Sent: NACK 1
Sent: ACK 3
Received: 20 (SEQ 1)
Sent: ACK 1
Received: 50 (SEQ 4)
Lost: ACK 4
Received: 20 (SEQ 1)
Sent: ACK 1
Received: 50 (SEQ 4)
Sent: ACK 4
Receive completed.
Array: 10 20 30 40 50
```



```
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1c$ gcc client.c
dell@dell-Latitude-5480:~/Programs/NetworkLab/cycle2/exp1c$ ./a.out
TCP Client
Connected to server.
Enter window size: 3
Enter array size: 5
Enter array elements: 10 20 30 40 50
Sent: 10 (SEQ 0)
Lost: 20 (SEQ 1)
Sent: 30 (SEQ 2)
Received: ACK 0
Sent: 40 (SEQ 3)
Received: ACK 2
ACK 1 not received! Frame 1 retransmitting.
Sent: 20 (SEQ 1)
Sent: 50 (SEQ 4)
Received: NACK 1. Frame 1 retransmitting.
Lost: 20 (SEQ 1)
Received: ACK 3
ACK 1 not received! Frame 1 retransmitting.
Sent: 20 (SEQ 1)
Received: ACK 1
Time out! Window retransmitting.
Sent: 50 (SEQ 4)
Received: ACK 4
Send completed.
Array: -1 -1 -1 -1 -1
```