Client:

```c
recvfrom(sockfd, &rcv_pkt, sizeof(rcv_pkt), 0, (struct sockaddr *)&info, (socklen_t *)&len);
for(int i=0;i<1024;i++){
    buffer[index++] = rcv_pkt.data[i];
}
//strcat(buffer, &rcv_pkt.data);
```

1. Receive data into buffer

```c
snd_pkt.header.seq_num = 0;
snd_pkt.header.ack_num = rcv_pkt.header.seq_num;
snd_pkt.header.is_last = rcv_pkt.header.is_last;
sendto(sockfd, &snd_pkt, sizeof(snd_pkt), 0,(struct sockaddr *)&info, len);
printf("Receive a packet (seq_num = %d, ack_num = %d)\n", rcv_pkt.header.seq_num, rcv_pkt.header.ack_num);
if(rcv_pkt.header.is_last == 1){

    if(fwrite(buffer,sizeof(char),index,fd)){
        // printf("Failed to write from buffer to file.\n");
    }
    break;
}
```

2. If last, write buffer into file

Server:

```c
//     sent_last=false;
if(!resend)
    for(int cnt=0;cnt<1024;cnt++){
            index++;
            snd_pkt.data[cnt] = fgetc(fd);
            if(index == filesize) {
                //sent_last = true;
                snd_pkt.header.isLast=1;
                break;
            }

    }
snd_pkt.header.ack_num = n;
snd_pkt.header.seq_num = n;
sendto(sockfd, &snd_pkt, sizeof(snd_pkt), 0,(struct sockaddr *)&client_info, len);
```

1. If resent, send the old pkt, else, read 1024 byte of file or until EOF into send pkt.

```c
setsockopt(sockfd,SOL_SOCKET,SO_RCVTIMEO,(char*)&timeout,sizeof(struct timeval));
if((recvfrom(sockfd, &rcv_pkt, sizeof(rcv_pkt), 0, (struct sockaddr *)&client_info, (socklen_t *)&len))== -1){
    resend = true;
    printf("Timeout! resend packet %d", snd_pkt.header.seq_num);
}else{
    n++;
    printf("Received a packet (seq_num = %d, ack_num = %d)\n)",  rcv_pkt.header.seq_num, rcv_pkt.header.ack_num);
    if(rcv_pkt.header.isLast == 1) break;
}
```

2. If timeout, resend, else, if received last ack, break while loop, finish sending. Else, send next pkt.

Run program:

Client:

```
       Oops! Packet loss!
Receive a packet (seq_num = 110, ack_num = 110)
       Oops! Packet loss!
Receive a packet (seq_num = 111, ack_num = 111)
       Oops! Packet loss!
       Oops! Packet loss!
Receive a packet (seq_num = 112, ack_num = 112)
       Oops! Packet loss!
Receive a packet (seq_num = 113, ack_num = 113)
Receive a packet (seq_num = 114, ack_num = 114)
       Oops! Packet loss!
       Oops! Packet loss!
Receive a packet (seq_num = 115, ack_num = 115)
Receive a packet (seq_num = 116, ack_num = 116)
       Oops! Packet loss!
Receive a packet (seq_num = 117, ack_num = 117)
       Oops! Packet loss!
       Oops! Packet loss!
Receive a packet (seq_num = 118, ack_num = 118)
Receive a packet (seq_num = 119, ack_num = 119)
       Oops! Packet loss!
       Oops! Packet loss!
       Oops! Packet loss!
Receive a packet (seq_num = 120, ack_num = 120)
Total cost 1 secs
Waiting for a commands...
```

Server:

```
)Received a packet (seq_num = 0, ack_num = 100)
)Received a packet (seq_num = 0, ack_num = 101)
)Received a packet (seq_num = 0, ack_num = 102)
)Received a packet (seq_num = 0, ack_num = 103)
)Received a packet (seq_num = 0, ack_num = 104)
)Received a packet (seq_num = 0, ack_num = 105)
)Received a packet (seq_num = 0, ack_num = 106)
)Received a packet (seq_num = 0, ack_num = 107)
)Received a packet (seq_num = 0, ack_num = 108)
)Received a packet (seq_num = 0, ack_num = 109)
)Received a packet (seq_num = 0, ack_num = 110)
)Received a packet (seq_num = 0, ack_num = 111)
)Received a packet (seq_num = 0, ack_num = 112)
)Received a packet (seq_num = 0, ack_num = 113)
)Received a packet (seq_num = 0, ack_num = 114)
)Received a packet (seq_num = 0, ack_num = 115)
)Received a packet (seq_num = 0, ack_num = 116)
)Received a packet (seq_num = 0, ack_num = 117)
)Received a packet (seq_num = 0, ack_num = 118)
)Received a packet (seq_num = 0, ack_num = 119)
)Received a packet (seq_num = 0, ack_num = 120)
)send file successfully
server waiting
```