EE3204E Lab Assignment

Submitted by

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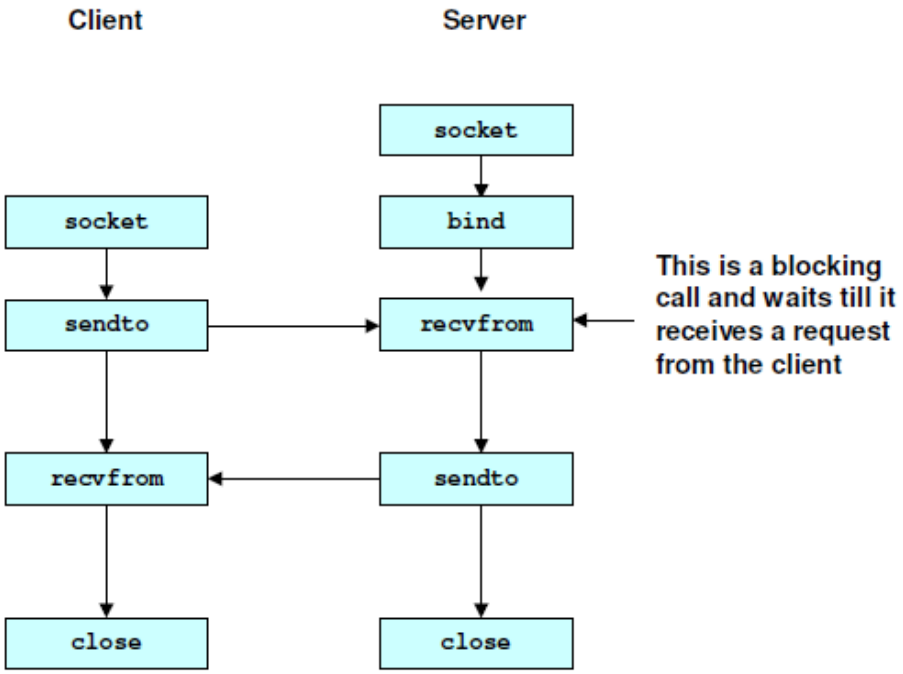
Problem

Develop a UDP-based client-server socket program for transferring a large message. Here, the message transmitted from the client to server is read from a large file. The message is split into short data-units which are sent by using stop-and-wait flow control. Also, a data-unit sent could be damaged with some error probability. Verify if the file has been sent completely and correctly by comparing the received file with the original file. Measure the message transfer time and throughput for various sizes of data-units. Also, measure the performance for various error probabilities and also for the error-free scenario.

Introduction

The flow for a UDP-based client-server socket program can be visualized as:



1. **int socket(int family,int type,int proto);**

   The socket() system call returns a socket descriptor (small integer) or -1 on error. It allocates resources needed for a communication endpoint - but it does not deal with endpoint addressing. The parameter family specifies the protocol family: (AF_INET for Internet, PF_INET for TCP/IP). 'type' specifies the type of service: SOCK_STREAM or SOCK_DGRAM and protocol specifies the specific protocol which is usually 0 (default).

2. **int bind(int sockfd, const struct sockaddr *myaddr, int addrlen);**

   The bind() system call is used to assign an address (specified by myaddr) to an existing socket and returns -1 on error. It binds the server to a port which is passed as a parameter.
   Note: In this case, we do not use bind for client because the OS can assign it any available number.

3. **sendto()**

   It transmits a message to another socket and returns -1 on error.

4. **recvfrom()**

   It receives a message from another socket and returns -1 on error.

Observations

1. Varying the Datalength and Frame Error Probability = 0

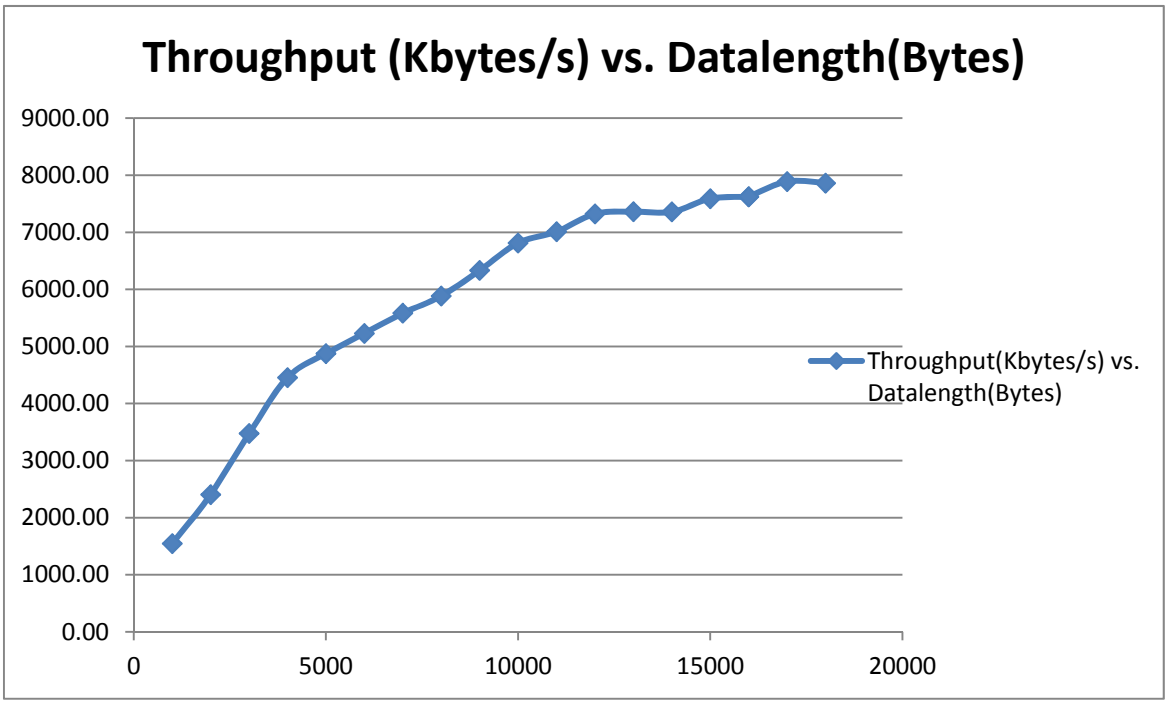
When I increased datalength from 1000 bytes to 18000 bytes,

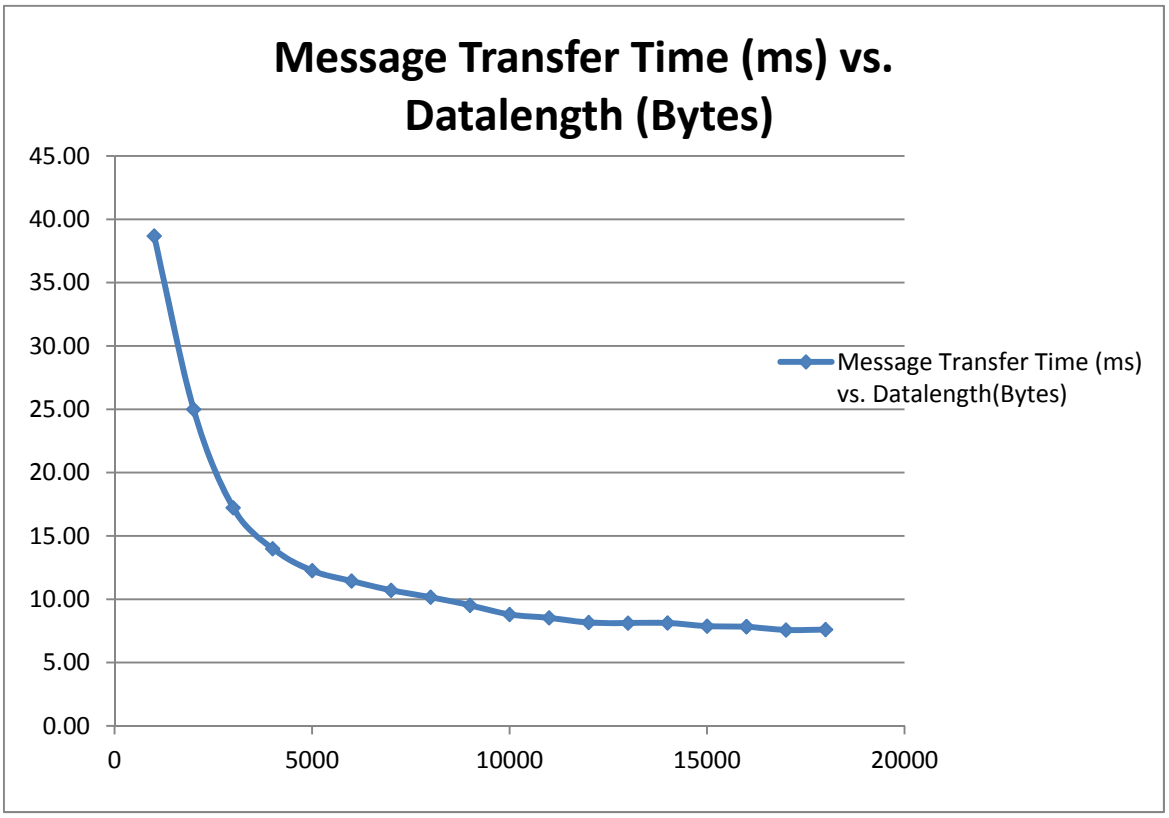
The throughput increased steeply at first, and marginally at higher values of datalength. This is because lesser packets were sent for larger datalengths.

The message transfer time decreased exponentially and then stabilized for larger datalengths.

Error Probability = 0

Datalength (bytes)	Throughput (Kbytes/s)	Message Transfer Time (ms)
1000	1545.68	38.68
2000	2405.00	25.00
3000	3474.32	17.23
4000	4454.85	14.00
5000	4874.98	12.27
6000	5228.03	11.44
7000	5583.96	10.71
8000	5884.56	10.16
9000	6331.99	9.52
10000	6813.24	8.80
11000	7010.00	8.53
12000	7323.09	8.16
13000	7360.95	8.12
14000	7357.75	8.13
15000	7589.00	7.88
16000	7621.80	7.84
16000	7621.797363	7.845
17000	7890.340332	7.578
18000	7860.260254	7.607


Throughput (Kbytes/s) vs. Datalength(Bytes)
9000.00
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
0
5000
10000
15000
20000
Throughput(Kbytes/s) vs. Datalength(Bytes)


Message Transfer Time (ms) vs. Datalength (Bytes)
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
5000
10000
15000
20000
Message Transfer Time (ms) vs. Datalength(Bytes)

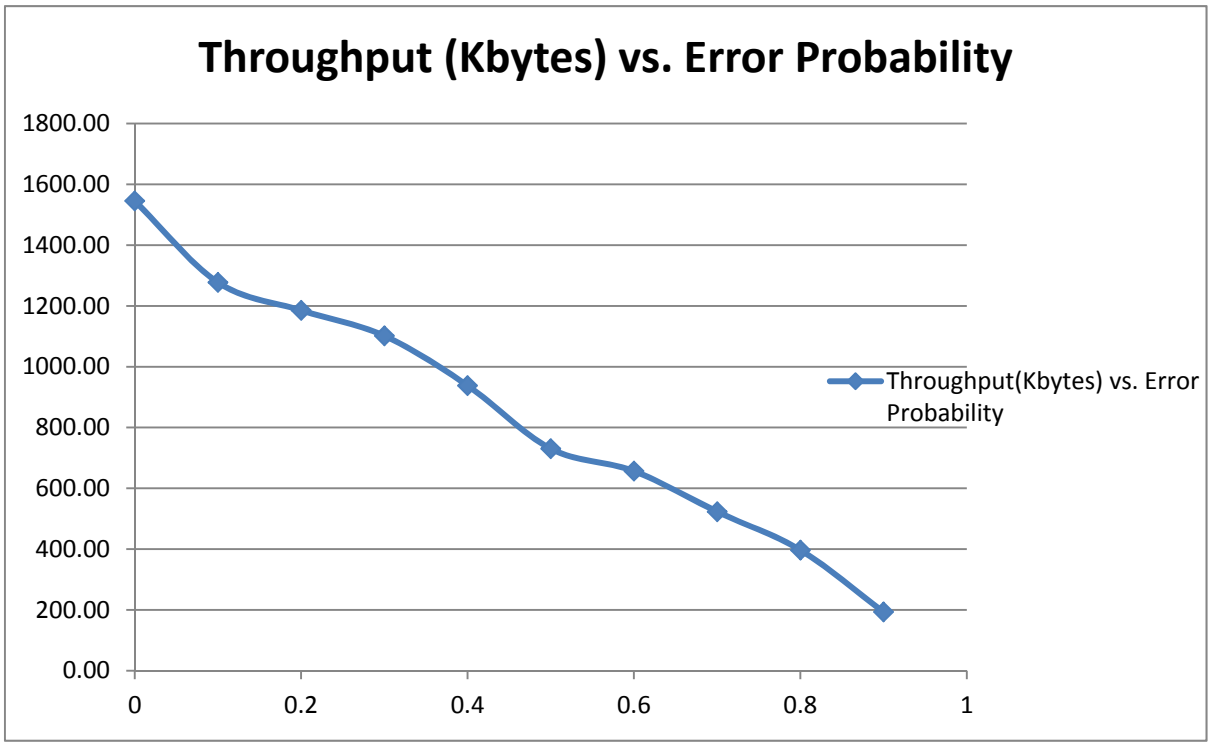
2. Varying the Frame Error Probability and Datalength = 1000 bytes

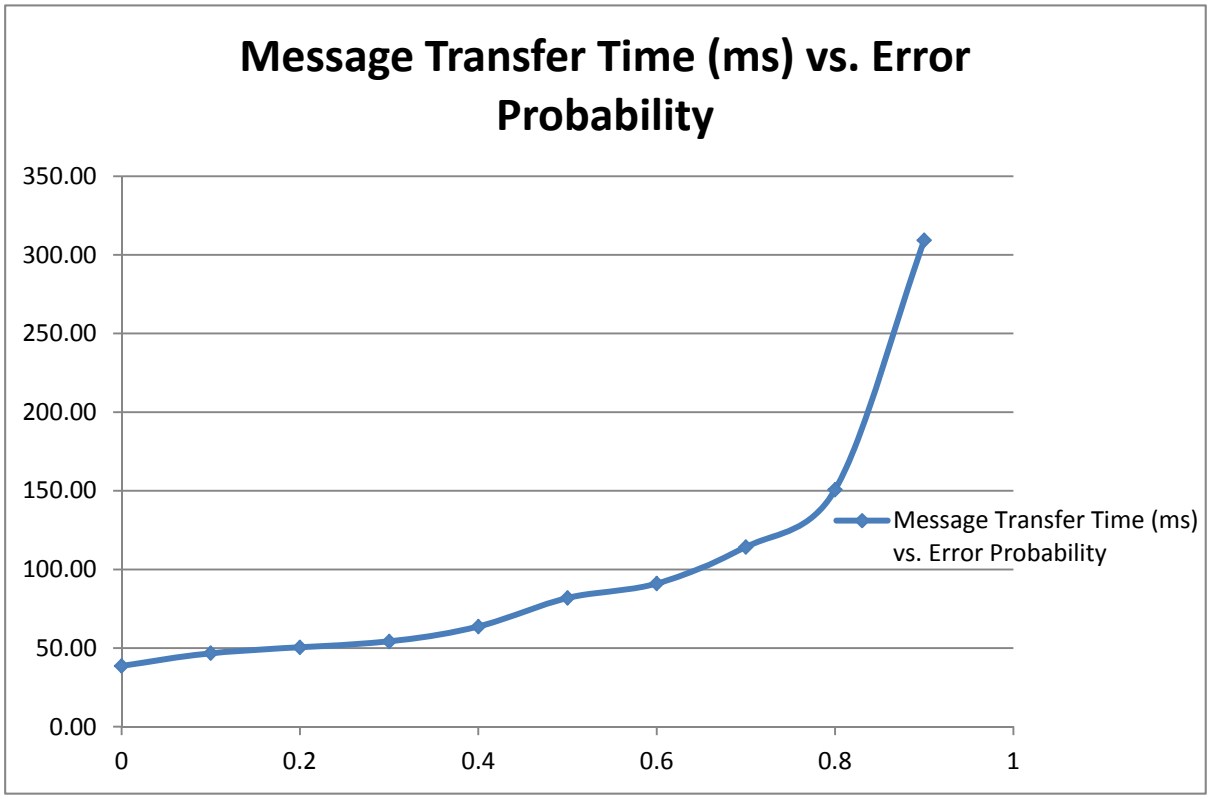
When I increased error probability from 0.0 to 0.9,

The throughput decreased and message transfer time increased because ‘bad’ packets were sent and good packets had to be retransmitted.

Datalength = 1000 bytes

Error Probability	Throughput (Kbytes/s)	Message Transfer Time (ms)
0	1545.68	38.68
0.1	1277.57	46.80
0.2	1185.40	50.44
0.3	1101.69	54.27
0.4	938.09	63.74
0.5	730.40	81.86
0.6	656.71	91.05
0.7	523.09	114.31
0.8	396.91	150.64
0.9	193.29	309.34


Throughput (Kbytes) vs. Error Probability
1800.00
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
0
0.2
0.4
0.6
0.8
1
Throughput(Kbytes) vs. Error Probability


Message Transfer Time (ms) vs. Error Probability
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
0
0.2
0.4
0.6
0.8
1
Message Transfer Time (ms) vs. Error Probability