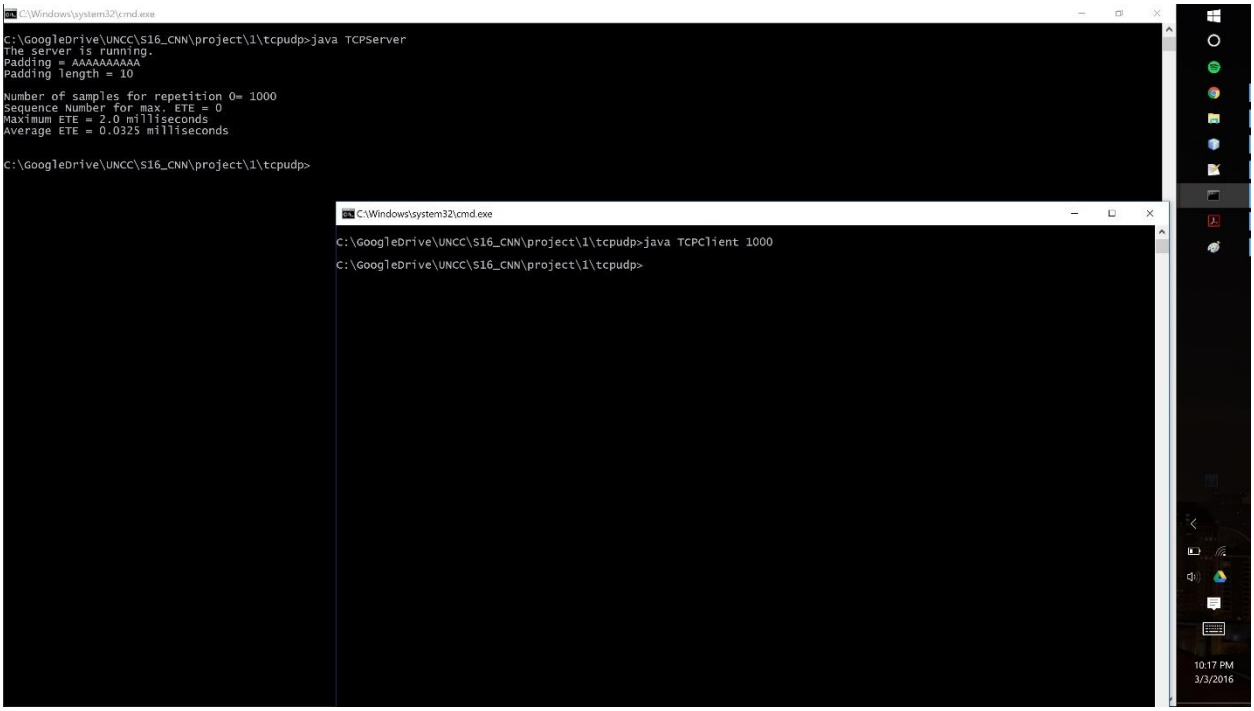
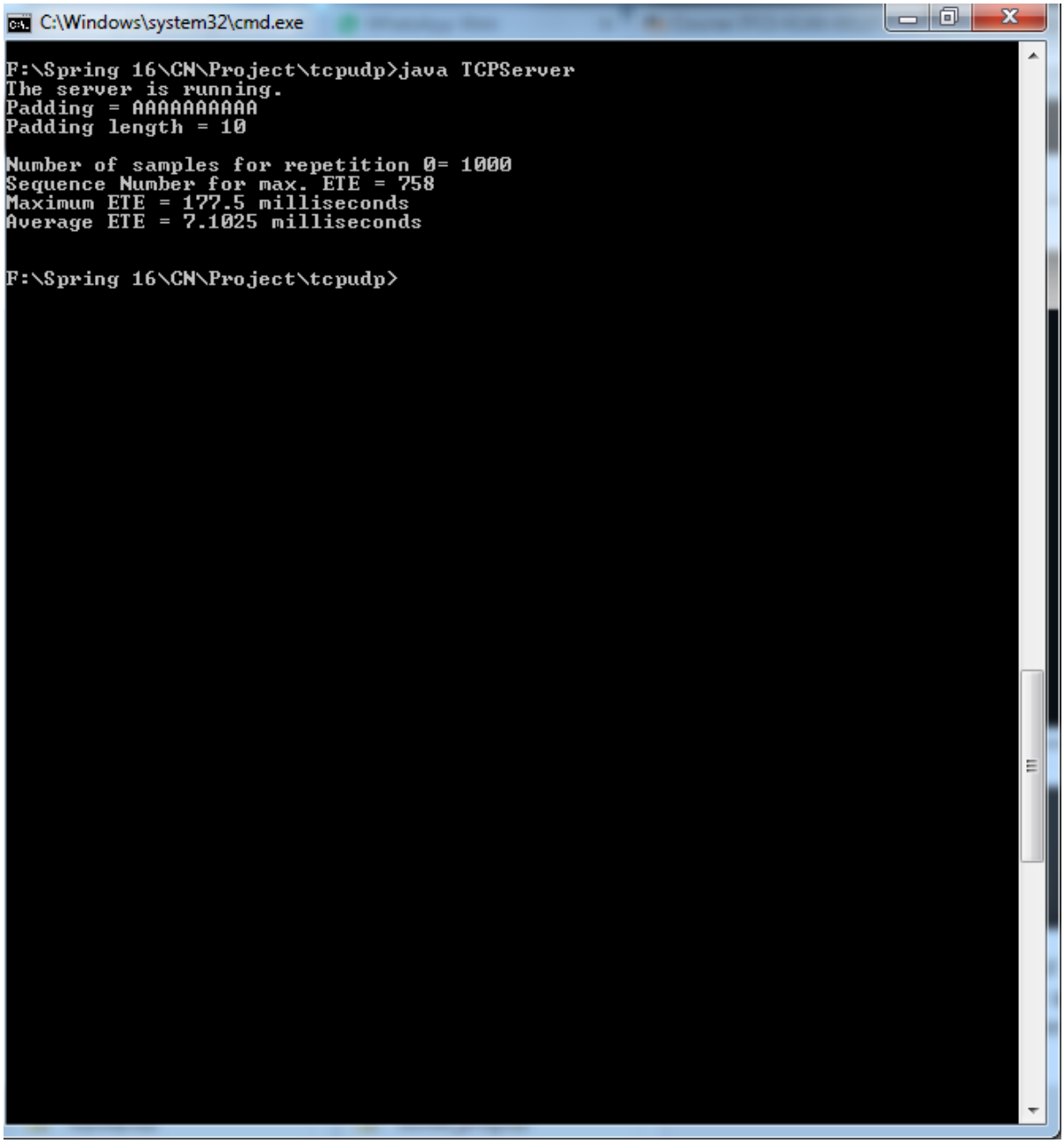
Part 2 : UDP vs TCP Performance Evaluation:

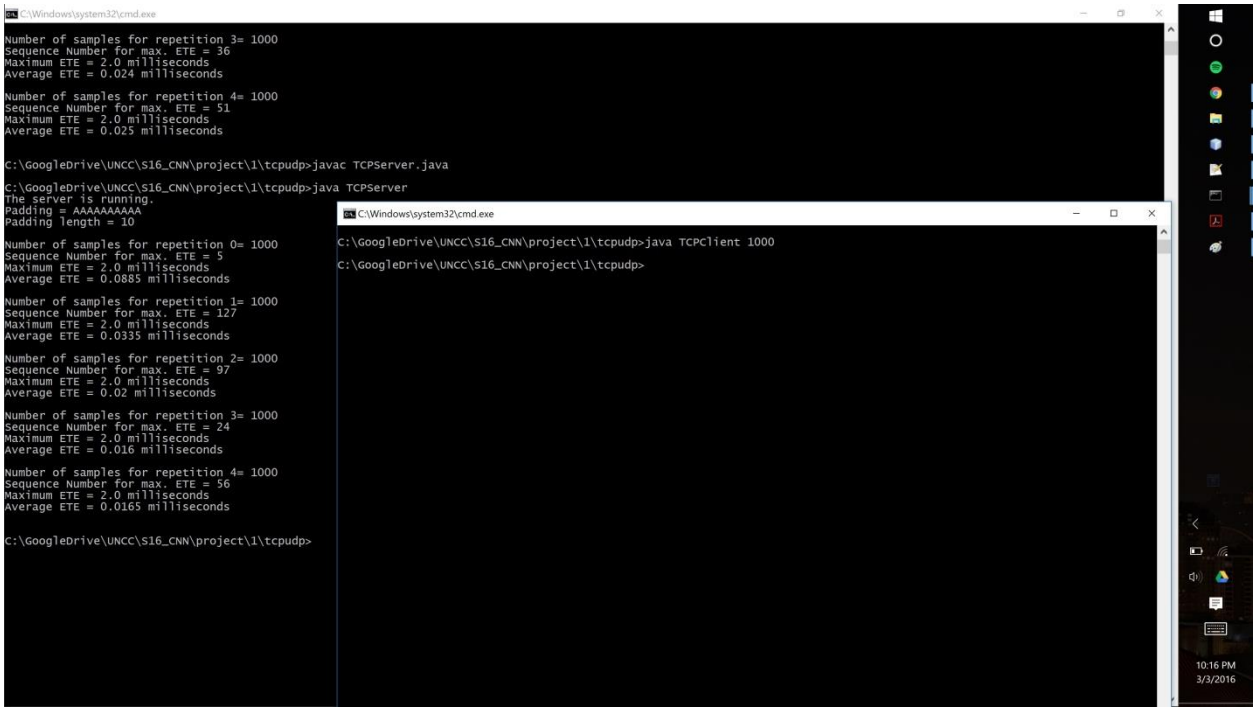
TCP:

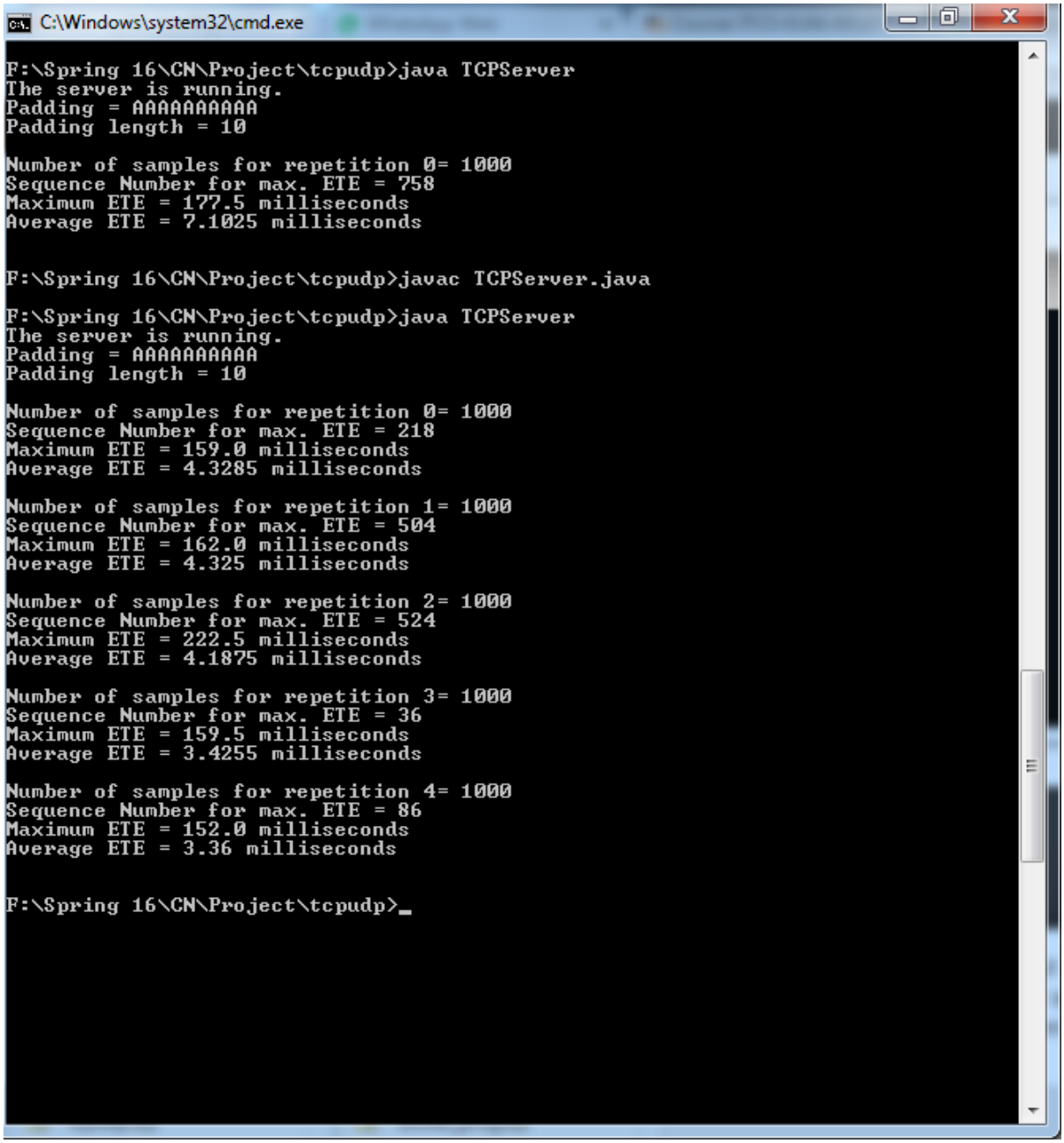
1. Padding length = 10,
   Repetitions = 1



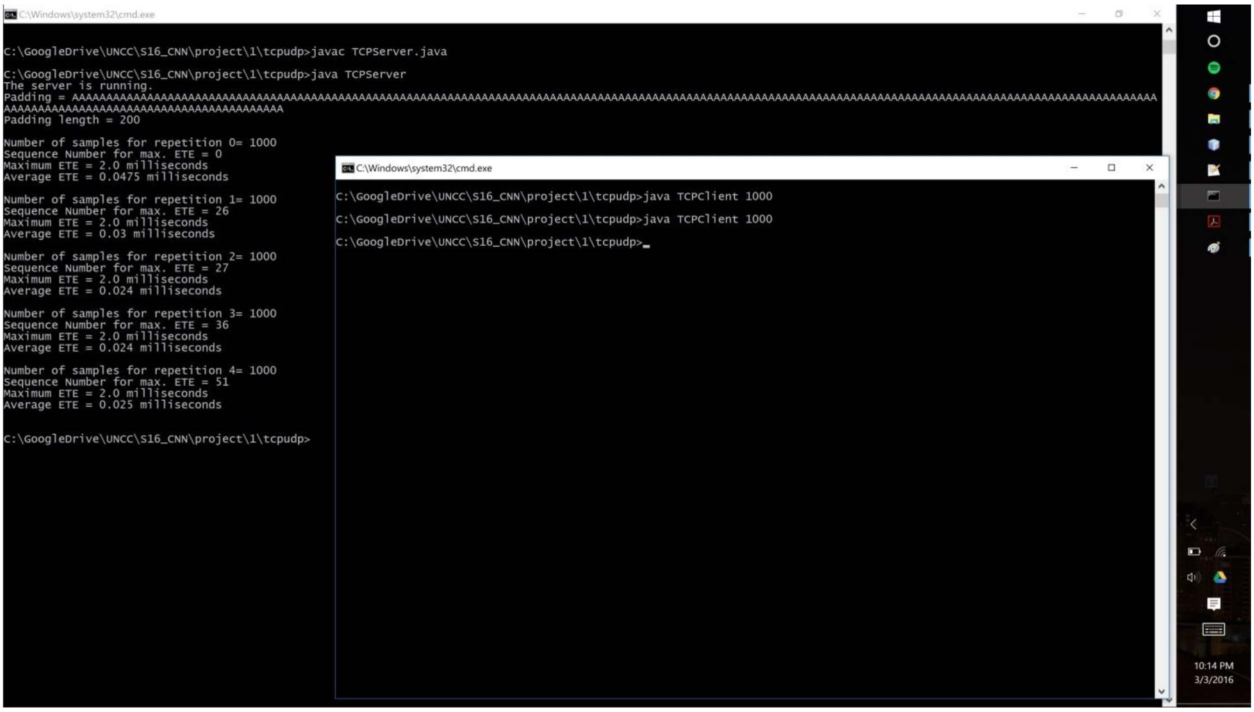

C:\Windows\system32\cmd.exe
F:\Spring 16\CN\Project\tcpudp>java TCPServer
The server is running.
Padding = AAAAAAAAAA
Padding length = 10
Number of samples for repetition 0= 1000
Sequence Number for max. ETE = 758
Maximum ETE = 177.5 milliseconds
Average ETE = 7.1025 milliseconds
F:\Spring 16\CN\Project\tcpudp>

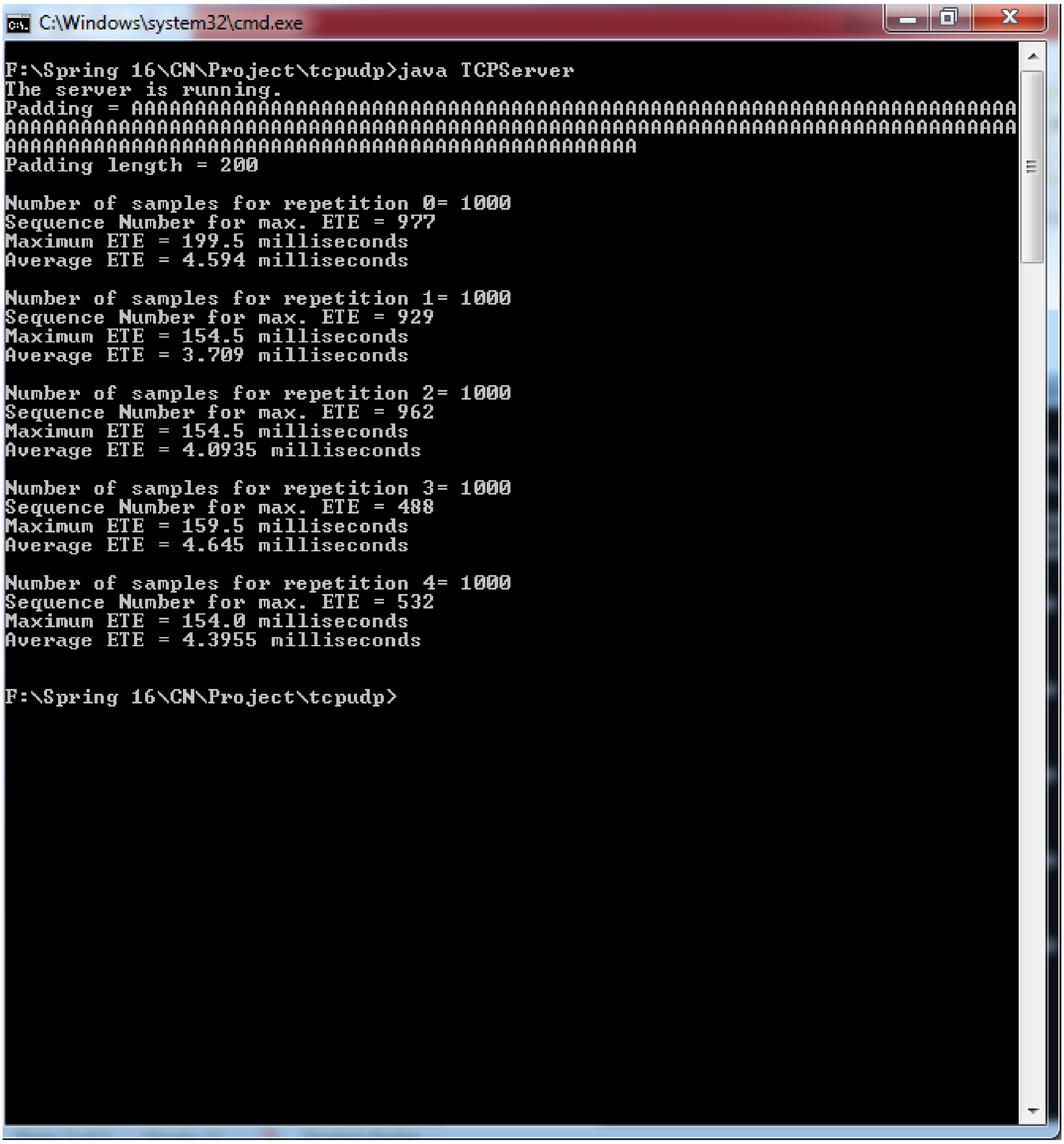
2. Padding length = 10,
   Repetitions = 5



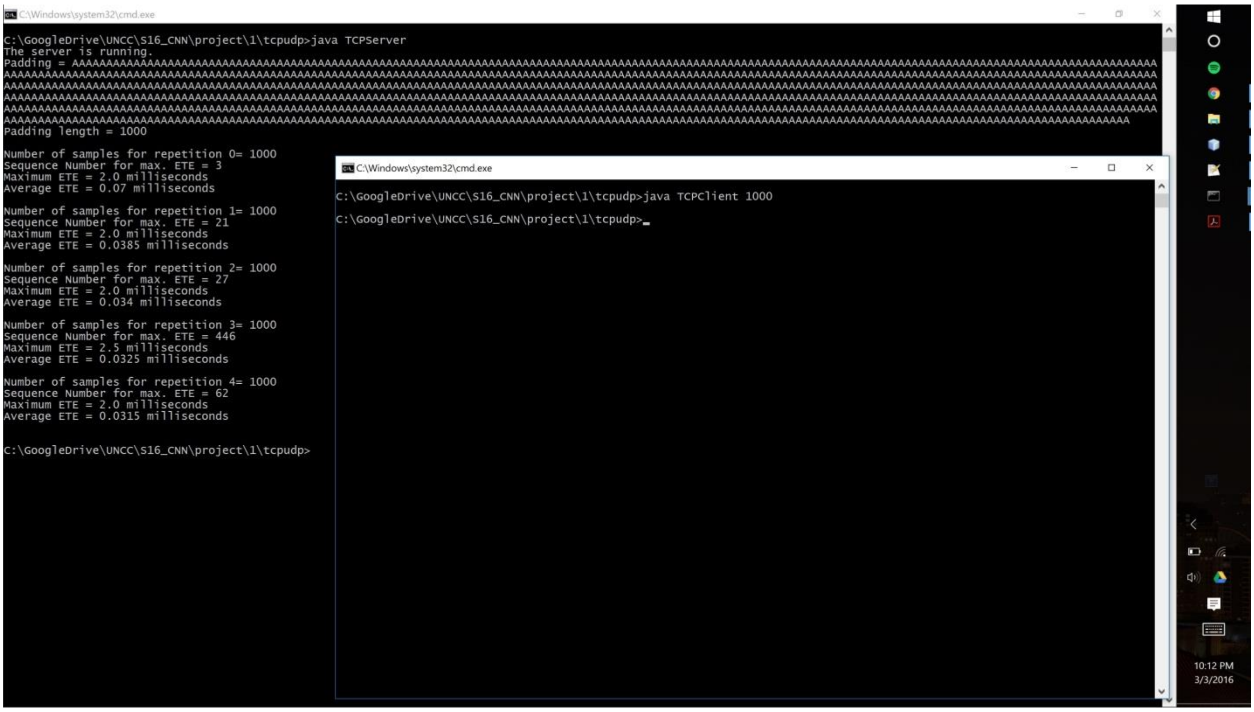

C:\Windows\system32\cmd.exe
F:\Spring 16\CN\Project\tcpudp>java TCPServer
The server is running.
Padding = AAAAAAAAAA
Padding length = 10
Number of samples for repetition 0= 1000
Sequence Number for max. ETE = 758
Maximum ETE = 177.5 milliseconds
Average ETE = 7.1025 milliseconds
F:\Spring 16\CN\Project\tcpudp>javac TCPServer.java
F:\Spring 16\CN\Project\tcpudp>java TCPServer
The server is running.
Padding = AAAAAAAAAA
Padding length = 10
Number of samples for repetition 0= 1000
Sequence Number for max. ETE = 218
Maximum ETE = 159.0 milliseconds
Average ETE = 4.3285 milliseconds
Number of samples for repetition 1= 1000
Sequence Number for max. ETE = 504
Maximum ETE = 162.0 milliseconds
Average ETE = 4.325 milliseconds
Number of samples for repetition 2= 1000
Sequence Number for max. ETE = 524
Maximum ETE = 222.5 milliseconds
Average ETE = 4.1875 milliseconds
Number of samples for repetition 3= 1000
Sequence Number for max. ETE = 36
Maximum ETE = 159.5 milliseconds
Average ETE = 3.4255 milliseconds
Number of samples for repetition 4= 1000
Sequence Number for max. ETE = 86
Maximum ETE = 152.0 milliseconds
Average ETE = 3.36 milliseconds
F:\Spring 16\CN\Project\tcpudp>_

3. Padding length = 200,
   Repetitions = 5




C:\Windows\system32\cmd.exe
F:\Spring 16\CN\Project\tcpudp>java TCPServer
The server is running.
Padding = AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Padding length = 200
Number of samples for repetition 0= 1000
Sequence Number for max. ETE = 977
Maximum ETE = 199.5 milliseconds
Average ETE = 4.594 milliseconds
Number of samples for repetition 1= 1000
Sequence Number for max. ETE = 929
Maximum ETE = 154.5 milliseconds
Average ETE = 3.709 milliseconds
Number of samples for repetition 2= 1000
Sequence Number for max. ETE = 962
Maximum ETE = 154.5 milliseconds
Average ETE = 4.0935 milliseconds
Number of samples for repetition 3= 1000
Sequence Number for max. ETE = 488
Maximum ETE = 159.5 milliseconds
Average ETE = 4.645 milliseconds
Number of samples for repetition 4= 1000
Sequence Number for max. ETE = 532
Maximum ETE = 154.0 milliseconds
Average ETE = 4.3955 milliseconds
F:\Spring 16\CN\Project\tcpudp>

4. Padding length = 1000,
   Repetitions = 5

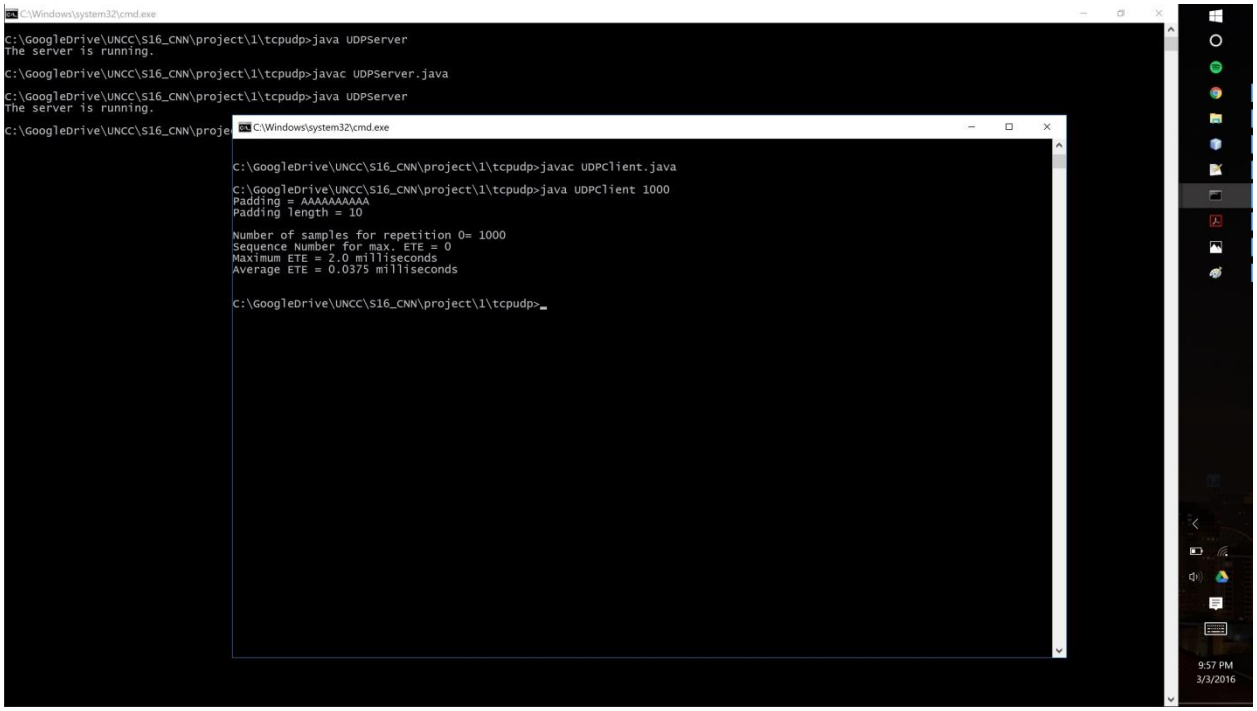


C:\Windows\system32\cmd.exe

```
F:\Spring 16\CN\Project\tcpudp>java TCPServer
The server is running.
Padding = AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
Padding length = 1000

Number of samples for repetition 0= 1000
Sequence Number for max. ETE = 756
Maximum ETE = 153.5 milliseconds
Average ETE = 3.1795 milliseconds

Number of samples for repetition 1= 1000
Sequence Number for max. ETE = 873
Maximum ETE = 20.0 milliseconds
Average ETE = 3.159 milliseconds

Number of samples for repetition 2= 1000
Sequence Number for max. ETE = 39
Maximum ETE = 17.5 milliseconds
Average ETE = 2.902 milliseconds

Number of samples for repetition 3= 1000
Sequence Number for max. ETE = 403
Maximum ETE = 16.5 milliseconds
Average ETE = 3.299 milliseconds

Number of samples for repetition 4= 1000
Sequence Number for max. ETE = 185
Maximum ETE = 24.0 milliseconds
Average ETE = 3.1685 milliseconds


F:\Spring 16\CN\Project\tcpudp>
```

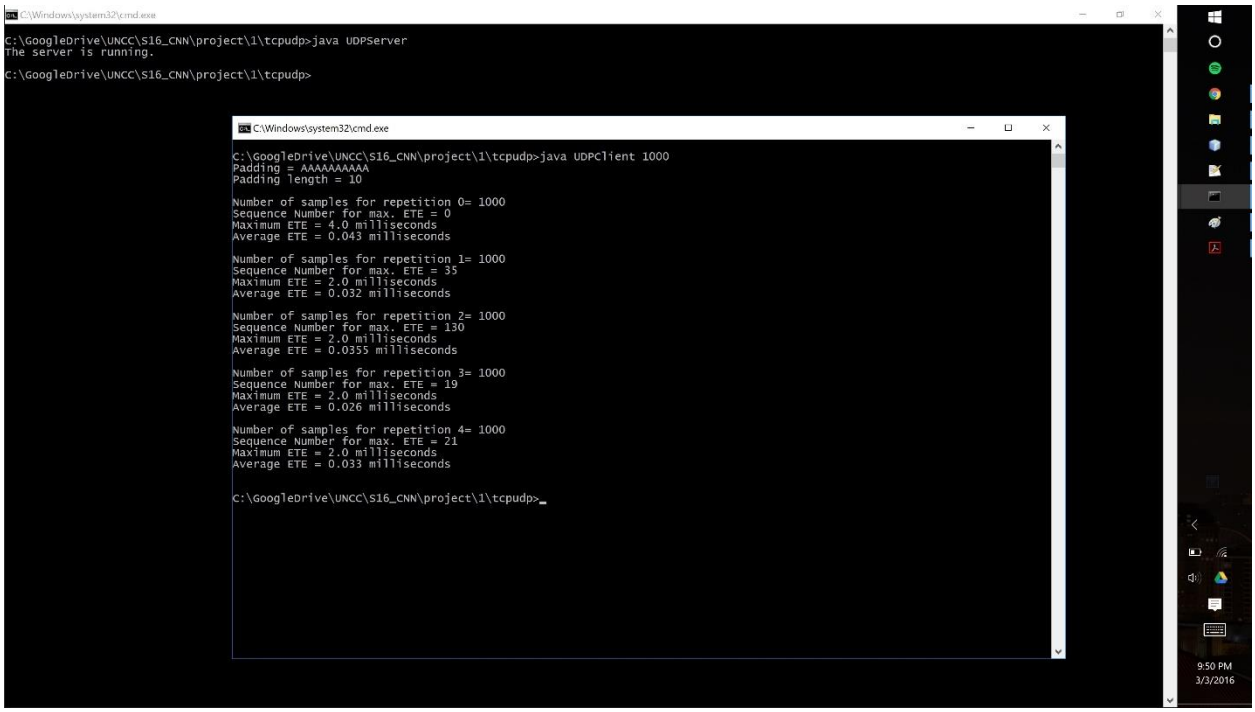
UDP:

1. Padding length = 10,
   Repetitions = 1



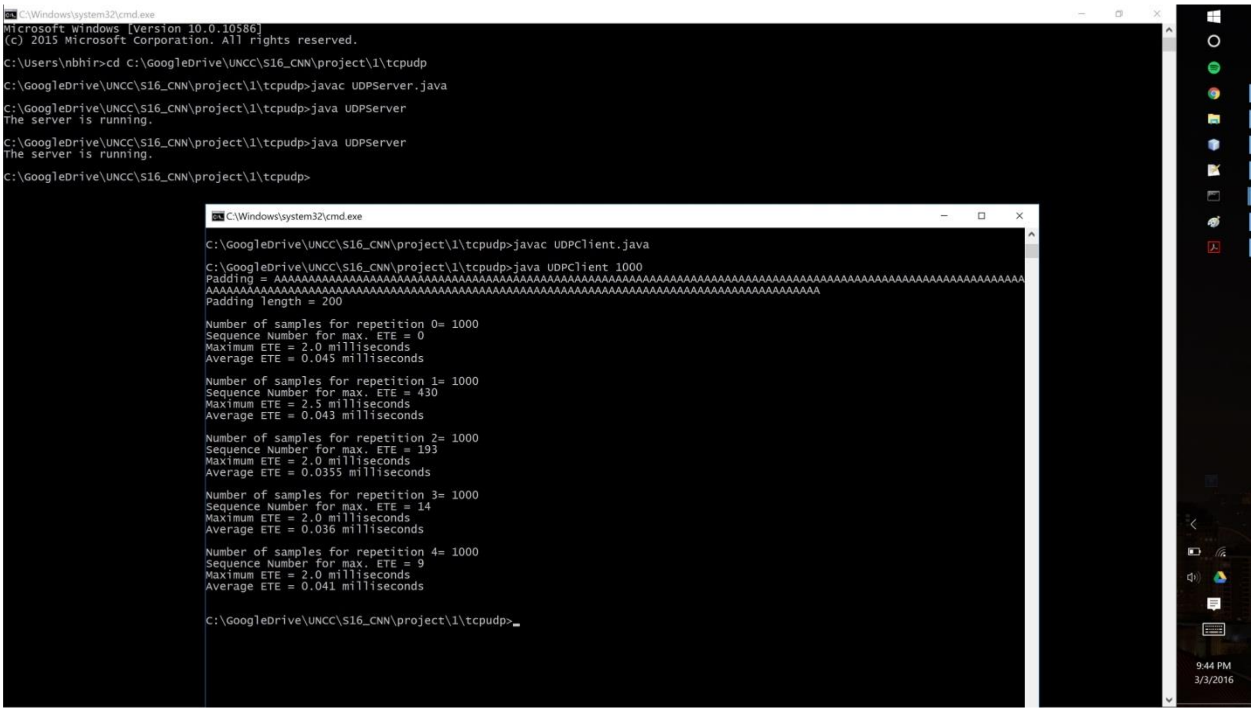
2. Padding length = 10,

   Repetitions = 5



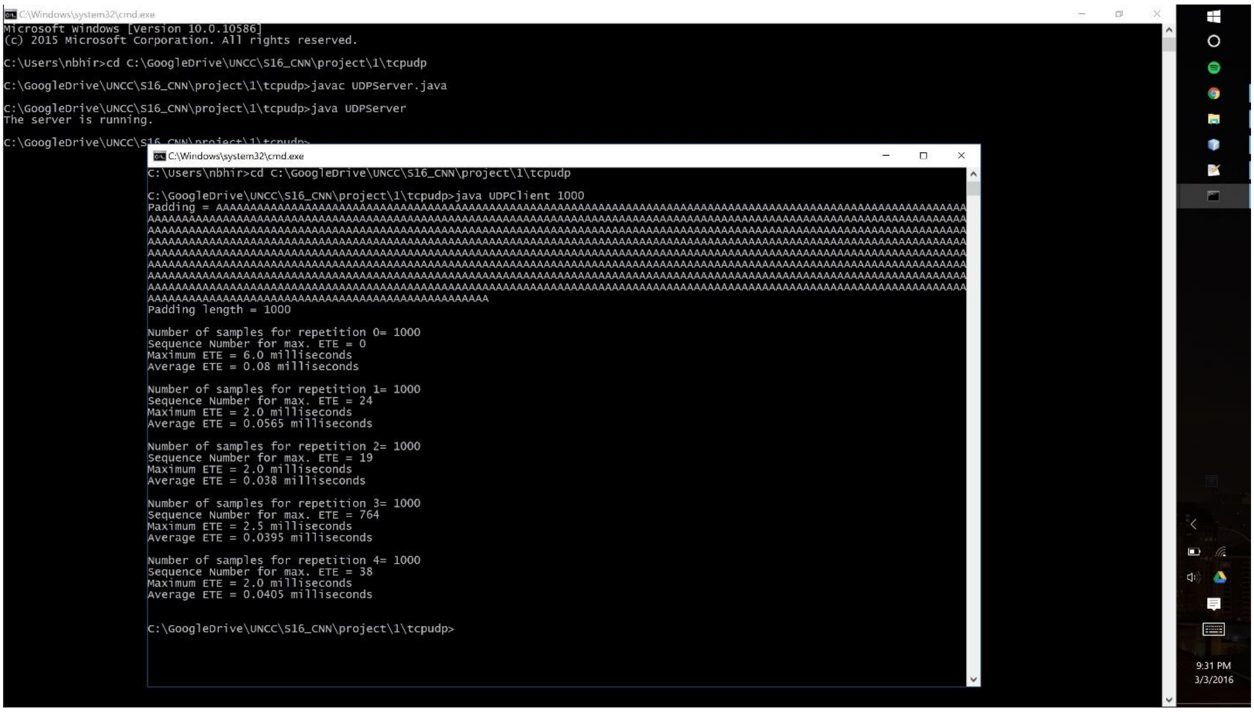
3. Padding length = 200,

   Repetitions = 5



4. Padding length = 1000,

   Repetitions = 5



Questions

1) Are the average ETE values, obtained from step 2, different for each of the 5 times that step 1 is repeated? Why?

Answer:

Yes, the average ETEs obtained in each of the 5 times are different in each repetition.

This is because the ETE depends on many factors like collision, timeout, network congestion, etc. and the average can get affected greatly because of a few low or high outliers.

2) Compare the average and maximum ETE for steps 2, 3, and 4 for TCP only. Explain the differences.

Answer:

Average and maximum ETE for 10 characters

AVG ETE = 1.845milliseconds

MAX ETE = 8.5 milliseconds

Average and maximum ETE for 200 characters

AVG ETE: 2.136 milliseconds

MAX ETE: 12.5 milliseconds

Average and maximum ETE for 1000 characters

AVG ETE: 3.711 milliseconds

MAX ETE: 16.0 milliseconds

It can be observed that as the size of the packet increases the time taken for transmission increases.

3) Compare the average and maximum ETE between TCP and UDP, for each of steps 2, 3, and 4. Explain the differences between TCP and UDP. What conclusion can you draw in terms of the performance of TCP and UDP?

Answer:

Step	TCP		UDP	
	Max ETE	Avg ETE	Max ETE	Avg ETE
2	1.845ms	8.5ms	2.633ms	16ms
3	2.136ms	12.5ms	2.3335ms	23.5ms
4	3.711ms	16ms	4.2275ms	42ms

From the above observations, it can be understood that TCP performance is better than that of UDP.

4) If the tests were run over the Internet, where there is a chance of packet loss, how would the ETE values be different between UDP and TCP?

Answer:

Both the protocols differ in the way the Connection setup and Retransmission of failed packets are handled. In case of TCP, which is connection oriented, a connection is established and maintained. Also a lost packet is retransmitted. Both of these do not happen in case of UDP. So in general, the performance of UDP will be better than TCP in a unreliable network.