Part-1 Socket Programming

Socket programming is a widely used concept in networking and provides communication mechanisms between two computers using HTTP/TCP. A socket is an endpoint of a two-way communication link between two programs running on the network. When the connection is made, the server creates a socket object on its end of the communication. The client and server can now communicate by writing to and reading from the socket.

HTTP GET and PUT Methods are two most commonly used methods for a request-response between a client and server are: GET and POST.

- GET Requests data from a specified resource
- **POST** Submits data to be processed to a specified resource

GET

In GET method, the clients connects to the server using a TCP connection. After this is done, a **filename** with **filepath** is sent as a request to the server, requesting for the contents of the file to be shown. On the server's side, the availability of the file is checked first by the server and then the content is sent if it is available along with a status message "**200 OK**". If the content is not available then a message "**404 Not Found**" is sent to the client.

PUT

In the PUT method, the clients gets connected to the server using TCP connection. The client then checks for the availability and if the file exists, the file is sent to the server. The server in turn saves the file and sends "200 OK" message to the client, if saved.

Execution Steps for GET:

Client:

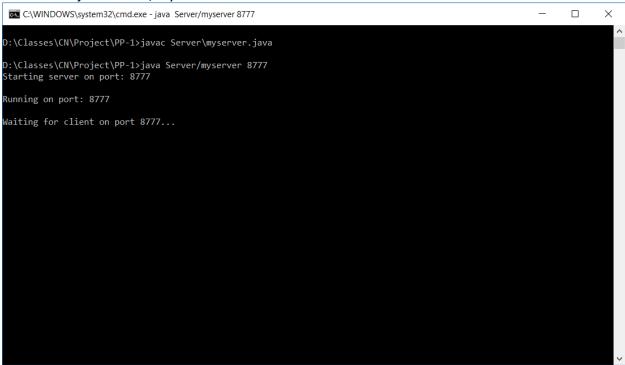
Compiling - javac Client\myclient.java

 $\label{thm:continuous} \mbox{Execution - java Client/myclient localhost 8777 GET D:\Classes\CN\Project\PP-1\Server\getdata.txt}$

Server:

Compiling - javac \Server\myserver.java

Execution - java Server/myserver 8777



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	Terminating connection to /127.0.0.1:60642 Waiting for client on port 8777		

Execution Steps for PUT:

Client:

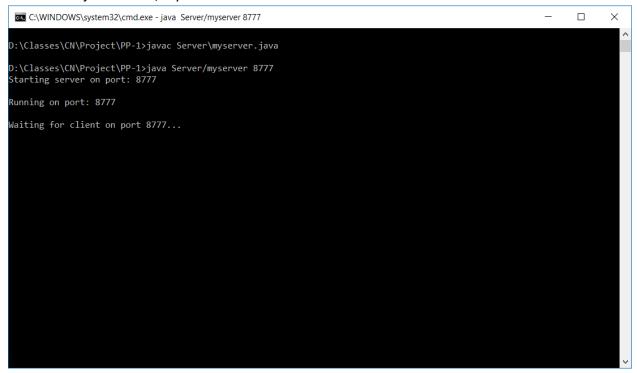
Compiling - javac Client\myclient.java

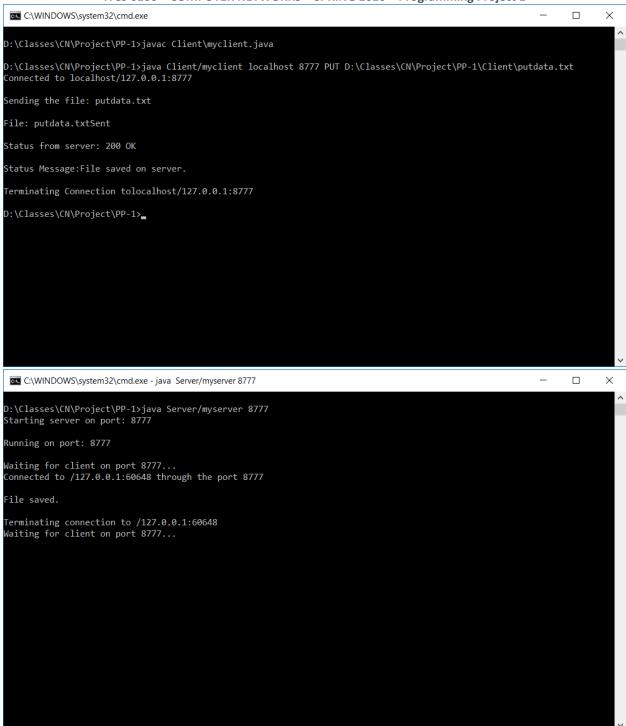
Execution - java Client/myclient localhost 8777 PUT D:\Classes\CN\Project\Socket_Programming_1\Client\putdata.txt

Server:

Compiling - javac \Server\myserver.java

Execution - java Server/myserver 8777





Part-2 TCP vs. UDP

Steps to Execute:

For TCP Readings	For UDP Readings
First Execute the tcp_receiver	First Execute the udp_receiver
javac tcp_receiver.java	javac udp_receiver.java
java tcp_receiver	java udp_receiver
Then execute tcp_sender	Then execute upd_sender
javac tcp_sender.java	javac udp_sender.java
java tcp_sender	java udp_sender

TCP Readings:	UDP Readings:
Step 1 - 10 Characters	Step 1 - 10 Characters
Maximum ETE: 146.0	Maximum ETE: 141.0
Average Time: 1.56	Average Time: 2.723
Max ETE at: 984	Max ETE at: 363
Zero Delay: 775	Zero Delay: 700
Step 2 - 10 Characters 5 Times	Step 2 - 10 Characters 5 Times
Maximum ETE: 137.0	Maximum ETE: 9.0
Average Time: 1.517	Average Time: 1.222
Max ETE at: 787	Max ETE at: 236
Zero Delay: 755	Zero Delay: 764
Maximum ETE: 9.0	Maximum ETE: 9.0
Average Time: 1.152	Average Time: 1.121
Max ETE at: 118	Max ETE at: 193
Zero Delay: 762	Zero Delay: 776
Maximum ETE: 9.0	Maximum ETE: 16.0
Average Time: 1.236	Average Time: 1.232
Max ETE at: 570	Max ETE at: 926
Zero Delay: 737	Zero Delay: 768
Maximum ETE: 403.0	Maximum ETE: 9.0
Average Time: 3.578	Average Time: 1.134
Max ETE at: 686	Max ETE at: 260
Zero Delay: 760	Zero Delay: 765
Maximum ETE: 15.0	Maximum ETE: 9.0
Average Time: 1.076	Average Time: 1.329
Max ETE at: 163	Max ETE at: 122
Zero Delay: 773	Zero Delay: 744

Taleba - Zuu Characiera a Times	Step 3 - 200 Characters 5 Times
Step 3 - 200 Characters 5 Times Maximum ETE: 15.0	Maximum ETE: 323.0
Average Time: 1.076	Average Time: 1.819
Max ETE at: 163	Max ETE at: 338
Zero Delay: 736	Zero Delay: 785
Zero Delay. 730	Zero Deray. 763
Maximum ETE: 11.0	Maximum ETE: 9.0
Average Time: 1.305	Average Time: 1.259
Max ETE at: 150	Max ETE at: 1
Zero Delay: 736	Zero Delay: 757
2010 Boldy. 730	Zero Belay. 737
Maximum ETE: 11.0	Maximum ETE: 9.0
Average Time: 1.477	Average Time: 1.36
Max ETE at: 353	Max ETE at: 67
Zero Delay: 745	Zero Delay: 733
Maximum ETE: 146.0	Maximum ETE: 9.0
Average Time: 1.903	Average Time: 1.164
Max ETE at: 95	Max ETE at: 245
Zero Delay: 754	Zero Delay: 763
Maximum ETE: 149.0	Maximum ETE: 143.0
Average Time: 1.847	Average Time: 1.095
Max ETE at: 831	Max ETE at: 96
Zero Delay: 709	Zero Delay: 752
Step 4 - 1000 Characters 5 Times	Step 4 - 1000 Characters 5 Times
Maximum ETE: 594.0	Maximum ETE: 144.0
Average Time: 3.508	Average Time: 3.321
===	NA ETE -+ 420
Max ETE at: 87	Max ETE at: 430
Max ETE at: 87 Zero Delay: 656	Zero Delay: 693
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Answer 1:

The average ETE values do not vary much as seen.

This is because the process we are repeating 5 times is using the same network connection (LAN) but the small variations are due to the utilizations of the network.

Answer 2:

The Average ETE values have increased for steps 2, 3, 4. This is because of the number of segments being transferred has increased for every step as the string length is increasing.

The Maximum ETE has increased for steps 2, 3, 4. Abrupt changes can be observed as there may be some packet losses or retransmissions involves in TCP.

Answer 3:

Step 2:

The average ETE and the maximum ETE values for TCP are greater than the values of the UDP. This is because TCP sends acknowledgement for the messages received so the higher values.

Step 3:

The average ETE and the maximum ETE values for TCP are greater than the values of the UDP. This is because of the increasing message size from step 2 and as a result more segments would be needed to transmit the message.

Step 4:

The average ETE and the maximum ETE values for TCP is much greater than the values of the UDP. This is because the padding is 1000 in this case so more segments for TCP.

Differences between TCP and UDP:

- TCP is a connection oriented whereas UDP is Connectionless as a result TCP takes more time to transfer the data. The same can be seen from the data collected.
- TCP is used for the applications for high reliability and for with the transmission time is
 if less concern on the other hand applications use UDP for fast transmission as it dumps
 the data at the receiver
- UDP is faster than the TCP as observed from the data collected.

Performance:

From these observations it is evident that the UDP performance is better in case of packet transmission rate and the number of zero delay values are greater in UDP case leading to the low overall average delay. But in case of UDP the there is no connection setup and packets can be dropped on the way to the recipient

Answer 4:

If the tests are run over the Internet where there is a high chance of a packet loss, the Average ETE values for TCP would be larger than UDP as TCP is a reliable service. As a result more delay will be caused due to packet loss for retransmission of lost packets

In case of UDP the lost packet would be discarded and would not be included for ETE as it can tolerate the loss unlike TCP.