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CSCE 313 - 910

Programming Assignment 5

Design of Code

In this assignment, I restructured my PA3 client.cpp in order to complete data point and file transfers using TCP/IP request channels. To fully implement TCP/IP channels I created constructors, destructors, and other functions in the TCPRequest.channel.cpp. I also rewrote the server.cpp so that multiple instances of the client program can connect to the server simultaneously. In this programming assignment, I removed the fork and exec functions in the client.cpp. This was necessary because I wanted to run the client and server on different terminal to implement IP communication.

In the client.cpp, I added an -a option that defaults to the IP address of 127.0.0.1 and a -r option that defaults to a port number of 8080. When I restructured the client I removed all instances of FIFORequest Channel and replaced them with TCPRequestChannel. Additionally, I also removed the create_new_channel I had in PA3. In the server I added an -r argument and a while loop to handle new connections.

TCPRequestChannel was created to replace the FIFORequestChannel.cpp file we had in PA3. To this file I added two TCP constructors (different use cases), one TCP destructor, an accept_conn() function ,a cread() function, and a cwrite(). In order to fully implement these functions I created my own helper variables like struct sockaddr_storage address_val.

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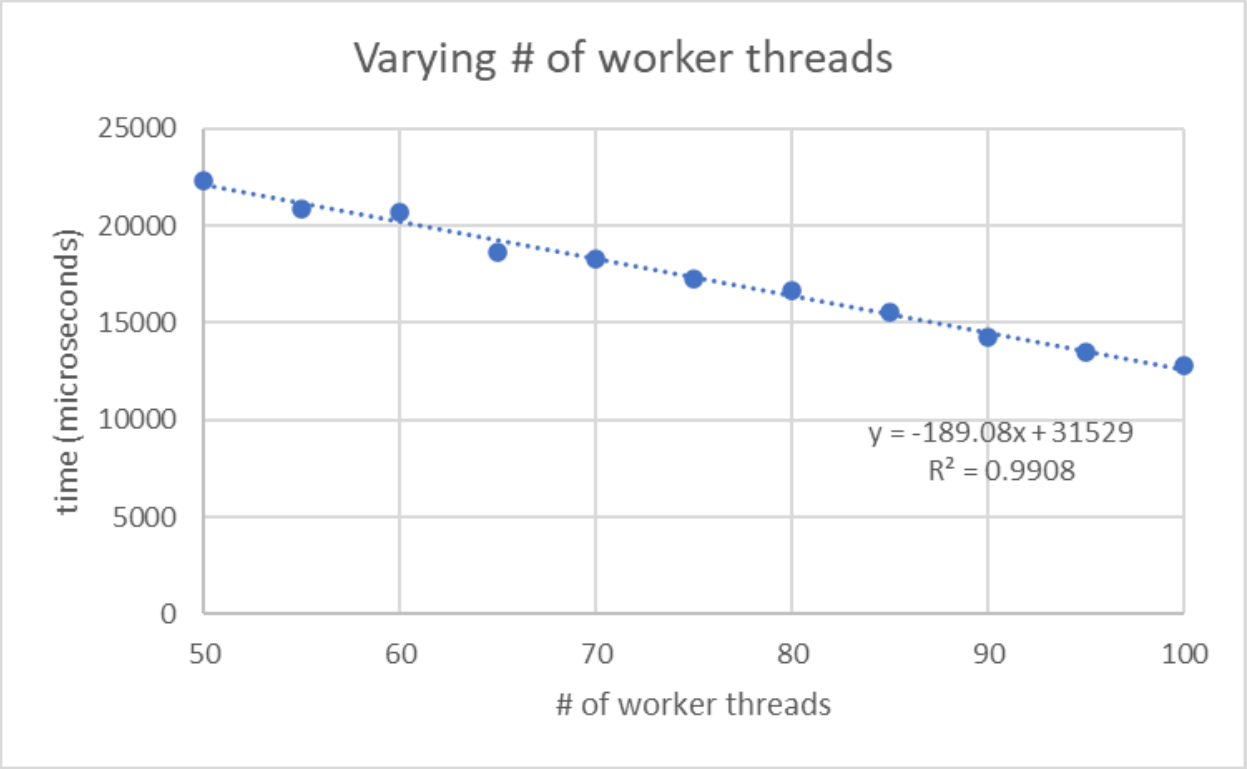
Data Analysis

data transfers:



When requested buffer and number of histogram threads are held constant while number of worker threads are varied there is a strong(R^2>0.7),negative,linear relationship between # of worker threads and microseconds taken to complete 15K data points transfer. With varying size of requested buffer and histogram threads there seems to be scaling occurring to the plot of varying # of worker threads.

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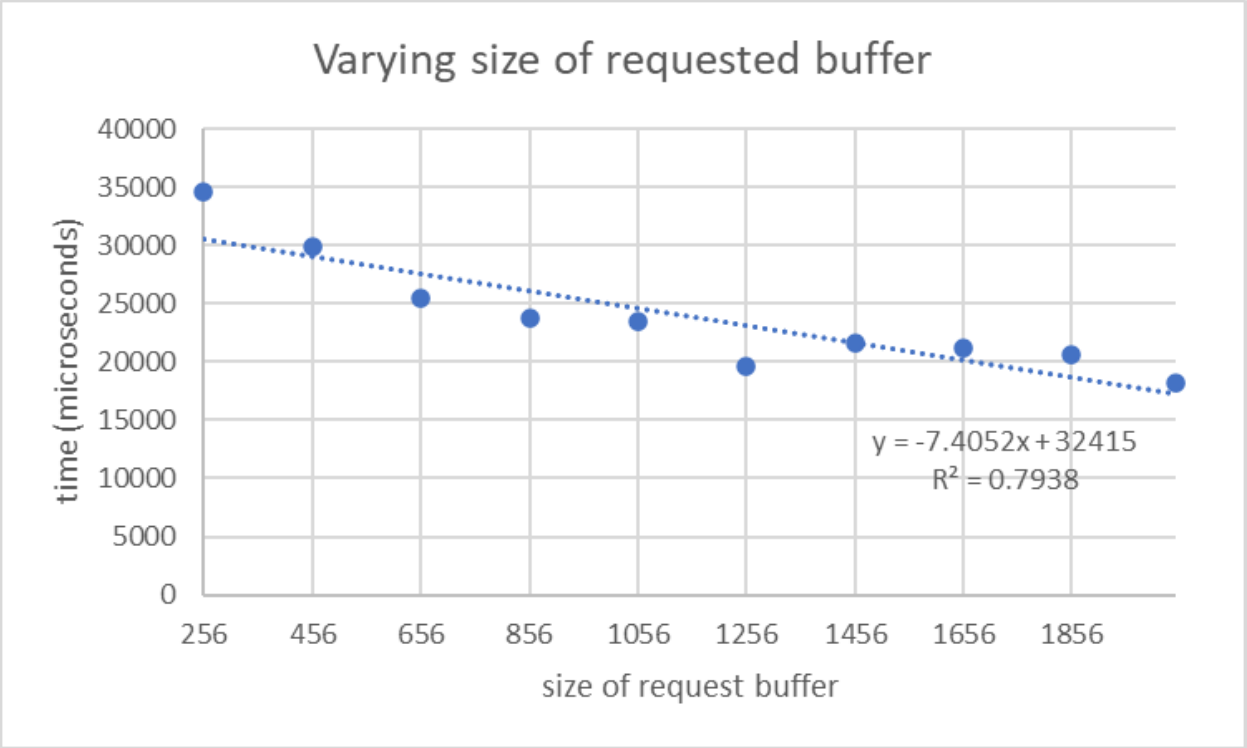

When number of worker threads and number of histogram threads are held constant while size of requested buffer is varied there is a strong(R^2>0.7),negative,linear relationship between size of requested buffer and microseconds taken to complete 15K data points transfer. With varying number of worker threads and number of histogram threads there seems to be scaling occurring to the plot of varying size of requested buffer.

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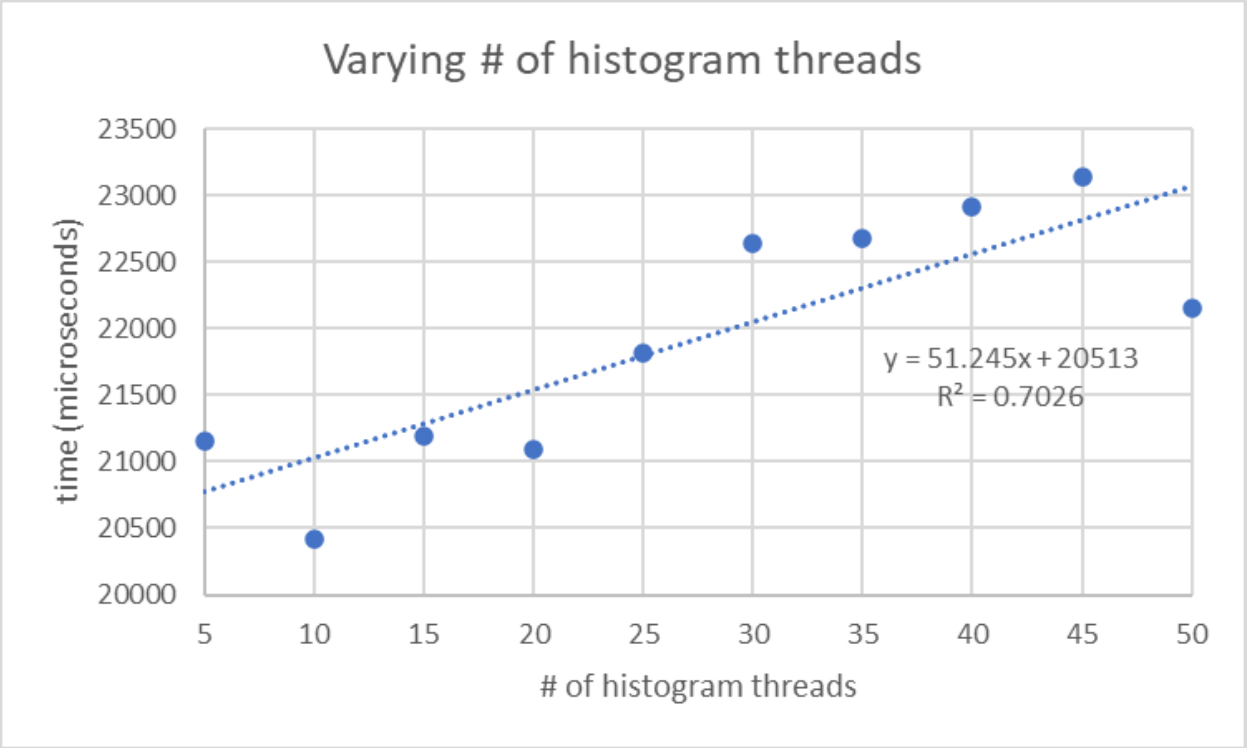

When number of worker threads and size of requested buffer are held constant while number of histogram threads is varied there is a strong(R^2>0.7),positive,linear relationship between number of histogram threads and microseconds taken to complete 15K data points transfer. With varying number of worker threads and size of requested buffer there seems to be scaling occurring to the plot of varying # of histogram threads.

file transfers:

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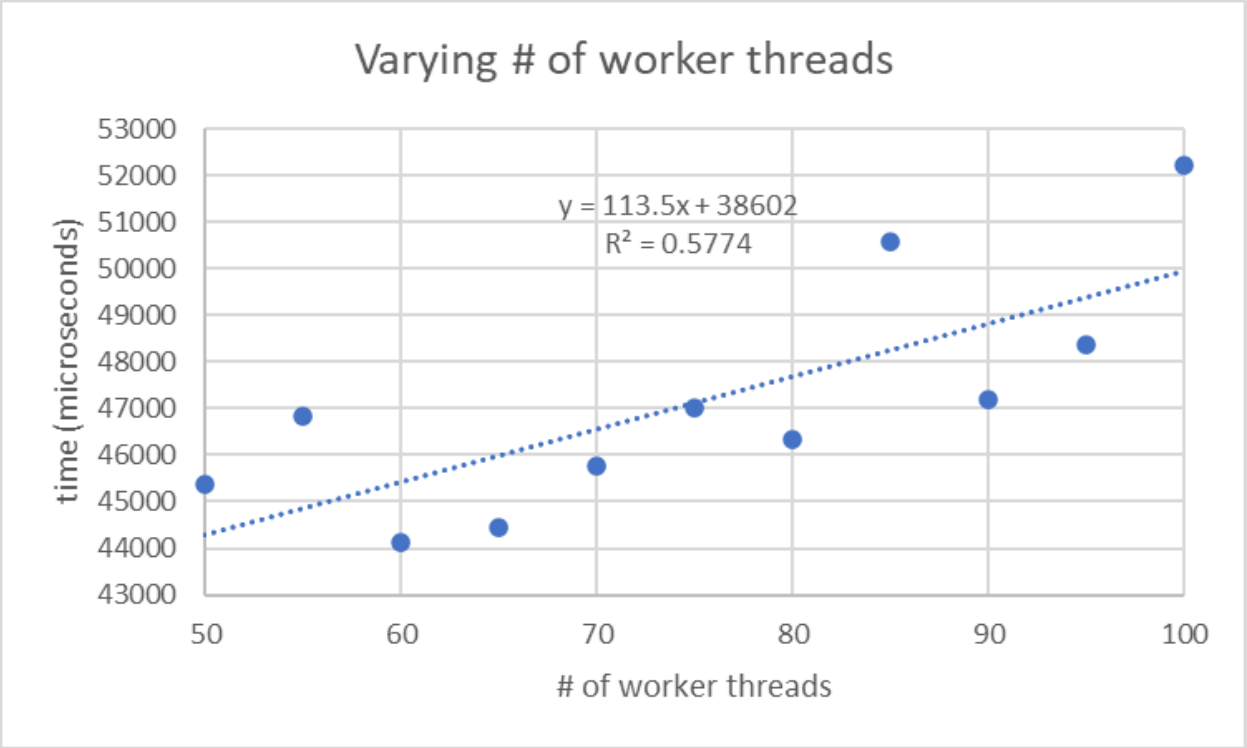

When buffer capacity is held constant while the number of worker threads is varied there is a weak (R^2<0.7),positive,linear relationship between number of worker threads and microseconds taken to complete a csv file transfer. With varying buffer capacity there seems to be scaling occurring to the plot of varying # of worker threads.

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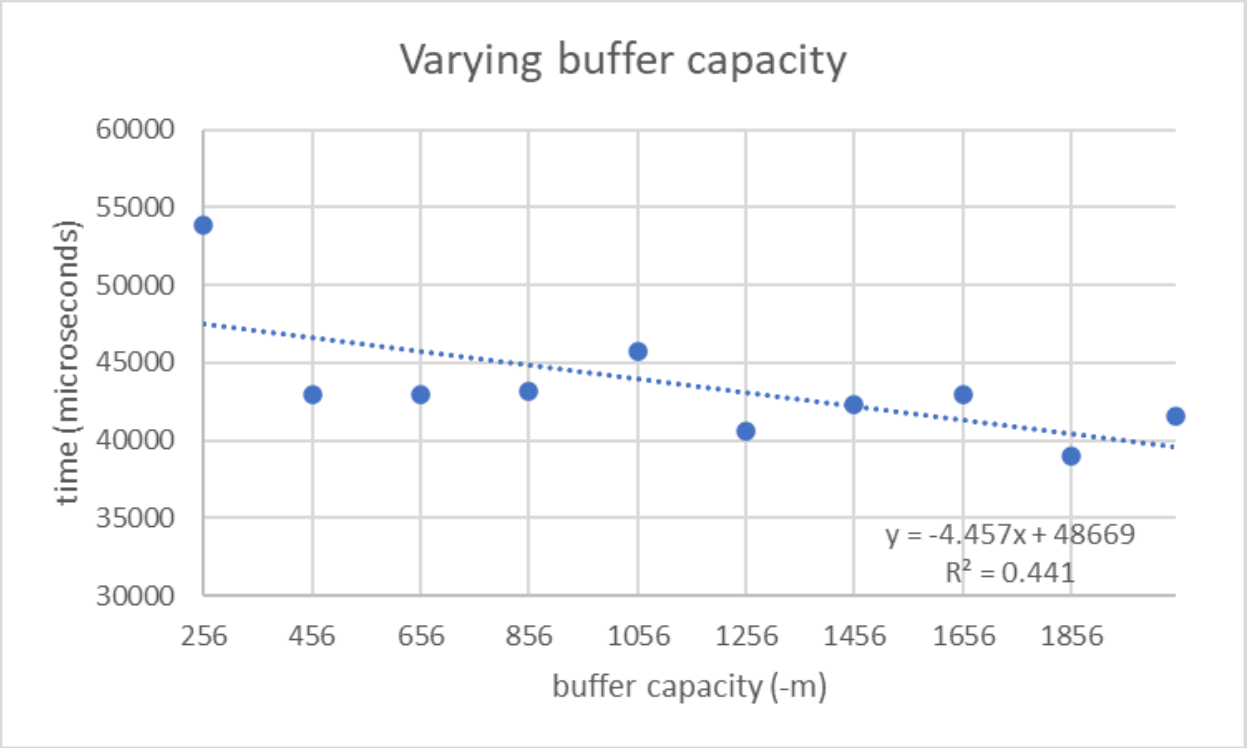

When the number of worker threads is held constant while buffer capacity is varied there is a weak (R^2<0.7),negative,linear relationship between buffer capacity size and microseconds taken to complete a csv file transfer. With a varying number of worker threads there seems to be scaling occurring to the plot of varying buffer capacity.

Insights

While working on this assignment I discovered that it does not matter if your default is `AF_UNSPEC or AF_INEN`.Additionally, I learned that implementing error handling for all function calls makes debugging much easier in the long run. Coding was much more time efficient with the error handling of statements I included.

Questions to Consider

a. How does the TCP/IP method differ from FIFO in terms of speed?

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In terms of speed TCP is much faster than FIFO. In PA3 I recall experiencing much longer runtimes (~30 seconds vs ~30000 microseconds) when the FIFO methods were used.

b. What is the maximum number of connections you can create without changing the ulimit parameter? Is the number the same as in PA3?

The maximum number of connections you can create without changing the ulimit parameter is 64K for TCP methods. The number is not the same as in PA3.

c. What happens to the point of diminishing return? Does it change from what you saw in PA3?

For PA5 there does not seem to be a point of diminishing returns like shows in PA3.

Commands Run

./server -r 8082 -m 256

Datapoint transfers

Varying number of worker threads

./client -n 15K -w 50 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 55 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 65 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 70 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

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./client -n 15K -w 80 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 85 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 90 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 95 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 100 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

Varying size of requested buffer

./client -n 15K -w 75 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 456 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 656 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 856 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 1056 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 1256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 1456 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 1656 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 1856 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 75 -b 2048 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

Varying size of histogram threads

./client -n 15K -w 60 -b 256 -p 15 -h 5 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 10 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 15 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 20 -m 256 -a 172.17.249.212 -r 8082

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./client -n 15K -w 60 -b 256 -p 15 -h 25 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 30 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 35 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 40 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 45 -m 256 -a 172.17.249.212 -r 8082

./client -n 15K -w 60 -b 256 -p 15 -h 50 -m 256 -a 172.17.249.212 -r 8082

File Request

Varying # of worker threads

./client -w 50 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 55 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 60 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 65 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 70 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 75 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 80 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 85 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 90 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 95 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 100 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

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Varying buffer capacity

./client -w 50 -b 256 -m 256 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 256 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 656 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 856 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 1056 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 1256 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 1456 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 1656 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 1856 -m 456 -f 2.csv -a 172.17.249.212 -r 8082

./client -w 50 -b 2048 -m 456 -f 2.csv -a 172.17.249.212 -r 8082