

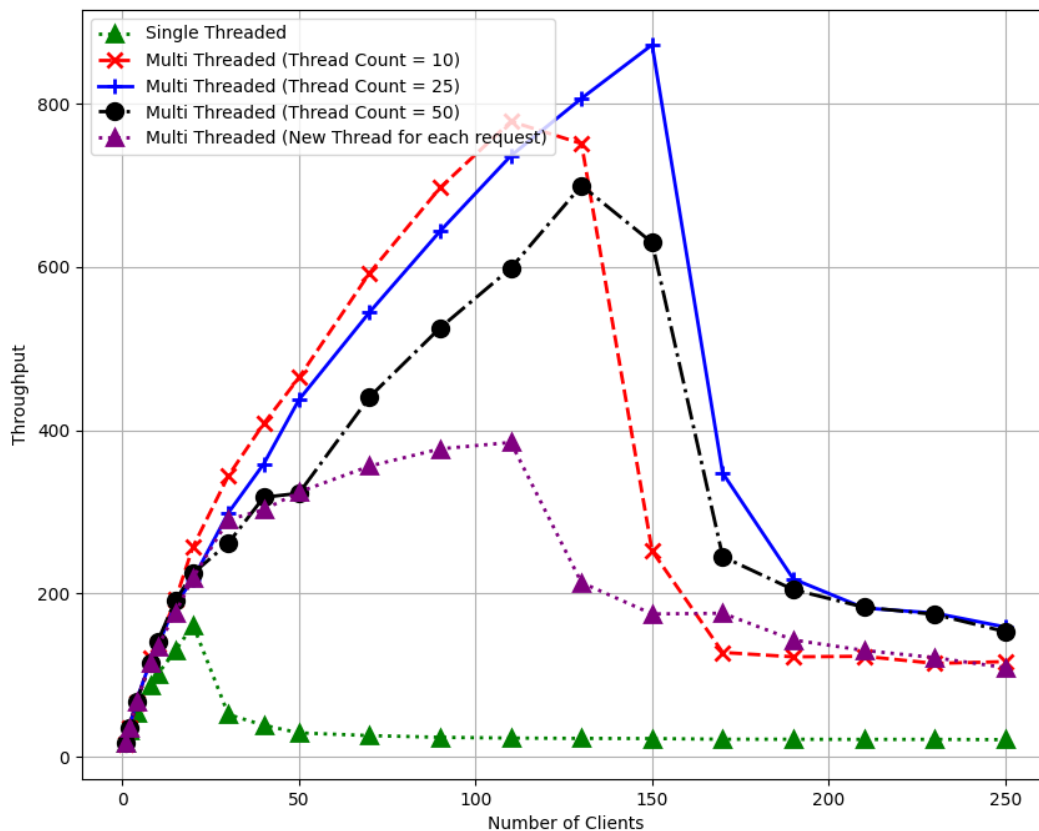
# CS 744: Design and Engineering of Computing Systems Autumn 2023

## Project DECServer

Het Patel : 23M0751

Bharat Patidar : 23M0761

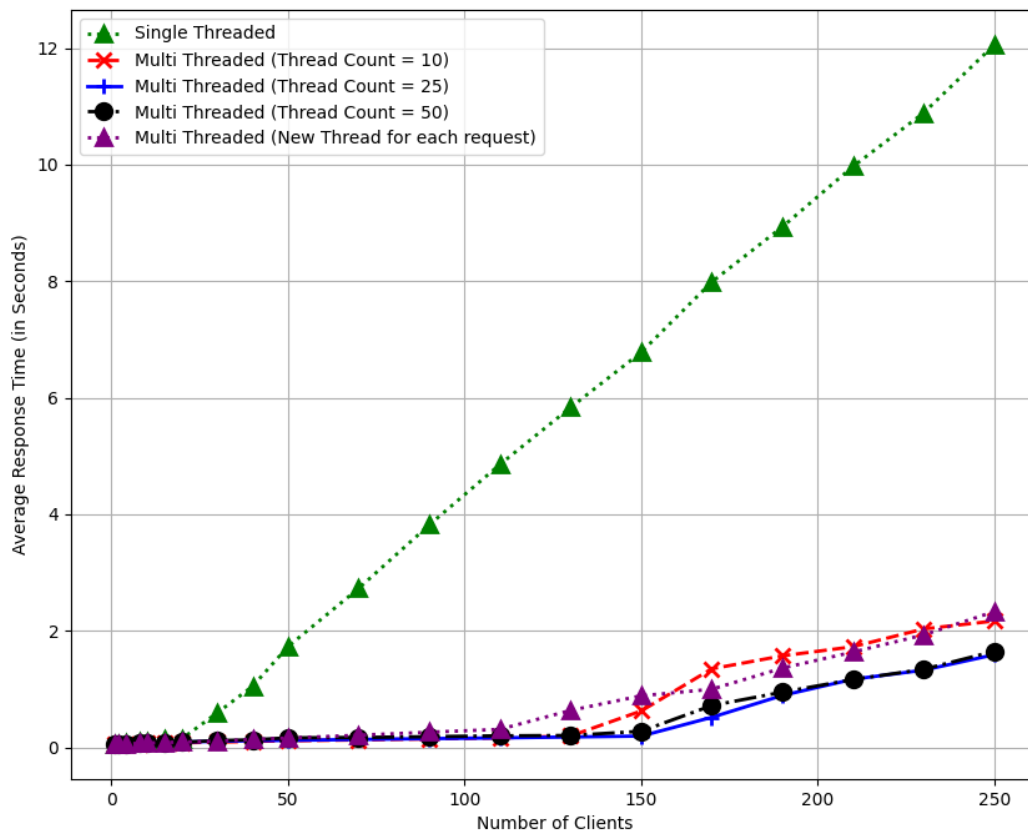
### Throughput vs Number of clients



- Single threaded design has least throughput as there is only single thread serving the request. So when one request is getting handled all other will be waiting which will increase the response time for others so throughput will degrade.

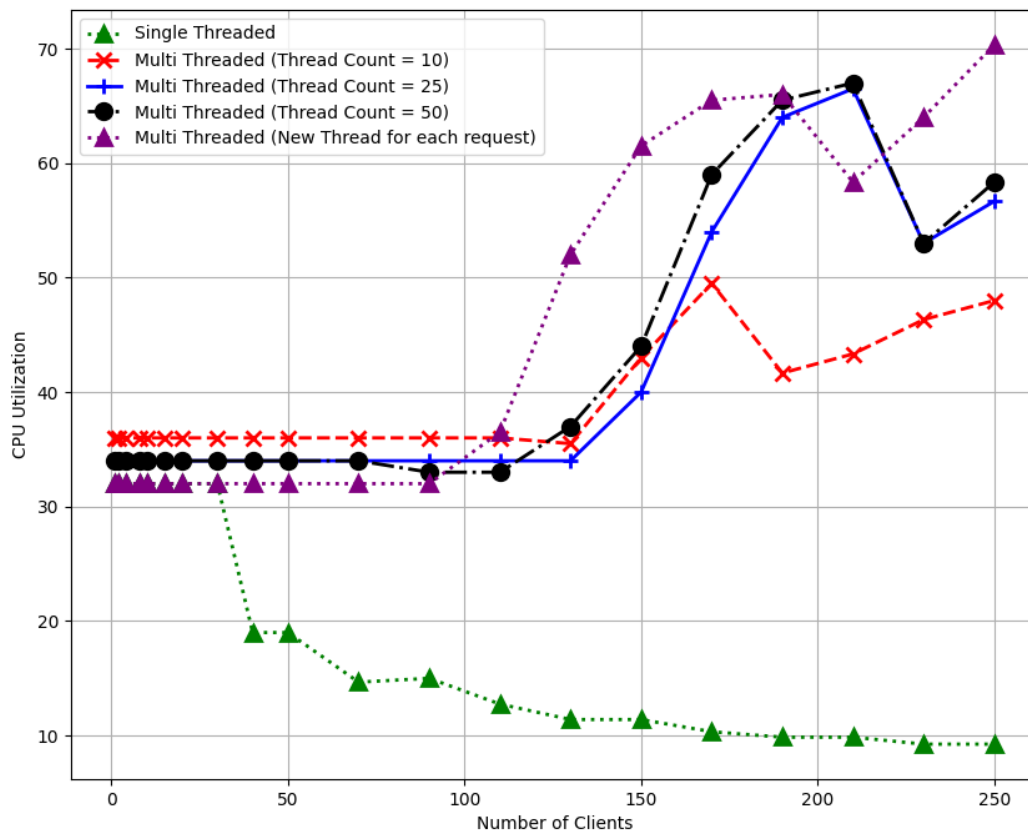
- For multithreaded design with thread pool, throughput will increase upto certain point then performance will stay same or degrade because of context switching time and other factors.
- Multithreaded server with create and destroy threads will perform better than single threaded design obviously.

## Average Response Time vs Number of clients



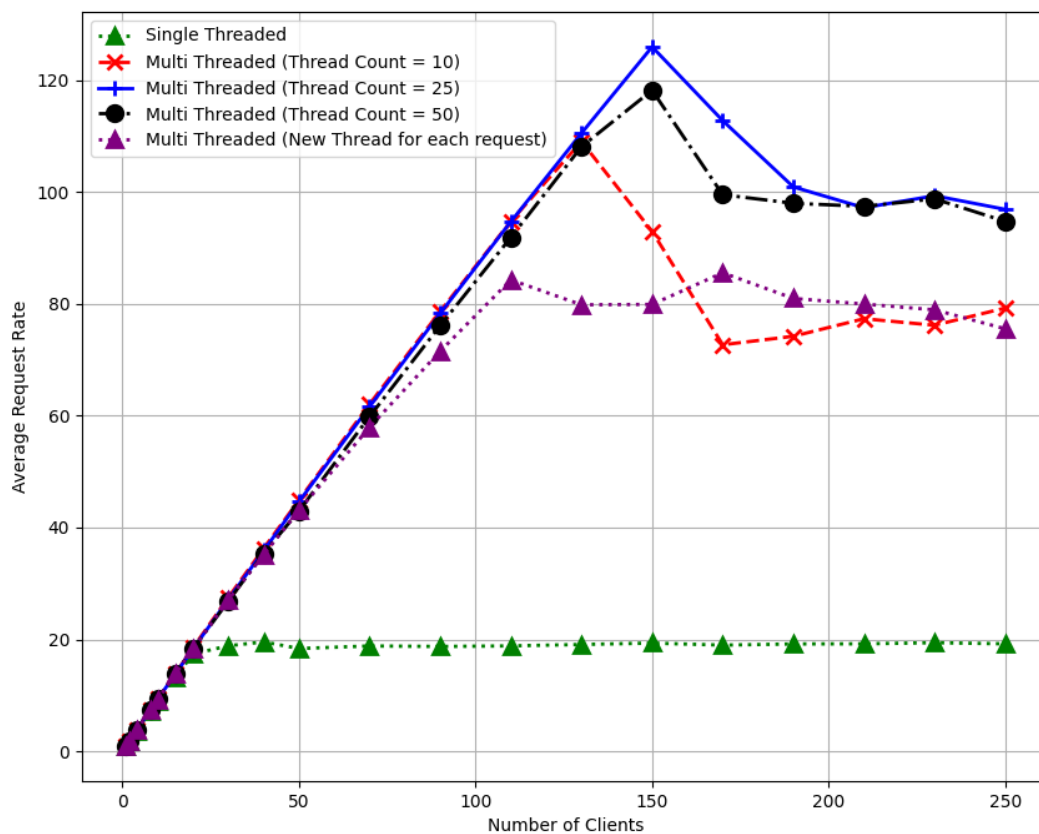
- Response time for single threaded design will be very high. But for multithreaded design the response time will be optimal until certain number of threads then again the response time will increase. As you can see for thread pool size = 25, the response time is less and for thread pool size = 50 it's slightly more.

## CPU utilization vs Number of clients



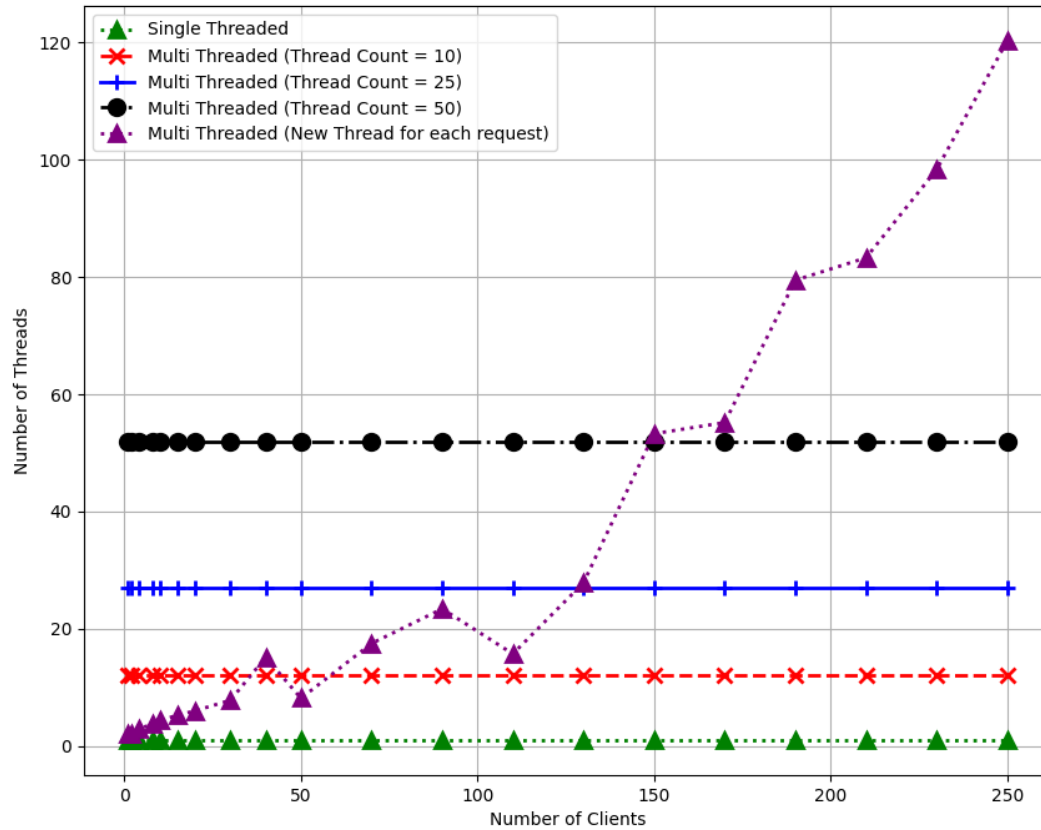
- For single threaded design the CPU utilization will be less as only one core will be busy and other cores will be free. But for multithreaded thread pool design for thread pool size = 10, the util will be less as in my laptop 20 cores are there so at any point 10 cores will be busy and other will be free so the util will be higher than single threaded. Now when you increase the thread pool further CPU util further increases as more cores will get busy. For create and destroy design it will use cores based on the load given so when load will be high, CPU util will also be high.

## Average Request Rate vs Number of clients



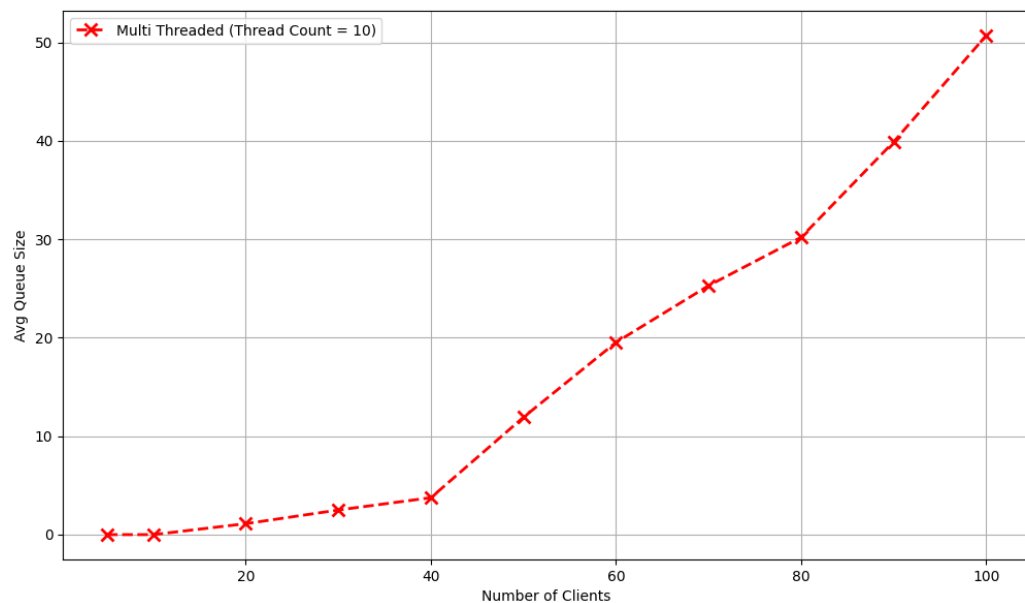
- For single threaded design, the request rate will be less as on the server side, only a single thread is doing all the work and due to that we are not able to send requests at a higher rate. (Because, loadtestClient will wait for earlier request's response before sending the next request). So the request rate will degrade.
- For multithreaded design server is able to process requests more quickly so client will be able to send requests at a higher rate.

## Number of threads vs Number of clients



- For single threaded design, only one thread will be active as can be seen in the graph. For multithreaded design we can see the number of active clients.

## Average Queue size vs Number of clients



- Here when number of clients are less, the queue size will be less because whenever requests get enqueued the threads will deque them quickly which won't increase the queue size. Now when clients will increase suppose 20 threads are there the 20 requests will be dequeed instantaneously. But since all threads are busy the new requests will get pile up and will increase the queue size.