Computer Networks (COL672)
Assignment 2

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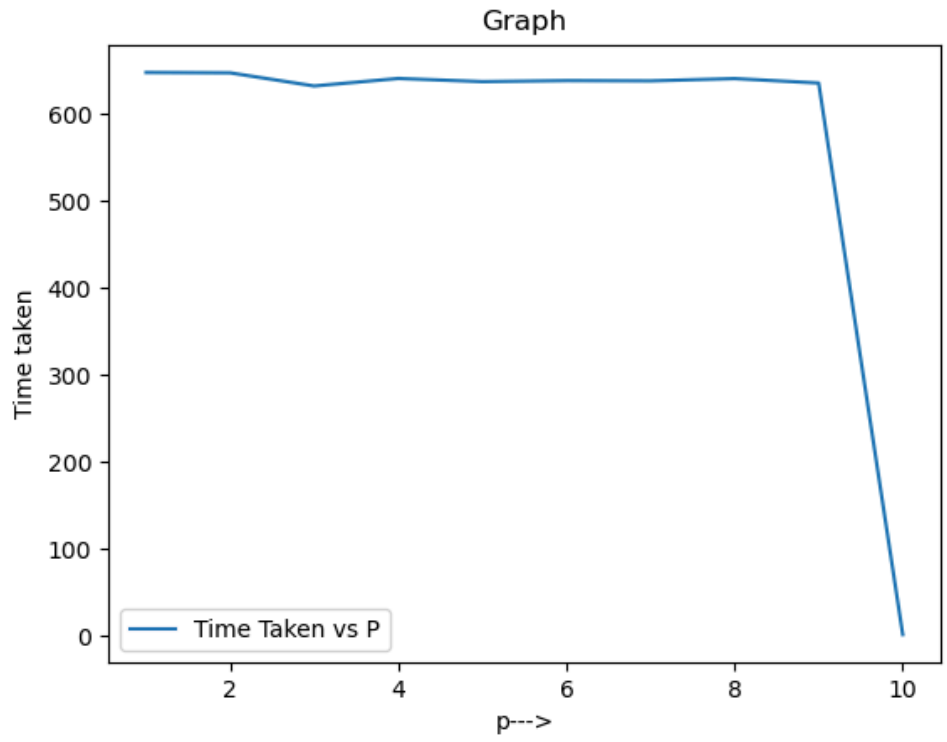
1)Word Counting Client



Observations:

Effect of Packet Size (p):

- ➔ Small p causes higher completion times due to frequent communication overhead.
- ➔ Medium p shows better performance as fewer packets reduce the overhead.

- ➔ Large p = 10 , when it is equal to k, it flattens the improvement since network throughput reaches its limit.

Network Overhead:

- ➔ Smaller packets result in more acknowledgments, increasing delays. Larger packets are more efficient but may face retransmission delays if there's congestion.

Impact of k:

- ➔ Since k is fixed at 10, the main factor affecting performance is p. With higher k, fewer requests would be required, potentially reducing completion time.

Latency:

- ➔ Higher latency increases completion time, especially for small packets where frequent round trips accumulate more delay. Larger packets are less impacted by latency.

Factors Influencing:

- ➔ Network Bandwidth: Higher bandwidth allows for faster data transfer rates, enabling the client to receive more words in less time. If the network bandwidth is a bottleneck, it can slow down the transfer, especially for larger packet sizes.

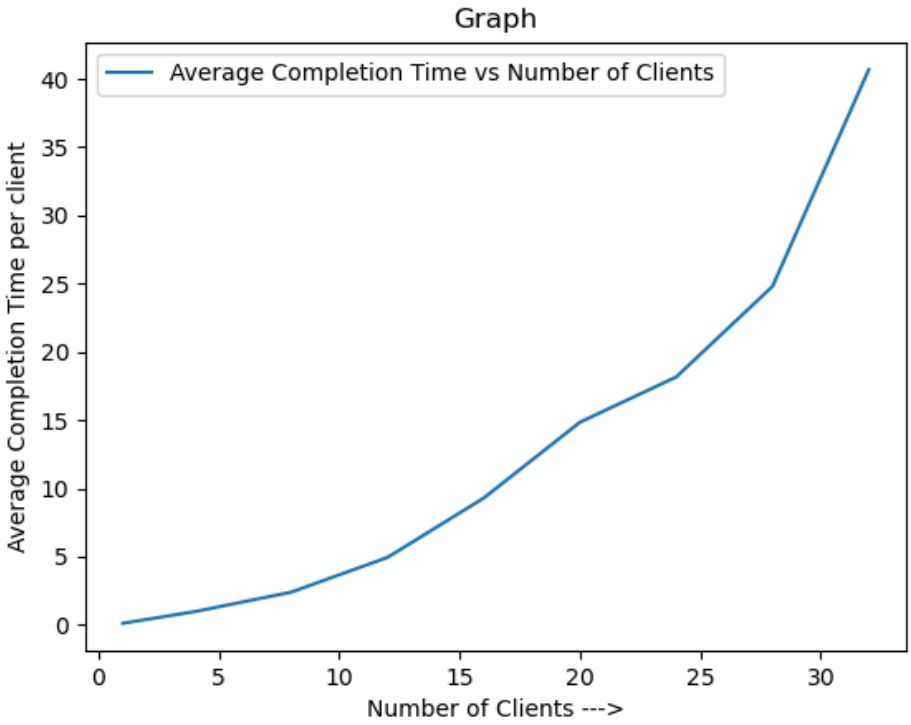
- ➔ Latency: Latency refers to the time it takes for a packet of data to travel from the client to the server and back. High latency increases the time between requests and responses, impacting overall completion time.

- ➔ k(Requested Number of Words): The number of words requested per transmission affects how often requests are made. A larger k value generates fewer requests reducing overhead but potentially increasing processing time on the server.

- ➔ p(Words in each packet): The size of each packet (how many words are sent per packet) influences the efficiency of data transmission. Larger packets can reduce the number of transmissions required.

2. Concurrent Word Counting Clients

Observations:



➔ Increasing Average Completion Times: As the number of clients increases, the average completion time per client also increases because the server concurrently handles multiple clients. When more clients are being handled, the server takes more time.

Effect of Concurrent Clients:

- ➔ With fewer clients, completion time per client is relatively stable, as the server can handle requests efficiently.
- ➔ As the number of clients increases, completion time rises significantly due to resource sharing and increased server load.

Server Load:

- ➔ The server experiences more contention as more clients connect simultaneously, leading to higher delays per client, especially beyond 16 clients.

Network Congestion:

- ➔ More clients increase the amount of data transferred, causing network congestion. This results in higher packet delays and retransmissions, impacting overall completion time.

Multiplexing and Context Switching:

- ➔ With more clients, the server switches between different connections, leading to context-switching overhead. This overhead grows with the number of clients, contributing to longer completion times.

Factors Influencing Completion Time:

Concurrency Overhead:

- ➔ Managing multiple client requests creates contention for server resources, leading to delays. Server load handling becomes a challenge as the number of concurrent clients grows.

Network Bandwidth:

- ➔ Limited bandwidth causes bottlenecks when many clients are sending or receiving data simultaneously, increasing the completion time for each client.

Latency:

- ➔ Higher latency due to the increased number of clients results in longer round-trip times, particularly in heavily loaded systems

Client-Server Communication:

- ➔ Frequent communication from multiple clients increases overall network traffic and delays, slowing down each client’s response.