Evaluation and Measurement

To test the scalability of the system, the following results were collected:

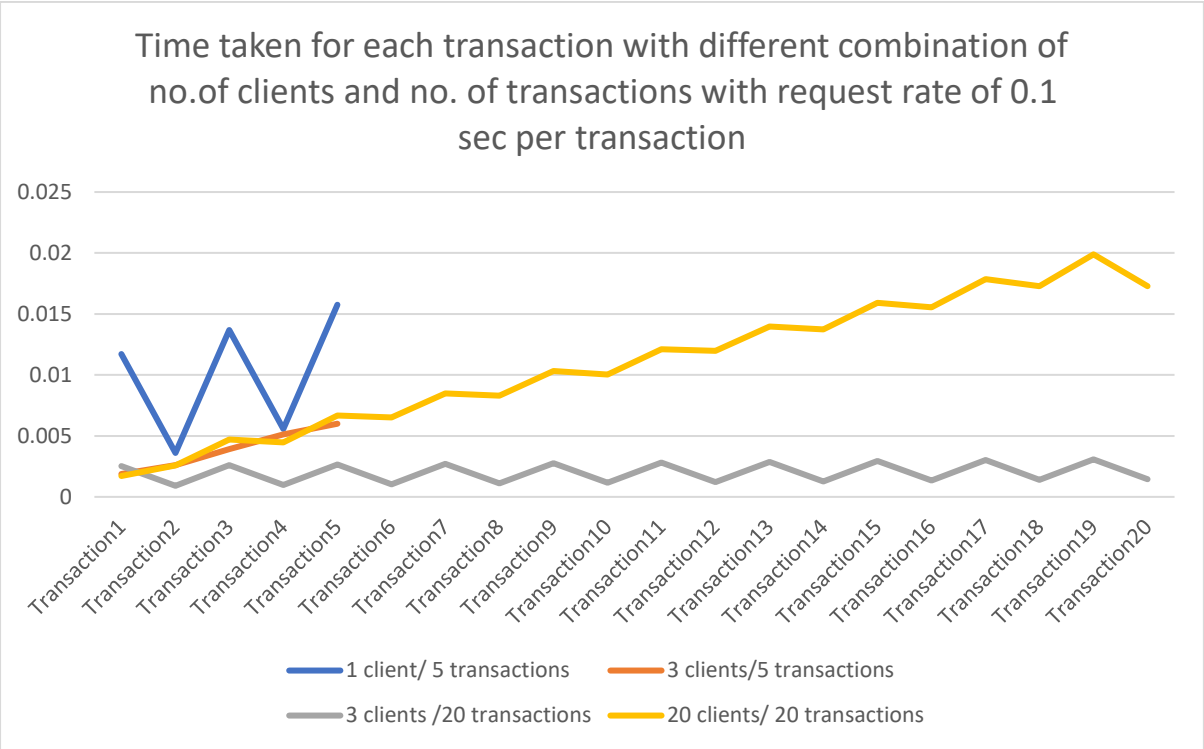
- A set of periodic requests at each client at rate of 0.1 sec per transaction was sent and the number of clients connected to the server were varied from 1 to 3 to 5 to 20. The readings were taken for time taken by each transaction when:
  - a single client requested server and performed 5 transactions,
  - 3 clients requested server having different timestamps, and performed total 5 transactions
  - 3 clients requested server having different timestamps, and performed total 20 transactions
  - 20 clients requested server having different timestamps and performed total 20 transactions.

- The request rate was then varied from 0.1 sec to 0.2 sec, to 0.5 sec and then to 1 sec and the number of clients were kept at a fixed number of 20.

For each case specified above, the time taken for all transactions was averaged out.

Scalability Test (time in sec)	1 client/ 5 transactions	3 clients/5 transactions	3 clients /20 transactions	20 clients/ 20 transactions	20 clients/20 transactions	20 clients/20 transactions	20 clients/20 transactions
request rate -->	0.1 sec	0.1 sec	0.1 sec	0.1 sec	0.2 sec	0.5	1 sec
Transaction 1	0.01171	0.001876	0.002534	0.001713	0.00322	0.001965	0.002851
Transaction 2	0.003603	0.002608	0.000908	0.002581	0.006889	0.004369	0.002247
Transaction 3	0.013687	0.00391	0.002596	0.004705	0.008276	0.004825	0.004172
Transaction 4	0.005562	0.005121	0.00097	0.004459	0.011631	0.005389	0.005408
Transaction 5	0.015757	0.005999	0.002655	0.006672	0.010834	0.007168	0.005145
Transaction 6			0.001026	0.006519	0.013716	0.007512	0.006784
Transaction 7			0.00271	0.008492	0.013227	0.009666	0.006593
Transaction 8			0.001103	0.008306	0.016301	0.009226	0.008084
Transaction 9			0.002768	0.010323	0.0181	0.0114	0.00794
Transaction 10			0.001158	0.010032	0.02159	0.012053	0.009613
Transaction 11			0.002823	0.0121	0.023221	0.013739	0.00933
Transaction 12			0.001213	0.011966	0.025965	0.014867	0.012313
Transaction 13			0.002878	0.013974	0.027833	0.017267	0.011873
Transaction 14			0.001271	0.013735	0.031041	0.017075	0.013745
Transaction 15			0.002934	0.015918	0.032498	0.019195	0.013099
Transaction 16			0.00133	0.015552	0.035167	0.019103	0.015459
Transaction 17			0.00302	0.017861	0.037169	0.021194	0.01448
Transaction 18			0.001388	0.017284	0.037236	0.021525	0.016849
Transaction 19			0.003075	0.01989	0.039306	0.024832	0.023284
Transaction 20			0.001445	0.017284	0.038811	0.023239	0.023389
Average time per transaction	0.0100638	0.0039028	0.00199	0.0109683	0.0226	0.01328	0.0106329

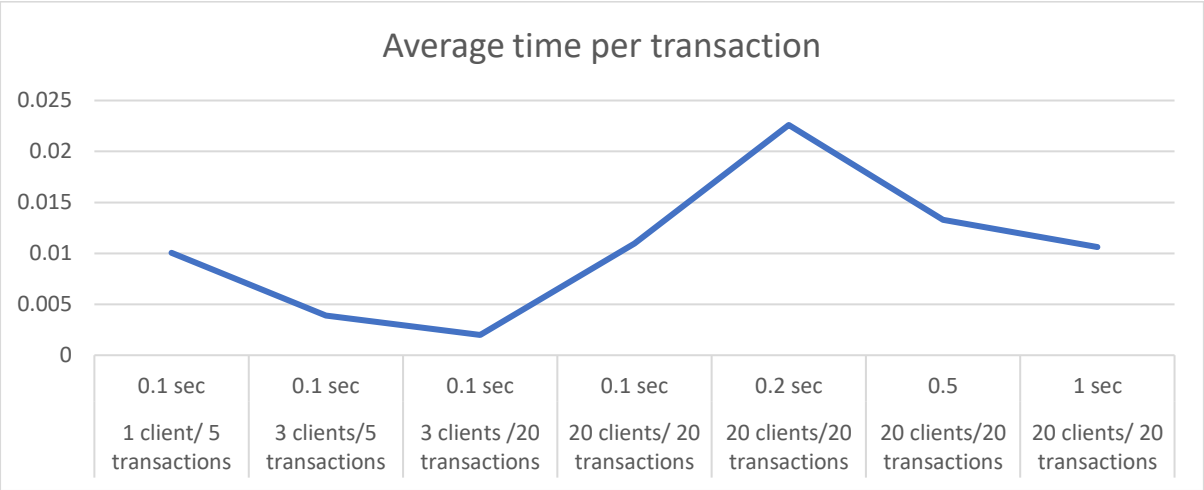
By plotting the time taken by each transaction against each case in above readings with request rate of 0.1 sec per transaction, the following graph was obtained:



It can be inferred from graph:

- that when there is only 1 client and the withdrawal and deposit transaction happen the time fluctuation for transactions is huge.
- When the no. of clients is increased from 1 to 3, the wait time and time taken by each transaction is linear.
- Increasing no. of transactions when no. of clients is still 3 depicts a different pattern showing each transaction takes approximately equal time to execute, i.e., once the connection is established with 3 clients, each request is served synchronously and there is negligible wait time.
- When no. of clients is considerably increased from 3 to 20, each client having one request, the pattern retains back to a linear graph.

By plotting the average time taken by transactions against different request rate of 0.1 sec, 0.2 sec, 0.5 sec, and 1 sec and keeping the number of clients at a fixed number of 20, the following graph was obtained:



It can be inferred from graph:

- That when request rate is increased initially from 0.1 to 0.2 sec, the time taken is more and performance decreases.
- Once the message exchange has started taking place and request rate is further increased, the wait time decreases and average time taken by transactions decreases at 0.5 sec and further at 1 sec.