CS739 Mini-Project 2 Result Summary

Team Members:
Tyler Wilson
Surendra Parla
Sree Kandasamy Gokulrajan
Tianyu Huang

Partner Team:
Harsha Varthan Chellaiah
Ramamoorthy
Souvik Roy
Wenxuan Tan
Zeren Yang

October 22, 2024

1 Partner Group's Test Result

1.1 Availability Test

The main purpose of the test is to simulate and test the availability of a distributed key-value storage system when the number of service nodes is gradually reduced, and to observe the changes in the success rate of PUT and GET operations in the process of reducing server instances.

At first, we started 100 server nodes, and then used kv739_die() function to shut down the nodes one by one and observe the changes in the success rate.

1.1.1 Availability Test Result

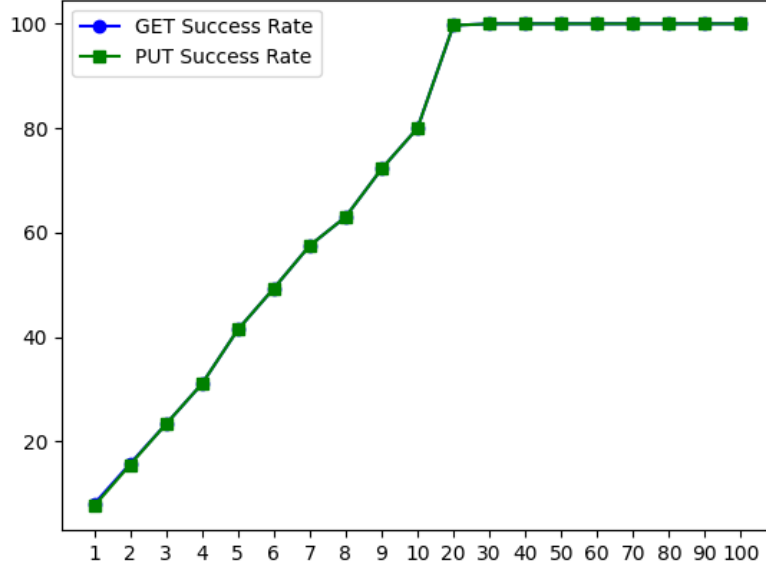| Server nodes	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100
puts_successful_rate(%)	8.0	15.7	23.3	31.0	41.4	49.3	57.5	63.0	72.2	80.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
gets_successful_rate(%)	7.6	15.5	23.3	31.0	41.4	49.3	57.5	63.0	72.2	80.0	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figure 1: Availability Result Table

Figure 2: Availability Result Graph

It can be seen that when the number of server nodes is greater than 20, the success rate is 100%, when the number below 20, the success rate begin to decline. The minimum number of server nodes that can operate normally is about 16.

1.2 Consistency Test

The purpose is to simulate multiple clients accessing the distributed key-value storage system at the same time, perform consistency testing, and record the ratio of successful operations to observe whether the success rate of the system is affected as the number of clients changes.

After each client PUTs a key-value pair, it immediately GETs the value and verifies that the value it gets is consistent with the value it PUT. Any inconsistencies (such as GET results that are different from the PUT values) are recorded.

1.2.1 Consistency Test Result

```
+----------------------------------------+-------+-------+-------+-------+------+------+
|              Clients count             |   1   |   5   |  10   |  20   |  50  | 100  |
+----------------------------------------+-------+-------+-------+-------+------+------+
| successful_rate_without_inconsistency(%) | 100.0 | 100.0 | 100.0 | 100.0 | 99.9 | 99.0 |
+----------------------------------------+-------+-------+-------+-------+------+------+
```
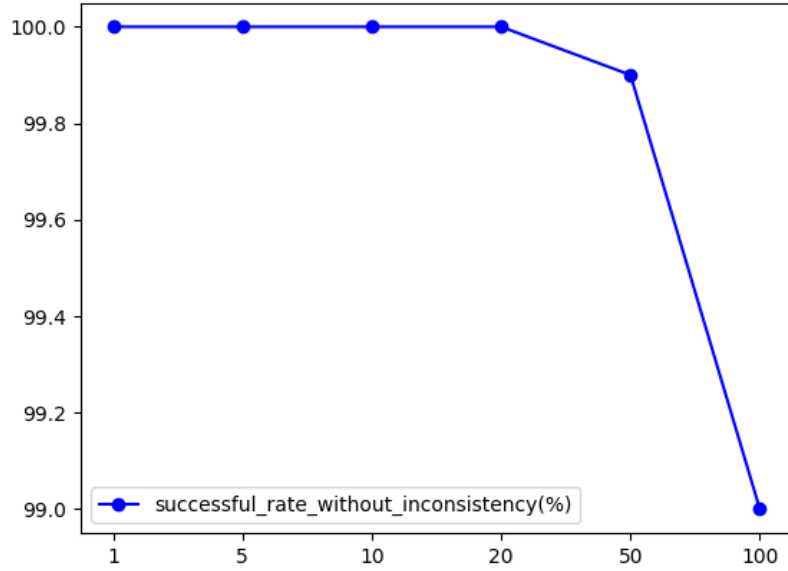
Figure 3: Consistency Result Table

Figure 4: Consistency Result Graph

1.3 Performance Test

The purpose is to measure the performance of the system, especially latency and throughput, by simulating PUT and GET operations of multiple clients on the distributed key-value storage system. It can also test the performance of the system when a certain proportion of hot keys are frequently accessed. Our results are the average of 10%, 20%, and 30% hot keys.

1.3.1 Performance Test Result

Clients count	1	5	10	20	50	100
PUT Latency(ms)	0.45	0.7	0.95	1.14	1.24	1.27
GET Latency(ms)	0.4	0.65	0.85	1.08	1.14	1.25

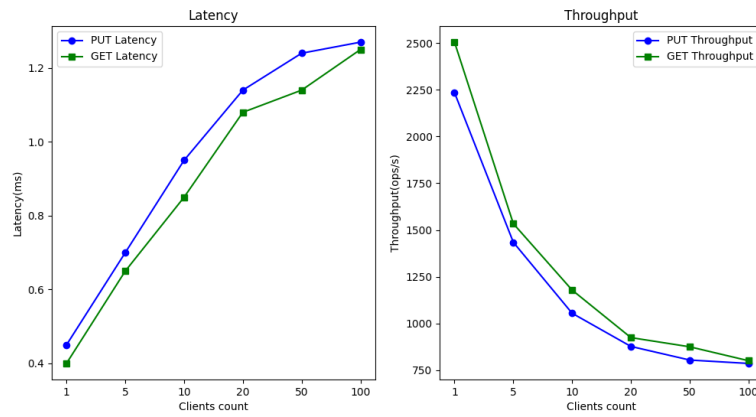| Clients count	1	5	10	20	50	100
PUT Throughput(ops/s)	2234.63	1434.42	1054.55	877.0	804.21	785.98
GET Throughput(ops/s)	2504.81	1534.02	1178.54	924.21	875.08	800.63

Figure 5: Performance Result Table

Figure 6: Performance Result Graph