

# CS 677 Lab 3 Performance Evaluation Report

**Dan Cline, Kyle Stevens, Tian Xia** *UMass Amherst, Amherst College*

---

This document provides a performance evaluation of our implementation.

---

## Performance of Sequential Requests w/wo Caching

In this test, we perform 100 requests of each for all the items and topics, and measure the average latency for each combination of item/topic and requests. The test can be found in `tests/sequential`. The output can be found in `tests/output`. We tested the latency with and without caching by performing the following operations (we only list the lookup latency for the first four items):

### *Performance of the System with Caching*

item/topic	Response Time of buy(s)	Response Time of lookup(s)	Response Time of search(s)
item1	0.145609	0.015043	N/A
item2	0.186815	0.017289	N/A
item3	0.169865	0.018120	N/A
item4	0.158762	0.014589	N/A
gradschool	N/A	N/A	0.016642
systems	N/A	N/A	0.016781

### *Performance of the System without Caching*

item/topic	Response Time of buy(s)	Response Time of lookup(s)	Response Time of search(s)
item1	0.147895	0.047688	N/A
item2	0.158601	0.047280	N/A
item3	0.157561	0.048731	N/A
item4	0.164243	0.048143	N/A
gradschool	N/A	N/A	0.047666
systems	N/A	N/A	0.048458

From these numerical results, we can see that caching improves the end-to-end response time on lookup and search requests, increasing the speed by almost 3 times. There was almost no changes in the end-to-end response time on buy requests, which makes intuitive sense since the buy requests are not cached and goes through the order server and then the catalog server.

## Cache Tests

In this test, we tested write operations w/wo invalidation triggers and read operations w/wo cache misses, sending 100 sequential requests for each and calculating the overhead.

#### *Write Operations w/wo Invalidations:*

Operations/Time(s)	Writes wo Invalidation(s)	Writes w Invalidation(s)	Overhead (s)
Time(s)	0.153312	0.150751	-0.002561

#### *Read Operations w/wo Cache Hits:*

Operations/Time(s)	Read without Cache Miss(s)	Read with Cache Miss(s)	Overhead (s)
Time(s)	0.029069	0.055862	+0.026793

From these results, we see that the overhead for writes that triggers the invalidation is negligible. This is probably because the cache invalidation simply deletes the record from the dictionary and is not a time-consuming operation. We do notice however that reads with cache hit takes less time than reads with cache misses. This makes sense because reads with cache misses forces the request to take another hop from the frontend server to the catalog server, which gives the request an overtime.

### **Fault Tolerance Test**

Test Description: In this test, we kill the primary catalog replica and perform updates on the secondary replica for `item 1`. After some time, we bring back the primary catalog replica, and kill the secondary replica. Then we bring back the secondary replica and perform more updates on `item 1`. At the very end, we perform lookup requests on both catalog servers to make sure that the number of items sold is consistent. The test can be found in `tests\fault_tolerance`.

Test Outcome: After performing the above operations, the number of items remaining in stock for `item 1` is consistent on both servers and matches the number of original stock subtracted by the number of buy operations performed. We conclude that our system is fault tolerant.