TESTING AND EVALUATION DOCUMENT

for

Trading Application

COMPSCI 677 Lab 2

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1 Evaluation methodology

1.1 What do we evaluate?

We perform evaluation by measuring latency in seconds for lookup and order requests using both server with and without Docker. Example of latency measuring code snippets are shown below:

1.2 How do we evaluate?

The client and server were on a local machine due to issues with running Docker on Edlab servers.

We run the following load testing experiments:

- **With Docker** Varying the number of clients from 1 to 5.
    1. Send 200 random lookup requests with 0.8 probability of sending a subsequent order request after lookup and average the response times.
- **Without Docker** Varying the number of clients from 1 to 5.
    1. Send 200 random lookup requests with 0.8 probability of sending a subsequent order request after lookup and average the response times.

2 Evaluation Results

Fig. 2.1 shows the variation in latency (lookup and order requests) for varying number of concurrent clients for both Docker and non-Docker implementations. We can observe that increasing the number of clients shows a higher average latency. Moreover, the non-Docker implementation has a lower latency in comparison to the Docker implementation as Docker introduces some overhead. This overhead is exacerbated by the fact that Docker starts a VM for running on on our system (Mac). We also observe that order requests have higher latency than lookup requests because of 2 reasons 1) Order requests require communication between 2 microservices whereas lookup only requires communicating with 1 microservice, 2) Order requests uses locks to perform an atomic transaction and it also requires writer locks to write the order to the database.

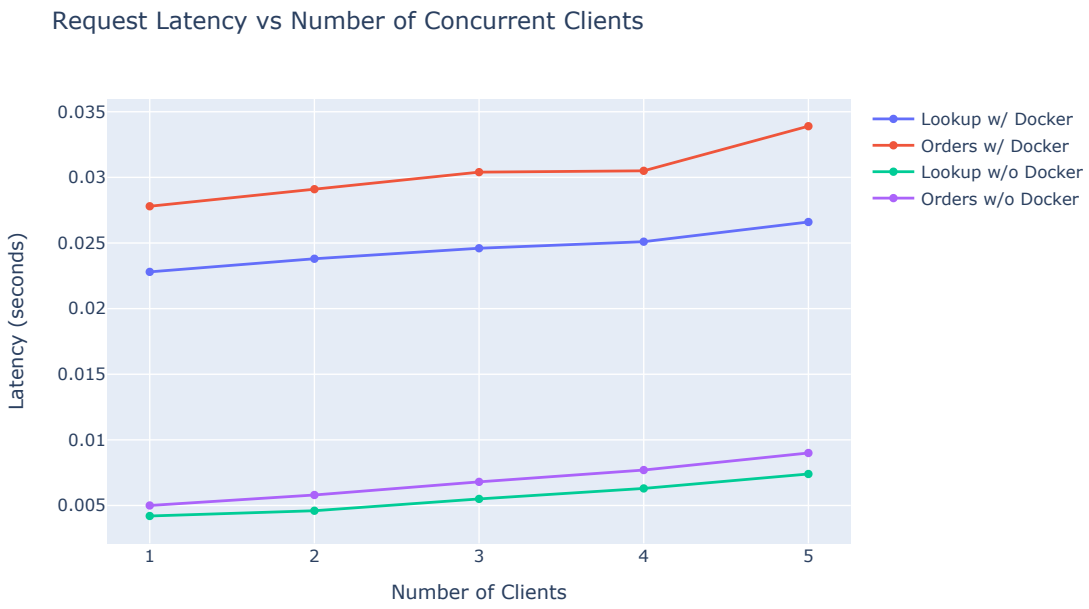

Figure 2.1: Request Latency vs Number of Concurrent Clients

3 Lab Questions

1. Does the latency of the application change with and without Docker containers? Did virtualization add any overheads?
   Ans: Yes, the latency changes. Using Docker increases latency due to virtualization overhead. The overhead is even higher for Mac and Windows systems as Docker needs to start a virtual machine.

2. How does the latency of the lookup requests compare to trade? Since trade requests involve all these microservices, while lookup requests only involve two microservices, does it impact the observed latency?
   Ans: Lookup requests have lower latency than trade requests. Yes, order requests involves 2 services, so it is slower. We have explained more about the reasons for higher latency in the above sections.

3. How does the latency change as the number of clients change? Does it change for different types of requests?
   Ans: As the number of clients increases, the latency also increases. The latency for trade requests has a steeper increase in latency due to the presence of writer locks, whereas lookup only uses reader locks (which can be accessed by multiple requests simultaneously).