Performance Evaluation

Request	Avg. Time	Multiple Client				
		2	3	4	5	6
Search	3.73 ms	4.12 ms	4.38 ms	4.44 ms	4.67 ms	4.90 ms
Lookup	3.98 ms	4.23 ms	4.41 ms	4.57 ms	4.78 ms	4.88 ms
Buy	5.46 ms	5.70 ms	6.01 ms	6.26 ms	6.54 ms	6.79 ms

All Performance are tested locally, with client sending request to the same FrontEndService every 500ms.

A) By comparing the average time of three requests, we find out time Time(Buy) > Time(LookUp) > Time(Search). The reason is that Buy Request goes through 3 servers (Client -> FrontEnd -> Order -> Catelog), while Search and LookUp go through 2 servers (Client -> FrontEnd -> Catelog). That's why Buy request takes more time than Lookup and Search request.

B) Also, Lookup takes more time than search both in Avg. Time or under Multiple client. From my perspective, the reason is that LookUp request passes more information through server than Search request. We can have a look at the length of their respond String.
Respond of Search: 144 characters

```
"Run command:http://128.119.243.164:5018/search/distributed%20systems"
"Result:""{\n  \""0\"": \""How to get a good grade in 677 in 20 minutes a day\""","\n  \""1\"": \""RPCs for Dummies\""\n}"""
```

Respond of Lookup: 245 characters

```
"Run command:http://128.119.243.164:5018/lookup/0"
"Result:""\""{\\n  \\\""itemNumber\\\"": 0","\\n  \\\""name\\\"": \\\""How to get a good grade in 677 in 20 minutes a day\\\""","\\n  \\\""topic\\\"": \\\""distributed systems\\\""","\\n  \\\""stack\\\"": 1498","\\n  \\\""c
```

From my perspective, lookup has 80 more characters to send for each HTTP request, which results in the slightly more time consuming of Lookup than Search.

C) With time number of multiple client increases, the average respond time increase also. The reason is that server has to deal with concurrence. Because all data are written in a local file, next request has to wait for the former one to finish revise data in the file. It takes some time to wait.