Northeastern University - Seattle

CS6650 Building Scalable Distributed Systems

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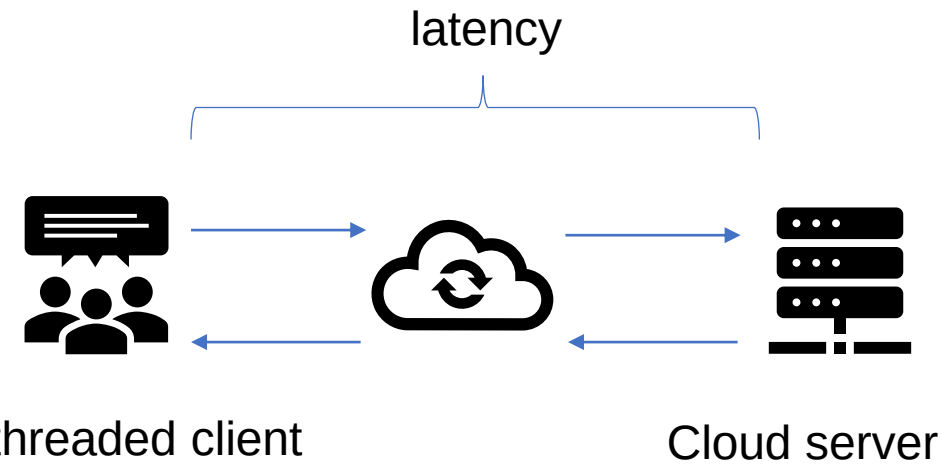
Building Scalable Distributed Systems

Assignment 1 Overview

Building the Client…

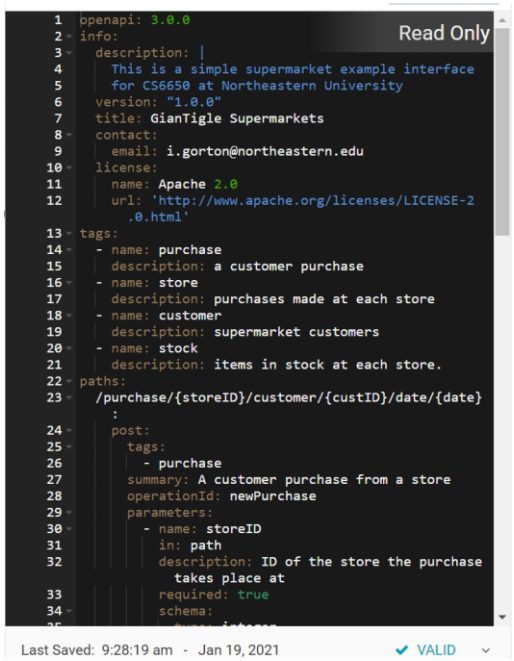
Overall Aim

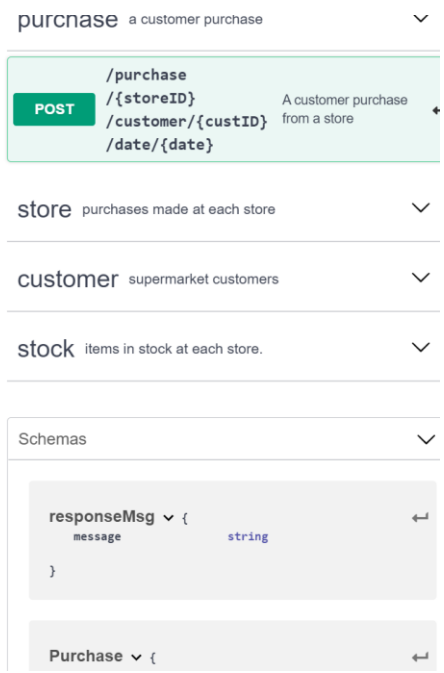


- Learning Objectives:
  - Write a complex multithreaded Java program
  - Implement a simple HTTP API
  - Configure and deploy a cloud based server
  - Implement a simple Java servlet
  - Learn how to analyze application performance

Step 1 – Build the Server

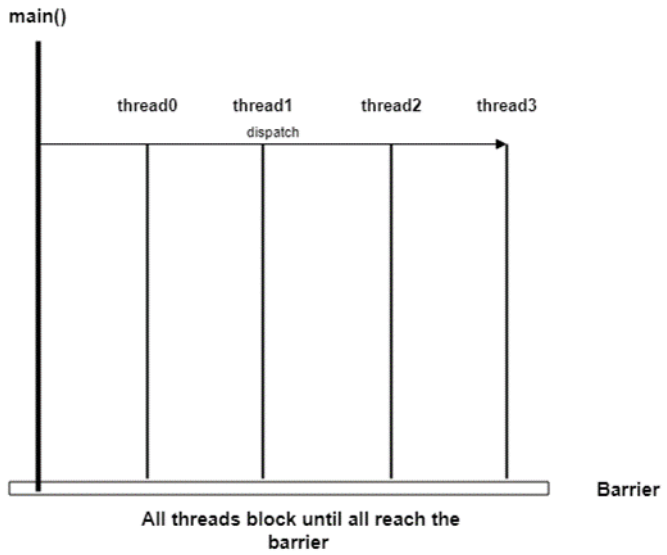
- API specified in Swagger
- Server implemented as a Java servlet running in Tomcat
- Each API
  - Validates inputs
  - Returns a valid response
  - That's it ☺
- Test APIs with Postman





Step 2 – Build the Client (Simple)

- Build a multithreaded Java client to measure server performance
  - 3 phases to warmup and cooldown server
  - Max 256 threads
  - Write-heavy workload specified in assignment
- Test with 32, 64, 128, 256 threads
- Measure total ‘wall time’ performance and throughput for a test

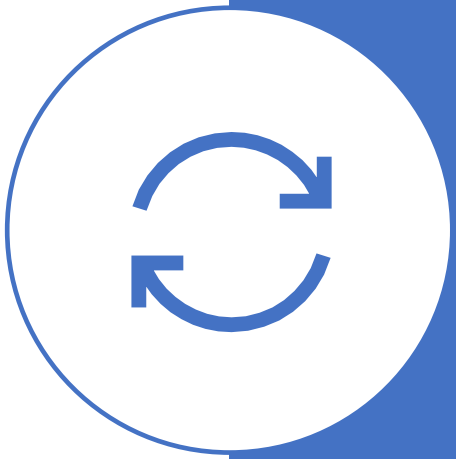


Stage 2 Results

- Server effectively does nothing
- Client threads send requests and do nothing
- Therefore you should get the highest possible throughput ☺☺☺
- Things to consider:
  - Execute client and server as close together as possible
    - Same data center?
    - Laptop -> data center distance minimized
  - Throughput is requests/second

Stage 3 – Instrument Client

- We want to measure and record the latency for every request
- We can use this to get insights into how the system is performing
- Every request latency needs to be stored for post-processing to calculate:
  - Mean, median, p99, throughput
- Want to achieve this with as little overhead as possible
  - Eg compare throughput with 32 threads from Stage 2 to instrumented version in Stage 3.
  - The difference is the code you have added - the instrumentation
  - Should be small (<5%)



Things to Consider in Stage 3

- Client has limited heap space
- You are capturing 1000s of latencies – this has to be fast
  - Thread local operations are fast
- Avoid unnecessary serialization
- Collections.sort() – scalable?
- Many charting options:
  - http://www.jfree.org/jfreechart/

Summary

There's lots of cloud/tomcat infrastructure to get working

Easy once you know how

Look critically at your results – we will ;)

Good luck!!