BSDS Assignment 3

Shujian Wen, Wenbo Wang

Results

- Codes are available at my github repo: https://github.com/Greatjian/CS_6650_distributed_system

	32	**64**	**128**	**256**
aws (assignment 2)	521	555	697	1127
aws lambda	812	906	1089	1296
gcp	377	423	525	887
gcp load_balancing	387	414	526	893

- From the table, we can see:
    - gcp (without lb) $\approx$ gcp (with lb) < aws < aws lambda
    - load balancing contributes little work
    - gcp has an upper limit of 2500 throughput at 256 threads (see pic below)
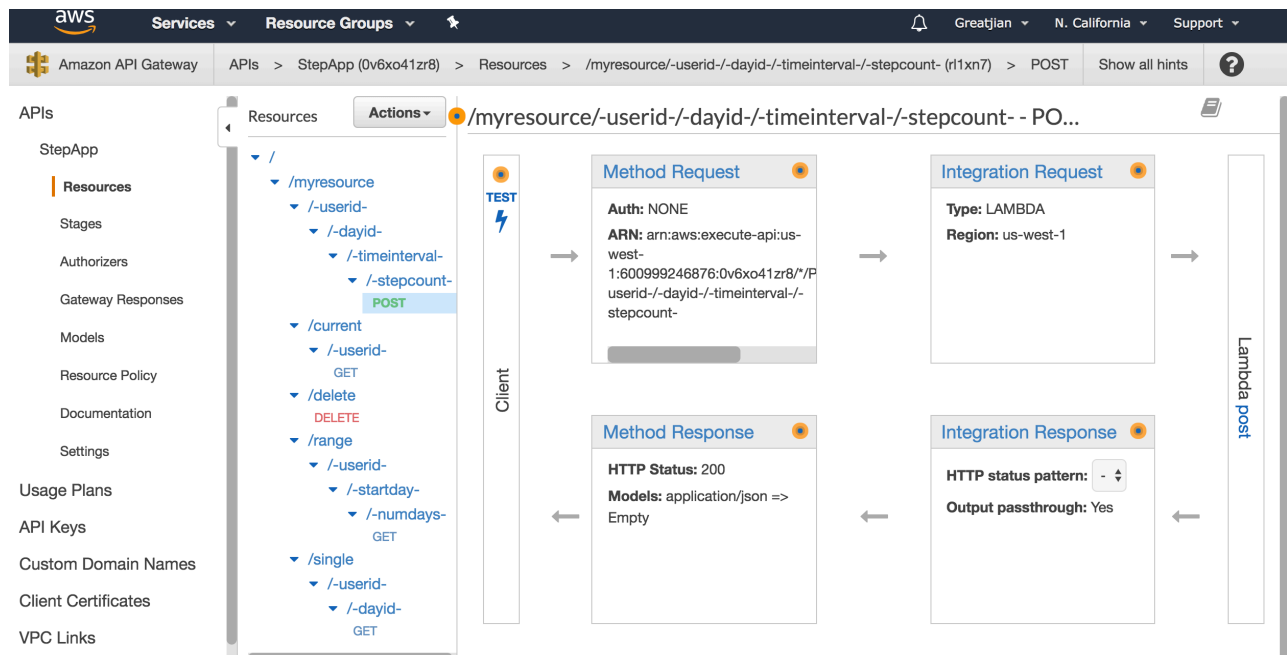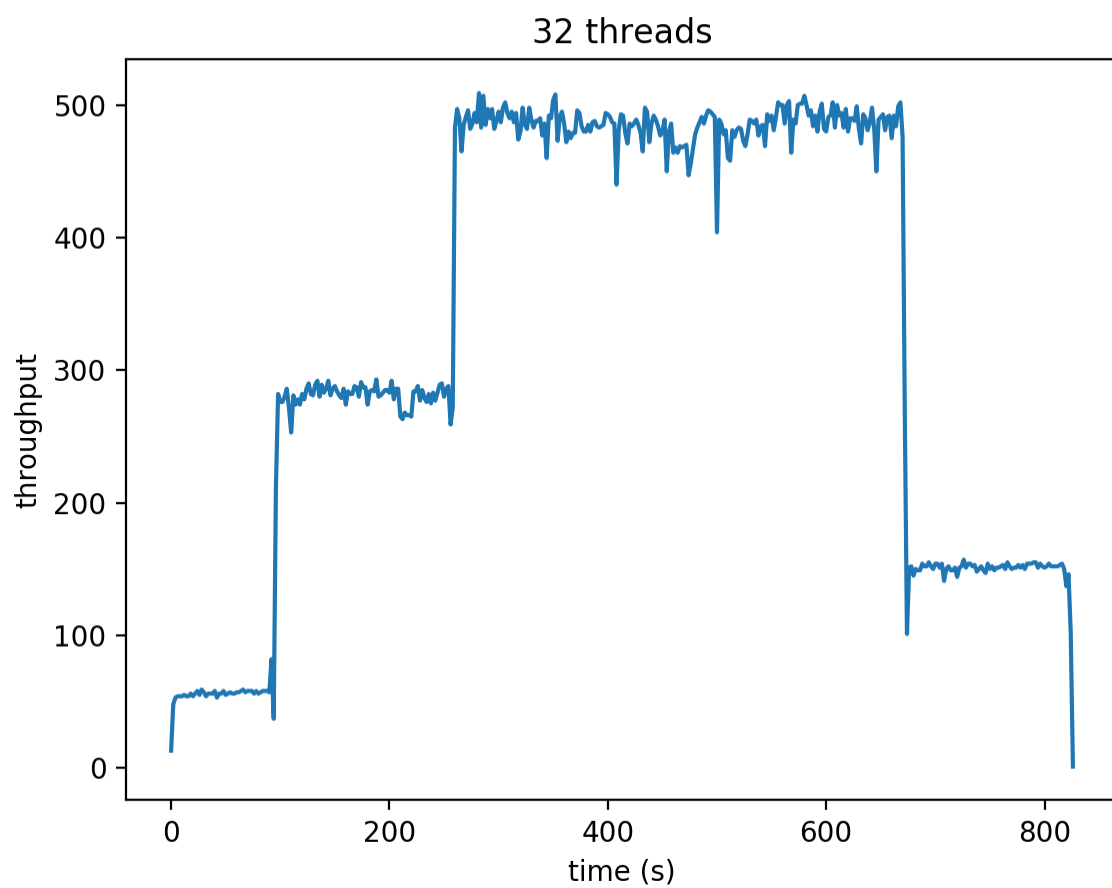
AWS Lambda

- eclipse setup
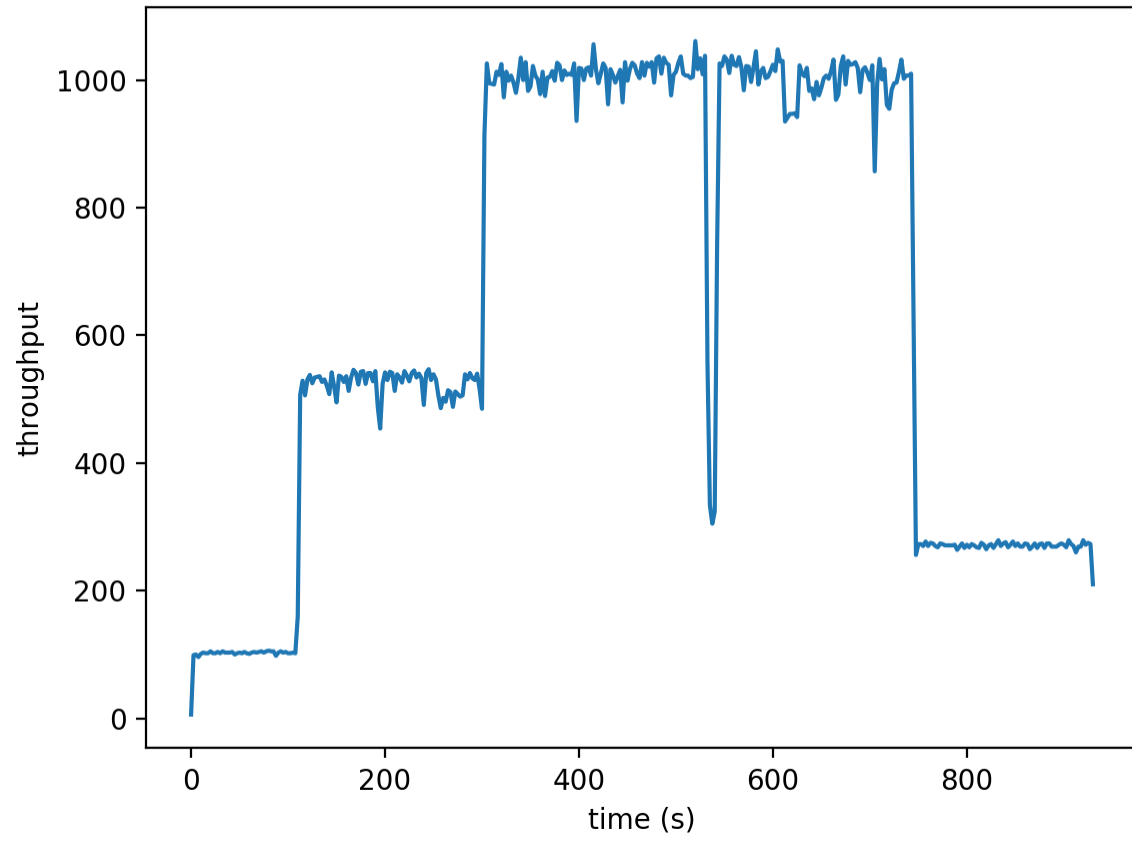
Eclipse IDE — `eclipse-workspace - bsds1/src/main/java/com/amazonaws/lambda/demo/post.java - Eclipse IDE`

```java
package com.amazonaws.lambda.demo;

import com.amazonaws.services.lambda.runtime.Context;
import com.amazonaws.services.lambda.runtime.RequestHandler;

import java.sql.SQLException;
import java.util.Map;

public class post implements RequestHandler<Object, String>{

    @Override
    public String handleRequest(Object input, Context context) {
        try {
            StepCountsDao stepCountsDao = StepCountsDao.getInstance();
            Map<String, String> params = (Map) input;
            StepCounts stepCounts = new StepCounts(Integer.parseInt(params.
                Integer.parseInt(params.get("dayID")),
                Integer.parseInt(params.get("timeInterval")),
                Integer.parseInt(params.get("stepCount")));
            stepCountsDao.create(stepCounts);
            return "post sucess";
        } catch (SQLException e) {
            e.printStackTrace();
        }
        return "";
    }
}
```

Console:
```
<terminated> bsds1 [Maven Build] /Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java (Dec 7, 2018, 9:09:53 PM)
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 4.868 s
[INFO] Finished at: 2018-12-07T21:10:00-08:00
[INFO] ------------------------------------------------------------------------
```

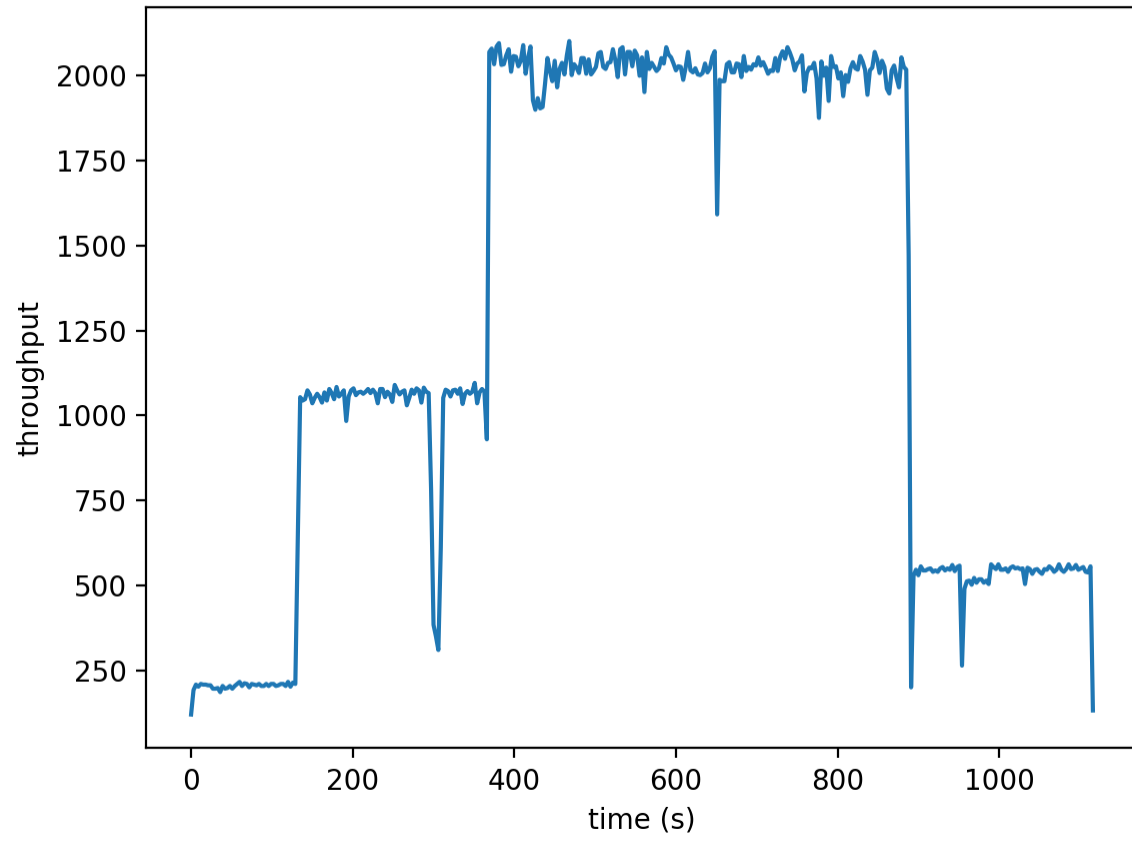- use API gateway to implement requests
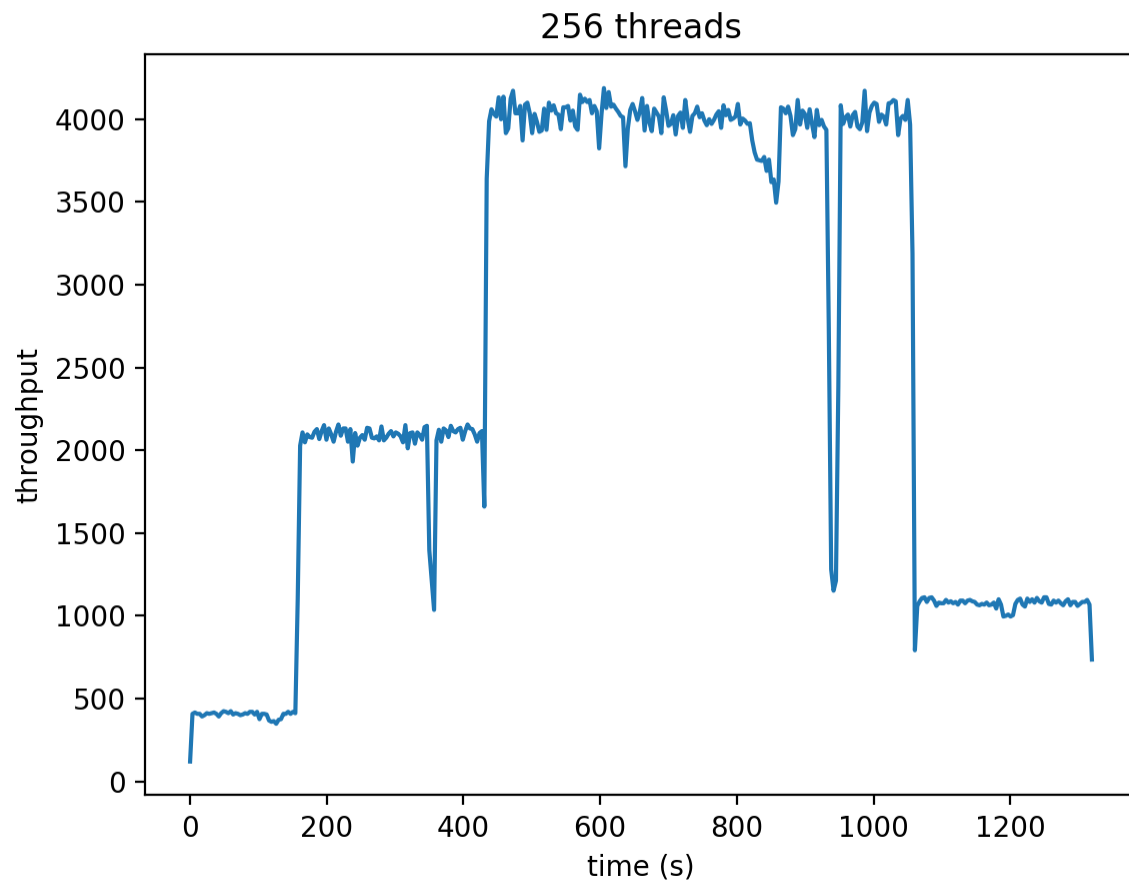
- throughput

32 threads

128 threads

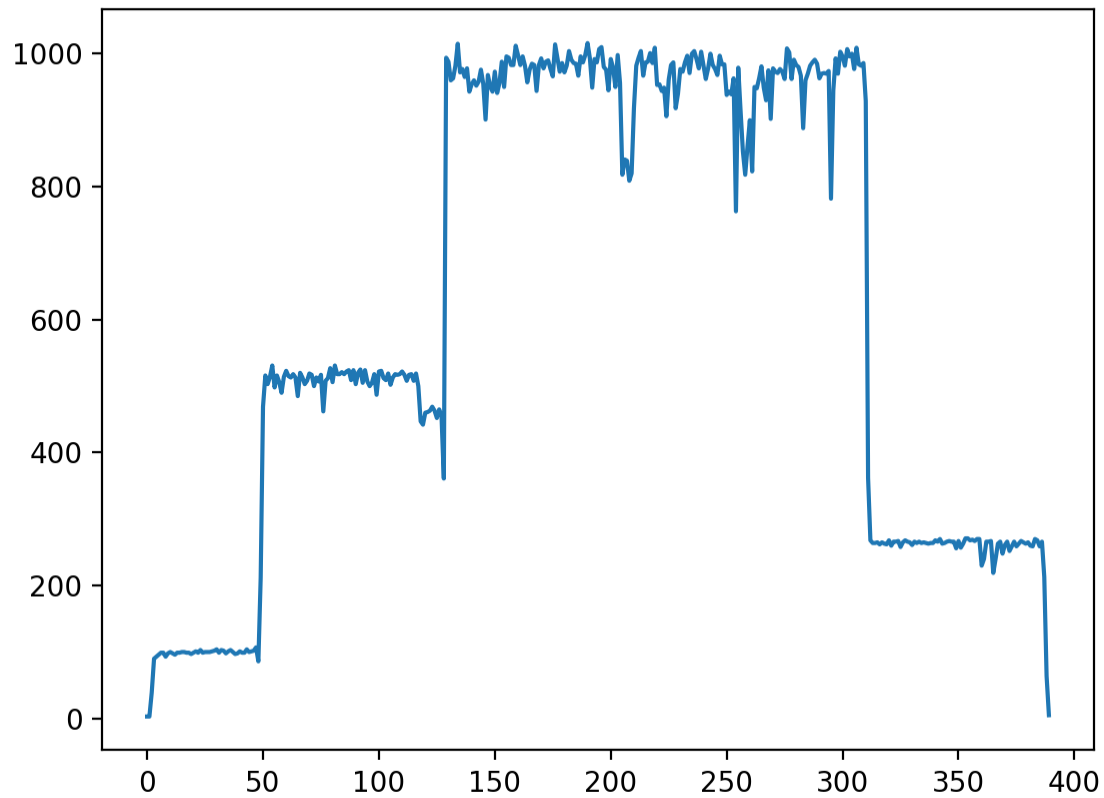## 256 threads

GCP

- without load balancing

```
Run  Main
 ▶   ⬆  ⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
 ■   ⬇    Warmup: 3 threads running ...
 �II  ⬛
 ◉   ⬛    Warmup complete: 43.949 seconds
 ⬛   ⬛    Loading: 16 threads running ...
 ⬛   🗑
           Loading complete: 78.479 seconds
 🔧
 ✕         Peak: 32 threads running ...
 ?         Peak complete: 179.305 seconds

           Cooldown: 8 threads running ...

           Cooldown complete: 75.821 seconds

           ---------------------------------------------------------
           Total run time: 377.561 seconds
           Total number of requests sent: 240500
           Mean latency: 634
           95% latency: 0.024
           99% latency: 0.022

           Process finished with exit code 0
```

Run ▣ Main

⊞ /Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
   Warmup: 6 threads running ...

   Warmup complete: 49.287 seconds

   Loading: 32 threads running ...

   Loading complete: 82.05 seconds
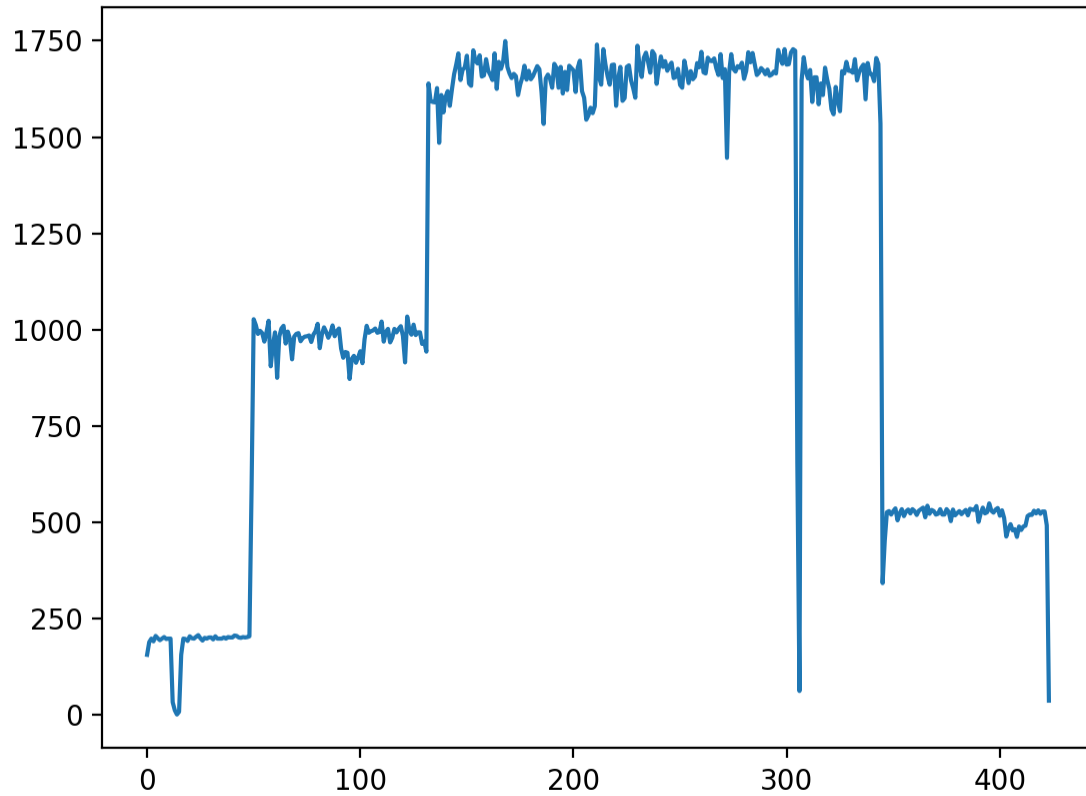
   Peak: 64 threads running ...

   Peak complete: 214.62 seconds

   Cooldown: 16 threads running ...
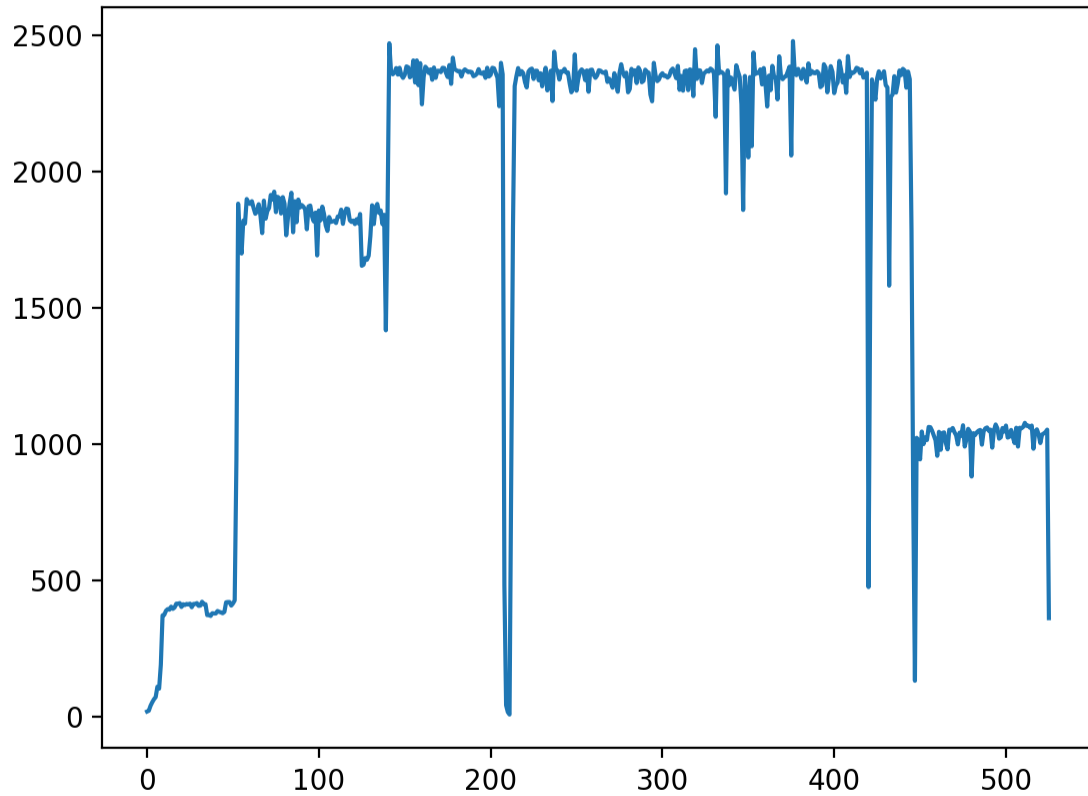
   Cooldown complete: 77.195 seconds

   _____
   Total run time: 423.16 seconds
   Total number of requests sent: 481000
   Mean latency: 1134
   95% latency: 0.026
   99% latency: 0.023

   Process finished with exit code 0

Run　Main

⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
    Warmup: 12 threads running ...

    Warmup complete: 51.92 seconds

    Loading: 64 threads running ...

    Loading complete: 87.652 seconds

    Peak: 128 threads running ...

    Peak complete: 307.768 seconds

    Cooldown: 32 threads running ...

    Cooldown complete: 77.747 seconds
    |
    _____
    Total run time: 525.092 seconds
    Total number of requests sent: 962000
    Mean latency: 1828
    95% latency: 0.027
    99% latency: 0.024

    Process finished with exit code 0

```
Run      Main
    /Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
    Warmup: 25 threads running ...

    Warmup complete: 45.795 seconds

    Loading: 128 threads running ...

    Loading complete: 137.655 seconds

    Peak: 256 threads running ...

    Peak complete: 611.091 seconds

    Cooldown: 64 threads running ...

    Cooldown complete: 92.953 seconds

    _____
    Total run time: 887.498 seconds
    Total number of requests sent: 1925500
    Mean latency: 2173
    95% latency: 0.032
    99% latency: 0.025

    Process finished with exit code 0
```
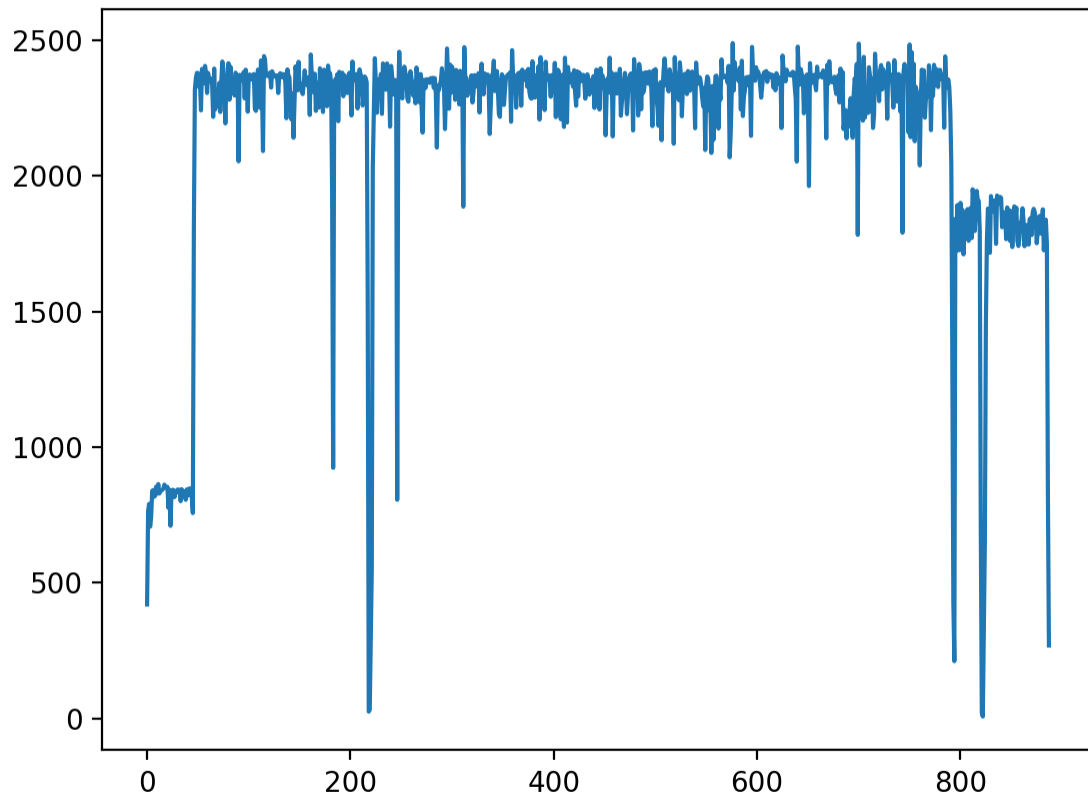
- load balancing setup

bsds

← Load balancer details   ✏ EDIT   🗑 DELETE

lb

Details   Monitoring   Caching

Frontend

Protocol ^	IP:Port	Certificate	Network Tier ⓘ
HTTP	35.244.254.5:80	—	Premium

Host and path rules

Hosts ^	Paths	Backend
All unmatched (default)	All unmatched (default)	bs

Backend

Backend services

✅ 1. bs

Endpoint protocol: **HTTP**   Named port: **http**   Timeout: **30 seconds**   Cloud CDN: **disabled**   Health check: hc

⌄ Advanced configurations

Instance group ^	Zone	Healthy	Autoscaling	Balancing mode	Capacity
instance-group-2	us-west1-b	2 / 2	Target CPU usage 60%	Max CPU: 80%	100%

Run ▦ Main

⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
Warmup: 3 threads running ...

Warmup complete: 44.774 seconds

Loading: 16 threads running ...

Loading complete: 79.497 seconds

Peak: 32 threads running ...

Peak complete: 183.116 seconds

Cooldown: 8 threads running ...

Cooldown complete: 80.389 seconds

_____

Total run time: 387.783 seconds
Total number of requests sent: 240500
Mean latency: 618
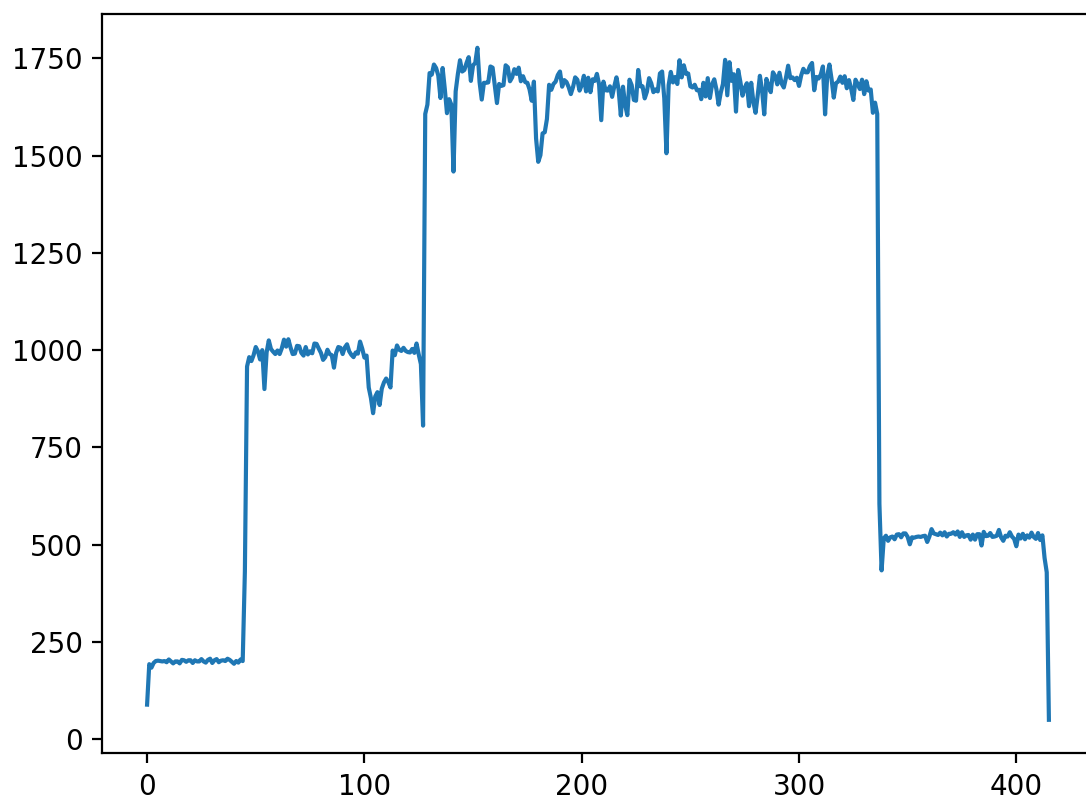95% latency: 0.024
99% latency: 0.023

Process finished with exit code 0
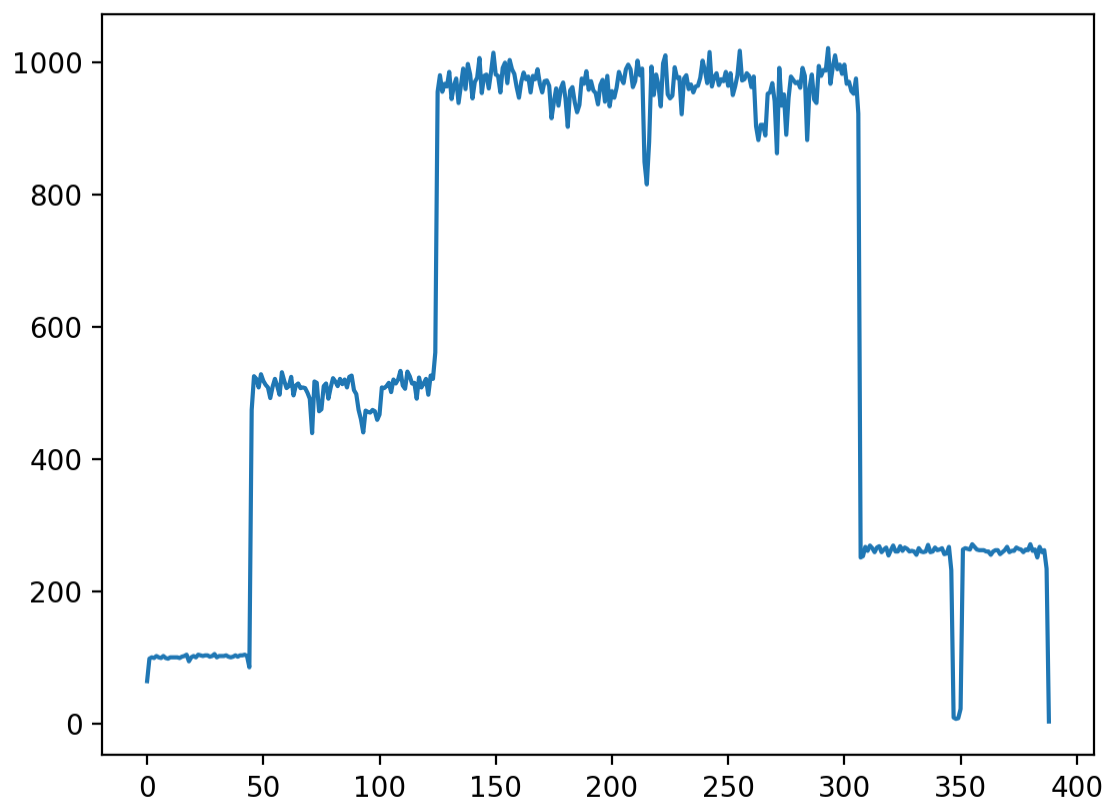
Run ▣ Main

⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
   Warmup: 6 threads running ...

   Warmup complete: 45.129 seconds

   Loading: 32 threads running ...

   Loading complete: 81.983 seconds

   Peak: 64 threads running ...

   Peak complete: 210.557 seconds

   Cooldown: 16 threads running ...

   Cooldown complete: 77.241 seconds

   _____

   Total run time: 414.916 seconds
   Total number of requests sent: 481000
   Mean latency: 1156
   95% latency: 0.025
   99% latency: 0.023

   Process finished with exit code 0

```
Run    Main
  ▶    ↑   ⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
       ↓      Warmup: 12 threads running ...
  �II   ⇄
              Warmup complete: 52.607 seconds
  ⟳   ▣
              Loading: 64 threads running ...
  ⇥   ⬚
              Loading complete: 88.944 seconds
  ⬛   ▥
              Peak: 128 threads running ...
  ⟋
              Peak complete: 302.932 seconds
  ✕
  ?           Cooldown: 32 threads running ...

              Cooldown complete: 82.15 seconds

              _____

              Total run time: 526.638 seconds
              Total number of requests sent: 962000
              Mean latency: 1828
              95% latency: 0.027
              99% latency: 0.024

              Process finished with exit code 0
```
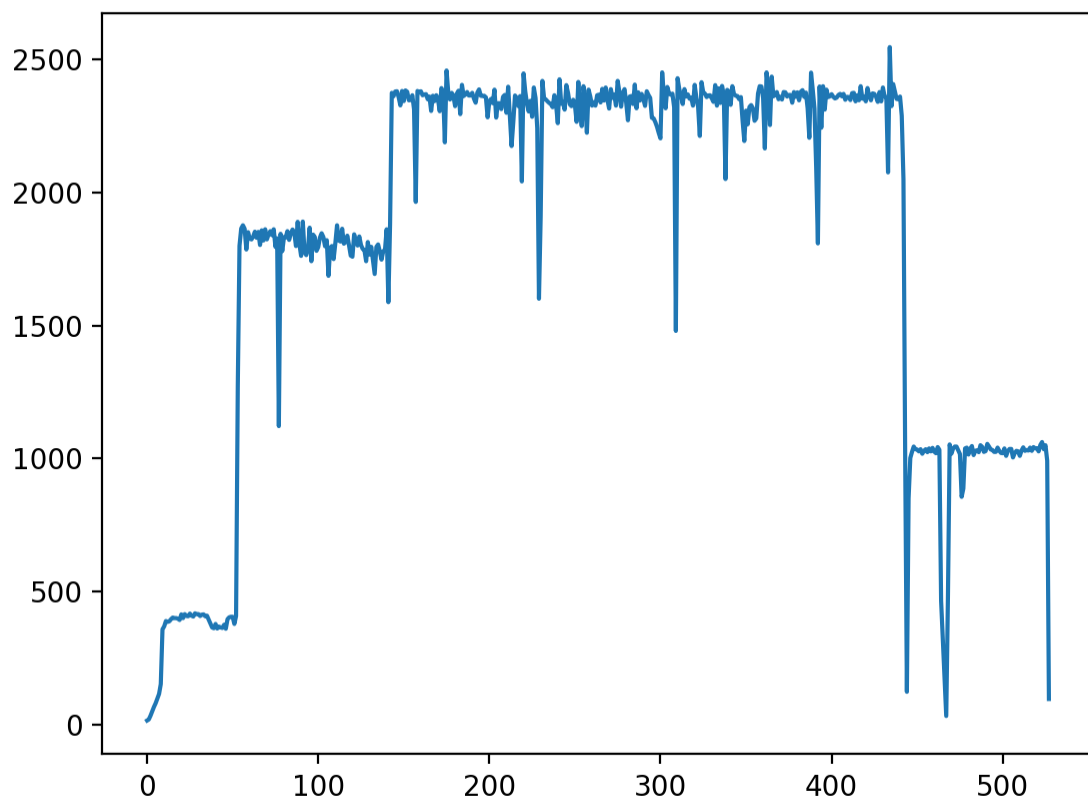
```
⊞/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ... <1 internal calls>
Warmup: 25 threads running ...

Warmup complete: 48.252 seconds

Loading: 128 threads running ...

Loading complete: 138.285 seconds

Peak: 256 threads running ...

Peak complete: 613.861 seconds

Cooldown: 64 threads running ...

Cooldown complete: 93.24 seconds

_____
Total run time: 893.643 seconds
Total number of requests sent: 1925500
Mean latency: 2153
95% latency: 0.033
99% latency: 0.026

Process finished with exit code 0
```