HW 2 Report - Linni Cai

Github URL:

https://github.com/linni-cai-lc/CS6650_Distributed_System/tree/main/hw2

Statistics URL:

https://docs.google.com/spreadsheets/d/1l0VhmU-Bu_0gtQ4B3u6QT-v6oz5fsVwlK6J3LJ9UpsM/edit#gid=0

Server Design:

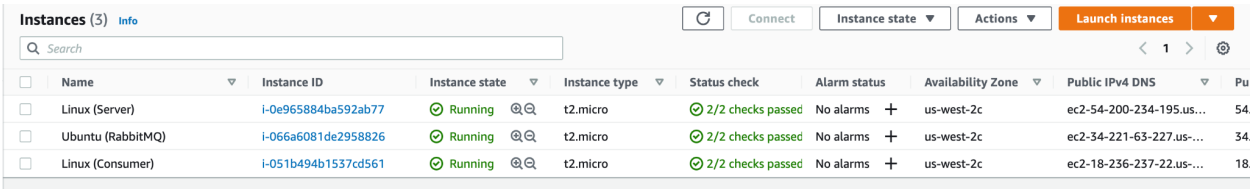
- ChannelFactory
    - Create a channel to connect to RabbitMQ with authentication on the EC2 instance which runs the RabbitMQ server
- SkierServlet
    - doGet
        - implement GET request
        - distinguish URL parts and obtain parameter information
        - report request status and message
    - doPost
        - implement POST request
        - distinguish URL parts and obtain parameter information
        - obtain request body as a JSON object
        - report request status and message
        - sendDataToQueue
            - pack and publish the JSON string to RabbitMQ's queue

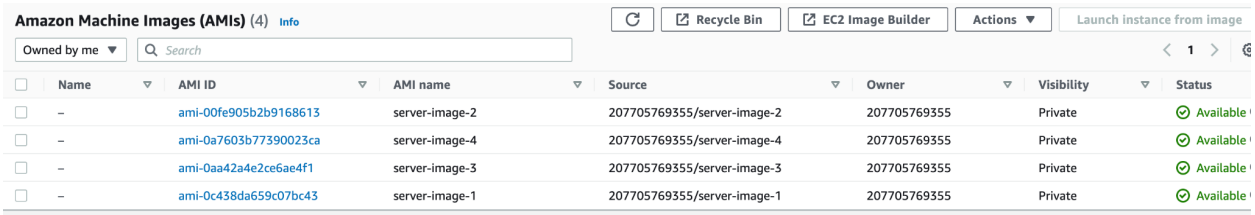
Results:

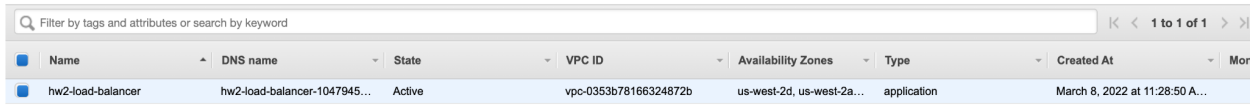
I run part2's multi-threaded client locally to send POST requests and obtain statistics reports.
I created three EC2 instances:

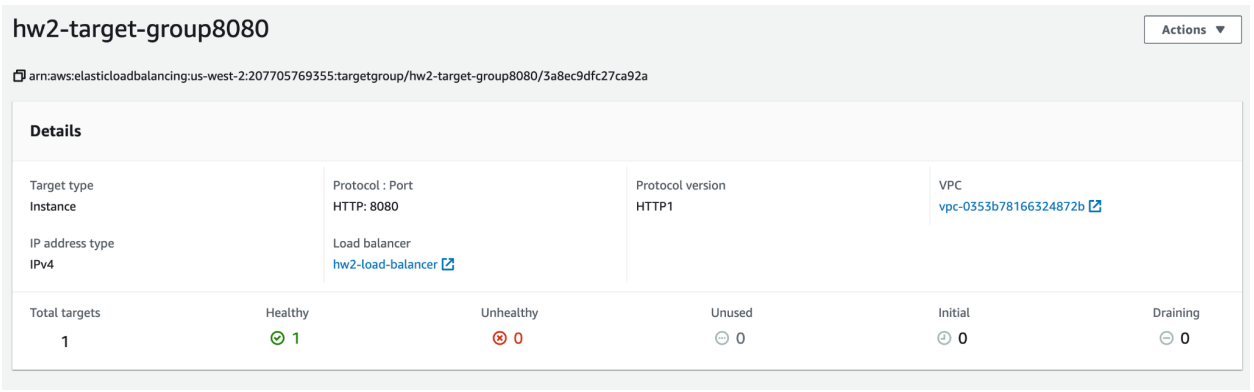
- Server
    - Linux instance to hold server war, providing skier API functionality
    - has four image copies
    - connect to load balancer
    - send messages to the queue
- RabbitMQ
    - Ubuntu instance to hold RabbitMQ server
    - owns the queue and store messages

- Consumer
    - Linux instance to run consumer jar
    - receive messages from the queue





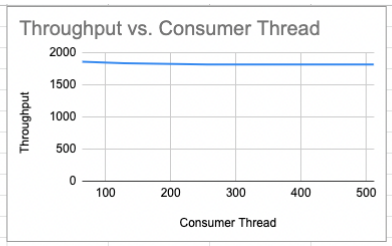


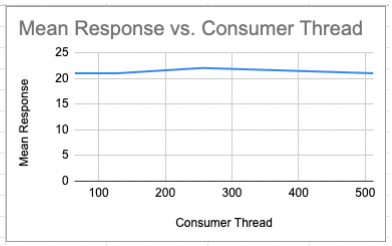


I obtained throughput and mean response statistics from part 2's multi-threaded client.

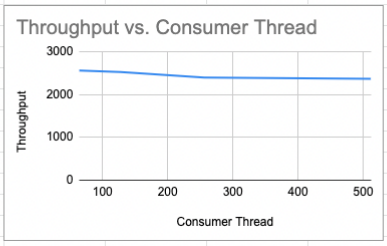
- When I set the constant number of client threads, increase the number of consumer max threads, it doesn't change too much on throughput and mean response, which means the number of consumer max threads might not affect on these outputs.

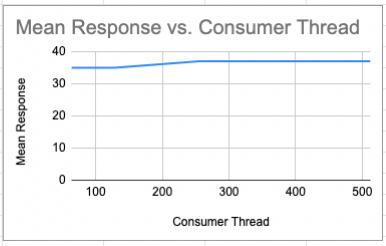
Client Thread 64		
Consumer Thread	Throughput	Mean Response
64	1858	21
128	1834	21
256	1814	22
512	1814	21



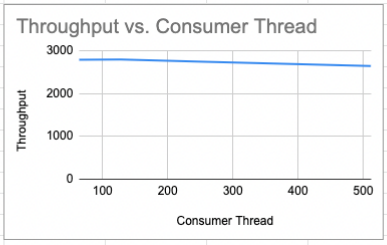


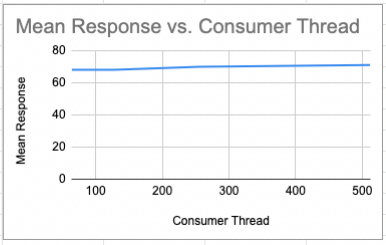
Client Thread 128		
Consumer Thread	Throughput	Mean Response
64	2558	35
128	2521	35
256	2393	37
512	2363	37



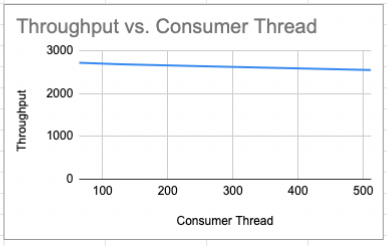


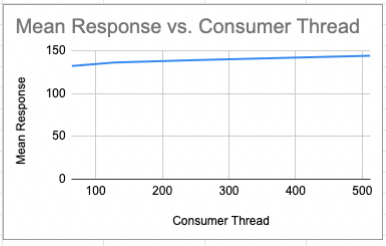
Client Thread 256		
Consumer Thread	Throughput	Mean Response
64	2788	68
128	2794	68
256	2740	70
512	2641	71





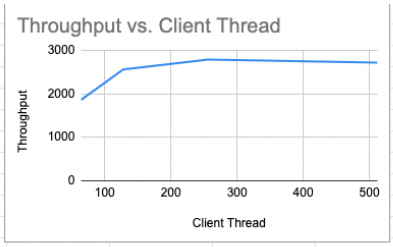
Client Thread 512		
Consumer Thread	Throughput	Mean Response
64	2719	132
128	2680	136
256	2632	139
512	2549	144

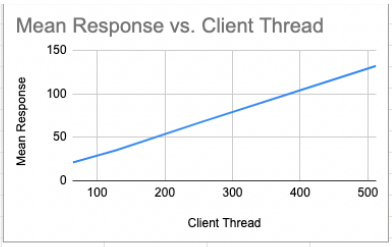




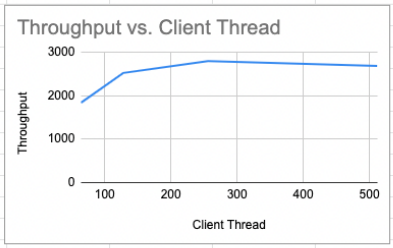
- However, when I set the constant number of consumer threads, increase the number of consumer max threads, there are some effects on throughput and mean response differently.
    - for the throughput, when the number of client threads increases, the throughput increases, however, when it hit a threshold around 256, the throughput becomes stable and not effective anymore.
    - for the mean response, when the number of client threads increases, the mean response time increases, which indicates a positive correlation.

Consumer Thread 64		
Client Thread	Throughput	Mean Response
64	1858	21
128	2558	35
256	2788	68
512	2719	132

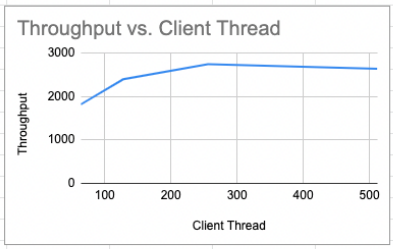


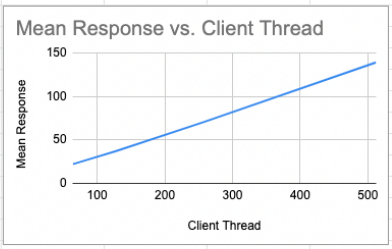


Consumer Thread 128		
Client Thread	Throughput	Mean Response
64	1834	21
128	2521	35
256	2794	68
512	2680	136

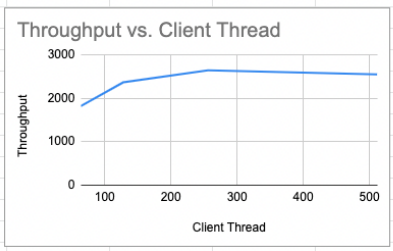


Consumer Thread 256		
Client Thread	Throughput	Mean Response
64	1814	22
128	2393	37
256	2740	70
512	2632	139





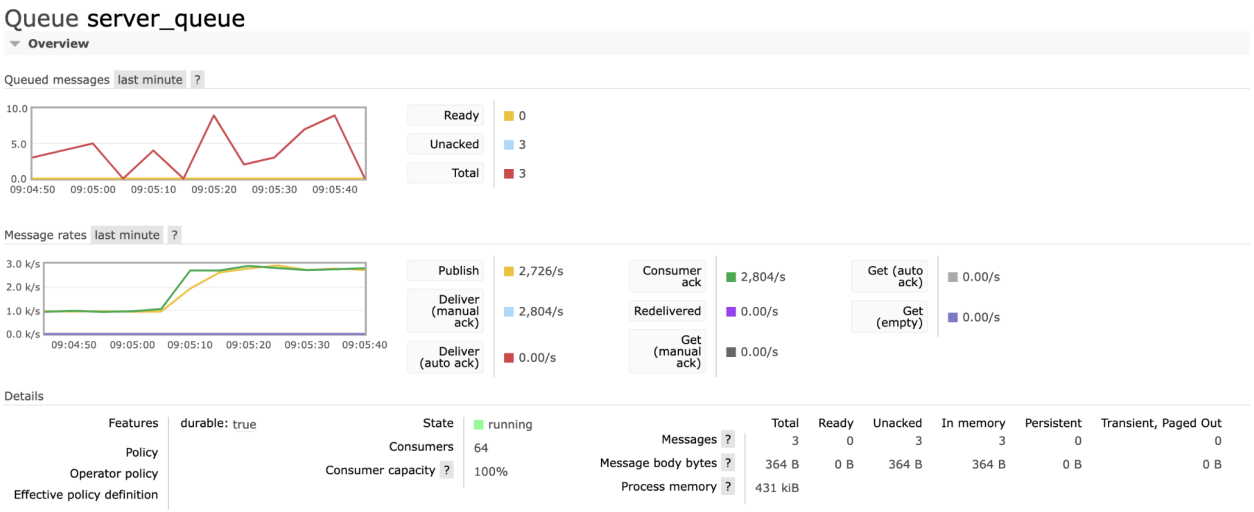
Consumer Thread 512		
Client Thread	Throughput	Mean Response
64	1814	21
128	2363	37
256	2641	71
512	2549	144

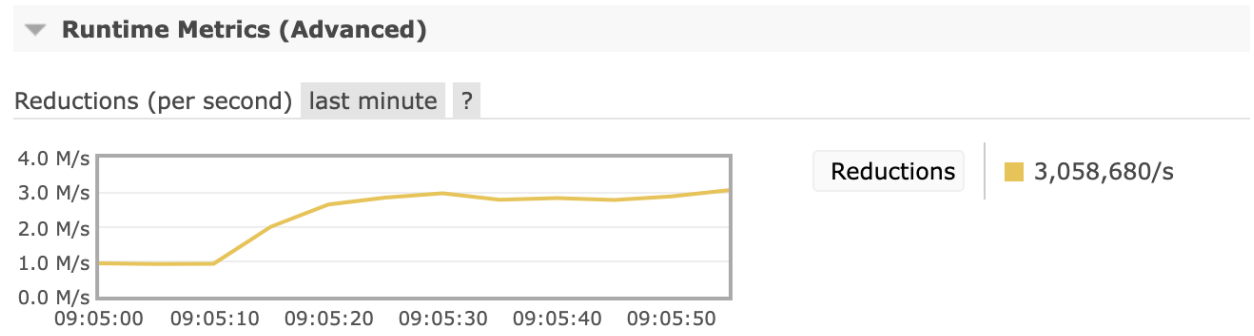


With 64 consumer max threads, we have the following RMQ's outputs for the different numbers of client threads, as we can see, the message send/receive rate is around 1, queue size is around 0-15:

- client thread 64

The queue size range is 0 - 10, message rate is around 1.

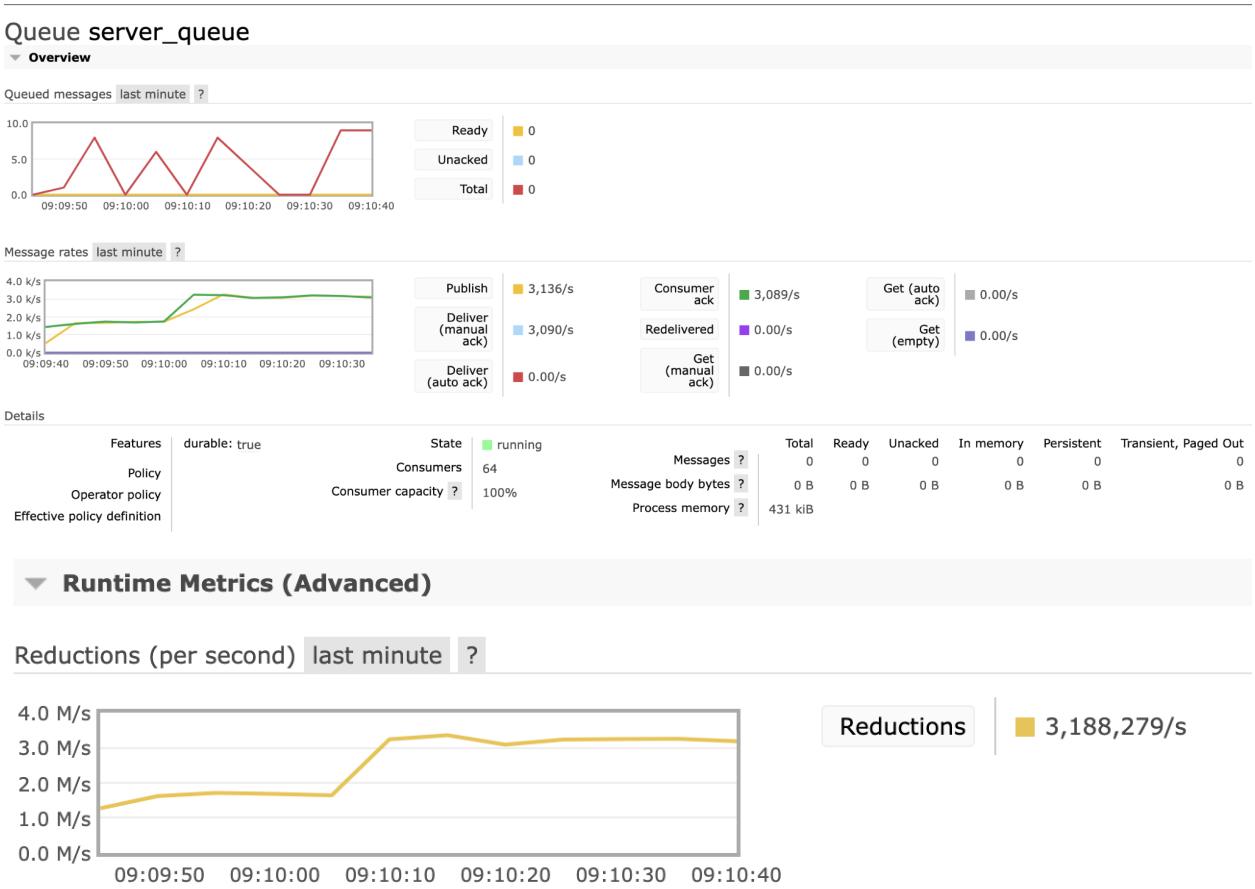




Minimum binary virtual heap size in words (min_bin_vheap_size)	46422
Minimum heap size in words (min_heap_size)	233
Maximum generational collections before fullsweep (fullsweep_after)	65535
Number of minor GCs (minor_gcs)	51

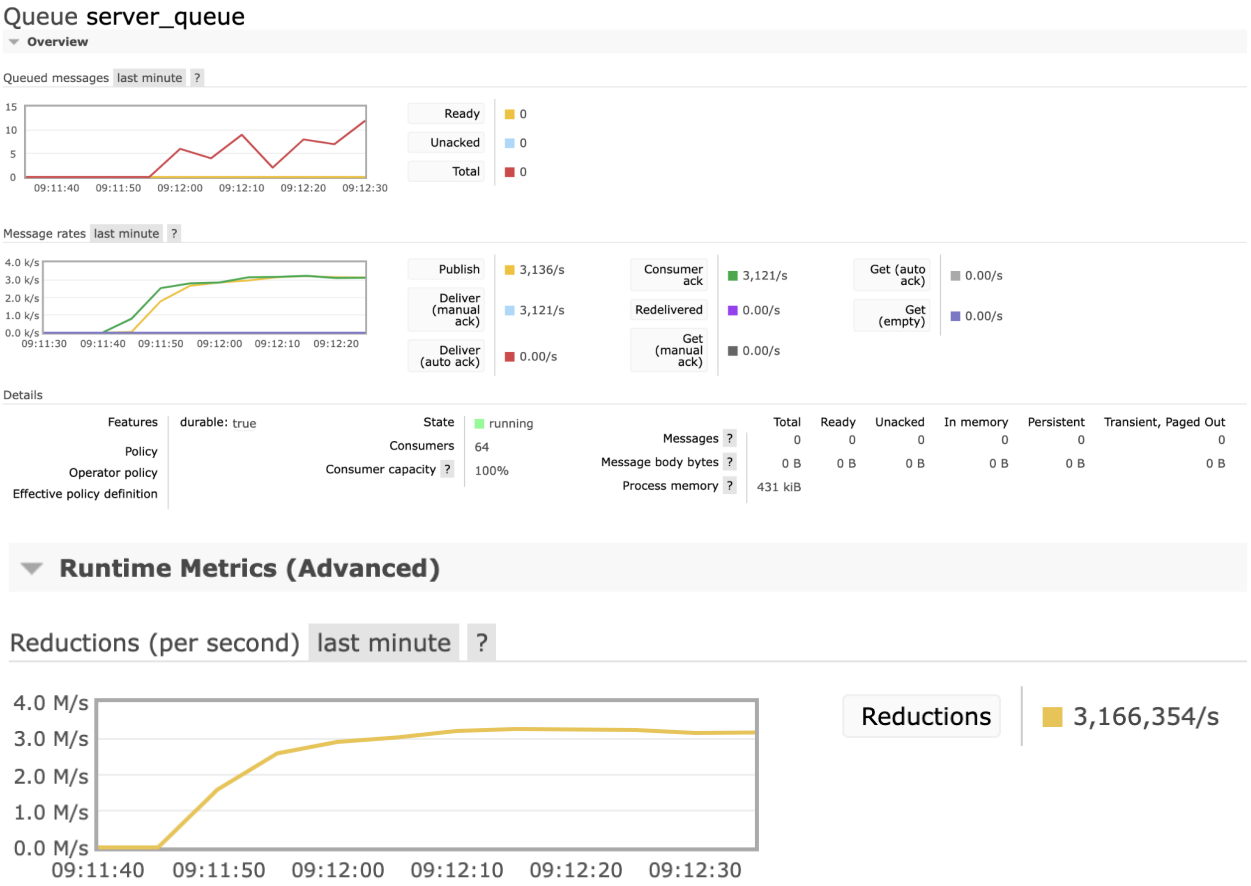
- client thread 128

The queue size range is 0 - 10, message rate is around 1.



- client thread 256

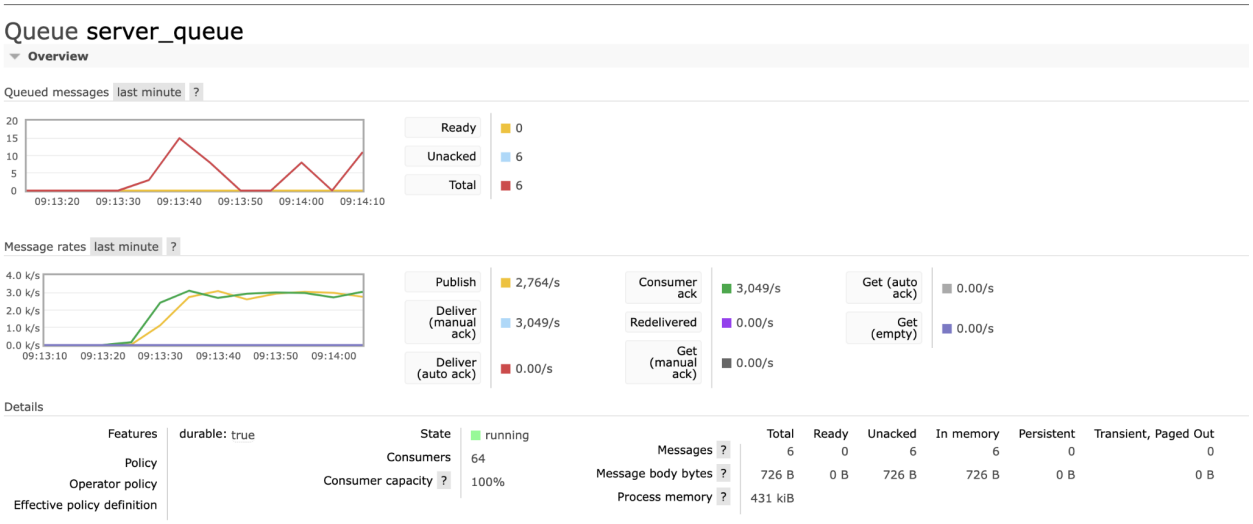
The queue size range is 0 - 15, message rate is around 1.

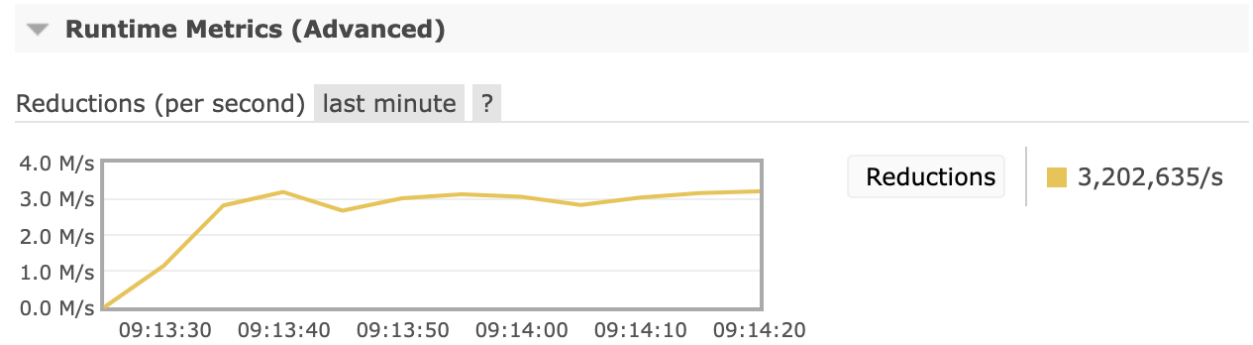


Minimum binary virtual heap size in words (min_bin_vheap_size)	46422
Minimum heap size in words (min_heap_size)	233
Maximum generational collections before fullsweep (fullsweep_after)	65535
Number of minor GCs (minor_gcs)	29

- client thread 512

The queue size range is 0 - 15, message rate is around 1.





Minimum binary virtual heap size in words (min_bin_vheap_size)	46422
Minimum heap size in words (min_heap_size)	233
Maximum generational collections before fullsweep (fullsweep_after)	65535
Number of minor GCs (minor_gcs)	38

Appendix:

The following statistics are running part2's multi-threaded client with the argument as following includes the various num_threads: 64, 128, 256, 512

--num_skiers 20000 --num_lifts 40 --ip_address 54.200.234.195:8080

Client - num_threads: 512

Consumer - maxThread: 64
mean response time (millisecs): 132
median response time (millisecs): 94

throughput: 2719
p99 (99th percentile) response time: 1604
min response time (millisecs): 11
max response time (millisecs): 7885

Consumer - maxThread: 128
mean response time (millisecs): 136
median response time (millisecs): 99
throughput: 2680
p99 (99th percentile) response time: 1732
min response time (millisecs): 12
max response time (millisecs): 9391

Consumer - maxThread: 256
mean response time (millisecs): 139
median response time (millisecs): 100
throughput: 2632
p99 (99th percentile) response time: 1752
min response time (millisecs): 12
max response time (millisecs): 9368

Consumer - maxThread: 512
mean response time (millisecs): 144
median response time (millisecs): 103
throughput: 2549
p99 (99th percentile) response time: 1887
min response time (millisecs): 13
max response time (millisecs): 9401

Client - num_threads: 256

Consumer - maxThread: 64
mean response time (millisecs): 68
median response time (millisecs): 64
throughput: 2788
p99 (99th percentile) response time: 278
min response time (millisecs): 12
max response time (millisecs): 1292

Consumer - maxThread: 128
mean response time (millisecs): 68
median response time (millisecs): 60
throughput: 2794
p99 (99th percentile) response time: 299

min response time (millisecs): 11
max response time (millisecs): 1202

Consumer - maxThread: 256
mean response time (millisecs): 70
median response time (millisecs): 35
throughput: 2740
p99 (99th percentile) response time: 366
min response time (millisecs): 12
max response time (millisecs): 1584

Consumer - maxThread: 512
mean response time (millisecs): 71
median response time (millisecs): 29
throughput: 2641
p99 (99th percentile) response time: 404
min response time (millisecs): 12
max response time (millisecs): 1417

Client - num_threads: 128

Consumer - maxThread: 64
mean response time (millisecs): 35
median response time (millisecs): 36
throughput: 2558
p99 (99th percentile) response time: 77
min response time (millisecs): 11
max response time (millisecs): 747

Consumer - maxThread: 128
mean response time (millisecs): 35
median response time (millisecs): 36
throughput: 2521
p99 (99th percentile) response time: 75
min response time (millisecs): 11
max response time (millisecs): 887

Consumer - maxThread: 256
mean response time (millisecs): 37
median response time (millisecs): 37
throughput: 2393
p99 (99th percentile) response time: 86
min response time (millisecs): 11
max response time (millisecs): 785

Consumer - maxThread: 512
mean response time (millisecs): 37
median response time (millisecs): 39
throughput: 2363
p99 (99th percentile) response time: 79
min response time (millisecs): 11
max response time (millisecs): 833

Client - num_threads: 64

Consumer - maxThread: 64
mean response time (millisecs): 21
median response time (millisecs): 20
throughput: 1858
p99 (99th percentile) response time: 44
min response time (millisecs): 11
max response time (millisecs): 639

Consumer - maxThread: 128
mean response time (millisecs): 21
median response time (millisecs): 20
throughput: 1834
p99 (99th percentile) response time: 49
min response time (millisecs): 10
max response time (millisecs): 556

Consumer - maxThread: 256
mean response time (millisecs): 22
median response time (millisecs): 20
throughput: 1814
p99 (99th percentile) response time: 57
min response time (millisecs): 11
max response time (millisecs): 586

Consumer - maxThread: 512
mean response time (millisecs): 21
median response time (millisecs): 20
throughput: 1814
p99 (99th percentile) response time: 46
min response time (millisecs): 11
max response time (millisecs): 698
