#1 EC2 Instance specifications:

1.1 Launching Instance:

Instance Naming: Cassandrax (x = instance number)

Basic information

Name	cassandra1
Instance Id	3724191378437183203
Description	None
Type	Instance
Status	✅ Running
Creation time	Mar 24, 2024, 12:12:02 AM UTC-04:00
Zone	us-east1-b
Instance template	None
In use by	None
Reservations	Automatically choose
Labels	None
Tags ❓	—

1.2 OS image:

- ubuntu 20.04 LTS
- Architecture 64 bit (x86)

✅ **ubuntu-2004-focal-v20240307b**

Description	Canonical, Ubuntu, 20.04 LTS, amd64 focal image built on 2024-03-07
Location	asia (Asia Pacific), eu (European Union), us (United States)
Architecture	x86/64
Labels	None
Creation time	Mar 8, 2024, 1:09:44 PM UTC-05:00
Family	ubuntu-2004-lts
Encryption type	Google-managed

EQUIVALENT REST

1.3 Instance type:

e2 - medium shared core, 2vpcu, 4GB RAM

Machine configuration

Machine type	e2-medium
CPU platform	Intel Broadwell
Minimum CPU platform	None
Architecture	x86/64
vCPUs to core ratio ❓	—
Custom visible cores ❓	—
Display device	Disabled Enable to use screen capturing and recording tools
GPUs	None
Resource policies	

1.6 Storage:

Storage

Boot disk

Name ↑	Image	Interface type	Size (GB)	Device name	Type	Architecture	Encryption
cassandra1	ubuntu-2004-focal-v20240307b	SCSI	10	cassandra1	Balanced persistent disk	x86/64	Google-managed

Special Consideration - GCP Free Tier

If this experiment is being done on the GCP free tier, only 8 IP addresses can be registered in the same region. This leads to an issue during the 9-node tests. To circumvent this, a new project must be created. Inside this project, create a new VPC with a subnet that doesn't overlap with the default one used for the main Cassandra node subnets. In this project, 11.0.0.0/9 was used as the subnet. Make two new nodes on this subnet, in the same region as the first project. Then, configure VPC network peering between the two projects, and allow all traffic between the two subnets in the firewall settings. This allows it so that we can use internal IP routing between two different projects.

2 Connecting to instance:

https://cloud.google.com/compute/docs/connect/create-ssh-keys
- Create a key pair

```
ssh-keygen -t rsa -f ~/.ssh/KEY_FILENAME -C USERNAME -b 2048
```

- Upload the public key to the instance

SSH Keys

SSH keys

Username	Key

- Connect to instance through ssh

```
ssh -i PATH_TO_PRIVATE_KEY USERNAME@EXTERNAL_IP
```

3 Installing Cassandra:

Alternatively, use the script 'install-cassandra.sh' provided in the folder

3.1 Installing necessary packages:

3.1.1 Install Java

```
sudo apt install openjdk-8-jre-headless
```

```
vi ~/.bashrc
```

Scroll to the end and then type 'i' to insert:

```
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export JRE_HOME=$JAVA_HOME/jre
export PATH=$PATH:$JAVA_HOME/bin:$JAVA_HOME/jre/bin
```

Press 'ESC', write ':wq', press enter

3.1.2 Install API-transport-https package

Enables access to repositories (Cassandra Repo) using HTTPs

```
sudo apt install apt-transport-https
```

3.2 Install Cassandra

3.2.1 Import the Apache Cassandra repository keys

```
curl -fsSL https://downloads.apache.org/cassandra/KEYS | sudo apt-key add -
```

3.2.2 Add the Cassandra repository

```
echo "deb https://downloads.apache.org/cassandra/debian 41x main" | sudo
tee -a /etc/apt/sources.list.d/cassandra.sources.list
```

3.2.3 Update package lists

```
sudo apt-get update
```

3.2.4 Install Cassandra

```
sudo apt-get install cassandra
```

3.3 Commands
To start Cassandra:

```
sudo systemctl start cassandra
```

To restart the service:

```
sudo systemctl restart Cassandra
```

To stop the Cassandra service:
```
sudo systemctl stop
```

Check Cassandra node status:

```
nodetool status
```

Leave Cluster:
```
nodetool decommission
```

Test Cassandra Command-Line Shell

```
cqlsh
```

Commands

```
help
describe cluster
describe keyspaces
describe tables
```

4 Set up YCSB:

```
// Install YCSB

curl -O --location
https://github.com/brianfrankcooper/YCSB/releases/download/0.17.0/ycsb-0.17
.0.tar.gz
tar xfvz ycsb-0.17.0.tar.gz
cd ycsb-0.17.0

// Install python 2.7
sudo apt install python2.7

// Configure YCSB
cd bin
- Change top line of yscb to be python2.7

// Install pip
sudo apt-get update
sudo apt install python3-pip

// Install cqlsh (cassandra commandline interface) to test connection
pip3 install cqlsh
echo 'export PATH=$PATH:<path>/.local/bin' >> ~/.bashrc (add to path)
source ~/.bashrc (reload .bashrc)

//Test connection to Cassandra server node
cqlsh 10.142.0.2 9042

//Example load workload
./bin/ycsb load cassandra-cql -P workloads/workloada -p hosts="10.142.0.2"
-p port=9042

//Example run workload
./bin/ycsb run cassandra-cql -P workloads/workloada -p hosts="10.142.0.2"
-p port=9042
```

5 Set up other node connections:

For each node edit "cassandra.yaml" file

Set:
(line: 763) listen_address: internal IP
(line: 859) rpc_address: internal IP
(line: 557)Seed_provider: "10.142.0.2,10.142.0.6,10.142.0.9" (Internal address of the seed nodes)

To kill a node

```
nodetool assassinate <Internal IP of the node>
```

Results (One node)

Workload a load

```
[OVERALL], RunTime(ms), 5717
[OVERALL], Throughput(ops/sec), 174.91691446562882
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 55
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9620430295609584
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 55
[TOTAL_GC_TIME_%], Time(%), 0.9620430295609584
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2229248.0
[CLEANUP], MinLatency(us), 2228224
[CLEANUP], MaxLatency(us), 2230271
[CLEANUP], 95thPercentileLatency(us), 2230271
[CLEANUP], 99thPercentileLatency(us), 2230271
[INSERT], Operations, 1000
[INSERT], AverageLatency(us), 2182.972
[INSERT], MinLatency(us), 718
[INSERT], MaxLatency(us), 113663
[INSERT], 95thPercentileLatency(us), 4811
[INSERT], 99thPercentileLatency(us), 9127
[INSERT], Return=OK, 1000
```

Workload a run

```
[OVERALL], RunTime(ms), 5476
[OVERALL], Throughput(ops/sec), 182.61504747991233
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 45
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.8217677136596055
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 45
[TOTAL_GC_TIME_%], Time(%), 0.8217677136596055
[READ], Operations, 536
[READ], AverageLatency(us), 2127.8600746268658
[READ], MinLatency(us), 799
[READ], MaxLatency(us), 37343
[READ], 95thPercentileLatency(us), 4547
[READ], 99thPercentileLatency(us), 10519
[READ], Return=OK, 536
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2245632.0
[CLEANUP], MinLatency(us), 2244608
[CLEANUP], MaxLatency(us), 2246655
[CLEANUP], 95thPercentileLatency(us), 2246655
[CLEANUP], 99thPercentileLatency(us), 2246655
[UPDATE], Operations, 464
[UPDATE], AverageLatency(us), 1828.7521551724137
[UPDATE], MinLatency(us), 782
[UPDATE], MaxLatency(us), 12727
[UPDATE], 95thPercentileLatency(us), 4491
[UPDATE], 99thPercentileLatency(us), 9079
[UPDATE], Return=OK, 464
```

Workload b load

```
[OVERALL], RunTime(ms), 5218
[OVERALL], Throughput(ops/sec), 191.64430816404752
```

```
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 63
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.2073591414334994
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 63
[TOTAL_GC_TIME_%], Time(%), 1.2073591414334994
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2239488.0
[CLEANUP], MinLatency(us), 2238464
[CLEANUP], MaxLatency(us), 2240511
[CLEANUP], 95thPercentileLatency(us), 2240511
[CLEANUP], 99thPercentileLatency(us), 2240511
[INSERT], Operations, 1000
[INSERT], AverageLatency(us), 1754.077
[INSERT], MinLatency(us), 659
[INSERT], MaxLatency(us), 36735
[INSERT], 95thPercentileLatency(us), 3563
[INSERT], 99thPercentileLatency(us), 7715
[INSERT], Return=OK, 1000
```

Workload b Run

```
[OVERALL], RunTime(ms), 5507
[OVERALL], Throughput(ops/sec), 181.58707100054477
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 53
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9624114763028873
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 53
[TOTAL_GC_TIME_%], Time(%), 0.9624114763028873
[READ], Operations, 937
[READ], AverageLatency(us), 1882.0811099252935
[READ], MinLatency(us), 744
[READ], MaxLatency(us), 28671
[READ], 95thPercentileLatency(us), 3815
[READ], 99thPercentileLatency(us), 7295
[READ], Return=OK, 937
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[CLEANUP], AverageLatency(us), 2235392.0
[CLEANUP], MinLatency(us), 2234368
[CLEANUP], MaxLatency(us), 2236415
[CLEANUP], 95thPercentileLatency(us), 2236415
[CLEANUP], 99thPercentileLatency(us), 2236415
[UPDATE], Operations, 63
[UPDATE], AverageLatency(us), 2849.8888888888887
[UPDATE], MinLatency(us), 998
[UPDATE], MaxLatency(us), 13511
[UPDATE], 95thPercentileLatency(us), 7903
[UPDATE], 99thPercentileLatency(us), 8727
[UPDATE], Return=OK, 63
```

```
[OVERALL], RunTime(ms), 5507
[OVERALL], Throughput(ops/sec), 181.58707100054477
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 53
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9624114763028873
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 53
[TOTAL_GC_TIME_%], Time(%), 0.9624114763028873
[READ], Operations, 937
```

```
[READ], AverageLatency(us), 1882.0811099252935
[READ], MinLatency(us), 744
[READ], MaxLatency(us), 28671
[READ], 95thPercentileLatency(us), 3815
[READ], 99thPercentileLatency(us), 7295
[READ], Return=OK, 937
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[CLEANUP], 95thPercentileLatency(us), 2236415
[CLEANUP], 99thPercentileLatency(us), 2236415
[UPDATE], Operations, 63
[UPDATE], AverageLatency(us), 2849.8888888888887
[UPDATE], MinLatency(us), 998
[UPDATE], MaxLatency(us), 13511
[UPDATE], 95thPercentileLatency(us), 7903
[UPDATE], 99thPercentileLatency(us), 8727
[UPDATE], Return=OK, 63
```

Workload c Load

```
[OVERALL], RunTime(ms), 4818
[OVERALL], Throughput(ops/sec), 207.55500207555002
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 63
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.3075965130759652
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 63
[TOTAL_GC_TIME_%], Time(%), 1.3075965130759652
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2241536.0
[CLEANUP], MinLatency(us), 2240512
[CLEANUP], MaxLatency(us), 2242559
[CLEANUP], 95thPercentileLatency(us), 2242559
[CLEANUP], 99thPercentileLatency(us), 2242559
[INSERT], Operations, 1000
[INSERT], AverageLatency(us), 1384.344
[INSERT], MinLatency(us), 633
[INSERT], MaxLatency(us), 27791
[INSERT], 95thPercentileLatency(us), 2565
[INSERT], 99thPercentileLatency(us), 6371
[INSERT], Return=OK, 1000
```

Workload c Run

```
ncy are: []
[OVERALL], RunTime(ms), 4909
[OVERALL], Throughput(ops/sec), 203.70747606437158
[TOTAL_GCS_G1_Young_Generation], Count, 3
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 59
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.2018741087797924
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 3
[TOTAL_GC_TIME], Time(ms), 59
[TOTAL_GC_TIME_%], Time(%), 1.2018741087797924
[READ], Operations, 1000
[READ], AverageLatency(us), 1471.794
[READ], MinLatency(us), 717
[READ], MaxLatency(us), 29231
[READ], 95thPercentileLatency(us), 2709
[READ], 99thPercentileLatency(us), 6699
[READ], Return=OK, 1000
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[CLEANUP], AverageLatency(us), 2237440.0
[CLEANUP], MinLatency(us), 2236416
[CLEANUP], MaxLatency(us), 2238463
[CLEANUP], 95thPercentileLatency(us), 2238463
[CLEANUP], 99thPercentileLatency(us), 2238463
```

Workload D Load

```
[OVERALL], RunTime(ms), 4790
[OVERALL], Throughput(ops/sec), 208.76826722338205
[TOTAL_GCS_G1_Young_Generation], Count, 5
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 58
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.210855949895616
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 5
[TOTAL_GC_TIME], Time(ms), 58
[TOTAL_GC_TIME_%], Time(%), 1.210855949895616
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2233344.0
[CLEANUP], MinLatency(us), 2232320
[CLEANUP], MaxLatency(us), 2234367
[CLEANUP], 95thPercentileLatency(us), 2234367
```

```
[CLEANUP], 99thPercentileLatency(us), 2234367
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[INSERT], AverageLatency(us), 1332.169
[INSERT], MinLatency(us), 662
[INSERT], MaxLatency(us), 33759
[INSERT], 95thPercentileLatency(us), 2399
[INSERT], 99thPercentileLatency(us), 6263
[INSERT], Return=OK, 1000
```

Workload D run

```
[OVERALL], RunTime(ms), 4879
[OVERALL], Throughput(ops/sec), 204.96003279360525
[TOTAL_GCS_G1_Young_Generation], Count, 3
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 47
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9633121541299446
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 3
[TOTAL_GC_TIME], Time(ms), 47
[TOTAL_GC_TIME_%], Time(%), 0.9633121541299446
[READ], Operations, 953
[READ], AverageLatency(us), 1386.5991605456454
[READ], MinLatency(us), 633
[READ], MaxLatency(us), 24479
[READ], 95thPercentileLatency(us), 2695
[READ], 99thPercentileLatency(us), 6779
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[CLEANUP], MinLatency(us), 2250752
[CLEANUP], MaxLatency(us), 2252799
[CLEANUP], 95thPercentileLatency(us), 2252799
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[INSERT], MaxLatency(us), 10631
[INSERT], 95thPercentileLatency(us), 5343
[INSERT], 99thPercentileLatency(us), 10631
[INSERT], Return=OK, 47
```

```
[OVERALL], RunTime(ms), 4879
[OVERALL], Throughput(ops/sec), 204.96003279360525
[TOTAL_GCS_G1_Young_Generation], Count, 3
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 47
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9633121541299446
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 3
[TOTAL_GC_TIME], Time(ms), 47
[TOTAL_GC_TIME_%], Time(%), 0.9633121541299446
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[READ], AverageLatency(us), 1386.5991605456454
[READ], MinLatency(us), 633
[READ], MaxLatency(us), 24479
[READ], 95thPercentileLatency(us), 2695
[READ], 99thPercentileLatency(us), 6779
[READ], Return=OK, 953
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2251776.0
[CLEANUP], MinLatency(us), 2250752
[CLEANUP], MaxLatency(us), 2252799
[CLEANUP], 95thPercentileLatency(us), 2252799
[CLEANUP], 99thPercentileLatency(us), 2252799
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[INSERT], AverageLatency(us), 2118.255319148936
[INSERT], MinLatency(us), 1015
```

```
[INSERT], MaxLatency(us), 10631
[INSERT], 95thPercentileLatency(us), 5343
[INSERT], 99thPercentileLatency(us), 10631
[INSERT], Return=OK, 47
```

Workload E Load

```
[OVERALL], RunTime(ms), 4739
[OVERALL], Throughput(ops/sec), 211.01498206372653
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 45
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 0.9495674192867694
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 45
[TOTAL_GC_TIME_%], Time(%), 0.9495674192867694
[CLEANUP], Operations, 1
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[CLEANUP], MaxLatency(us), 2248703
[CLEANUP], 95thPercentileLatency(us), 2248703
[CLEANUP], 99thPercentileLatency(us), 2248703
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[INSERT], AverageLatency(us), 1333.958
[INSERT], MinLatency(us), 664
[INSERT], MaxLatency(us), 26527
[INSERT], 95thPercentileLatency(us), 2535
[INSERT], 99thPercentileLatency(us), 5803
[INSERT], Return=OK, 1000
```

Workload E Run

```
[OVERALL], RunTime(ms), 6691
[OVERALL], Throughput(ops/sec), 149.45449110745778
[TOTAL_GCS_G1_Young_Generation], Count, 13
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 95
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.419817665520849
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 13
[TOTAL_GC_TIME], Time(ms), 95
[TOTAL_GC_TIME_%], Time(%), 1.419817665520849
[CLEANUP], Operations, 1
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[CLEANUP], MinLatency(us), 2232320
[CLEANUP], MaxLatency(us), 2234367
[CLEANUP], 95thPercentileLatency(us), 2234367
[CLEANUP], 99thPercentileLatency(us), 2234367
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[INSERT], AverageLatency(us), 2531.603773584906
[INSERT], MinLatency(us), 1027
[INSERT], MaxLatency(us), 13999
[INSERT], 95thPercentileLatency(us), 6219
[INSERT], 99thPercentileLatency(us), 11527
[INSERT], Return=OK, 53
[SCAN], Operations, 947
[SCAN], AverageLatency(us), 3228.336853220697
[SCAN], MinLatency(us), 836
[SCAN], MaxLatency(us), 51007
[SCAN], 95thPercentileLatency(us), 6683
[SCAN], 99thPercentileLatency(us), 12519
[SCAN], Return=OK, 947
```

```
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 95
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.419817665520849
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 13
[TOTAL_GC_TIME], Time(ms), 95
[TOTAL_GC_TIME_%], Time(%), 1.419817665520849
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2233344.0
[CLEANUP], MinLatency(us), 2232320
[CLEANUP], MaxLatency(us), 2234367
[CLEANUP], 95thPercentileLatency(us), 2234367
[CLEANUP], 99thPercentileLatency(us), 2234367
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[INSERT], AverageLatency(us), 2531.603773584906
[INSERT], MinLatency(us), 1027
[INSERT], MaxLatency(us), 13999
[INSERT], 95thPercentileLatency(us), 6219
[INSERT], 99thPercentileLatency(us), 11527
[INSERT], Return=OK, 53
[SCAN], Operations, 947
[SCAN], AverageLatency(us), 3228.336853220697
[SCAN], MinLatency(us), 836
[SCAN], MaxLatency(us), 51007
[SCAN], 95thPercentileLatency(us), 6683
[SCAN], 99thPercentileLatency(us), 12519
[SCAN], Return=OK, 947
```

Workload F Load

```
[OVERALL], RunTime(ms), 4900
[OVERALL], Throughput(ops/sec), 204.08163265306123
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 59
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.2040816326530612
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 59
[TOTAL_GC_TIME_%], Time(%), 1.2040816326530612
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2231296.0
[CLEANUP], MinLatency(us), 2230272
[CLEANUP], MaxLatency(us), 2232319
[CLEANUP], 95thPercentileLatency(us), 2232319
[CLEANUP], 99thPercentileLatency(us), 2232319
[INSERT], Operations, 1000
[INSERT], AverageLatency(us), 1380.421
[INSERT], MinLatency(us), 579
[INSERT], MaxLatency(us), 28191
[INSERT], 95thPercentileLatency(us), 2571
[INSERT], 99thPercentileLatency(us), 5159
[INSERT], Return=OK, 1000
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Workload F Run

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[OVERALL], RunTime(ms), 5197
[OVERALL], Throughput(ops/sec), 192.41870309794112
[TOTAL_GCS_G1_Young_Generation], Count, 4
[TOTAL_GC_TIME_G1_Young_Generation], Time(ms), 54
[TOTAL_GC_TIME_%_G1_Young_Generation], Time(%), 1.039060996728882
[TOTAL_GCS_G1_Old_Generation], Count, 0
[TOTAL_GC_TIME_G1_Old_Generation], Time(ms), 0
[TOTAL_GC_TIME_%_G1_Old_Generation], Time(%), 0.0
[TOTAL_GCs], Count, 4
[TOTAL_GC_TIME], Time(ms), 54
[TOTAL_GC_TIME_%], Time(%), 1.039060996728882
[READ], Operations, 1000
[READ], AverageLatency(us), 1170.543
[READ], MinLatency(us), 563
[READ], MaxLatency(us), 25135
[READ], 95thPercentileLatency(us), 2197
[READ], 99thPercentileLatency(us), 5383
[READ], Return=OK, 1000
[READ-MODIFY-WRITE], Operations, 497
[READ-MODIFY-WRITE], AverageLatency(us), 2391.2977867203217
[READ-MODIFY-WRITE], MinLatency(us), 1130
[READ-MODIFY-WRITE], MaxLatency(us), 13367
[READ-MODIFY-WRITE], 95thPercentileLatency(us), 5255
[READ-MODIFY-WRITE], 99thPercentileLatency(us), 9167
[CLEANUP], Operations, 1
[CLEANUP], AverageLatency(us), 2233344.0
[CLEANUP], MinLatency(us), 2232320
[CLEANUP], MaxLatency(us), 2234367
[CLEANUP], 95thPercentileLatency(us), 2234367
[CLEANUP], 99thPercentileLatency(us), 2234367
[UPDATE], Operations, 497
[UPDATE], AverageLatency(us), 1215.2796780684105
[UPDATE], MinLatency(us), 514
[UPDATE], MaxLatency(us), 11207
[UPDATE], 95thPercentileLatency(us), 3333
[UPDATE], 99thPercentileLatency(us), 5683
[UPDATE], Return=OK, 497
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[UPDATE], MinLatency(us), 514
[UPDATE], MaxLatency(us), 11207
[UPDATE], 95thPercentileLatency(us), 3333
[UPDATE], 99thPercentileLatency(us), 5683
[UPDATE], Return=OK, 497
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