

## STEPS TO INSTALL QEMU, UBUNTU VM, DOCKER, SYSBENCH

1. Install “ xcode-select –install”
  2. Install homebrew using /bin/bash -c "\$(curl -fsSL <https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh>)"
  3. Install Qemu executable using brew command on mac M1 OS using “brew install qemu”  
Output **Pouring qemu--6.1.0\_1.arm64\_big\_sur.bottle.tar.gz**  
`/opt/homebrew/Cellar/qemu/6.1.0_1: 161 files, 552.2MB`
  4. Download Ubuntu image for ARM(M1) processor Mac 20.04.3 version
  5. Create ubuntu qcow2 disk image using  
“qemu-img create -f qcow2 disk.qcow2 10G”
  6. Create an empty file for persisting UEFI variables:  
“dd if=/dev/zero conv=sync bs=1m count=64 of=ovmf\_vars.fd”
  7. Create Ubuntu VM using following command along with qcow2 disk input parameter, ovmf\_vars.fd file input parameter and ubuntu os iso file  
`“qemu-system-aarch64 \
-accel hvf \
-m 2048 \
-cpu cortex-a57 -M virt,highmem=off \
-drive file=/opt/homebrew/Cellar/qemu/6.1.0_1/share/qemu/edk2-aarch64-
code.fd,if=pflash,format=raw,readonly=on \
-drive file=/Users/himanivaidya/Downloads/ovmf_vars.fd,if=pflash,format=raw \
-serial telnet::4444,server,nowait \
-drive if=none,file=/Users/himanivaidya/Downloads/disk.qcow2,format=qcow2,id=hd0 \
\
-device virtio-blk-device,drive=hd0,serial="dummyserial" \
-device virtio-net-device,netdev=net0 \
-netdev user,id=net0 \
-vga none -device ramfb \
-cdrom /Users/himanivaidya/Downloads/ubuntu-20.04.3-live-server-arm64.iso \
-device usb-ehci -device usb-kbd -device usb-mouse -usb \
-monitor stdio “`
  8. After configuring VM settings and booting it first shutdown VM and restart VM without cdrom parameter option in qemu command  
“(qemu) system\_powerdown
- ```
(qemu) qemu-system-aarch64 \
-accel hvf \
-m 2048 \
-cpu cortex-a57 -M virt,highmem=off \
-drive file=/opt/homebrew/Cellar/qemu/6.1.0_1/share/qemu/edk2-aarch64-
code.fd,if=pflash,format=raw,readonly=on \
-drive file=/Users/himanivaidya/Downloads/ovmf_vars1.fd,if=pflash,format=raw \
-serial telnet::4444,server,nowait \
```

```
-drive if=none,file=/Users/himanivaidya/Downloads/disk.qcow2,format=qcow2,id=hd0
 \
 -device virtio-blk-device,drive=hd0,serial="dummyserial" \
 -device virtio-net-device,netdev=net0 \
 -netdev user,id=net0 \
 -vga none -device ramfb \
 -device usb-ehci -device usb-kbd -device usb-mouse -usb \
 -monitor stdio"
```

9. Login to Ubuntu VM to verify credentials and successful installation.
10. Install docker executable for MAC M1 OS.
11. Install sysbench on Ubuntu VM using  
“\$sudo apt update  
\$sudo apt install sysbench”
12. Install docker image containing sysbench packaged in it using  
“docker pull csminpp/ubuntu-sysbench”
13. Run docker CLI to open ubuntu-sysbench container terminal using  
“docker exec -it  
506540645e284dd2d93462ec1c58fbe8f2f3a5b41fc10b5e5c4de61e4700f085 /bin/sh”

## **CONFIGURATIONS OF MACHINES.**

Mac M1 OS configurations

1. Mem = 8G
2. Apple M1 processor
3. CPUs = 8
4. 256 G SSD

Ubuntu VM configurations

1. CPUs = 1
2. Mem = 2G
3. CPU op-mode = 64bit

Docker configurations

1. CPUs = 4
2. Mem = 2G
3. CPU op-mode = 32bit

## **CREATION OF DOCKERFILE**

```
dockerfile
FROM ubuntu:latest
RUN apt-get update
RUN apt-get install sysbench
CMD["sysbench", "-v"]
```

## SHELL SCRIPTS

Sysbench CPU max prime command shell script Qemu VM

```
#!/bin/bash
sysbench cpu --cpu-max-prime=50000 run
```

Sysbench CPU max prime command shell script Docker

```
#!/bin/bash
sysbench --test(cpu --cpu-max-prime=50000 run)
```

Sysbench FileIO command shell script Qemu VM

```
#!/bin/bash
sysbench fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G prepare &&
sysbench fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G run && sysbench
fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G cleanup
```

```
#!/bin/bash
sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-
mode=seqrewr --file-fsync-req=10 --time=60 prepare && sysbench fileio --num-threads=16 --file-
total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-req=10 --time=60 run &&
sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-
mode=seqrewr --file-fsync-req=10 --time=60 cleanup
```

```
#!/bin/bash
sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr
--file-io-mode=async --file-fsync-mode=fdatasync prepare && sysbench fileio --num-threads=8 --
file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-io-mode=async --file-fsync-
mode=fdatasync run && sysbench fileio --num-threads=8 --file-total-size=3G --file-block-
size=4K --file-test-mode=rndwr --file-io-mode=async --file-fsync-mode=fdatasync cleanup
```

Sysbench FileIO command shell script Docker

```
#!/bin/bash
sysbench --test=fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G prepare &&
sysbench --test=fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G run &&
sysbench --test=fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G cleanup
```

```
#!/bin/bash
sysbench --test=fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-
mode=seqrewr --file-fsync-req=10 --time=60 prepare && sysbench --test=fileio --num-threads=16 --
file-total-size=2G --file-block-size=4K --file-test- mode=seqrewr --file-fsync-req=10 --time=60
run && sysbench --test=fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-
test- mode=seqrewr --file-fsync-req=10 --time=60 cleanup
```

```
#!/bin/bash
sysbench -test=fileio -num-threads=8 -file-total-size=3G -file-block-size=4K -file-test-
mode=rndwr -file-io-mode=async -file-fsync-mode=fdatasync prepare && sysbench -
test=fileio -num-threads=8 -file-total-size=3G -file-block-size=4K -file-test-mode=rndwr -file-
io-mode=async -file-fsync-mode=fdatasync run && sysbench -test=fileio -num-threads=8 -
file-total-size=3G -file-block-size=4K -file-test-mode=rndwr -file-io-mode=async -file-fsync-
mode=fdatasync cleanup
```

## **RESULT OF EXPERIMENTS FOR TOTAL 4 COMMANDS EACH EXECUTED FOR 5 TIMES.**

### **Sysbench CPU max prime command**

1.Sysbench cpu = 2000 Qemu VM

```
himani@hvaidya:~/sysbench$ sysbench cpu --cpu-max-prime=2000
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

The 'cpu' test requires a command argument. See 'sysbench cpu help'
himani@hvaidya:~/sysbench$ sysbench cpu --cpu-max-prime=2000 run
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 1
Initializing random number generator from current time

Prime numbers limit: 2000

Initializing worker threads...

Threads started!

CPU speed:
    events per second: 107434.01

General statistics:
    total time:          10.0012s
    total number of events: 1074702

Latency (ms):
    min:                  0.01
    avg:                  0.01
    max:                  0.82
    95th percentile:      0.01
    sum:                 9868.73

Threads fairness:
    events (avg/stddev): 1074702.0000/0.00
    execution time (avg/stddev): 9.8687/0.00

himani@hvaidya:~/sysbench$ :_
```

## 2.Sybench CPU max prime = 50000 Docker

```
himanivaidya — com.docker.cli - docker exec -it 506540645e284dd2d93...  
Doing CPU performance benchmark  
Threads started!  
Done.  
Maximum prime number checked in CPU test: 50000  
  
Test execution summary:  
total time: 61.7638s  
total number of events: 10000  
total time taken by event execution: 61.7519  
per-request statistics:  
    min: 5.17ms  
    avg: 6.18ms  
    max: 8.99ms  
    approx. 95 percentile: 6.33ms  
  
Threads fairness:  
    events (avg/stddev): 10000.0000/0.00  
    execution time (avg/stddev): 61.7519/0.00  
#
```

## 3. Sysbench CPU max prime=50000 Qemu VM

```
QEMU - (Press ctrl + alt + g to release Mouse)  
Threads fairness:  
    events (avg/stddev): 9.0000/0.00  
    execution time (avg/stddev): 10.6572/0.00  
  
imani@hvaidya:/$ sysbench cpu --cpu-max-prime=50000 run  
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)  
Running the test with following options:  
    number of threads: 1  
    initializing random number generator from current time  
  
    prime numbers limit: 50000  
    initializing worker threads...  
    threads started!  
    CPU speed:  
        events per second: 1181.51  
    general statistics:  
        total time: 10.0002s  
        total number of events: 11817  
    latency (ms):  
        min: 0.82  
        avg: 0.85  
        max: 1.35  
        95th percentile: 0.87  
        sum: 9992.83  
  
Threads fairness:  
    events (avg/stddev): 11817.0000/0.00  
    execution time (avg/stddev): 9.9928/0.00  
imani@hvaidya:/$
```

#### 4. Sysbench CPU max prime = 8000 docker

```
● ● ● himanivaidya — com.docker.cli ▾ docker exec -it 506540645e284dd2d93...  
  
Doing CPU performance benchmark  
  
Threads started!  
Done.  
  
Maximum prime number checked in CPU test: 8000  
  
Test execution summary:  
    total time:                      6.8732s  
    total number of events:          10000  
    total time taken by event execution: 6.8623  
    per-request statistics:  
        min:                          0.67ms  
        avg:                          0.69ms  
        max:                          1.84ms  
        approx. 95 percentile:         0.71ms  
  
Threads fairness:  
    events (avg/stddev):           10000.0000/0.00  
    execution time (avg/stddev):   6.8623/0.00  
  
#
```

#### 5. Sysbench CPU max prime=8000 Qemu VM

```
● ● ● QEMU - (Press ctrl + alt + g to release Mouse)  
  
Threads fairness:  
    events (avg/stddev):           11817.0000/0.00  
    execution time (avg/stddev):   9.9928/0.00  
  
imani@hvaidya:/$ sysbench cpu --cpu-max-prime=8000 run  
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)  
  
Running the test with following options:  
Number of threads: 1  
Initializing random number generator from current time  
  
Prime numbers limit: 8000  
Initializing worker threads...  
Threads started!  
CPU speed:  
    events per second: 14871.51  
General statistics:  
    total time:                      10.0002s  
    total number of events:          148741  
Latency (ms):  
    min:                            0.07  
    avg:                            0.07  
    max:                            0.38  
    95th percentile:                0.07  
    sum:                            9982.88  
Threads fairness:  
    events (avg/stddev):           148741.0000/0.00  
    execution time (avg/stddev):   9.9829/0.00  
  
imani@hvaidya:/$ _
```

## 6. Sysbench CPU max prime =10000 Qemu VM

```
● ● ● QEMU - (Press ctrl + alt + g to release Mouse)
Threads fairness:
  events (avg/stddev):      148741.0000/0.00
  execution time (avg/stddev):  9.9829/0.00

nimani@hvaidya:/$ sysbench cpu --cpu-max-prime=10000 run
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 1
Initializing random number generator from current time

Prime numbers limit: 10000
Initializing worker threads...

Threads started!

CPU speed:
  events per second: 10903.67

General statistics:
  total time:          10.0004s
  total number of events: 109050

Latency (ms):
  min:                 0.09
  avg:                 0.09
  max:                 2.15
  95th percentile:    0.10
  sum:                9985.81

Threads fairness:
  events (avg/stddev):      109050.0000/0.00
  execution time (avg/stddev):  9.9858/0.00

nimani@hvaidya:/$
```

## 7. Sysbench CPU max prime = 10000 docker

```
● ● ● himanivaidya — com.docker.cli < docker exec -it 506540645e284dd2d93...
Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          8.8870s
  total number of events: 10000
  total time taken by event execution: 8.8765
  per-request statistics:
    min:                 0.86ms
    avg:                 0.89ms
    max:                 2.69ms
    approx. 95 percentile: 0.91ms

Threads fairness:
  events (avg/stddev):      10000.0000/0.00
  execution time (avg/stddev):  8.8765/0.00

#
```

## 8. Sysbench CPU max prime =10000 docker

```
● ● ● himanivaidya — com.docker.cli ▾ docker exec -it 506540645e284dd2d93...
```

```
Doing CPU performance benchmark
```

```
Threads started!
```

```
Done.
```

```
Maximum prime number checked in CPU test: 10000
```

```
Test execution summary:
```

|                                      |         |
|--------------------------------------|---------|
| total time:                          | 3.2905s |
| total number of events:              | 10000   |
| total time taken by event execution: | 9.8396  |
| per-request statistics:              |         |
| min:                                 | 0.93ms  |
| avg:                                 | 0.98ms  |
| max:                                 | 3.16ms  |
| approx. 95 percentile:               | 1.03ms  |

```
Threads fairness:
```

|                              |                |
|------------------------------|----------------|
| events (avg/stddev):         | 3333.3333/4.03 |
| execution time (avg/stddev): | 3.2799/0.00    |

```
#
```

## 9. Sysbench CPU max prime=20000 docker

```
● ● ● himanivaidya — com.docker.cli ▾ docker exec -it 506540645e284dd2d93...
```

```
Doing CPU performance benchmark
```

```
Threads started!
```

```
Done.
```

```
Maximum prime number checked in CPU test: 20000
```

```
Test execution summary:
```

|                                      |         |
|--------------------------------------|---------|
| total time:                          | 5.7402s |
| total number of events:              | 10000   |
| total time taken by event execution: | 34.3647 |
| per-request statistics:              |         |
| min:                                 | 2.12ms  |
| avg:                                 | 3.44ms  |
| max:                                 | 21.30ms |
| approx. 95 percentile:               | 12.21ms |

```
Threads fairness:
```

|                              |                  |
|------------------------------|------------------|
| events (avg/stddev):         | 1666.6667/302.59 |
| execution time (avg/stddev): | 5.7275/0.00      |

```
#
```

## 10. Sysbench CPU max prime =20000 QEMU VM

```
QEMU - (Press ctrl + alt + g to release Mouse)
events (avg/stddev):          36592.6667/11.12
execution time (avg/stddev):   9.9856/0.01

himani@hvaidya:/$ sysbench cpu --cpu-max-prime=20000 --num-threads=6 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 6
Initializing random number generator from current time

Prime numbers limit: 20000
Initializing worker threads...
Threads started!

^[[^GCPU speed:
  events per second: 4287.51

General statistics:
  total time:           10.00008s
  total number of events: 42880

Latency (ms):
  min:                  0.23
  avg:                 1.40
  max:                 32.24
  95th percentile:     20.37
  sum:                 59872.03

Threads fairness:
  events (avg/stddev):    7146.6667/8.52
  execution time (avg/stddev): 9.9787/0.02

himani@hvaidya:/$
```

## 11. sysbench CPU max prime =50000 Qemu vm

```
QEMU - (Press ctrl + alt + g to release Mouse)
events (avg/stddev):          7146.6667/8.52
execution time (avg/stddev):   9.9787/0.02

himani@hvaidya:/$ sysbench cpu --cpu-max-prime=50000 --num-threads=6 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 6
Initializing random number generator from current time

Prime numbers limit: 50000
Initializing worker threads...
Threads started!

CPU speed:
  events per second: 1224.81

General statistics:
  total time:           10.00020s
  total number of events: 12251

Latency (ms):
  min:                  0.79
  avg:                 4.89
  max:                 24.95
  95th percentile:     20.74
  sum:                 59922.14

Threads fairness:
  events (avg/stddev):    2041.8333/1.34
  execution time (avg/stddev): 9.9870/0.01

himani@hvaidya:/$
```

## 12. Sysbench CPU max prime =30000 docker

● ● ● himanivaidya — com.docker.cli ▾ docker exec -it 506540645e284dd2d93...

```
Doing CPU performance benchmark
```

```
Threads started!  
Done.
```

```
Maximum prime number checked in CPU test: 30000
```

```
Test execution summary:
```

|                                      |         |
|--------------------------------------|---------|
| total time:                          | 9.2627s |
| total number of events:              | 10000   |
| total time taken by event execution: | 55.4926 |
| per-request statistics:              |         |
| min:                                 | 3.43ms  |
| avg:                                 | 5.55ms  |
| max:                                 | 24.62ms |
| approx. 95 percentile:               | 13.66ms |

```
Threads fairness:
```

|                              |                  |
|------------------------------|------------------|
| events (avg/stddev):         | 1666.6667/301.66 |
| execution time (avg/stddev): | 9.2488/0.00      |

```
#
```

## 13. Sysbench CPU max prime =30000 Qemu vm

QEMU - (Press ctrl + alt + g to release Mouse)

```
events (avg/stddev): 2041.8333/1.34  
execution time (avg/stddev): 9.9870/0.01  
  
himani@hvaidya:~/sysbench$ sysbench cpu --cpu-max-prime=30000 --num-threads=6 run  
WARNING: --num-threads is deprecated, use --threads instead  
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)  
  
Running the test with following options:  
Number of threads: 6  
Initializing random number generator from current time  
  
Prime numbers limit: 30000  
  
Initializing worker threads...  
  
Threads started!  
  
CPU speed:  
    events per second: 2452.08  
  
General statistics:  
    total time: 10.0018s  
    total number of events: 24526  
  
Latency (ms):  
    min: 0.39  
    avg: 2.44  
    max: 28.43  
    95th percentile: 20.37  
    sum: 59922.75  
  
Threads fairness:  
    events (avg/stddev): 4087.6667/3.94  
    execution time (avg/stddev): 9.9871/0.01  
  
himani@hvaidya:~$
```

## SUMMARY

| VALUE | QEMU VM CPU-MAX-PRIME | DOCKER CPU-MAX-PRIME |
|-------|-----------------------|----------------------|
| 50000 | 1181 events/sec       | 161 events/sec       |
| 8000  | 14873 events/sec      | 1454 events/sec      |
| 10000 | 10904 events/sec      | 1125 events/sec      |
| 20000 | 4287 events/sec       | 1742 events/sec      |
| 30000 | 2452 events/sec       | 1079 events/sec      |

## Sysbench FileIO commands

```
1.sysbench FileIO Qemu vm  
sysbench fileio --num-threads=16 --file-test-mode=rndrw --file-total-size=2G run
```

```
● ● ● QEMU - (Press ctrl + alt + g to release Mouse)  
Block size 16KiB  
Number of IO requests: 0  
Read/Write ratio for combined random IO test: 1.50  
Periodic FSYNC enabled, calling fsync() each 100 requests.  
Calling fsync() at the end of test, Enabled.  
Using synchronous I/O mode  
Doing random r/w test  
Initializing worker threads...  
  
Threads started!  
  
File operations:  
  reads/s:          18134.08  
  writes/s:         12088.72  
  fsyncs/s:        38886.84  
  
Throughput:  
  read, MiB/s:      288.34  
  written, MiB/s:   188.89  
  
General statistics:  
  total time:       10.0210s  
  total number of events: 690585  
  
Latency (ms):  
  min:              0.00  
  avg:              0.28  
  max:              17.51  
  95th percentile:  0.99  
  sum:             158958.13  
  
Threads fairness:  
  events (avg/stddev):    43161.5625/495.45  
  execution time (avg/stddev): 9.9349/0.01  
  
himani@hvaidya:/$
```

## 2. Sysbench FileIO command docker

```
# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw prepare

# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 16Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Threads started!
FATAL: Failed to fsync file! file: 0 errno = 22 ()
Done.

Operations performed: 6091 Read, 4055 Write, 12810 Other = 22956 Total
Read 95.172Mb Written 63.359Mb Total transferred 158.53Mb (309.31Mb/sec)
19795.59 Requests/sec executed

Test execution summary:
total time: 0.5125s
total number of events: 10146
total time taken by event execution: 1.8221
per-request statistics:
    min: 0.00ms
    avg: 0.18ms
    max: 8.00ms
    approx. 95 percentile: 0.64ms

Threads fairness:
events (avg/stddev): 634.1250/166.30
execution time (avg/stddev): 0.1139/0.03
```

### 3.Sysbench FileIO Qemu vm

Sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-req=10 --time=60 run

```
QEMU - (Press ctrl + alt + g to release Mouse)

128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

Threads started!

File operations:
  reads/s:          0.00
  writes/s:        6636.35
  fsyncs/s:       84977.94

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   25.92

General statistics:
  total time:           60.0220s
  total number of events: 5496868

Latency (ms):
  min:                  0.00
  avg:                  0.16
  max:                 33.63
  95th percentile:     0.60
  sum:                885104.58

Threads fairness:
  events (avg/stddev): 343554.2500/2662.29
  execution time (avg/stddev): 55.3190/0.09
```

### 4. Sysbench FileIO docker

```

# sysbench --test=fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=60 prepare
sysbench 0.4.12: multi-threaded system evaluation benchmark

128 files, 16384Kb each, 2048Mb total
Creating files for the test...
# sysbench --test=fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=60 run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 4Kb
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Threads started!
FATAL: Too large position discovered in request!
(last message repeated 13 times)
Done.

Operations performed: 0 Read, 524274 Write, 128 Other = 524402 Total
Read 0b Written 1.9999Gb Total transferred 1.9999Gb (645.82Mb/sec)
165328.78 Requests/sec executed

Test execution summary:
total time: 3.1711s
total number of events: 524274
total time taken by event execution: 13.9659
per-request statistics:
    min: 0.00ms
    avg: 0.03ms
    max: 31.08ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 32767.1250/36849.52
execution time (avg/stddev): 0.8729/0.84

```

## 5.Sysbench FileIO command Qemu vm

Sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-req=10 --time=60 run

```

128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

Threads started!

File operations:
  reads/s: 0.00
  writes/s: 6636.35
  fsyncs/s: 84977.94

Throughput:
  read, MiB/s: 0.00
  written, MiB/s: 25.92

General statistics:
  total time: 60.0220s
  total number of events: 5496868

Latency (ms):
    min: 0.00
    avg: 0.16
    max: 38.63
    95th percentile: 0.60
    sum: 885104.58

Threads fairness:
  events (avg/stddev): 343554.2500/2662.29
  execution time (avg/stddev): 55.3190/0.09

```

## 6.Sysbench FileIO Qemu vm

```
himani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-io-mode=async --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuajIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
3GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using asynchronous I/O mode
Doing random write test
Initializing worker threads...

Threads started!
```

```
Threads started!

File operations:
  reads/s:          0.00
  writes/s:        19504.65
  fsyncs/s:        25067.71

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   76.19

General statistics:
  total time:       10.0126s
  total number of events: 445288

Latency (ms):
  min:                0.00
  avg:                0.18
  max:               34.81
  95th percentile:    0.74
  sum:            79692.27

Threads fairness:
  events (avg/stddev):   55661.0000/665.49
  execution time (avg/stddev): 9.9615/0.00
```

## 7. Sysbench FileIO Qemu vm

```
himani@hvaidya:/$ #
himani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
3GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Initializing worker threads...

Threads started!
```

```
File operations:
    reads/s:          0.00
    writes/s:         19076.15
    fsyncs/s:         19076.15

Throughput:
    read, MiB/s:     0.00
    written, MiB/s:  74.52

General statistics:
    total time:      10.0012s
    total number of events: 190797

Latency (ms):
    min:              0.07
    avg:              0.42
    max:              7.13
    95th percentile:  0.99
    sum:              79858.33

Threads fairness:
    events (avg/stddev):   23849.6250/253.62
    execution time (avg/stddev): 9.9823/0.00
```

## 8. Sysbench FileIO command docker

```
# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Done.

Operations performed: 0 Read, 10022 Write, 10022 Other = 20044 Total
Read 0b Written 39.148Mb Total transferred 39.148Mb (51.95Mb/sec)
13299.24 Requests/sec executed

Test execution summary:
  total time:          0.7536s
  total number of events: 10022
  total time taken by event execution: 5.8007
  per-request statistics:
    min:                0.11ms
    avg:                0.58ms
    max:                4.72ms
    approx. 95 percentile: 1.14ms

Threads fairness:
  events (avg/stddev): 10022.7500/7.20
```

```

# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Done.

Operations performed: 0 Read, 10029 Write, 10029 Other = 20058 Total
Read 0b Written 39.176Mb Total transferred 39.176Mb (57.67Mb/sec)
14763.52 Requests/sec executed

Test execution summary:
total time: 0.6793s
total number of events: 10029
total time taken by event execution: 5.1961
per-request statistics:
    min: 0.10ms
    avg: 0.52ms
    max: 3.72ms
    approx. 95 percentile: 1.10ms

Threads fairness:
events (avg/stddev): 1253.6250/6.48
execution time (avg/stddev): 0.6495/0.00

[# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync cleanup
sysbench 0.4.12: multi-threaded system evaluation benchmark

```

## 9. Sysbench FileIO command Qemu vm

```

nimani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
3GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Initializing worker threads...

Threads started!

```

```
File operations:
  reads/s:          0.00
  writes/s:        18886.63
  fsyncs/s:        18886.63

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   73.78

General statistics:
  total time:       10.0009s
  total number of events: 188895

Latency (ms):
  min:              0.07
  avg:              0.42
  max:             34.30
  95th percentile:  0.99
  sum:            79849.07

Threads fairness:
  events (avg/stddev): 23611.8750/385.79
  execution time (avg/stddev): 9.9811/0.00
```

## 10. Sysbench Fileio command Qemu vm

```
himani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
3GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Initializing worker threads...

Threads started!
```

```
File operations:
  reads/s:          0.00
  writes/s:        19073.55
  fsyncs/s:        19073.55

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   74.51

General statistics:
  total time:       10.0007s
  total number of events: 190759

Latency (ms):
  min:              0.07
  avg:              0.42
  max:              4.58
  95th percentile:  0.99
  sum:             79830.98

Threads fairness:
  events (avg/stddev): 23844.8750/119.37
  execution time (avg/stddev): 9.9789/0.00
```

## 11. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=8G --file-block-size=4K --
file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
8GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Initializing worker threads...
```

```

File operations:
  reads/s:                      0.00
  writes/s:                     18668.14
  fsyncs/s:                      18668.14

Throughput:
  read, MiB/s:                  0.00
  written, MiB/s:                72.92

General statistics:
  total time:                   10.0011s
  total number of events:        186711

Latency (ms):
  min:                           0.07
  avg:                           0.43
  max:                           18.83
  95th percentile:               0.97
  sum:                           79864.52

Threads fairness:
  events (avg/stddev):         23338.8750/137.38
  execution time (avg/stddev):  9.9831/0.00

```

## 12. Sysbench FileIO command Qemu vm

```

himani@hvaidya:/$ sudo sysbench fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 8
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 24MiB each
3GiB total file size
Block size 4KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Initializing worker threads...

```

```

File operations:
  reads/s:          0.00
  writes/s:         19271.93
  fsyncs/s:         19271.93

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   75.28

General statistics:
  total time:       10.0006s
  total number of events: 192741

Latency (ms):
  min:              0.07
  avg:              0.41
  max:              6.41
  95th percentile:  0.99
  sum:              79854.20

Threads fairness:
  events (avg/stddev): 24092.6250/133.99
  execution time (avg/stddev): 9.9818/0.00

```

### 13. Sysbench FileIO command Qemu vm

```

himani@hvaidya:/$ sudo sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --
file-test-mode=seqrewr --file-fsync-freq=10 --time=60 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

```

```

File operations:
  reads/s:          0.00
  writes/s:         6297.98
  fsyncs/s:         80646.80

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   24.60

General statistics:
  total time:       60.0218s
  total number of events: 5216584

Latency (ms):
  min:              0.00
  avg:              0.16
  max:              19.75
  95th percentile:  0.64
  sum:              849085.57

Threads fairness:
  events (avg/stddev): 326036.5000/2922.92
  execution time (avg/stddev): 53.0678/0.06

```

#### 14. Sysbench FileIO command Qemu vm

```

nimani@hvaidya:/$ sudo sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --time=60 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

Threads started!

```

```

File operations:
  reads/s:          0.00
  writes/s:         6233.89
  fsyncs/s:        79827.76

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   24.35

General statistics:
  total time:       60.0229s
  total number of events: 5163673

Latency (ms):
  min:              0.00
  avg:              0.16
  max:              25.47
  95th percentile:  0.64
  sum:             846108.87

Threads fairness:
  events (avg/stddev): 322729.5625/2283.09
  execution time (avg/stddev): 52.8818/0.04

```

## 15. Sysbench FileIO command Qemu vm

```

himani@hvaidya:/$ sudo sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --
file-test-mode=seqrewr --file-fsync-freq=10 --time=20 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

Threads started!

File operations:
  reads/s:          0.00
  writes/s:         6391.06
  fsyncs/s:        81906.82

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   24.97

General statistics:
  total time:       20.0212s
  total number of events: 1765827

Latency (ms):
  min:              0.00
  avg:              0.16
  max:              18.86
  95th percentile:  0.63
  sum:             284747.20

Threads fairness:
  events (avg/stddev): 110364.1875/1418.11
  execution time (avg/stddev): 17.7967/0.03

```

## 16. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench fileio --num-threads=16 --file-total-size=2G --file-block-size=4K --file-test-mode=segrewr --file-fsync-freq=10 run
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 4KiB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Initializing worker threads...

File operations:
  reads/s:          0.00
  writes/s:         6466.99
  fsyncs/s:         82979.27

Throughput:
  read, MiB/s:      0.00
  written, MiB/s:   25.26

General statistics:
  total time:       10.0196s
  total number of events: 894214

Latency (ms):
  min:              0.00
  avg:              0.16
  max:              6.15
  95th percentile:  0.62
  sum:             143236.20

Threads fairness:
  events (avg/stddev): 55888.3750/742.76
  execution time (avg/stddev): 8.9528/0.02
```

## 17. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...
```

```

File operations:
  reads/s:          19387.81
  writes/s:         12891.54
  fsyncs/s:        41447.43

Throughput:
  read, MiB/s:      302.15
  written, MiB/s:   201.43

General statistics:
  total time:       10.0274s
  total number of events: 736792

Latency (ms):
  min:              0.00
  avg:              0.22
  max:              7.25
  95th percentile:  0.92
  sum:             158782.68

Threads fairness:
  events (avg/stddev): 46049.5000/318.07
  execution time (avg/stddev): 9.9239/0.01

```

## 18. Sysbench FileIO command Qemu vm

```

himani@hvaidya:/$ sudo sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

```

```
File operations:
  reads/s:          20198.34
  writes/s:         13464.78
  fsyncs/s:        43287.98

Throughput:
  read, MiB/s:     315.60
  written, MiB/s:  210.39

General statistics:
  total time:      10.0223s
  total number of events: 769221

Latency (ms):
  min:              0.00
  avg:              0.21
  max:             19.28
  95th percentile: 0.86
  sum:            158815.25

Threads fairness:
  events (avg/stddev): 48076.3125/386.11
  execution time (avg/stddev): 9.9260/0.00
```

## 19. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

File operations:
  reads/s:          19606.45
  writes/s:         13070.40
  fsyncs/s:         42022.95

Throughput:
  read, MiB/s:      306.35
  written, MiB/s:   204.23

General statistics:
  total time:       10.0207s
  total number of events: 746533

Latency (ms):
  min:              0.00
  avg:              0.21
  max:              8.11
  95th percentile:  0.90
  sum:              158936.11

Threads fairness:
  events (avg/stddev):    46658.3125/346.39
  execution time (avg/stddev): 9.9335/0.01
```

## 20. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

File operations:
  reads/s:          17789.12
  writes/s:         11858.92
  fsyncs/s:         38144.88

Throughput:
  read, MiB/s:      277.96
  written, MiB/s:   185.80

General statistics:
  total time:       10.0200s
  total number of events: 677298

Latency (ms):
  min:              0.00
  avg:              0.23
  max:              8.84
  95th percentile:  1.03
  sum:             158940.05

Threads fairness:
  events (avg/stddev): 42331.1250/458.99
  execution time (avg/stddev): 9.9338/0.01
```

## 21. Sysbench FileIO command Qemu vm

```
himani@hvaidya:/$ sudo sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

Running the test with following options:
Number of threads: 16
Initializing random number generator from current time

Extra file open flags: (none)
128 files, 16MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...
```

```
File operations:
  reads/s:          19671.69
  writes/s:         13113.79
  fsyncs/s:         42157.32

Throughput:
  read, MiB/s:      307.37
  written, MiB/s:   204.90

General statistics:
  total time:       10.0253s
  total number of events: 749312

Latency (ms):
  min:              0.00
  avg:              0.21
  max:              20.33
  95th percentile:  0.90
  sum:              158902.06

Threads fairness:
  events (avg/stddev):    46832.0000/364.81
  execution time (avg/stddev): 9.9314/0.01
```

## 22. Sysbench FileIO docker command

```

# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Done.

Operations performed: 0 Read, 10040 Write, 10080 Other = 20080 Total
Read 9b Written 39.219Mb Total transferred 39.219Mb (56.755Mb/sec)
14529.19 Requests/sec executed

Test execution summary:
total time: 0.6910s
total number of events: 10080
total time taken by event execution: 5.2912
per-request statistics:
    min: 0.11ms
    avg: 0.53ms
    max: 4.46ms
approx. 95 percentile: 1.09ms

Threads fairness:
events (avg/stddev): 1255.0000/10.85
execution time (avg/stddev): 0.6614/0.00

```

## 23. Sysbench FileIO docker command

```
# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24MB each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Threads started!
Done.

Operations performed: 0 Read, 10018 Write, 10018 Other = 20036 Total
Read 0b Written 39.133Mb Total transferred 39.133Mb (57.519Mb/sec)
14724.75 Requests/sec executed

Test execution summary:
total time: 0.6804s
total number of events: 10018
total time taken by event execution: 5.2598
per-request statistics:
min: 0.11ms
avg: 0.53ms
max: 3.97ms
approx. 95 percentile: 1.18ms

Threads fairness:
events (avg/stddev): 1252.2500/8.76
execution time (avg/stddev): 0.6575/0.00
```

## 24. Sysbench FileIO docker command

```
Read 0b Written 39.133Mb Total transferred 39.133Mb (57.519Mb/sec)
14724.75 Requests/sec executed

Test execution summary:
total time: 0.6804s
total number of events: 10018
total time taken by event execution: 5.2598
per-request statistics:
min: 0.11ms
avg: 0.53ms
max: 3.97ms
approx. 95 percentile: 1.18ms

Threads fairness:
events (avg/stddev): 1252.2500/8.76
execution time (avg/stddev): 0.6575/0.00

[# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync cleanup
sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
[# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync prepare
sysbench 0.4.12: multi-threaded system evaluation benchmark

128 files, 24576Kb each, 3072Mb total
Creating files for the test...
[# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4KB
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Threads started!
Done.

Operations performed: 0 Read, 10021 Write, 10021 Other = 20042 Total
Read 0b Written 39.145Mb Total transferred 39.145Mb (55.998Mb/sec)
14335.52 Requests/sec executed

Test execution summary:
total time: 0.6990s
total number of events: 10021
total time taken by event execution: 5.3717
per-request statistics:
min: 0.10ms
avg: 0.54ms
max: 5.45ms
approx. 95 percentile: 1.14ms

Threads fairness:
events (avg/stddev): 1252.6250/8.38
execution time (avg/stddev): 0.6715/0.00

# ]
```

## 25. Sysbench FileIO docker command

```
# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Done.

Operations performed: 0 Read, 10030 Write, 10030 Other = 20060 Total
Read 0b Written 39.18Mb Total transferred 39.18Mb (57.355Mb/sec)
14682.96 Requests/sec executed

Test execution summary:
    total time:          0.6831s
    total number of events: 10030
    total time taken by event execution: 5.2472
    per-request statistics:
        min:                0.11ms
        avg:                0.52ms
        max:                6.56ms
        approx. 95 percentile: 1.09ms

Threads fairness:
    events (avg/stddev):   1253.7500/10.86
    execution time (avg/stddev):  0.6559/0.00
```

## 26. Sysbench FileIO docker command

```
# sysbench --test=fileio --num-threads=8 --file-total-size=3G --file-block-size=4K --file-test-mode=rndwr --file-fsync-all --file-fsync-mode=fdatasync run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 8

Extra file open flags: 0
128 files, 24Mb each
3Gb total file size
Block size 4Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Calling fsync() after each write operation.
Using synchronous I/O mode
Doing random write test
Threads started!
Done.

Operations performed: 0 Read, 10033 Write, 10033 Other = 20066 Total
Read 0b Written 39.191Mb Total transferred 39.191Mb (57.728Mb/sec)
14778.31 Requests/sec executed

Test execution summary:
    total time:          0.6789s
    total number of events: 10033
    total time taken by event execution: 5.2397
    per-request statistics:
        min:                0.12ms
        avg:                0.52ms
        max:                5.78ms
        approx. 95 percentile: 1.09ms

Threads fairness:
    events (avg/stddev):   1254.1250/15.25
    execution time (avg/stddev):  0.6558/0.00
```

## 27. Sysbench FileIO docker command

```
# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 16Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Threads started!
Done.

Operations performed: 6076 Read, 4043 Write, 12801 Other = 22920 Total
Read 94.938Mb Written 63.172Mb Total transferred 158.11Mb (311.23Mb/sec)
19918.79 Requests/sec executed

Test execution summary:
  total time:          0.5080s
  total number of events:    10119
  total time taken by event execution: 2.0581
  per-request statistics:
    min:                 0.00ms
    avg:                 0.20ms
    max:                 9.42ms
    approx. 95 percentile: 0.75ms

Threads fairness:
  events (avg/stddev):   632.4375/47.93
  execution time (avg/stddev): 0.1286/0.01
```

## 28. Sysbench FileIO docker command

```
# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 16Kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Threads started!
Done.

Operations performed: 6129 Read, 4078 Write, 12802 Other = 23009 Total
Read 95.766Mb Written 63.719Mb Total transferred 159.48Mb (299.8Mb/sec)
19186.98 Requests/sec executed

Test execution summary:
  total time:          0.5320s
  total number of events:    10207
  total time taken by event execution: 2.1655
  per-request statistics:
    min:                 0.00ms
    avg:                 0.21ms
    max:                 10.98ms
    approx. 95 percentile: 0.76ms

Threads fairness:
  events (avg/stddev):   637.9375/40.84
  execution time (avg/stddev): 0.1353/0.01
```

## 29. Sysbench FileIO docker command

```

19186.98 Requests/sec executed

Test execution summary:
  total time:          0.5320s
  total number of events: 10287
  total time taken by event execution: 2.1655
  per-request statistics:
    min:                0.00ms
    avg:                0.21ms
    max:                10.98ms
    approx. 95 percentile: 0.76ms

Threads fairness:
  events (avg/stddev):   637.9375/40.84
  execution time (avg/stddev): 0.1353/0.01

[# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw cleanup
sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
[# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw prepare
sysbench 0.4.12: multi-threaded system evaluation benchmark

128 files, 16384K each, 2048Mb total
Creating files for the test...
[# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 16kb
Number of random requests for random IO: 10000
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Threads started!
Done.

Operations performed: 6082 Read, 4046 Write, 12802 Other = 22930 Total
Read 95.031Mb Written 63.219Mb Total transferred 158.25Mb (316.79Mb/sec)
20278.43 Requests/sec executed

Test execution summary:
  total time:          0.4996s
  total number of events: 10128
  total time taken by event execution: 1.9467
  per-request statistics:
    min:                0.00ms
    avg:                0.19ms
    max:                8.68ms
    approx. 95 percentile: 0.71ms

Threads fairness:
  events (avg/stddev):   633.0000/27.29
  execution time (avg/stddev): 0.1217/0.01

# ]

```

## 30. Sysbench FileIO docker command

```

# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-test-mode=rndrw run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16MB each
2Gb total file size
Block size 16kb
Number of random requests for random IO: 10000
ReadWrite ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Threads started!
FATAL: Failed to fsync file! file: 0 errno = 22 ()
Done.

Operations performed: 6069 Read, 4037 Write, 12802 Other = 22908 Total
Read 94.828Mb Written 63.078Mb Total transferred 157.91Mb (233.09Mb/sec)
14917.82 Requests/sec executed

Test execution summary:
  total time:          0.6774s
  total number of events: 10106
  total time taken by event execution: 3.8213
  per-request statistics:
    min:                0.00ms
    avg:                0.38ms
    max:                27.54ms
    approx. 95 percentile: 2.02ms

Threads fairness:
  events (avg/stddev):   631.6250/166.82
  execution time (avg/stddev): 0.2388/0.06

```

## 31. Sysbench FileIO docker command

```
--validate=[on|off]      perform validation checks where possible [off]
--help=[on|off]          print help and exit
--version=[on|off]        print version and exit

Compiled-in tests:
fileio - File I/O test
cpu - CPU performance test
memory - Memory functions speed test
threads - Threads subsystem performance test
mutex - Mutex performance test
oltp - OLTP test

Commands: prepare run cleanup help version

See 'sysbench --test=<name> help' for a list of options for each test.

# sysbench --num-threads=16 --test=fileio --file-total-size=2g --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=20 prepare
sysbench 0.4.12: multi-threaded system evaluation benchmark

FATAL: Invalid value for file-total-size: 0
# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=20 prepare
sysbench 0.4.12: multi-threaded system evaluation benchmark

128 files, 16384Kb each, 2048Mb total
Creating files for the test...
[ # sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=20 run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 4KB
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Threads started!
FATAL: Too large position discovered in request!
(last message repeated 11 times)
Done.

Operations performed: 0 Read, 524276 Write, 128 Other = 524404 Total
Read 0b Written 2Gb Total transferred 20b (786.07Mb/sec)
201234.94 Requests/sec executed

Test execution summary:
total time:           2.6053s
total number of events: 524276
total time taken by event execution: 12.9799
per-request statistics:
    min:           0.00ms
    avg:           0.02ms
    max:          46.20ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev):   32767.2500/35030.93
execution time (avg/stddev): 0.8112/0.73
# ]
```

## 32. Sysbench FileIO docker command

```

# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=20 run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 4Kb
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Threads started!
FATAL: Too large position discovered in request!
(last message repeated 3 times)
Done.

Operations performed: 0 Read, 524284 Write, 128 Other = 524412 Total
Read 0b Written 2Gb Total transferred 2Gb (689.76Mb/sec)
176578.93 Requests/sec executed

Test execution summary:
    total time:                      2.9691s
    total number of events:          524284
    total time taken by event execution: 27.739s
    per-request statistics:
        min:                          0.00ms
        avg:                          0.05ms
        max:                          71.06ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           32767.7500/12666.88
    execution time (avg/stddev):   1.7337/0.66

```

### 33. Sysbench FileIO docker command

```

# sysbench --num-threads=16 --test=fileio --file-total-size=2G --file-block-size=4K --file-test-mode=seqrewr --file-fsync-freq=10 --max-time=20 run
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 16

Extra file open flags: 0
128 files, 16Mb each
2Gb total file size
Block size 4Kb
Periodic FSYNC enabled, calling fsync() each 10 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential rewrite test
Threads started!
FATAL: Too large position discovered in request!
(last message repeated 9 times)
Done.

Operations performed: 0 Read, 524278 Write, 128 Other = 524406 Total
Read 0b Written 2Gb Total transferred 2Gb (677.63Mb/sec)
173473.77 Requests/sec executed

Test execution summary:
    total time:                      3.0222s
    total number of events:          524278
    total time taken by event execution: 16.5572
    per-request statistics:
        min:                          0.00ms
        avg:                          0.03ms
        max:                          49.22ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           32767.3750/28800.05
    execution time (avg/stddev):   1.0348/0.89

```

| FILEIO OPTIONS                                                                                                                               | QEMU                                                                                                                      | DOCKER                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| sysbench fileio –num-threads=16 –file-test-mode=rndrw –file-total-size=2G run                                                                | Read bytes/sec = 283.34<br>written bytes = 188.89<br>total = 472.23 Mbytes/sec<br>events = 68913 events/sec<br>time=10sec | read = 95.172 MB<br>write = 63.359 MB/sec<br>total = 309.31 MB/sec<br>events = 19812 events/sec<br>time=0.5 sec |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-block-size=4K–file-test- mode=seqrewr –file-fsync-req=10 –time=60 run              | reads = 0<br>write = 25.92 MB/sec<br>total =<br>events/sec= 91580<br>time= 60sec                                          | red = 0<br>Write = 1.99999GB<br>total = 645.82MB/sec<br>events = 165369 events/sec<br>time=3s                   |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-blokc-size=4K –file-test-mode=rndwr –file-fsync-all –file-fsync-mode=fdatasync run | read = 0<br>write = 76.19 MB/sec<br>Events/sec=44472<br>Time=10s                                                          | read = 0 b<br>write = 39.148mb<br>total= 51.95 mb/sec<br>Events/sec=13309<br>Time=0.75s                         |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-blokc-size=4K –file-test-mode=rndwr –file-fsync-all –file-fsync-mode=fdatasync run | Read =0<br>write = 73.78 MB/sec<br>Events/sec = 18872<br>Time=10s                                                         | Read = 0<br>Write = 39.21 mb<br>total = 56.755 mb/sec<br>Events/sec = 14550<br>Time=0.69sec                     |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-blokc-size=4K –file-test-mode=rndwr –file-fsync-all –file-fsync-mode=fdatasync run | read=0<br>write 74.51 MB/sec<br>Events/sec = 19074<br>Time=10s                                                            | read = 0<br>write = 39.133 mb/sec<br>total = 57.51 mb/sec<br>Events/sec= 14732<br>Time=0.6sec                   |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-blokc-size=4K –file-test-mode=rndwr –file-fsync-all –file-fsync-mode=fdatasync run | read = 0<br>Write = 72.92 MB/sec<br>Events/sec = 18669<br>Time=10s                                                        | read = 0<br>write = 39.14 mb/sec<br>total = 55.99 mb/sec<br>events/sec = 14336<br>time=0.68sec                  |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-blokc-size=4K –file-test-mode=rndwr –file-fsync-all –file-fsync-mode=fdatasync run | Read = 0<br>write = 75.98 MB/sec<br>events/sec = 19272<br>time=10s                                                        | read = 0<br>write = 39.18 mb/sec<br>total = 57.35 mb/sec<br>Events/sec=14750<br>Time=0.699sec                   |
| Sysbench fileio –num-threads=16 –file-total-size=2G –file-block-size=4K–file-                                                                | read = 0<br>write = 24.35 MB/sec<br>Events/sec= 86028<br>Time=60sec                                                       | read =0<br>write= 2gb<br>total = 689 mb/sec<br>Events/sec = 176580<br>Time=5sec                                 |

|                                                                                                                                 |                                                                      |                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| test- mode=seqrewr -file-fsync-req=10 -time=60 run                                                                              |                                                                      |                                                                                           |
| Sysbench fileio -num-threads=16 -file-total-size=2G -file-block-size=4K-file-test- mode=seqrewr -file-fsync-req=10 -time=60 run | read = 0<br>write = 24.97 MB/sec<br>Events/sec = 88197<br>Time=60sec | read=0<br>write= 2gb<br>total = 677MB /sc<br>Events/sec = 173475<br>Time=2.9sec           |
| Sysbench fileio -num-threads=16 -file-total-size=2G -file-block-size=4K-file-test- mode=seqrewr -file-fsync-req=10 -time=60 run | Read=0<br>write= 25.26 mb/sec<br>events/sec= 89246<br>time=60sec     | read=0<br>write= 2gb<br>total = 677MB /sc<br>Events/sec = 173475<br>Time=3.02sec          |
| Sysbench fileio -num-threads=16 -file-total-size=2G -file-block-size=4K-file-test- mode=seqrewr -file-fsync-req=10 -time=60 run | read = 0<br>write = 24.97 mb/sec<br>Events/sec = 88197<br>Time=60sec | read =0<br>write= 2gb<br>total 786 mb/sec<br>events/sec = 201234<br>time=2.6sec           |
| sysbench fileio -num-threads=16 -file-test-mode=rndrw -file-total-size=2G run                                                   | read = 302<br>write 201 mb/sec<br>Events/sec = 73477<br>Time=10s     | read = 94 nb<br>write = 63 mb<br>Total = 311 mb/sec<br>events/sec = 20238<br>time=0.5sec  |
| sysbench fileio -num-threads=16 -file-test-mode=rndrw -file-total-size=2G run                                                   | read 315<br>Write = 210 mb/sec<br>Events/sec= 76750<br>Time=10s      | read=95 mb<br>write = 63mb<br>total = 299 mb<br>events/sec = 19258<br>time=0.5            |
| sysbench fileio -num-threads=16 -file-test-mode=rndrw -file-total-size=2G run                                                   | read = 306<br>write = 204 mb/sec<br>events/sec = 74504<br>time=10s   | Read = 95 mb/sec<br>write=63 mb/sec<br>total = 316mb/sec<br>Events/sec= 20296<br>Time=0.4 |
| sysbench fileio -num-threads=16 -file-test-mode=rndrw -file-total-size=2G run                                                   | Read = 277<br>Write = 185 mb/sec<br>events/sec = 67581<br>time=10s   | Read = 94 mb/sec<br>Write = 63 mb/sec<br>total = 233<br>events/sec = 14927<br>time=0.6    |

## TOP COMMAND OUTPUT OF HOST PC FOR USER AND KERNEL CPU USAGE

cpu usage 28.2% and 27.5% for ubuntu 2 terminals. User level usage is 11.15% kernel usage 4.12%

disk utilization 7488M used.

```
● ● ● himanivaidya — top — 80x24
Processes: 339 total, 2 running, 337 sleeping, 1901 threads          15:29:08
Load Avg: 2.07, 2.29, 2.43  CPU usage: 11.15% user, 4.12% sys, 84.72% idle
SharedLibs: 210M resident, 69M data, 10M linkedit.
MemRegions: 175635 total, 1411M resident, 91M private, 995M shared.
PhysMem: 7488M used (1508M wired), 55M unused.
VM: 132T vsize, 3272M framework vsize, 13944678(0) swapins, 14516379(0) swapouts
Networks: packets: 24746348/11G in, 7846563/1943M out.
Disks: 14899979/493G read, 8169975/518G written.

PID      COMMAND      %CPU TIME      #TH      #WQ      #PORT      MEM      PURG      CMPRS      PGRP
77531    qemu-system- 28.2 04:01.74 8        2        183      1231M    15M+      418M      77531
70754    qemu-system- 27.5 07:00:34 9        2        190      4073M-  15M+      1978M     70754
```

## TOP COMMAND ON QEMU UBUNTU VM

cpu usage is 0.3% kernel level and 0% in user level

## TOP COMMAND ON DOCKER

cpu 2.5% user level cpu 6.9% kernel level cpu