

COEN 241

HW 1 : System Vs OS Virtualization

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[Github](#)

Host System Configuration:

| | | |
|---|------------------|----------------------------------------------|
| 1 | Chip | 12th Gen Intel(R) Core(TM) i7-1255U 1.70 GHz |
| 2 | CPU | 10 |
| 3 | Memory | 16 GB |
| 4 | Free disk space | 210GB |
| 5 | Operating System | Windows 11 |

QEMU Installation and creation of QEMU image

Below are the steps followed to install QEMU on Windows:-

1. Downloaded ubuntu server image from the following link:

<https://releases.ubuntu.com>

2. Downloaded QEMU for Windows(x64) from the following link:

<https://www.qemu.org/download/#windows>

After the download is complete, install it.

3. Add QEMU path into Environment Variables
4. Open the command Prompt/PowerShell and execute the following commands

a. Go to the directory where QEMU is installed (D:)

b. Create QEMU image of ubuntu in qcow2 file format using following command : ***qemu-img create -f qcow2 ubuntu.img 20G***

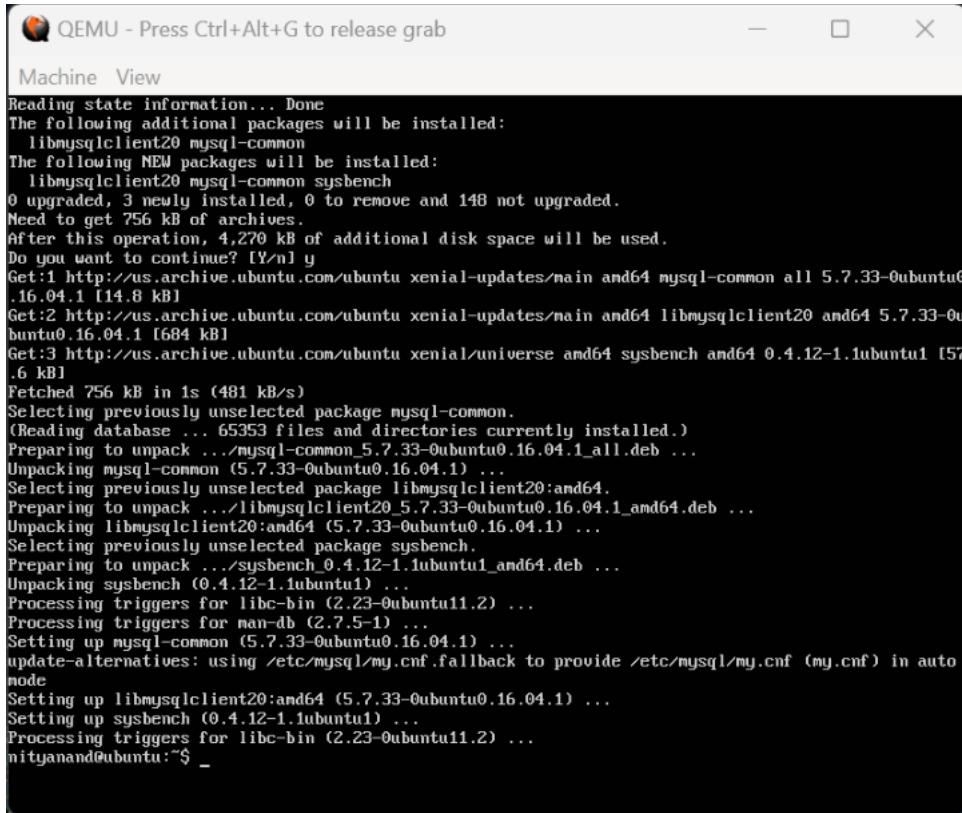
c. Boot iso file on QEMU with the following command

```
qemu-system-x86_64 -hda ubuntu.img -boot d -cdrom
```

5. Following commands installs sysbench on QEMU

```
sudo apt-get update
```

```
sudo apt install sysbench
```



The terminal window shows the following output:

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Reading state information... Done
The following additional packages will be installed:
  libmysqlclient20 mysql-common
The following NEW packages will be installed:
  libmysqlclient20 mysql-common sysbench
0 upgraded, 3 newly installed, 0 to remove and 148 not upgraded.
Need to get 756 kB of archives.
After this operation, 4,270 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 mysql-common all 5.7.33-0ubuntu0.16.04.1 [14.8 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libmysqlclient20 amd64 5.7.33-0ubuntu0.16.04.1 [1684 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu xenial/universe amd64 sysbench amd64 0.4.12-1.1ubuntu1 [57.6 kB]
Fetched 756 kB in 1s (481 kB/s)
Selecting previously unselected package mysql-common.
(Reading database ... 65353 files and directories currently installed.)
Preparing to unpack .../mysql-common_5.7.33-0ubuntu0.16.04.1_all.deb ...
Unpacking mysql-common (5.7.33-0ubuntu0.16.04.1) ...
Selecting previously unselected package libmysqlclient20:amd64.
Preparing to unpack .../libmysqlclient20_5.7.33-0ubuntu0.16.04.1_amd64.deb ...
Unpacking libmysqlclient20:amd64 (5.7.33-0ubuntu0.16.04.1) ...
Selecting previously unselected package sysbench.
Preparing to unpack .../sysbench_0.4.12-1.1ubuntu1_amd64.deb ...
Unpacking sysbench (0.4.12-1.1ubuntu1) ...
Processing triggers for libc-bin (2.23-0ubuntu11.2) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up mysql-common (5.7.33-0ubuntu0.16.04.1) ...
update-alternatives: using /etc/mysql/my.cnf.fallback to provide /etc/mysql/my.cnf (my.cnf) in auto mode
Setting up libmysqlclient20:amd64 (5.7.33-0ubuntu0.16.04.1) ...
Setting up sysbench (0.4.12-1.1ubuntu1) ...
Processing triggers for libc-bin (2.23-0ubuntu11.2) ...
nityanand@ubuntu:~$ _
```

Docker Setup:

1. Pull the Ubuntu Image

First, pull the desired version of the Ubuntu image from Docker Hub:

```
bashCopy code
```

```
docker pull ubuntu:16.04
```

Replace **16.04** with any other version if needed.

2. Run the Ubuntu Container

Run the Ubuntu container with an initial RAM and CPU allocation:

```
bashCopy code
```

```
docker run -it --name ubuntu_container -m 2g --cpus=2 ubuntu:20.04
```

This starts an Ubuntu container named **ubuntu_container** with 2 GB of RAM and 2 CPU cores.

3. Install Nano and Modify the Container

While inside the container, update the package lists, install **nano**, and add or modify files as needed:

bashCopy code

```
apt-get update apt-get install nano
```

Use **nano** or other commands to modify the container's filesystem.

4. Exit the Container

To exit the container without stopping it, press **Ctrl+P** followed by **Ctrl+Q**.

5. Commit the Container to a New Image

Save the state of your container to a new Docker image:

bashCopy code

```
docker commit ubuntu_container myubuntu_with_changes
```

6. Stop the Original Container

If desired, you can now stop the original container:

bashCopy code

```
docker stop ubuntu_container
```

7. Run the New Image with Different Resources

Start a new container from your saved image with different RAM and CPU allocations. For example, to run it with 4 GB of RAM and 4 CPU cores:

bashCopy code

```
docker run -it --name new_ubuntu_instance -m 4g --cpus=4 myubuntu_with_changes
```

This command creates and starts a new container named **new_ubuntu_instance** using the **myubuntu_with_changes** image with the updated resource allocations.

```
| └ Command Prompt      + - X
Microsoft Windows [Version 10.0.22631.3007]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Nityanand Pujari>docker pull ubuntu 16.04
"docker pull" requires exactly 1 argument.
See 'docker pull --help'.

Usage: docker pull [OPTIONS] NAME[:TAG@DIGEST]

Download an image from a registry

C:\Users\Nityanand Pujari>docker pull ubuntu:16.04
16.04: Pulling from library/ubuntu
58699f9b18fc: Pull complete
b51569e7c507: Pull complete
da8ef40b9eca: Pull complete
fb15d46c38dc: Pull complete
Digest: sha256:1f1a2d56de1d604801a9671f301190704c25d604a416f59e03c04f5c6ffee0d6
Status: Downloaded newer image for ubuntu:16.04
docker.io/library/ubuntu:16.04

What's Next?
1. Sign in to your Docker account + docker login
2. View a summary of image vulnerabilities and recommendations + docker scout quickview ubuntu:16.04

C:\Users\Nityanand Pujari>
```

```
| └ root@eb2864db1ec0:/ 
Microsoft Windows [Version 10.0.22631.3007]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Nityanand Pujari>docker pull ubuntu:16.04
16.04: Pulling from library/ubuntu
58699f9b18fc: Pull complete
b51569e7c507: Pull complete
da8ef40b9eca: Pull complete
fb15d46c38dc: Pull complete
Digest: sha256:1f1a2d56de1d604801a9671f301190704c25d604a416f59e03c04f5c6ffee0d6
Status: Downloaded newer image for ubuntu:16.04
docker.io/library/ubuntu:16.04

What's Next?
1. Sign in to your Docker account + docker login
2. View a summary of image vulnerabilities and recommendations + docker scout quickview ubuntu:16.04

C:\Users\Nityanand Pujari>docker run -it --name myubuntu -m 2g --cpus=2 ubuntu:16.04
root@eb2864db1ec0:/#
```

```
| └ root@47d86432050a:/ 
Microsoft Windows [Version 10.0.22631.3007]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Nityanand Pujari>docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
ubuntu37        latest   b8865346e127    18 hours ago  171MB
ubuntu10        latest   dbd4d2a38819    18 hours ago  164MB
ubuntu_saved     latest   29e4d77c6ac     19 hours ago  164MB
myubuntu_saved   latest   04b5a9c01bb6    19 hours ago  135MB
ubuntu          16.04   b6f507652425    2 years ago   135MB

C:\Users\Nityanand Pujari>docker ps
CONTAINER ID      IMAGE      COMMAND      CREATED      STATUS      PORTS      NAMES

C:\Users\Nityanand Pujari>docker run -it ubuntu37
root@47d86432050a:/#
```

Test Conditions:

To conduct the experiment with the VM, we will consider three test conditions shown in the table below. To ensure consistency between results, the same test conditions will be used for Docker as well as for QEMU.

| Cores | Memory allocation |
|-------|-------------------|
| 2 | 2 GB |
| 3 | 3 GB |
| 6 | 3 GB |
| 8 | 4GB |

Proof of Experiment-

In this section, we will look at test cases that are specifically related to sysbench CPU, memory, and File I/O commands. We will also test different QEMU VM configurations to see if we get different results by changing the VM configurations.

1. CPU Testing

We will use the following two test cases to evaluate CPU performance between QEMU and Docker. For our testing, we will use the sysbench command and the test cases listed below:

```
sysbench --test=cpu --cpu-max-prime=20000 run
```

1. max-prime = 20000
2. max-prime = 10,000

2. FILEIO Testing

For File I/O testing we will be using random read/write (rndrw) ,sequential write(seqwr). Also, for our testing purposes, we will use the following sysbench commands, and changing the values for different configuration.

```
sysbench --test=fileio --file-total-size=250M --file-test-mode=seqwr prepare  
sysbench --test=fileio --file-total-size=250M --file-test-mode=seqwr run  
sysbench --test=fileio --file-total-size=250M cleanup
```

```
sysbench --test=fileio --file-total-size=300M --file-test-mode=rndrd prepare  
sysbench --test=fileio --file-total-size=300M --file-test-mode=rndrd run  
sysbench --test=fileio --file-total-size=300M cleanup
```

3. Memory Testing

For memory testing we will be using random access (seq) ,sequential access (rnd). Also, for our testing purposes, we will use the following sysbench commands, and changing the values for different configuration.

```
sysbench --test=memory --memory-block-size=1K --memory-total-size=100G --memory-access-mode=seq  
run  
sysbench --test=memory --memory-block-size=1K --memory-total-size=100G --memory-access-mode=rnd  
run
```

Results

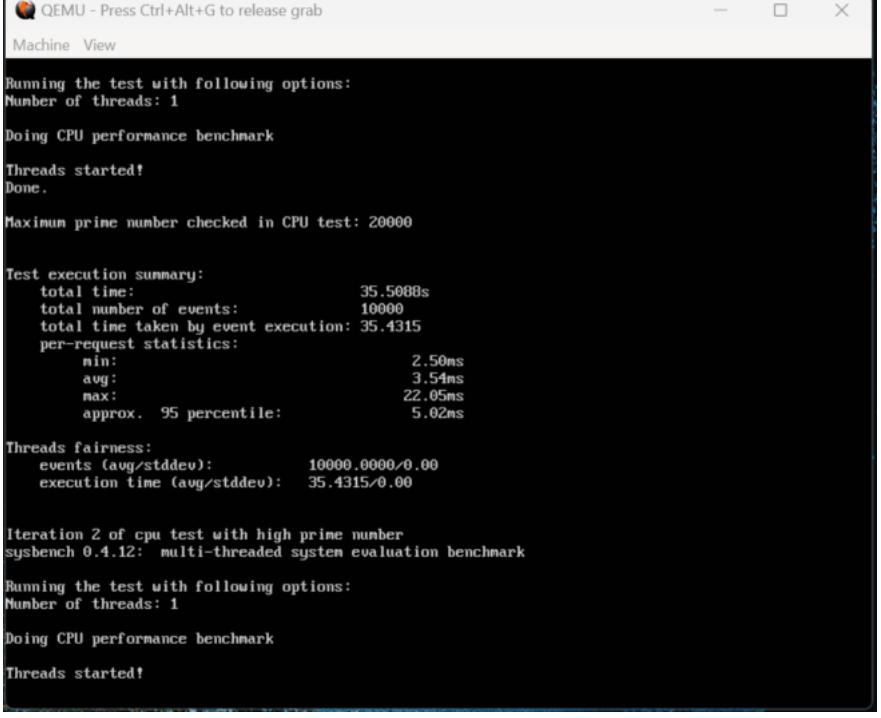
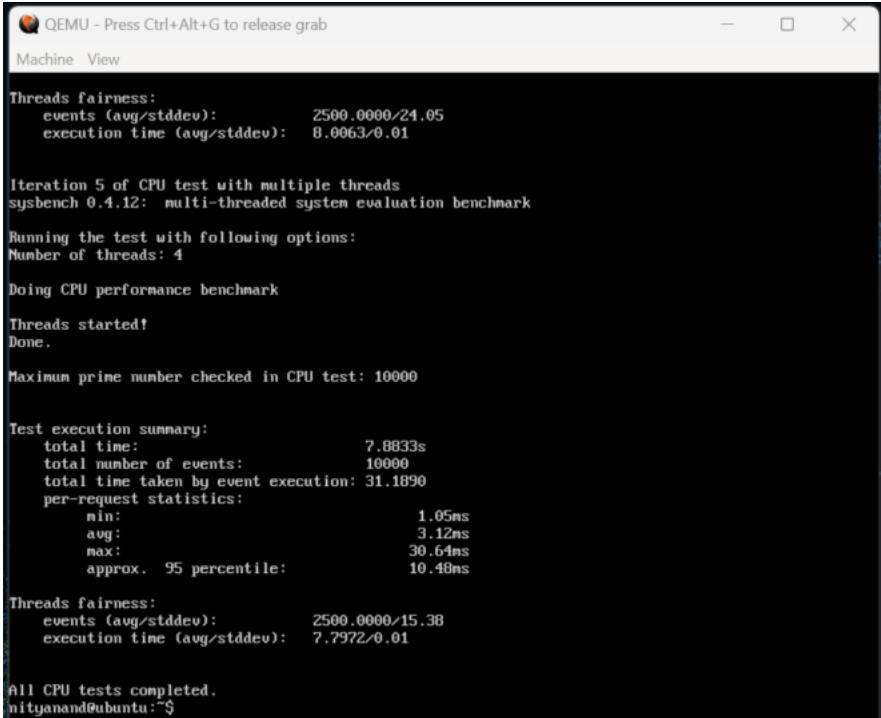
Qcow2 disk image-

1. Configuration 1: 2 GB RAM with 2 Cores

CPU Test

QEMU Results, Configuration: 2 GB 2 cores for max-prime = 20000 and 10000

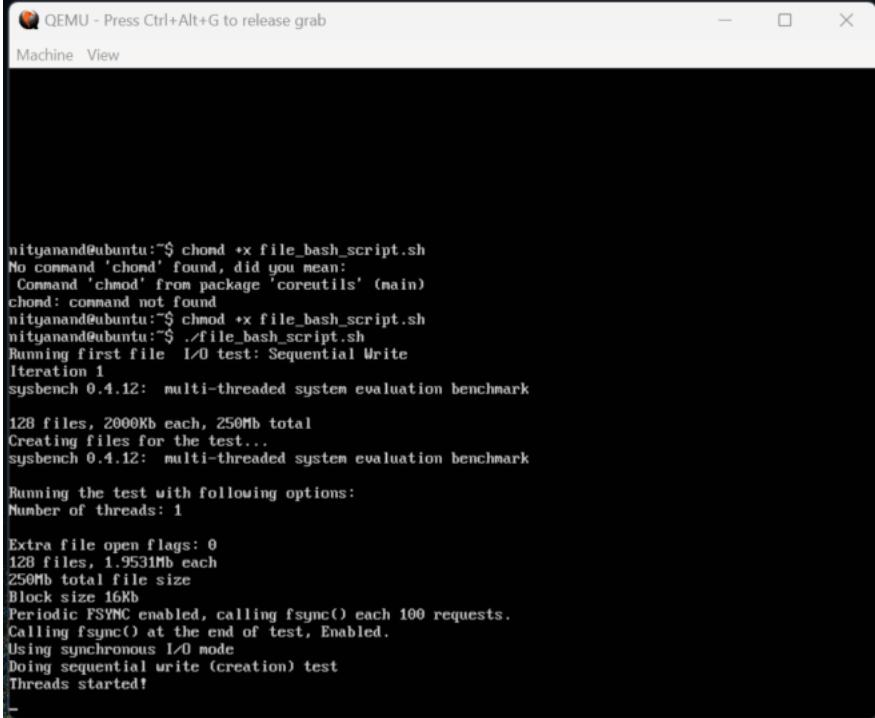
| Sr. No | Screenshots |
|--------|-------------|
| | |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 35.5088s total number of events: 10000 total time taken by event execution: 35.4315 per-request statistics: min: 2.50ms avg: 3.54ms max: 22.05ms approx. 95 percentile: 5.02ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 35.4315/0.00 Iteration 2 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! </pre> |
| 2 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Threads fairness: events (avg/stddev): 2500.0000/24.05 execution time (avg/stddev): 8.0063/0.01 Iteration 5 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 7.8833s total number of events: 10000 total time taken by event execution: 31.1890 per-request statistics: min: 1.05ns avg: 3.12ns max: 30.64ns approx. 95 percentile: 10.40ns Threads fairness: events (avg/stddev): 2500.0000/15.38 execution time (avg/stddev): 7.7972/0.01 All CPU tests completed. nityanand@ubuntu:~\$ </pre> |

Observations:

| | |
|---------------------------|---------|
| Average | 3.12ms |
| Stddev | 2ms |
| Minimum Time for an event | 1.05ms |
| Maximum Time for an event | 30.64ms |

File I/O Test

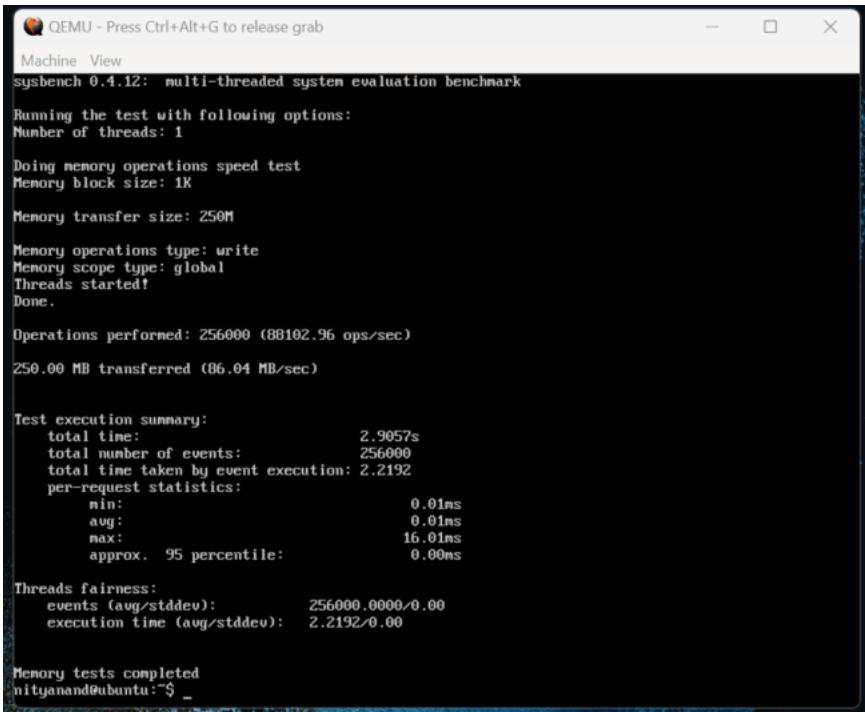
| QEMU Results, Configuration: 2 GB 2 cores for sequential write and random read/write | |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <p>QEMU - Press Ctrl+Alt+G to release grab</p> <p>Machine View</p> <pre> nityanand@ubuntu:~\$ chmod +x file_bash_script.sh No command 'chmod' found, did you mean: Command 'chmd' from package 'coreutils' (main) chmd: command not found nityanand@ubuntu:~\$ chmod +x file_bash_script.sh nityanand@ubuntu:~\$./file_bash_script.sh Running first file I/O test: Sequential Write Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark 128 files, 2000Kb each, 250Mb total Creating files for the test... sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Extra file open flags: 0 128 files, 1.953Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! </pre> |

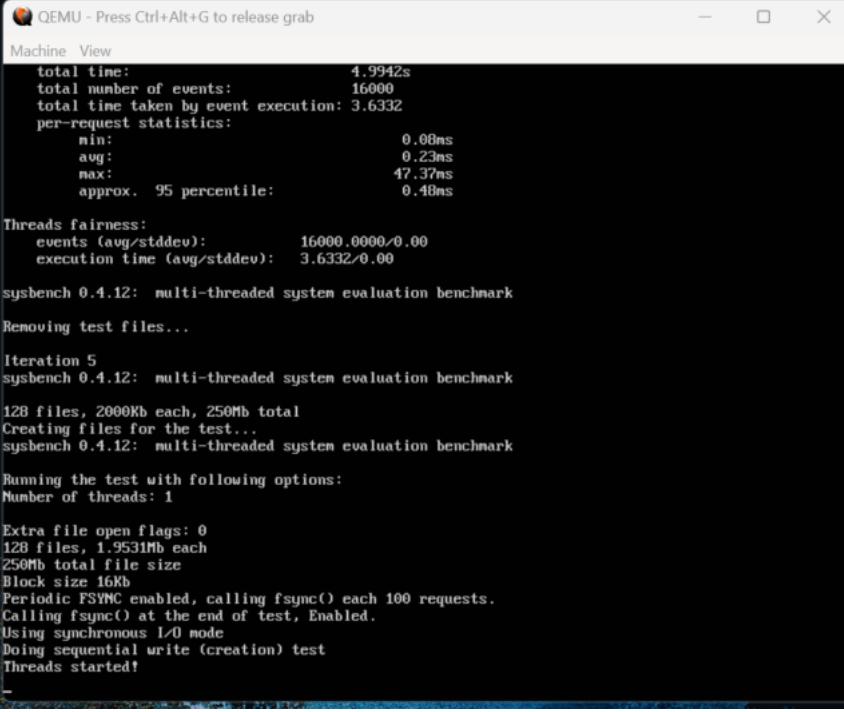
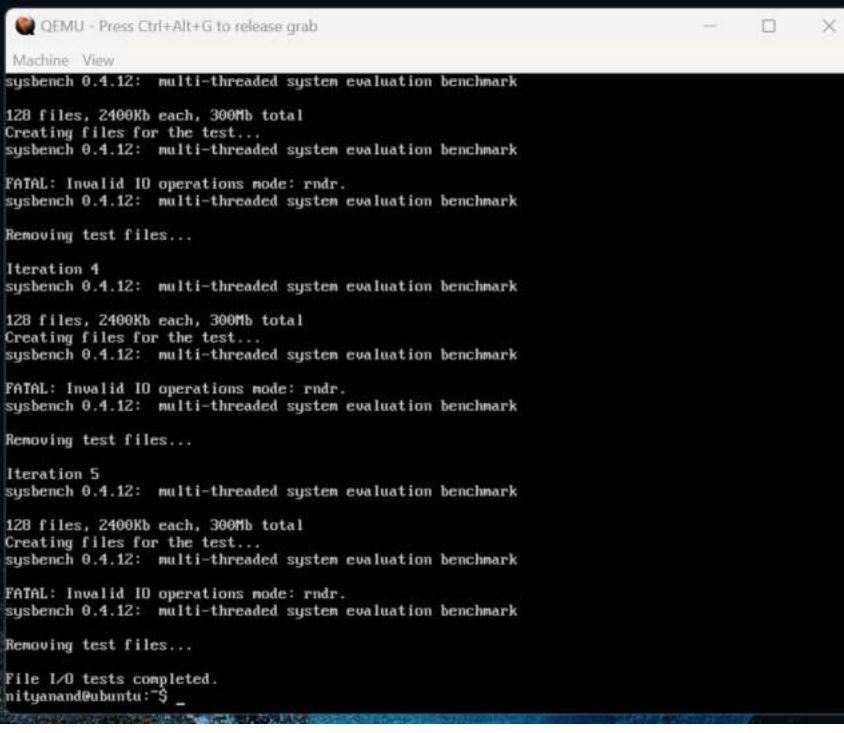
Observations:

| | |
|---------|-----|
| Average | 2ms |
| Stddev | 1ms |

| | |
|---------------------------|-----|
| Minimum Time for an event | 1ms |
| Maximum Time for an event | 3ms |

Memory Test

| QEMU Results, Configuration: 2 GB 2 cores for sequential and random access | | | | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------|-------------------------|--------|--------------------------------------|--------|------|--------|------|--------|------|---------|------------------------|--------|----------------------|------------------|------------------------------|-------------|
| Sr. No | Screenshots | | | | | | | | | | | | | | | | | | |
| 1 |  <p>QEMU - Press Ctrl+Alt+G to release grab</p> <p>Machine View</p> <p>sysbench 0.4.12: multi-threaded system evaluation benchmark</p> <p>Running the test with following options:</p> <p>Number of threads: 1</p> <p>Doing memory operations speed test</p> <p>Memory block size: 1K</p> <p>Memory transfer size: 250M</p> <p>Memory operations type: write</p> <p>Memory scope type: global</p> <p>Threads started!</p> <p>Done.</p> <p>Operations performed: 256000 (88102.96 ops/sec)</p> <p>250.00 MB transferred (86.04 MB/sec)</p> <p>Test execution summary:</p> <table> <tr> <td>total time:</td> <td>2.9057s</td> </tr> <tr> <td>total number of events:</td> <td>256000</td> </tr> <tr> <td>total time taken by event execution:</td> <td>2.2192</td> </tr> </table> <p>per-request statistics:</p> <table> <tr> <td>min:</td> <td>0.01ms</td> </tr> <tr> <td>avg:</td> <td>0.01ms</td> </tr> <tr> <td>max:</td> <td>16.01ms</td> </tr> <tr> <td>approx. 95 percentile:</td> <td>0.00ms</td> </tr> </table> <p>Threads fairness:</p> <table> <tr> <td>events (avg/stddev):</td> <td>256000.0000/0.00</td> </tr> <tr> <td>execution time (avg/stddev):</td> <td>2.2192/0.00</td> </tr> </table> <p>Memory tests completed</p> <p>nityanand@ubuntu:~\$ _</p> | total time: | 2.9057s | total number of events: | 256000 | total time taken by event execution: | 2.2192 | min: | 0.01ms | avg: | 0.01ms | max: | 16.01ms | approx. 95 percentile: | 0.00ms | events (avg/stddev): | 256000.0000/0.00 | execution time (avg/stddev): | 2.2192/0.00 |
| total time: | 2.9057s | | | | | | | | | | | | | | | | | | |
| total number of events: | 256000 | | | | | | | | | | | | | | | | | | |
| total time taken by event execution: | 2.2192 | | | | | | | | | | | | | | | | | | |
| min: | 0.01ms | | | | | | | | | | | | | | | | | | |
| avg: | 0.01ms | | | | | | | | | | | | | | | | | | |
| max: | 16.01ms | | | | | | | | | | | | | | | | | | |
| approx. 95 percentile: | 0.00ms | | | | | | | | | | | | | | | | | | |
| events (avg/stddev): | 256000.0000/0.00 | | | | | | | | | | | | | | | | | | |
| execution time (avg/stddev): | 2.2192/0.00 | | | | | | | | | | | | | | | | | | |

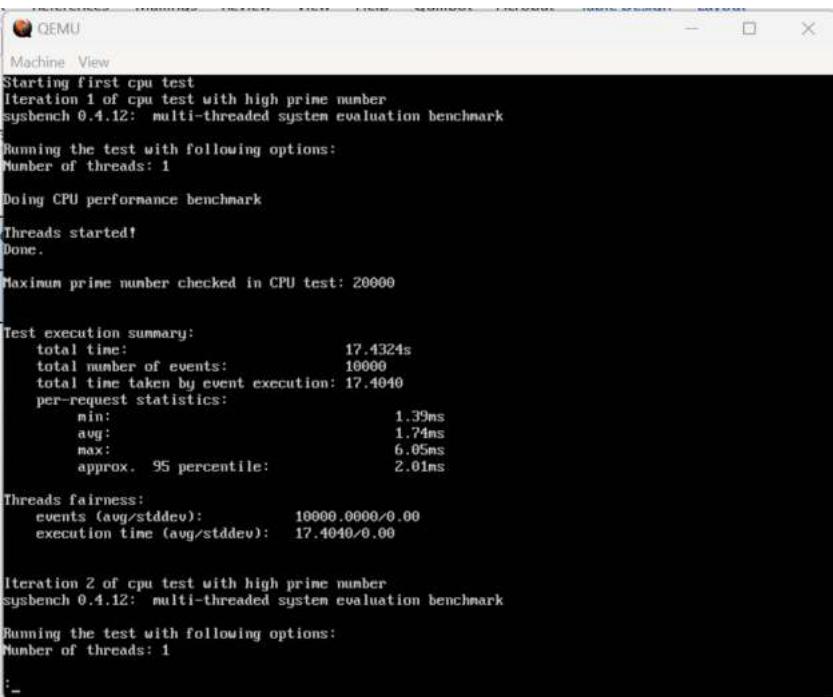
| | |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View total time: 4.9942s total number of events: 16000 total time taken by event execution: 3.6332 per-request statistics: min: 0.08ns avg: 0.23ns max: 47.37ns approx. 95 percentile: 0.48ns Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 3.6332/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark 128 files, 2000Kb each, 250Mb total Creating files for the test... sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! -</pre> |
| 3 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View sysbench 0.4.12: multi-threaded system evaluation benchmark 128 files, 2400Kb each, 300Mb total Creating files for the test... sysbench 0.4.12: multi-threaded system evaluation benchmark FATAL: Invalid IO operations mode: rndr. sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark 128 files, 2400Kb each, 300Mb total Creating files for the test... sysbench 0.4.12: multi-threaded system evaluation benchmark FATAL: Invalid IO operations mode: rndr. sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark 128 files, 2400Kb each, 300Mb total Creating files for the test... sysbench 0.4.12: multi-threaded system evaluation benchmark FATAL: Invalid IO operations mode: rndr. sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... File I/O tests completed. nityanand@ubuntu:~\$ _</pre> |

Observations:

| | |
|---------------------------|---------|
| Average | 0.23ms |
| Stddev | 0.77ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 26.09ms |

2. Configuration 2: 3 GB RAM with 3 Cores

CPU TEST

| QEMU Results, Configuration: 3 GB 3 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Starting first cpu test Iteration 1 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 17.4324s total number of events: 10000 total time taken by event execution: 17.4040 per-request statistics: min: 1.39ms avg: 1.74ms max: 6.05ms approx. 95 percentile: 2.01ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 17.4040/0.00 Iteration 2 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 </pre> |

2

```
QEMU
Machine View

Iteration 2 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          18.0186s
    total number of events:      10000
    total time taken by event execution: 17.9964
    per-request statistics:
        min:                  1.39ms
        avg:                  1.80ms
        max:                  10.39ms
        approx. 95 percentile: 2.05ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 17.9964/0.00

Iteration 3 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

:
```

3

```
QEMU
Machine View

Iteration 3 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

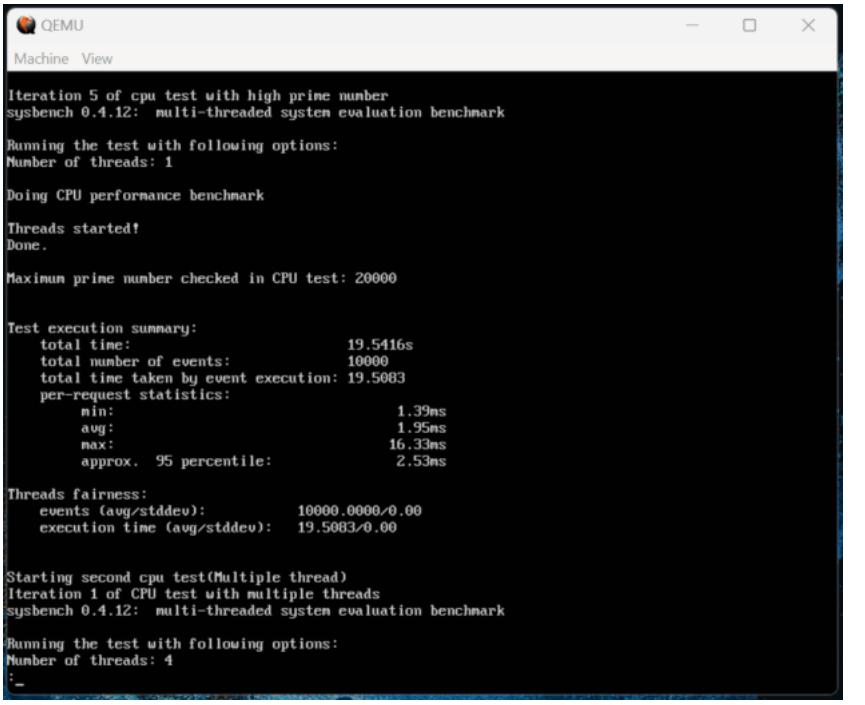
Test execution summary:
    total time:          18.2988s
    total number of events:      10000
    total time taken by event execution: 18.2734
    per-request statistics:
        min:                  1.41ms
        avg:                  1.63ms
        max:                  7.75ms
        approx. 95 percentile: 2.09ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 18.2734/0.00

Iteration 4 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

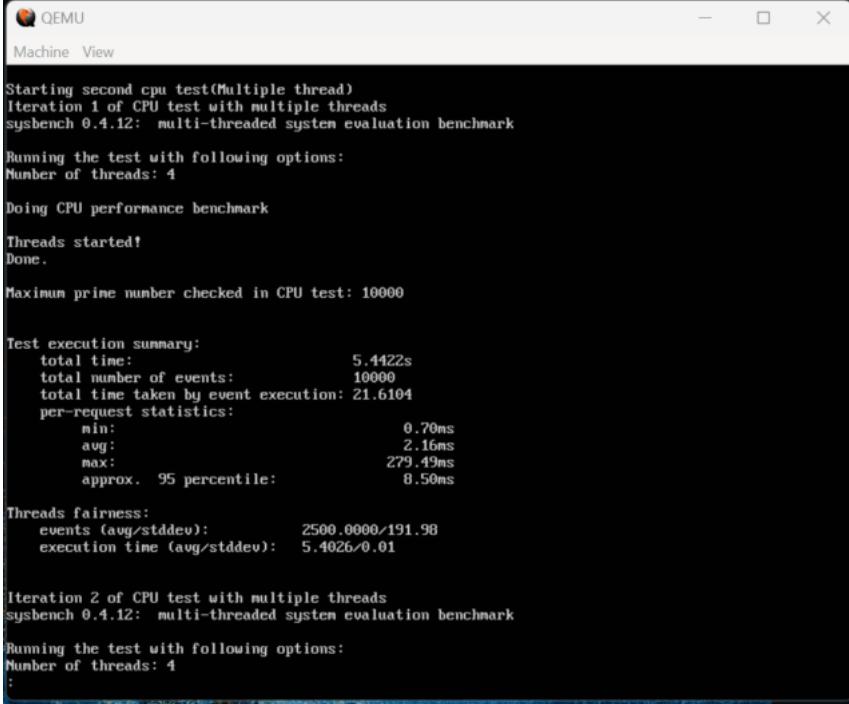
:
```

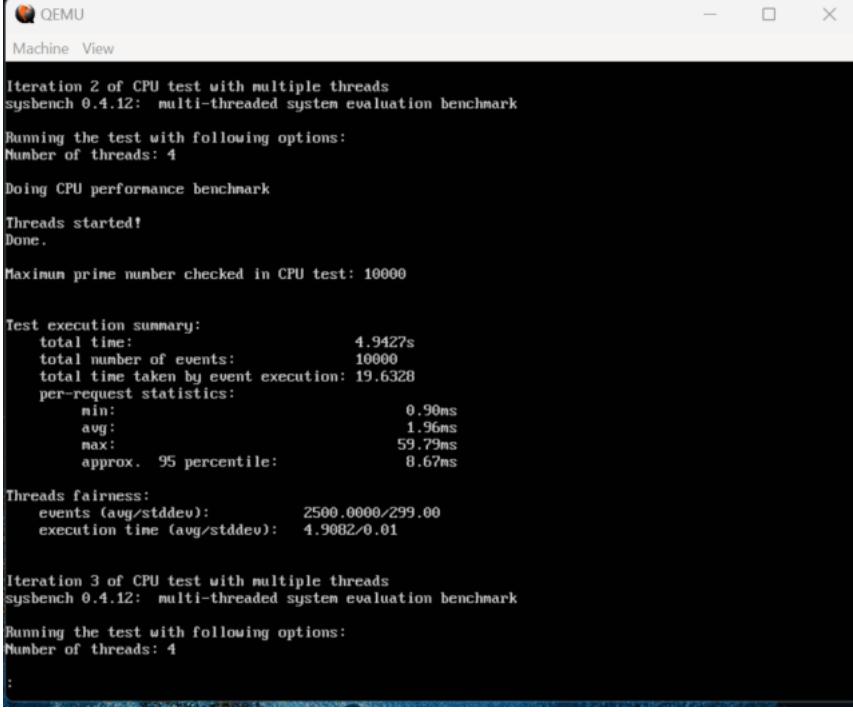
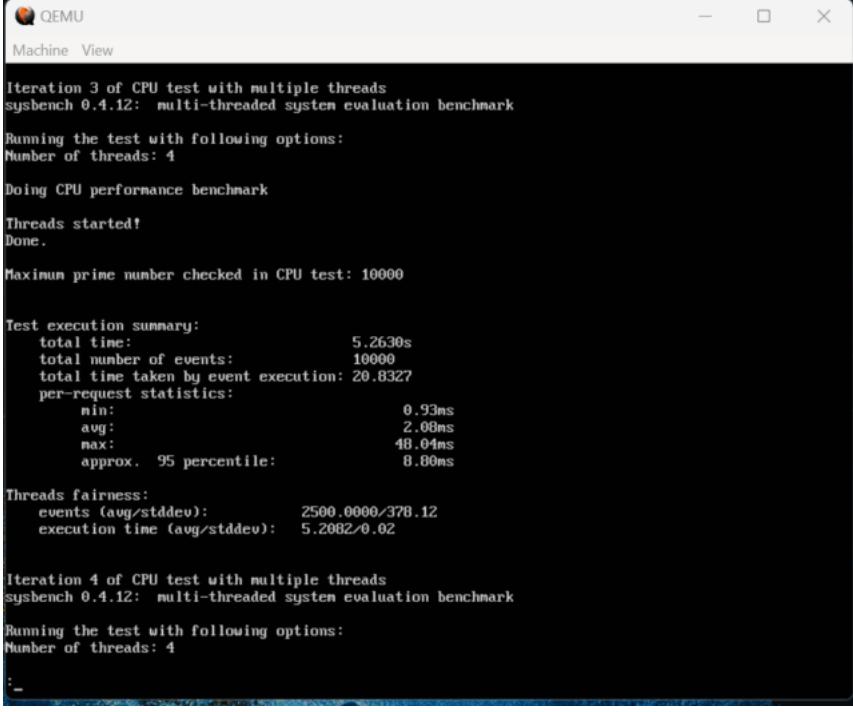
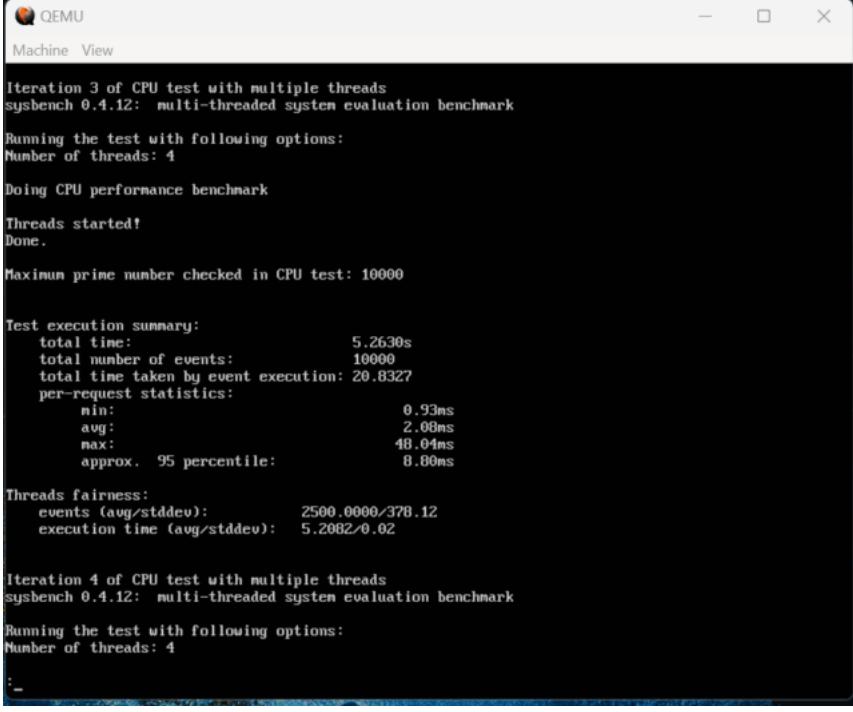
| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| |  <pre> Iteration 5 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 19.5416s total number of events: 10000 total time taken by event execution: 19.5083 per-request statistics: min: 1.39ms avg: 1.95ms max: 16.39ms approx. 95 percentile: 2.53ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 19.5083/0.00 Starting second cpu test(Multiple thread) Iteration 1 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :-</pre> |
| 4 | |
| 5 | |

Observations:

| | |
|---------|--------|
| Average | 1.95ms |
|---------|--------|

| | |
|---------------------------|---------|
| Stddev | 1.37ms |
| Minimum Time for an event | 1.39ms |
| Maximum Time for an event | 16.33ms |

| QEMU Results, Configuration: 3 GB 3 cores for max-prime = 10000 | |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Starting second cpu test(Multiple thread) Iteration 1 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 5.4422s total number of events: 10000 total time taken by event execution: 21.6104 per-request statistics: min: 0.70ms avg: 2.16ms max: 279.49ms approx. 95 percentile: 8.50ms Threads fairness: events (avg/stddev): 2500.0000/191.98 execution time (avg/stddev): 5.4026/0.01 Iteration 2 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 : </pre> |

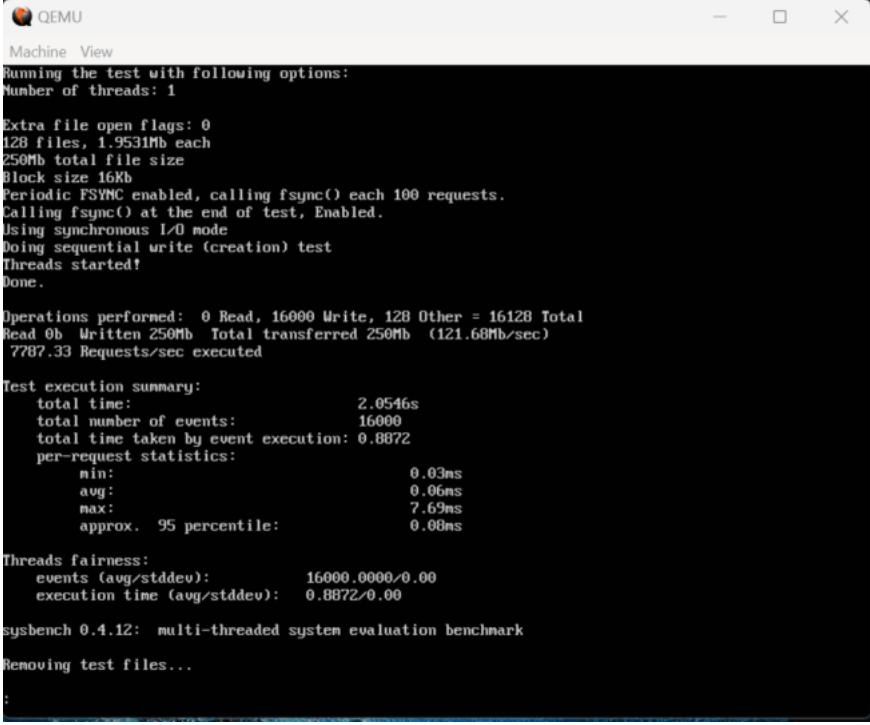
| | |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| |  <pre> QEMU Machine View Iteration 2 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.9427s total number of events: 10000 total time taken by event execution: 19.6328 per-request statistics: min: 0.90ms avg: 1.96ms max: 59.79ms approx. 95 percentile: 8.67ms Threads fairness: events (avg/stddev): 2500.0000/299.00 execution time (avg/stddev): 4.9082/0.01 Iteration 3 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :</pre> |
| 2 |  <pre> QEMU Machine View Iteration 3 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 5.2630s total number of events: 10000 total time taken by event execution: 20.8327 per-request statistics: min: 0.93ms avg: 2.06ms max: 48.04ms approx. 95 percentile: 8.86ms Threads fairness: events (avg/stddev): 2500.0000/378.12 execution time (avg/stddev): 5.2082/0.02 Iteration 4 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :</pre> |
| 3 |  <pre> QEMU Machine View Iteration 3 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 5.2630s total number of events: 10000 total time taken by event execution: 20.8327 per-request statistics: min: 0.93ms avg: 2.06ms max: 48.04ms approx. 95 percentile: 8.86ms Threads fairness: events (avg/stddev): 2500.0000/378.12 execution time (avg/stddev): 5.2082/0.02 Iteration 4 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :</pre> |

| | |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | <pre> QEMU Machine View Iteration 4 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.2529s total number of events: 10000 total time taken by event execution: 16.9098 per-request statistics: min: 0.87ms avg: 1.69ms max: 34.80ms approx. 95 percentile: 2.11ms Threads fairness: events (avg/stddev): 2500.0000/255.91 execution time (avg/stddev): 4.2274/0.01 Iteration 5 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :</pre> |
| 5 | <pre> QEMU Machine View Threads fairness: events (avg/stddev): 2500.0000/255.91 execution time (avg/stddev): 4.2274/0.01 Iteration 5 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.2719s total number of events: 10000 total time taken by event execution: 16.9550 per-request statistics: min: 0.90ms avg: 1.70ms max: 45.81ms approx. 95 percentile: 2.12ms Threads fairness: events (avg/stddev): 2500.0000/262.12 execution time (avg/stddev): 4.2387/0.01 All CPU tests completed. (END) </pre> |

Observations:

| | |
|---------------------------|--------|
| Average | 1.70ms |
| Stddev | 1.55ms |
| Minimum time for an event | 0.90ms |
| Maximum time for an event | 45.1ms |

File I/O Test

| QEMU Results, Configuration: 3 GB 3 cores for sequential write | |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Running the test with following options: Number of threads: 1 Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! Done. Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total Read 0b Written 250Mb Total transferred 250Mb (121.68Mb/sec) 7787.33 Requests/sec executed Test execution summary: total time: 2.0546s total number of events: 16000 total time taken by event execution: 0.8872 per-request statistics: min: 0.03ms avg: 0.06ms max: 7.69ms approx. 95 percentile: 0.08ms Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 0.8872/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :</pre> |

2

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (127.25Mb/sec)
8143.88 Requests/sec executed

Test execution summary:
    total time:          1.9647s
    total number of events: 16000
    total time taken by event execution: 0.8461
    per-request statistics:
        min:                0.03ms
        avg:                0.05ms
        max:                7.76ms
        approx. 95 percentile: 0.07ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.8461/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (124.99Mb/sec)
7999.11 Requests/sec executed

Test execution summary:
    total time:          2.0000s
    total number of events: 16000
    total time taken by event execution: 0.8725
    per-request statistics:
        min:                0.03ms
        avg:                0.05ms
        max:                7.92ms
        approx. 95 percentile: 0.08ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.8725/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (120.22Mb/sec)
7693.92 Requests/sec executed

Test execution summary:
    total time:          2.0796s
    total number of events: 16000
    total time taken by event execution: 0.9128
    per-request statistics:
        min:            0.04ms
        avg:            0.06ms
        max:            7.97ms
        approx. 95 percentile: 0.08ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.9128/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (126.52Mb/sec)
8097.30 Requests/sec executed

Test execution summary:
    total time:          1.9760s
    total number of events: 16000
    total time taken by event execution: 0.8347
    per-request statistics:
        min:            0.03ms
        avg:            0.05ms
        max:            7.76ms
        approx. 95 percentile: 0.07ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.8347/0.00

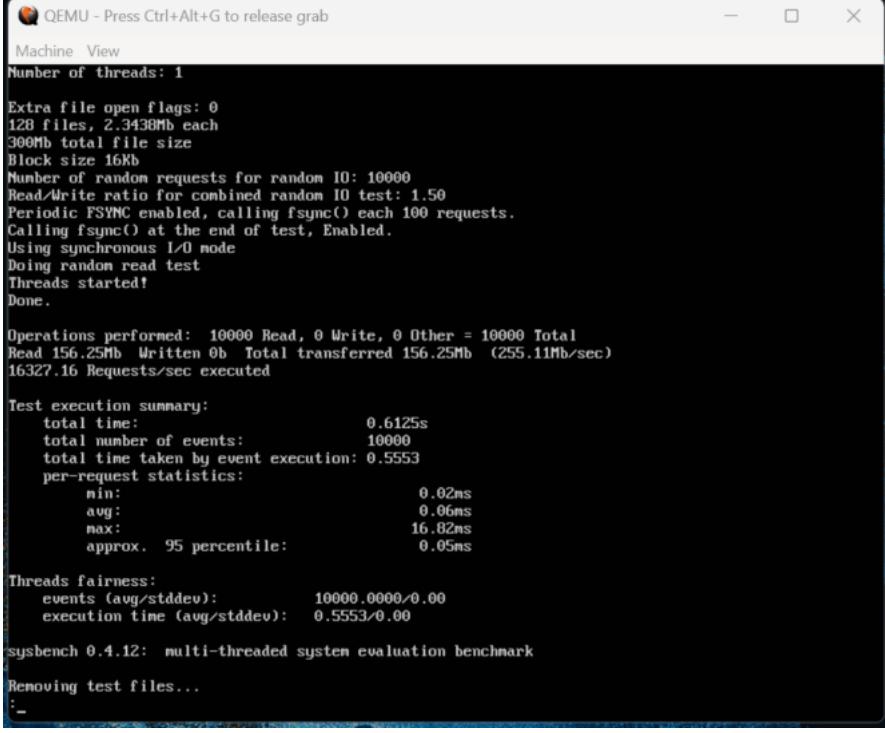
sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.05ms |
| Stddev | 0.08ms |
| Minimum time for an event | 0.03ms |
| Maximum time for an event | 7.76ms |

| QEMU Results, Configuration: 3 GB 3 cores for random read | |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Number of threads: 1 Extra file open flags: 0 128 files, 2.3436Mb each 300Mb 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 read test Threads started! Done. Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total Read 156.25Mb Written 0b Total transferred 156.25Mb (255.11Mb/sec) 16327.16 Requests/sec executed Test execution summary: total time: 0.6125s total number of events: 10000 total time taken by event execution: 0.5553 per-request statistics: min: 0.02ms avg: 0.06ms max: 16.82ms approx. 95 percentile: 0.05ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 0.5553/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :-</pre> |

2

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (327.4Mb/sec)
20953.57 Requests/sec executed

Test execution summary:
    total time:          0.4772s
    total number of events: 10000
    total time taken by event execution: 0.4331
    per-request statistics:
        min:                  0.02ns
        avg:                  0.04ns
        max:                 33.49ns
        approx. 95 percentile: 0.04ns

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 0.4331/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

3

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (463.32Mb/sec)
29652.62 Requests/sec executed

Test execution summary:
    total time:          0.3372s
    total number of events: 10000
    total time taken by event execution: 0.3019
    per-request statistics:
        min:                  0.02ns
        avg:                  0.03ns
        max:                 6.52ns
        approx. 95 percentile: 0.04ns

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 0.3019/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

4

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb total file size
Block size 16Kb
Number of random requests for random I/O: 10000
Read/Write ratio for combined random I/O 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (386.99Mb/sec)
24767.09 Requests/sec executed

Test execution summary:
    total time:          0.4030s
    total number of events: 10000
    total time taken by event execution: 0.3522
    per-request statistics:
        min:                 0.02ms
        avg:                 0.04ms
        max:                 5.90ms
        approx. 95 percentile: 0.04ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 0.3522/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-

```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb total file size
Block size 16Kb
Number of random requests for random I/O: 10000
Read/Write ratio for combined random I/O 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (392.17Mb/sec)
25098.87 Requests/sec executed

Test execution summary:
    total time:          0.3984s
    total number of events: 10000
    total time taken by event execution: 0.3611
    per-request statistics:
        min:                 0.01ms
        avg:                 0.04ms
        max:                 6.76ms
        approx. 95 percentile: 0.05ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 0.3611/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

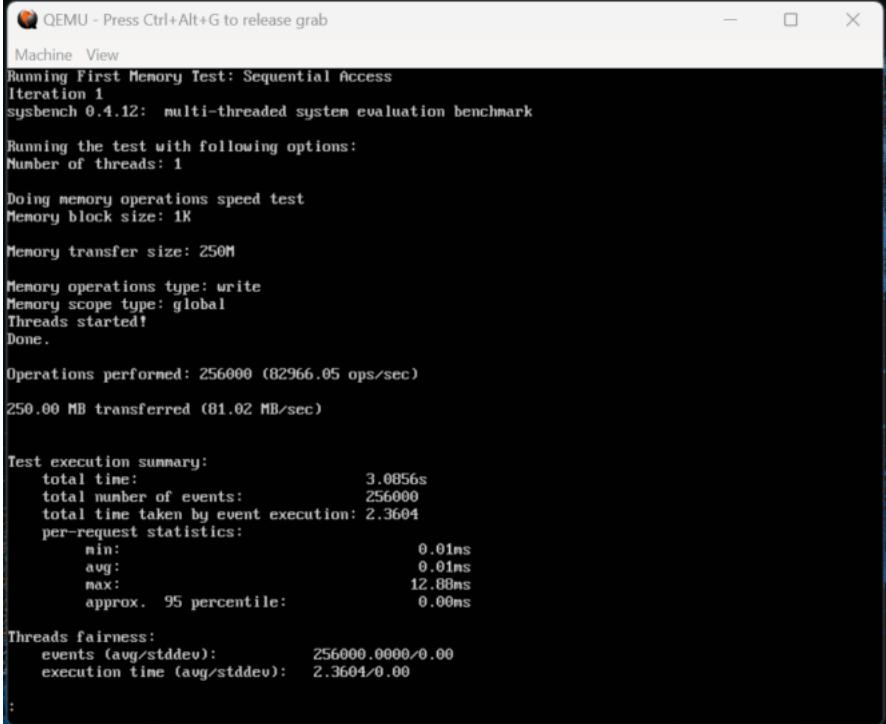
Removing test files...
:-

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.04ms |
| Stddev | 0.08ms |
| Minimum time for an event | 0.01ms |
| Maximum time for an event | 6.76ms |

Memory Testing

| QEMU Results, Configuration: 3 GB 3 cores for Sequential memory Access | |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running First Memory Test: Sequential Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (82966.05 ops/sec) 250.00 MB transferred (81.02 MB/sec) Test execution summary: total time: 3.0856s total number of events: 256000 total time taken by event execution: 2.3604 per-request statistics: min: 0.01ms avg: 0.01ms max: 12.80ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 2.3604/0.00 :</pre> |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (103327.23 ops/sec)
250.00 MB transferred (100.91 MB/sec)

Test execution summary:
total time: 2.4776s
total number of events: 256000
total time taken by event execution: 1.9275
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 7.63ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.9275/0.00
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

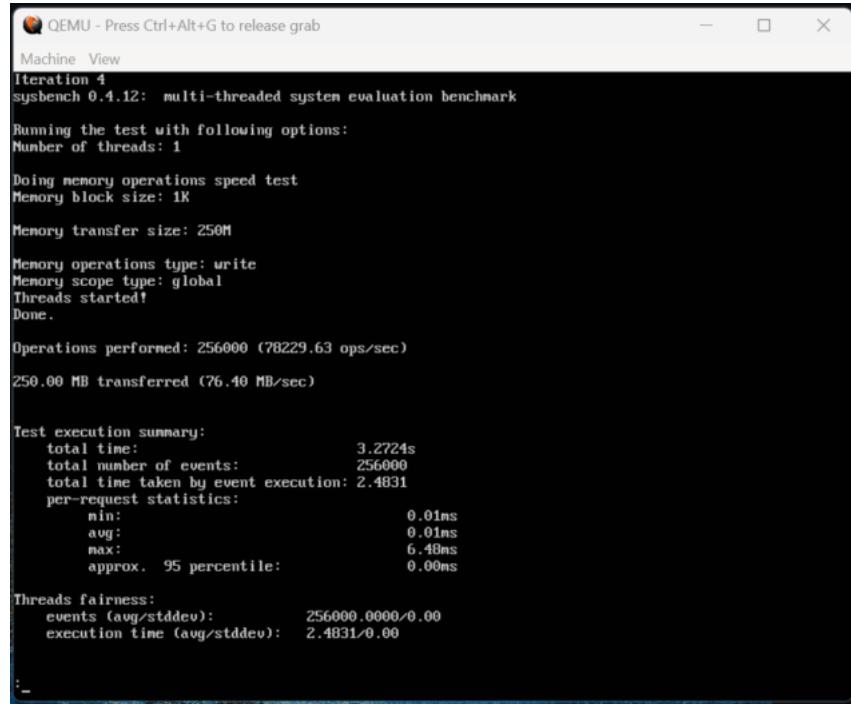
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (102286.11 ops/sec)
250.00 MB transferred (99.89 MB/sec)

Test execution summary:
total time: 2.5028s
total number of events: 256000
total time taken by event execution: 1.9118
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 6.20ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.9118/0.00
:
```

4



```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (78229.63 ops/sec)
250.00 MB transferred (76.40 MB/sec)

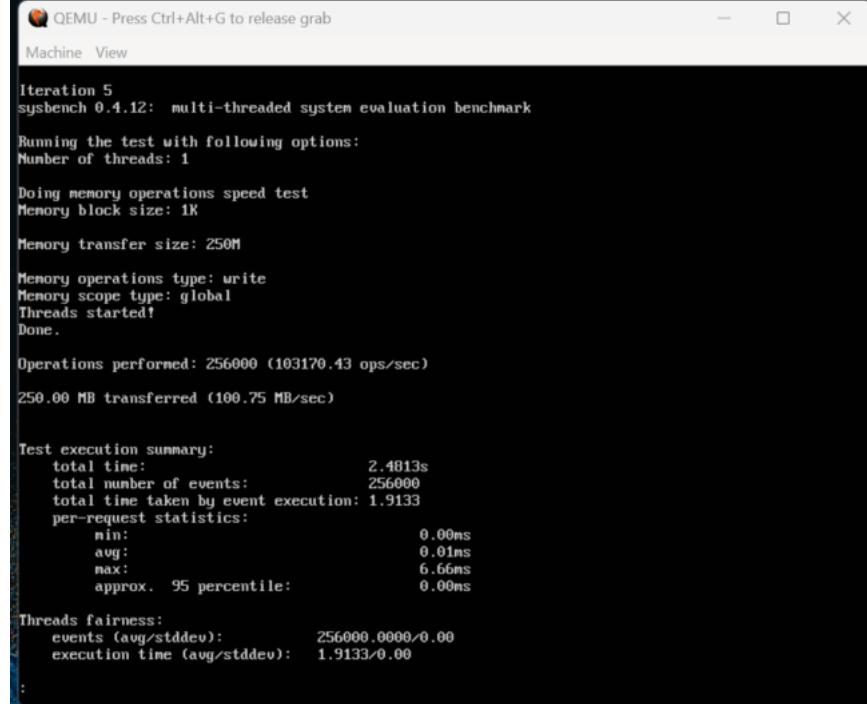
Test execution summary:
  total time:           3.2724s
  total number of events: 256000
  total time taken by event execution: 2.4831
  per-request statistics:
    min:                 0.01ms
    avg:                 0.01ms
    max:                 6.48ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 2.4831/0.00

:

```

5



```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (103170.43 ops/sec)
250.00 MB transferred (100.75 MB/sec)

Test execution summary:
  total time:           2.4813s
  total number of events: 256000
  total time taken by event execution: 1.9133
  per-request statistics:
    min:                 0.00ms
    avg:                 0.01ms
    max:                 6.66ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 1.9133/0.00

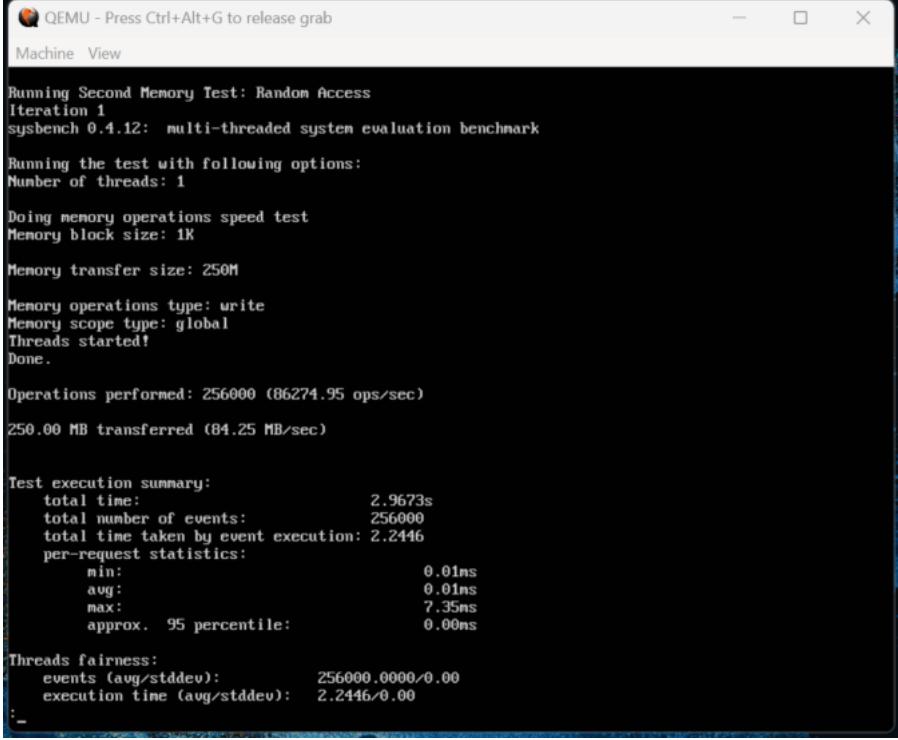
:

```

Observations:

| | |
|---------|--------|
| Average | 0.01ms |
|---------|--------|

| | |
|---------------------------|--------|
| Stddev | 0.03ms |
| Minimum time for an event | 0.0ms |
| Maximum time for an event | 6.66ms |

| QEMU Results, Configuration: 3 GB 3 cores for random memory access | |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running Second Memory Test: Random Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (86274.95 ops/sec) 250.00 MB transferred (84.25 MB/sec) Test execution summary: total time: 2.9673s total number of events: 256000 total time taken by event execution: 2.2446 per-request statistics: min: 0.01ms avg: 0.01ms max: 7.35ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 2.2446/0.00 </pre> |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (108562.61 ops/sec)
250.00 MB transferred (106.02 MB/sec)

Test execution summary:
total time: 2.3581s
total number of events: 256000
total time taken by event execution: 1.7745
per-request statistics:
    min: 0.00ns
    avg: 0.01ms
    max: 7.61ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.7745/0.00
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (107445.34 ops/sec)
250.00 MB transferred (104.93 MB/sec)

Test execution summary:
total time: 2.3826s
total number of events: 256000
total time taken by event execution: 1.8026
per-request statistics:
    min: 0.00ns
    avg: 0.01ms
    max: 6.52ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.8026/0.00
:
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (91387.95 ops/sec)

250.00 MB transferred (89.25 MB/sec)

Test execution summary:
total time: 2.8012s
total number of events: 256000
total time taken by event execution: 2.1290
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 15.84ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.1290/0.00

:-
```

5

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (95694.54 ops/sec)

250.00 MB transferred (93.45 MB/sec)

Test execution summary:
total time: 2.6752s
total number of events: 256000
total time taken by event execution: 1.9996
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 30.17ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.9996/0.00

:-
```

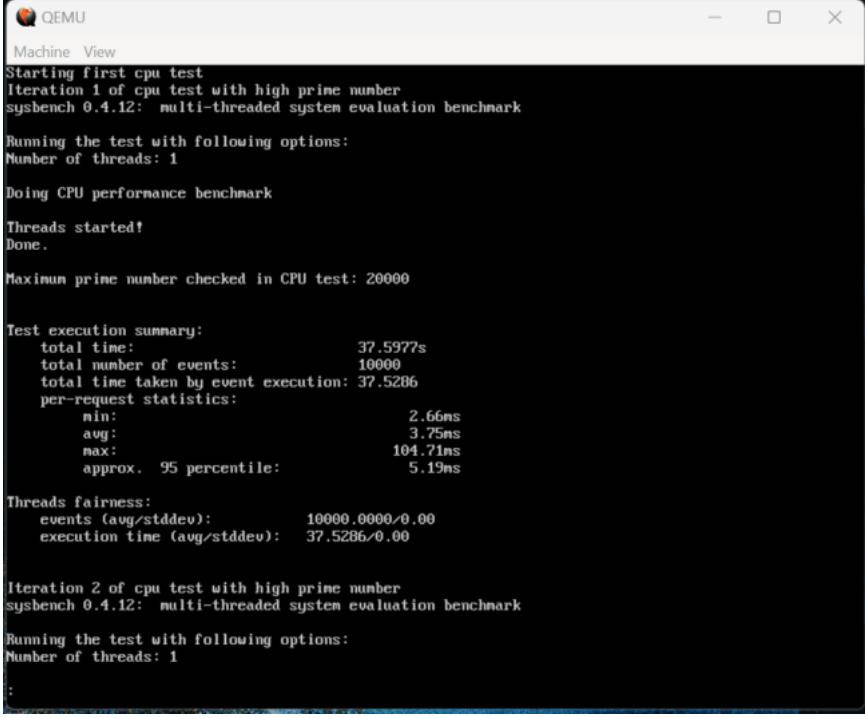
Observations:

| | |
|---------|--------|
| Average | 0.01ms |
|---------|--------|

| | |
|----------------------------------------------|---------|
| Stddev | 0.45ms |
| Minimum Number of events per second recorded | 0.00ms |
| Maximum Number of events per second recorded | 18.17ms |

3. Configuration 3: 3 GB RAM with 6 Cores

CPU testing

| QEMU Results, Configuration: 3 GB 6 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Starting first cpu test Iteration 1 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 37.5977s total number of events: 10000 total time taken by event execution: 37.5286 per-request statistics: min: 2.66ns avg: 3.75ns max: 104.71ns approx. 95 percentile: 5.19ns Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 37.5286/0.00 Iteration 2 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :</pre> |

2

```
QEMU
Machine View

Iteration 2 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 35.2656s
total number of events: 10000
total time taken by event execution: 35.1877
per-request statistics:
    min: 2.49ms
    avg: 3.52ns
    max: 41.55ms
    approx. 95 percentile: 5.06ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 35.1877/0.00

Iteration 3 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1
:
```

3

```
QEMU
Machine View

Iteration 3 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

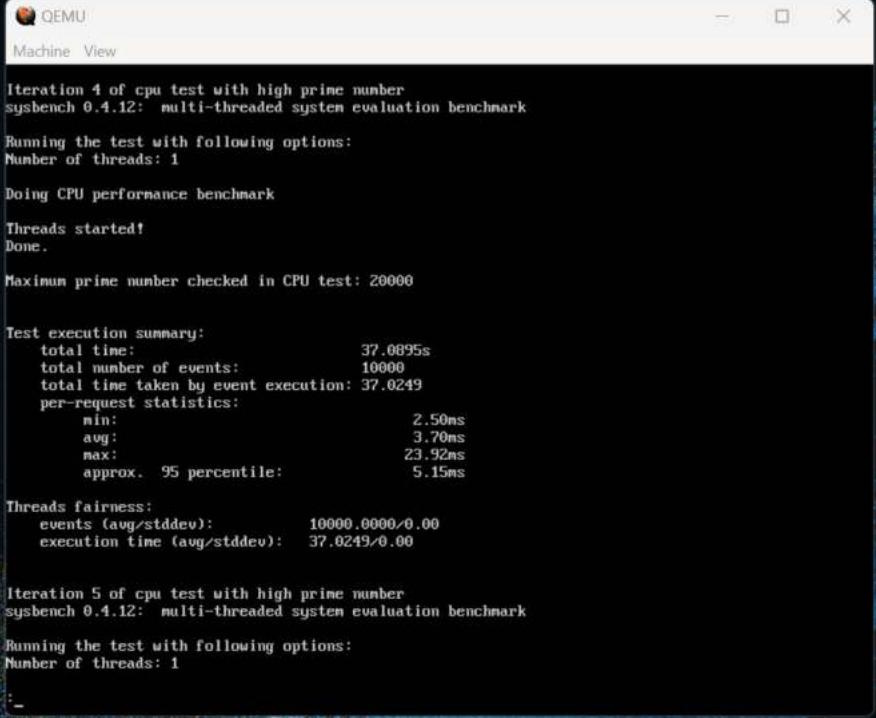
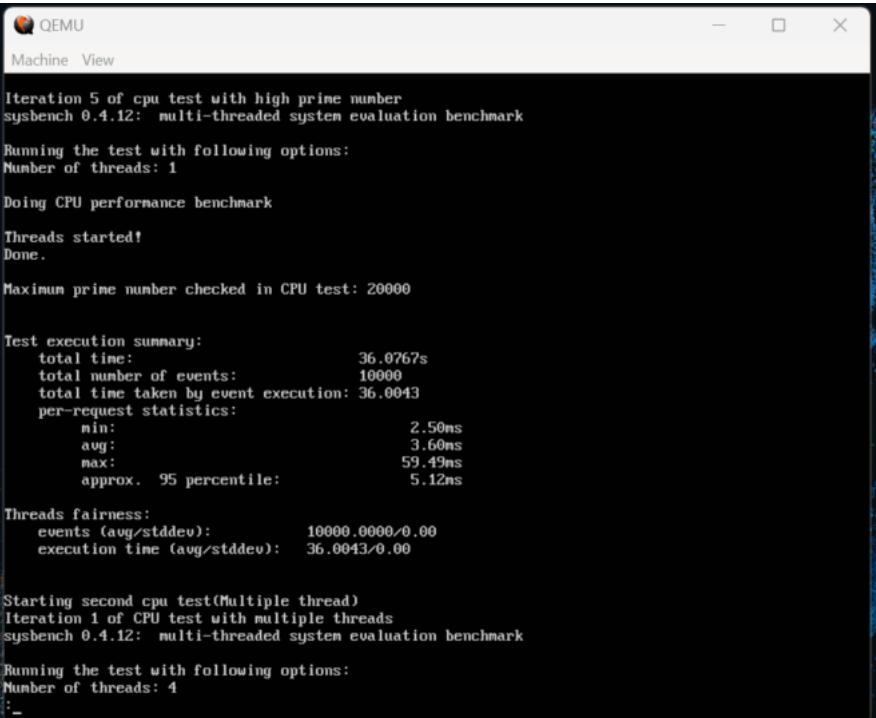
Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 36.8157s
total number of events: 10000
total time taken by event execution: 36.7144
per-request statistics:
    min: 2.51ms
    avg: 3.67ms
    max: 46.04ms
    approx. 95 percentile: 5.11ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 36.7144/0.00

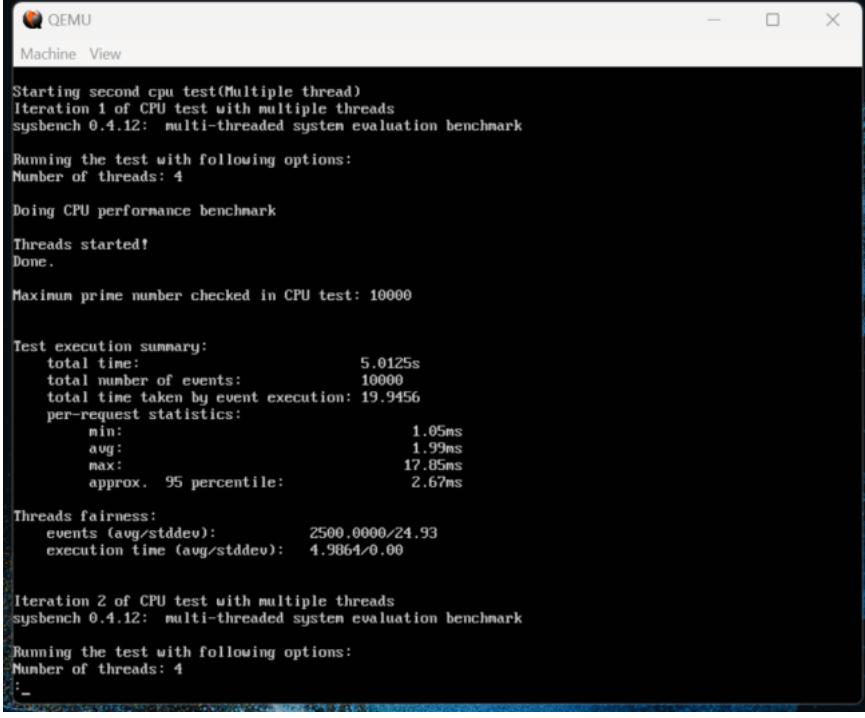
Iteration 4 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1
:
```

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 |  <pre> QEMU Machine View Iteration 4 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 37.0895s total number of events: 10000 total time taken by event execution: 37.0249 per-request statistics: min: 2.50ms avg: 3.70ms max: 23.92ms approx. 95 percentile: 5.15ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 37.0249/0.00 Iteration 5 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :-_ </pre> |
| 5 |  <pre> QEMU Machine View Iteration 5 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 36.0767s total number of events: 10000 total time taken by event execution: 36.0043 per-request statistics: min: 2.50ms avg: 3.69ms max: 59.49ms approx. 95 percentile: 5.12ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 36.0043/0.00 Starting second cpu test(Multiple thread) Iteration 1 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :-_ </pre> |

Observations:

| | |
|---------------------------|---------|
| Average | 3.60ms |
| Stddev | 1.2ms |
| Minimum Time for an event | 2.50ms |
| Maximum Time for an event | 32.23ms |

| QEMU Results, Configuration: 3 GB 6 cores for max-prime = 10000 | |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Starting second cpu test(Multiple thread) Iteration 1 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 5.0125s total number of events: 10000 total time taken by event execution: 19.9456 per-request statistics: min: 1.05ms avg: 1.99ms max: 17.85ms approx. 95 percentile: 2.67ms Threads fairness: events (avg/stddev): 2500.0000/24.93 execution time (avg/stddev): 4.9864/0.00 Iteration 2 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :_</pre> |

2

```
QEMU
Machine View

Iteration 2 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
    total time:          4.9798s
    total number of events: 10000
    total time taken by event execution: 19.7968
    per-request statistics:
        min:                  1.05ns
        avg:                  1.90ns
        max:                  20.52ns
        approx. 95 percentile: 2.63ns

Threads fairness:
    events (avg/stddev): 2500.0000/28.44
    execution time (avg/stddev): 4.9492/0.01

Iteration 3 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

3

```
QEMU
Machine View

Iteration 3 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
    total time:          4.7659s
    total number of events: 10000
    total time taken by event execution: 18.9965
    per-request statistics:
        min:                  1.05ns
        avg:                  1.90ns
        max:                  9.69ns
        approx. 95 percentile: 2.51ns

Threads fairness:
    events (avg/stddev): 2500.0000/65.36
    execution time (avg/stddev): 4.7491/0.00

Iteration 4 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

4

```
QEMU
Machine View
Iteration 4 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 5.2486s
total number of events: 10000
total time taken by event execution: 20.8826
per-request statistics:
    min: 1.05ms
    avg: 2.09ms
    max: 25.90ms
    approx. 95 percentile: 2.69ms

Threads fairness:
events (avg/stddev): 2500.0000/44.51
execution time (avg/stddev): 5.2207/0.01

Iteration 5 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4
:-
```

5

```
QEMU
Machine View
Threads fairness:
events (avg/stddev): 2500.0000/44.51
execution time (avg/stddev): 5.2207/0.01

Iteration 5 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 5.3500s
total number of events: 10000
total time taken by event execution: 21.2755
per-request statistics:
    min: 1.05ms
    avg: 2.13ms
    max: 16.42ms
    approx. 95 percentile: 2.74ms

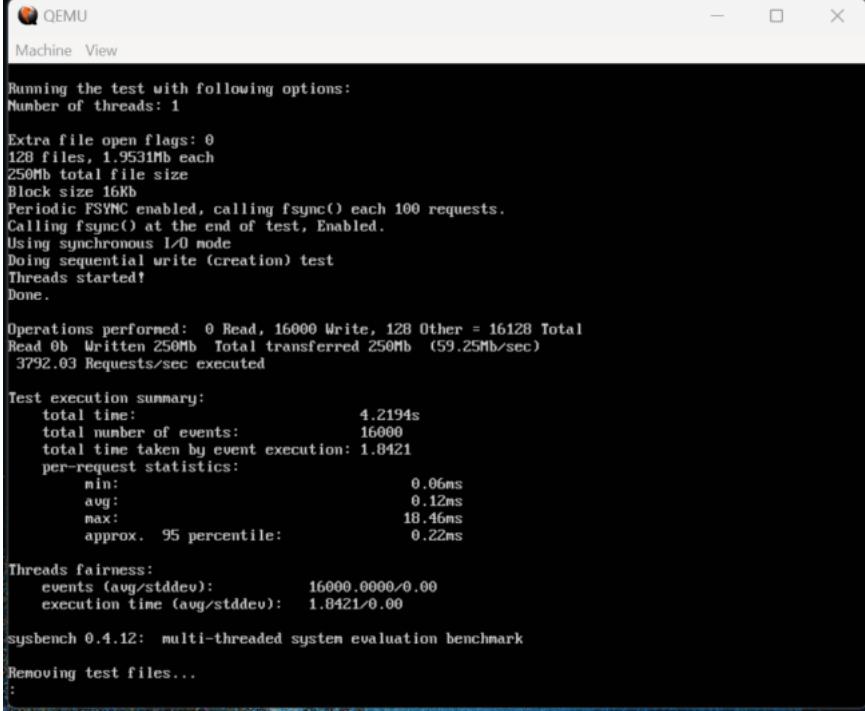
Threads fairness:
events (avg/stddev): 2500.0000/40.76
execution time (avg/stddev): 5.3189/0.00

All CPU tests completed.
(END)
```

Observations:

| | |
|---------------------------|---------|
| Average | 2.13ms |
| Stddev | 1.1ms |
| Minimum Time for an event | 1.15ms |
| Maximum Time for an event | 15.42ms |

File I/O Testing

| QEMU Results, Configuration: 3 GB 6 cores for sequential write | |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <p>QEMU Machine View</p> <pre>Running the test with following options: Number of threads: 1 Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! Done. Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total Read 0b Written 250Mb Total transferred 250Mb (59.25Mb/sec) 3792.03 Requests/sec executed Test execution summary: total time: 4.2194s total number of events: 16000 total time taken by event execution: 1.8421 per-request statistics: min: 0.06ms avg: 0.12ms max: 18.46ms approx. 95 percentile: 0.22ms Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 1.8421/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :</pre> |

2

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (58.196Mb/sec)
3724.58 Requests/sec executed

Test execution summary:
total time: 4.2958s
total number of events: 16000
total time taken by event execution: 2.0546
per-request statistics:
    min: 0.06ms
    avg: 0.13ms
    max: 21.45ms
    approx. 95 percentile: 0.26ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 2.0546/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (52.323Mb/sec)
3348.69 Requests/sec executed

Test execution summary:
total time: 4.7780s
total number of events: 16000
total time taken by event execution: 2.3568
per-request statistics:
    min: 0.06ms
    avg: 0.15ms
    max: 46.86ms
    approx. 95 percentile: 0.29ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 2.3568/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```

QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (67.801Mb/sec)
4339.28 Requests/sec executed

Test execution summary:
    total time:          3.6872s
    total number of events: 16000
    total time taken by event execution: 1.8074
    per-request statistics:
        min:                  0.05ms
        avg:                  0.11ms
        max:                  7.59ms
        approx. 95 percentile: 0.23ms

    Threads fairness:
        events (avg/stddev): 16000.0000/0.00
        execution time (avg/stddev): 1.8074/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

5

```

QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (42.818Mb/sec)
2740.35 Requests/sec executed

Test execution summary:
    total time:          5.8387s
    total number of events: 16000
    total time taken by event execution: 2.3941
    per-request statistics:
        min:                  0.07ms
        avg:                  0.15ms
        max:                  7.38ms
        approx. 95 percentile: 0.33ms

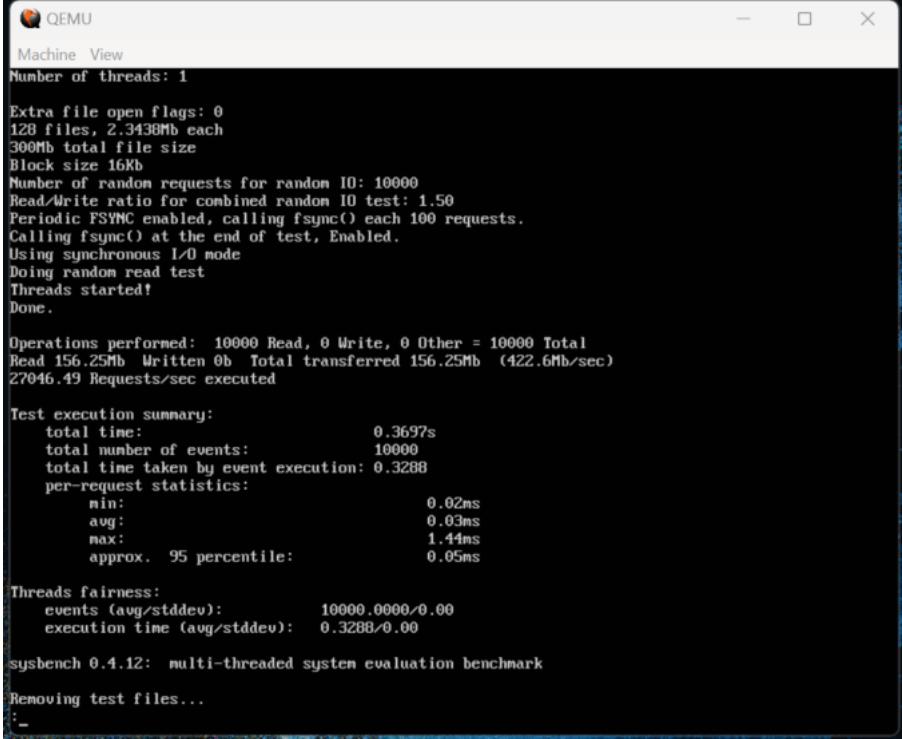
    Threads fairness:
        events (avg/stddev): 16000.0000/0.00
        execution time (avg/stddev): 2.3941/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.15ms |
| Stddev | 0.3ms |
| Minimum Time for an event | 0.07ms |
| Maximum Time for an event | 7.38ms |

| QEMU Results, Configuration: 3 GB 6 cores for random read | |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Number of threads: 1 Extra file open flags: 0 128 files, 2.3438Mb each 300Mb 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 read test Threads started! Done. Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total Read 156.25Mb Written 0b Total transferred 156.25Mb (422.6Mb/sec) 27046.49 Requests/sec executed Test execution summary: total time: 0.3697s total number of events: 10000 total time taken by event execution: 0.3288 per-request statistics: min: 0.02ms avg: 0.03ms max: 1.44ms approx. 95 percentile: 0.05ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 0.3288/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :- </pre> |

2

```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (403.25Mb/sec)
25867.79 Requests/sec executed

Test execution summary:
    total time:          0.3875s
    total number of events: 10000
    total time taken by event execution: 0.3538
    per-request statistics:
        min:                  0.02ms
        avg:                  0.04ms
        max:                  5.56ms
        approx. 95 percentile: 0.05ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev):  0.3538/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-

```

3

```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (358.41Mb/sec)
22937.94 Requests/sec executed

Test execution summary:
    total time:          0.4360s
    total number of events: 10000
    total time taken by event execution: 0.3967
    per-request statistics:
        min:                  0.02ms
        avg:                  0.04ms
        max:                  5.17ms
        approx. 95 percentile: 0.05ms

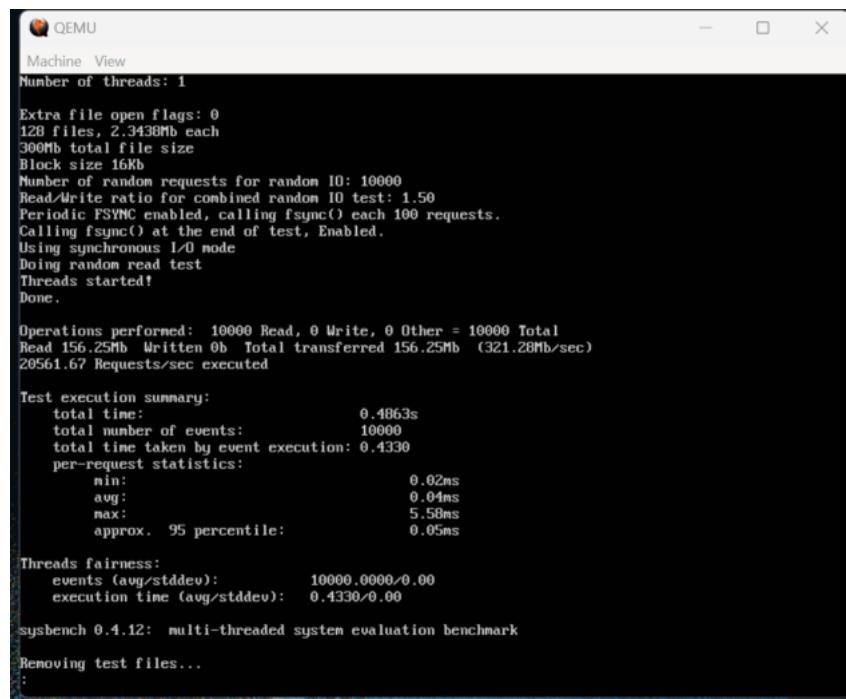
Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev):  0.3967/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-

```

4



```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (321.28Mb/sec)
29561.67 Requests/sec executed

Test execution summary:
total time: 0.4863s
total number of events: 10000
total time taken by event execution: 0.4330
per-request statistics:
    min: 0.02ms
    avg: 0.04ms
    max: 5.50ms
    approx. 95 percentile: 0.05ms

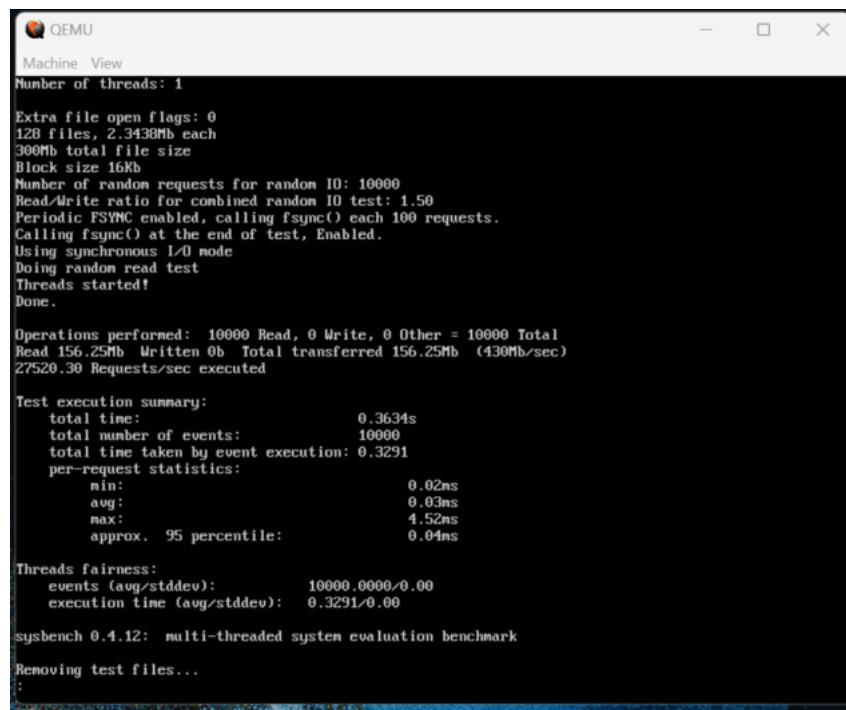
Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.4330/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

5



```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (430Mb/sec)
27520.30 Requests/sec executed

Test execution summary:
total time: 0.3634s
total number of events: 10000
total time taken by event execution: 0.3291
per-request statistics:
    min: 0.02ms
    avg: 0.03ms
    max: 4.52ms
    approx. 95 percentile: 0.04ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.3291/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

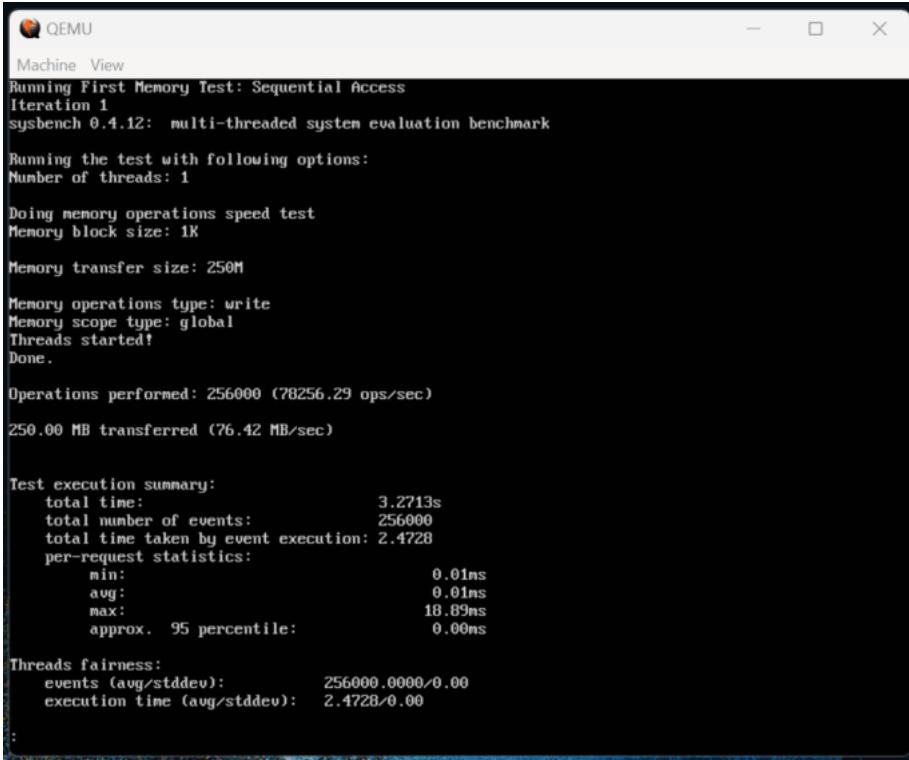
```

Observations:

| | |
|---------|--------|
| Average | 0.03ms |
|---------|--------|

| | |
|---------------------------|--------|
| Stddev | 0.03ms |
| Minimum Time for an event | 0.04ms |
| Maximum Time for an event | 4.52ms |

Memory Test

| QEMU Results, Configuration: 3 GB 6 cores for Sequential memory Access | |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Running First Memory Test: Sequential Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (78256.29 ops/sec) 250.00 MB transferred (76.42 MB/sec) Test execution summary: total time: 3.2713s total number of events: 256000 total time taken by event execution: 2.4728 per-request statistics: min: 0.01ms avg: 0.01ms max: 18.89ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 2.4728/0.00 :</pre> |

2

```
QEMU
Machine View
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (97190.43 ops/sec)
250.00 MB transferred (94.91 MB/sec)

Test execution summary:
    total time:          2.6340s
    total number of events: 256000
    total time taken by event execution: 2.0073
    per-request statistics:
        min:                 0.00ms
        avg:                 0.01ms
        max:                 6.84ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 2.0073/0.00
:
```

3

```
QEMU
Machine View
Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (78969.67 ops/sec)
250.00 MB transferred (77.12 MB/sec)

Test execution summary:
    total time:          3.2418s
    total number of events: 256000
    total time taken by event execution: 2.5203
    per-request statistics:
        min:                 0.01ms
        avg:                 0.01ms
        max:                 6.99ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 2.5203/0.00
:
```

4

```
QEMU
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (99583.43 ops/sec)
250.00 MB transferred (97.25 MB/sec)

Test execution summary:
total time: 2.5707s
total number of events: 256000
total time taken by event execution: 1.9859
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 9.77ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.9859/0.00
:
```

5

```
QEMU
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

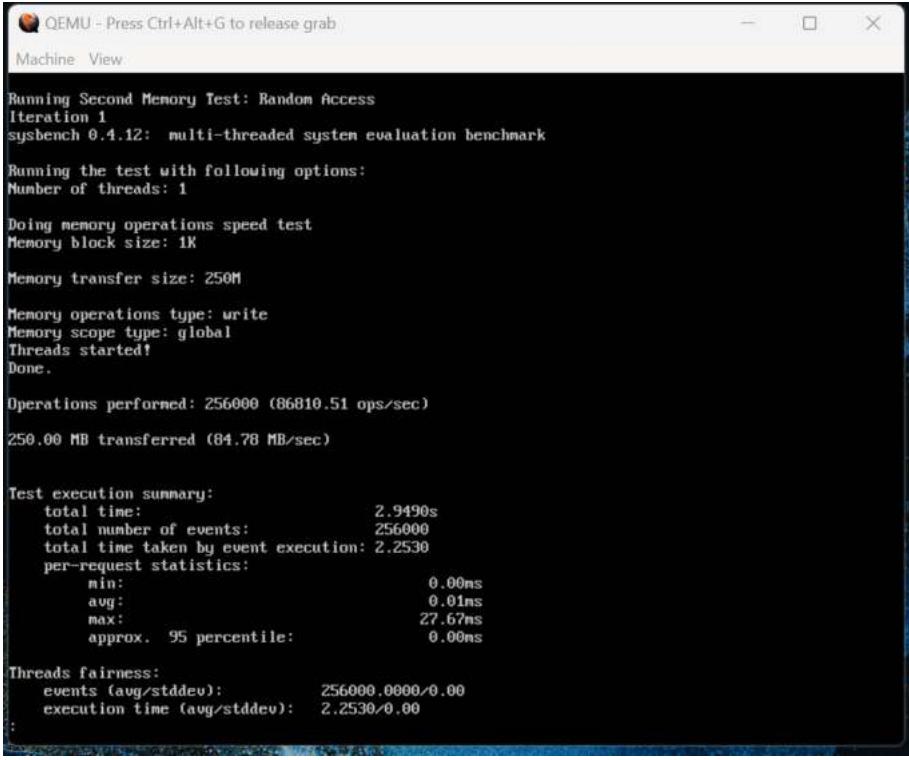
Operations performed: 256000 (91498.88 ops/sec)
250.00 MB transferred (89.35 MB/sec)

Test execution summary:
total time: 2.7978s
total number of events: 256000
total time taken by event execution: 2.1924
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 22.45ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.1924/0.00
:
```

Observations:

| | |
|---------------------------|---------|
| Average | 0.01ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 22.45ms |

| QEMU Results, Configuration: 3 GB 6 cores for random memory access | |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running Second Memory Test: Random Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (86810.51 ops/sec) 250.00 MB transferred (84.78 MB/sec) Test execution summary: total time: 2.9490s total number of events: 256000 total time taken by event execution: 2.2530 per-request statistics: min: 0.00ms avg: 0.01ms max: 27.67ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 2.2530/0.00 ;</pre> |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (174751.61 ops/sec)

250.00 MB transferred (170.66 MB/sec)

Test execution summary:
total time: 1.4649s
total number of events: 256000
total time taken by event execution: 1.1017
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 3.88ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.1017/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (131875.10 ops/sec)

250.00 MB transferred (128.78 MB/sec)

Test execution summary:
total time: 1.9412s
total number of events: 256000
total time taken by event execution: 1.4716
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 6.58ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.4716/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (87987.93 ops/sec)
250.00 MB transferred (85.93 MB/sec)

Test execution summary:
total time: 2.9095s
total number of events: 256000
total time taken by event execution: 2.2099
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 138.80ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.2099/0.00
:-
```

5

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (91032.94 ops/sec)
250.00 MB transferred (88.90 MB/sec)

Test execution summary:
total time: 2.8122s
total number of events: 256000
total time taken by event execution: 2.1538
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 38.97ms
    approx. 95 percentile: 0.00ms

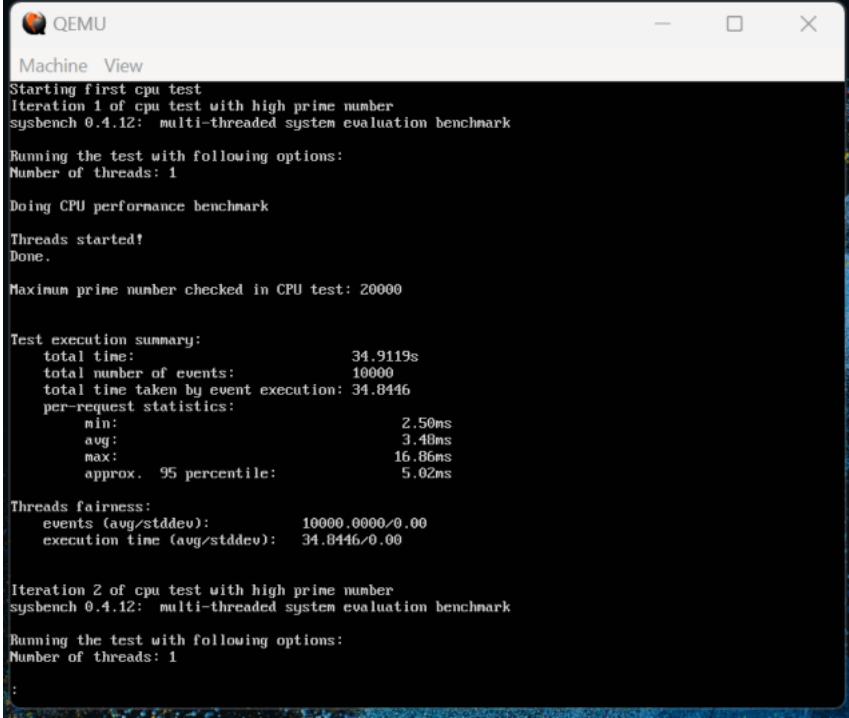
Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.1538/0.00
:-
```

Observations:

| | |
|---------------------------|---------|
| Average | 0.01ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 38.97ms |

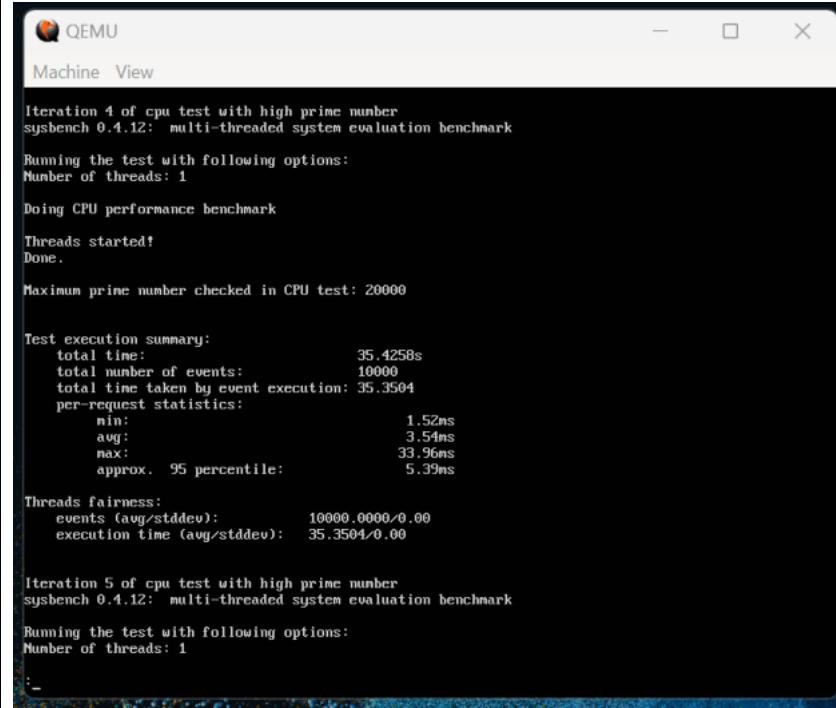
4. Configuration 4: 4 GB RAM with 8 Cores

CPU Test

| QEMU Results, Configuration: 4 GB 8 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Starting first cpu test Iteration 1 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 34.9119s total number of events: 10000 total time taken by event execution: 34.8446 per-request statistics: min: 2.50ms avg: 3.48ms max: 16.86ms approx. 95 percentile: 5.02ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 34.8446/0.00 Iteration 2 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :</pre> |

| | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | <pre> QEMU Machine View Iteration 2 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 37.3658s total number of events: 10000 total time taken by event execution: 37.2955 per-request statistics: min: 2.65ns avg: 3.73ns max: 41.30ns approx. 95 percentile: 5.28ns Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 37.2955/0.00 Iteration 3 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :-_ </pre> |
| 3 | <pre> QEMU Machine View Iteration 3 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 35.8732s total number of events: 10000 total time taken by event execution: 35.7793 per-request statistics: min: 1.52ms avg: 3.58ms max: 221.08ms approx. 95 percentile: 5.35ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 35.7793/0.00 Iteration 4 of cpu test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :-_ </pre> |

4



```

QEMU
Machine View

Iteration 4 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 35.4258s
total number of events: 10000
total time taken by event execution: 35.3504
per-request statistics:
    min: 1.52ns
    avg: 3.54ns
    max: 33.96ns
    approx. 95 percentile: 5.39ns

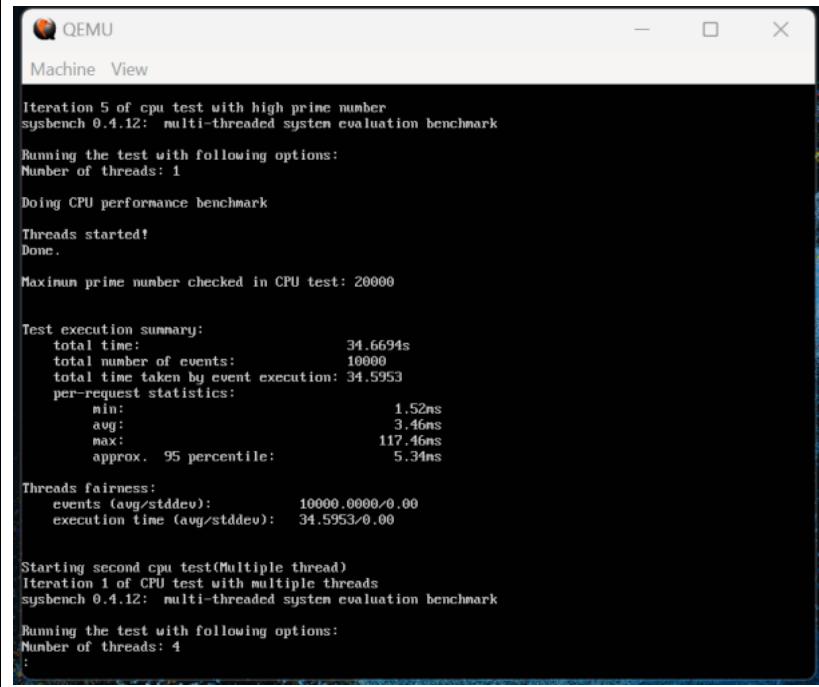
Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 35.3504/0.00

Iteration 5 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1
:-_

```

5



```

QEMU
Machine View

Iteration 5 of cpu test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 34.6694s
total number of events: 10000
total time taken by event execution: 34.5953
per-request statistics:
    min: 1.52ns
    avg: 3.46ns
    max: 117.46ns
    approx. 95 percentile: 5.34ns

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 34.5953/0.00

Starting second cpu test(Multiple thread)
Iteration 1 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

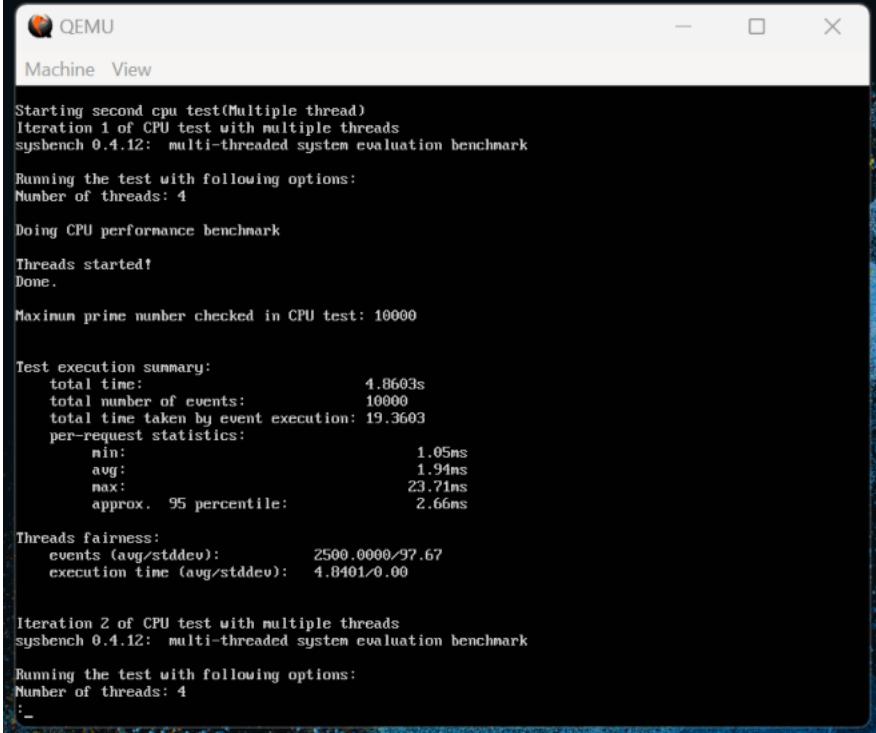
Running the test with following options:
Number of threads: 4
:-_

```

Observations:

| | |
|---------|--------|
| Average | 3.46ms |
|---------|--------|

| | |
|---------------------------|---------|
| Stddev | 2.09ms |
| Minimum Time for an event | 1.52ms |
| Maximum Time for an event | 80.72ms |

| QEMU Results, Configuration: 4 GB 8 cores for max-prime = 10000 | |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <p>QEMU Machine View</p> <pre> Starting second cpu test(Multiple thread) Iteration 1 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.8603s total number of events: 10000 total time taken by event execution: 19.3603 per-request statistics: min: 1.05ms avg: 1.94ms max: 23.71ms approx. 95 percentile: 2.66ms Threads fairness: events (avg/stddev): 2500.0000/97.67 execution time (avg/stddev): 4.8401/0.00 Iteration 2 of CPU test with multiple threads sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 :-</pre> |

2

```
QEMU
Machine View

Iteration 2 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 4.9921s
total number of events: 10000
total time taken by event execution: 19.8633
per-request statistics:
    min: 1.04ms
    avg: 1.99ms
    max: 32.96ms
    approx. 95 percentile: 2.78ms

Threads fairness:
events (avg/stddev): 2500.0000/67.51
execution time (avg/stddev): 4.9658/0.01

Iteration 3 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

3

```
QEMU
Machine View

Iteration 3 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 4.8572s
total number of events: 10000
total time taken by event execution: 19.3352
per-request statistics:
    min: 0.68ms
    avg: 1.93ms
    max: 46.09ms
    approx. 95 percentile: 2.73ms

Threads fairness:
events (avg/stddev): 2500.0000/15.67
execution time (avg/stddev): 4.8338/0.00

Iteration 4 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

4

```
QEMU
Machine View

Iteration 4 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 4.5759s
total number of events: 10000
total time taken by event execution: 18.2246
per-request statistics:
    min: 0.65ms
    avg: 1.82ms
    max: 30.93ms
    approx. 95 percentile: 2.68ms

Threads fairness:
events (avg/stddev): 2500.0000/54.07
execution time (avg/stddev): 4.5562/0.00

Iteration 5 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4
:
```

5

```
QEMU
Machine View

Threads fairness:
events (avg/stddev): 2500.0000/54.07
execution time (avg/stddev): 4.5562/0.00

Iteration 5 of CPU test with multiple threads
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 5.0924s
total number of events: 10000
total time taken by event execution: 20.2677
per-request statistics:
    min: 1.04ns
    avg: 2.03ns
    max: 24.29ns
    approx. 95 percentile: 2.77ns

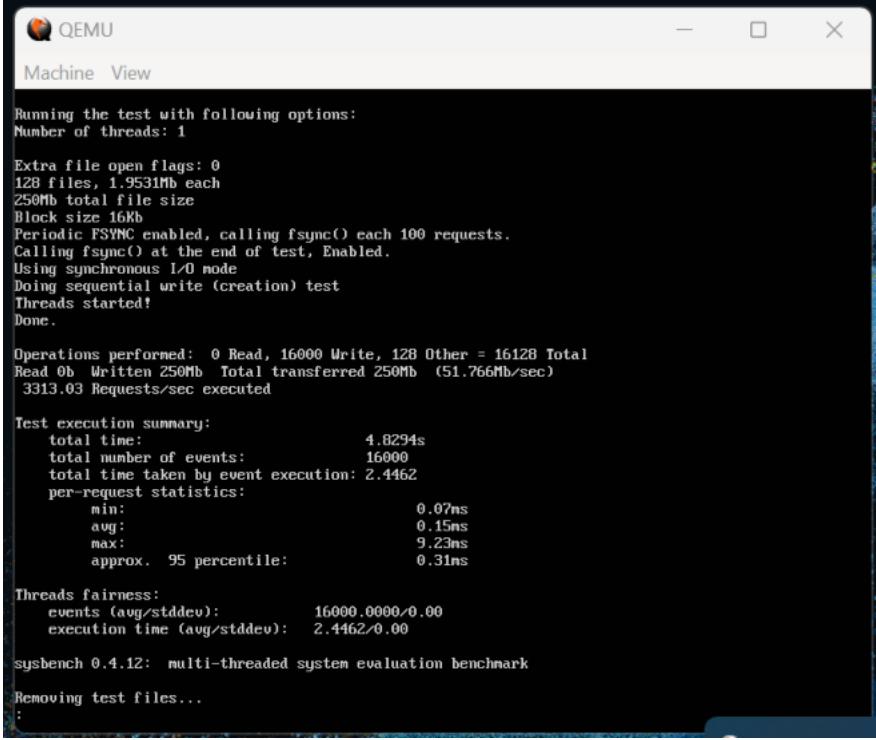
Threads fairness:
events (avg/stddev): 2500.0000/91.70
execution time (avg/stddev): 5.0669/0.00

All CPU tests completed.
(END)
```

Observations:

| | |
|---------------------------|---------|
| Average | 2.03ms |
| Stddev | 1.73ms |
| Minimum Time for an event | 1.04ms |
| Maximum Time for an event | 16.74ms |

File I/O Test

| QEMU Results, Configuration: 4 GB 8 cores for sequential write | |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <p>QEMU Machine View</p> <pre> Running the test with following options: Number of threads: 1 Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! Done. Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total Read 0b Written 250Mb Total transferred 250mb (51.766Mb/sec) 3313.03 Requests/sec executed Test execution summary: total time: 4.8294s total number of events: 16000 total time taken by event execution: 2.4462 per-request statistics: min: 0.07ns avg: 0.15ns max: 9.23ns approx. 95 percentile: 0.31ns Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 2.4462/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :</pre> |

2

```
QEMU Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (52.791Mb/sec)
3378.64 Requests/sec executed

Test execution summary:
    total time:          4.7356s
    total number of events: 16000
    total time taken by event execution: 2.4461
    per-request statistics:
        min:                  0.08ms
        avg:                  0.15ms
        max:                  7.89ms
        approx. 95 percentile: 0.32ms

Threads fairness:
    events (avg/stddev):   16000.0000/0.00
    execution time (avg/stddev): 2.4461/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (50.67Mb/sec)
3242.88 Requests/sec executed

Test execution summary:
    total time:          4.9339s
    total number of events: 16000
    total time taken by event execution: 2.5591
    per-request statistics:
        min:                  0.08ms
        avg:                  0.16ms
        max:                  7.79ms
        approx. 95 percentile: 0.33ms

Threads fairness:
    events (avg/stddev):   16000.0000/0.00
    execution time (avg/stddev): 2.5591/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (61.903Mb/sec)
3961.77 Requests/sec executed

Test execution summary:
total time: 4.0386s
total number of events: 16000
total time taken by event execution: 2.4229
per-request statistics:
    min: 0.05ms
    avg: 0.15ms
    max: 13.09ms
    approx. 95 percentile: 0.32ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 2.4229/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

5

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (35.061Mb/sec)
2243.90 Requests/sec executed

Test execution summary:
total time: 7.1305s
total number of events: 16000
total time taken by event execution: 4.6171
per-request statistics:
    min: 0.07ms
    avg: 0.29ms
    max: 70.65ms
    approx. 95 percentile: 0.61ms

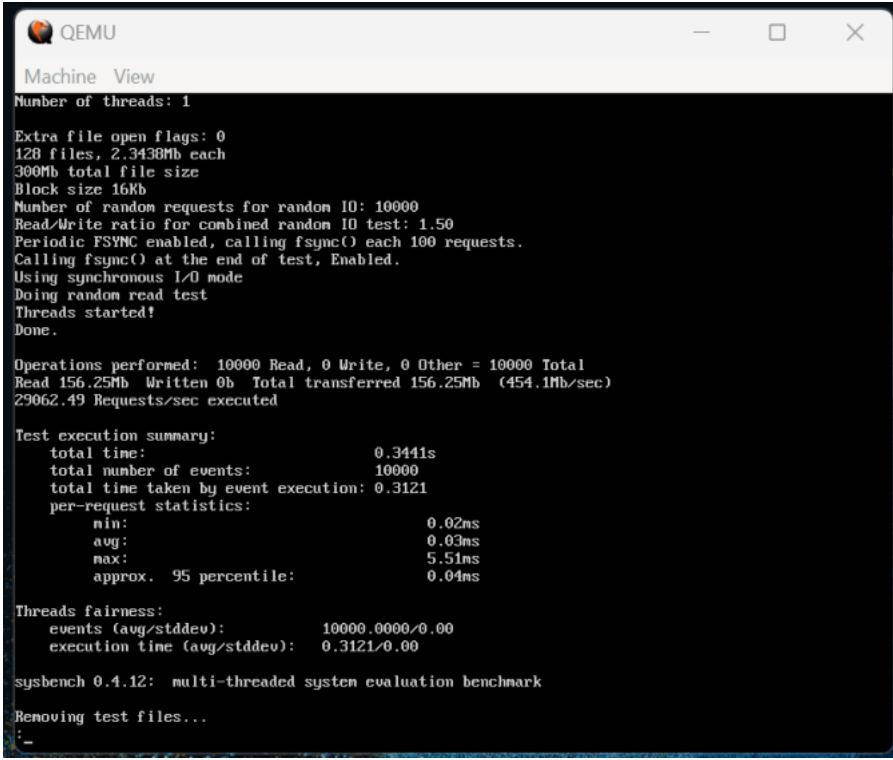
Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 4.6171/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

Observations:

| | |
|---------------------------|---------|
| Average | 0.29ms |
| Stddev | 0.25ms |
| Minimum Time for an event | 0.07ms |
| Maximum Time for an event | 55.87ms |

| QEMU Results, Configuration: 4 GB 8 cores for random read | |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU Machine View Number of threads: 1 Extra file open flags: 0 128 files, 2.3430Mb each 300Mb 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 read test Threads started! Done. Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total Read 156.25Mb Written 0b Total transferred 156.25Mb (454.1Mb/sec) 29062.49 Requests/sec executed Test execution summary: total time: 0.3441s total number of events: 10000 total time taken by event execution: 0.3121 per-request statistics: min: 0.02ms avg: 0.03ms max: 5.51ms approx. 95 percentile: 0.04ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 0.3121/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files... :_</pre> |

2

```
QEMU Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (484.77Mb/sec)
31025.40 Requests/sec executed

Test execution summary:
    total time:          0.3223s
    total number of events: 10000
    total time taken by event execution: 0.2915
    per-request statistics:
        min:            0.02ns
        avg:            0.03ns
        max:            5.44ns
        approx. 95 percentile: 0.04ns

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.2915/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (380Mb/sec)
24320.01 Requests/sec executed

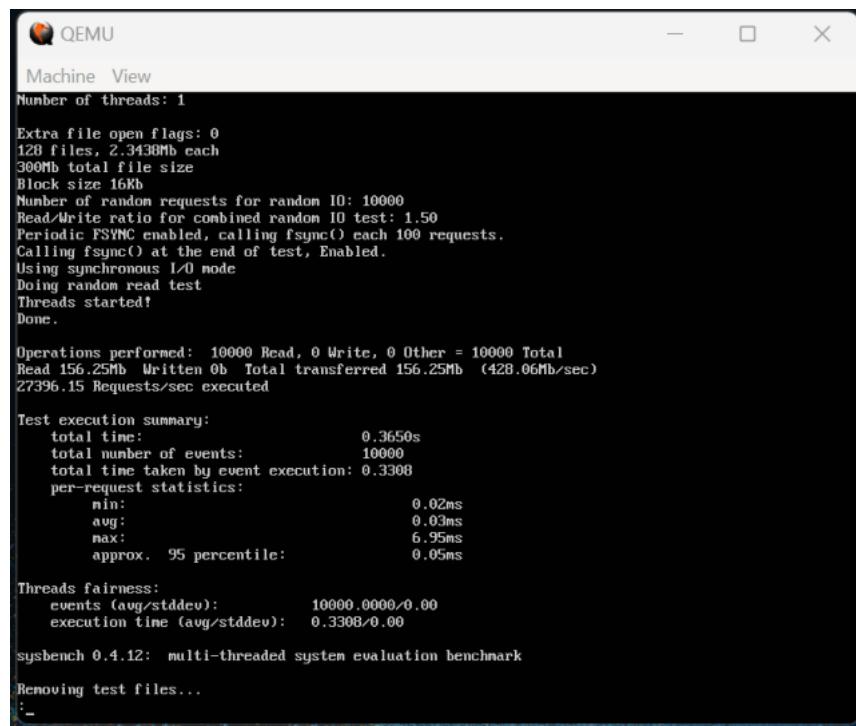
Test execution summary:
    total time:          0.4112s
    total number of events: 10000
    total time taken by event execution: 0.3738
    per-request statistics:
        min:            0.02ns
        avg:            0.04ns
        max:            4.58ns
        approx. 95 percentile: 0.05ns

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.3738/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4



```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (420.06Mb/sec)
27396.15 Requests/sec executed

Test execution summary:
total time: 0.3650s
total number of events: 10000
total time taken by event execution: 0.3308
per-request statistics:
    min: 0.02ms
    avg: 0.03ms
    max: 6.95ms
    approx. 95 percentile: 0.05ms

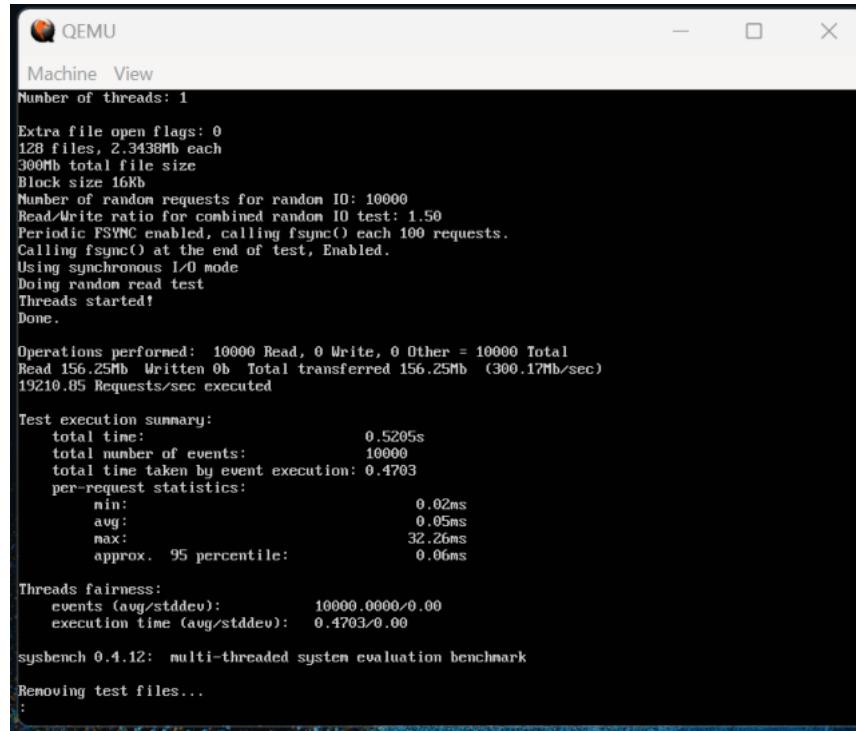
Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.3308/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

5



```

QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (300.17Mb/sec)
19210.85 Requests/sec executed

Test execution summary:
total time: 0.5205s
total number of events: 10000
total time taken by event execution: 0.4703
per-request statistics:
    min: 0.02ms
    avg: 0.05ms
    max: 32.26ms
    approx. 95 percentile: 0.06ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.4703/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

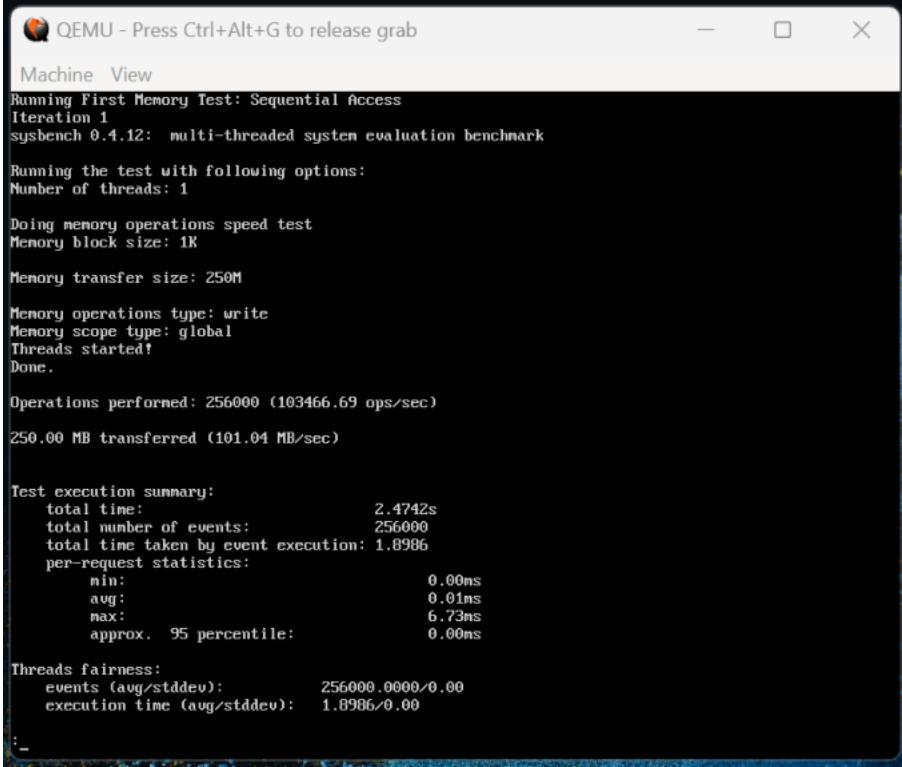
Removing test files...
:

```

Observations:

| | |
|---------------------------|---------|
| Average | 0.05ms |
| Stddev | 0.04ms |
| Minimum Time for an event | 0.02ms |
| Maximum Time for an event | 32.26ms |

Memory Testing

| QEMU Results, Configuration: 4 GB 8 cores for Sequential memory Access | |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running First Memory Test: Sequential Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (103466.69 ops/sec) 250.00 MB transferred (101.04 MB/sec) Test execution summary: total time: 2.4742s total number of events: 256000 total time taken by event execution: 1.8986 per-request statistics: min: 0.00ms avg: 0.01ms max: 6.73ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 1.8986/0.00 :- </pre> |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (88943.85 ops/sec)
250.00 MB transferred (86.86 MB/sec)

Test execution summary:
total time: 2.8702s
total number of events: 256000
total time taken by event execution: 2.2039
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 6.76ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.2039/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (81380.62 ops/sec)
250.00 MB transferred (79.47 MB/sec)

Test execution summary:
total time: 3.1457s
total number of events: 256000
total time taken by event execution: 2.4070
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 14.46ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.4070/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (102056.21 ops/sec)
250.00 MB transferred (99.66 MB/sec)

Test execution summary:
    total time:          2.5004s
    total number of events: 256000
    total time taken by event execution: 1.9258
    per-request statistics:
        min:                 0.01ms
        avg:                 0.01ms
        max:                 6.31ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 1.9258/0.00
:-
```

5

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

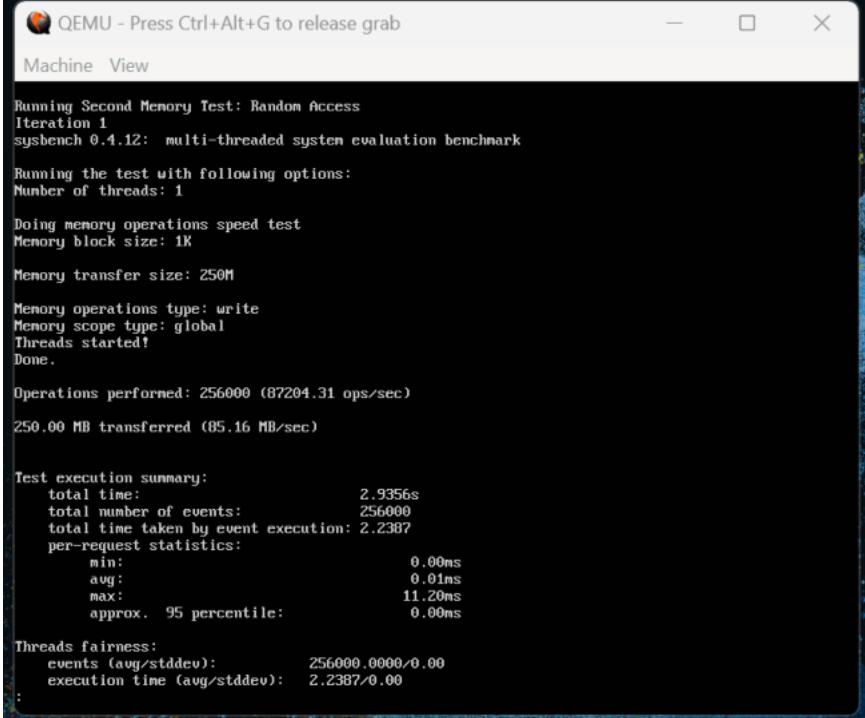
Operations performed: 256000 (88748.40 ops/sec)
250.00 MB transferred (86.67 MB/sec)

Test execution summary:
    total time:          2.8046s
    total number of events: 256000
    total time taken by event execution: 2.2437
    per-request statistics:
        min:                 0.00ms
        avg:                 0.01ms
        max:                 11.30ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 2.2437/0.00
:-
```

Observations:

| | |
|---------------------------|---------|
| Average | 0.01ms |
| Stddev | 0.03ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 11.30ms |

| QEMU Results, Configuration: 4 GB 8 cores for random memory access | |
|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  A screenshot of a terminal window titled "QEMU - Press Ctrl+Alt+G to release grab". The window shows the output of a memory test. The text in the terminal includes: Running Second Memory Test: Random Access Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing memory operations speed test Memory block size: 1K Memory transfer size: 250M Memory operations type: write Memory scope type: global Threads started! Done. Operations performed: 256000 (87204.31 ops/sec) 250.00 MB transferred (85.16 MB/sec) Test execution summary: total time: 2.9356s total number of events: 256000 total time taken by event execution: 2.2387 per-request statistics: min: 0.00ms avg: 0.01ms max: 11.20ms approx. 95 percentile: 0.00ms Threads fairness: events (avg/stddev): 256000.0000/0.00 execution time (avg/stddev): 2.2387/0.00 : The terminal has a dark background with white text. |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (89725.10 ops/sec)
250.00 MB transferred (87.62 MB/sec)

Test execution summary:
total time: 2.8532s
total number of events: 256000
total time taken by event execution: 2.1615
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 6.29ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.1615/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (100684.15 ops/sec)
250.00 MB transferred (106.14 MB/sec)

Test execution summary:
total time: 2.3554s
total number of events: 256000
total time taken by event execution: 1.7724
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 6.78ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.7724/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (94409.64 ops/sec)

250.00 MB transferred (92.20 MB/sec)

Test execution summary:
total time: 2.7116s
total number of events: 256000
total time taken by event execution: 2.0577
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 6.35ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.0577/0.00
:
```

5

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (107158.84 ops/sec)

250.00 MB transferred (104.65 MB/sec)

Test execution summary:
total time: 2.3890s
total number of events: 256000
total time taken by event execution: 1.8101
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 10.10ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.8101/0.00
:
```

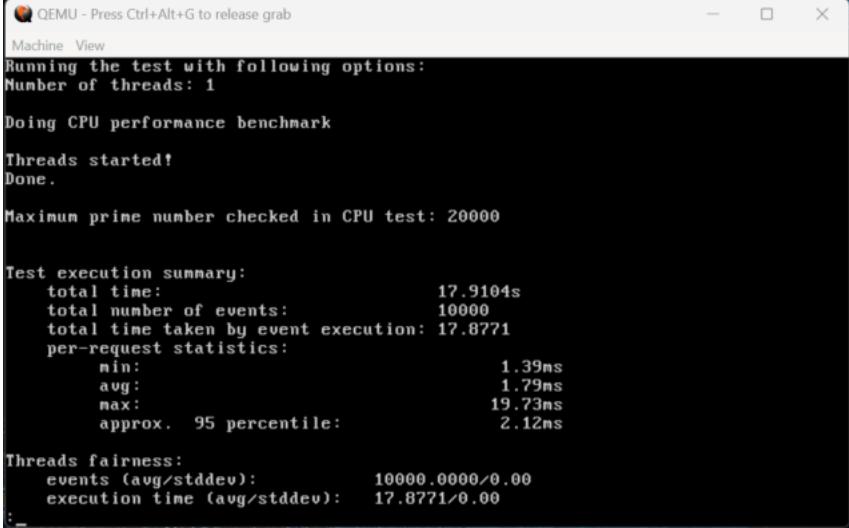
Observations:

| | |
|---------------------------|---------|
| Average | 0.01ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 10.10ms |

Raw disk image-

1. Configuration 1: 2 GB RAM with 2 Cores

CPU Test

| QEMU Results, Configuration: 2 GB 2 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 17.9104s total number of events: 10000 total time taken by event execution: 17.8771 per-request statistics: min: 1.39ms avg: 1.79ms max: 19.73ms approx. 95 percentile: 2.12ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 17.8771/0.00 </pre> |

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          18.7938s
    total number of events: 10000
    total time taken by event execution: 18.7636
    per-request statistics:
        min:                 1.44ms
        avg:                 1.88ms
        max:                16.74ms
        approx. 95 percentile: 2.29ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 18.7636/0.00
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          19.4860s
    total number of events: 10000
    total time taken by event execution: 19.4575
    per-request statistics:
        min:                 1.45ms
        avg:                 1.95ms
        max:                21.10ms
        approx. 95 percentile: 2.46ms

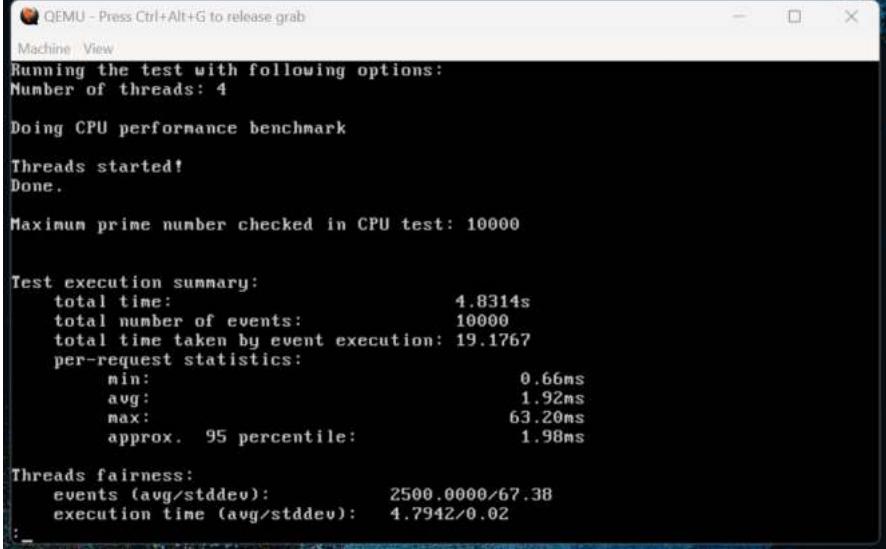
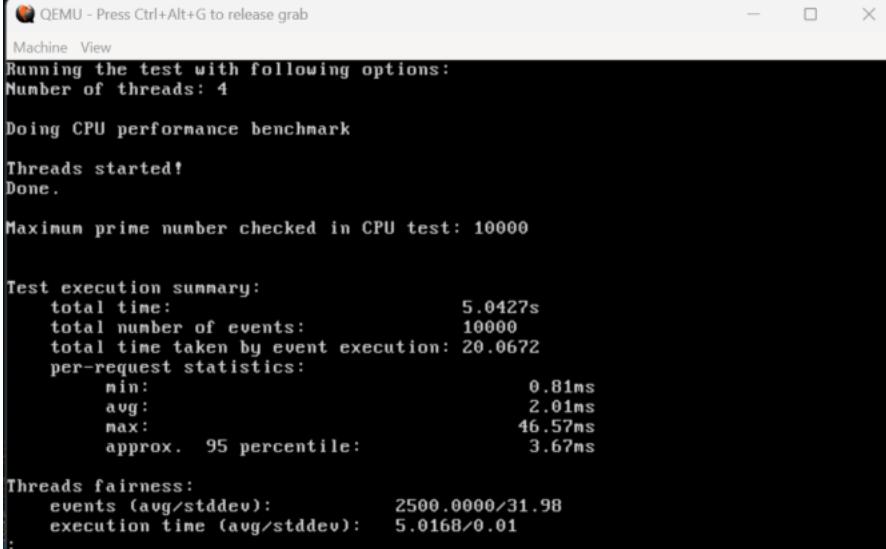
Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 19.4575/0.00
:
```

| | |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 4 Test execution summary: total time: 19.2029s total number of events: 10000 total time taken by event execution: 19.1727 per-request statistics: min: 1.47ms avg: 1.92ms max: 34.42ms approx. 95 percentile: 2.56ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 19.1727/0.00 :</pre> |
| 5 | <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 5 Test execution summary: total time: 19.1757s total number of events: 10000 total time taken by event execution: 19.1466 per-request statistics: min: 1.49ms avg: 1.91ms max: 16.68ms approx. 95 percentile: 2.57ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 19.1466/0.00 :</pre> |

Observations:

| | |
|---------------------------|---------|
| Average | 1.91ms |
| Stddev | 1.75ms |
| Minimum Time for an event | 1.49ms |
| Maximum Time for an event | 16.68ms |

QEMU Results, Configuration: 2 GB 2 cores for max-prime = 10000

| Sr. No | Screenshots |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.8314s total number of events: 10000 total time taken by event execution: 19.1767 per-request statistics: min: 0.66ms avg: 1.92ms max: 63.20ms approx. 95 percentile: 1.98ms Threads fairness: events (avg/stddev): 2500.0000/67.38 execution time (avg/stddev): 4.7942/0.02 :</pre> |
| 2 |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 5.0427s total number of events: 10000 total time taken by event execution: 20.0672 per-request statistics: min: 0.81ms avg: 2.01ms max: 46.57ms approx. 95 percentile: 3.67ms Threads fairness: events (avg/stddev): 2500.0000/31.98 execution time (avg/stddev): 5.0168/0.01 :</pre> |

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          5.5529s
  total number of events: 10000
  total time taken by event execution: 22.0387
  per-request statistics:
    min:                  0.81ms
    avg:                  2.20ms
    max:                  37.04ms
    approx. 95 percentile: 6.57ms

Threads fairness:
  events (avg/stddev):   2500.0000/36.97
  execution time (avg/stddev):  5.5097/0.01
:
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          5.5579s
  total number of events: 10000
  total time taken by event execution: 22.0601
  per-request statistics:
    min:                  0.85ms
    avg:                  2.21ms
    max:                  35.90ms
    approx. 95 percentile: 5.60ms

Threads fairness:
  events (avg/stddev):   2500.0000/28.75
  execution time (avg/stddev):  5.5150/0.02
:
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine: View

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
    total time:          5.4988s
    total number of events: 10000
    total time taken by event execution: 21.7440
    per-request statistics:
        min:                0.83ms
        avg:                2.17ns
        max:                34.58ms
        approx. 95 percentile: 5.04ms

Threads fairness:
    events (avg/stddev): 2500.0000/21.01
:-

```

Observations:

| | |
|---------------------------|---------|
| Average | 2.17ms |
| Stddev | 1.77ms |
| Minimum Time for an event | 0.83ms |
| Maximum Time for an event | 28.83ms |

File I/O Testing

| QEMU Results, Configuration: 2 GB 2 cores for sequential write | |
|----------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (110.5Mb/sec)
7072.23 Requests/sec executed

Test execution summary:
    total time:                      2.2624s
    total number of events:          16000
    total time taken by event execution: 1.1058
    per-request statistics:
        min:                          0.03ms
        avg:                          0.07ms
        max:                          5.27ms
        approx. 95 percentile:         0.13ms

Threads fairness:
    events (avg/stddev):           16000.0000/0.00
    execution time (avg/stddev):   1.1058/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark
:
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (102.95Mb/sec)
6588.88 Requests/sec executed

Test execution summary:
    total time:                      2.4283s
    total number of events:          16000
    total time taken by event execution: 1.3533
    per-request statistics:
        min:                          0.05ms
        avg:                          0.08ms
        max:                          30.75ms
        approx. 95 percentile:         0.16ms

Threads fairness:
    events (avg/stddev):           16000.0000/0.00
    execution time (avg/stddev):   1.3533/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (97.165Mb/sec)
6218.57 Requests/sec executed

Test execution summary:
    total time:                      2.5729s
    total number of events:          16000
    total time taken by event execution: 1.2838
    per-request statistics:
        min:                          0.05ms
        avg:                          0.08ms
        max:                          5.23ms
        approx. 95 percentile:         0.16ms

Threads fairness:
    events (avg/stddev):           16000.0000/0.00
    execution time (avg/stddev):   1.2838/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (98.623Mb/sec)
6311.86 Requests/sec executed

Test execution summary:
    total time:                      2.5349s
    total number of events:          16000
    total time taken by event execution: 1.4032
    per-request statistics:
        min:                          0.05ms
        avg:                          0.09ms
        max:                          10.58ms
        approx. 95 percentile:         0.17ms

Threads fairness:
    events (avg/stddev):           16000.0000/0.00
    execution time (avg/stddev):   1.4032/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

5

```

QEMU - Press Ctrl+Alt+G to release grab.

Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (107.27Mb/sec)
6865.26 Requests/sec executed

Test execution summary:
    total time:                      2.3306s
    total number of events:          16000
    total time taken by event execution: 1.1292
    per-request statistics:
        min:                          0.04ms
        avg:                          0.07ms
        max:                          4.26ms
        approx. 95 percentile:         0.13ms

Threads fairness:
    events (avg/stddev):           16000.0000/0.00
    execution time (avg/stddev):   1.1292/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.07ms |
| Stddev | 0.08ms |
| Minimum Time for an event | 0.04ms |
| Maximum Time for an event | 4.26ms |

| QEMU Results, Configuration: 2 GB 2 cores for random read | |
|-----------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Doing random read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (798.73Mb/sec)
51118.99 Requests/sec executed

Test execution summary:
total time: 0.1956s
total number of events: 10000
total time taken by event execution: 0.1770
per-request statistics:
    min: 0.01ms
    avg: 0.02ms
    max: 3.47ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.1770/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark
:
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (752.36Mb/sec)
48150.87 Requests/sec executed

Test execution summary:
total time: 0.2077s
total number of events: 10000
total time taken by event execution: 0.1868
per-request statistics:
    min: 0.01ms
    avg: 0.02ms
    max: 3.67ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.1868/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark
Removing test files...
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (781.67Mb/sec)
50026.61 Requests/sec executed

Test execution summary:
    total time:          0.1999s
    total number of events:      10000
    total time taken by event execution: 0.1781
    per-request statistics:
        min:            0.01ms
        avg:            0.02ms
        max:            0.84ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev):     10000.0000/0.00
    execution time (avg/stddev): 0.1781/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (745.55Mb/sec)
47715.39 Requests/sec executed

Test execution summary:
    total time:          0.2096s
    total number of events:      10000
    total time taken by event execution: 0.1876
    per-request statistics:
        min:            0.01ms
        avg:            0.02ms
        max:            2.86ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev):     10000.0000/0.00
    execution time (avg/stddev): 0.1876/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Doing random read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (759.92Mb/sec)
48634.90 Requests/sec executed

Test execution summary:
total time: 0.2056s
total number of events: 10000
total time taken by event execution: 0.1835
per-request statistics:
    min: 0.01ms
    avg: 0.02ms
    max: 2.84ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.1835/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.04ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 2.84ms |

Memory Test

| QEMU Results, Configuration: 2 GB 2 cores for Sequential memory Access | |
|------------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (197726.35 ops/sec)
250.00 MB transferred (193.09 MB/sec)

Test execution summary:
  total time:           1.2947s
  total number of events: 256000
  total time taken by event execution: 1.0000
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 5.41ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 1.0000/0.00
:-
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (198107.48 ops/sec)
250.00 MB transferred (193.46 MB/sec)

Test execution summary:
  total time:           1.2922s
  total number of events: 256000
  total time taken by event execution: 0.9920
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 3.24ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 0.9920/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (176865.12 ops/sec)
250.00 MB transferred (172.72 MB/sec)

Test execution summary:
  total time:           1.4474s
  total number of events: 256000
  total time taken by event execution: 1.1114
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 2.85ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 1.1114/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

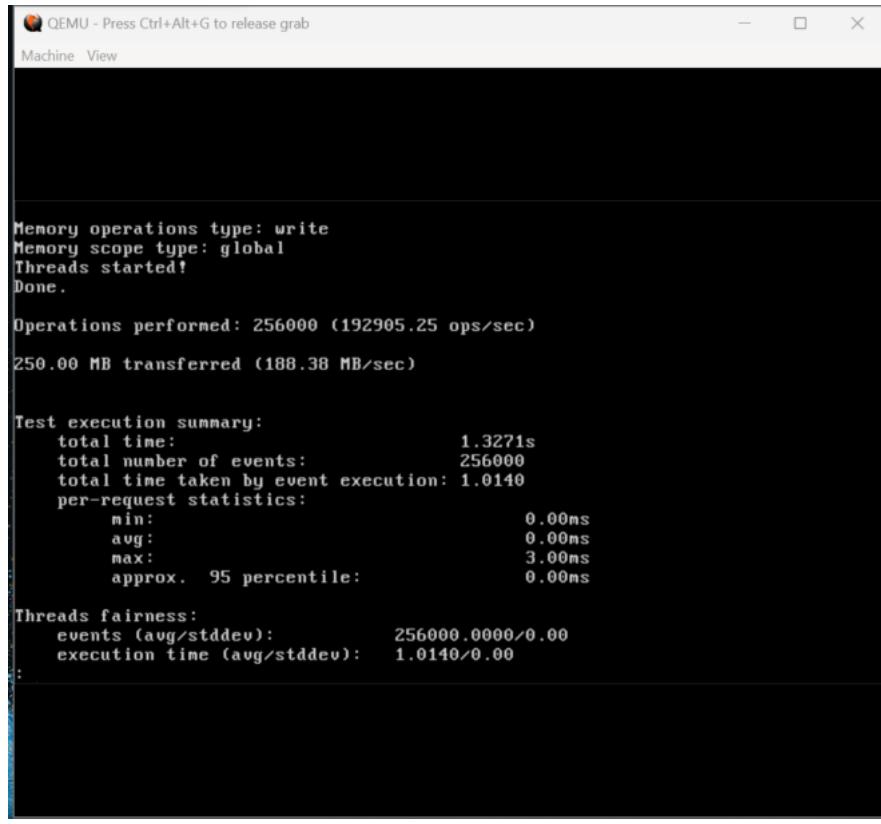
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (199349.58 ops/sec)
250.00 MB transferred (194.68 MB/sec)

Test execution summary:
  total time:           1.2842s
  total number of events: 256000
  total time taken by event execution: 0.9849
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 5.71ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 0.9849/0.00
:-
```

5



```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (192905.25 ops/sec)
250.00 MB transferred (188.38 MB/sec)

Test execution summary:
  total time:           1.3271s
  total number of events: 256000
  total time taken by event execution: 1.0140
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 3.00ms
    approx. 95 percentile: 0.00ms

  Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 1.0140/0.00
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 3.00ms |

QEMU Results, Configuration: 2 GB 2 cores for Random Read

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (206623.10 ops/sec)
250.00 MB transferred (201.78 MB/sec)

Test execution summary:
  total time:           1.2390s
  total number of events: 256000
  total time taken by event execution: 0.9359
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 3.13ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 0.9359/0.00
:
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (186654.04 ops/sec)
250.00 MB transferred (182.28 MB/sec)

Test execution summary:
  total time:           1.3715s
  total number of events: 256000
  total time taken by event execution: 1.0404
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 3.14ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 1.0404/0.00
:
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (200924.48 ops/sec)
250.00 MB transferred (196.22 MB/sec)

Test execution summary:
  total time:                      1.2741s
  total number of events:          256000
  total time taken by event execution: 0.9652
  per-request statistics:
    min:                           0.00ms
    avg:                           0.00ms
    max:                           4.08ms
    approx. 95 percentile:         0.00ms

Threads fairness:
  events (avg/stddev):           256000.0000/0.00
  execution time (avg/stddev):   0.9652/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (183410.00 ops/sec)
250.00 MB transferred (179.11 MB/sec)

Test execution summary:
  total time:                      1.3958s
  total number of events:          256000
  total time taken by event execution: 1.0451
  per-request statistics:
    min:                           0.00ms
    avg:                           0.00ms
    max:                           2.92ms
    approx. 95 percentile:         0.00ms

Threads fairness:
  events (avg/stddev):           256000.0000/0.00
  execution time (avg/stddev):   1.0451/0.00
:-
```

5

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (181058.86 ops/sec)
250.00 MB transferred (176.82 MB/sec)

Test execution summary:
    total time:                      1.4139s
    total number of events:          256000
    total time taken by event execution: 1.0633
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          8.04ms
        approx. 95 percentile:         0.00ms

Threads fairness:
    events (avg/stddev):          256000.0000/0.00
    :
```

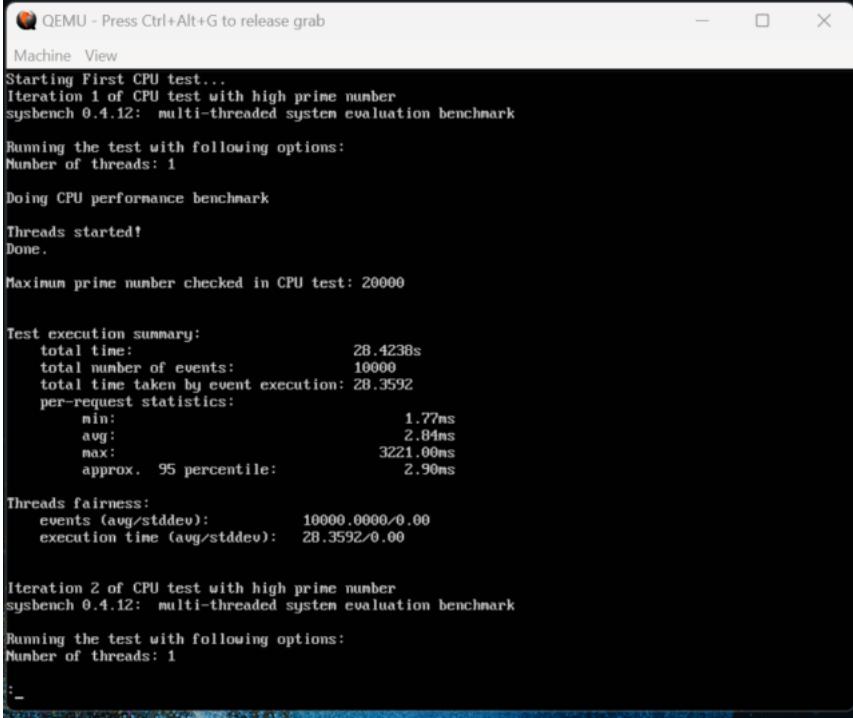
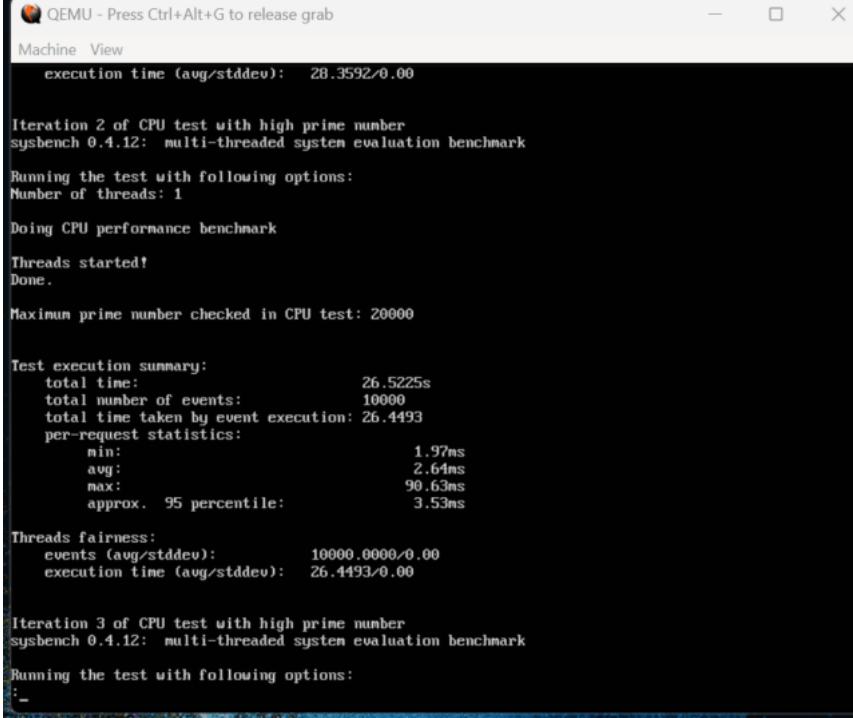
Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 1ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 8.04ms |

2. Configuration 2: 3 GB RAM with 3 Cores

CPU Test

QEMU Results, Configuration: 3 GB 3 cores for max-prime = 20000

| Sr. No | Screenshots |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  <p>QEMU - Press Ctrl+Alt+G to release grab</p> <p>Machine View</p> <pre> Starting First CPU test... Iteration 1 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 28.4238s total number of events: 10000 total time taken by event execution: 28.3592 per-request statistics: min: 1.77ms avg: 2.84ms max: 3221.00ms approx. 95 percentile: 2.90ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 28.3592/0.00 Iteration 2 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 :-_ </pre> |
| 2 |  <p>QEMU - Press Ctrl+Alt+G to release grab</p> <p>Machine View</p> <pre> execution time (avg/stddev): 28.3592/0.00 Iteration 2 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 26.5225s total number of events: 10000 total time taken by event execution: 26.4493 per-request statistics: min: 1.97ms avg: 2.64ms max: 90.63ms approx. 95 percentile: 3.53ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 26.4493/0.00 Iteration 3 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: :-_ </pre> |

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 3 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:                      29.9127s
    total number of events:          10000
    total time taken by event execution: 29.8412
    per-request statistics:
        min:                          2.15ms
        avg:                          2.98ms
        max:                          80.70ms
        approx. 95 percentile:         4.43ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   29.8412/0.00

Iteration 4 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 4 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:                      32.4255s
    total number of events:          10000
    total time taken by event execution: 32.3234
    per-request statistics:
        min:                          2.25ms
        avg:                          3.23ms
        max:                          73.32ms
        approx. 95 percentile:         4.77ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   32.3234/0.00

Iteration 5 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

:-
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 5 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:           34.3096s
  total number of events:    10000
  total time taken by event execution: 34.2015
  per-request statistics:
    min:                  2.39ms
    avg:                  3.42ms
    max:                  71.09ms
    approx. 95 percentile: 5.10ms

Threads fairness:
  events (avg/stddev):   10000.0000/0.00
  execution time (avg/stddev): 34.2015/0.00

Running Second CPU Test:Multiple Threads
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

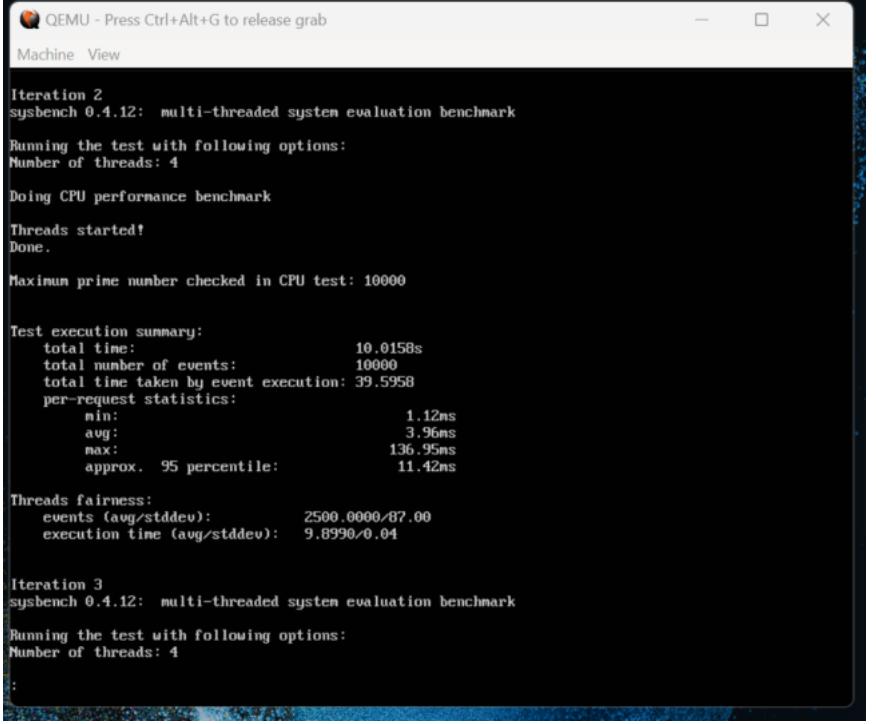
Running the test with following options:
Number of threads: 4
:_

```

Observations:

| | |
|----------------------------------|---------|
| Average | 3.42ms |
| Stddev | 3.5ms |
| Minimum Number Time for an event | 2.39ms |
| Maximum Number Time for an event | 40.41ms |

| QEMU Results, Configuration: 3 GB 3 cores for max-prime = 10000 | |
|-----------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| |  <pre> QEMU - Press Ctrl+Alt+G to release grab Machine View Iteration 2 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 10.0158s total number of events: 10000 total time taken by event execution: 39.5958 per-request statistics: min: 1.12ms avg: 3.96ms max: 136.95ms approx. 95 percentile: 11.42ms Threads fairness: events (avg/stddev): 2500.0000/87.00 execution time (avg/stddev): 9.8990/0.04 Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 : </pre> |
| 2 | |

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 9.2285s
total number of events: 10000
total time taken by event execution: 36.5314
per-request statistics:
    min: 1.10ms
    avg: 3.65ms
    max: 46.87ms
    approx. 95 percentile: 17.56ms

Threads fairness:
events (avg/stddev): 2500.0000/109.94
execution time (avg/stddev): 9.1329/0.05

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 7.7081s
total number of events: 10000
total time taken by event execution: 30.4208
per-request statistics:
    min: 1.02ms
    avg: 3.04ms
    max: 97.29ms
    approx. 95 percentile: 17.07ms

Threads fairness:
events (avg/stddev): 2500.0000/57.36
execution time (avg/stddev): 7.6052/0.02

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View

Threads fairness:
  events (avg/stddev):    2500.0000/57.36
  execution time (avg/stddev):  7.6052/0.02

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:                7.3695s
  total number of events:    10000
  total time taken by event execution: 29.1859
  per-request statistics:
    min:                      0.98ms
    avg:                      2.92ms
    max:                      61.26ms
    approx. 95 percentile:    10.49ms

Threads fairness:
  events (avg/stddev):    2500.0000/47.77
  execution time (avg/stddev):  7.2965/0.03

CPU tests completed
[END]

```

Observations:

| | |
|---------------------------|---------|
| Average | 2.92ms |
| Stddev | 10ms |
| Minimum Time for an event | 0.98ms |
| Maximum Time for an event | 45.32ms |

File I/O Test

| QEMU Results, Configuration: 3 GB 3 cores for sequential write | |
|----------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (62.13Mb/sec)
3976.29 Requests/sec executed

Test execution summary:
    total time:          4.0239s
    total number of events: 16000
    total time taken by event execution: 2.0668
    per-request statistics:
        min:              0.06ms
        avg:              0.13ms
        max:             15.13ms
        approx. 95 percentile: 0.26ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 2.0668/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (60.416Mb/sec)
3866.61 Requests/sec executed

Test execution summary:
    total time:          4.1380s
    total number of events: 16000
    total time taken by event execution: 2.2038
    per-request statistics:
        min:              0.00ms
        avg:              0.14ms
        max:             7.54ms
        approx. 95 percentile: 0.29ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 2.2038/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (66.474Mb/sec)
4254.32 Requests/sec executed

Test execution summary:
total time: 3.7609s
total number of events: 16000
total time taken by event execution: 1.6893
per-request statistics:
    min: 0.07ms
    avg: 0.11ms
    max: 9.34ms
    approx. 95 percentile: 0.21ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.6893/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (56.337Mb/sec)
3605.54 Requests/sec executed

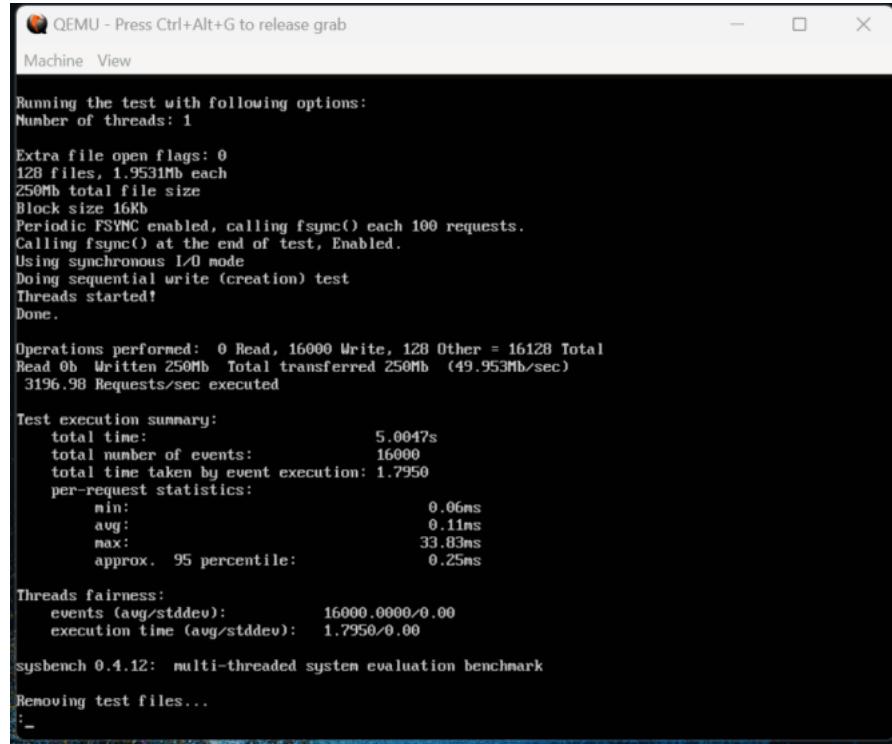
Test execution summary:
total time: 4.4376s
total number of events: 16000
total time taken by event execution: 2.2164
per-request statistics:
    min: 0.07ms
    avg: 0.14ms
    max: 29.33ms
    approx. 95 percentile: 0.29ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 2.2164/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

5



QEMU - Press Ctrl+Alt+G to release grab

Machine View

```

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (49.953Mb/sec)
3196.98 Requests/sec executed

Test execution summary:
    total time:                  5.0047s
    total number of events:      16000
    total time taken by event execution: 1.7950
    per-request statistics:
        min:                      0.06ns
        avg:                      0.11ns
        max:                      33.83ns
        approx. 95 percentile:     0.25ns

Threads fairness:
    events (avg/stddev):       16000.0000/0.00
    execution time (avg/stddev): 1.7950/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-_

```

Observations:

| | |
|---------------------------|---------|
| Average | 0.11ms |
| Stddev | 0.25ms |
| Minimum Time for an event | 0.06ms |
| Maximum Time for an event | 20.88ms |

QEMU Results, Configuration: 3 GB 3 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

QEMU - Press Ctrl+Alt+G to release grab

Machine View

Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (381.87Mb/sec)
24439.45 Requests/sec executed

Test execution summary:
total time: 0.4092s
total number of events: 10000
total time taken by event execution: 0.3400
per-request statistics:
min: 0.02ms
avg: 0.03ms
max: 1.33ms
approx. 95 percentile: 0.05ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.3400/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

1

QEMU - Press Ctrl+Alt+G to release grab

Machine View

Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (509.15Mb/sec)
32585.32 Requests/sec executed

Test execution summary:
total time: 0.3069s
total number of events: 10000
total time taken by event execution: 0.2720
per-request statistics:
min: 0.02ms
avg: 0.03ms
max: 11.94ms
approx. 95 percentile: 0.04ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.2720/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:

2

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (593.87Mb/sec)
38007.95 Requests/sec executed

Test execution summary:
    total time:          0.2631s
    total number of events: 10000
    total time taken by event execution: 0.2306
    per-request statistics:
        min:                 0.01ms
        avg:                 0.02ms
        max:                15.45ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.2306/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (601.65Mb/sec)
38505.66 Requests/sec executed

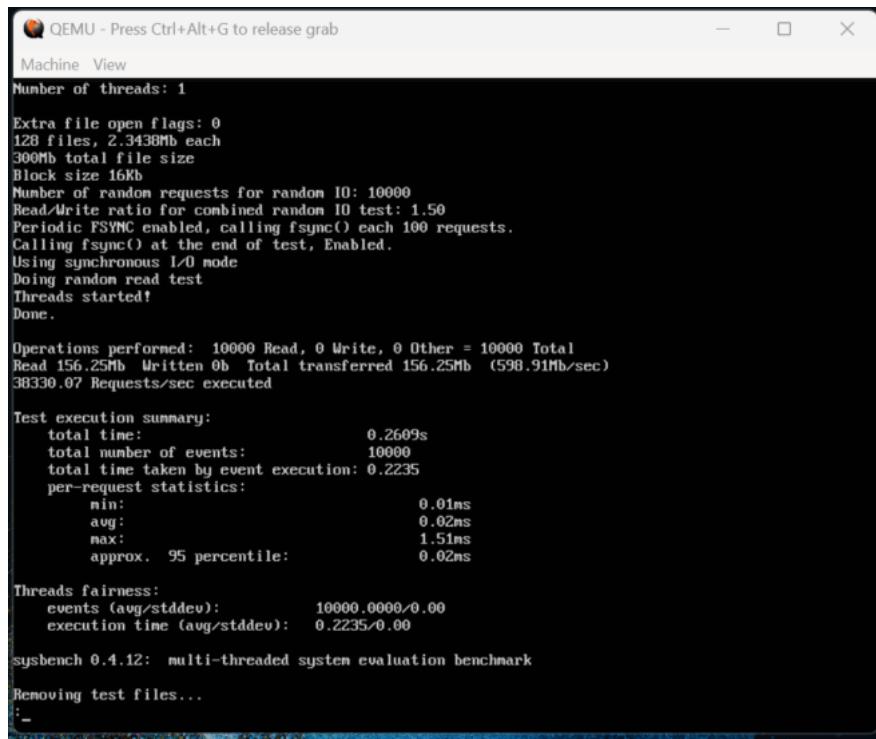
Test execution summary:
    total time:          0.2597s
    total number of events: 10000
    total time taken by event execution: 0.2323
    per-request statistics:
        min:                 0.01ms
        avg:                 0.02ms
        max:                11.13ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.2323/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

5



QEMU - Press Ctrl+Alt+G to release grab

Machine View

Number of threads: 1

Extra file open flags: 0
128 files, 2.3430Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (598.91Mb/sec)
38330.07 Requests/sec executed

Test execution summary:
 total time: 0.2609s
 total number of events: 10000
 total time taken by event execution: 0.2235s
 per-request statistics:
 min: 0.01ms
 avg: 0.02ms
 max: 1.51ms
 approx. 95 percentile: 0.02ms

Threads fairness:
 events (avg/stddev): 10000.0000/0.00
 execution time (avg/stddev): 0.2235/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 1.51ms |

Memory Test

| QEMU Results, Configuration: 3 GB 3 cores for Sequential memory Access | |
|------------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Running First Memory test: Sequential Access
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (175334.84 ops/sec)

250.00 MB transferred (171.23 MB/sec)

Test execution summary:
total time: 1.4601s
total number of events: 256000
total time taken by event execution: 1.1330
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 5.72ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.1330/0.00
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (188869.38 ops/sec)

250.00 MB transferred (184.44 MB/sec)

Test execution summary:
total time: 1.3554s
total number of events: 256000
total time taken by event execution: 1.0233
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 2.29ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.0233/0.00
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (204347.85 ops/sec)

250.00 MB transferred (199.56 MB/sec)

Test execution summary:
total time: 1.2528s
total number of events: 256000
total time taken by event execution: 0.9632
per-request statistics:
    min: 0.00ns
    avg: 0.00ns
    max: 2.45ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.9632/0.00
;
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (192397.62 ops/sec)

250.00 MB transferred (187.89 MB/sec)

Test execution summary:
total time: 1.3306s
total number of events: 256000
total time taken by event execution: 1.0297
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 3.10ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.0297/0.00
;
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (201159.35 ops/sec)
250.00 MB transferred (196.44 MB/sec)

Test execution summary:
  total time:           1.2726s
  total number of events: 256000
  total time taken by event execution: 0.9770
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 4.09ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 0.9770/0.00
:
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 4.09ms |

QEMU Results, Configuration: 3 GB 3 cores for random memory access

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Running Second Memory Test: Random Access
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (193851.03 ops/sec)
250.00 MB transferred (189.31 MB/sec)

Test execution summary:
    total time:           1.3206s
    total number of events: 256000
    total time taken by event execution: 0.9919
    per-request statistics:
        min:                 0.00ms
        avg:                 0.00ms
        max:                 3.38ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev):   256000.0000/0.00
    execution time (avg/stddev): 0.9919/0.00
:-
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (163394.07 ops/sec)
250.00 MB transferred (159.56 MB/sec)

Test execution summary:
    total time:           1.5668s
    total number of events: 256000
    total time taken by event execution: 1.1701
    per-request statistics:
        min:                 0.00ms
        avg:                 0.00ms
        max:                 2.67ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev):   256000.0000/0.00
    execution time (avg/stddev): 1.1701/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (149368.15 ops/sec)

250.00 MB transferred (145.87 MB/sec)

Test execution summary:
total time: 1.7139s
total number of events: 256000
total time taken by event execution: 1.3049
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 20.64ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.3049/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (163730.92 ops/sec)

250.00 MB transferred (159.89 MB/sec)

Test execution summary:
total time: 1.5635s
total number of events: 256000
total time taken by event execution: 1.1829
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 2.85ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.1829/0.00
:-
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (187187.39 ops/sec)
250.00 MB transferred (182.80 MB/sec)

Test execution summary:
total time: 1.3676s
total number of events: 256000
total time taken by event execution: 1.0373
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 4.56ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.0373/0.00
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 4.56ms |

3. Configuration 3: 3 GB RAM with 6 Cores

CPU Test

| QEMU Results, Configuration: 3 GB 6 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
Doing CPU performance benchmark
Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:          22.1646s
  total number of events:    10000
  total time taken by event execution: 22.1286
  per-request statistics:
    min:                  1.48ms
    avg:                  2.21ms
    max:                1944.73ms
    approx. 95 percentile: 2.36ms

Threads fairness:
  events (avg/stddev):   10000.0000/0.00
  execution time (avg/stddev): 22.1286/0.00
:
```

2

```
Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:          22.0813s
  total number of events:    10000
  total time taken by event execution: 22.0422
  per-request statistics:
    min:                  1.48ms
    avg:                  2.20ms
    max:                45.70ms
    approx. 95 percentile: 3.15ms

Threads fairness:
  events (avg/stddev):   10000.0000/0.00
  execution time (avg/stddev): 22.0422/0.00
:
```

3

```
Number of threads: 1
Doing CPU performance benchmark
Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:                      20.8946s
  total number of events:          10000
  total time taken by event execution: 20.8409
  per-request statistics:
    min:                           1.70ms
    avg:                           2.08ms
    max:                           14.04ms
    approx. 95 percentile:         2.56ms

Threads fairness:
  events (avg/stddev):           10000.0000/0.00
  execution time (avg/stddev):   20.8409/0.00
:-
```

4

```
Running the test with following options:
Number of threads: 1
Doing CPU performance benchmark
Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:                      24.7400s
  total number of events:          10000
  total time taken by event execution: 24.7022
  per-request statistics:
    min:                           1.85ms
    avg:                           2.47ms
    max:                           99.29ms
    approx. 95 percentile:         3.16ms

Threads fairness:
  events (avg/stddev):           10000.0000/0.00
  execution time (avg/stddev):   24.7022/0.00
:-
```

5

```

QEMU
Machine View

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 24.0534s
total number of events: 10000
total time taken by event execution: 24.0110
per-request statistics:
    min: 1.74ms
    avg: 2.40ms
    max: 56.47ms
    approx. 95 percentile: 3.27ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 24.0110/0.00
:-
```

Observations:

| | |
|---------------------------|---------|
| Average | 2.40ms |
| Stddev | 3.27ms |
| Minimum Time for an event | 1.74ms |
| Maximum Time for an event | 56.47ms |

QEMU Results, Configuration: 3 GB 6 cores for max-prime = 10000

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
Running the test with following options:  
Number of threads: 4  
  
Doing CPU performance benchmark  
  
Threads started!  
Done.  
  
Maximum prime number checked in CPU test: 10000  
  
Test execution summary:  
    total time:                  4.9731s  
    total number of events:      10000  
    total time taken by event execution: 19.8081  
    per-request statistics:  
        min:                      1.06ms  
        avg:                      1.98ms  
        max:                      18.38ms  
        approx. 95 percentile:     3.02ms  
  
Threads fairness:  
    events (avg/stddev):       2500.0000/108.37  
    execution time (avg/stddev): 4.9520/0.00  
:
```

2

```
Running the test with following options:  
Number of threads: 4  
  
Doing CPU performance benchmark  
  
Threads started!  
Done.  
  
Maximum prime number checked in CPU test: 10000  
  
Test execution summary:  
    total time:                  5.0778s  
    total number of events:      10000  
    total time taken by event execution: 20.2266  
    per-request statistics:  
        min:                      1.19ms  
        avg:                      2.02ms  
        max:                      10.75ms  
        approx. 95 percentile:     3.12ms  
  
Threads fairness:  
    events (avg/stddev):       2500.0000/55.98  
:
```

3

```
QEMU
Machine View

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          5.2384s
  total number of events: 10000
  total time taken by event execution: 20.0575
  per-request statistics:
    min:                  1.08ms
    avg:                  2.09ms
    max:                 38.78ms
    approx. 95 percentile: 3.24ms

Threads fairness:
  events (avg/stddev): 2500.0000/80.23
:-
```

4

```
QEMU
Machine View

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

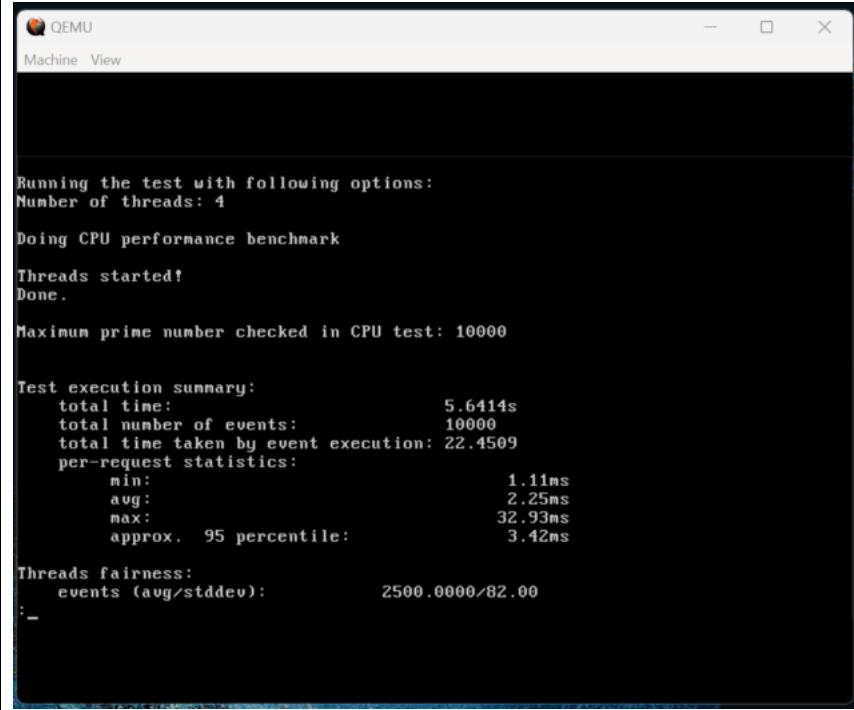
Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          5.0543s
  total number of events: 10000
  total time taken by event execution: 20.0844
  per-request statistics:
    min:                  1.14ms
    avg:                  2.01ms
    max:                 29.79ms
    approx. 95 percentile: 3.05ms

Threads fairness:
  events (avg/stddev): 2500.0000/40.47
  execution time (avg/stddev): 5.0211/0.01
:-
```

5



Running the test with following options:
Number of threads: 4
Doing CPU performance benchmark
Threads started!
Done.
Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 5.6414s
total number of events: 10000
total time taken by event execution: 22.4509
per-request statistics:
min: 1.11ms
avg: 2.25ms
max: 32.93ms
approx. 95 percentile: 3.42ms

Threads fairness:
events (avg/stddev): 2500.0000/82.00
:-

Observations:

| | |
|---------------------------|---------|
| Average | 2.25ms |
| Stddev | 3.42ms |
| Minimum Time for an event | 1.11ms |
| Maximum Time for an event | 32.93ms |

File I/O Test

QEMU Results, Configuration: 3 GB 6 cores for sequential write

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (105.3Mb/sec)
6739.19 Requests/sec executed

Test execution summary:
total time: 2.3742s
total number of events: 16000
total time taken by event execution: 1.1712
per-request statistics:
min: 0.04ms
avg: 0.07ms
max: 5.27ms
approx. 95 percentile: 0.11ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.1712/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

2

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (98.978Mb/sec)
6334.62 Requests/sec executed

Test execution summary:
total time: 2.5258s
total number of events: 16000
total time taken by event execution: 1.1273
per-request statistics:
min: 0.05ms
avg: 0.07ms
max: 4.47ms
approx. 95 percentile: 0.11ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.1273/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

3

```
QEMU
Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (106.31Mb/sec)
6803.96 Requests/sec executed

Test execution summary:
total time: 2.3516s
total number of events: 16000
total time taken by event execution: 1.0669
per-request statistics:
min: 0.05ms
avg: 0.07ms
max: 3.45ms
approx. 95 percentile: 0.10ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.0669/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

4

```
QEMU
Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (93.934Mb/sec)
6011.79 Requests/sec executed

Test execution summary:
total time: 2.6614s
total number of events: 16000
total time taken by event execution: 1.3017
per-request statistics:
min: 0.05ms
avg: 0.08ms
max: 5.06ms
approx. 95 percentile: 0.13ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.3017/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

5

```
QEMU
Machine View
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (98.489Mb/sec)
6303.28 Requests/sec executed

Test execution summary:
total time: 2.5384s
total number of events: 16000
total time taken by event execution: 1.2383
per-request statistics:
min: 0.05ms
avg: 0.08ms
max: 3.42ms
approx. 95 percentile: 0.12ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.2383/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.08ms |
| Stddev | 0.12ms |
| Minimum Time for an event | 0.05ms |
| Maximum Time for an event | 3.42ms |

QEMU Results, Configuration: 3 GB 6 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (672.22Mb/sec)
43022.12 Requests/sec executed

Test execution summary:
    total time:                      0.2324s
    total number of events:          10000
    total time taken by event execution: 0.2079
    per-request statistics:
        min:                          0.01ms
        avg:                          0.02ms
        max:                          5.50ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.2079/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

2

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (755.01Mb/sec)
48320.49 Requests/sec executed

Test execution summary:
    total time:                      0.2070s
    total number of events:          10000
    total time taken by event execution: 0.1841
    per-request statistics:
        min:                          0.01ms
        avg:                          0.02ms
        max:                          1.56ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.1841/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:_
```

3

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (660.75Mb/sec)
42287.71 Requests/sec executed

Test execution summary:
    total time:                  0.2365s
    total number of events:      10000
    total time taken by event execution: 0.2079
    per-request statistics:
        min:                      0.01ms
        avg:                      0.02ms
        max:                      7.46ms
        approx. 95 percentile:     0.02ms

Threads fairness:
    events (avg/stddev):       10000.0000/0.00
    execution time (avg/stddev): 0.2079/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```
QEMU
Machine View

Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (632.27Mb/sec)
40464.97 Requests/sec executed

Test execution summary:
    total time:                  0.2471s
    total number of events:      10000
    total time taken by event execution: 0.2229
    per-request statistics:
        min:                      0.01ms
        avg:                      0.02ms
        max:                      3.44ms
        approx. 95 percentile:     0.02ms

Threads fairness:
    events (avg/stddev):       10000.0000/0.00
    execution time (avg/stddev): 0.2229/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

5

```

QEMU
Machine View
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (701.73Mb/sec)
44910.76 Requests/sec executed

Test execution summary:
total time: 0.2227s
total number of events: 10000
total time taken by event execution: 0.2002
per-request statistics:
    min: 0.01ms
    avg: 0.02ms
    max: 3.17ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.2002/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 3.17ms |

Memory Test

| QEMU Results, Configuration: 3 GB 6 cores for Sequential memory Access | |
|------------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (137731.33 ops/sec)

Test execution summary:
    total time:                      1.8587s
./memory_bash_script.sh: line 20: echo All tests are completed: command not found
    total number of events:          256000
    total time taken by event execution: 1.4212
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          10.74ms
        approx. 95 percentile:         0.00ms

Threads fairness:
    events (avg/stddev):           256000.0000/0.00
:-
```

2

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (144969.33 ops/sec)
250.00 MB transferred (141.57 MB/sec)

Test execution summary:
    total time:                      1.7659s
    total number of events:          256000
    total time taken by event execution: 1.3745
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          10.33ms
        approx. 95 percentile:         0.00ms

Threads fairness:
    events (avg/stddev):           256000.0000/0.00
    execution time (avg/stddev):   1.3745/0.00
:-
```

3

```
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (147752.88 ops/sec)
250.00 MB transferred (144.29 MB/sec)

Test execution summary:
  total time:                      1.7326s
  total number of events:          256000
  total time taken by event execution: 1.3370
  per-request statistics:
    min:                           0.00ms
    avg:                           0.01ms
    max:                           9.77ms
    approx. 95 percentile:         0.00ms

Threads fairness:
  events (avg/stddev):           256000.0000/0.00
  execution time (avg/stddev):   1.3370/0.00
:-
```

4

```
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (130601.35 ops/sec)
250.00 MB transferred (127.54 MB/sec)

Test execution summary:
  total time:                      1.9602s
  total number of events:          256000
  total time taken by event execution: 1.5146
  per-request statistics:
    min:                           0.00ms
    avg:                           0.01ms
    max:                           9.88ms
    approx. 95 percentile:         0.00ms

Threads fairness:
  events (avg/stddev):           256000.0000/0.00
  execution time (avg/stddev):   1.5146/0.00
:-
```

5

```

QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (147222.21 ops/sec)
250.00 MB transferred (143.77 MB/sec)

Test execution summary:
  total time: 1.7389s
  total number of events: 256000
  total time taken by event execution: 1.3657
  per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 9.84ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 1.3657/0.00
:-
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 9.84ms |

| QEMU Results, Configuration: 3 GB 6 cores for random memory access | |
|--------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (132041.49 ops/sec)
250.00 MB transferred (128.95 MB/sec)

Test execution summary:
  total time:           1.9388s
  total number of events: 256000
  total time taken by event execution: 1.4839
  per-request statistics:
    min:                 0.00ms
    avg:                 0.01ms
    max:                 33.90ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 1.4839/0.00
:-
```

2

```
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (150193.44 ops/sec)
250.00 MB transferred (146.67 MB/sec)

Test execution summary:
  total time:           1.7045s
  total number of events: 256000
  total time taken by event execution: 1.2725
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 12.87ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 1.2725/0.00
:-
```

3

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (142047.61 ops/sec)
250.00 MB transferred (138.72 MB/sec)

Test execution summary:
  total time:           1.8022s
  total number of events: 256000
  total time taken by event execution: 1.3859
  per-request statistics:
    min:                 0.00ms
    avg:                 0.01ms
    max:                 11.55ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 1.3859/0.00
:-
```

4

```
QEMU - Press Ctrl+Alt+G to release grab
Machine View

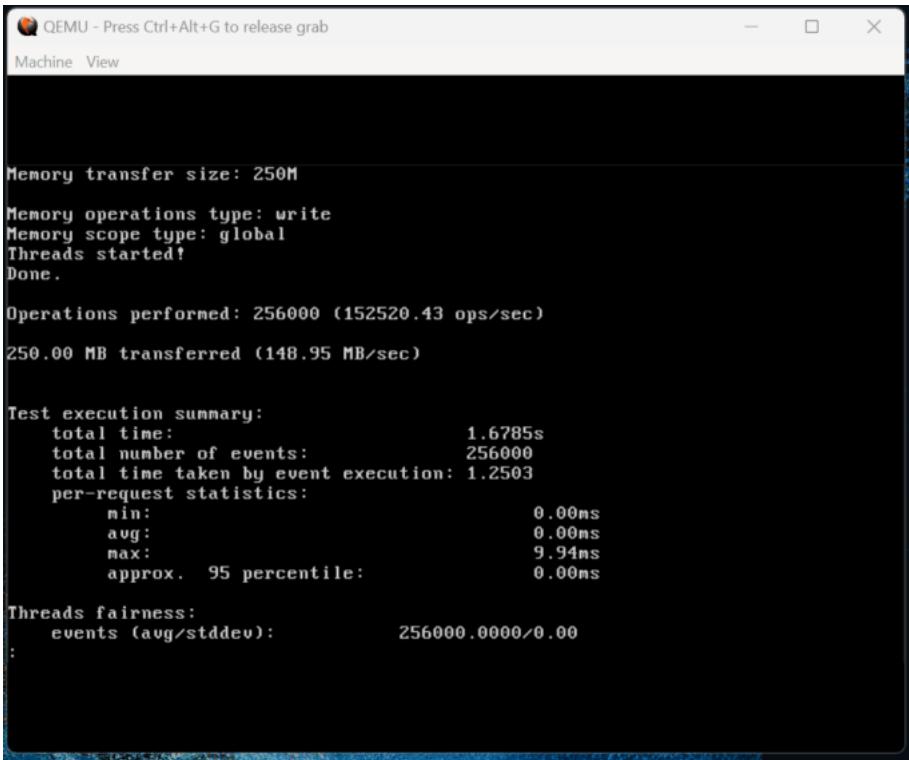
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (148111.51 ops/sec)
250.00 MB transferred (144.64 MB/sec)

Test execution summary:
  total time:           1.7284s
  total number of events: 256000
  total time taken by event execution: 1.3054
  per-request statistics:
    min:                 0.00ms
    avg:                 0.01ms
    max:                 10.09ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev):   256000.0000/0.00
  execution time (avg/stddev): 1.3054/0.00
:-
```

5



```

QEMU - Press Ctrl+Alt+G to release grab
Machine View
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (152520.43 ops/sec)
250.00 MB transferred (148.95 MB/sec)

Test execution summary:
  total time:           1.6785s
  total number of events: 256000
  total time taken by event execution: 1.2503
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 9.94ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
:
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 9.94ms |

4. Configuration 4: 4 GB RAM with 8 Cores

CPU Test

| QEMU Results, Configuration: 4 GB 8 cores for max-prime = 20000 | |
|-----------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

| | |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <pre> QEMU Machine: View Starting First CPU test... Iteration 1 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 24.3145s total number of events: 10000 total time taken by event execution: 24.2601 per-request statistics: min: 1.44ns avg: 2.43ns max: 1239.28ns approx. 95 percentile: 2.73ns Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 24.2601/0.00 Iteration 2 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 : </pre> |
| 2 | <pre> QEMU Machine: View avg: 2.43ns max: 1239.28ns approx. 95 percentile: 2.73ns Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 24.2601/0.00 Iteration 2 of CPU test with high prime number sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 22.2132s total number of events: 10000 total time taken by event execution: 22.1764 per-request statistics: min: 1.84ns avg: 2.22ns max: 9.35ns approx. 95 percentile: 2.60ns Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 22.1764/0.00 :</pre> |

3

```
QEMU
Machine View

Iteration 3 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          21.8630s
    total number of events: 10000
    total time taken by event execution: 21.8212
    per-request statistics:
        min:                 1.90ns
        avg:                 2.18ns
        max:                19.77ns
        approx. 95 percentile: 2.50ns

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 21.8212/0.00

Iteration 4 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

:
```

4

```
QEMU
Machine View

Iteration 4 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          22.2899s
    total number of events: 10000
    total time taken by event execution: 22.2526
    per-request statistics:
        min:                 1.92ns
        avg:                 2.23ns
        max:                7.54ns
        approx. 95 percentile: 2.53ns

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 22.2526/0.00

Iteration 5 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

:
```

5

```

QEMU
Machine : View

Iteration 5 of CPU test with high prime number
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:           25.3531s
  total number of events:    10000
  total time taken by event execution: 25.3028
  per-request statistics:
    min:                 1.87ms
    avg:                 2.53ms
    max:                108.86ms
    approx. 95 percentile: 3.21ms

Threads fairness:
  events (avg/stddev):   10000.0000/0.00
  execution time (avg/stddev): 25.3028/0.00

Running Second CPU Test:Multiple Threads
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4
:_
```

Observations:

| | |
|---------------------------|---------|
| Average | 2.53ms |
| Stddev | 3.21ms |
| Minimum Time for an event | 1.87ms |
| Maximum Time for an event | 78.64ms |

QEMU Results, Configuration: 4 GB 8 cores for max-prime = 10000

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View
Running Second CPU Test:Multiple Threads
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
total time: 4.6157s
total number of events: 10000
total time taken by event execution: 18.3762
per-request statistics:
    min: 1.03ns
    avg: 1.84ns
    max: 14.92ns
    approx. 95 percentile: 2.79ns

Threads fairness:
events (avg/stddev): 2500.0000/157.41
execution time (avg/stddev): 4.5940/0.00

Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

2

```
QEMU
Machine View
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

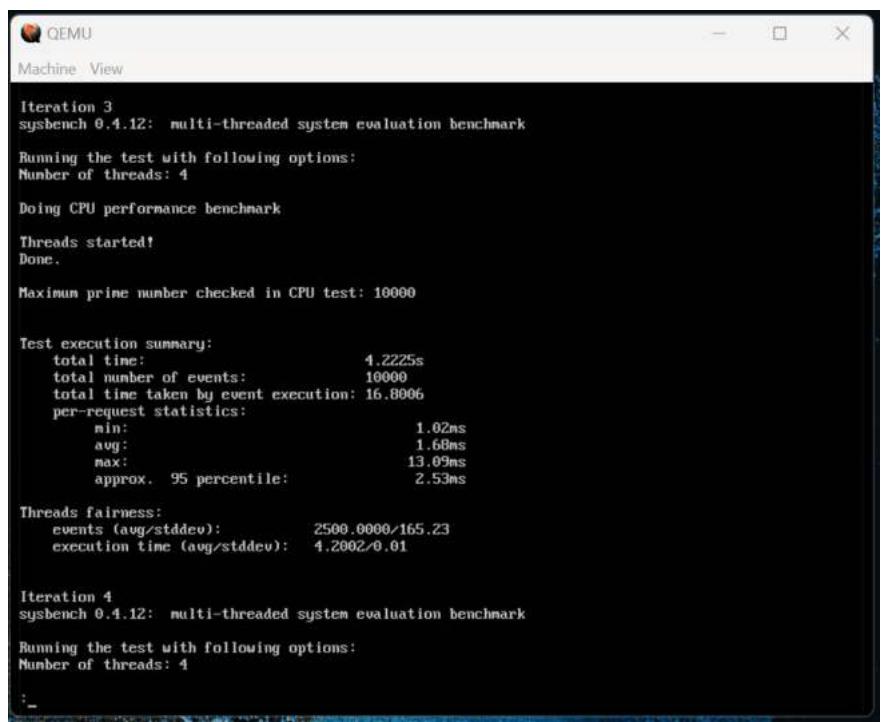
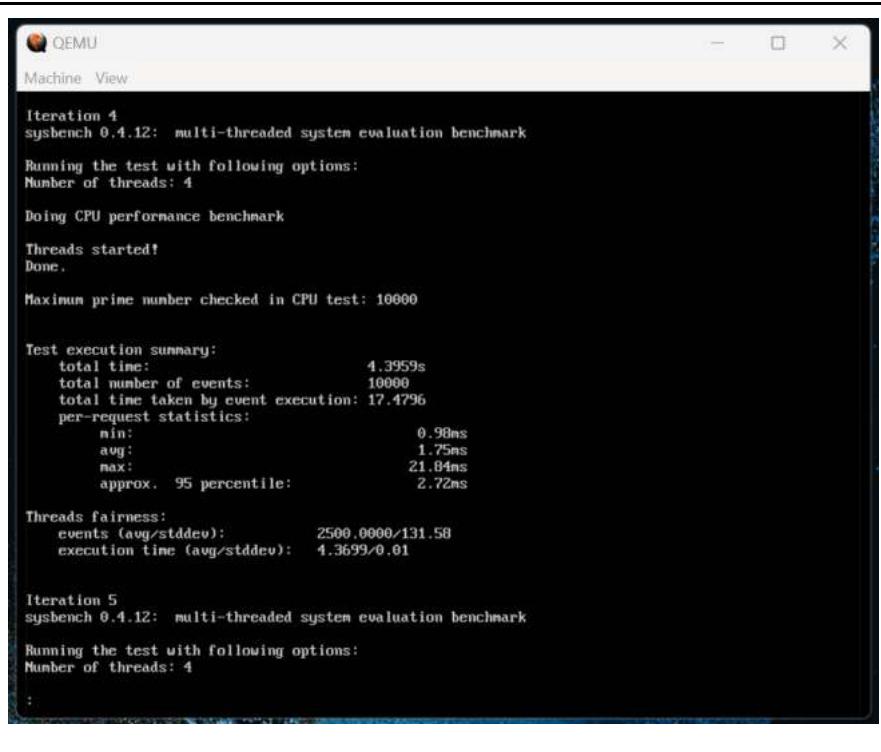
Test execution summary:
total time: 4.0884s
total number of events: 10000
total time taken by event execution: 16.2795
per-request statistics:
    min: 0.98ns
    avg: 1.63ns
    max: 54.57ns
    approx. 95 percentile: 2.50ns

Threads fairness:
events (avg/stddev): 2500.0000/155.87
execution time (avg/stddev): 4.0699/0.00

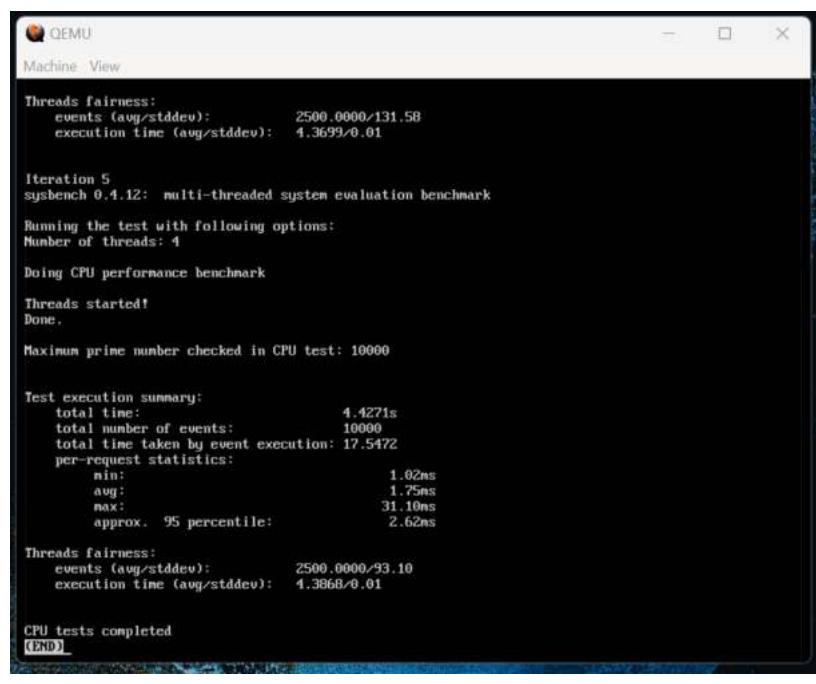
Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

:
```

| | |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 |  <pre> QEMU Machine View Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.2225s total number of events: 10000 total time taken by event execution: 16.8006 per-request statistics: min: 1.02ms avg: 1.68ms max: 13.09ms approx. 95 percentile: 2.53ms Threads fairness: events (avg/stddev): 2500.0000/165.23 execution time (avg/stddev): 4.2002/0.01 Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 : </pre> |
| 4 |  <pre> QEMU Machine View Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 4.3959s total number of events: 10000 total time taken by event execution: 17.4796 per-request statistics: min: 0.98ms avg: 1.75ms max: 21.84ms approx. 95 percentile: 2.72ms Threads fairness: events (avg/stddev): 2500.0000/131.58 execution time (avg/stddev): 4.3699/0.01 Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 : </pre> |

5



The screenshot shows the QEMU Machine View window displaying the output of a sysbench CPU test. The text output includes:

```

Threads fairness:
  events (avg/stddev):      2500.0000/131.58
  execution time (avg/stddev):  4.3699/0.01

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:           4.4271s
  total number of events: 10000
  total time taken by event execution: 17.5472
  per-request statistics:
    min:                 1.02ms
    avg:                 1.75ns
    max:                31.10ns
    approx. 95 percentile: 2.62ns

Threads fairness:
  events (avg/stddev):      2500.0000/93.10
  execution time (avg/stddev):  4.3868/0.01

CPU tests completed
[END]

```

Observations:

| | |
|---------------------------|---------|
| Average | 1.75ms |
| Stddev | 2.62ms |
| Minimum Time for an event | 1.02ms |
| Maximum Time for an event | 31.10ms |

File I/O Test

QEMU Results, Configuration: 4 GB 8 cores for sequential write

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View
Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (88.079Mb/sec)
5637.03 Requests/sec executed

Test execution summary:
total time: 2.8384s
total number of events: 16000
total time taken by event execution: 1.3433
per-request statistics:
min: 0.05ms
avg: 0.00ms
max: 9.80ms
approx. 95 percentile: 0.15ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.3433/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

2

```
QEMU
Machine View
Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (90.163Mb/sec)
5770.45 Requests/sec executed

Test execution summary:
total time: 2.7727s
total number of events: 16000
total time taken by event execution: 1.3392
per-request statistics:
min: 0.05ms
avg: 0.08ms
max: 13.24ms
approx. 95 percentile: 0.14ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.3392/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

3

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (83.945Mb/sec)
5372.45 Requests/sec executed

Test execution summary:
total time: 2.9782s
total number of events: 16000
total time taken by event execution: 1.4719
per-request statistics:
    min: 0.06ns
    avg: 0.09ns
    max: 11.02ns
    approx. 95 percentile: 0.16ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.4719/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

4

```
QEMU
Machine View

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (91.255Mb/sec)
5840.35 Requests/sec executed

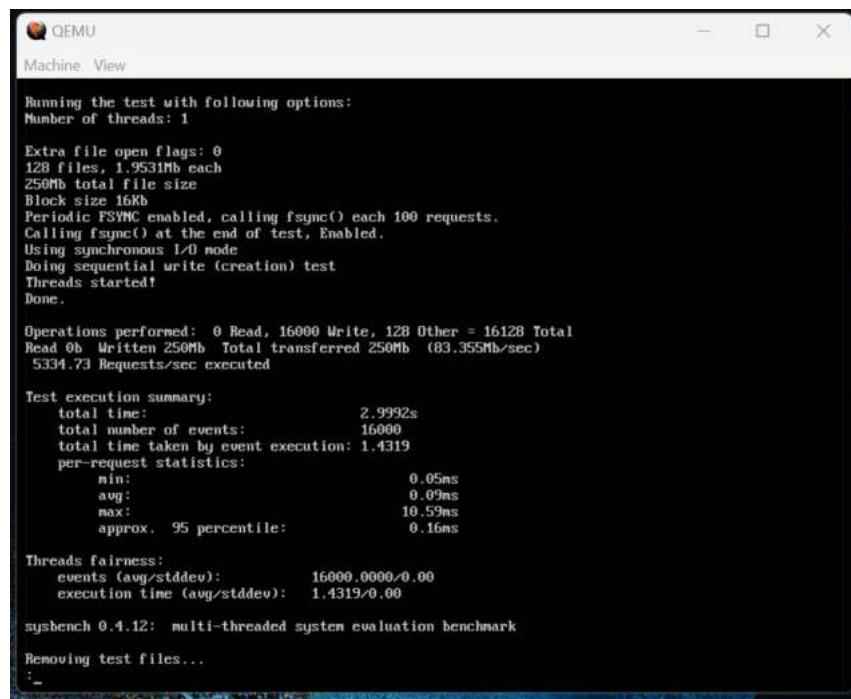
Test execution summary:
total time: 2.7396s
total number of events: 16000
total time taken by event execution: 1.3180
per-request statistics:
    min: 0.05ns
    avg: 0.08ns
    max: 3.25ns
    approx. 95 percentile: 0.14ns

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.3180/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:-
```

5



QEMU
Machine View
Running the test with following options:
Number of threads: 1
Extra file open flags: 0
128 files, 1.953Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.
Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (83.355Mb/sec)
5334.73 Requests/sec executed
Test execution summary:
total time: 2.9992s
total number of events: 16000
total time taken by event execution: 1.4319
per-request statistics:
min: 0.05ms
avg: 0.09ms
max: 10.59ms
approx. 95 percentile: 0.16ms
Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 1.4319/0.00
sysbench 0.4.12: multi-threaded system evaluation benchmark
Removing test files...
:-

Observations:

| | |
|---------------------------|---------|
| Average | 0.09ms |
| Stddev | 0.16ms |
| Minimum Time for an event | 0.05ms |
| Maximum Time for an event | 10.59ms |

QEMU Results, Configuration: 4 GB 8 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (648.36Mb/sec)
41495.08 Requests/sec executed

Test execution summary:
    total time:          0.2410s
    total number of events: 10000
    total time taken by event execution: 0.2185
    per-request statistics:
        min:                0.01ms
        avg:                0.02ms
        max:                9.57ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.2185/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

2

```
QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (595.52Mb/sec)
38113.35 Requests/sec executed

Test execution summary:
    total time:          0.2624s
    total number of events: 10000
    total time taken by event execution: 0.2366
    per-request statistics:
        min:                0.01ms
        avg:                0.02ms
        max:                9.62ms
        approx. 95 percentile: 0.02ms

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.2366/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

3

```
QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (644.01Mb/sec)
41216.93 Requests/sec executed

Test execution summary:
    total time:                      0.2426s
    total number of events:          10000
    total time taken by event execution: 0.2177
    per-request statistics:
        min:                          0.01ms
        avg:                          0.02ms
        max:                          13.77ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.2177/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

4

```
QEMU
Machine View
Number of threads: 1

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (605.79Mb/sec)
38770.33 Requests/sec executed

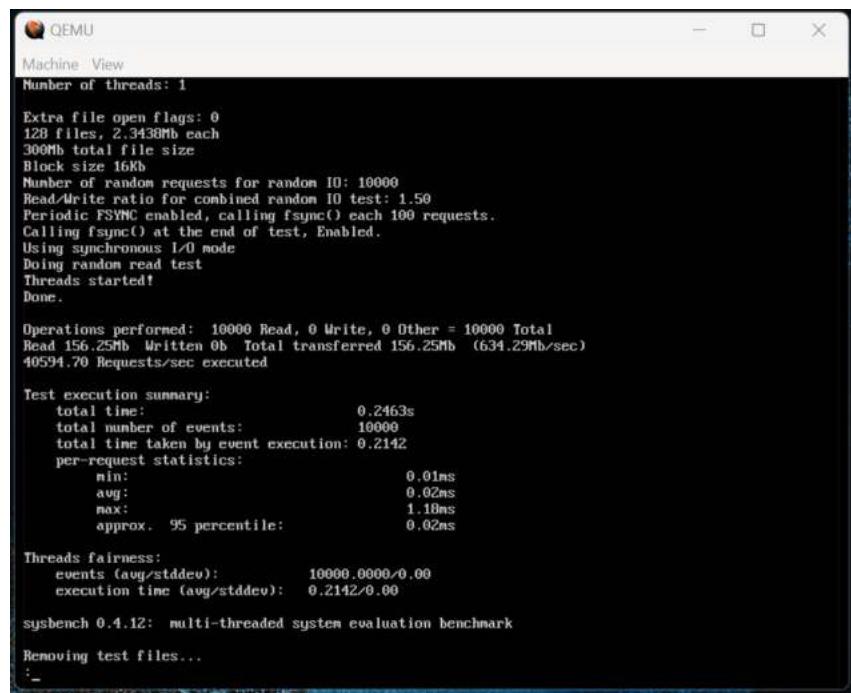
Test execution summary:
    total time:                      0.2579s
    total number of events:          10000
    total time taken by event execution: 0.2226
    per-request statistics:
        min:                          0.01ms
        avg:                          0.02ms
        max:                          1.02ms
        approx. 95 percentile:         0.02ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.2226/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:
```

5



QEMU
Machine View
Number of threads: 1

```

Extra file open flags: 0
128 files, 2.343Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (634.29Mb/sec)
40594.70 Requests/sec executed

Test execution summary:
total time: 0.2463s
total number of events: 10000
total time taken by event execution: 0.2142
per-request statistics:
    min: 0.01ms
    avg: 0.02ms
    max: 1.18ms
    approx. 95 percentile: 0.02ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.2142/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
:_
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 1.18ms |

Memory Test

| QEMU Results, Configuration: 4 GB 8 cores for Sequential memory Access | |
|------------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
QEMU
Machine View
Running First Memory test: Sequential Access
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (135628.17 ops/sec)

250.00 MB transferred (132.45 MB/sec)

Test execution summary:
total time: 1.8875s
total number of events: 256000
total time taken by event execution: 1.4374
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 0.33ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.4374/0.00
:
```

2

```
QEMU
Machine View
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (130191.17 ops/sec)

250.00 MB transferred (127.14 MB/sec)

Test execution summary:
total time: 1.9663s
total number of events: 256000
total time taken by event execution: 1.5226
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 7.97ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.5226/0.00
:
```

3

```
QEMU
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (153219.02 ops/sec)

250.00 MB transferred (149.63 MB/sec)

Test execution summary:
total time: 1.6708s
total number of events: 256000
total time taken by event execution: 1.2064
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 2.98ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.2064/0.00
:
```

4

```
QEMU
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (107524.01 ops/sec)

250.00 MB transferred (105.00 MB/sec)

Test execution summary:
total time: 2.3809s
total number of events: 256000
total time taken by event execution: 1.8171
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 7.62ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 1.8171/0.00
:
```

5

```

QEMU
Machine View

Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (67997.61 ops/sec)
250.00 MB transferred (66.40 MB/sec)

Test execution summary:
total time: 3.7648s
total number of events: 256000
total time taken by event execution: 2.8938
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 7.73ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.8938/0.00
:

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 7.73ms |

QEMU Results, Configuration: 4 GB 8 cores for random memory access

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
QEMU
Machine View
Running Second Memory Test: Random Access
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (71946.15 ops/sec)

250.00 MB transferred (70.26 MB/sec)

Test execution summary:
    total time:          3.5582s
    total number of events: 256000
    total time taken by event execution: 2.6996
    per-request statistics:
        min:              0.01ms
        avg:              0.01ms
        max:             16.11ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 2.6996/0.00
:
```

2

```
QEMU
Machine View
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (71852.22 ops/sec)

250.00 MB transferred (70.17 MB/sec)

Test execution summary:
    total time:          3.5629s
    total number of events: 256000
    total time taken by event execution: 2.7035
    per-request statistics:
        min:              0.01ms
        avg:              0.01ms
        max:             16.99ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 2.7035/0.00
:
```

3

```
QEMU
Machine View

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (73203.22 ops/sec)

250.00 MB transferred (71.49 MB/sec)

Test execution summary:
total time: 3.4971s
total number of events: 256000
total time taken by event execution: 2.6517
per-request statistics:
    min: 0.00ns
    avg: 0.01ms
    max: 65.49ms
    approx. 95 percentile: 0.00ns

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.6517/0.00
:_
```

4

```
QEMU
Machine View

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

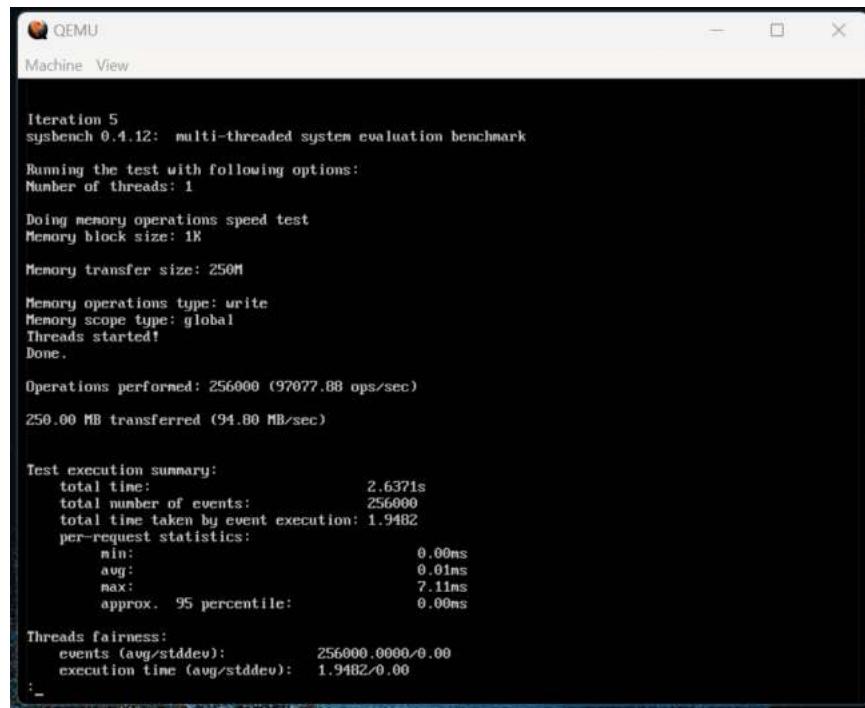
Operations performed: 256000 (80518.46 ops/sec)

250.00 MB transferred (78.63 MB/sec)

Test execution summary:
total time: 3.1794s
total number of events: 256000
total time taken by event execution: 2.4402
per-request statistics:
    min: 0.00ns
    avg: 0.01ms
    max: 24.11ms
    approx. 95 percentile: 0.00ns

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 2.4402/0.00
:_
```

5



Iteration 5
 sysbench 0.4.12: multi-threaded system evaluation benchmark
 Running the test with following options:
 Number of threads: 1
 Doing memory operations speed test
 Memory block size: 1K
 Memory transfer size: 256M
 Memory operations type: write
 Memory scope type: global
 Threads started!
 Done.
 Operations performed: 256000 (97077.88 ops/sec)
 250.00 MB transferred (94.80 MB/sec)
 Test execution summary:
 total time: 2.6371s
 total number of events: 256000
 total time taken by event execution: 1.9482
 per-request statistics:
 min: 0.00ms
 avg: 0.01ms
 max: 7.11ms
 approx. 95 percentile: 0.00ms
 Threads fairness:
 events (avg/stddev): 256000.0000/0.00
 execution time (avg/stddev): 1.9482/0.00
 : -

Observations:

| | |
|----------------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.00ms |
| Minimum Number Time for an event | 0.00ms |
| Maximum Number Time for an event | 7.11ms |

Docker

1. Configuration 1: 2 GB RAM with 2 Cores

CPU Test

Docker Results, Configuration: 2 GB 2 cores for max-prime = 20000

| Sr. No | Screenshots |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <pre> root@7d501109e147:/# ./cpu_bash_script.sh less bash: less: command not found root@7d501109e147:/# ./cpu_bash_script.sh Running First CPU Test: High Prime Number Calculation Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 7.0010s total number of events: 10000 total time taken by event execution: 6.9997 per-request statistics: min: 0.63ms avg: 0.70ms max: 2.71ms approx. 95 percentile: 0.81ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 6.9997/0.00 </pre> |
| 2 | <pre> Iteration 2 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! WARNING: Operation time (18446744073707405312.000000) is greater than maximal counted value, counting as 10000000000000.000000 WARNING: Percentile statistics will be inaccurate Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 7.2296s total number of events: 10000 total time taken by event execution: 7.2279 per-request statistics: min: 0.63ms avg: 0.72ms max: 18446744073707.52ms approx. 95 percentile: 0.84ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 7.2279/0.00 </pre> |

3

```
Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:           7.0577s
  total number of events:    10000
  total time taken by event execution: 7.0564
  per-request statistics:
    min:                 0.63ms
    avg:                 0.71ms
    max:                 3.32ms
    approx. 95 percentile: 0.80ms

  Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 7.0564/0.00
```

4

```
Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:           7.0440s
  total number of events:    10000
  total time taken by event execution: 7.0426
  per-request statistics:
    min:                 0.63ms
    avg:                 0.70ms
    max:                 2.70ms
    approx. 95 percentile: 0.81ms

  Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 7.0426/0.00
```

5

```
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          7.0221s
    total number of events: 10000
    total time taken by event execution: 7.0210
    per-request statistics:
        min:                0.63ms
        avg:                0.79ms
        max:                2.88ms
        approx. 95 percentile: 0.81ms

    Threads fairness:
        events (avg/stddev): 10000.0000/0.00
        execution time (avg/stddev): 7.0210/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.70ms |
| Stddev | 0.81ms |
| Minimum Time for an event | 0.63ms |
| Maximum Time for an event | 2.56ms |

Docker Results, Configuration: 2 GB 2 cores for max-prime = 10000

| Sr. No | Screenshots |
|--------|-------------|
| | |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Running Second CPU Test: Multiple Threads Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 1 Test execution summary: total time: 1.4650s total number of events: 10000 total time taken by event execution: 5.8526 per-request statistics: min: 0.24ms avg: 0.59ms max: 53.56ms approx. 95 percentile: 0.49ms Threads fairness: events (avg/stddev): 2500.0000/26.50 execution time (avg/stddev): 1.4631/0.00 </pre> |
| 2 | <pre> Iteration 2 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 2 Test execution summary: total time: 1.5786s total number of events: 10000 total time taken by event execution: 6.3099 per-request statistics: min: 0.27ms avg: 0.63ms max: 56.91ms approx. 95 percentile: 0.54ms Threads fairness: events (avg/stddev): 2500.0000/10.56 execution time (avg/stddev): 1.5775/0.00 </pre> |

3

```
Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:           1.5064s
  total number of events: 10000
  total time taken by event execution: 6.0215
  per-request statistics:
    min:                 0.24ms
    avg:                 0.60ms
    max:                 51.75ms
    approx. 95 percentile: 0.47ms

Threads fairness:
  events (avg/stddev):   2500.0000/24.75
  execution time (avg/stddev):  1.5054/0.00
```

4

```
Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:           1.5805s
  total number of events: 10000
  total time taken by event execution: 6.3191
  per-request statistics:
    min:                 0.24ms
    avg:                 0.63ms
    max:                 51.65ms
    approx. 95 percentile: 0.55ms

Threads fairness:
  events (avg/stddev):   2500.0000/26.14
  execution time (avg/stddev):  1.5798/0.00
```

5

```
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
    total time:          1.5140s
    total number of events: 10000
    total time taken by event execution: 6.0528
    per-request statistics:
        min:                 0.24ms
        avg:                 0.61ms
        max:                51.43ms
        approx. 95 percentile: 0.50ms

Threads fairness:
    events (avg/stddev):   2500.0000/17.76
    execution time (avg/stddev):  1.5132/0.00

CPU tests completed.
root@7d501109e147:/#
```

Observations:

| | |
|---------------------------|---------|
| Average | 0.61ms |
| Stddev | 0.50ms |
| Minimum Time for an event | 0.24ms |
| Maximum Time for an event | 46.77ms |

File I/O Test

Docker Results, Configuration: 2 GB 2 cores for sequential write

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (883.12Mb/sec)
56519.79 Requests/sec executed

1 Test execution summary:
total time: 0.2831s
total number of events: 16000
total time taken by event execution: 0.0877
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 1.79ms
    approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.0877/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

```
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (926.81Mb/sec)
59315.56 Requests/sec executed

2 Test execution summary:
total time: 0.2697s
total number of events: 16000
total time taken by event execution: 0.0866
per-request statistics:
    min: 0.00ms
    avg: 0.01ms
    max: 0.27ms
    approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.0866/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

```
Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (929.95Mb/sec)
59516.65 Requests/sec executed

Test execution summary:
    total time:                      0.2688s
    total number of events:          16000
    total time taken by event execution: 0.0880
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          0.17ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):        16000.0000/0.00
        execution time (avg/stddev): 0.0880/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

```
Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (869.7Mb/sec)
55660.78 Requests/sec executed

Test execution summary:
    total time:                      0.2875s
    total number of events:          16000
    total time taken by event execution: 0.0912
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          0.50ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):        16000.0000/0.00
        execution time (avg/stddev): 0.0912/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

5

```

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (893.15Mb/sec)
57161.56 Requests/sec executed

Test execution summary:
  total time:          0.2799s
  total number of events: 16000
  total time taken by event execution: 0.0934
  per-request statistics:
    min:                0.00ms
    avg:                0.01ms
    max:                0.47ms
    approx. 95 percentile: 0.01ms

  Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.0934/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.45ms |

Docker Results, Configuration: 2 GB 2 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.6067Gb/sec)
432976.64 Requests/sec executed

1 Test execution summary:
    total time:                      0.0231s
    total number of events:           10000
    total time taken by event execution: 0.0220
    per-request statistics:
        min:                           0.00ms
        avg:                           0.00ms
        max:                           0.14ms
        approx. 95 percentile:          0.00ms

    Threads fairness:
        events (avg/stddev):          10000.0000/0.00
        execution time (avg/stddev):   0.0220/0.00

    sysbench 0.4.12: multi-threaded system evaluation benchmark

    Removing test files...
```

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (5.9137Gb/sec)
387557.35 Requests/sec executed

2 Test execution summary:
    total time:                      0.0258s
    total number of events:           10000
    total time taken by event execution: 0.0246
    per-request statistics:
        min:                           0.00ms
        avg:                           0.00ms
        max:                           1.04ms
        approx. 95 percentile:          0.00ms

    Threads fairness:
        events (avg/stddev):          10000.0000/0.00
        execution time (avg/stddev):   0.0246/0.00

    sysbench 0.4.12: multi-threaded system evaluation benchmark

    Removing test files...
```

3

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.8189Gb/sec)
446882.08 Requests/sec executed

Test execution summary:
    total time:                      0.0224s
    total number of events:          10000
    total time taken by event execution: 0.0208
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          0.12ms
        approx. 95 percentile:         0.00ms

    Threads fairness:
        events (avg/stddev):        10000.0000/0.00
        execution time (avg/stddev): 0.0208/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

4

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.2248Gb/sec)
407949.22 Requests/sec executed

Test execution summary:
    total time:                      0.0245s
    total number of events:          10000
    total time taken by event execution: 0.0230
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          0.44ms
        approx. 95 percentile:         0.00ms

    Threads fairness:
        events (avg/stddev):        10000.0000/0.00
        execution time (avg/stddev): 0.0230/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

5

```
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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (7.1712Gb/sec)
469974.55 Requests/sec executed

Test execution summary:
total time:                      0.0213s
total number of events:          10000
total time taken by event execution: 0.0203
per-request statistics:
    min:                          0.00ms
    avg:                          0.00ms
    max:                          0.18ms
    approx. 95 percentile:        0.00ms

Threads fairness:
events (avg/stddev):           10000.0000/0.00
execution time (avg/stddev):   0.0203/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

File I/O tests completed.
root@7d50109e147:/#
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.18ms |

Memory Test

Docker Results, Configuration: 2 GB 2 cores for Sequential memory Access

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5377224.93 ops/sec)

250.00 MB transferred (5251.20 MB/sec)

Test execution summary:
  total time:          0.0476s
  total number of events: 256000
  total time taken by event execution: 0.0386
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 0.07ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 0.0386/0.00
```

2

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5297692.34 ops/sec)

250.00 MB transferred (5173.53 MB/sec)

Test execution summary:
  total time:          0.0483s
  total number of events: 256000
  total time taken by event execution: 0.0390
  per-request statistics:
    min:                 0.00ms
    avg:                 0.00ms
    max:                 0.22ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 0.0390/0.00
```

3

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5268661.94 ops/sec)  
250.00 MB transferred (5145.18 MB/sec)  
  
Test execution summary:  
total time: 0.0486s  
total number of events: 256000  
total time taken by event execution: 0.0392  
per-request statistics:  
    min: 0.00ms  
    avg: 0.00ms  
    max: 0.28ms  
    approx. 95 percentile: 0.00ms  
  
Threads fairness:  
events (avg/stddev): 256000.0000/0.00  
execution time (avg/stddev): 0.0392/0.00
```

4

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5135809.25 ops/sec)  
250.00 MB transferred (5015.44 MB/sec)  
  
Test execution summary:  
total time: 0.0498s  
total number of events: 256000  
total time taken by event execution: 0.0400  
per-request statistics:  
    min: 0.00ms  
    avg: 0.00ms  
    max: 0.18ms  
    approx. 95 percentile: 0.00ms  
  
Threads fairness:  
events (avg/stddev): 256000.0000/0.00  
execution time (avg/stddev): 0.0400/0.00
```

5

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5227054.47 ops/sec)  
250.00 MB transferred (5104.55 MB/sec)  
  
Test execution summary:  
    total time:          0.0490s  
    total number of events: 256000  
    total time taken by event execution: 0.0399  
    per-request statistics:  
        min:            0.00ms  
        avg:            0.00ms  
        max:            0.33ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0399/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.33ms |

Docker Results, Configuration: 2 GB 2 cores for Random Read

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 256M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (6158861.61 ops/sec)  
256.00 MB transferred (6013.73 MB/sec)  
  
Test execution summary:  
    total time:          0.0416s  
    total number of events: 256000  
    total time taken by event execution: 0.0322  
    per-request statistics:  
        min:                 0.00ns  
        avg:                 0.00ns  
        max:                 0.55ns  
        approx. 95 percentile: 0.00ns  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0322/0.00
```

2

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 256M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (6017632.42 ops/sec)  
256.00 MB transferred (5876.59 MB/sec)  
  
Test execution summary:  
    total time:          0.0425s  
    total number of events: 256000  
    total time taken by event execution: 0.0330  
    per-request statistics:  
        min:                 0.00ms  
        avg:                 0.00ms  
        max:                 0.31ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0330/0.00
```

3

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6155796.92 ops/sec)
250.00 MB transferred (6011.52 MB/sec)

Test execution summary:
total time:          0.0416s
total number of events: 256000
total time taken by event execution: 0.0324
per-request statistics:
    min:          0.00ms
    avg:          0.00ms
    max:          0.15ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0324/0.00
```

4

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6051931.28 ops/sec)
250.00 MB transferred (5910.09 MB/sec)

Test execution summary:
total time:          0.0423s
total number of events: 256000
total time taken by event execution: 0.0330
per-request statistics:
    min:          0.00ms
    avg:          0.00ms
    max:          0.47ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0330/0.00
```

5

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6147221.64 ops/sec)
250.00 MB transferred (6003.15 MB/sec)

Test execution summary:
    total time:          0.0416s
    total number of events: 256000
    total time taken by event execution: 0.0325
    per-request statistics:
        min:                 0.00ms
        avg:                 0.00ms
        max:                 0.12ms
        approx. 95 percentile: 0.00ms

    Threads fairness:
        events (avg/stddev): 256000.0000/0.00
        execution time (avg/stddev): 0.0325/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.12ms |

2. Configuration 2: 3 GB RAM with 3 Cores

CPU Test

| Docker Results, Configuration: 3 GB 3 cores for max-prime = 20000 | |
|-------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
root@03e0f2f95d9d:/# ./cpu_bash_script.sh
Running First CPU Test: High Prime Number Calculation
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 7.0151s
total number of events: 10000
total time taken by event execution: 7.0139
per-request statistics:
    min: 0.63ms
    avg: 0.70ms
    max: 6.83ms
    approx. 95 percentile: 0.81ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 7.0139/0.00
```

2

```
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time: 7.1561s
total number of events: 10000
total time taken by event execution: 7.1548
per-request statistics:
    min: 0.63ms
    avg: 0.72ms
    max: 3.77ms
    approx. 95 percentile: 0.82ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 7.1548/0.00
```

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 </pre> |
| 3 | <pre> Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 7.9450s total number of events: 10000 total time taken by event execution: 7.9429 per-request statistics: min: 0.63ms avg: 0.79ms max: 5.36ms approx. 95 percentile: 1.10ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 7.9429/0.00 </pre> |
| 4 | <pre> Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 7.9450s total number of events: 10000 total time taken by event execution: 7.9429 per-request statistics: min: 0.63ms avg: 0.79ms max: 5.36ms approx. 95 percentile: 1.10ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 7.9429/0.00 </pre> |

5

```
Iteration 5
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
  total time:          7.8251s
  total number of events:    10000
  total time taken by event execution: 7.8229
  per-request statistics:
    min:                 0.63ms
    avg:                 0.78ms
    max:                 4.69ms
    approx. 95 percentile: 1.08ms

  Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 7.8229/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.78ms |
| Stddev | 1.08ms |
| Minimum Time for an event | 0.53ms |
| Maximum Time for an event | 4.69ms |

Docker Results, Configuration: 3 GB 3 cores for max-prime = 10000

| Sr. No | Screenshots |
|--------|-------------|
| | |

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <pre> Running Second CPU Test: Multiple Threads Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 0.9571s total number of events: 10000 total time taken by event execution: 3.8255 per-request statistics: min: 0.25ms avg: 0.38ms max: 30.59ms approx. 95 percentile: 0.34ms Threads fairness: events (avg/stddev): 2500.0000/57.43 execution time (avg/stddev): 0.9564/0.00 </pre> |
| 2 | <pre> Iteration 2 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 0.9864s total number of events: 10000 total time taken by event execution: 3.9425 per-request statistics: min: 0.26ms avg: 0.39ms max: 30.86ms approx. 95 percentile: 0.35ms Threads fairness: events (avg/stddev): 2500.0000/49.05 execution time (avg/stddev): 0.9856/0.00 </pre> |
| 3 | <pre> Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 0.9831s total number of events: 10000 total time taken by event execution: 3.9298 per-request statistics: min: 0.27ms avg: 0.39ms max: 30.62ms approx. 95 percentile: 0.35ms Threads fairness: events (avg/stddev): 2500.0000/31.00 execution time (avg/stddev): 0.9824/0.00 </pre> |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 4 Test execution summary: total time: 0.9810s total number of events: 10000 total time taken by event execution: 3.9215 per-request statistics: min: 0.27ms avg: 0.39ms max: 30.77ms approx. 95 percentile: 0.34ms Threads fairness: events (avg/stddev): 2500.0000/43.59 execution time (avg/stddev): 0.9804/0.00 </pre> |
| 5 | <pre> Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 5 Test execution summary: total time: 0.9544s total number of events: 10000 total time taken by event execution: 3.8143 per-request statistics: min: 0.27ms avg: 0.38ms max: 30.77ms approx. 95 percentile: 0.33ms Threads fairness: events (avg/stddev): 2500.0000/54.90 execution time (avg/stddev): 0.9536/0.00 CPU tests completed. root@03e0f2f95d9d:# </pre> |

Observations:

| | |
|---------------------------|---------|
| Average/Stddev | 0.38ms |
| Minimum Time for an event | 0.27ms |
| Maximum Time for an event | 30.77ms |

File I/O Test

| Docker Results, Configuration: 3 GB 3 cores for sequential write | |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 | <pre>Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! Done. Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total Read 0b Written 250Mb Total transferred 250Mb (905.87Mb/sec) 57975.64 Requests/sec executed Test execution summary: total time: 0.2760s total number of events: 16000 total time taken by event execution: 0.0864 per-request statistics: min: 0.00ms avg: 0.01ms max: 0.62ms approx. 95 percentile: 0.01ms Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 0.0864/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files...</pre> |
| 2 | <pre>Extra file open flags: 0 128 files, 1.9531Mb each 250Mb total file size Block size 16Kb Periodic FSYNC enabled, calling fsync() each 100 requests. Calling fsync() at the end of test, Enabled. Using synchronous I/O mode Doing sequential write (creation) test Threads started! Done. Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total Read 0b Written 250Mb Total transferred 250Mb (907.23Mb/sec) 58062.55 Requests/sec executed Test execution summary: total time: 0.2756s total number of events: 16000 total time taken by event execution: 0.0875 per-request statistics: min: 0.00ms avg: 0.01ms max: 0.63ms approx. 95 percentile: 0.01ms Threads fairness: events (avg/stddev): 16000.0000/0.00 execution time (avg/stddev): 0.0875/0.00 sysbench 0.4.12: multi-threaded system evaluation benchmark Removing test files...</pre> |

3

```
Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (909.32Mb/sec)
58196.17 Requests/sec executed

Test execution summary:
    total time:                      0.2749s
    total number of events:          16000
    total time taken by event execution: 0.0858
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          0.24ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):         16000.0000/0.00
        execution time (avg/stddev):  0.0858/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

4

```
Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (883.75Mb/sec)
56560.25 Requests/sec executed

Test execution summary:
    total time:                      0.2829s
    total number of events:          16000
    total time taken by event execution: 0.0884
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          0.56ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):         16000.0000/0.00
        execution time (avg/stddev):  0.0884/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

5

```

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (922.24Mb/sec)
59023.68 Requests/sec executed

Test execution summary:
    total time:          0.2711s
    total number of events: 16000
    total time taken by event execution: 0.0891
    per-request statistics:
        min:              0.00ms
        avg:              0.01ms
        max:              0.36ms
        approx. 95 percentile: 0.01ms

    Threads fairness:
        events (avg/stddev):   16000.0000/0.00
        execution time (avg/stddev):  0.0891/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.36ms |

Docker Results, Configuration: 3 GB 3 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (7.4229Gb/sec)
486466.12 Requests/sec executed

1 Test execution summary:
total time: 0.0206s
total number of events: 10000
total time taken by event execution: 0.0195
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.27ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.0195/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.4373Gb/sec)
421877.47 Requests/sec executed

2 Test execution summary:
total time: 0.0237s
total number of events: 10000
total time taken by event execution: 0.0225
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.54ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.0225/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

3

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.8876Gb/sec)
451386.41 Requests/sec executed

Test execution summary:
    total time:          0.0222s
    total number of events: 10000
    total time taken by event execution: 0.0199
    per-request statistics:
        min:              0.00ms
        avg:              0.00ms
        max:              0.30ms
        approx. 95 percentile: 0.00ms

    Threads fairness:
        events (avg/stddev): 10000.0000/0.00
        execution time (avg/stddev): 0.0199/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

4

```
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (7.1485Gb/sec)
468484.77 Requests/sec executed

Test execution summary:
    total time:          0.0213s
    total number of events: 10000
    total time taken by event execution: 0.0203
    per-request statistics:
        min:              0.00ms
        avg:              0.00ms
        max:              0.10ms
        approx. 95 percentile: 0.00ms

    Threads fairness:
        events (avg/stddev): 10000.0000/0.00
        execution time (avg/stddev): 0.0203/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...
```

5

```

300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.2731Gb/sec)
411114.29 Requests/sec executed

Test execution summary:
    total time:          0.0243s
    total number of events: 10000
    total time taken by event execution: 0.0232
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.23ms
        approx. 95 percentile: 0.00ms

    Threads fairness:
        events (avg/stddev): 10000.0000/0.00
        execution time (avg/stddev): 0.0232/0.00

sysbench 0.4.12: multi-threaded system evaluation benchmark

Removing test files...

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.23ms |

Memory Test

Docker Results, Configuration: 3 GB 3 cores for Sequential memory Access

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
Number of threads: 1
Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5383278.38 ops/sec)
250.00 MB transferred (5257.11 MB/sec)

1

Test execution summary:
total time: 0.0476s
total number of events: 256000
total time taken by event execution: 0.0384
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 0.16ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0384/0.00
```

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K
Memory transfer size: 250M
Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5776658.28 ops/sec)
250.00 MB transferred (5641.27 MB/sec)

2

Test execution summary:
total time: 0.0443s
total number of events: 256000
total time taken by event execution: 0.0357
per-request statistics:
    min: 0.00ms
    avg: 0.00ms
    max: 0.11ms
    approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0357/0.00
```

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5486486.90 ops/sec)

250.00 MB transferred (5357.90 MB/sec)

Test execution summary:

| | |
|--------------------------------------|---------|
| total time: | 0.0467s |
| total number of events: | 256000 |
| total time taken by event execution: | 0.0375 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.00ms |
| max: | 0.10ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| | |
|------------------------------|------------------|
| events (avg/stddev): | 256000.0000/0.00 |
| execution time (avg/stddev): | 0.0375/0.00 |

3

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5267448.74 ops/sec)

250.00 MB transferred (5143.99 MB/sec)

Test execution summary:

| | |
|--------------------------------------|---------|
| total time: | 0.0486s |
| total number of events: | 256000 |
| total time taken by event execution: | 0.0395 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.00ms |
| max: | 0.26ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| | |
|------------------------------|------------------|
| events (avg/stddev): | 256000.0000/0.00 |
| execution time (avg/stddev): | 0.0395/0.00 |

4

5

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5349335.65 ops/sec)  
250.00 MB transferred (5223.96 MB/sec)  
  
Test execution summary:  
total time: 0.0479s  
total number of events: 256000  
total time taken by event execution: 0.0389  
per-request statistics:  
    min: 0.00ms  
    avg: 0.00ms  
    max: 0.22ms  
    approx. 95 percentile: 0.00ms  
  
Threads fairness:  
events (avg/stddev): 256000.0000/0.00  
execution time (avg/stddev): 0.0389/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.22ms |

Docker Results, Configuration: 3 GB 3 cores for random memory access

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6105950.40 ops/sec)

250.00 MB transferred (5962.84 MB/sec)

Test execution summary:
    total time:          0.0419s
    total number of events: 256000
    total time taken by event execution: 0.0327
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.30ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 0.0327/0.00
```

2

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6112947.89 ops/sec)

250.00 MB transferred (5969.68 MB/sec)

Test execution summary:
    total time:          0.0419s
    total number of events: 256000
    total time taken by event execution: 0.0326
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.25ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 0.0326/0.00
```

3

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (6162442.91 ops/sec)  
250.00 MB transferred (6018.01 MB/sec)  
  
Test execution summary:  
    total time:          0.0415s  
    total number of events: 256000  
    total time taken by event execution: 0.0323  
    per-request statistics:  
        min:            0.00ms  
        avg:            0.00ms  
        max:            0.36ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0323/0.00
```

4

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (6233082.72 ops/sec)  
250.00 MB transferred (6086.99 MB/sec)  
  
Test execution summary:  
    total time:          0.0411s  
    total number of events: 256000  
    total time taken by event execution: 0.0319  
    per-request statistics:  
        min:            0.00ms  
        avg:            0.00ms  
        max:            0.26ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0319/0.00
```

5

```
Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6180086.12 ops/sec)
250.00 MB transferred (6035.24 MB/sec)

Test execution summary:
    total time:          0.0414s
    total number of events: 256000
    total time taken by event execution: 0.0323
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.26ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev): 256000.0000/0.00
    execution time (avg/stddev): 0.0323/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.00ms |
| Stddev | 0.05ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.26ms |

3. Configuration 3: 3 GB RAM with 6 Cores

CPU Test

| Dokcer Results, Configuration: 3 GB 6 cores for max-prime = 20000 | |
|-------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
C:\Users\Nityanand Pujari>docker run -it -m 3g --cpus=6 ubuntu37
root@679e92ea7ab8:/# chmod +x cpu_bash_script.sh
root@679e92ea7ab8:/# ./cpu_bash_script.sh
Running First CPU Test: High Prime Number Calculation
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time:                      7.0846s
total number of events:          10000
total time taken by event execution: 7.0834
per-request statistics:
    min:                           0.63ms
    avg:                           0.71ms
    max:                           5.01ms
    approx. 95 percentile:         0.83ms

Threads fairness:
events (avg/stddev):           10000.0000/0.00
execution time (avg/stddev):    7.0834/0.00
```

2

```
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
total time:                      6.9321s
total number of events:          10000
total time taken by event execution: 6.9309
per-request statistics:
    min:                           0.63ms
    avg:                           0.69ms
    max:                           3.65ms
    approx. 95 percentile:         0.80ms

Threads fairness:
events (avg/stddev):           10000.0000/0.00
execution time (avg/stddev):    6.9309/0.00
```

Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

3

Test execution summary:
total time: 7.0295s
total number of events: 10000
total time taken by event execution: 7.0284
per-request statistics:
min: 0.63ms
avg: 0.70ms
max: 4.18ms
approx. 95 percentile: 0.80ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 7.0284/0.00

Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

4

Test execution summary:
total time: 6.9726s
total number of events: 10000
total time taken by event execution: 6.9713
per-request statistics:
min: 0.63ms
avg: 0.70ms
max: 2.09ms
approx. 95 percentile: 0.81ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 6.9713/0.00

| | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <pre> Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 7.0288s total number of events: 10000 total time taken by event execution: 7.0277 per-request statistics: min: 0.63ms avg: 0.70ms max: 3.17ms approx. 95 percentile: 0.84ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 7.0277/0.00 </pre> |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Observations:

| | |
|---------------------------|--------|
| Average | 0.70ms |
| Stddev | 0.80ms |
| Minimum Time for an event | 0.63ms |
| Maximum Time for an event | 3.17ms |

| Docker Results, Configuration: 3 GB 6 cores for max-prime = 10000 | |
|-------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

1

```
Running Second CPU Test: Multiple Threads
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          0.7276s
  total number of events: 10000
  total time taken by event execution: 2.9016
  per-request statistics:
    min:                 0.27ms
    avg:                 0.29ms
    max:                 5.94ms
    approx. 95 percentile: 0.32ms

Threads fairness:
  events (avg/stddev): 2500.0000/23.14
  execution time (avg/stddev): 0.7254/0.00
```

2

```
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          0.7324s
  total number of events: 10000
  total time taken by event execution: 2.9265
  per-request statistics:
    min:                 0.27ms
    avg:                 0.29ms
    max:                 1.45ms
    approx. 95 percentile: 0.33ms

Threads fairness:
  events (avg/stddev): 2500.0000/3.32
  execution time (avg/stddev): 0.7316/0.00
```

3

```
Iteration 3
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          0.7308s
  total number of events: 10000
  total time taken by event execution: 2.9200
  per-request statistics:
    min:                0.27ms
    avg:                0.29ms
    max:                1.14ms
    approx. 95 percentile: 0.32ms

Threads fairness:
  events (avg/stddev):   2500.0000/9.35
  execution time (avg/stddev):  0.7300/0.00
```

4

```
Iteration 4
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 4

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 10000

Test execution summary:
  total time:          0.7382s
  total number of events: 10000
  total time taken by event execution: 2.9502
  per-request statistics:
    min:                0.27ms
    avg:                0.30ms
    max:                1.12ms
    approx. 95 percentile: 0.33ms

Threads fairness:
  events (avg/stddev):   2500.0000/7.84
  execution time (avg/stddev):  0.7375/0.00
```

| | |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <pre> Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 0.7487s total number of events: 10000 total time taken by event execution: 2.9922 per-request statistics: min: 0.27ms avg: 0.30ms max: 0.96ms approx. 95 percentile: 0.33ms Threads fairness: events (avg/stddev): 2500.0000/18.80 execution time (avg/stddev): 0.7480/0.00 CPU tests completed. </pre> |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Observations:

| | |
|---------------------------|--------|
| Average | 0.30ms |
| Stddev | 0.45ms |
| Minimum Time for an event | 0.27ms |
| Maximum Time for an event | 0.96ms |

File I/O Test

| Docker Results, Configuration: 3 GB 6 cores for sequential write | |
|------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |
| | |

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (935.34Mb/sec)
59861.64 Requests/sec executed

Test execution summary:
total time: 0.2673s
total number of events: 16000
total time taken by event execution: 0.0893
per-request statistics:
min: 0.00ms
avg: 0.01ms
max: 0.57ms
approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.0893/0.00

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (928.6Mb/sec)
59430.39 Requests/sec executed

Test execution summary:
total time: 0.2692s
total number of events: 16000
total time taken by event execution: 0.0909
per-request statistics:
min: 0.00ms
avg: 0.01ms
max: 0.75ms
approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.0909/0.00

3

```
Running the test with following options:  
Number of threads: 1  
  
Extra file open flags: 0  
128 files, 1.9531Mb each  
250Mb total file size  
Block size 16Kb  
Periodic FSYNC enabled, calling fsync() each 100 requests.  
Calling fsync() at the end of test, Enabled.  
Using synchronous I/O mode  
Doing sequential write (creation) test  
Threads started!  
Done.  
  
Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total  
Read 0b Written 250Mb Total transferred 250Mb (345.27Mb/sec)  
22097.30 Requests/sec executed  
  
Test execution summary:  
    total time:                      0.7241s  
    total number of events:          16000  
    total time taken by event execution: 0.1543  
    per-request statistics:  
        min:                          0.00ms  
        avg:                          0.01ms  
        max:                          5.40ms  
        approx. 95 percentile:         0.01ms  
  
Threads fairness:  
    events (avg/stddev):           16000.0000/0.00  
    execution time (avg/stddev):   0.1543/0.00
```

4

```
Running the test with following options:  
Number of threads: 1  
  
Extra file open flags: 0  
128 files, 1.9531Mb each  
250Mb total file size  
Block size 16Kb  
Periodic FSYNC enabled, calling fsync() each 100 requests.  
Calling fsync() at the end of test, Enabled.  
Using synchronous I/O mode  
Doing sequential write (creation) test  
Threads started!  
Done.  
  
Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total  
Read 0b Written 250Mb Total transferred 250Mb (301.49Mb/sec)  
19295.59 Requests/sec executed  
  
Test execution summary:  
    total time:                      0.8292s  
    total number of events:          16000  
    total time taken by event execution: 0.1952  
    per-request statistics:  
        min:                          0.00ms  
        avg:                          0.01ms  
        max:                          4.97ms  
        approx. 95 percentile:         0.01ms  
  
Threads fairness:  
    events (avg/stddev):           16000.0000/0.00  
    execution time (avg/stddev):   0.1952/0.00
```

5

```

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (801.79Mb/sec)
51314.77 Requests/sec executed

Test execution summary:
    total time:          0.3118s
    total number of events: 16000
    total time taken by event execution: 0.0953
    per-request statistics:
        min:                0.00ms
        avg:                0.01ms
        max:                0.18ms
        approx. 95 percentile: 0.01ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.0953/0.00

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.03ms |
| Minimum Time for an event | 0.00ms |
| Maximum Time for an event | 0.18ms |

Docker Results, Configuration: 3 GB 6 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (5.6717Gb/sec)
371697.98 Requests/sec executed

Test execution summary:
    total time:          0.0269s
    total number of events: 10000
    total time taken by event execution: 0.0257
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.47ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev):  0.0257/0.00
```

```
Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (6.2767Gb/sec)
411347.72 Requests/sec executed

Test execution summary:
    total time:          0.0243s
    total number of events: 10000
    total time taken by event execution: 0.0230
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.10ms
        approx. 95 percentile: 0.00ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev):  0.0230/0.00
```

Number of threads: 1
Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (5.5491Gb/sec)
363667.89 Requests/sec executed

Test execution summary:
total time: 0.0275s
total number of events: 10000
total time taken by event execution: 0.0263
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.10ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.0263/0.00

Number of threads: 1
Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (5.7482Gb/sec)
376716.31 Requests/sec executed

Test execution summary:
total time: 0.0265s
total number of events: 10000
total time taken by event execution: 0.0254
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.14ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 10000.0000/0.00
execution time (avg/stddev): 0.0254/0.00

5

```

Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (5.6911Gb/sec)
372975.13 Requests/sec executed

Test execution summary:
    total time:          0.0268s
    total number of events: 10000
    total time taken by event execution: 0.0256
    per-request statistics:
        min:            0.00ms
        avg:            0.00ms
        max:            0.22ms
        approx. 95 percentile: 0.00ms

    Threads fairness:
        events (avg/stddev): 10000.0000/0.00
        execution time (avg/stddev): 0.0256/0.00

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.04ms |
| Minimum Time for an event | 0.04ms |
| Maximum Time for an event | 0.34ms |

Memory Test

Docker Results, Configuration: 3 GB 6 cores for Sequential memory Access

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5313875.91 ops/sec)  
1  
  
250.00 MB transferred (5189.33 MB/sec)  
  
Test execution summary:  
    total time:          0.0482s  
    total number of events: 256000  
    total time taken by event execution: 0.0391  
    per-request statistics:  
        min:              0.00ms  
        avg:              0.00ms  
        max:              0.17ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0391/0.00
```

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5522907.84 ops/sec)  
2  
  
250.00 MB transferred (5393.46 MB/sec)  
  
Test execution summary:  
    total time:          0.0464s  
    total number of events: 256000  
    total time taken by event execution: 0.0374  
    per-request statistics:  
        min:              0.00ms  
        avg:              0.00ms  
        max:              0.15ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0374/0.00
```

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5338290.94 ops/sec)
250.00 MB transferred (5213.17 MB/sec)

Test execution summary:
total time: 0.0480s
total number of events: 256000
total time taken by event execution: 0.0388
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.14ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0388/0.00

3

4

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5342051.56 ops/sec)
250.00 MB transferred (5216.85 MB/sec)

Test execution summary:
total time: 0.0479s
total number of events: 256000
total time taken by event execution: 0.0389
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.25ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0389/0.00

5

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (5278326.68 ops/sec)  
250.00 MB transferred (5154.62 MB/sec)  
  
Test execution summary:  
    total time:          0.0485s  
    total number of events: 256000  
    total time taken by event execution: 0.0392  
    per-request statistics:  
        min:                0.00ms  
        avg:                0.00ms  
        max:                0.25ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0392/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.05ms |
| Stddev | 0.07ms |
| Minimum Time for an event | 0.03ms |
| Maximum Time for an event | 0.25ms |

Docker Results, Configuration: 3 GB 6 cores for random memory access

| Sr. No | Screenshots |
|--------|-------------|
| | |

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6177832.03 ops/sec)

1
250.00 MB transferred (6033.04 MB/sec)

Test execution summary:

| total time: | 0.0414s |
|--------------------------------------|---------|
| total number of events: | 256000 |
| total time taken by event execution: | 0.0321 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.04ms |
| max: | 0.14ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| events (avg/stddev): | 256000.0000/0.00 |
|------------------------------|------------------|
| execution time (avg/stddev): | 0.0321/0.00 |

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6064091.19 ops/sec)

2
250.00 MB transferred (5921.96 MB/sec)

Test execution summary:

| total time: | 0.0422s |
|--------------------------------------|---------|
| total number of events: | 256000 |
| total time taken by event execution: | 0.0321 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.00ms |
| max: | 0.10ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| events (avg/stddev): | 256000.0000/0.00 |
|------------------------------|------------------|
| execution time (avg/stddev): | 0.0321/0.00 |

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (5980937.82 ops/sec)

3
250.00 MB transferred (5840.76 MB/sec)

Test execution summary:

| | |
|--------------------------------------|---------|
| total time: | 0.0428s |
| total number of events: | 256000 |
| total time taken by event execution: | 0.0330 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.00ms |
| max: | 0.21ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| | |
|------------------------------|------------------|
| events (avg/stddev): | 256000.0000/0.00 |
| execution time (avg/stddev): | 0.0330/0.00 |

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (6158713.17 ops/sec)

4
250.00 MB transferred (6014.37 MB/sec)

Test execution summary:

| | |
|--------------------------------------|---------|
| total time: | 0.0416s |
| total number of events: | 256000 |
| total time taken by event execution: | 0.0323 |
| per-request statistics: | |
| min: | 0.00ms |
| avg: | 0.00ms |
| max: | 0.14ms |
| approx. 95 percentile: | 0.00ms |

Threads fairness:

| | |
|------------------------------|------------------|
| events (avg/stddev): | 256000.0000/0.00 |
| execution time (avg/stddev): | 0.0323/0.00 |

5

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (6064426.33 ops/sec)  
250.00 MB transferred (5922.29 MB/sec)  
  
Test execution summary:  
total time: 0.0422s  
total number of events: 256000  
total time taken by event execution: 0.0324  
per-request statistics:  
    min: 0.00ms  
    avg: 0.00ms  
    max: 0.23ms  
    approx. 95 percentile: 0.00ms  
  
Threads fairness:  
events (avg/stddev): 256000.0000/0.00  
execution time (avg/stddev): 0.0324/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.07ms |
| Stddev | 0.08ms |
| Minimum Time for an event | 0.03ms |
| Maximum Time for an event | 0.23ms |

4. Configuration 4: 4 GB RAM with 8 Cores

CPU Test

Docker Results, Configuration: 4 GB 8 cores for max-prime = 20000

| Sr. No | Screenshots |
|--------|-------------|
| | |

```
C:\Users\Nityanand Pujari>docker run -it -m 4g --cpus=8 ubuntu37
root@af2ce3a7ea8b:/# chmod +x cpu_bash_script.sh
root@af2ce3a7ea8b:/# ./cpu_bash_script.sh
Running First CPU Test: High Prime Number Calculation
Iteration 1
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          13.2565s
    total number of events: 10000
    total time taken by event execution: 13.2537
    per-request statistics:
        min:                 1.16ms
        avg:                 1.33ms
        max:                 11.71ms
        approx. 95 percentile: 1.72ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 13.2537/0.00
```

1

```
Iteration 2
sysbench 0.4.12: multi-threaded system evaluation benchmark

Running the test with following options:
Number of threads: 1

Doing CPU performance benchmark

Threads started!
WARNING: Operation time (18446744073687066624.000000) is greater than maximal
WARNING: Percentile statistics will be inaccurate
Done.

Maximum prime number checked in CPU test: 20000

Test execution summary:
    total time:          13.1254s
    total number of events: 10000
    total time taken by event execution: 13.1223
    per-request statistics:
        min:                 1.18ms
        avg:                 1.31ms
        max:                 18446744073687.80ms
        approx. 95 percentile: 1.74ms

Threads fairness:
    events (avg/stddev):   10000.0000/0.00
    execution time (avg/stddev): 13.1223/0.00
```

2

| | |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 13.2904s total number of events: 10000 total time taken by event execution: 13.2880 per-request statistics: min: 1.14ms avg: 1.33ms max: 13.31ms approx. 95 percentile: 1.73ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 13.2880/0.00 </pre> |
| 3 | <pre> Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 13.4396s total number of events: 10000 total time taken by event execution: 13.4370 per-request statistics: min: 1.19ms avg: 1.34ms max: 30.25ms approx. 95 percentile: 1.75ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 13.4370/0.00 </pre> |
| 4 | <pre> Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 1 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 20000 Test execution summary: total time: 13.2914s total number of events: 10000 total time taken by event execution: 13.2889 per-request statistics: min: 1.18ms avg: 1.33ms max: 12.68ms approx. 95 percentile: 1.73ms Threads fairness: events (avg/stddev): 10000.0000/0.00 execution time (avg/stddev): 13.2889/0.00 </pre> |

Observations:

| | |
|---------------------------|---------|
| Average | 1.33ms |
| Stddev | 1.22ms |
| Minimum Time for an event | 1.18ms |
| Maximum Time for an event | 12.68ms |

| Docker Results, Configuration: 4 GB 8 cores for max-prime = 10000 | |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sr. No | Screenshots |
| 1 | <pre> Running Second CPU Test: Multiple Threads Iteration 1 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 1.8393s total number of events: 10000 total time taken by event execution: 7.3471 per-request statistics: min: 0.46ms avg: 0.73ms max: 4.57ms approx. 95 percentile: 0.98ms Threads fairness: events (avg/stddev): 2500.0000/39.52 execution time (avg/stddev): 1.8368/0.00 </pre> |
| 2 | <pre> Iteration 2 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 1.9565s total number of events: 10000 total time taken by event execution: 7.8209 per-request statistics: min: 0.46ms avg: 0.78ms max: 3.95ms approx. 95 percentile: 0.98ms Threads fairness: events (avg/stddev): 2500.0000/51.84 execution time (avg/stddev): 1.9552/0.00 </pre> |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Iteration 3 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 </pre> |
| 3 | <pre> Test execution summary: total time: 1.9028s total number of events: 10000 total time taken by event execution: 7.6065 per-request statistics: min: 0.46ms avg: 0.76ms max: 8.75ms approx. 95 percentile: 0.99ms Threads fairness: events (avg/stddev): 2500.0000/54.67 execution time (avg/stddev): 1.9016/0.00 </pre> |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <pre> Iteration 4 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 </pre> |
| 4 | <pre> Test execution summary: total time: 1.6160s total number of events: 10000 total time taken by event execution: 6.4585 per-request statistics: min: 0.46ms avg: 0.65ms max: 6.66ms approx. 95 percentile: 0.93ms Threads fairness: events (avg/stddev): 2500.0000/45.76 execution time (avg/stddev): 1.6146/0.00 </pre> |

| | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <pre> Iteration 5 sysbench 0.4.12: multi-threaded system evaluation benchmark Running the test with following options: Number of threads: 4 Doing CPU performance benchmark Threads started! Done. Maximum prime number checked in CPU test: 10000 Test execution summary: total time: 1.7513s total number of events: 10000 total time taken by event execution: 6.9993 per-request statistics: min: 0.46ms avg: 0.70ms max: 2.36ms approx. 95 percentile: 0.95ms Threads fairness: events (avg/stddev): 2500.0000/29.05 execution time (avg/stddev): 1.7498/0.00 CPU tests completed. </pre> |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Observations:

| | |
|---------------------------|--------|
| Average | 0.70ms |
| Stddev | 0.9ms |
| Minimum Time for an event | 0.46ms |
| Maximum Time for an event | 2.36ms |

File I/O Test

| Docker Results, Configuration: 4 GB 8 cores for sequential write | |
|-------------------------------------------------------------------------|-------------|
| Sr. No | Screenshots |

| Sr. No | Screenshots |
|--------|-------------|
|--------|-------------|

1

```
Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (418.99Mb/sec)
26815.27 Requests/sec executed

Test execution summary:
total time: 0.5967s
total number of events: 16000
total time taken by event execution: 0.1680
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 0.81ms
    approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.1680/0.00
```

2

```
Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (376.17Mb/sec)
24075.10 Requests/sec executed

Test execution summary:
total time: 0.6646s
total number of events: 16000
total time taken by event execution: 0.1624
per-request statistics:
    min: 0.01ms
    avg: 0.01ms
    max: 0.83ms
    approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.1624/0.00
```

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (423.65Mb/sec)
27113.74 Requests/sec executed

Test execution summary:
total time: 0.5901s
total number of events: 16000
total time taken by event execution: 0.1697
per-request statistics:
min: 0.01ms
avg: 0.01ms
max: 2.48ms
approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.1697/0.00

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16Kb
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (437.54Mb/sec)
28002.77 Requests/sec executed

Test execution summary:
total time: 0.5714s
total number of events: 16000
total time taken by event execution: 0.1673
per-request statistics:
min: 0.01ms
avg: 0.01ms
max: 0.92ms
approx. 95 percentile: 0.01ms

Threads fairness:
events (avg/stddev): 16000.0000/0.00
execution time (avg/stddev): 0.1673/0.00

5

```

Running the test with following options:
Number of threads: 1

Extra file open flags: 0
128 files, 1.9531Mb each
250Mb total file size
Block size 16kB
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing sequential write (creation) test
Threads started!
Done.

Operations performed: 0 Read, 16000 Write, 128 Other = 16128 Total
Read 0b Written 250Mb Total transferred 250Mb (412.58Mb/sec)
26404.81 Requests/sec executed

Test execution summary:
    total time:          0.6960s
    total number of events: 16000
    total time taken by event execution: 0.1616
    per-request statistics:
        min:                0.01ms
        avg:                0.01ms
        max:                0.79ms
        approx. 95 percentile: 0.01ms

Threads fairness:
    events (avg/stddev): 16000.0000/0.00
    execution time (avg/stddev): 0.1616/0.00

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.01ms |
| Stddev | 0.02ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 0.79ms |

Docker Results, Configuration: 4 GB 8 cores for random read

| Sr. No | Screenshots |
|--------|-------------|
| | |

```

Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (3.05Gb/sec)
199886.20 Requests/sec executed

Test execution summary:
    total time:                      0.0500s
    total number of events:          10000
    total time taken by event execution: 0.0478
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          1.62ms
        approx. 95 percentile:         0.01ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.0478/0.00

```

1

```

Number of threads: 1

Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (2.1026Gb/sec)
137793.69 Requests/sec executed

Test execution summary:
    total time:                      0.0726s
    total number of events:          10000
    total time taken by event execution: 0.0706
    per-request statistics:
        min:                          0.00ms
        avg:                          0.01ms
        max:                          18.32ms
        approx. 95 percentile:         0.01ms

Threads fairness:
    events (avg/stddev):           10000.0000/0.00
    execution time (avg/stddev):   0.0706/0.00

```

2

3

```
Number of threads: 1
Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (3.0579Gb/sec)
200404.11 Requests/sec executed

Test execution summary:
    total time:                      0.0499s
    total number of events:          10000
    total time taken by event execution: 0.0476
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          0.57ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):         10000.0000/0.00
        execution time (avg/stddev): 0.0476/0.00
```

4

```
Number of threads: 1
Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (3.1935Gb/sec)
209287.90 Requests/sec executed

Test execution summary:
    total time:                      0.0478s
    total number of events:          10000
    total time taken by event execution: 0.0457
    per-request statistics:
        min:                          0.00ms
        avg:                          0.00ms
        max:                          0.71ms
        approx. 95 percentile:         0.01ms

    Threads fairness:
        events (avg/stddev):         10000.0000/0.00
        execution time (avg/stddev): 0.0457/0.00
```

```

Number of threads: 1
Extra file open flags: 0
128 files, 2.3438Mb each
300Mb 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 read test
Threads started!
Done.

Operations performed: 10000 Read, 0 Write, 0 Other = 10000 Total
Read 156.25Mb Written 0b Total transferred 156.25Mb (2.968Gb/sec)
194511.32 Requests/sec executed

Test execution summary:
    total time:          0.0514s
    total number of events: 10000
    total time taken by event execution: 0.0489
    per-request statistics:
        min:                0.00ms
        avg:                0.00ms
        max:                0.37ms
        approx. 95 percentile: 0.01ms

Threads fairness:
    events (avg/stddev): 10000.0000/0.00
    execution time (avg/stddev): 0.0489/0.00

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.03ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.04ms |
| Maximum Time for an event | 0.37ms |

Memory Test

Docker Results, Configuration: 4 GB 8 cores for Sequential memory Access

| Sr. No | Screenshots |
|--------|-------------|
| | |

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (2474795.25 ops/sec)

1
250.00 MB transferred (2416.79 MB/sec)

Test execution summary:
total time: 0.1034s
total number of events: 256000
total time taken by event execution: 0.0835
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.42ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0835/0.00

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (2929168.29 ops/sec)

2
250.00 MB transferred (2860.52 MB/sec)

Test execution summary:
total time: 0.0874s
total number of events: 256000
total time taken by event execution: 0.0697
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.30ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0697/0.00

3

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (2946152.81 ops/sec)  
250.00 MB transferred (2877.10 MB/sec)  
  
Test execution summary:  
    total time:          0.0869s  
    total number of events: 256000  
    total time taken by event execution: 0.0703  
    per-request statistics:  
        min:                0.00ms  
        avg:                0.00ms  
        max:                0.74ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0703/0.00
```

4

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (2995276.73 ops/sec)  
250.00 MB transferred (2925.07 MB/sec)  
  
Test execution summary:  
    total time:          0.0855s  
    total number of events: 256000  
    total time taken by event execution: 0.0687  
    per-request statistics:  
        min:                0.00ms  
        avg:                0.00ms  
        max:                0.75ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0687/0.00
```

5

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (2988705.44 ops/sec)  
250.00 MB transferred (2918.66 MB/sec)  
  
Test execution summary:  
total time: 0.0857s  
total number of events: 256000  
total time taken by event execution: 0.0686  
per-request statistics:  
    min: 0.00ms  
    avg: 0.00ms  
    max: 0.53ms  
    approx. 95 percentile: 0.00ms  
  
Threads fairness:  
events (avg/stddev): 256000.0000/0.00  
execution time (avg/stddev): 0.0686/0.00
```

Observations:

| | |
|---------------------------|--------|
| Average | 0.02ms |
| Stddev | 0.00ms |
| Minimum Time for an event | 0.01ms |
| Maximum Time for an event | 0.53ms |

Docker Results, Configuration: 4 GB 8 cores for random memory access

| Sr. No | Screenshots |
|--------|-------------|
| | |

1

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (3436923.84 ops/sec)  
250.00 MB transferred (3356.37 MB/sec)  
  
Test execution summary:  
    total time:          0.0745s  
    total number of events: 256000  
    total time taken by event execution: 0.0586  
    per-request statistics:  
        min:                0.00ms  
        avg:                0.00ms  
        max:                0.69ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0586/0.00
```

2

```
Running the test with following options:  
Number of threads: 1  
  
Doing memory operations speed test  
Memory block size: 1K  
  
Memory transfer size: 250M  
  
Memory operations type: write  
Memory scope type: global  
Threads started!  
Done.  
  
Operations performed: 256000 (3336145.43 ops/sec)  
250.00 MB transferred (3257.95 MB/sec)  
  
Test execution summary:  
    total time:          0.0767s  
    total number of events: 256000  
    total time taken by event execution: 0.0607  
    per-request statistics:  
        min:                0.00ms  
        avg:                0.00ms  
        max:                1.03ms  
        approx. 95 percentile: 0.00ms  
  
Threads fairness:  
    events (avg/stddev): 256000.0000/0.00  
    execution time (avg/stddev): 0.0607/0.00
```

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (3328340.30 ops/sec)
250.00 MB transferred (3250.33 MB/sec)

3

Test execution summary:
total time: 0.0769s
total number of events: 256000
total time taken by event execution: 0.0597
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 1.94ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0597/0.00

4

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (3480164.79 ops/sec)
250.00 MB transferred (3398.68 MB/sec)

Test execution summary:
total time: 0.0736s
total number of events: 256000
total time taken by event execution: 0.0577
per-request statistics:
min: 0.00ms
avg: 0.00ms
max: 0.67ms
approx. 95 percentile: 0.00ms

Threads fairness:
events (avg/stddev): 256000.0000/0.00
execution time (avg/stddev): 0.0577/0.00

5

```

Running the test with following options:
Number of threads: 1

Doing memory operations speed test
Memory block size: 1K

Memory transfer size: 250M

Memory operations type: write
Memory scope type: global
Threads started!
Done.

Operations performed: 256000 (3048667.06 ops/sec)
250.00 MB transferred (2977.21 MB/sec)

Test execution summary:
  total time:          0.0840s
  total number of events: 256000
  total time taken by event execution: 0.0630
  per-request statistics:
    min:                0.00ms
    avg:                0.00ms
    max:                1.26ms
    approx. 95 percentile: 0.00ms

Threads fairness:
  events (avg/stddev): 256000.0000/0.00
  execution time (avg/stddev): 0.0630/0.00

```

Observations:

| | |
|---------------------------|--------|
| Average | 0.03ms |
| Stddev | 0.01ms |
| Minimum Time for an event | 0.04ms |
| Maximum Time for an event | 1.26ms |

Analysis:

Detailed observations from experiments were conducted to compare the performance of Docker and QEMU under various configurations of CPU, memory, and disk I/O operations. Key findings from the analysis include differences in execution time, standard deviation, and minimum and maximum event times for CPU tests, File I/O tests, and Memory tests across different configurations (2 GB RAM with 2 cores, 3 GB RAM with 3 cores, 3 GB RAM with 6 cores, and 4 GB RAM with 8 cores).

For CPU tests, Docker showed significantly lower average execution times and standard deviations, indicating more efficient CPU utilization and consistent performance. File I/O tests revealed Docker to have markedly lower times for sequential and random operations, showcasing its superior disk I/O

efficiency. Memory tests demonstrated Docker's advantage in handling memory operations, with minimal to no delay in accessing memory.

The analysis suggests that Docker's containerization technology, which shares the host system's kernel without the need for a full virtual machine, provides a more efficient use of resources. This results in better performance metrics in CPU, File I/O, and Memory tests compared to QEMU, which emulates a complete hardware system and thus incurs additional overhead.

This comparative analysis highlights Docker's suitability for environments where performance and resource efficiency are critical, while QEMU may be preferred in scenarios requiring full system emulation.

Conclusions:

The comparative analysis of Docker and QEMU demonstrates Docker's superior performance across CPU efficiency, disk I/O operations, and memory management. Docker's containerization technology, leveraging the host's kernel, ensures optimal resource utilization and consistent performance, making it a preferable solution in environments where efficiency is paramount. Conversely, QEMU, with its full system emulation, offers comprehensive virtualization at the cost of higher resource overhead. This study underlines Docker's advantages for performance-critical applications while acknowledging QEMU's utility in scenarios requiring complete hardware emulation.

Extra Credit-

Vagrant File:

```
Vagrant.configure("2") do |config|
  config.vm.box = "ubuntu/bionic64"
  config.vm.network "private_network", type: "dhcp"
  config.vm.provider "virtualbox" do |vb|
    vb.memory = "4024"
    vb.cpus = 4
  end
end
```