

1. QEMU Set Up

I tried a variety of commands to install QEMU on M2 Mac, but it still not work, the commands and results are as follows.

(1)Commands

```
brew install qemu
```

```
sudo qemu-img create ubuntu.img 10G -f qcow2
```

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

```
/Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso -m 2046 -boot strict=on
```

```
2022-10-15 23:47:53.941 qemu-system-x86_64[30178:2371529] Text input context does not respond to _valueForTIPProperty:  
(base) zian@zhangziyandeMacBook-Pro ~ % brew install qemu  
Warning: qemu 3.2.0 is already installed and up-to-date.  
To reinstall 7.1.0, run:  
brew reinstall qemu  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo apt-get install qemu  
sudo: apt: command not found  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo qemu-img create ubuntu.img 10G -f qcow2  
Formatting '/ubuntu.img', fmt=qcow2 cluster_size=65536 extended_l2=off compression_type=zlib size=10737418240 lazy_refcounts=off refcount_bits=16  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo qemu-system-x86_64 -hda ubuntu.img -boot d -cdrom ./Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso -m 2046 -boot strict=on  
qemu-system-x86_64: -cdrom ./Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso: Could not open '/Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso': No such file or directory  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo qemu-system-x86_64 -hda ubuntu.img -boot d -cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso -m 2046 -boot strict=on  
qemu-system-x86_64: -cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso: Could not open '/Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso': No such file or directory  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo qemu-system-x86_64 -hda ubuntu.img -boot d -cdrom /Ubuntu/Ubuntu-20.04.5-live-server-arm64.iso -m 2046 -boot strict=on  
qemu-system-x86_64: -cdrom /Ubuntu/Ubuntu-20.04.5-live-server-arm64.iso: Could not open '/Ubuntu/Ubuntu-20.04.5-live-server-arm64.iso': No such file or directory  
(base) zian@zhangziyandeMacBook-Pro ~ % sudo qemu-system-x86_64 -hda ubuntu.img -boot d -cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso -m 2046 -boot strict=on  
2022-10-15 23:52:53.852 ipxe[31458:2378382] imxpc_getApplicationPropertyParams: reply called with an incorrect property value 4, bailning.  
2022-10-15 23:52:53.856 ipxe[31458:2378382] imxpc_getApplicationPropertyParams: reply called with an incorrect property value 4, bailning.  
2022-10-15 23:52:53.856 ipxe[31458:2378382] imxpc_getApplicationPropertyParams: reply called with an incorrect property value 4, bailning.  
2022-10-15 23:52:53.856 ipxe[31458:2378382] Text input context does not respond to _valueForTIPProperty:  
2022-10-15 23:52:53.856 ipxe[31458:2378382] imxpc_getApplicationPropertyParams: reply called with an incorrect property value 4, bailning.  
2022-10-15 23:52:53.856 ipxe[31458:2378382] Text input context does not respond to _valueForTIPProperty:  
2022-10-15 23:52:53.856 ipxe[31458:2378382] imxpc_getApplicationPropertyParams: reply called with an incorrect property value 4, bailning.  
2022-10-15 23:52:53.856 ipxe[31458:2378382] TIPPropertyValueisValid called with 4 on nil context!
```

Fig1.1

No bootable device

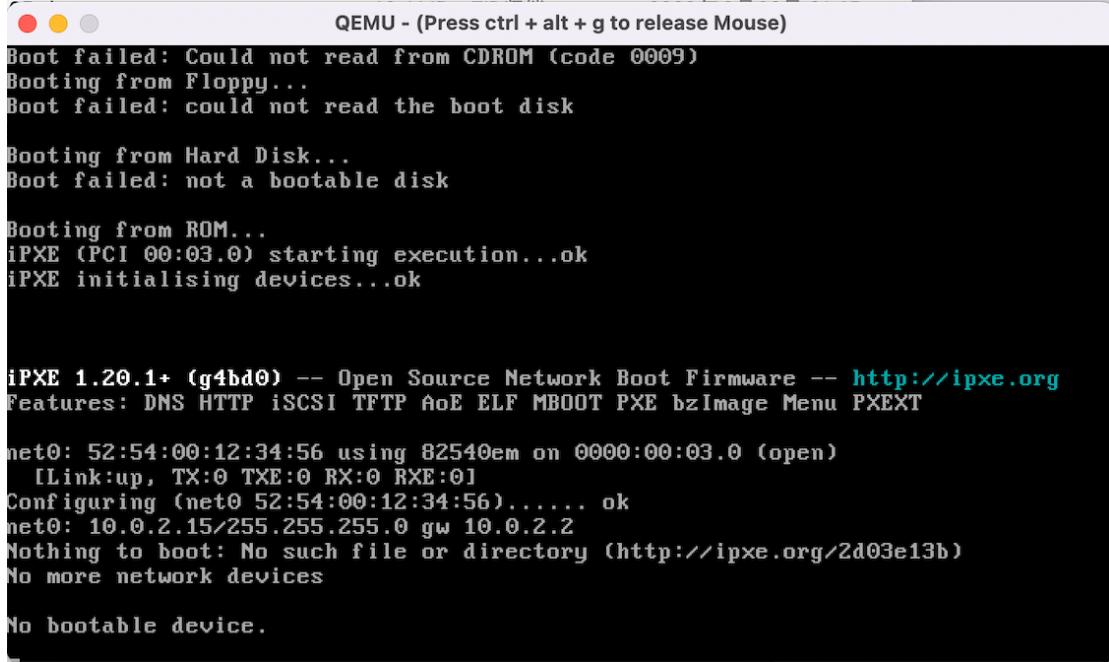


Fig1.2

(2)Commands

```
qemu-img create -f qcow2 ~/QEMU/ubuntu-desktop-20.04.qcow2 10G
```

```
qemu-system-x86_64 \
```

```
-m 4G \
```

```
-vga virtio \
```

```
-display default,show-cursor=on \
```

```
-usb \
```

```
-device usb-tablet \
```

```

-machine type=q35,accel=hvf \
-smp 4 \
-drive file=ubuntu-desktop-20.04.qcow2,if=virtio \
-cpu Nehalem-v1 \
-net user,hostfwd=tcp::2222-:22 \
-net nic \
-cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso

```

```

Use --machine help to list supported machines
(base) zian@hangziyandeMacBook-Pro ~ % [200-qemu-img
zsh: bad pattern: [200-qemu-img
(base) zian@hangziyandeMacBook-Pro ~ % qemu-img create -f qcow2 ~/QEMU/ubuntu-desktop-20.04.qcow2 10G
Formatting '/Users/zian/QEMU/ubuntu-desktop-20.04.qcow2', fmt=qcow2 cluster_size=65536 extended_l2=off compression_type=zlib size=10737418240 lazy_refcounts=off refcount_bits=16
(base) zian@hangziyandeMacBook-Pro ~ % qemu-system-x86_64 \
-m 4G \
-vga virtio \
--display default,show-cursor=on \
-usb \
-device usb-tablet \
-machine type=q35,accel=hvf \
-smp 4 \
-drive file=ubuntu-desktop-20.04.qcow2,if=virtio \
-cpu Nehalem-v1 \
-net user,hostfwd=tcp::2222-:22 \
-net nic \
-cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso

```

Fig1.3

qemu-system-x86_64: -drive file=ubuntu-desktop-20.04.qcow2,if=virtio: Could not open 'ubuntu-desktop-20.04.qcow2': No such file or directory

```

-net user,hostfwd=tcp::2222-:22 \
-net nic \
-cdrom /Users/zian/Downloads/ubuntu-20.04.5-live-server-arm64.iso
qemu-system-x86_64: -drive file=ubuntu-desktop-20.04.qcow2,if=virtio: Could not open 'ubuntu-desktop-20.04.qcow2': No such file or directory
(base) zian@hangziyandeMacBook-Pro ~ % qemu-system-x86_64 \
-m 4G \
-vga virtio \

```

Fig1.4

The commands above didn't work, so finally I decided to use UTM and set up the Ubuntu.

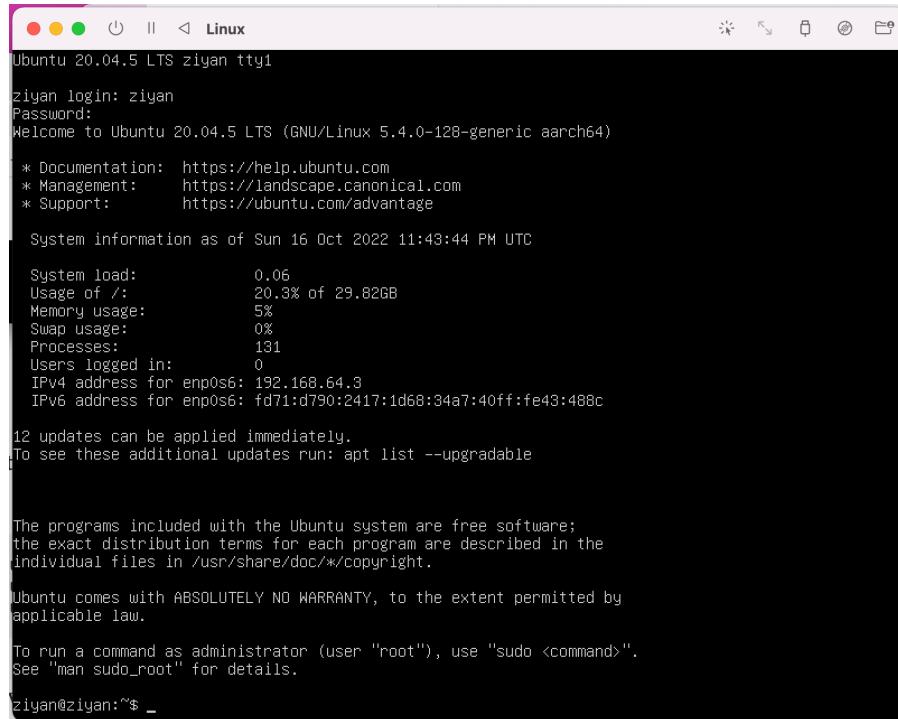


Fig1.5 Ubuntu Set Up

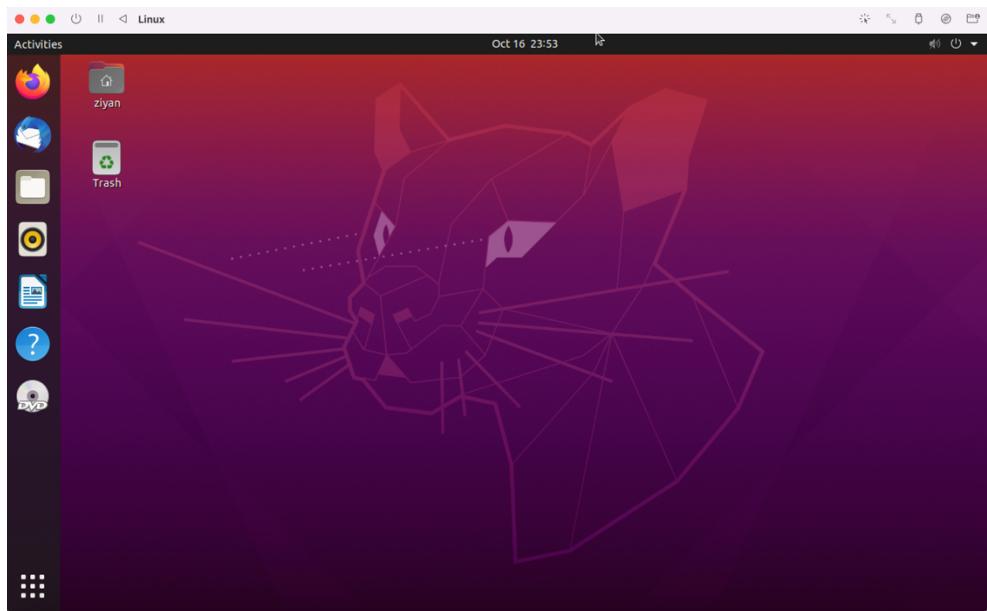


Fig1.6 Ubuntu Set Up

2. Sysbench Installation on QEMU

```
$ sudo apt update
```

```
$ sudo apt install sysbench
```

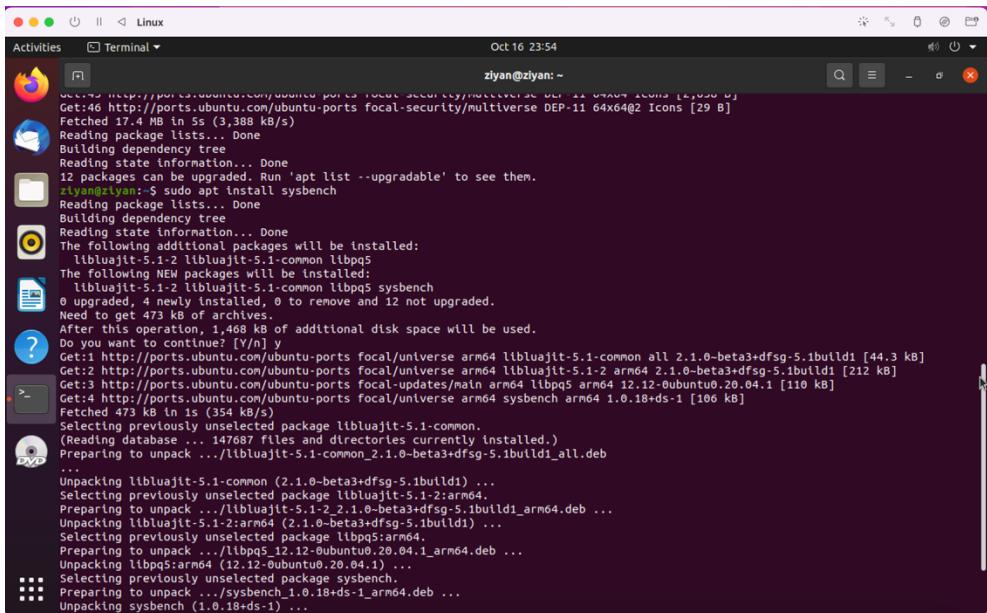


Fig2.1 Sysbench Install

3. Docker Set Up

(1) Install Ubuntu

```
docker pull ubuntu
```

```
[(base) ziyan@zhangziyandeMacBook-Pro ~ % docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
d6cb415e2683: Pull complete
Digest: sha256:35fb073f9e56eb84041b0745cb714eff0f7b225ea9e024f703cab56aaa5c7720
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
(base) ziyan@zhangziyandeMacBook-Pro ~ % ]
```

Fig3.1 Ubuntu Installation

(2) Run Container

```
docker pull centos
```

```
docker run -d -it --name=ziyan centos
```

```
docker ps
```

```
docker exec -it ziyan /bin/bash
```

```
● ● ● ziyan — root@c5b7dec9e5d8:~ — com.docker.cli - docker exec -it ziyan /bin/bash — 96x23
[(base) ziyan@zhangziyandeMacBook-Pro ~ % docker pull centos
Using default tag: latest
latest: Pulling from library/centos
52f9ef134af7: Pull complete
Digest: sha256:a27fd8080b517143cbbbab9dfb7c8571c40d67d534bbdee55bd6c473f432b177
Status: Downloaded newer image for centos:latest
docker.io/library/centos:latest
[(base) ziyan@zhangziyandeMacBook-Pro ~ % docker run -d -it --name=ziyan centos
c5b7dec9e5d809a59349ca87ca63991d27cb7fe25d4124e99197530f610c0010
[(base) ziyan@zhangziyandeMacBook-Pro ~ % docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
c5b7dec9e5d8 centos "/bin/bash" 5 seconds ago Up 4 seconds
[(base) ziyan@zhangziyandeMacBook-Pro ~ % docker exec -it ziyan /bin/bash
```

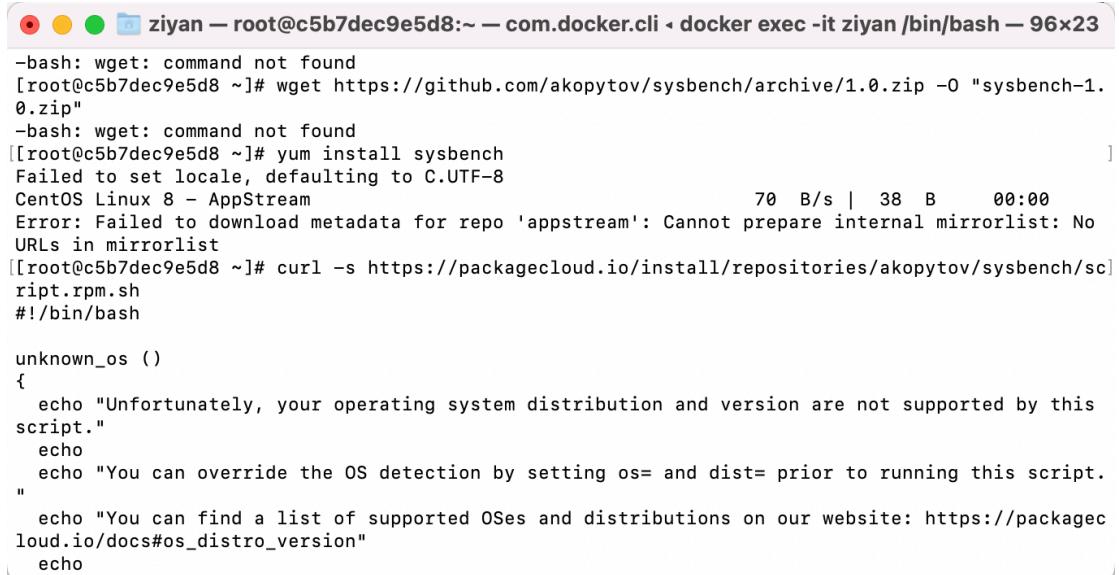
Fig3.2 Run Container

4. Sysbench Installation

I tried several ways to install sysbench in the container, but it didn't work.

```
● ● ● ziyan — root@c5b7dec9e5d8:~ — com.docker.cli - docker exec -it ziyan /bin/bash — 96x23
[[root@c5b7dec9e5d8 /]# sudo yum install sysbench
bash: sudo: command not found
[[root@c5b7dec9e5d8 /]# yum -y install epel-release
Failed to set locale, defaulting to C.UTF-8
CentOS Linux 8 - AppStream
66 B/s | 38 B 00:00
Error: Failed to download metadata for repo 'appstream': Cannot prepare internal mirrorlist: No URLs in mirrorlist
[[root@c5b7dec9e5d8 /]# yum -y install make automake libtool pkgconfig libaio-devel vim-common
Failed to set locale, defaulting to C.UTF-8
CentOS Linux 8 - AppStream
117 B/s | 38 B 00:00
Error: Failed to download metadata for repo 'appstream': Cannot prepare internal mirrorlist: No URLs in mirrorlist
[[root@c5b7dec9e5d8 /]# wget https://download-ib01.fedoraproject.org/pub/epel/8/Everything/x86_64
/Packages/s/sysbench-1.0.20-5.el8.x86_64.rpm
bash: wget: command not found
[[root@c5b7dec9e5d8 /]# apt-get install sudo
bash: apt-get: command not found
[[root@c5b7dec9e5d8 /]# su -
[[root@c5b7dec9e5d8 ~]# apt-get install sudo
-bash: apt-get: command not found
[[root@c5b7dec9e5d8 ~]# wget https://download-ib01.fedoraproject.org/pub/epel/8/Everything/x86_64
/Packages/s/sysbench-1.0.20-5.el8.x86_64.rpm
-bash: wget: command not found
```

Fig4.1 Sysbench installation in Container Failed 1



```

ziyan — root@c5b7dec9e5d8:~ — com.docker.cli - docker exec -it ziyan /bin/bash — 96x23
-bash: wget: command not found
[root@c5b7dec9e5d8 ~]# wget https://github.com/akopytov/sysbench/archive/1.0.zip -O "sysbench-1.0.zip"
-bash: wget: command not found
[[root@c5b7dec9e5d8 ~]# yum install sysbench
Failed to set locale, defaulting to C.UTF-8
CentOS Linux 8 - AppStream
Error: Failed to download metadata for repo 'appstream': Cannot prepare internal mirrorlist: No URLs in mirrorlist
[[root@c5b7dec9e5d8 ~]# curl -s https://packagecloud.io/install/repositories/akopytov/sysbench/sc]
ript.rpm.sh
#!/bin/bash

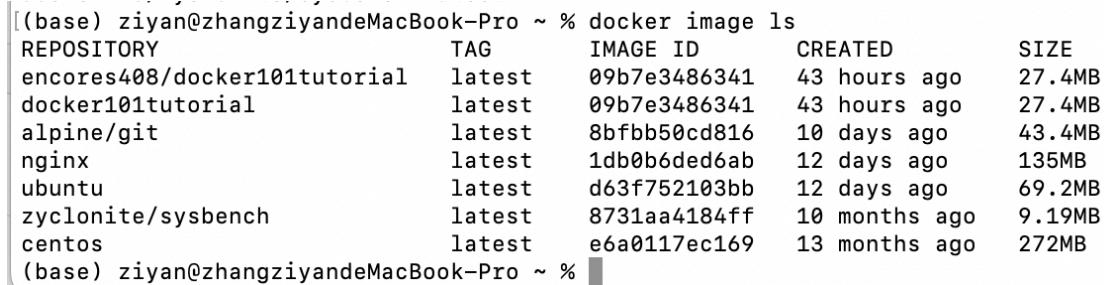
unknown_os ()
{
    echo "Unfortunately, your operating system distribution and version are not supported by this script."
    echo
    echo "You can override the OS detection by setting os= and dist= prior to running this script."
    echo
    echo "You can find a list of supported OSes and distributions on our website: https://packagec
loud.io/docs#os_distro_version"
    echo
}

```

Fig4.1 Sysbench installation in Container Failed 2

5. Docker Image

docker image ls



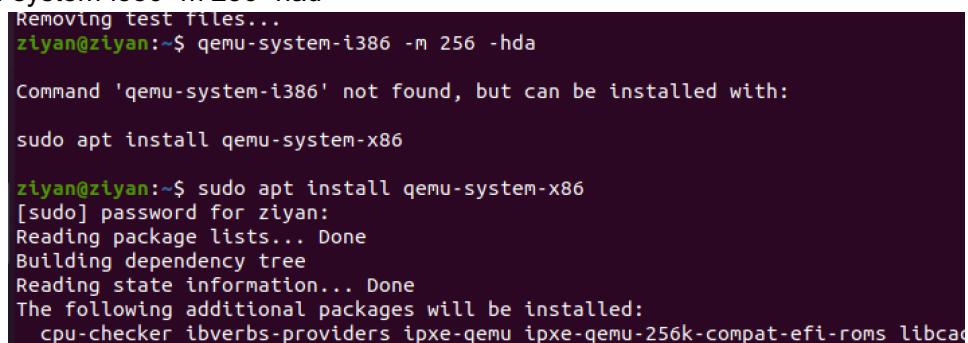
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
encores408/docker101tutorial	latest	09b7e3486341	43 hours ago	27.4MB
docker101tutorial	latest	09b7e3486341	43 hours ago	27.4MB
alpine/git	latest	8bfbb50cd816	10 days ago	43.4MB
nginx	latest	1db0b6ded6ab	12 days ago	135MB
ubuntu	latest	d63f752103bb	12 days ago	69.2MB
zyclonite/sysbench	latest	8731aa4184ff	10 months ago	9.19MB
centos	latest	e6a0117ec169	13 months ago	272MB

Fig5.1 Docker Image

6. Measurements

6.1 Arguments of QEMU

qemu-system-i386 -m 256 -had



```

Removing test files...
ziyan@ziyan:~$ qemu-system-i386 -m 256 -hda
Command 'qemu-system-i386' not found, but can be installed with:

sudo apt install qemu-system-x86

ziyan@ziyan:~$ sudo apt install qemu-system-x86
[sudo] password for ziyan:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  cpu-checker ibverbs-providers ipxe-qemu ipxe-qemu-256k-compat-efi-roms libcad

```

Fig6.1 -m test

sudo apt install qemu-system-x86

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

Boot failed: Could not read from CDROM (code 0009)
Booting from Floppy...
Boot failed: could not read the boot disk

Booting from Hard Disk...
Boot failed: not a bootable disk

Booting from ROM...
iPXE (PCI 00:03.0) starting execution...ok
iPXE initialising devices...ok

iPXE 1.20.1+ (g4bd0) -- Open Source Network Boot Firmware -- <http://ipxe.org>
Features: DNS HTTP iSCSI TFTP AoE ELF MBOOT PXE bzImage Menu PXEXT

net0: 52:54:00:12:34:56 using 82540em on 0000:00:03.0 (open)
[Link:up, TX:0 RX:0 RXE:0]
Configuring (net0 52:54:00:12:34:56)... ok
net0: 10.0.2.15/255.255.255.0 gw 10.0.2.2
Nothing to boot: No such file or directory (<http://ipxe.org/2d03e13b>)
No more network devices

No bootable device.

Fig6.2 No bootable device

6.2 CPU

6.2.1 QEMU

(1)Run On QEMU

sysbench --test=cpu --cpu-max-prime=25000 run

```
ziyan@ziyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
events (avg/stddev):      1231692.0000/0.00
execution time (avg/stddev):   9.9075/0.00

ziyan@ziyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Prime numbers limit: 25000
Initializing worker threads...
Threads started!

CPU speed:
  events per second: 3325.41

General statistics:
  total time:          10.0003s
  total number of events: 33257

Latency (ms):
  min:           0.29
  avg:           0.30
  max:           0.65
  95th percentile: 0.32
  sum:          9993.35

Threads fairness:
  events (avg/stddev):      33257.0000/0.00
  execution time (avg/stddev):   9.9933/0.00

ziyan@ziyan:~$
```

Fig6.3 QEMU CPU Test 1

```
zhiyan@zhiyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Prime numbers limit: 25000
Initializing worker threads...
Threads started!

CPU speed:
  events per second: 3295.04

General statistics:
  total time:          10.00003s
  total number of events: 32953

Latency (ms):
  min:                 0.29
  avg:                 0.30
  max:                 1.52
  95th percentile:    0.33
  sum:                9988.62
  █

Threads fairness:
  events (avg/stddev): 32953.0000/0.00
  execution time (avg/stddev): 9.9886/0.00

zhiyan@zhiyan:~$
```

Fig6.4 QEMU CPU Test 2

```
zhiyan@zhiyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Prime numbers limit: 25000
Initializing worker threads...
Threads started!

CPU speed:
  events per second: 3291.94

General statistics:
  total time:          10.0002s
  total number of events: 32922

Latency (ms):
  min:                 0.29
  avg:                 0.30
  max:                 1.80
  95th percentile:    0.33
  sum:                9991.56
  █

Threads fairness:
  events (avg/stddev): 32922.0000/0.00
  execution time (avg/stddev): 9.9916/0.00

zhiyan@zhiyan:~$ █
```

Fig6.5 QEMU CPU Test 3

```

events (avg/stddev):      32922.0000/0.00
execution time (avg/stddev):  9.9916/0.00

ziyan@ziyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

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

Prime numbers limit: 25000

Initializing worker threads...

Threads started!

CPU speed:
  events per second: 3296.14

General statistics:
  total time:          10.0002s
  total number of events: 32964

Latency (ms):
  min:                 0.29
  avg:                 0.30
  max:                 1.85
  95th percentile:    0.33
  sum:                9990.54

Threads fairness:
  events (avg/stddev): 32964.0000/0.00
  execution time (avg/stddev): 9.9905/0.00

ziyan@ziyan:~$ 

```

Fig6.6 QEMU CPU Test 4

```

[+]
zilyan@ziyan: ~
events (avg/stddev):      32964.0000/0.00
execution time (avg/stddev):  9.9905/0.00

ziyan@ziyan:~$ sysbench --test=cpu --cpu-max-prime=25000 run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

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

Prime numbers limit: 25000

Initializing worker threads...

Threads started!

CPU speed:
  events per second: 3178.59

General statistics:
  total time:          10.0004s
  total number of events: 31789

Latency (ms):
  min:                 0.30
  avg:                 0.31
  max:                 1.41
  95th percentile:    0.34
  sum:                9990.16

Threads fairness:
  events (avg/stddev): 31789.0000/0.00
  execution time (avg/stddev): 9.9902/0.00

zilyan@ziyan:~$ 

```

Fig6.7 QEMU CPU Test 5

(2) Analyze Performance

Table6.1 QEMU CPU Analysis

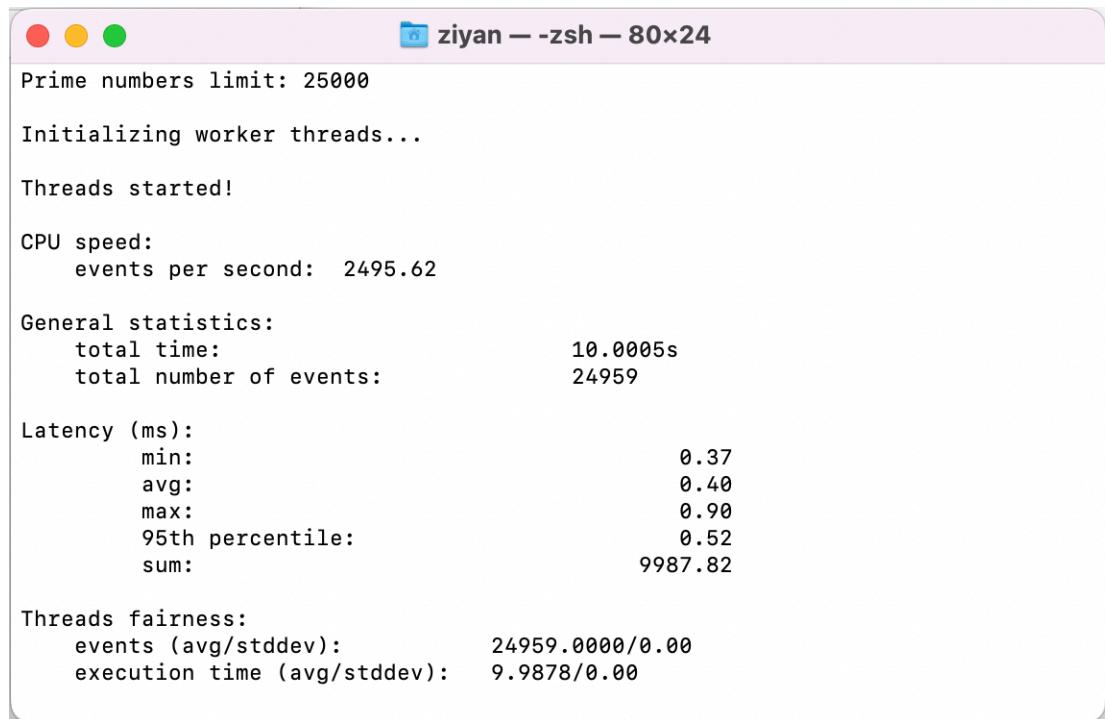
	Average	MIN	MAX	STD
Total Time	10.00028	10.0002	10.0004	8.3666E-05

6.2.2 On Docker

(1)Run On Docker

Though failed to install sysbench in container, I still pulled sysbench from Docker Hub to install sysbench in Docker, and the results are as follows.

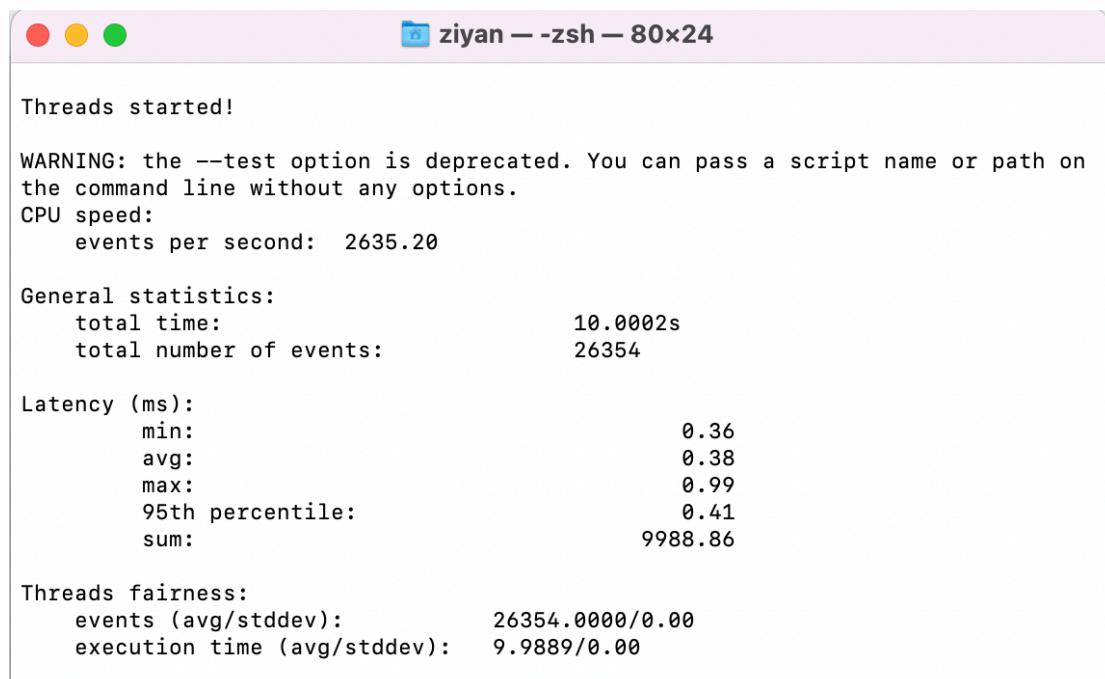
```
docker run zyclonite/sysbench:latest sysbench --test=cpu --cpu-max-prime=25000 run
```



The screenshot shows a terminal window titled "ziyan -- zsh -- 80x24". The output of the sysbench command is displayed:

```
Prime numbers limit: 25000
Initializing worker threads...
Threads started!
CPU speed:
events per second: 2495.62
General statistics:
total time: 10.0005s
total number of events: 24959
Latency (ms):
min: 0.37
avg: 0.40
max: 0.90
95th percentile: 0.52
sum: 9987.82
Threads fairness:
events (avg/stddev): 24959.0000/0.00
execution time (avg/stddev): 9.9878/0.00
```

Fig6.8 Docker CPU Test 1



The screenshot shows a terminal window titled "ziyan -- zsh -- 80x24". The output of the sysbench command includes a warning message:

```
Threads started!
WARNING: the --test option is deprecated. You can pass a script name or path on
the command line without any options.
CPU speed:
events per second: 2635.20
General statistics:
total time: 10.0002s
total number of events: 26354
Latency (ms):
min: 0.36
avg: 0.38
max: 0.99
95th percentile: 0.41
sum: 9988.86
Threads fairness:
events (avg/stddev): 26354.0000/0.00
execution time (avg/stddev): 9.9889/0.00
```

Fig6.9 Docker CPU Test 2

```
ziyan -- zsh -- 80x24

WARNING: the --test option is deprecated. You can pass a script name or path on
the command line without any options.
Threads started!

CPU speed:
events per second: 2634.41

General statistics:
total time: 10.0001s
total number of events: 26346

Latency (ms):
min: 0.36
avg: 0.38
max: 1.24
95th percentile: 0.41
sum: 9987.82

Threads fairness:
events (avg/stddev): 26346.0000/0.00
execution time (avg/stddev): 9.9878/0.00

(base) ziyan@zhangziyandeMacBook-Pro ~ %
```

Fig6.10 Docker CPU Test 3

```
ziyan -- zsh -- 80x24

Threads started!

WARNING: the --test option is deprecated. You can pass a script name or path on
the command line without any options.
CPU speed:
events per second: 2544.21

General statistics:
total time: 10.0005s
total number of events: 25445

Latency (ms):
min: 0.36
avg: 0.39
max: 0.93
95th percentile: 0.42
sum: 9991.52

Threads fairness:
events (avg/stddev): 25445.0000/0.00
execution time (avg/stddev): 9.9915/0.00

(base) ziyan@zhangziyandeMacBook-Pro ~ % $
```

Fig6.11 Docker CPU Test 4

```

Initializing worker threads...
Threads started!
CPU speed:
events per second: 2607.90

General statistics:
total time: 10.0002s
total number of events: 26081

Latency (ms):
min: 0.36
avg: 0.38
max: 1.76
95th percentile: 0.41
sum: 9989.04

Threads fairness:
events (avg/stddev): 26081.0000/0.00
execution time (avg/stddev): 9.9890/0.00

(base) ziyan@zhangziyandeMacBook-Pro ~ %

```

Fig6.12 Docker CPU Test 5

(2) Analyze Performance

Table6.2 Docker CPU Analysis

	Average	MIN	MAX	STD
Total Time	10.0003	10.0001	10.0005	0.000187083

6.3 I/O

6.3.1 On QEMU

```

sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw
prepare
sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw
cleanup

```

```

ziyan@ziyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw prepare
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

128 files, 81920Kb each, 10240Mb total
Creating files for the test...
Extra file open flags: (none)
Creating file test_file.0
Creating file test_file.1
Creating file test_file.2
Creating file test_file.3
Creating file test_file.4

```

Fig6.13 QEMU I/O Prepare

```
zlyan@zlyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Extra file open flags: (none)
128 files, 80MiB each
10GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

Threads started!

File operations:
  reads/s:           13684.50
  writes/s:          9122.50
  fsyncs/s:          29386.53

Throughput:
  read, MiB/s:       213.82
  written, MiB/s:    142.54

General statistics:
  total time:        10.0577s
  total number of events: 522931

Latency (ms):
  min:                0.00
  avg:                0.31
  max:                8.28
  95th percentile:   0.78
  sum:               159801.74

Threads fairness:
```

Fig6.14 QEMU I/O Run 1

```
zlyan@zlyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw cleanup
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

Removing test files...
zlyan@zlyan:~$
```

Fig6.15 QEMU I/O CleanUp

```

zlyan@zlyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

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

Extra file open flags: (none)
128 files, 80MiB each
10GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

Threads started!

File operations:
  reads/s:          13935.65
  writes/s:         9289.77
  fsyncs/s:        29921.92

Throughput:
  read, MiB/s:      217.74
  written, MiB/s:   145.15

General statistics:
  total time:       10.0575s
  total number of events: 532505

Latency (ms):
  min:              0.00
  avg:              0.30
  max:              5.75
  95th percentile:  0.77
  sum:             159805.04

Threads fairness:

```

Fig6.16 QEMU I/O Run 2

```

zlyan@zlyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuAJIT 2.1.0-beta3)

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

Extra file open flags: (none)
128 files, 80MiB each
10GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

Threads started!

File operations:
  reads/s:          14179.92
  writes/s:         9452.45
  fsyncs/s:        30446.59

Throughput:
  read, MiB/s:      221.56
  written, MiB/s:   147.69

General statistics:
  total time:       10.0577s
  total number of events: 541891

Latency (ms):
  min:              0.00
  avg:              0.29
  max:              9.30
  95th percentile:  0.75
  sum:             159810.69

Threads fairness:

```

Fig6.17 QEMU I/O Run 3

```

ziyan@ziyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Extra file open flags: (none)
128 files, 80MiB each
10GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

Threads started!

File operations:
  reads/s:           14267.12
  writes/s:          9510.75
  fsyncs/s:          30637.45

Throughput:
  read, MiB/s:       222.92
  written, MiB/s:    148.61

General statistics:
  total time:        10.0550s
  total number of events: 545129

Latency (ms):
  min:                0.00
  avg:                0.29
  max:                10.19
  95th percentile:   0.74
  sum:               159817.78

Threads fairness:

```

Fig6.18 QEMU I/O Run 4

```

ziyan@ziyan:~$ sysbench --num-threads=16 --test=fileio --file-total-size=10G --file-test-mode=rndrw run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line without any options.
WARNING: --num-threads is deprecated, use --threads instead
sysbench 1.0.18 (using system LuaJIT 2.1.0-beta3)

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

Extra file open flags: (none)
128 files, 80MiB each
10GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsync() at the end of test, Enabled.
Using synchronous I/O mode
Doing random r/w test
Initializing worker threads...

Threads started!

File operations:
  reads/s:           13959.79
  writes/s:          9305.70
  fsyncs/s:          29981.33

Throughput:
  read, MiB/s:       218.12
  written, MiB/s:    145.40

General statistics:
  total time:        10.0487s
  total number of events: 533041

Latency (ms):
  min:                0.00
  avg:                0.30
  max:                6.17
  95th percentile:   0.75
  sum:               159815.90

Threads fairness:

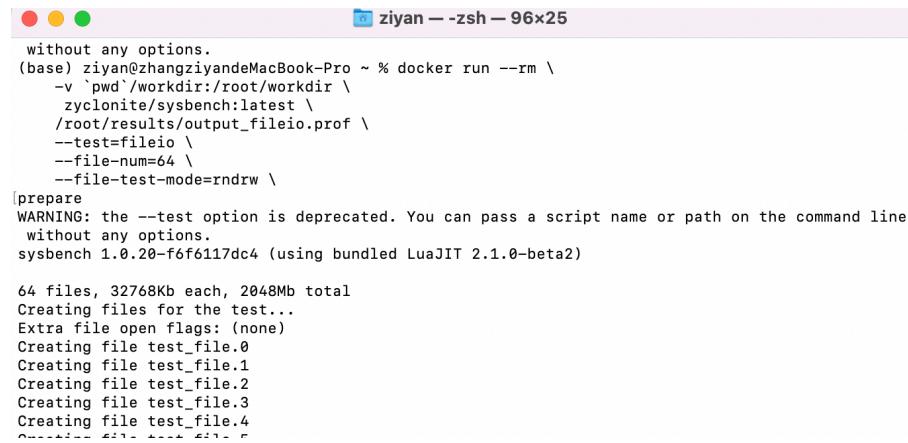
```

Fig6.19 QEMU I/O Run 5

6.2.2 On Docker

```
docker run --rm \
```

```
-v `pwd`/workdir:/root/workdir \
cyclonite/sysbench:latest \
/root/results/output_fileio.prof \
--test=fileio \
--file-num=64 \
--file-test-mode=rndrw \
prepare
```



```
without any options.
(base) ziyan@zhangziyandeMacBook-Pro ~ % docker run --rm \
-v `pwd`/workdir:/root/workdir \
cyclonite/sysbench:latest \
/root/results/output_fileio.prof \
--test=fileio \
--file-num=64 \
--file-test-mode=rndrw \
[prepare
WARNING: the --test option is deprecated. You can pass a script name or path on the command line
without any options.
sysbench 1.0.20-f6f6117dc4 (using bundled LuaJIT 2.1.0-beta2)

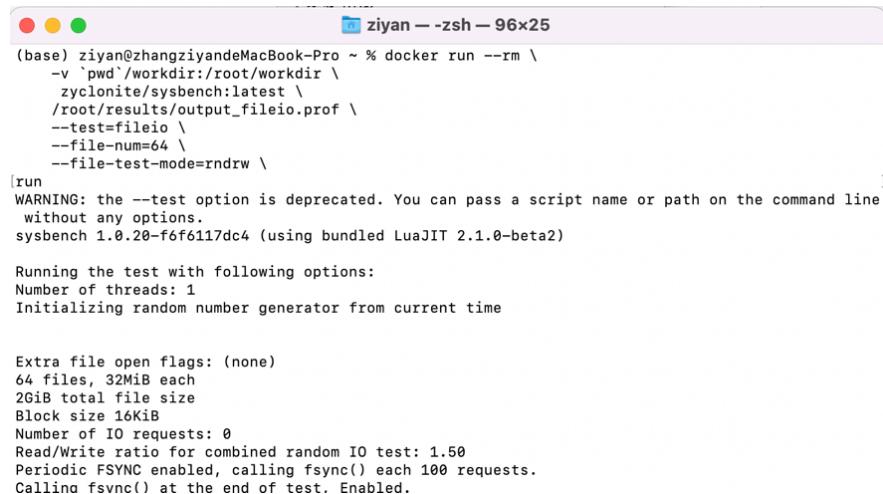
64 files, 32768KB each, 2048Mb total
Creating files for the test...
Extra file open flags: (none)
Creating file test_file.0
Creating file test_file.1
Creating file test_file.2
Creating file test_file.3
Creating file test_file.4
Creating file test_file.5
Creating file test_file.6
Creating file test_file.7
Creating file test_file.8
Creating file test_file.9
Creating file test_file.10
Creating file test_file.11
Creating file test_file.12
Creating file test_file.13
Creating file test_file.14
Creating file test_file.15
Creating file test_file.16
Creating file test_file.17
Creating file test_file.18
Creating file test_file.19
Creating file test_file.20
Creating file test_file.21
Creating file test_file.22
Creating file test_file.23
Creating file test_file.24
Creating file test_file.25
Creating file test_file.26
Creating file test_file.27
Creating file test_file.28
Creating file test_file.29
Creating file test_file.30
Creating file test_file.31
Creating file test_file.32
Creating file test_file.33
Creating file test_file.34
Creating file test_file.35
Creating file test_file.36
Creating file test_file.37
Creating file test_file.38
Creating file test_file.39
Creating file test_file.40
Creating file test_file.41
Creating file test_file.42
Creating file test_file.43
Creating file test_file.44
Creating file test_file.45
Creating file test_file.46
Creating file test_file.47
Creating file test_file.48
Creating file test_file.49
Creating file test_file.50
Creating file test_file.51
Creating file test_file.52
Creating file test_file.53
Creating file test_file.54
Creating file test_file.55
Creating file test_file.56
Creating file test_file.57
Creating file test_file.58
Creating file test_file.59
Creating file test_file.60
Creating file test_file.61
Creating file test_file.62
Creating file test_file.63
Creating file test_file.64]
```

Fig6.20 Docker I/O Test Prepare

Then I tried to run, but it didn't work.

```
docker run --rm \
```

```
-v `pwd`/workdir:/root/workdir \
cyclonite/sysbench:latest \
/root/results/output_fileio.prof \
--test=fileio \
--file-num=64 \
--file-test-mode=rndrw \
run
```



```
(base) ziyan@zhangziyandeMacBook-Pro ~ % docker run --rm \
-v `pwd`/workdir:/root/workdir \
cyclonite/sysbench:latest \
/root/results/output_fileio.prof \
--test=fileio \
--file-num=64 \
--file-test-mode=rndrw \
[run
WARNING: the --test option is deprecated. You can pass a script name or path on the command line
without any options.
sysbench 1.0.20-f6f6117dc4 (using bundled LuaJIT 2.1.0-beta2)

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

Extra file open flags: (none)
64 files, 32MiB each
2GiB total file size
Block size 16KiB
Number of IO requests: 0
Read/Write ratio for combined random IO test: 1.50
Periodic FSYNC enabled, calling fsync() each 100 requests.
Calling fsvnc() at the end of test. Enabled.
```

Fig6.21 Docker I/O Test Run