VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

VIRTUALIZATION CSE4011

2020

PERFORMANCE OF STANDARD WORKLOAD ON NATIVE OS AND VIRTUAL MACHINE

Under the guidance of

Prof. Shymala L

Submitted by
HARSH KAILASH[18BCE1340]
KAUSTUBH JHA[18BCE1043]
PARTH CHOUDHARY[18BCE1039]
ADITYA PRASAD[18BCE1047]
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING VIT UNIVERSITY,
CHENNAI -600127
TAMIL NADU, INDIA

Abstract:

Virtualization empowers establishment and running of various virtual machines on a similar PC framework. Operating System that discusses straightforwardly with hardware equipment is known as the host operating framework though virtual working system have every one of the highlights of a genuine operating system, however they keep running inside the host operating system.

The performance of a virtual machine on similar PC framework equipment relies upon the presentation of the host OS.

We first perform various different benchmarks and performance tests and provide a survey of performance studies, comparing and analysing different benchmark results of various tasks like start-up(boot-up),video editing, video conferencing and many more. We run these tests on different virtual machines namely,

1. Windows 10.
2. Ubuntu 18.04.
3. Kali Linux .
4. Fedora.

Keywords: *Virtualisation, Benchmarks, Cinebench, Geekbench, PCmark10, CrystalDiskMark, Virtual Machine Monitor, Hypervisor.*

Software and Hardware specifications:

1. Operating Systems: Windows 10, Kali Linux, Fedora, Ubunntu.
2. Benchmarking Softwares: Phoronix Test Suite, Geek-bench, Sysbench.
3. Word processor: Libre-Office Writer and Libre-Office Impress.
4. Hardware: We used 3 different physical machines to run our benchmarking tests, the following are the specifications:

   Machine-1: i5-7200U, number of cores:2, Memory:4-5Gb.

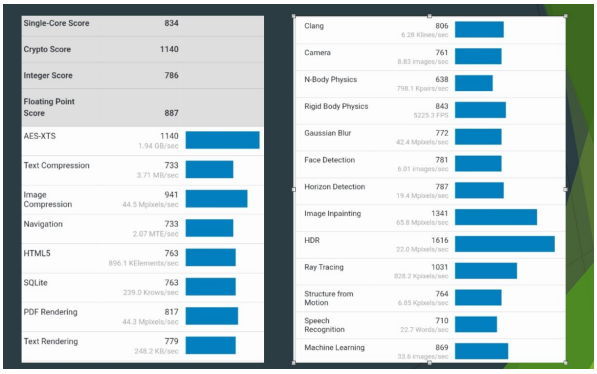
   Machine-2:i7-9750H, number of cores:2,Memory:4 Gb.

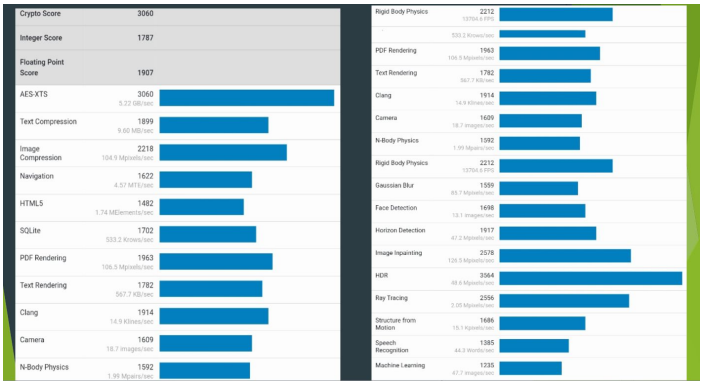
   Machine-3:i5-9750H,number of cores:2,Memory:5-6 Gb.

Sample Screenshots and Output

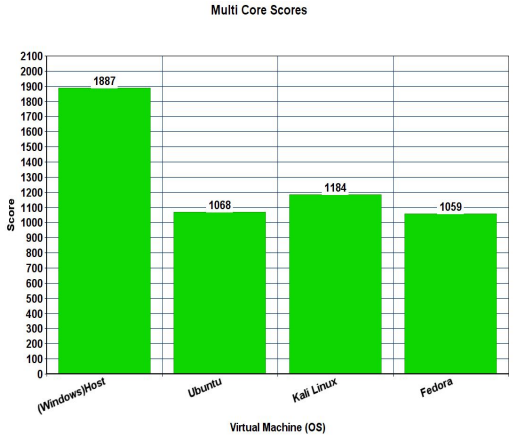
GEEKBENCH

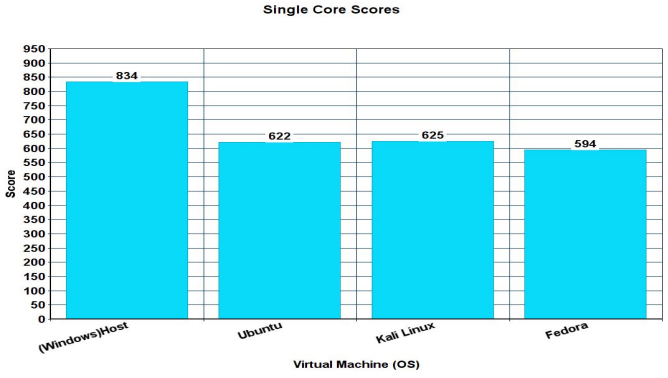
SINGLE CORE PERFORMANCE AND MULTICORE PERFORMANCE:



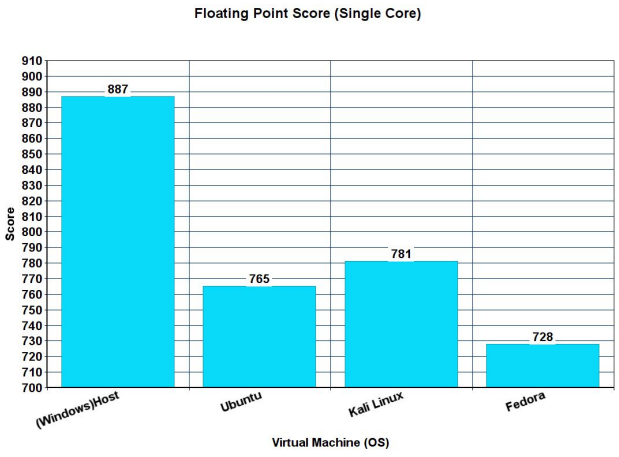


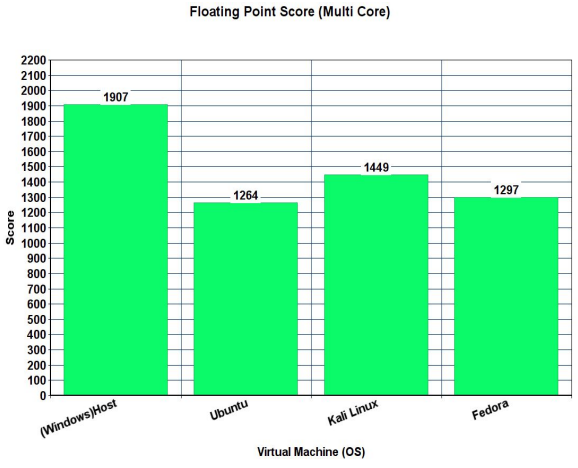
MULTICORE SCORES AND SINGLE CORE SCORES:



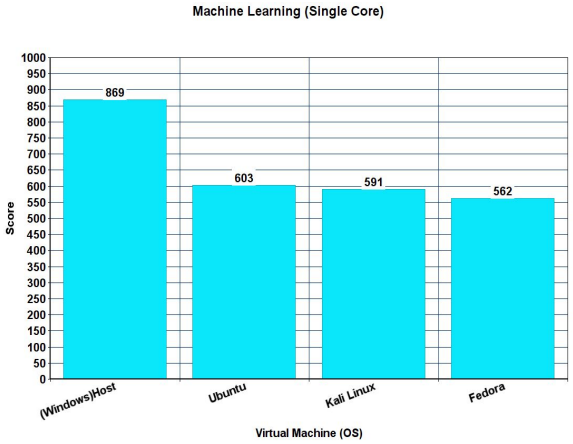


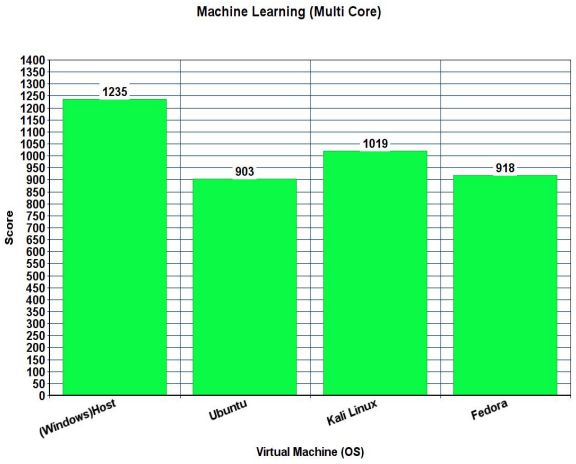
FLOATING POINT SCORES(SINGLE VS MULTI CORE):



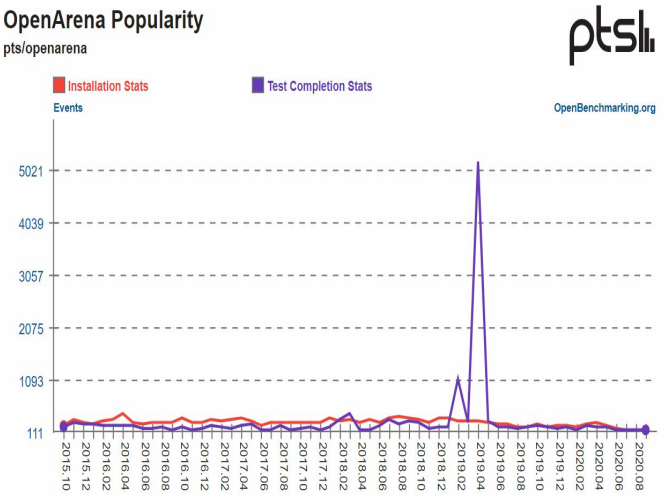


MACHINE LEARNING (SINGLE VS MULTI CORE):

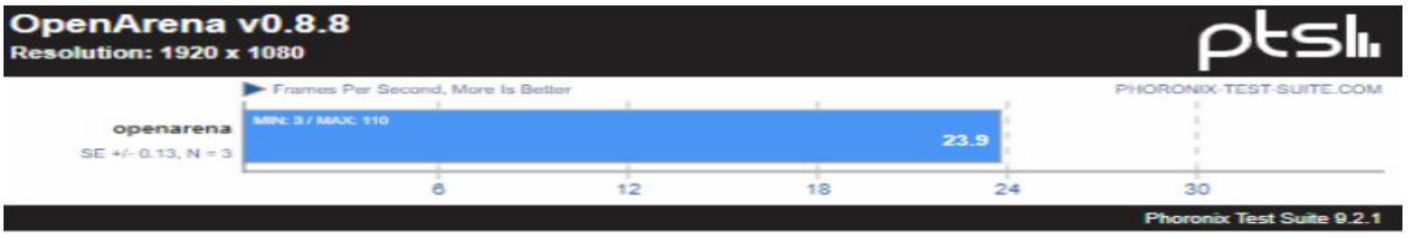


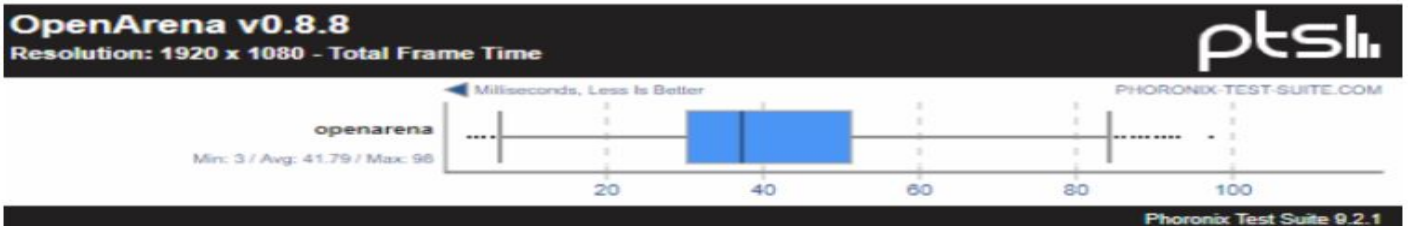


PHORONIX TEST SUITE:



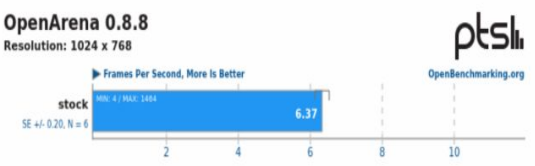
UBUNTU:

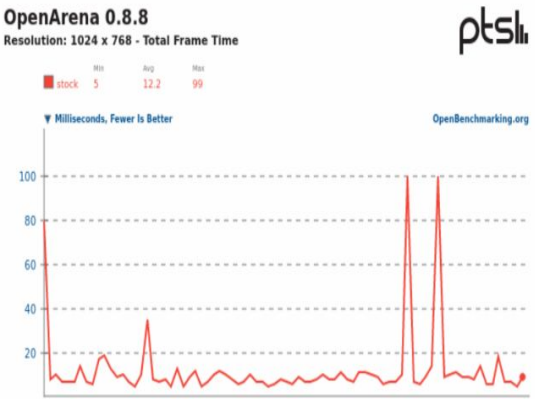




FEDORA:

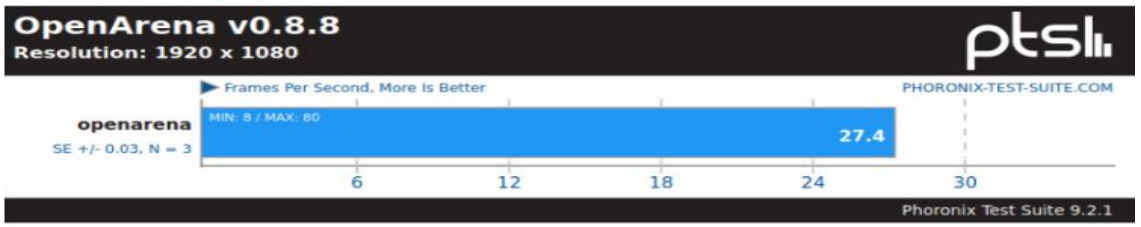
```
System Information

  PROCESSOR:          Intel Core i7-9750H
    Core Count:       1
    Extensions:       SSE 4.2 + AVX2 + AVX + RDRAND + FSGSBASE
    Cache Size:       12288 KB
    Microcode:        0xb4

  GRAPHICS:           SVGA3D; build: RELEASE; LLVM;
    OpenGL:           3.3 Mesa 20.0.4
    Screen:           1920x957

  MOTHERBOARD:        Intel 440BX
    BIOS Version:     6.00
    Chipset:          Intel 440BX/ZX/DX
    Audio:            Ensoniq ES1371/ES1373
    Network:          Intel 82545EM

  MEMORY:             7168MB

  DISK:               21GB VMware Virtual S
    File-System:      ext4
    Mount Options:    relatime rw seclabel
    Disk Scheduler:   BFQ

  OPERATING SYSTEM:   Fedora 32
    Kernel:           5.6.6-300.fc32.x86_64 (x86_64)
    Desktop:          GNOME Shell 3.36.1
    Display Server:   X Server + Wayland
    Compiler:         GCC 10.0.1 20200328
    System Layer:     VMware
    Security:         SELinux
```

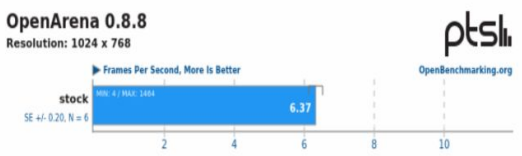




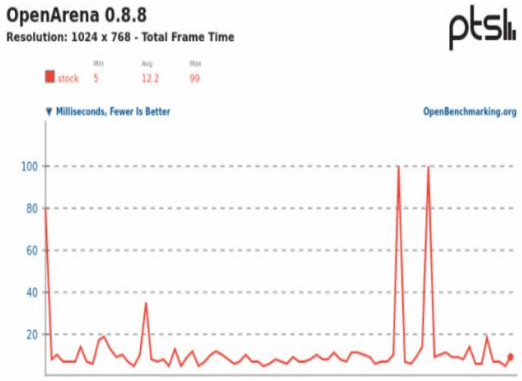
KALI LINUX:

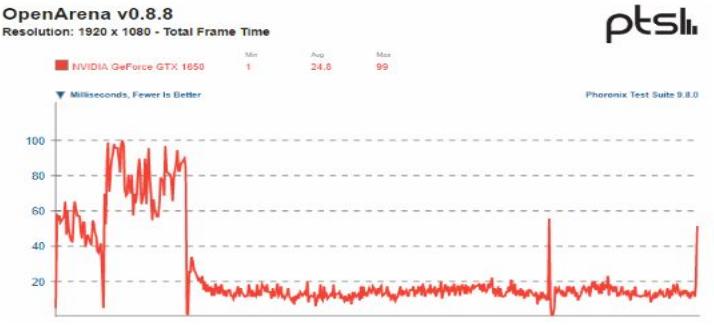
```
Byte Order:                      Little Endian
Address sizes:                   39 bits physical, 48 bits virtual
CPU(s):                          2
On-line CPU(s) list:             0,1
Thread(s) per core:              1
Core(s) per socket:              2
Socket(s):                       1
NUMA node(s):                    1
Vendor ID:                       GenuineIntel
CPU family:                      6
Model:                           158
Model name:                      Intel(R) Core(TM) i7-9750H CPU @ 2.60GHz
Stepping:                        10
CPU MHz:                         2592.002
BogoMIPS:                        5184.00
Hypervisor vendor:               KVM
Virtualization type:             full
L1d cache:                       64 KiB
L1i cache:                       64 KiB
L2 cache:                        512 KiB
L3 cache:                        24 MiB
NUMA node0 CPU(s):               0,1
Vulnerability Itlb multihit:     KVM: Vulnerable
Vulnerability L1tf:              Mitigation; PTE Inversion
Vulnerability Mds:               Mitigation; Clear CPU buffers; SMT Host st
                                 ate unknown
Vulnerability Meltdown:          Mitigation; PTI
```

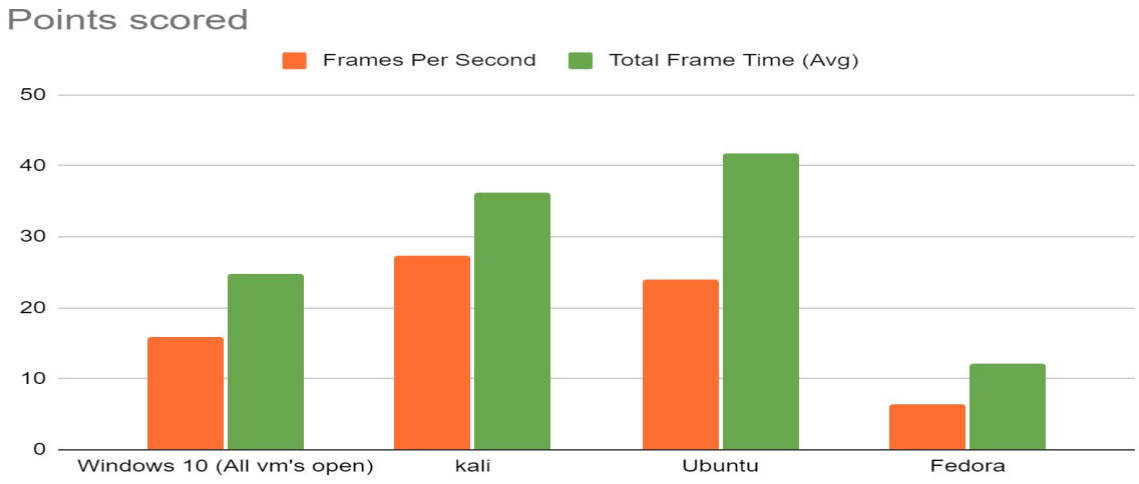



OpenArena 0.8.8
Resolution: 1024 x 768
Frames Per Second, More Is Better
OpenBenchmarking.org
stock
6.37
2
4
6
8
10


OpenArena v0.8.8
Resolution: 1920 x 1080
Frames Per Second, More Is Better
Phoronix Test Suite 9.8.0
NVIDIA GeForce GTX 1650
15.8
4
8
12
16
20


OpenArena 0.8.8
Resolution: 1024 x 768 - Total Frame Time
stock
5
12.2
99
Milliseconds, Fewer Is Better
OpenBenchmarking.org
100
80
60
40
20


OpenArena v0.8.8
Resolution: 1920 x 1080 - Total Frame Time
NVIDIA GeForce GTX 1650
1
24.8
99
Milliseconds, Fewer Is Better
Phoronix Test Suite 9.8.0
100
80
60
40
20


Points scored
Frames Per Second
Total Frame Time (Avg)
50
40
30
20
10
0
Windows 10 (All vm's open)
kali
Ubuntu
Fedora

SYSBENCH RESULTS:

	WINDOWS	KALI LINUX	UBUNTU 20.04	FEDORA
CPU BENCHMARKING	10.0021 SEC	10.0094 sec	10.0023 sec	10.0014 sec
IO BENCHMARKING	READ: 674.43 kbps Write: 449.63 kbps	Read:318.87 kbps Write:212.60 kbps	Read:312.20 kbps Write:214.13 kbps	Read: 340.31 kbps Write:226.84 kbps
Memory benchmarking	10.002 sec	10 sec	10.0001 sec	10.0003 sec

As of sysbench 1.0 support for native Windows builds was dropped. Currently, the recommended way to build sysbench on Windows is using

Windows Subsystem for Linux available in Windows 10.

Running the code on windows subsystem for Linux will give the performance of windows (host) and not Linux. It just helps us to run the Linux code on windows operating system.

CONCLUSION AND RESULTS:

Based on the VMs(OS) taken, the overall performance is highest in Host OS, followed by Kali Linux in both single core (75% of Host OS) and multi core(63% of Host OS), which means general day to day tasks could be performed better/faster on Kali Linux.

Order of Performance: Host(Windows) > Kali Linux(VM) > Ubuntu(VM) > Fedora(VM)

When comparing machine learning capability, for single core, Ubuntu scored the highest up to 70% of Host OS with Kali Linux being very close with 68% of Host OS' scores, whereas for Multi core, Kali Linux scored highest among the VMs again with 82% of Host OS' scores and Ubuntu's score falling even below Fedora's multi core score.

In general performance (Opening and closing of files or applications, mathematical operations, etc), Kali Linux is the best in single as well as multi core performance. Dealing with images, Ubuntu got better score for single core but last in multi core. Kali Linux got highest in image operations among VMs.
Kali Linux performed best overall with Ubuntu being closer followed by Fedora. Ubuntu's performance seems to suffer a little-bit in multi core.