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ANALYSIS OF THE PERFORMANCE OF TWO OPERATING SYSTEMS

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ABSTRACT

Monitoring the performance of operating systems and processes is essential to debug processes and systems, effectively manage system resources, making system decisions, and evaluating and examining systems. Log-based monitoring tools record system performance information for post-processing and analysis and to find trends in the system performance. This document presents a survey of the two most commonly used Operating Systems LINUX and MACINTOSH and comparing which of the two gives a better performance based on the Response time and CPU cycles.

1. INTRODUCTION

An operating system (OS) is the software component of a computer system that is responsible for the management and coordination of activities and the sharing of the resources of the computer. The OS acts as a host for application programs that are run on the machine. As a host, one of the purposes of an OS is to handle the details of the operation of the hardware. This relieves application programs from having to manage these details and makes it easier to write applications. Almost all computers use an OS of some type.

OSs offer various administrations to application projects and clients. Applications get to these administrations through application programming interfaces (APIs) or framework calls. By utilizing these interfaces, the application can ask for an administration from the OS, pass parameters, and get the consequences of the task. Clients may likewise communicate with the OS by composing directions or utilizing a graphical UI (GUI).

The point of the undertaking is to break down the variety in the execution of the working frameworks while a similar given program is running.

CPU utilization is a key performance metric. It can be used to track CPU performance regressions or improvements, and is a useful data point for performance problem investigations. It is also fairly ubiquitous; it is reported in numerous places in the Windows family of operating systems, including Task Manager (taskmgr.exe), Resource Monitor (resmon.exe), and Performance Monitor (perfmon.exe).

For those who are unaware, CPU utilization is typically used to track CPU performance regressions or improvements when running a specific piece of code.

CPU usage can likewise be utilized to explore execution issues.

At long last, CPU use has imperative ramifications on other framework execution attributes, to be specific power utilization. Some may think the greatness of CPU use is just critical incase you're bottlenecked on CPU at 100%, yet that is not in the least the case. Each extra % of CPU Utilization devours more squeeze from the outlet,

which costs cash. In case you're paying the power bill for the datacenter, you unquestionably care about that!

Current processor innovation is considerably more mind boggling. A solitary processor bundle may contain different centers with powerfully evolving frequencies, equipment multithreading, and shared reserves. These mechanical advances can change the conduct of CPU usage revealing components and increment the trouble of execution examination for designers, analyzers, and heads. The goal of this post is to explain the subtleties of CPU utilization on modern hardware, and to give readers an understanding of which CPU utilization measurements can and cannot be compared during performance analysis.

The 2 most popular Operating System:-

Common contemporary OSs include Microsoft Windows, Mac OS X, and Linux. Microsoft Windows has a significant majority of market share in the desktop and notebook computer markets, while the server and embedded device markets are split amongst several OSs.

LINUX

Linux (also known as GNU/Linux) is one of the most prominent examples of free software and open source development which means that typically all underlying source code can be freely modified, used, and redistributed by anyone. The name "Linux" comes from the Linux kernel, started in 1991 by Linus Torvalds. The system's utilities and libraries usually come from the GNU operating system (which is why it is also known as GNU/Linux).

Linux is predominantly known for its use in servers. It is also used as an operating system for a wide variety of computer hardware, including desktop computers, supercomputers, video game systems, and embedded devices such as mobile phones and routers.

Linux is a modular Unix-like OS. It derives much of its basic design from principles established in Unix during the 1970s and 1980s. Linux uses a monolithic kernel which handles process control, networking, and peripheral and file system access. The device drivers are integrated directly with the kernel. Much of Linux's higher-level functionality is provided by seperate projects which interface with the kernel. The GNU userland is an important part of most Linux systems, providing the shell and Unix tools which carry out many basic OS tasks. On top of the kernel, these tools form a Linux system with a GUI that can be used, usually running in the X Windows System (X).

Linux can be controlled by one or more of a text-based command line interface (CLI), GUI, or through controls on the device itself (like on embedded machines). Desktop machines have 3 popular user interfaces (UIs): KDE, GNOME, and Xfce. These UIs run on top of X, which provides network transparency, enabling a graphical application running on one machine to be displayed and controlled from another (that's like running a game on your computer but your friend's computer can control and see the game from his computer). The window manager provides a means to control the placement and appearance of individual application windows, and interacts with the X window system.

MACINTOSH

OS X is the major operating system that is created by Apple Inc. Unlike its predecessor (referred to Classic or OS 9), OS X is a UNIX based operating system. Currently OS X is in version 10.5, with 10.5.3 being the last major software update and plans for 10.6 having been announced. Apple has chosen to name each version of OS X after a large cat with 10.0 being Cheetah, 10.1 as Puma, 10.2 as Jaguar, 10.3 as Panther, 10.4 as Tiger, 10.5 as Leopard,

and the unreleased 10.6 named Snow Leopard.

Apple also develops a server OS X that is very similar to the normal OS X, but is designed to work on Apple's X-Serve hardware. Some of the tools included with the server OS X are workgroup management and administration software that provide simplified access to common network services, including a mail transfer agent, a Samba server, an LDAP server, a domain name server, a graphical interface for distributed computing (which Apple calls Xgrid Admin), and others.

OS X is a UNIX based OS built on top of the XNU kernel, with standard Unix facilities available from the CLI. Apple has layered a number of components over this base, including their own GUI. The most notable features of their GUI are the Dock and the Finder.

OS X is not backward compatible with earlier Mac OSs. It functions like Unix-based Linux systems which mean that most BSD or Linux packages can be run on OS X. Due to earlier PowerPC processors, OS X has an image of not being compatible with Windows standards, documents, etc. However, with new Intel-based machines, dual booting and virtual machines have become possible.

OS X is a more secure OS than Windows just like Linux. Rather than Linux, however, OS X is a closed OS. The latest version of OS X (10.5 - Leopard) was designed to add a lot more features. The next version of OS X will focus more on functionality than cool features.

These OSs are used because they are the most common in our everyday lives and most of us wants to know the difference between these Operating Systems and how their performance affects a systems CPU utilization, memory size as well as response time.

Two different Operating Systems will be installed using VMware running on another different OS and then their performance is measured under different conditions.

In this work, an analysis on the efficiency of Operating Systems will be carried out based on the response time and CPU cycles with different scenarios of apps being deployed.

2. LITERATURE SURVEY

- GORAN MARTINOVIC et. Al. [1] proposes- Performance Evaluation of Recent Windows Operating Systems- This paper presents a performance evaluation of three latest versions of the Microsoft OS for personal computers; namely Windows XP, Windows Vista and Windows 7. OS performance measurement is done by means of a set of benchmark applications in the controlled environment. To ensure accurate, reliable and repeatable performance measurement results, we have created a performance measurement process and a performance evaluation model. Special emphasis is placed on evaluation areas with the greatest impact on the performance: CPU scheduling, memory management, graphic subsystem management, hard disk drive management and network performance. To determine the Windows OSs performance in different environments, performance measurement is done in three experiments. Experimental results indicate that Windows Vista and Windows 7 have several

performance improvements on the stand-alone high-end computer system, but Windows XP outperforms Windows Vista and Windows 7 on the stand-alone low-end computer system. Furthermore, on network computer system Windows Vista and Windows 7 show network performance improvements mostly for the traffic with medium-sized packets.

- PRABODH S. NIMAT et. Al. [2] proposes- Comparative Analysis of Different Operating Systems for a Raspberry Pi - In this paper we will take a look at different operating system for Raspberry Pi set up so you can try it and start using it for the variety of purposes. Raspberry Pi is small but powerful credit card sized little computer, but before doing anything awesome, you need to configure Raspberry Pi kit and install an operating system. Without an operating system Raspberry Pi is just a piece of silicon, fiberglass, and a few other semiconductor materials. This paper shed the light on different operating systems available for Raspberry Pi. We are going to compare them based on their emergent features, that makes them different than other Many from the available lists of operating systems, each one of them are segregated based on their applications, features and specifications.

- NASEER AHMAD et. Al. [3] proposes - Comparative Analysis of Operating System of Different Smart Phones- Nowadays rapidly increasing technology is mobile phone technology in telecommunication sector. This mobile device technology has great effect on everyone's life. This technology has reduced the burden of people in their daily life. To manage the rising demand for such mobile devices, numerous operating systems came in the market as a platform upon which modern application can be produced. As a result, numbers of platforms and essential depository describe these platforms; customers may or may not be aware of these platforms that are appropriate for their needs. In order to solve this issue, we examine the most famous mobile phone operating systems to decide which operating system is most suitable for developers, business applications as well as casual use. In this paper we make assessment on the popular operating systems of mobile devices available in the business market, and on behalf of such assessment we distinguish that operating system OS is much useful of its particular characteristics compared with other systems.

- J. BRADLEY CHEN et. Al. [4] proposes - The Measured Performance of Computer Operating Systems- This article presents a comparative study of the pefiormance of three operating systems that run on the personal computer architecture derived from the IBM-PC. The operating systems, Windows for Workgroups, Windows NT, and NetBSD (a freely available variant of the UNIX operating system), cover a broad range of system

functionality and user requirements, from a single-address-space model to full protection with preemptive multitasking, Our measurements are enabled by hardware counters in Intel's Pentium processor that permit measurement of a broad range of processor events including instruction counts and on-chip cache miss counts, We use both microbenchmarks, which expose spcific differences between the systems, and application workloads, which provide an indication of expected end-to-end performance.

- SHANEEL NARAYAN et. Al. [5] proposes- Performance Analysis of Network Operating Systems in Local Area Networks- In this paper, in a laboratory environment the performance of four different operating systems (Windows NT4, Windows 2000, Windows 2003, and Linux Fedora) are compared. The performance parameters measured are bandwidth and network delay. Linux Fedora provided the highest bandwidth for a file server at 17.1Mbps, Windows 2000 was fastest for a FTP (83.2Mbps), and Windows 2003 and Windows 2000 gave the highest bandwidth for a web server (4.3Mbps and 4.5Mbps respectively).

3. TEST CASES SCENARIOS:-

Using Windows 10 as the host OS and Ubuntu 18 as well as Macintosh OS Sierra as the Guest Operating Systems, VMware Workstation 12 is used for running different Operating Systems. A heavy application such as Visual Studio was implemented on both the guest OS and the System performance are observed during different conditions.

COMPARISON TABLE

	LINUX	MACINTOSH
System Configuration	CPU History :- CPU1- 0.0% CPU2- 0.0% CPU3- 1.0% CPU4- 1.0% Memory- 2.2 GiB (56.2%) of 3.8GiB	Processor Speed- 1.72 GHz Number of Processors- 1 Total Number of Cores- 1 L2 Cache- 256 KB L3 Cache- 6 MB Memory- 4 GB

CASE 1:-
When the default no. of processors and memory is used.

No. of processors – 1
Memory used- default

	LINUX	**MACINTOSH**
CPU cycles	CPU Utilization – 10% Speed- 3.29 GHz Processes running – 229 Threads – 2726 Handles- 83147	CPU Utilization – 24% Speed- 1.80 GHz Processes running – 220 Threads – 2386 Handles- 80259
Average Response Time	Active time- 9% Average Response time- 46.6 ms Read speed – 82.4 KB/s Write speed – 190 KB/s	Active time- 3% Average Response time- 8.4 ms Read speed – 0 KB/s Write speed – 289 KB/s
Memory used	Memory In use(Compressed)- 7.1 GB Available- 727 MB Memory Committed – 8.6/10.9 GB Cached- 768 MB	Memory In use(Compressed)- 6.9 GB Available- 960 MB Memory Committed – 7.9/10.9 GB Cached- 961 MB

OBSERVATIONS MADE:-

When the no. of processors and the memory is set to its default values:-

- The CPU Utilization of Linux is 10%, while that of Macintosh is 24%.
- The Average Response time of Linux is 46.6 ms, while that of Macintosh is 8.4 ms.
- Memory committed in Linux is 8.6/10.9 GB, while that of Macintosh is 7.9/10.9 GB.

CASE 2:-
When maximum no. of processors and memory is used.

No. of processors – 4
Memory (maximum) - 8192

	LINUX	**MACINTOSH**
CPU Cycles	CPU Utilization – 30% Speed- 1.80 GHz Processes running – 212 Threads – 2714 Handles- 74495	CPU Utilization – 100% Speed- 1.80 GHz Processes running – 217 Threads – 2333 Handles- 79376
Average Response Time	Active time- 100% Average Response time- 167 ms Read speed – 1.6 MB/s Write speed – 106 KB/s	Active time- 3% Average Response time- 8.4 ms Read speed – 0 KB/s Write speed – 289 KB/s
Memory used	Memory In use(Compressed)- 5.8 GB Available- 358 MB Memory Committed – 7.3/9.1 GB Cached- 378 MB	Memory In use(Compressed)- 6.6 GB Available- 1.2 MB Memory Committed – 7.7/10.9 GB Cached- 297 MB

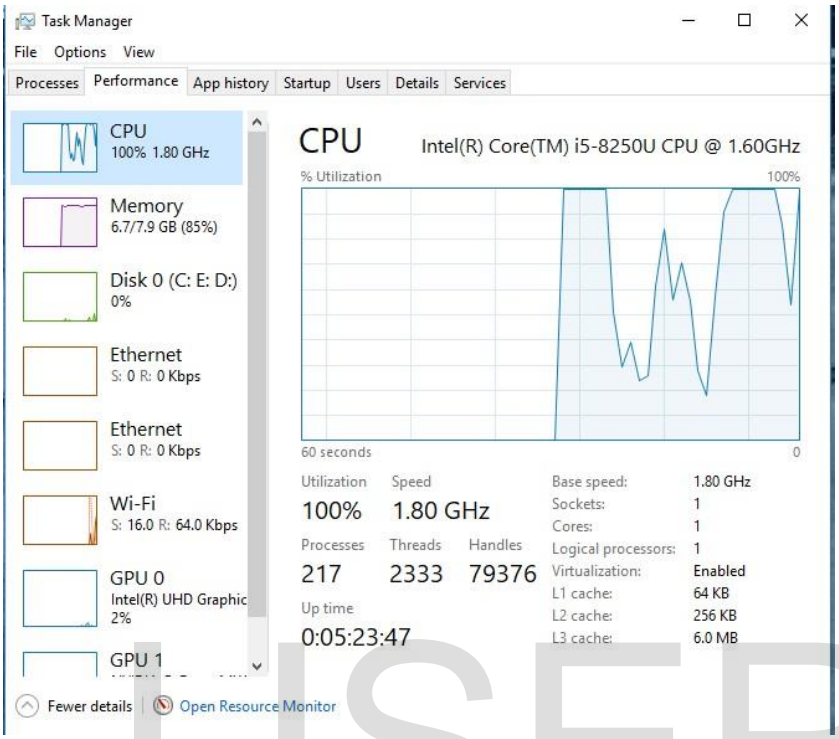
OBSERVATIONS MADE:-

When the no. of processors and the memory is set to its maximum values:-

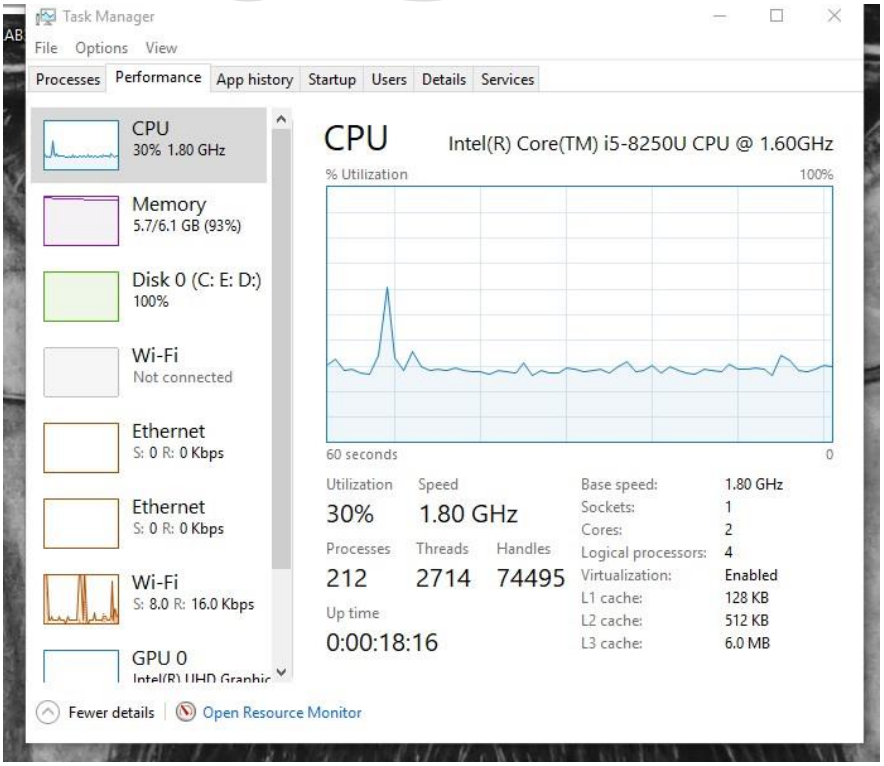
- The CPU Utilization of Linux is 30% , while that of Macintosh is 100%.
- The Average Response time of Linux is 167ms, while that of Macintosh is 0ms.
- Memory committed in Linux is 7.3/9.1 GB, while that of Macintosh is 7.7/10.9 GB.

We can see that the CPU Performance and Utilization is much more efficient in MACINTOSH than that of LINUX.

1. **MACINTOSH- The Utilization is 100%.**



2. **LINUX – The Utilization is 30%.**



4. CONCLUSION

Linux and Mac are two operating systems that are highly popular among their users. Mac OS which has a very appealing user interface with much ease of use working style and on the other hand Linux which is known for its command line interface, more popular for open source license that is very useful for the business world. Apple's OS X is a very stable and refined operating system.. It has several security features that prevent unwanted applications from exploiting any of its weaknesses.

Therefore, by analyzing these obversations, we can say that MACINTOSH OS is more efficient and gives a better performance than LINUX OS.

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