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Comparative Analysis of Performance of Various Virtual Machines in Hybrid Cloud Environment using KVM

Anjali Asawa[1], Anil Saroliya[2], Varun Sharma[3]
[1,2,3]Amity School of Engineering & Technology
Amity University Rajasthan, India
[1]anjali15893@gmail.com,[2]asaroliya@jpr.amity.edu,[3]vsharma@jpr.amity.edu

Abstract:

Virtualization means to create a virtual version of a device or resource, such as a server, storage device. Thus the virtualization play good role in the resource provisioning for the cloud controller. There is large scope in the resources provisioning management in Virtualized Cloud. This paper presents a process of analysis of performance in terms of CPU Time, Memory usage for the different virtual machines of Ubuntu, RHEL 6.0 and Win7's using the KVM hypervisor in hybrid virtualization environment. The main objective is to find the performance parameters of various virtual machines on a single host and proceeds to find an effective choice for the collection of effective virtual machine for the cloud user.

Introduction: The Cloud computing is a model for enabling convenient, on-demand network to a shared pool of configurable computing resource (e.g., network, server, storage, application and service) that can be rapidly provisioned and released with minimum management effort for service provide interact. The virtualization is an extensively used word basically; it refers to the abstraction of physical and other resources. Virtualization offers standard interfaces for applications and Operating Systems and removes their dependency on the underlying hardware or software layer. Hardware resources can be multiplexed between several Operating Systems and made to look like something else using virtualization [1]. It is possible to virtualized complete machines or just parts of the machine. It is possible to divide the physical hardware among several Virtual Machines (VM). NIST[12] define the Cloud computing as "a model for enabling convenient, on-demand network to a shared pool of configurable computing resource (e.g., network, server, storage, application and service) that can be rapidly provisioned and released with minimum management effort for service provide interact"[2]. The hybrid Cloud which is combination of private Cloud and public Cloud is becoming an important part of the commercial Cloud computing model [3].Nowadays one use of virtualization is to decrease the proliferation of server machines and to improve their cost efficiency. Not only this also it reduces the requirement for hardware but it also reduces running costs such as electricity and memory space. These VMs are controlled by a Virtual Machine Monitor (VMM). VMM is the abstraction layer that hides the hardware below and provides a generic interface for the

Virtual Machines. The Applications and operating systems run as they were run on the physical hardware[14]. VMs are isolated from each other by VMM so that they cannot affect to each other. A key component of Hybrid Cloud Computing is virtual infrastructure management, which provides some virtualized resource in virtualization platform such as Xen, kernel base virtual machine, VMware by the management of Virtual Machine provide storage requirement and user policies. The objective is to manage the hybrid Cloud database for the hybrid Cloud system which manages the private Cloud and the public Cloud. [4]

It is software layer between hardware and Virtual Machine (VM) which allows virtualization. It is use to providing the virtual environment of the various operating systems on a single host. It managed the user systems and make sure that the resources are allocated to the guests requirements. There are two types of Hypervisor. The hypervisor is known as native or bare metal hypervisor. It is the lowest level of hypervisor. This hypervisor is directly run on the host machine. All the allocation of memory, disk, CPU etc are done by this hypervisor. These hypervisors have very limited drivers so limited hardware can be installed by these hypervisor. This hypervisor is generally used in server virtualization the hypervisor run on full host operating system to operate. This means that is working on the top of the host operating system. It requires fewer driver/hardware to interface with the host operating system. So that is has less issue to operate it. This hypervisor is used in Java Virtual Machine (JVM) to used application portability.

In our experimentation work we will use the Kernal based Virtual Machine (KVM) hypervisor.

Kernel-based Virtual Machine: Kernel-based virtual machine (KVM) is a Virtualization tool for the Linux kernel on the x86 hardware platforms. It used the Intel VT-x and AMD-V technology, to allow for virtualization. KVM is an open source-project that is a kernel module which is supplied with each major community and enterprise level Linux distributions. KVM offers an interface, /dev/kvm, which a user-space program, such as Qemu uses to communicate with the hypervisor. Early version of Red Hat working with Xen hypervisor but in latest version Red hat version 6 is using KVM.

First of all the Kernal Virtual Machine hypervisor setup which is already discussed in previous section after that a software requires for the performance analysis of virtualization . Once the comparison of different-2 virtual machine is completed than the benchmarking tool is used.

Libvirt – The Libvirt is a software package which interacts with the virtualization capabilities of Linux and other Operating Systems. The main objective of Libvirt is to provide a homogenous layer sufficient to securely manage domains on a node with the Libvirt node it can be managed in remotely connection. Libvirt consist a rich set of APIs needed to manage such as: provision, create, modify, monitor, control, migrate and stop the domains - within the limits of the support of the hypervisor for those operations. Libvirt is also

providing the monitoring management of the Virtual machines and Libvirt's API deploys the manage the policies, checking the domain positions, resource utilization of node. Libvirt is also providing the TLS encryption and x509 certificates and authentication with Kerberos and SASL. The category of Libvirt command are Node commands, Domain commands, Interface commands, Network commands, Storage commands, Security commands.

Algorithm for the performance comparison of the various virtual machines:

Step 1: Create a Virtual Machine(s) software layer in RHEL 6.0 OS which is work as Host Operating System on a System.

Step 2: Run a Virtual Machine(s) software layer in RHEL 6.0 Operating System.

Step 3: Run a python Script file collection of Input Linux commands for performance measurement.

Step 4: Select the option for RHEL 6.0 Update/Upgrade for operating system analysis for the system resources.

Step 5: Select the option for RHEL 6.0 KVM (Kernel Virtual Machine) installation & Libvirt Installation of a Hypervisor on Host operating system.

Step 6: Give the Guest OS Name as Input for System analysis for various consumed resources in the current Virtual Machine.

Step 7: Display the 10 Samples Outputs as a performance parameters of both host and Selective guest OS.

Step 8: Calculate the Average Values of 10 Samples Outputs of Performance parameters.

Step 9: Comparison of these average values of 10 samples of resources with the other Virtual machines resources.

The algorithmic implementation is designed according to take the iterative results from the different Virtual Machines. The objective is design to run the virtual machine in the host machine then take the system performance according to current utilization of resources like- CPU uses, RAM and memory etc.

The comparative result of different Virtual machines run in Kernel-based virtual machine (KVM) hypervisor in RHEL 6.0. Description of System is that first system creates a virtual machine(s) in the RHEL6.0 after that when the virtual machine(s) is in the running state then we make a script file in python programming language which is running on the host OS RHEL 6.0 in which Libvirt directory commands are performing to the current system. Thus the various virtual machines can run on the RHEL 6.0. Every time the hypervisor is same and result is evaluated by the libvirt commands. At the last system current resources performance evaluated as how much it consumed by the system. Thus the project take various virtual machine consumption data and result generated by them are compare with the other system.

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Comparative Analysis of the various virtual machines:

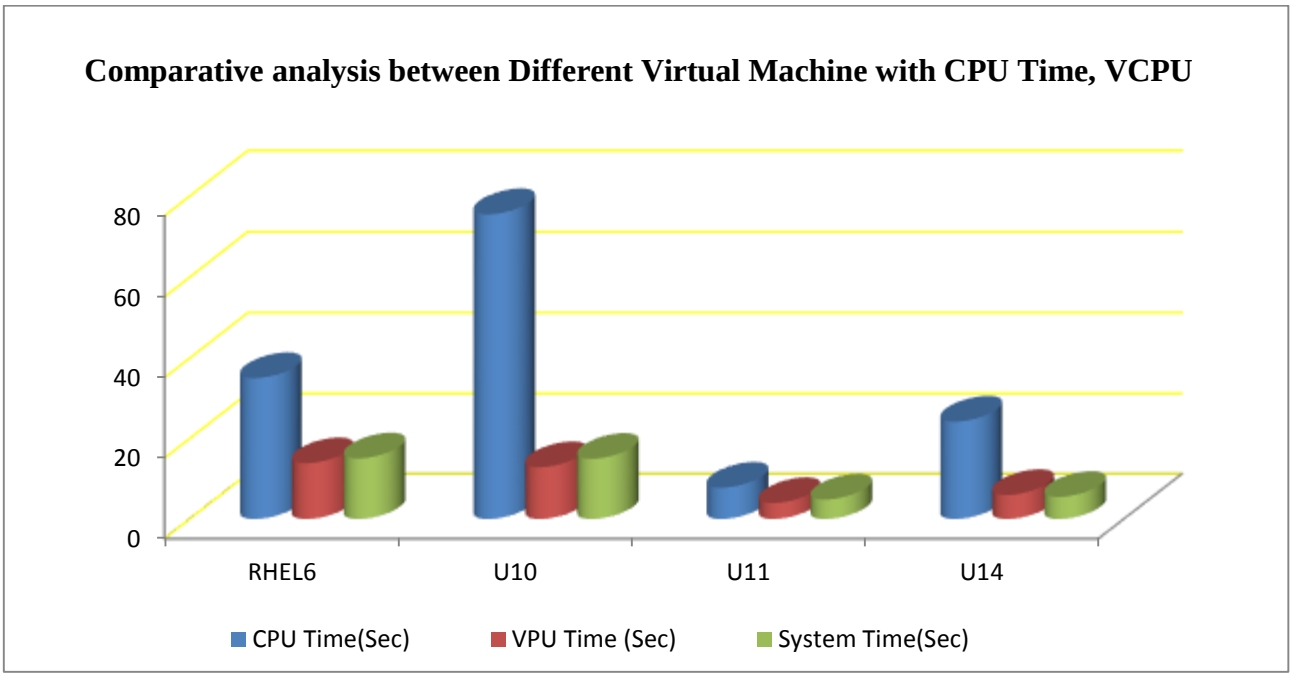

Figure 1: Comparative analysis between Different Virtual Machine with CPU Time, VCPU Time and System Time.

In the figure 1 analysis the CPU time, VCPU time and System time of Virtual machine (Domain) and Ubuntu10 consumes the maximum 75.53sec of CPU time, RHEL6.0 also take the VCPU time (13.892Sec) and System time (15.084 Sec) which is second highest of all VM. Ubuntu10 also take the maximum system time (14.98 Sec). The figure shows that when running the RHEL6.0 at the domain side it takes the maximum CPU time and the Ubuntu10 use the minimum CPU time (75.53Sec). Virtual CPU time (VCPU) of RHEL6.0 also the maximum of all VCPU time which is 13.892sec.

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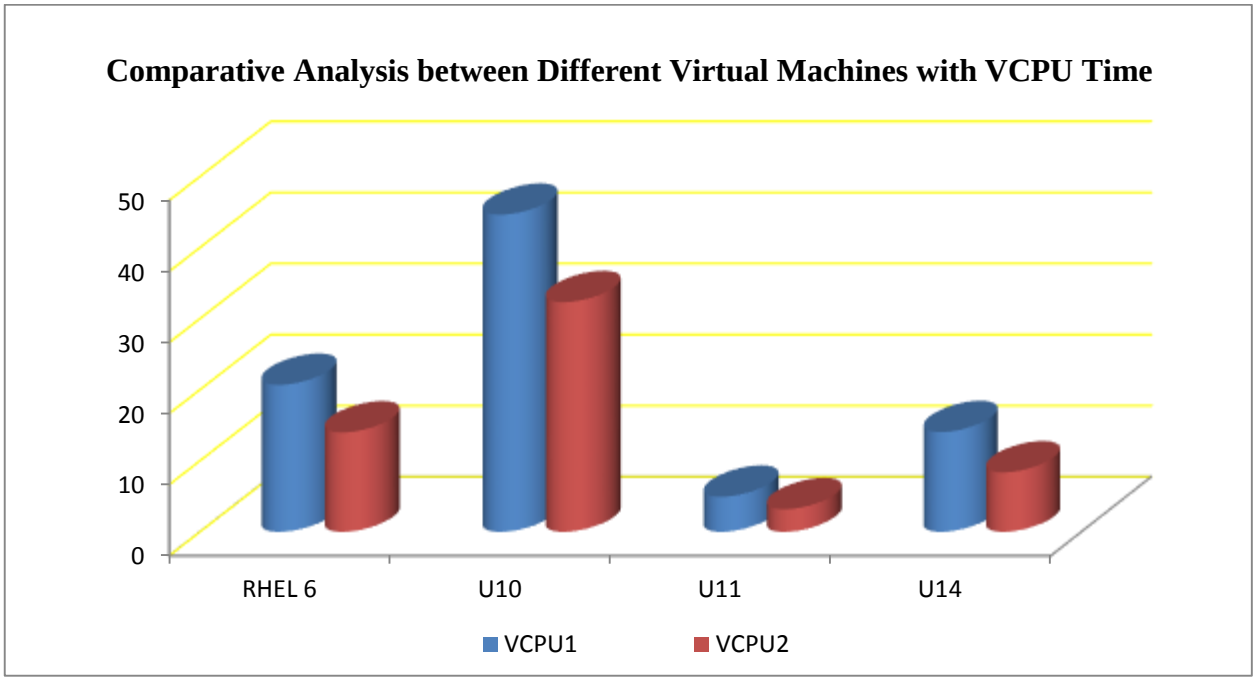

Figure 2: Comparative analysis between Different Virtual Machines with VCPU Time

The figure 2 shows comparative figure of VCPU time of different Virtual Machine. It shows the both CPU core of the system VCPU time. Figure shows that the Ubuntu10 takes the maximum VCPU time in both cores. The VCPU time of both core are 44.63sec and 32.32 sec. It is clear that Ubuntu11 take the minimum virtual CPU in all the Virtual Machine.

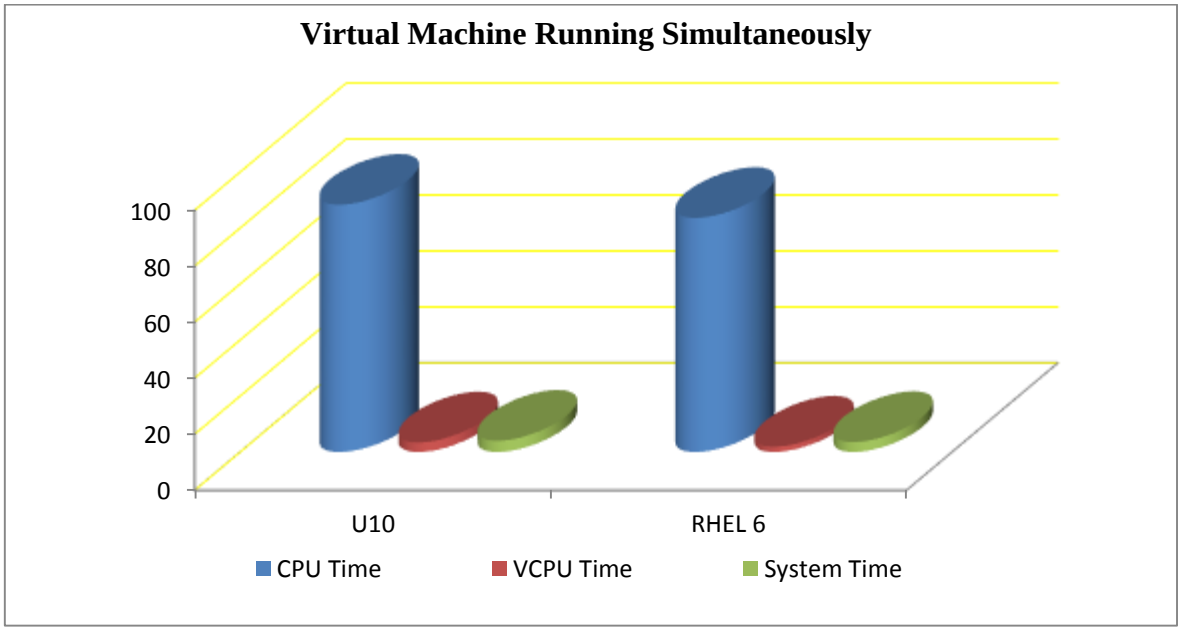

Figure 3: Comparative analysis between CPU Status of the Ubuntu10 and RHEL6.0

The figure 3 shows comparative CPU status of Ubuntu10 and RHEL6.0 running simultaneously. It show that when both are in stable state Ubuntu10 uses the maximum time of CPU (88.31sec), VCPU time

(3.414Sec) and System time (4.016sec) as compared to RHEL6.0 is CPU (83.6sec), VCPU time (1.916Sec) and System time (3.545 sec).

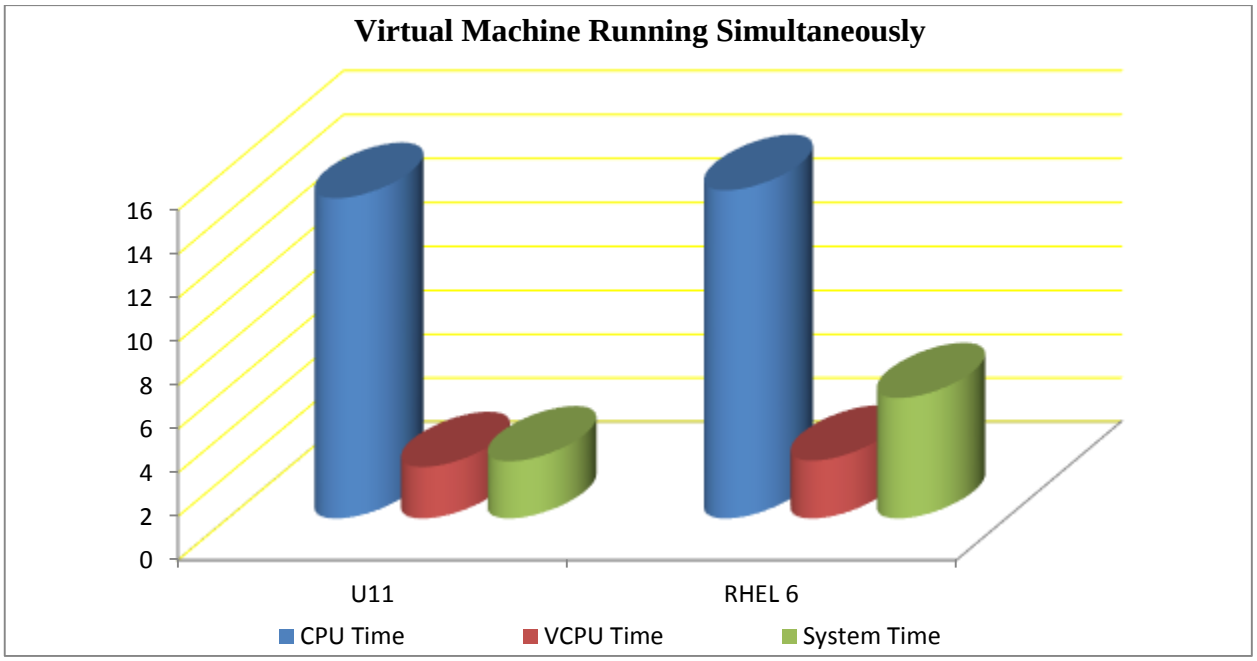

Figure 4 Comparative analyses between CPU Status of the Ubuntu11 and RHEL 6.0 Simultaneously

The Figure 4 shows the comparative analysis of Ubuntu11 and RHEl6.0 with parameter of CPU time, VCPU time and System Time. It is shows the RHEL6.0 uses the CPU time 15.0 sec, VCPU time 2.65sec and System time 5.522Sec. RHEl6.0 use the more CPU time then the Ubuntu11.

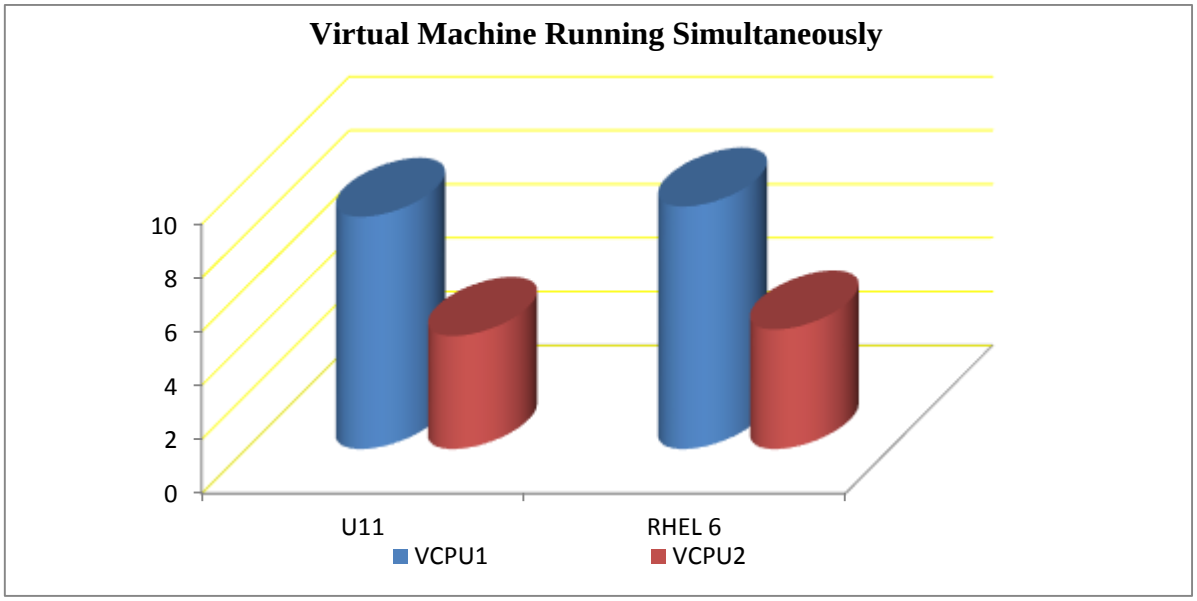

Figure 5: Comparative analyses between VCPU Status of the Ubuntu11 and RHEL 6.0 Simultaneously

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The figure 5 shows the comparative analysis of VCPU requirement of both domain Ubuntu10 and RHEL 6.0. As expected the RHEL6.0 take the maximum VCPU time because its CPU time is also lager than Ubuntu11. The VCPU times of both the core of Ubuntu11 are 9.01 Sec and 4.44 sec.

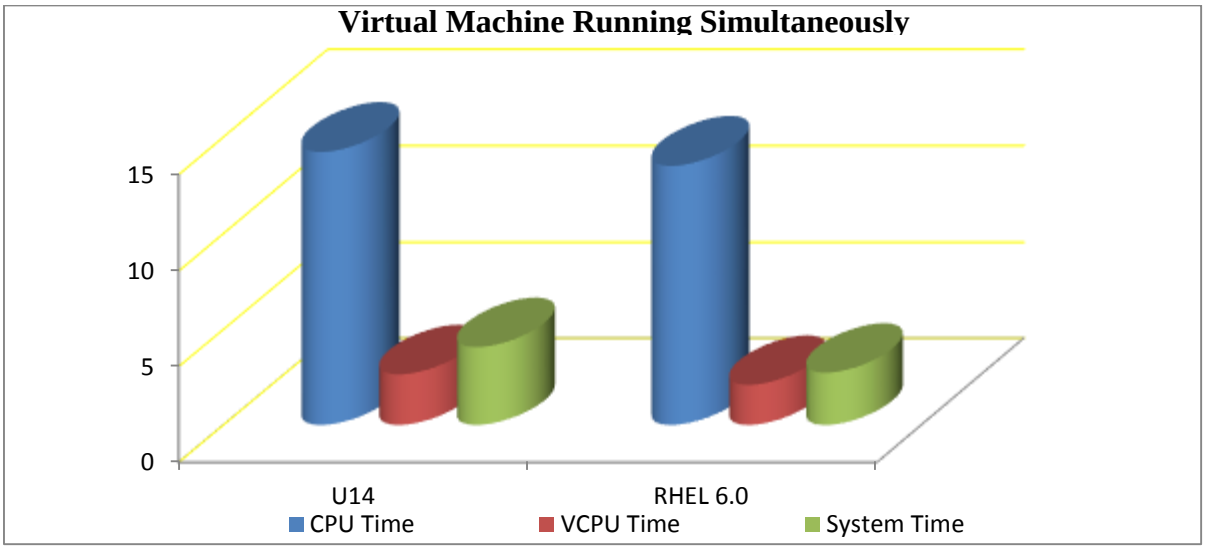

Figure 6: Comparative analyses between CPU Status of Ubuntu14 and RHEL6.0 simultaneously

This Figure 6 shows the comparative analysis of RHEL6.0 and Ubuntu14.04 with parameter of CPU time, VCPU time and System time while they are running in at time. In this figure the Ubuntu14.04 uses the CPU time 14.22sec, VCPU time 2.642sec and System time 4.068 Sec. with compare to Ubuntu14.04, RHEl6.0 takes only CPU time 13.5sec, VCPU time 2.093sec and System time 2.729Sec.

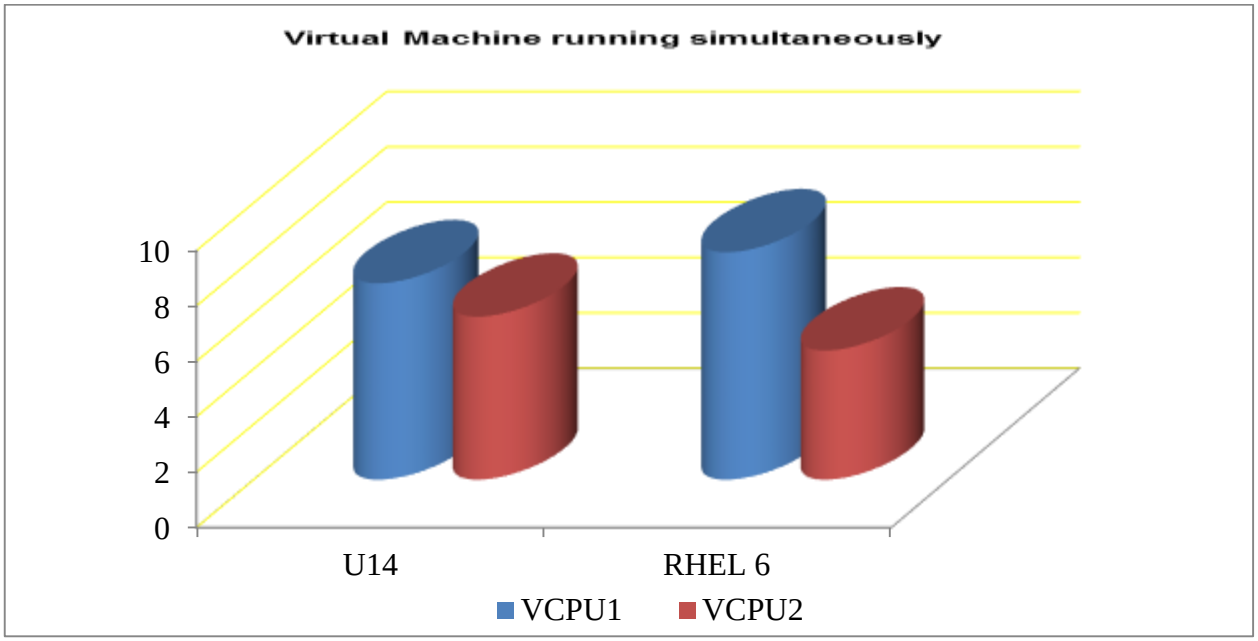

Figure 7: Comparative analysis between VCPU Status of the Ubuntu14 and RHEL6.0 simultaneously

This figure 7 show comparative analysis of VCPU states of RHEl6.0 and Ubuntu14.04. Both the cores of Ubuntu14.04 use VCPU time as 7.09 Sec and 5.883 sec. RHEl6.0 takes only VCPU1 as 8.21sec and VCPU2 as 4.66 sec. It is clear that RHEl6.0 take more VCPU then Ubuntu 14.04 while they are running simultaneously.

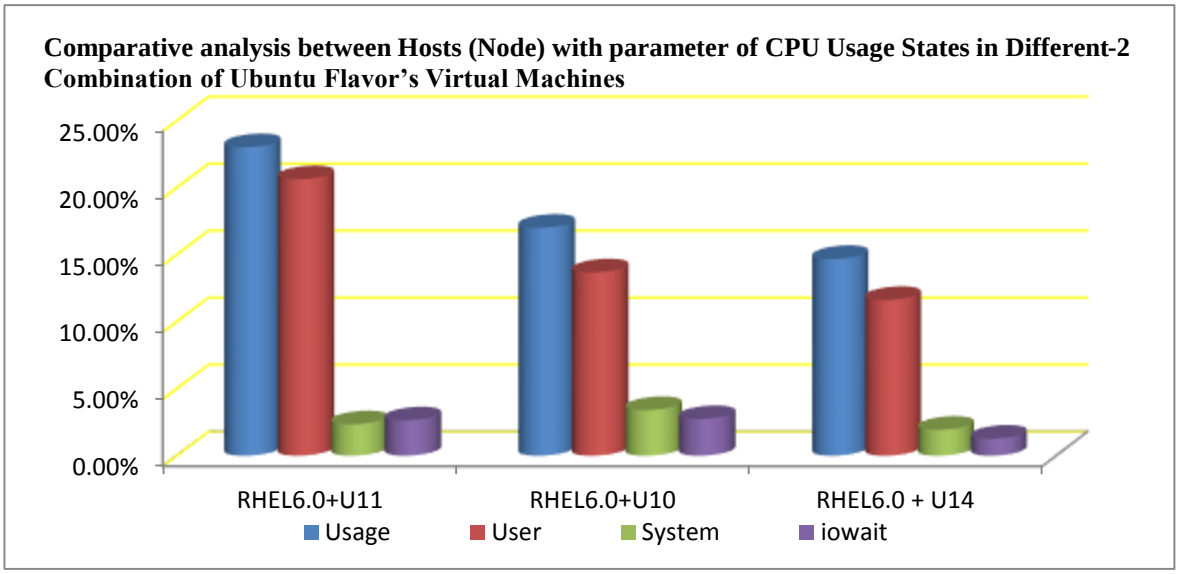

Figure 8: Comparative analysis between Hosts (RHEL6.0) with parameter of CPU Usage States in Different Combination of Ubuntu versions Virtual Machines.

This figure 8 shows the comparative analysis of Host Machine (RHEL6.0) with the parameter CPU usage while the combination of RHEL6.0 + Ubuntu11, RHEL6.0 + Ubuntu14, RHEL6.0+ Ubuntu10, . It shows that usage time is taken by RHEL6.0 + Ubuntu11is 25.8 % which is highest analysis all Virtual Machine. So it is clear that RHEL6.0 + Ubuntu11 consume the maximum CPU for processing the virtual machine. RHEL6.0 + Ubuntu10 also use the I/O wait 2.73 %. So it clear that in stable state the combination of RHEL6.0 + Ubuntu10 takes the highest CPU use percentage.

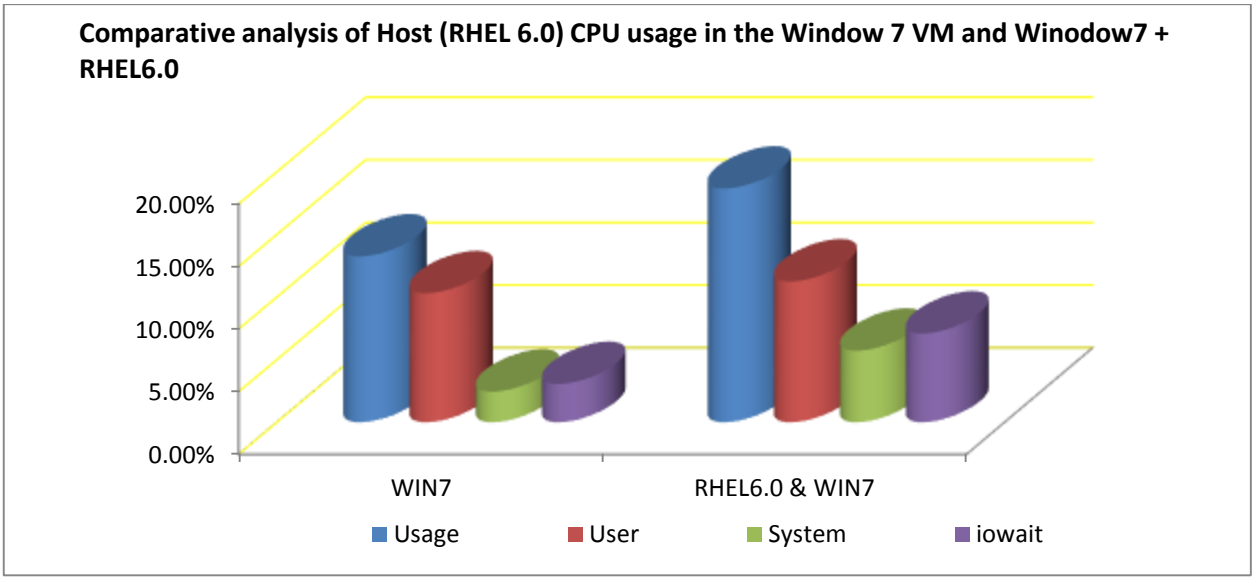

Figure 9: Comparative analysis of Host (RHEL 6.0) CPU usage in the Window 7 VM and WIN7 + RHEL6.0

In this figure shows comparative analysis of Host Machine (RHEL 6.0) with the parameter CPU usage while the window 7 runs and the combination of Window 7 + RHEL6.0 run simultaneously. It shows that usage time is taken by Win7+RHEL6.0 is 18.66 % which is greater than single 7 System. The user time of

Win7+RHEL6.0 is 11.24 %. I/O wait of Win7+RHEL is 7.08% which is greater than single Window7 virtual machine. Thus it can be said that combination of Win7+ RHEL6.0 takes more system CPU percent.

Conclusion: In the beginning, there was a objective taken which was Implementation of Virtual Machine with KVM hypervisor. To achieve this, virtualization was created on the Hybrid Cloud model as various virtual machines are implemented in RHEL6.0. After that results are evaluated using Libvirt commands. Result of libvirt commands are taken in term of CPU Time, VCPU Time, and Memory. Thus the performance measurement of Virtual Machine full filled as per objectives. In scenario 1 the Ubnutu10 has minimum load because it's idle time 83.92 %. In scenario 2 the combination of Ubuntu10&RHEL6.0 has maximum load onto it. Where as in the scenario3 Window 7& RHEL6.0 has maximum load.

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