

# Generating and Optimization of Resources in Database Servers using Virtualized Environment

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**Abstract**— There are many very costly and high configuration systems currently on the market for hosting servers with different purposes. These environments are IT infrastructures frequently deployed in large database center servers. But these high configuration system never utilized there full resources .Moreover, for increasing the number of user and assets in the market we focus on the resources and its optimization by costing, space and performance of physical machines. For achieving, there is a critical need to evaluate performance of large database centers in virtual environments. Virtualization not only help to utilize wastage resources even it saving space, resources and costing of hardware's on same execution timing as on separate physical system. For this, make database server on one separate physical machine and another one in the virtual machine which shows the execution timing in both the case are same but virtualization saving space, hardware's, costing and utilize free resources of base system of virtual machine.

**Keywords**— *Virtual Machine, performance, experimentation, database, cost comparisons.*

## I. INTRODUCTION

Virtualization began in the 1960s; it is a method of logically dividing the system resources provided by mainframe computers between different applications [6]. Virtualization plays an important role in the software market. Virtualization is a technique for creating virtual resources such as a virtual hardware platform [5], storage device, or network resources, to improve the utilization of the hardware resources. The cloud computing is very advantageous in educational process since the educational institutes lack of the resources such as providing computational software [3]. Generally in educational institutes, every student and faculty member is required a physical machine in order to install and use the desired software. However, the institutes have lack of resources some time they cannot provide physical system to every student in the institute. Therefore, this wraps up a time consuming and costly process. So solution for this problem is virtualization.

The virtualization makes use of server resources in dynamic and powerful manner [3] by setting up different types of servers within different cloud platforms such as public cloud

and private cloud. It is very useful in education by providing easy access to the required resources via remote learning. Moreover, the virtualization helps in reducing the total cost of extra resources such as assigning each physical Machine to client also it snip the cost of privilege computational software. By using virtualization technology we need to install the software on single machine while students and faculty can assess virtually [3]. The virtualization has three types [4];

### A. Full virtualization

It is almost complete simulation of the actual hardware to allow software, which typically consists of a guest operating system, to run unmodified.

### B. Para virtualization

It is a hardware environment is not simulated; however, the guest programs are executed in their own isolated domains, as if they are running on a separate system. Guest programs need to be specifically modified to run in this environment.

### C. Partial virtualization

Including address space virtualization, the virtual machine simulates multiple instances of much of an underlying hardware environment, particularly address spaces. Usually, this means that entire operating systems cannot run in the virtual machine—which would be the sign of full virtualization— but that many applications can run. A key form of partial virtualization is address space virtualization, in which each virtual machine consists of an independent address space.

Data center is a place where applications and data are placed and run. Those data and applications saved on various server based on function of application run. Since it has variety of, then it needs various server types, such as server of database, proxy, portal, website, application and so on.

## II. LITERATURE STUDIES

### A. Growing Technology

Increasing levels of server utilization in the data center raises several issues including the room needed becomes larger, energy consumption increases and the need for server

management becomes more complicated. Some literatures have discussed how the high use of energy for data center usage. In a Congress on server and data center in 2007, mentions a report from Environmental Protection Agency (EPA) said that the data center in the United States of America spent 1.5% portion of the electrical energy total consumption, which cost \$ 4.5 billion [1]. Other research mentioned that in 2000-2006, data center electrical consumption in USA doubled, and in 2011 also doubled (100 billion Kwh) or equivalent to \$ 7.4 billion dollars. This is similar to research done by [1], which states that data center energy consumption doubled every 5 years. It happens because the server is very high growth. In 2000 to 2006, according to a study server growth increased from 5.5 million to 10.9 million servers, while the growth of the server according to requires energy of 10 to 30 times compared with the energy needs for the office mentions that America and Europe are the top countries in terms of data center energy usage, but the Asia Pacific region is an area with the fastest growth of data center energy consumption.

Virtualization is the process of decoupling the hardware from the operating system on a physical machine. It turns what used to be considered purely hardware into software. Put simply, you can think of virtualization as essentially a computer within a computer, implemented in software. This is true all the way down to the emulation of certain types of devices, such as sound cards, CPUs, memory, and physical storage. An instance of an operating system running in a virtualized environment is known as a virtual machine. The main idea of virtualization is to provide computing resources as pools. Depending on the needs, resources are then assigned to different applications either manually or dynamically from different pools. The scope of virtualization can vary from a single device to a large data centre and virtualization can be applied to different areas such as servers, networks, storage systems and applications. Data Centre in virtualized environment is presented in Figure 1.

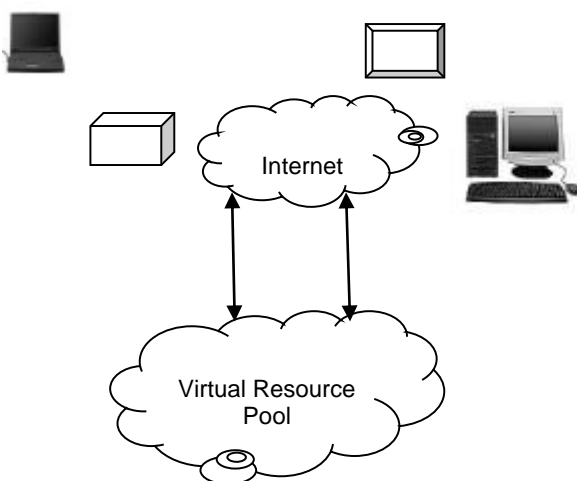


Figure No. 1 Data Centre in Virtualized Environment

**B. Server virtualization**

One way to reduce the level of energy in the data center is to use virtualization technology. Virtualization technology is a technology in which software runs on the virtual machine,

instead of a real machine. Virtual Machine (VM) is a machine that runs on a physical machine, in which can be installed Operating System (OS) and supporting application. The terminology used to distinguish VMs and physical machines is to use the term Host as physical machines, and Guest for the VM, so it will be known the term Host OS and Guest OS. VM was first introduced in 1960 by IBM using Time Sharing concept approach. Before virtualization technology is known, a computer or server only has one operating system, the relationship between the software in this case the operating system and hardware are very dependent on each other, the interface between the hardware and the operating system is done by using the ISA system. Some of the application can be run on the operating system; application can also be associated directly with the hardware by using the user ISA. As can be seen in the Figure below, all hardware collaborates on the x86 architecture.

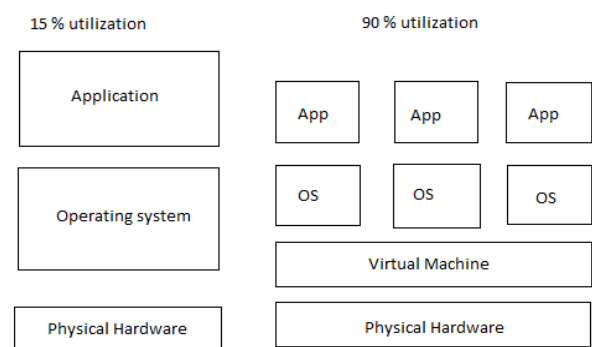


Fig 2: Classical vs virtualization

Application using this virtual machine does not know whether the application is running on a real machine or running in a VM. In figure above also shows that the server utilization rate increased from 10% to 90%. By using virtualization technology, there will be a decrease in the number of physical servers which will result in reduced energy loads and the burden of cost operation, besides there is ease in maintenance server by involving VMotion. VMWare VMotion is a technology that allows users to be able to migrate VMs between hosts that have the same compatibility without any downtime.

**III. PROBLEM DEFINITION AND SOLUTION METHOD**

Before you begin to format your paper, first write and save the content as a separate text file. Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads- the template will do that for you? Finally, complete content and organizational editing before formatting. Please take note of the following items when proof reading spelling and grammar: These are some problems related points; this could be overcome by Virtualization [2]. With virtualization in data centers and the wide use of number of SQL databases that support large demands of data in a scalable and flexible manner, so here our aim is to evaluate through performance of the system by run MySQL in physical machine as well as all

virtual machine. And then fetch data from database, so there will be no effect on code accessing time.

If in any organization number of servers required to run so for that individual system will be needed. By the use of individual machine there are some problems will be occur?

For this stabilize solutions in market virtualization based on different techniques were take on: virtual box or vbox.

#### IV. ADVANTAGES OF VIRTUALIZATION

following advantages are there:

##### A. Maximize the storage

One way to improve storage performance is to ensure that you're making the most of the storage you already have. You may have features that aren't even turned on, or perhaps you have features that could be enabled for a minimal cost. I/O workloads change over time, In many cases, admins tend to look to new "bells and whistles" to improve performance when the source of virtual infrastructure storage performance issues are the same things that typically affect traditional physical servers.

##### B. Partition alignment

When older operating systems (OSes) are run in VMs without taking partition alignment into account, you can cause performance issues. However, with Windows Vista, Windows 7 and Windows 2008 (or later, such as Windows 8 and Windows 2012), this is no longer an issue. There are a number of tools available to help you verify partition alignment of pre-Windows Vista and pre-Windows 2008 OSes.

##### C. Storage I/O control

With multiple virtualization hosts sharing the same storage, something needs to ensure the storage isn't monopolized by an I/O-hungry application or that more critical apps aren't starved for I/O. VMware's vSphere Storage I/O Control does this and is enabled with a single checkbox on a VMFS data store.

##### D. Storage Distributed Resource Scheduler (SDRS)

What VMware's Distributed Resource Scheduler does for CPU and RAM, SDRS does for storage. SDRS will move virtual machine disks (with no downtime) from one data store to another (or even from one array to another) should that data store be experiencing high latency or high disk space utilization. Make sure your storage can speak to vCenter using the VMware vStorage APIs for Storage Awareness (VASA) so vCenter can identify the capabilities of the storage for SDRS to be as successful as possible in preventing storage hiccups.

##### E. Disaster recovery

A disaster recovery (DR) plan is good business practice for a hardware virtualization platform solution. DR of a virtualization environment can ensure high rate of availability

during a wide range of situations that disrupt normal business operations. Continued operations of VMs are mission critical and a DR can compensate for concerns of hardware performance and maintenance requirements. A hardware virtualization DR environment involves hardware and software protection solutions based on business continuity needs, which include the methods described below.

- Whole-file and application replication

The implementation of this method will require control software and storage capacity for application and data file storage replication typically on the same site. The data is replicated on a different disk partition or separate disk device and can be a scheduled activity for most servers and is implemented more for database-type applications.

- Hardware and software redundancy

Ensures the highest level of disaster recovery protection for a hardware virtualization solution, by providing duplicate hardware and software replication in two distinct geographic areas.

##### F. Fault tolerance

##### G. Load balancing

##### I. Recovery to non-identical

#### V. RESEARCH METHOD

Here we find out issues of providing hardware redundancy for highly available services in the context of a middleware defined and standardized by the Service Availability here. In addition here physical machine act as a database server. In this research, there are two methods which have been done, Computing virtualized cost and improve performance of system

##### A. Computing virtualized cost

This could be classifying further by following steps:

a) Dynamic cost accounting: This is based on the basic requirements for the cost of consumption, in the dynamic cost accounting all its costs will be according to the trading volume, frequency of service, the number of users and other assessment its consumption of basic index division. If in a virtualized environment analysis and tracking can be clear at a glance, the dynamic cost accounting method can play a role, but also the statistics of unused resources. External service provider, the cost per minute calculation of a heartbeat, but is only possible because other users you do not use these services to pay.

b) Hierarchical Pricing: The branch does not require large storage, high bandwidth and additional support. This method can solve most of the problems of business support, to deploy and manage server and other tasks.

c) The cost of services and infrastructure cost ratio: Statistics unused resources of one of the ways is to benchmark cost categories, such as application, network access or other services provided to the business sector to Wan application bandwidth or data center facilities with cost. The base cost of the business sector may remain relatively stable, but the cost of service is different from consumption. The density of the virtual server, all the infrastructure costs will affect virtual infrastructure permission, servers, storage, bandwidth, it staff, site, additional components and so on to operation to carry on the summary, and according to the business requirements of the virtual server the number of partition. In addition, costs can be divided according to the need of practical application; all similar elements together, like incorporated into server virtualization density statistics in the same, but in this case cost to partition according to the specific application of resources occupancy. The cost of the business sector should be based on whether or not it alone for the application to decide, or according to the proportion of it in other business sectors were decided.

d) Assessment: direct or indirect evaluation is the external accounting for some special needs of the business sector cost distinction. This includes the IT cost of the business department according to the company's overall operating budget.

*B. Improve performance of system*

System performance can improve by following example: If in an organization there are number of different machines required so it would be costly eg. Cost of server machines will be estimated as:

Sr. No.	Table 1: Cost of different servers	
	Servers	Hardware cost
1.	Dell power edge T430	Rs.2,08,950
2.	LENOVO TD350	RS.1,51,515
3.	BQ889A HP	Rs.68,11,549

Table 1: Cost of different servers

So as we can see three machines cost will be high but using virtualization we can deduct this cost which means by using single machine we can perform different operating system on single machine at one time. Here we can show software virtualization as well as hardware virtualization both. By comparison of 3 operating system in vbox that will be run at one time simultaneously and check performance of system and after that load balancing perform in mysql and fetch data from server to utilization of resources properly.

**VI. EXPERIMENTAL DETAIL**

For the experiment, we adopted VirtualBox-5.1.20-114628-Win.

*A. Virtual Box*

A Virtual Box or VB is a software virtualization package that installs on an operating system as an application. Virtual Box allows additional operating systems to be installed on it, as a Guest OS, and run in a virtual environment. Virtual Box was the most popular virtualization software application. Supported operating systems include Windows XP, Windows Vista, Windows 7, macOS X, Linux, Solaris, and Open Solaris. Virtual Box was originally developed by Innotek GmbH and released in 2007 as a source software package. The company was later purchased by Sun Microsystems. Oracle Corporation now develops the software package and titles it Oracle VM Virtual Box.

*B. Benefits of Virtual Machine*

- **Reducing Number of Servers:** the benefit of virtualization is fewer servers, which result in lower the capital expenditure.
- **Running multiple operating systems simultaneously:** Virtual Box allows you to run more than one operating system at a time. This way, you can run software written for one operating system on another (for example, Windows software on Linux or a Mac) without having to reboot to use it.
- **Easier software installation:** software vendors can use the virtual machine for the software installation. For example, installing a complete mail server solution on a real machine can be a tedious task. But with the help of virtual machine this software can be easily packed in virtual machine and installed.

*C. Calculation*

The loads were calculated by giving different operating System loads on virtual box when we have Window 10 operating system as the base operating system. Followings steps are given to perform the experiments:

1. Current CPU configuration which is shown by given table:

Sr. No.	Table 2: CPU CONFIGURATION	
	Servers	Hardware cost
1.	Operating System	Red Hat Enterprise Linux
2.	Type of processor	Intel® Xeon® processor E5-2600
3.	Processor sockets	2
4.	RAM	4.00 GB

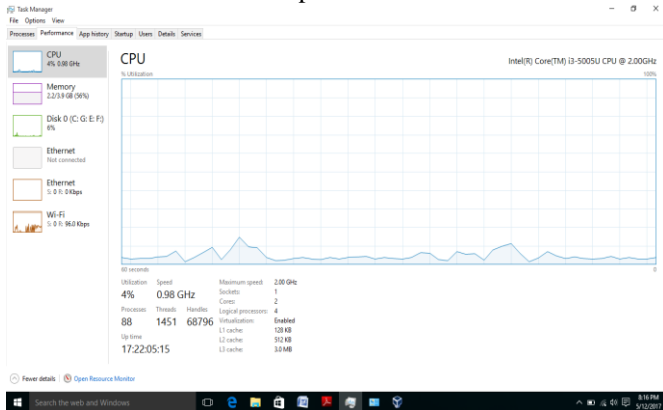
\* Table 2: Configuration of different servers



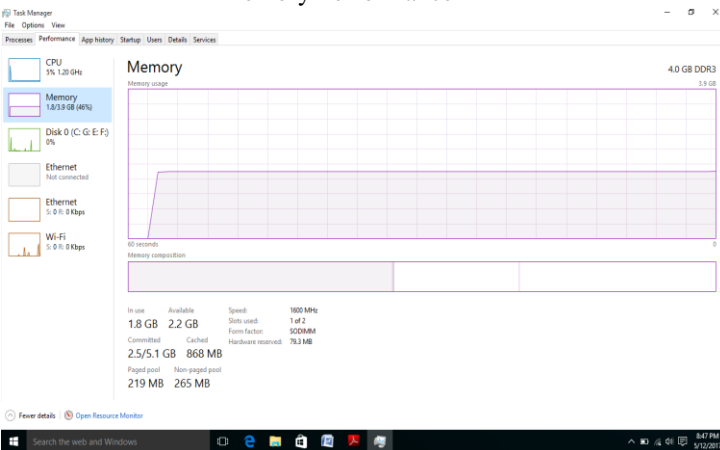
b.

2. As the Window 10(as the base operating system) is started and we run the Virtual Box application, the CPU utilization is very less as we seen in the fig. 1, We see that the CPU is near by 4% and memory is 55% in used as we can see in the fig. 3.

CPU performance

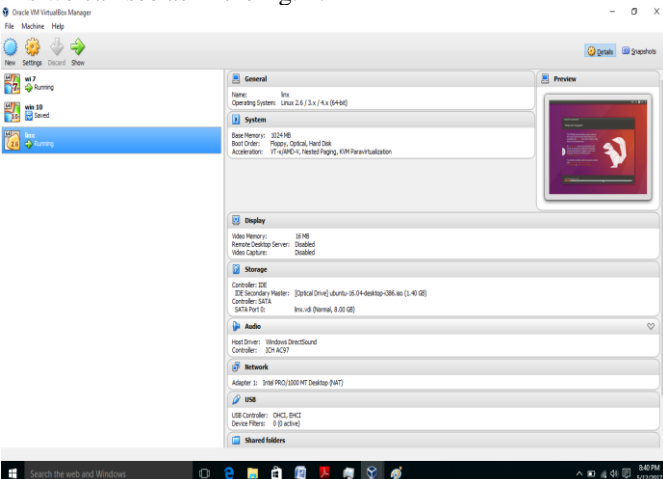


Memory Performance



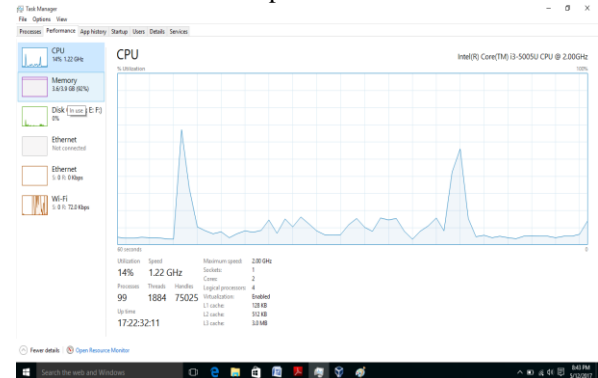
3. Now we installing the three operating system (Microsoft windows server 2007, Windows 2010, Ubuntu Linux) in the Virtual box. Before installation we decide the virtual hardware Configuration for the operating systems in the Virtual Box.

As we can see as in the fig. 4.

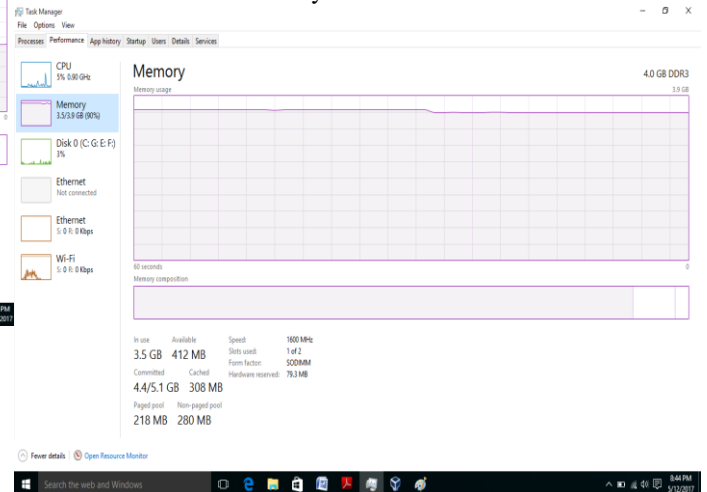


4. When we start the all operating system in Virtual box, the CPU utilization is increase according to the reserved configuration of virtual hardware in Virtual box. The utilization graph in fig. 3, shows that how the free resources came in use when all virtual parallel operating system are working. As compared to previous figure, the utilization of CPU is about 74% and memory is 65% that is almost 5 times increase resource utilization. So now you can see CPU performance is as follow:

CPU performance



Memory Performance



## VII. CONCLUSION

This paper discusses resource sharing and proper utilization of resources by load balancing. Virtualization technology is used for sharing the abilities of computer systems by isolate the resources among various virtual PCs. As you can see in this paper, one physical machine and three virtual machines are used these are used to increase performance of the system here this work will be done by make database on physical machine and same database configure on different virtual machines and then we will check access time of physical machine as well as virtual machines. Both machines will take same time to access data from database. There are some advantages of virtualization and the concept of increase performance of system and utilize resources properly with load balancing will be more clear with the help of following table.

Sr. No.	Table 3: current status of machine	
	Virtual machine server	Physical Server
1. Cost	Rs. 1,50,000(cost of one server)	45,00,000(cost of three server)
2. Space	Required less space	Required more space
3. Resources	a)almost 10% resources are unused b)only 5 % resources are remaining	a)80% RAM wastage b)95%resources are free

Table 3: Status of current machine

Virtual desktop is the best solution for virtualization Where every user can use virtual desktop like its own personal PC. The results have shown that the system performs well with 3 virtual desktops without reaching the saturation point. VBox in many domain environments provide good isolation when running high throughput. So in short with the help of virtualization system performance will increase and resources utilize more properly.

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