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Performance Evaluation of Server Virtualization with Different Parameters in Windows Host Server

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Abstract- *If there's one technology which can very much improve computing environments of any size that is virtualization. Via a single physical server to run plenty of virtual servers, you can reduce operational costs and boost resource utilization. The reasons to virtualize come down to ease of administration and cost reductions. Cost reductions come from cutting down the number of physical servers, dropping the power and cooling requirements, but they also come in the form of greatly reduced expansion. Rather than having to purchase new hardware to support a new application, all you need to do is add a new virtual server.*

Keywords: *Virtualization, VirtualBox, Resource Utilization, Cost Optimization, Server Consolidation*

I. INTRODUCTION

Virtualization is a mechanism which permits a single physical computer to run sets of code independently and in separation from other sets. It is the process of decoupling the hardware from the OS on a physical machine. This is done by one of four ways. Each method provides the code to be run with an abstraction later to communicate with, so limiting communication with the physical host. In this way, virtualization has the likely to allow a single physical host the ability to act as multiple hosts that operate independently. Under-utilized hardware may have its utility increased in a way that will keep applications from having a negative impact on each other. With performance controls mechanisms, the independent virtual machines can be kept from rob others of physical host resources (i.e. CPU, RAM, &c.) Memory Virtualization allows a program to make much larger amount of memory than which is actually available. We create swap units back and forth as needed by a storage device to achieve memory virtualization and virtual memory. In storage management, Virtualization is the collection of physical storage from different multiple network storage devices into a single storage device that is controlled from a central console. In an environment used by Network Virtualization, the virtual machine implements virtual network adapters with a host network adapter.

II. WHY USE VIRTUALIZATION

Today's modern IT communications operates in a completely different way than did ten years ago. Even though the data center may have a similar appear in some ways – you still have servers and storage, for example – as you peel back the layers, the way that data center is operated has evolved in a significant way. Before concept of virtualization was extended to the x 86 server markets, when organizations needed a new service, the deployment of that service started with the purchase, installation and configuration of what could be expensive hardware. In those days, individual servers were sized to put up peak loads. After all, you didn't want the end user or customer experience to suffer because a server, for example, had too little RAM or few disks. Nevertheless, although servers were sized for peak loads, average utilization for most resource components – processors, RAM and storage – felt far short of the maximum provided by the hardware. Organizations sized each individual workload at peak and did so across all services.

At the same time, the technology was booming and new services being brought on at a fast and furious pace. In order to accommodate new workloads, individual servers were purchased for each of those workloads in order to avoid the possible for clash between software and resources. So, the situation of "server sprawl" was born. Server sprawl is a situation in which multiple, under-utilized servers take up more space and consume more resources than can be justified by their workload.

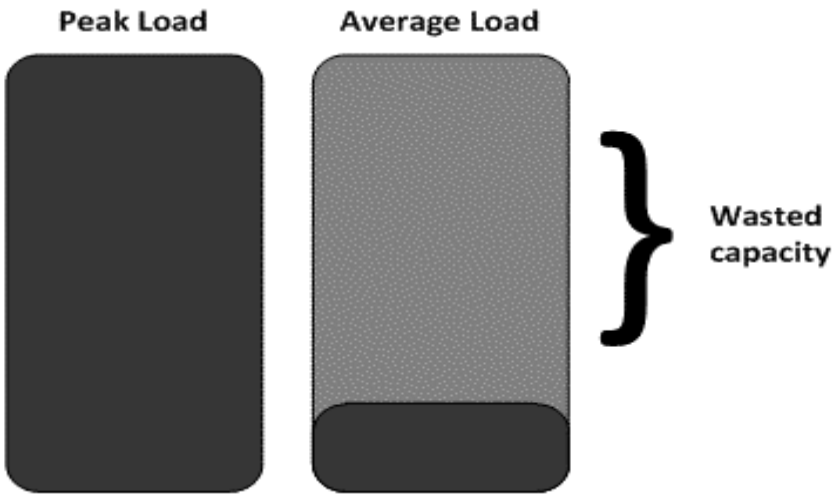

Figure 1: Server's Resource Utilization

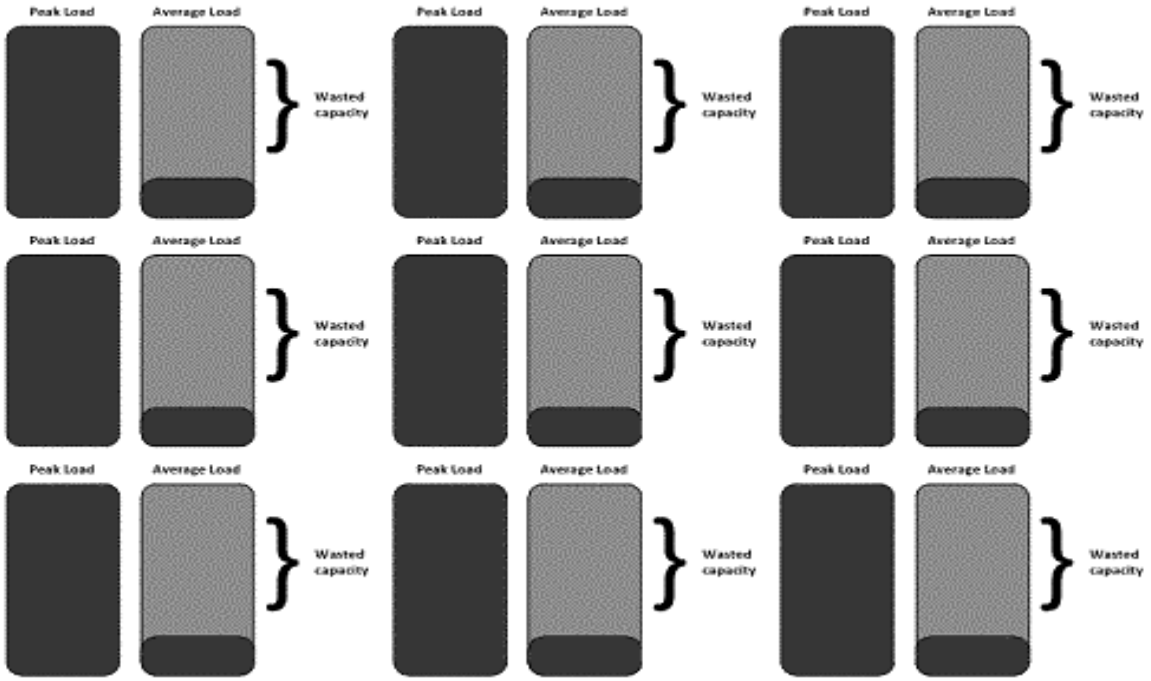

Figure 2: A lot of waste through Server sprawl

As add more things, each of these servers carries an amount, which, at the time, was not insignificant. As each server was added to the data center, the organization had to suppose new power and cooling costs. Additional, given the rapidity growth, data center space was a rare service. Racks were being added at a furious rate while companies struggled to keep up with demand.

In the past, companies were deploy servers that would not run at maximum capacity and, with every new service, new costs can be added in two way: First, each hardware device carried with it ongoing capital costs due to the need to ultimately replace that device; Second, the company's ongoing operating budget had to be adjusted for account for new power and cooling costs.

III. TYPES OF VIRTUALIZATION

There are many types of virtualization options but I am focusing mainly on the type of virtualization that makes organizations run – overall x86 server virtualization. Even though these are different types of virtualization, these virtualization types are usually integrated in people's x86 server virtualization plans.

- **Network Virtualization**. Network virtualization is the process to combine hardware and software network resources and network functionality into a single, software-based administrative entity, a virtual network. Network virtualization includes platform virtualization, often combined with resource virtualization. Network virtualization is categorize as either external virtualization, combining many networks or parts of networks into a virtual unit, or internal virtualization, providing network-like functionality to software containers on a single network server.
- **Application virtualization.** Virtualization is all about abstraction. When it comes to application virtualization, traditional applications are wrapping up inside a container that allows the application to understand that it is running on an original supported platform. It is software technology that encapsulates application software from the underlying operating system on which it is executed. A fully virtualized application is not installed in the traditional logic, although it is still executed as if it were. The application behaves at runtime like it is directly interfacing with the original operating system and all the resources managed by it, but can be isolated to varying degrees.
- **Desktop virtualization.** Both Desktop and server virtualization are involve virtualization of entire systems, but there are some differences between them. Server virtualization involves abstracting server-based workloads from the original hardware, which are then delivered to clients as normal. Clients don't see any difference between a physical and virtual server. Desktop virtualization, virtualizes the traditional desktop and moves the execution of client workload to the data center. Those workloads are accessed via a number of different methods, such as thin clients or other means.

IV. VIRTUALIZATION BENEFITS

There are many reasons that x86 server virtualization is predicted to become the norm rather than the exception. In other words, full virtualization will exceed the 50% mark. Here are two benefits of virtualization.

- **Separation of Workload**

  One of the reasons that the term "server sprawl" was observed was that servers were growing up everywhere to serve a single purpose. Windows doesn't always play nice when multiple workloads are being served. The feature of x86 virtualization is that workloads can be separated but rather than being placed on separate physical servers, these applications are installed inside individual software containers known as virtual machines. Administrators install an operating system such as Windows inside this container, just as they would with physical hardware. The hypervisor is responsible for ensuring that each software container has the resources that the operating system expects to see. For example, Windows needs access to storage resources, RAM and a processor in order to operate. The hypervisor makes sure that the virtual machine container is lead to believe that it has other critical resources as well, such as a keyboard; mouse and display adapter. Once an Operating System is deployed into this virtual machine, an administrator can install an application just as if this VM were a physical server, thus maintaining separation of workloads.

- **Improvement of Resource Utilization**

  The capability to separate workloads into their own containers while sharing hardware resources leads directly to much improved hardware utilization. For example, suppose you have five servers, each averaging about 10% utilization. With virtualization, you can combine these five workloads into five virtual machine containers and, assuming that benefits are direct and linear, expect 50% utilization with all other things being equal. Figure 3 shows how this can improve usage. Perceptibly, this is an exaggerated and normalized diagram. It shows equal workloads, which is probably not the case that never changes. In reality, under a virtualized infrastructure, care must be taken to separate workloads with competing demands among different hosts. By the example, you are able to decommission four servers and leave just one in place. That means less opportunity for hardware failure, lower ongoing power and cooling costs and lower ongoing costs related to server replacement.

Figure 3: *Improve resource usage with virtualization*

V. PROPOSED WORK

Working With Multiple Server Using Virtualization

I have installed three virtual operating system on the physical machine

- Windows 8,
- Android
- Ubuntu

These OS provides different server services on a single Windows Host Machine. Windows 8 using as FTP server, Ubuntu using as HTTP server and android using for running Android applications.

The resource usage and memory utilization are different for each of kind of the operating system.

VI. IMPLEMENTATION & RESULT

We are implementing virtualization with three main parameters, CPU & Memory utilization and cost optimization. Now I run VirtualBox application afresh and no virtual machine is running till. Now I run every machine one by one and check resource utilization and memory consumption in system monitor console application in guest operating system. The below table shows the resource usage for all the servers separately as well as after implementing one of them as a virtual machine. We find that CPU usage as well Memory Utilization increases as we start increasing the virtualization or adding separate virtual servers. Most important point to be noted here is that Memory Utilization gets decreased when I successfully implemented the virtualization, and thus optimizing the resource usage.

TABLE1

Populates the Resource Usage and Memory Utilization

Sr. No.	Scenario	CPU Usage (%)	Memory Utilization (%)
1.	Windows 8	53.18	42.92
2.	Ubuntu	34.27	42.17
3.	Android	34.27	43.25
4.	Windows 8 & Ubuntu	18.1	56.86
5.	Ubuntu & Android	41.3	56.27
6.	Android & Windows 8	29.58	58.6
7.	Windows 8 , Ubuntu & Android	79.65	58.02

Now suppose we are not using Virtualization, and have the three operating systems running on three different physical servers. The total cost for all three physical servers (Hp Proliant ML 110 G7) are approx. ₹ 109500 (₹ 36500*3).

CPU configuration used for the implementation –

- No of Cores – 2
- Processor Speed – 2.8GHz
- RAM – 2 GB

Using this configuration for Windows 8 (at the instance when table was made) we can say that it is using 42.92% of 2048 MB i.e. 879 MB.

Android is using 43.25 % of 2048 MB i.e. 886 MB

Ubuntu is using 42.17% of 2048 MB i.e. 864 MB

Total resource utilization comes out to be 2629 MB.

Now after implementing Virtualization using Virtual Box all three systems are using 58.02 % of 2048 MB which is 1188 MB, which is conclusively less than the total resource utilization for each operating system successfully. Similarly adding the CPU usage we find out that after virtualization total CPU usage has increased by 8%, which can be accounted for the extra implementation of Virtualization running on Windows Operating System. Total cost reduced to ₹ 36500, which is 1/3rd before virtualization. Figure below shows the CPU usage and memory usage graph when virtualization has been implemented for all three operating systems.

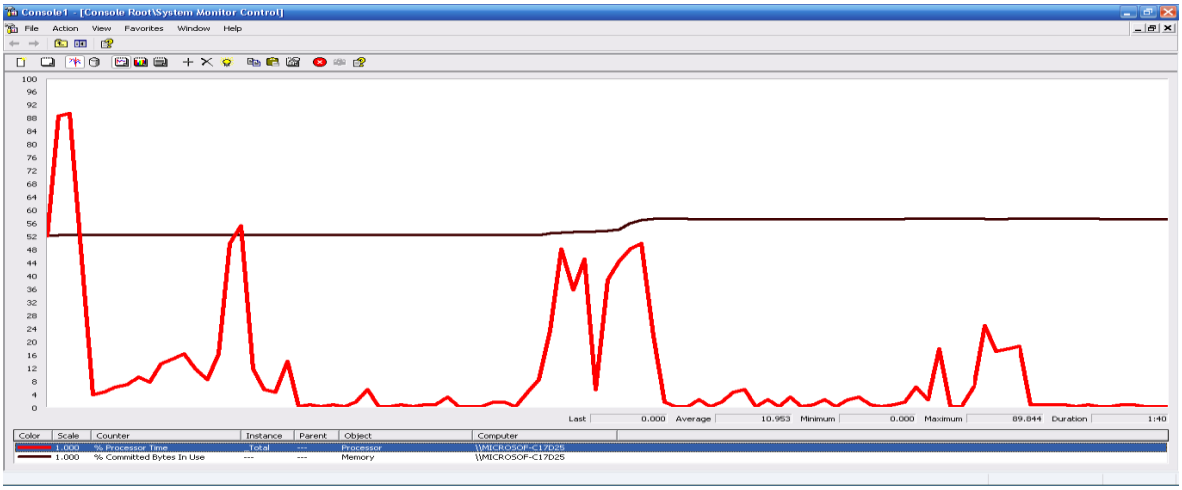

Figure 4 System Performances after Virtualization (Virtual Box) with Windows 8, Android and Ubuntu.

V. CONCLUSION

We have discussed the concept of virtualization and their types through this research paper. These virtualization methods help in making the resource optimization and better performance of the system. Performance and cost are the main issue for a system the virtualization will create a virtual environment to that will help to reduce the cost and increase the overall performance of a system .This paper show, with the help of server virtualization, how the different operating system run simultaneously on a single machine and increase the resource utilization and reduce the hardware cost of the system . Thus the server virtualization will provide a better way to optimize the resources and cost.

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