

NCOMPUTING: A CHANGE TOWARD GREEN COMPUTING BY COMPUTER VIRTUALIZATION

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ABSTRACT;-Now probably all fields weather its medicine, agriculture, Information Technology, transportation, defense uses machines those needed a large amount of energy and finance for its proper and effectively execution. We have different and very large machinery and equipment's to achieve our goals and tasks, great widgets with regal looks and features makes our lives effective, impressive and easy. NComputing targets are to minimize the use of perilous materials, maximize energy efficiency, and enhance the recyclability or biodegradability of outdated products and organization waste. NComputing, Cloud Computing, Virtualization, Grid Computing, Power Optimizations are the technologies of green computing. Basically through Virtualization we use software to simulate hardware. In the data-center stand-alone server system are replaced with virtual servers those run as software on a small number of large computers by virtual server and we can use computer resources effectively. NComputing virtualization software and hardware beat this unused capacity so that it can be shared simultaneously by many users. NComputing with remote access has not only saved more energy and power consumption but it also effects on the e-waste a lot. It also reduces the cost and increase the efficiency of the system.

Keywords: NComputing, Green Computing, Virtualization, Power Optimization, Virtual Machine (VM)

I. INTRODUCTION

All business communities throughout the world needs to save the energy power and so therefore like those technologies which save the energy power and minimize the finance. NComputing technology has been developed to meet these requirements of the business world. It reduces the organizations electricity bills and business community rapidly adopts this technology. Organizations apply the strict rules at their employees to reduce power and production would be maximized. There are two major issues faced by the business community; first increase in the power energy cost and the second one is the effect on environment. Business community switches on automated computing systems those need energy and due to rapid increase in cost of energy, they adopt different technologies to minimize to automated computing cost and it has been reached at a critical point. NComputing reduces power energy consumption and also a good impact on environmental e-waste. This technology minimizes the use of noxious and peril equipments that effect the environment badly and also increase the production with minimum use of energy and e-waste must be recycle. E-waste badly impacts on the environment as well as increase the cost of computation. Green Computing, Power Optimization, Cloud Computing, Virtualization are basically the approaches of NComputing. It has much potential to save energy consumption in its infrastructure. In NComputing there are some problems which we not only gave an idea but also we implemented in a well reputed institution in which NComputing already working. Today modern systems as social networks rely on different technologies such as clouds computing and green computing and NComputing must be systemic in nature. Day by day the PCs become more powerful than the previous era computers and also the use of computers is much more than before. Modern age computers need less electricity as compared to the previous computers such as first generation general purpose computer ENIAC required almost 150000 watts of energy whereas today's PC takes 150 watts' maximum energy. Where in previous era

there is one computer was used in comparison now millions of PCs are used which take a lot of energy. Millions of PCs used a lot of energy and also it will affect the environment as e-waste that will cause of pollution, emit carbon dioxide in air. These emanations can cause respiratory ailments, acid rain, and will change climate globally [1, 2].

According to CIOs survey in 2006, the business organization invests around about \$55 billion to purchase new automated equipment and to support them, they were spent \$29 billion i.e. more than the half of the actual cost of automated equipment to keep cool that machinery. For desktop computers the cost and energy consumption have been estimated as; a computer lab with 50 computers need energy to supply them to each computer or PC. The heat omitted by all these computers must need an addition equipment to support them in form of air-conditioned, developing countries the cost of electricity is more expensive and even unreliable, the power is also effected as whole much more and as the PCs needs to replace it will cause the pollution as e-waste, so finance, energy consumption and e-waste are the burning issues of this modern age. The NComputing approach has benefits over the above problem mentioned such as; Less power consumption, reduce the cost, use machine when needed, reduce e-waste, heat emitted is much less and they have no need for additional resources as air-conditioned [3].

II. VIRTUALIZATION

Virtualization of computer is comprising that two or more than two logical computers run on one physical hardware. In virtualization many physical systems have been combined into virtual machines on one powerful physical system and it will cause less energy consumption and reduces the electricity cost. Virtualization approach makes the efficient use of resources. Virtualization clicks NComputing by combining logical machines and makes it possible to use CPU processing power. Storage cost also reduced much more and has been centralized, amount of energy required, the heat generated and also reduced the operational and administrative

cost [4, 5]. Virtualization evolves in virtual hardware, operating system, storage and other network resources.

Constraints: Licensing Complexities is the major issues in virtualization. It is a big gap to take all benefits from virtualization on demand. Some organization tried to update the scheme of licensing for virtualization, but cost issue is the major barrier. Depending on centralized machines and other networks foliage the end users susceptible to centralized machines. The user can operate as locally, but as the user switch off or restart the system, it will not able to work. In contrast of the client's systems through the user can operate locally will continue until the connection will be reestablished. NComputing technology is the major step that leads to another power saving technology called Green Computing. Over 18,000 Organizations and other institutions are using this technology in more than 85 countries to save power consumption and to control e-waste. Today PCs are much more powerful and have a large capacity, now in TBs and most off programs takes a fraction of this large capacity. NComputing virtualization software and hardware with remote access spigot the capacity i.e. not used which can be shared at a time among multi users [7]. To access the virtual hardware an NComputing access device has been used and this access device has too much longer life than a PC and also it will cause to control the e-waste. In the system introduced by us the cost and usability of power has been reduced much times and the life of this access device if much more than a PC. PCs after 2 to 3 years must need to replace and they will affect the whole environment but using NComputing access device there is no need to replace it minimum 5 years and the e-waste of these devices will not cause to affect the environment almost 90% better than of normal powerful PCs.

- a. Consumes 99% less energy per user
- b. Reduces cost (no need of air condition, virtual hardware reduces the cost).
- c. It reduces the e-waste up to 98% less as compared to the PCs e-waste.

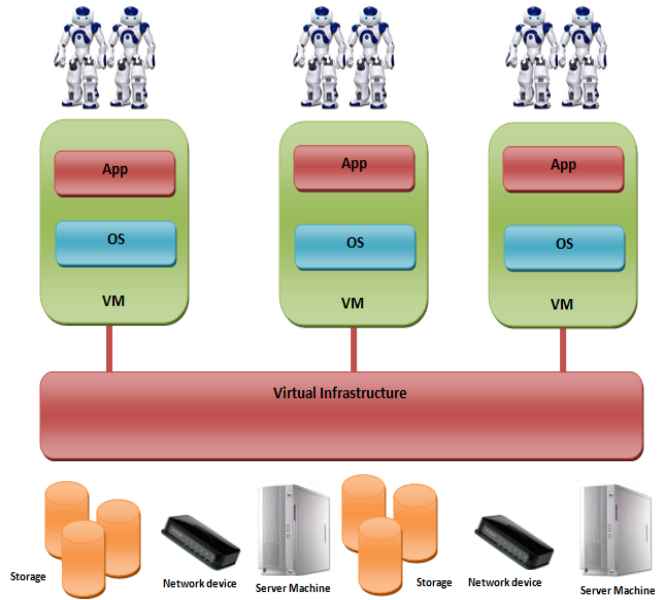


Fig.2: NComputing Virtualization Infrastructure



Fig.1 NComputing Virtualization Architecture with n users [6].

This technology has can be implemented on standard MS-Windows, Linux PCs. Each NComputing node has a keyboard, LCD/TFT, mouse and an access device. It is very easy to deploy and to maintain. Infrastructure represents the resources of the company. Virtual Infrastructure is a lively plotting of business resources. Result minimizes the cost and increase the efficiency. It consumes very small amount of electricity. Key advantages of our implemented system of NComputing are:

III. VIRTUALIZATION TECHNOLOGIES/DOMAINS

Many different types of virtualization techniques are used and these techniques can share area of internet in common. These techniques and technologies are organized in different domains. Every domain consists a group of techniques and technologies those can share that common area of internet. We will discuss five different domains of computer virtualization technologies: server virtualization, application virtualization, desktop virtualization, storage virtualization and network virtualization. These domains are discussed consecutively [8].

Server Virtualization:

This virtualization is the important and main domain. In this domain the physical server machine has been converted into virtual server machine. Virtual vendors often used this term as a physical server that differentiates between a virtual server machine and the physical machine.

Physical Server: Physical server represents the hardware machine that is actually involved in computations that is processed through the software say like system software and different application software's. A virtual server without a physical server in nothing and cannot perform anything without server machine. There is a physical server called a host which is basically converted from multiple physical servers to the virtual servers and then treated as a single physical server called host in virtualization. So this host can perform and control the whole process.

Virtual Server: The physical server called host and the virtual servers called guests. In server virtualization there is a virtual layer, and physical server hardware and the virtual layer exist above the physical server hardware and the system software is under the physical server hardware machine. System software such as operating system and other related system software and the application software architecture is same as a common architecture and there only the difference is this, there are many instances have been executed rather than a single instance has been executed.

Virtual Machine (VM): A VM virtually represents the host i.e. the physical server machine serene of system software and a lot of applications or single application software. A VM consists on a collection of files of a single file that can be read or executed through the virtual layer or virtual machine. Every virtual machine is treated as a complete computer and it works as a common PC and it's a combination of a mouse, keyboard, LCD/TFT as physical hardware and virtual system software. Each VM is an individual machine and other VMs are not aware about each other, basically they are deployed in such a way that they are treated as individual and isolated. It means that all virtual machines represented by a single physical hardware server are treated as individual machines and work isolated and the user understand each VM as a node or client of a network or a single independent machine. So this virtual layer is known as Hypervisor.

Hypervisor: It is basically the VMM i.e. Virtual Machine Monitor is a host layer, also known as the physical server hardware machine where many virtual machines and system software execute on a single physical server machine called host. Two types of Hypervisor called Type1 and Type2.Type1 is installed on hardware and also known as Bare-metal Hypervisor. Type2 is positioned among the VMs and the hardware.

Application Virtualization

It consists on those techniques or technologies which are independent applications from the system software. An application is encapsulated in a single executable file or a set of executable files which may distributed individually by the system software. Application virtualization is of different types. Here we will discuss two most common types of application virtualization; sandbox and application streaming.

Sandbox Applications: Sandbox applications are independent and are called bubble in which it is covered or encapsulated through the system software. In sandbox there is no need any additional installation for execution that omits the dependency issues. All the features are already embedded in the executable file of applications in the system software. There is no need to store data or files of application. The user gets the copy of application called clean copy; this file is executable file that represents the application s an image. User can change application according to the given or allotted rights [8].

Desktop Virtualization

Desktop virtualization containing system software, application software and the user's data from the node, this node is basically a computer that consists on a mouse, keyboard, LCS/TFT and an NComputing Access Device that is used to access the desktop. This virtualization is further subdivided into two types; 1: Client Side, 2: Server Side.

Client side takes the resources and its desktop virtual and on the server side, the user application software is executed remotely on the physical sever machine and client sided is controlled by this server through remote display protocols or others different virtual technologies.

Client side: Client side gets resources from the Server side and it is executed locally as a virtual desktop and the user does not know about the other clients those are connected the Physical Server machine on server side. For this purpose, Type1 Hypervisor and Type2 Hypervisor are used.

Server side: The solution is shared virtual desktop for the proper execution of the applications on the server side. All the programs and applications have been executed on the server side and it is treated as the central location and Data Centre. The information and data have been displayed on the virtual client desktop from the server side through remote access protocols. Each user has its own virtual desktop, but share the same system software and applications those are installed on server side.

Storage Virtualization

Storage virtualization provides the abstraction layer between the physical storage and the logical storage system [9]. This virtualization can be divided into block and file virtualization. In Block virtualization, virtual disks have been created to appear, only one physical storage in the distributed storage networks as the physical server machine is also one. Whereas, in File Virtualization a file system for storage devices have been created. This system unites a number of files into a single file system that makes a logical pool. It also keeps track of files and data those are remain or used and which data and information reside on which storage device.

Network Virtualization

NV is consisting of a set of technologies and techniques that does not show the main complexity of the whole network and subdivided into the small parts. In NV, many different virtual networks have been combined in a single physical network. Well known virtualization networks are VPN, VIP and VLAN.

The Ncomputing Architecture

The NComputing architecture is very simple. The modern personal computers are very powerful computers and most of the applications software's take a very small amount of its computing capacity and this technology cope up the remaining capacity by sharing to others computers which are connected to a single PC called a host or Physical Server Machine and they have been controlled by providing virtual software to each node. Each node consists on a mouse, a keyboard, an LCD/TFT and a very smart device called NComputing Access Device that is connected to the Physical server machine. This device has no any central processing unit, memory, mother board etc. NComputing technology uses not more than five watts of energy. A normal PC uses 110-150 watts of power energy and the NComputing takes only 1 watt to 5 watts. Almost there is 90% reduction in energy consumption. There are others major benefits of NComputing Access Device are; it is highly reliable device which is treated as a complete system unit and also does not affect the environment as the PC can cause the landfill. It is very effective technology especially for developing countries or those where electricity cost has been increasing day by day

such as Pakistan. This technology uses MS-Windows, Linux and common PC applications. The technology, i.e. embedded by us is more reliable and increase the efficiency of NComputing systems and it reduces the power consumption from 90% to 99% almost as shown.

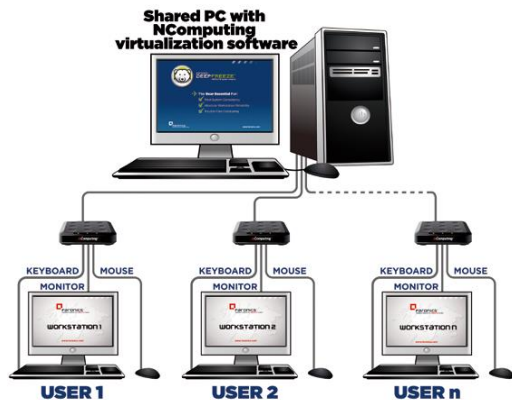


Fig.03: Shared PC with NComputing Virtualization Software

A Radical Difference

As a powerful PC consumes energy at least 110watts and maximum is 200watts, as compared to this use of energy consumption NComputing access device takes maximum 5 watts and minimum 1 watt’s energy consumption. Our smart system with NComputing technology saves 110 watts for 10 users and 220watts for 15 users set. In NComputing Access Devices, there are two common series are used-L-Series that takes 5 watts per added user and X-Series that takes only 1 watt per added user. Where our smart access device reduces the power consumption saves 99% energy consumption. That is the major step leads to the green computing.

- An X300 smart device saves 99% of the energy of a PC.
- An X300 saves 90% of the energy of a PC.
- An L230 saves 95%. [23]

E-Waste

In the world’s major problems, e-waste is also a key problem faced throughout the world and mostly in developing countries. PCs after 2 years need to replace and they have been the major cause of landfill and effect the environment badly because of its toxic waste. NComputing technology overcome this problem and solved it at maximum level because;

- NComputing Access device has much long life than a common PC as discussed above.
- In absolute mass, PCs are the major caused the e-waste. A PC has about 20 pounds’ weight whereas NComputing access device has about 1/3 of a pound. It means there is 98% difference in weights.
- Because the NComputing access device has much more less weight than a PC, its cost less to ship and fuel.
- NComputing access devices have no such martial that can cause harmful such as mercury, cadmium and lead etc.

- NComputing also the cause to reduce the paper consumption [9, 10].

Problems Identification

Although NComputing is a powerful and very useful technology of the modern age; and minimize the cost by virtualization terminals, but it has some limitations as follows; First, Limited number of computer having virtual desktop can be used, second, Length of wire is small for NComputing Switch, and third is Virtual Desktop creates some problems for the proper execution of different Applications. There are a limited number of computers used in NComputing. Maximum users can take part in single NComputing is 30. Each user’s node has an independent physical connection to the Shared PC that will create complications. NComputing network uses physical medium size 20 ft maximum.

IV. Proposed Solution Remote NComputing

To overcome the said problem novel solution is proposed. This proposed solution is based for proper execution of applications and increasing the number of computers. NComputing terminals having Virtual Desktop must be accessed remotely. In this case you can increase the number of computers and the distance. To access remotely we must embedded a remote access device in NComputing Switch so that it will cause to reduce the cost to establish or implement the NComputing and also reduces the energy consumption as well as e-waste. This implementation of remote system by using router in RJ-45 port of NComputing switch.

Table: 1 Calculating the Energy Savings Model and efficiency of our smart system using 5 users on a single shared PC					
No of Sets	Normal PC Power Consumption Watts	NComputing Power Consumption (L-Series) Watts	NComputing Power Consumption (X-Series) Watts	Remote NComputing Power Consumption Watts	Efficiency Saving Watts
1	110-150 x 5 = 550 – 750 watts	5 x 4 = 20 +110 Watts = 130 Watts	1 x 4 = 4 watts + 110 = 114 watts	1 x 4 = 4 + 110 =114 watts	Zero
2	110-150 x 5 x2 = 1100 – 1500 watts	5 x 4 = 20 +110 = 130 x 2 = 260 Watts	1 x 4 = 4 + 110 = 114 x2= 228 watts	1 x 4 = 4x2= 8 + 110 =118 watts	110 watts
3	110-150 x 5x3 = 1650 – 2250 watts	5 x 4 = 20 +110 = 130 x3= 390 Watts	1 x 4 = 4 + 110 = 114 x3 = 342 watts	1 x 4 = 4x3=12 + 110 =122 watts	220 watts
15	8250- 11250 watts	1950 watts	1710 watts	60+550=610 watts	1100 watts
30	16500- 22500 watts	3900 watts	3420 watts	120+1100=1220 watts	2200 watts

NComputing technology deployed in a well renowned institution in Pakistan, where it had been studied and observed. This technology faces the issue and found these

mentioned problems. First of all, select a shared PC and a single node and take a WiFi router with port RJ-45. Implement this on these two NComputing set and experiment have been conducted successfully. After successful implementation, it is expanding on the whole lab and after struggling a lot being successful to implement this new technique. The results will be observed after deploying this technology. Below table carry the following results.

If it has been expanded for 30 users, then our introduced system gives the results accordingly. The main constraint is that used router, because Router to achieve our goal. We must embed the remote technology in the NComputing Access Device. switch.

of e-waste. It also reduces the overall cost to implement the Labs and computer equipment's in any organization. NComputing Smart technology saves more energy than the existing NComputing technology. In future it will embed a small and a smart router in NComputing Access Device so that there will be no need to use a separate router for this purpose.

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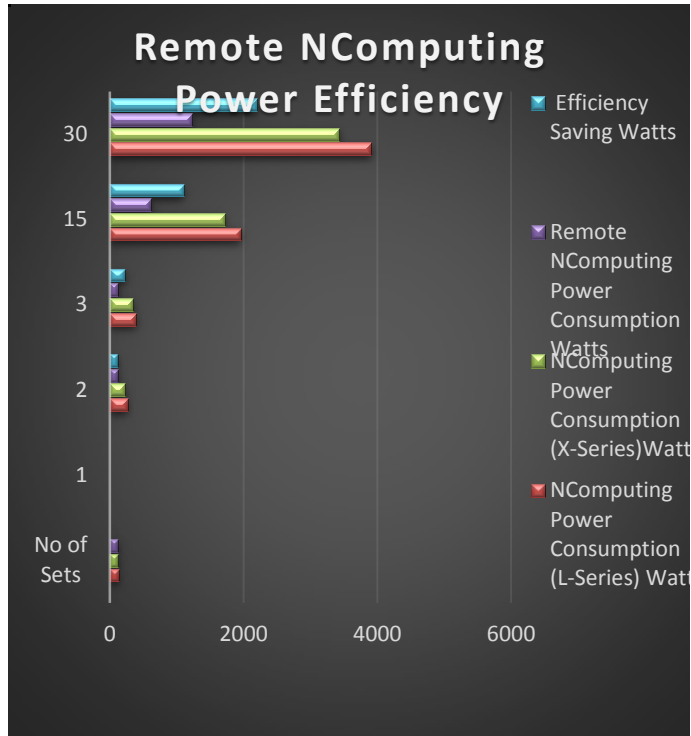


Fig-04 Proposed solution power efficiency graph

V. CONCLUSION

All business organizations, especially in developing countries where electricity is a major issue in the form of cost or availability are needed to save energy consumptions. They are trying that how they can reduce the power energy consumption cost. The organizations which are using automated environment have been bearing the high electricity cost and the main reasons are PCs. And PCs are effect the environments badly in the form of high rate of land fill and increase the e-waste ratio. NComputing cope this problem and minimize the energy consumption cost and reduce 99%