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A Review on Energy Efficient Cloud Computing

[1]Sudheer Tindivanam, [2]Sikinder Baig Mohammed and [3]Tarik Eltaeib,
[1,2,3]Computer Science and Engineering, University of Bridgeport, Bridgeport, Connecticut, United States of America.

Abstract— Energy efficiency is one of a pressing issue in the future of cloud computing as ICT (information and communication technologies) is playing a major role in communication and transportation of information, but the ICT still has some shortcomings which cause it to be a less feasible solution because of its high cost of operating [1]. Relatively the need for Green Computing is also gaining importance due to limited power sources[2]. In this paper, we discuss methods for efficient power utilization and limiting Green House emissions.

Keywords: *Cloud Computing*

I. INTRODUCTION

A. Cloud computing

Cloud computing is becoming more popular now-a-days, and that in turn is being responsible for a hike in demand for resources on the provider's end[3].For example we can analyze the extent by data provided by google that their energy consumption was estimated to be around 2,675,898 MWh[4].Most popular companies spend close to half of their annual budget for the operation as well as cooling of the infrastructure in their data centers. The operation and cooling efforts also amount for Green House Emissions including co2[5]. According to Centre energy forecast report[1] Cloud computing reduces the operation costs by one-fifth and costs on cooling needs by close to one-third[6] as the services run on remotely and provide virtualized resources [7]which shifts peak loads to other parts of cloud and provide extra hardware utilization.Virtualization technology makes computing resources more flexible[1] it is usually referred to as pay per use technology in other words users pay for what resources they have used[8] This is achieved by using smart hardware where smart indicates that the hardware which is used produces less GHG (greenhouse gases),which is accomplished by using various mechanisms which reduce the overhead and cause the hardware to power down when they are idle ,for example we can use SpeedStep[1] , PowerNow[1] , Demand based switching [1] and so on which cause the processer in the systems to reduce processing and release less Greenhouse gases

B. Virtualization

Virtualization Is a concept that is a major component of cloud computing technology, the word virtual represents something that not real which in the context of cloud computing means a storage space that is not present at the location of the user but it can be accessed by the user. The generalized virtualization process consists of three phases or components which are

1. Guest
2. Host
3. Virtualization layer [9]

The guest represents a component which interrelates with the virtualization layer, the host represents the platform in which the virtualization layer and the guest interact with each other, finally the virtualization layer provides the environment in which the host or the user can function. The environment which created in virtualization is a safe and remote and customizable environment which the user can operate without any risks of crashes or failure which can critically damage the system[9].

II. LOW ENERGY CONSUMING HARDWARE

As we discussed above in the introduction one of the way to reduce the energy consumption by the cloud computing using ICT (information and communication technologies) is by implementing the use of hardware which uses less energy to function and by using strategies for placement of data which in turn reduce the duplication of information which saves disk space and energy consumption by the hard disks because they do not have duplicate information which is not required in the first place[10].

A. Energy efficient power consumption

Most of the energy resource consumption in data centers is used mainly for computational operations, networks, cooling needs and other overheads. Some of the methods can be used to reduce power consumption without affecting the performance in data centers. They are as follows

A. Virtual server consolidation

A study conducted by Corradi et al, Revealed that virtual machine consolidation is used at cloud data centers[11] in order to reduce power consumption. Using this technique we can allocate more number of virtual servers on less number of hosts thus, we can reduce operating cost and increase energy efficiency though there is a threshold limit on host to allocate virtual servers beyond which if virtual servers are connected to a host performance of virtual servers would be degraded.

B. Thermal and power management

Using this method, efficiency in cooling needs is increased that decreases total power consumption by decreasing the servers that are ON and maintaining temperature of cold air supply. However, we need to have minimal information about incoming workload in-terms of rps(requests per second) to be able to use this technique[8].

III. CLOUD AS A STORGE

Cloud storage service accepts 20 active files with a constant rate of 1.25MB per user and download rate is one download per hour. In this service the data is maintained, managed and also backed up and made available to the users remotely over Internet

IV. FUTURE SCOPE FOR CLOUD COMPUTING

The investigation in the above discussed points was performed in the technology of the past decade, but there have been a lot of advancements in the technology used in the manufacturing of the equipment which is used in the functioning of the cloud

computing environment. The advancements lead to a vast increase in the efficiency of the equipment. These advancements in hardware like semiconductor technology, processors which consume low power and high performance[2].

CONCLUSION

As energy consumption is a significant factor for energy saving strategies for integrated systems which involve in computation and networks. We surveyed on areas contributed for recent research, exploring these areas tend to propose the best way to put cloud computation is with the virtualization by identifying the main sources of energy consumption and the relevant trade-off of performances. Also through in sight energy consumption in cloud based systems in a large scale can help in conserving the energy as a whole, which are mainly communication needs integrated with in the system. Based on the surveys by efficient use of specific plug-ins and energy control centers to map the network of huge computational hardware with optimized firmware can make system more reliable and power efficient and the results include individual expenditure per hardware as well as software with optimized processing power keeping system to its minimal performance. This increase the balance in frontend and backend of the system at user ends which gives the efficient QoS and performance at every single individual. Depletion of emissions like GHG & Co2 from data centers and respective coolants supports better eco-friendly state

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