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Review Article

Energy Consumption Survey on Cloud Environment

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A B S T R A C T

Today's users prefer pay-per-use internet services. Cloud computing provides this service. Thus, the use of cloud services has gradually become more widespread. Clouds offer services like file sharing, file storage, data backup. Online database Flexibility reduced administrative burden, scalability. However, there is too much energy use. In the paper, various factors are explained.

Keywords: Cloud Data Centers, Energy Consumption, Green Cloud

Introduction

Incorporating storage, networks, hosts, services, cloud data centers are a collection of heterogeneous resources that are connected to one another and offer network access to a variety of resources upon request.[4-6] Cloud data centers (CDCs) house a large number of physical servers-possibly thousands. The benefits offered by the cloud, such as pay per use, security, quick access, dependability, energy optimization, are growing in popularity every day.

The number of data centers is growing along with the use of the cloud. Thus, various servers' energy consumption will likewise rise. In the modern era, energy is the most crucial component to take into account. The environmental problem caused by this energy usage is heat production and CO2 emissions.[1] The key problem is to decrease energy consumption without affecting the effectiveness of the services, as more data and computing applications must be processed as quickly as possible, which requires more disc space and servers.[3] Numerous researchers conduct studies to improve energy efficiency. Such as better application techniques, better energy-efficient hardware, Dynamic Voltage and Frequency Scaling (DVFS), client, server, virtualization.[2] Virtual systems in cloud computing use some energy during execution to run their operations. Green cloud computing refers to computing that focuses on energy use optimization. The major goals of green cloud computing are to increase material biodegradability or recyclability, reduce the usage of hazardous materials, increase energy efficiency over the course of a computing device's lifecycle.

Architecture for Energy Consumption

Our energy-saving mechanism's architecture is primarily built on the principles of optimization, monitoring, reconfiguration. Cloud environments have uncontrolled, unsupervised states at all times. The Monitoring and Reconfiguration modules communicate with clouds to complete the task. Energy calculator Module predicts energy consumption without going against the current Service Level Agreement (SLA). SLA is the contract between the client and the service provider, so that expectation of both service provider and service users are met at same level. SLA is documented between both parties.

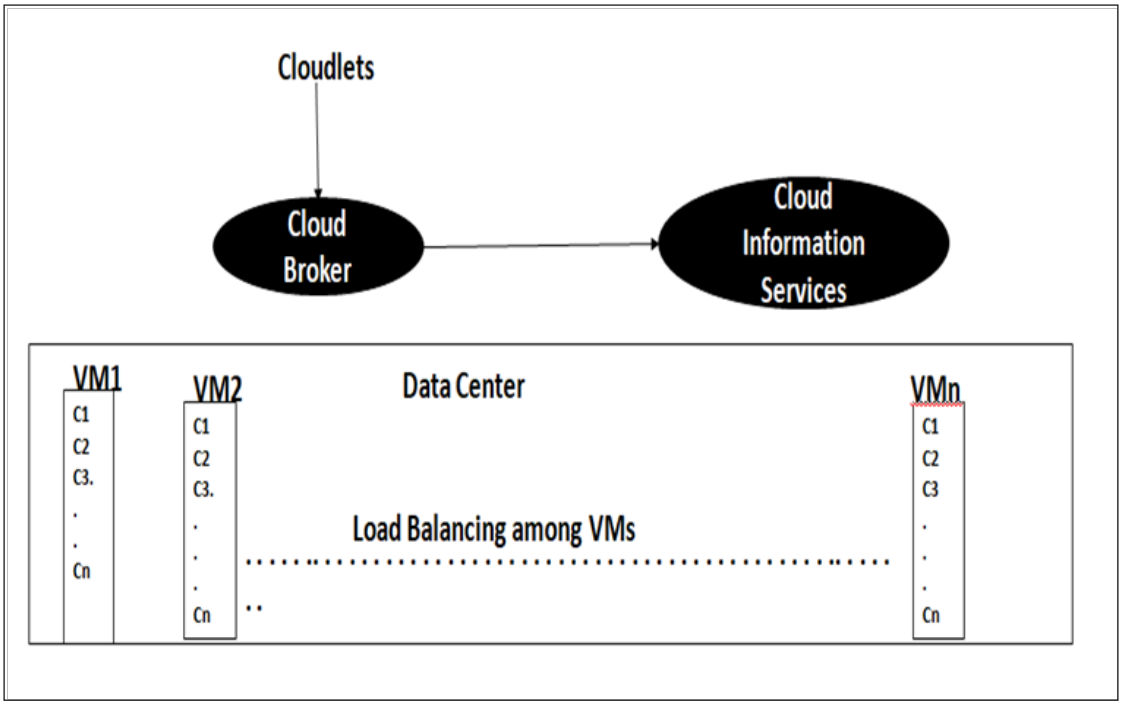

Figure 1.Data Centers with different Virtual Machine

Energy Consumed by Data Centers

There is significant energy production as data is transferred between nodes. This energy generates heat that is extremely detrimental to the environment and shortens the lifespan of data centers. Therefore, energy optimization is crucial in today's world. Thus, it is the primary problem facing the electronic sector. With energy optimization, heat is decreased and gadget life is increased. Virtual Machines (VM) are frequently not fully utilised for data transformation. Energy is being wasted too much in these situations. Such VM"S are essentially torpid at that point due to the energy optimization.

Data centers energy efficiency is predicted by a standardized metric called Power Usage Effectiveness (PUE). The basic proportion of the total electricity entering data centers that is consumed by IT equipment. The electricity utilised by support equipment, which mostly consists of power distribution, cooling systems, other facilities like lighting, is known as overhead load. By extending roll-on computing demands over numerous users and time zones, hardware utilisation can be enhanced. Cloud-based virtual servers are simpler and less expensive to manage than physical servers. When compared to a physical server, moving data to the cloud is more cost- and time-effective.[3]

Analysis For Energy Consumption

Two measures are devised to determine the overall energy consumed by data centres, according to Green Grid.[8] The benchmarks are Data Center Infrastructure Efficiency (DCiE) and Power Usage Effectiveness (PUE), they are as follows:

PUE=Total Facility Power / IT Equipment Power

DCiE=1/PUE= (IT Equipment Power/ Total Facility Power)*100

In cloud infrastructure a node consist of network topology, storage capacity, power supply unit, server with parallel processing unit. In cloud computing environment total energy consumption is defined as:[7]

Ecloud= ESwitch + ENode + EStorage + Eothers

Consumption of energy in cloud environment having n number of nodes and m number of switches elements are defined as:

ECloud = n(EMemory+ENIC+EDisk+ECPU)+ M(EChassis+ EPorts+ELinecards) + (EStorageConroller + EDiskArray) + EOthers.[4]

Different Energy Reduction Techniques

Green cloud computing is implement three different approaches. These are software approach, hardware approach and network approach These techniques are used for the depletion of energy consumption.

Software approach used for Energy Reduction

Depletion Server Consumed Energy

There are number of servers attached on clouds. Sometimes the work can be handled by few of them.

So by decreasing the number of active servers energy consumption can also be reduced. This can be performed by execute scheduling optimization, It is the main perspective

of Green Cloud which are more well planned than hardware optimization[10] with reference to consumed resource, cost and scalability. Energy optimization techniques with the capability to adhere SLA are provided by network optimization technique.

Depletion Memory Consumed Energy

By using MPSim (Memory Power Simulator), scheduling algorithms are assessed. The average waiting time of VMs and the energy consumed are calculated to determine the average time to schedule.

Hardware approach for Energy Reduction

Other methods of energy reduction use physical hardware to increase the server's computational power by adjusting the server's voltage and frequency settings, which affect how much energy is needed. In Green Clouds, expensive, specialized hardware with scalability issues is used for this purpose.

Network approach for Energy Reduction

Datacenters use energy for virtual machine connectivity.[9] Network traffic between the servers is reduced to reduce energy consumption. Datacenter Energy-efficient Standard) Network-aware Scheduling primary goal is to reduce energy usage, it achieves this by redistributing traffic patterns and consolidating tasks.

Conclusion

as day-by-day growth in cloud computing usage. Data centers are being used more frequently as it grows. These centers are now producing more energy, which has negative effects on the environment and shortens product lifespan. Green technology creates a welcoming environment. It maximizes energy effectiveness. Three main strategies are used in green computing, each one uses a unique method to reduce energy use.

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