Green Cloud Computing Approaches w.r.t Energy Saving to Data Centers

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ABSTRACT: *Cloud Computing technology can be used more and more in IT projects due to less cost and friendly use environments. With the use of cloud hardware infrastructure the energy power can be decrease by following factors: Dynamic provisioning, multi-tenancy, server utilization and data centre efficiency. This paper discuss the various approaches for energy saving, high performance with low cost and based on accurate measurement of energy consumption of cloud computing.*

1. Introduction

Cloud computing is one of the most powerful technologies in the world. They can be provide servers, software, hardware resources and data access anywhere and computation service on the internet and pay as you go model. Cloud Computing used as a utility [1]. It can be provide access data, software and computation resources everywhere and pasy as you go model. The main advantages of cloud computing is user cannot invest too much investment on resources in computing infrastructure.

However with the rapid development of cloud services to the customers i.e. Google [2], Yahoo![3], Microsoft[4] and Gmail[5] etc. there is increasing amount of energy consumption to their data centers where all data can be stored and for running these data center there is in need of huge amount of power. The amount of energy required for data centers to monitor client data network peripherals, cooling fans and cooling system for the servers in data centers. In 2012 around 38 Giga Watt (GW) power consumption of the data centers and it is 63% more consumption power in 2011.[6]. The total estimated bill for data centers in 2010 is 11.5 billion and it double every year because of clients. [7]. with the increasing amount of data centers then energy efficiency also increasing. Then there is in need to implement for energy consumption for data center they introduce friendly computing

environment called "Green Cloud Computing".

Green Cloud Computing is defining as maximize the amount of power consumption and energy efficiency and minimize the cost and CO2 Emission [8]. The main purpose of green cloud computing is investigate the computer application and resources with low cost and low power consumption and promote to development of society. In the internet one each Google search is the amount of energy consumption and carbon dioxide emission is present in Fig. 1 [9]. The amount of carbon dioxide is emitted is increase with the greenhouse effect.

They solution for energy consumption power is introducing a technique called virtualization in the cloud. The virtualization is providing better resources solution for energy consumption and live migration.
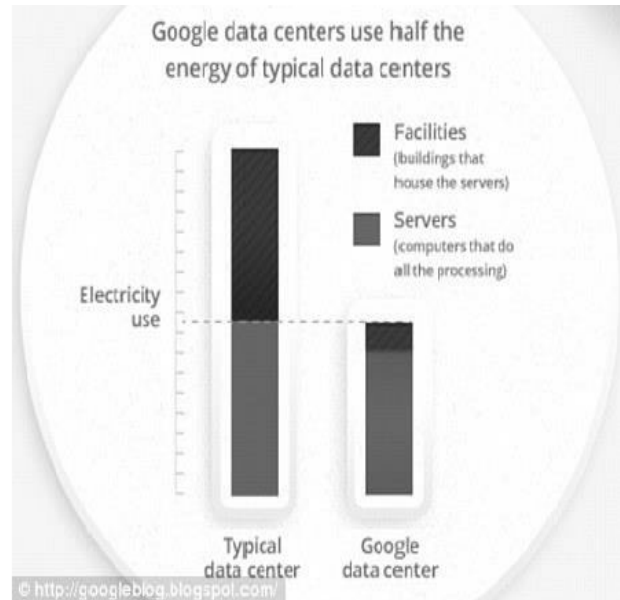

Figure 1. Energy Use in Google

2. Energy Efficiency Strategies

The performance and energy depend upon many factors. Some techniques for server energy management in Cloud environments for example sleep mode, turn on and turn off server. Other techniques Dynamic Frequency Voltage Scaling is also provide better resources utilization. Another technique for Cloud Computing introduces Green Cloud Computing.

2.1 Calculating Energy with single task as a unit:
The author calculating the total energy consumption in Cloud environment base on runtime tasks. A single task measured and energy produce by task under configuration was measured. In this task they introduce an Analysis tools which taken as a input and energy consume by each task based on parameters like processing, data size and system configuration. They can be helpful to identify the relationship between power consumption and power saving as well as system performance. The analytical result is important for the energy efficient mechanism.

2.2 Daily Workloads:
It can be depend on schedule upon server availability in order to improve the efficiency. It can used queuing theory principleand depend on packet arrival rate, data in queue and response time by servers. It depend on power cost of server to maximize efficiency .This principle can configured with respect to require utilization for handling the recommended workload.

3. Green Cloud Computing

This section describe the Green computing use in IT, application in Green IT and where its need as follows:

It can be started in 1987 and the report name is "Our common Future is issue by World commission" This idea can be came by "sustainable development" It purpose is to minimized the consumption of energy for IT related resources like computer products.

3.1 Definition of Green Cloud:
Green cloud refer to efficient use of computer and other resources with respect to environment and the main goal is energy efficiently used by peripheral devices and electronic wastes can be satisfied more efficiently overall performance.
For this purpose we are using such method for proper efficiency of program, storage and energy. As well as recycle the efficient energy economically.

3.2 Green Cloud used in IT Areas
IT industry needs focus and proper management of resources on the following issues as below:

1. Power can be proper manage
2. Server can be virtualized
3. Data Centre Design
4. Recycling the Design
5. Environment sustainability Design
6. Energy Efficient Rate Resource

4. Review In Green: It Areas

There are many authors who work on green cloud with respect to cloud computing. Now a day large data storage and computational demand is growing. IT area mainly focus on management of power, energy efficiency and virtualization of servers A year-wise study from 2009 to 2014 is given and main objective which has focus to work in the areas of Green Cloud Computing. The result is as follows:

Year	Concern Area in Green IT
2009	Energy Efficiency
2010	Reducing the rate if CO_2 and Energy
2011	Energy Efficiency and Power Management
2012	Energy Efficiency
2012	To provide Green and Cost efficient
2012	Virtualization of servers
2013	Reduce Energy Consumption for data centers
2013	Sustain the natural resources
2013	Energy consumption and Co2 Emission
2014	Power Management

5. Proposed Sytem For Green Simulation Software For Energy Consumption

The Green cloud simulator is packet level simulator in which energy awareness to cloud data centers and mainly focus on communication. It provides a modeling technique related to Public license Agreement and also known as NS2 Network simulator.80% code is implementing in C++ and 20% Tool Command Language (TCL) is used.

It can be focus on the following components:

• Server will perform and run all the tasks.

• Switches and laplink devices are connected with different Cabling solution.

• Cloud use services are main objective of the Workload such as massaging and social networks.
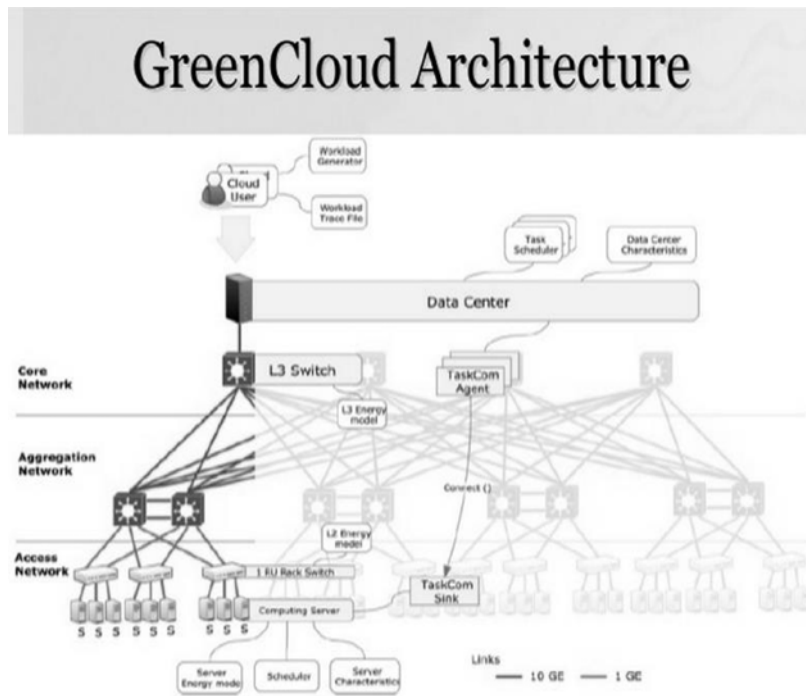
The architecture can be shown as Figure# 2:

Figure 2. Green Cloud Architecture

Green Cloud Computing provides better solution for the performance and quality of services than CloudSim.

• Green Cloud Simulation tool are used to aware energy computing and capturing the detail energy consumed in data center

• Avaliable using NAM simulator with Graphic User Interface.

• The simulator tools also support performance and QOS.

• Using C++ and TCL scripts.

• It is available open source

• Available on website

Energy consumes in all data centers can be calculated by Green Cloud Simulator for power management; Dynamic Voltage and Frequency Scaling is best option for performance. It can be calculated by

• Types of switch which are connected to data center.

• Number of ports

• Rate transmission of ports

• Type of cabling

$$P_{switch} = P_{hardware} + n_{cables} * P_{active\ switch\ port} + n \sum P_r$$

P switch is the total power consume by the switch, P hardware is the piece of hardware attached to the data center, n cables is the type of cable which is attached to the switch port, P active switch port is the switch card which is power consumed by port and Pr is the bit rate.

The following parameters are using in green cloud computing based on energy consumption and compotation resources.

i. Application Models
ii. Communication Model
iii. Energy Models
iv. Power Saving Model

i) Application Model:
It can be easily implement in green cloud simulator for computation, data transfer and execution deadline that draw the necessary requirements and mainly focus upon the data transfer and Green cloud have an advantage to set and all task of deadline execution.

ii) Communication Model:
Green cloud offer a detail of communication setup for data center and easy to implement for TCP/IP protocols and calculate full energy affected by packets, delay, congestion and routing because it can easily capture all protocol where any massage can be sent to the network and it can be fragment the packets and can be monitor easily by green cloud. Congestion control error also handled by Green Cloud Simulator.

iii) Energy Model:
The energy model can be implemented to all component of the cloud data center like server, switches & links. It can update and calculate the energy consumption while moving packets from one port to another port.

iv) Power Saving Modes:
Green Cloud is the only model which can be implement in different power saving modes like DVFS, DNS and DVFS+ Dynamic Network Shutdown.

5. Conclusion

Green Cloud computing is about energy crises in the world and green cloud help to introduce the new techniques and simulation to monitor and capture the data. Green cloud is based on NS2 Simulator and allows capturing every packet details. It can easily implement in any power saving modes and provide accurate calculation for energy consumption. Whereas the Green cloud is provide finer control and more accurate result from CloudSim Simulator.

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