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Green Cloud Computing-A Review

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Abstract

Cloud-Computing is a structure that allows users to connect with the server and use hardware, software, and other resources. In cloud technology, the software and resources will be shared on the remote servers. The client can access the resources from the server with a high-speed internet connection. The goal of green-cloud-computing is to reduce the consumption of energy and carbon footprints. Data Centers are in huge demand, and there is a lot of power consumption. Micro and Macro metrics are the two metrics are used to evaluate the consumption of energy. Virtualization, best allocation, and scheduling mechanisms reduce power consumption and decrease the release of harmful gases. Cloud balancing techniques can have used to reduce the consumption of resources, which will result in a decrease in the consumption of energy and decrease the carbon footprint. Some research challenges on green cloud computing are mentioned along with solutions for those challenges, which will help in reducing the power consumption and heat generated while processing.

Keywords - *Cloud Computing, Energy Efficiency, Load Balancing, Cloud Broker, Power Consumption, Carbon Footprints.*

I. INTRODUCTION

Green IT or Green Computing, refers to the systems and technology that is eco-friendly. It encompasses an approach that is aimed at achieving environmental sustainability. Cloud Computing separates service, platform, and infrastructure and virtualizes these layers. These service layers communicate with each other through networking. Cloud computing is computing as a service. It provides three services, namely, infrastructure as service, Platform as Service, and Software as service. With cloud computing, hardware resources usage is maximized, and many virtual machines can be hosted on each machine. Demand for cloud computing is growing, as the users can pay and use the resources without owning or maintaining them. The resources can be accessed from anywhere. Since the demand is increasing day by day, this increases the demand for the data centers. This has a flawed environmental impact, such as an increase in the carbon footprint. Therefore, it is necessary to use some green solutions to reduce environmental impact.

II. EXISTING FRAMEWORK

A new software approach [1] as proposed where an energy efficient layer is introduced in the software architecture. This layer automatically evaluates the micro-metrics and macro-metrics of energy consumption in the data centers. After the calculation of these parameters, the services utilize the hosts who are more energy efficient. Therefore, it helps in consuming energy more efficiently. Architecture for Green Clouds is designed, which uses Green Cloud Broker to reduce energy consumption and carbon footprints. It also manages and serves the incoming requests following greener rules. There are various alternatives to improve energy efficiencies, such as hardware and software methodologies. Hardware alternatives try to modify the hardware structure and configuration such that it consumes less energy. Software solutions use techniques such as virtualization to consume energy efficiently.

By calculating the micro and macro metrics, the best site is identified where the services can run with minimum energy consumption. Energy-efficient cloud computing solutions and a green-scheduling algorithm. Dynamic Voltage frequency scaling technique where the voltage of the supply is maintained by changing the operating frequency. This method saves energy. The virtual Machine Migration technique transfers the virtual machine so that the power spent is low. Using an ideal server is more energy-efficient and saves power compared to a regular server. Cloud computing has many consequences that lead to the release of harmful gases and more power consumption. To avoid these effects, many techniques and algorithms are employed. It replaces physical systems with virtual systems, and with allocation and scheduling mechanisms, over-utilization and underutilization are managed.

The emission of carbon footprints [5] is taking place due to Data Centers used to achieve cloud computing architecture. Data Centers use cloud energy to serve the user-generated request, and this energy consumption is the fundamental cause of carbon emission. Possible solutions can be adopted to reduce carbon footprints and produce green computing. Central LB policy for virtual machines, Central LB policy for VMs, Task Scheduling Based on LB, Ant Colony, and Complex Network Theory, Two-phase scheduling are the techniques and methods mainly focus on resource consumption.

One of the main challenges in cloud computing is Load balancing. It helps in the ideal usage of assets and upgrades the execution of the framework. The objective of load balancing is to limit resource utilization, reducing energy utilization, and carbon emission rate. Load balancing techniques need to be adopted to minimize energy consumption.

Improved Data Centre Cooling Methods, Storage Methods, and Efficient Server usage by Virtualization technique, Energy-saving initiatives are a few methods used to reduce energy consumption.

Cloud Computing integrates various components and results like OS running on an individual virtualized computing medium, middleware layers that try to merge the physical and virtual resources from many OS's, and specialized application engines that control a significant gain of the cloud service provider. Without social monitoring, a cloud platform can create a platform that manages resources. With the help of cloud OS [3], we can cover the gap between multiple systems. Cloud OS is implemented that can avoid viruses and other malicious activities from causing damage to the system. Cloud computing is a rapidly growing "Internet-Based Computing," which allows users to host their data on the web using cloud services. Solutions for some research challenges are provided. Green computing research challenges and solutions helps in reducing the power consumption and heat generated in processing.

III. PROPOSED FRAMEWORK

There are several ways to reduce the carbon footprint and to improve energy efficiency.

TABLE 1: Comparison of Methods used

Title	Purpose	Method Used	Advantages	Disadvantages
Green-Cloud Computing: Energy-Aware-Layer in Software-Architecture	Calculates the micro and macro metrics of consumption of energy. Makes services migrate to hosts, which has better energy efficiency.	Using a layer in the software architecture which is aware of energy.	Improves the overall efficiency of energy.	The energy-aware layer should be efficient. Dependent on mobile agents.
Green Cloud Computing	Using solutions of cloud-computing that can reduce usage of energy and reduce operating-cost.	Using DVFS technique. Virtual Machine Migration technique. Algorithmic approaches such as using an ideal server.	VM migration saves a lot of energy. Improved energy efficiency.	DVFS technology is less flexible.
Effective utilization of Cloud resources with a Cloud Operating system	Creating a cloud platform that manages resources which are virtualized with least amount of supervision.	By using cloud OS; we can reduce the difference between many systems. Cloud OS is implemented that can prevent the system from various attacks.	This helps in better use of resources and thereby contributes towards improving the computing performance.	Cloud OS is used to perform few tasks only i.e., it is limiting only to present scope but in future it has a wide range.
Survey of computing strategies in green	Decreasing number of hosts so that the increased and decreased utilization are taken care of.	Virtualization to place virtual machine over physical systems. Consolidation and migration	Minimal resources utilization and power consumption is reduced. Reduction in the number of used servers.	Maintenance is high
Cloud-Load Balancing Techniques: A Step towards Green Computing	The aim of balancing the load is to reduce the number of resources used and also to reduce the carbon-footprint.	Central-LB policy for Virtual Machines. Task Scheduling Based on LB ACCLB(Ant-Colony and Complex-Network Theory) Two-phase scheduling.	Improves the overall performance by balancing the load. Enhances flexibility and robustness. Improves task response time. Efficient utilization of resources	Techniques that have been mentioned mainly focus on resource utilization rather than energy consumption.
Green Cloud Computing Research Challenges: A Survey	Green Computing research challenges and solutions will help in reducing power consumption and the heat generated while processing.	Improved Data Center Cooling Methods. Storage Methods. Efficient Server usage by Virtualization technique. Energy saving initiatives.	Using current lower power technologies, computers can be made more efficient.	All these efforts are still in limited areas.
Towards Green-Cloud-Computing: Impact of a Carbon Foot print on environment	Design of energy efficient Cloud Architecture in order to reduce energy consumption and carbon footprints.	Architecture for Green Clouds Green Cloud Broker	Reduces energy consumption and carbon footprints. Manages and serves the incoming requests following greener rules	Difficult to maintain

IV. CONCLUSION

The Green Cloud Computing corresponds to the strategies and the development of computer systems that utilize resources efficiently to decrease the impact of IT processes on the environment. All the methods and strategies discussed in this paper reduces greenhouse gases releasing to the great extent possible. Energy and resource utilization are utilized effectively, although it is difficult to maintain and has few limitations. Green computing motivates to improve its efficiency. Even though there is more concern in the community that Cloud computing can bring about higher energy utilization by the data centers, the Cloud clouding has a green covering.

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