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GREEN COMPUTING

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Abstract - *Green Computing or Green IT is the practice of implementing policies and procedures that improve the efficiency of computing resources. The main aim is to reduce the energy consumption and environmental impact of their utilization. Energy efficiency is rigorously important for future information and communication technologies (ICT), because the increased usage of ICT. Increasing energy costs and the need to reduce green house gas emissions for energy-efficient technologies will help to decrease the overall energy consumption of computation, storage and communications.*

***Key Words*:** ICT, cloud computing, Load balancer, Multi-tenancy, carbon emission ,resource utilisation, VM

1. Introduction

Cloud computing addresses two major ICT challenges related to Green computing – energy usage and resource consumption. Energy efficiency is rigorously important for future information and communication technologies (ICT), because the increased usage of ICT increasing energy costs and the need to reduce greenhouse gas emissions for energy-efficient technologies will help to decrease the overall energy consumption of computation, storage and communications. Energy consumption, and therefore the generation of greenhouse gases by this technology are already at very high levels. It is currently estimated that the ICT industry is responsible for approximately 2-4% of the entire carbon footprint generated by human activity. This corresponds to about 25% of all car emissions and is approximately equal to all airplane emissions in the world. It is estimated that there will be an annual growth rate of nearly 50% in global mobile data traffic in 2018–2021. With the spread use of smart phones, video, and social networking, this rate of increase can be expected to be at least sustained for many years to come.

1.1 Problem Definition

Implementation of environmental friendly load balancing algorithm to achieve green computing

1.2 Motivation

To reduce load on datacenters and in distributed system they started to uses load balancer. The same load balancer is practiced in next level computational inventions like grid computing as well as cloud computing, they handle this by modifying the existing algorithms and

producing new algorithms. The new paradigms apply artificial intelligent system on load balancer and achieve the load distribution to the present servers. Load balancer deal with the management of distributed system is to have a unique decision maker that will lead the system to its optimum

2. Literature Survey

Paper 1

This paper focuses on the issue of amount of electricity consumed to support global information infrastructure and electronic devices requirements. The authors propose algorithms to reduce energy consumption by data centers by considering the placement of virtual machines onto the servers in the data center intelligently. He has used two greedy approximation algorithms, minimum energy virtual machine (VM) scheduling algorithm (MinES) and minimum communication virtual machine scheduling algorithm (MinCS), to reduce the energy while satisfying the tenants' service level agreements. After examination of the performance of these two algorithms using real data traces and synthetic workloads, and compare them to other alternatives. The results demonstrate that MinES and MinCS yield scheduling that are within 4.3 to 6.1 percent energy consumption and are computationally efficient.

Paper 2

With the increasing popularity of the cloud computing model and rapid proliferation of cloud infrastructures there are increasing concerns about energy consumption and consequent impact of cloud computing as a contributor to global CO2 emissions., this paper describes an eco-aware approach that relies on the definition, monitoring and utilization of energy and CO2metrics.author suggested some of the innovative application scheduling and runtime adaptation techniques to optimize energy consumption .The eco-aware approach involves measuring or quantifying the energy consumption and CO2 at different levels of cloud computing., The experimental and validation results show the potential of the eco-aware approach to significantly reduce the CO2 footprint and consequent environmental impact of cloud applications.

Paper 3

The increasing utilization of cloud resources raises several issues related to their environmental impact and, more in general, sustainability. Recently, most of the contributions have focused on energy efficiency achieved through a better physical and virtual resource management. The present paper considers instead the application level, extending the focus to the reduction of CO2 emissions related to the execution of applications. The author suggested the design of application controller which supports right adaption strategy for current application .and allows the improvement in the QoS and CO2 emission reduction. The effectiveness of the approach has been observed by running an HPC application in a federated cloud infrastructure.

Paper 4

The authors demonstrates the rigorous, comparative analysis of the fog computing paradigm and the conventional cloud computing paradigm in the context of the Internet of Things (IoT), With the rapid increase in the number of Internet connected devices, the increased demand of real-time, low-latency services is proving to be challenging for the traditional cloud computing framework. Also increasing demand of cloud computing, cloud data centers are always to be in running stage

which exhausts huge amount of power and yield tons of carbon dioxide (CO2) gas. In this context authors have suggested newly proposed fog computing paradigm to serve the demands of the latency-sensitive applications in the context of IoT. This paradigm focuses power consumption, service latency, CO2 emission, and cost, and evaluating its performance for an environment with high number of Internet-connected devices demanding real time service. A case study is performed with traffic generated from the 100 highest populated cities being served by eight geographically distributed DCs. as no of real time applications increases the fog computing structure enhance its performance over traditional cloud computing.

Therefore, the work shows that in the context of IoT, with high number of latency-sensitive applications fog computing outperforms cloud computing.

Paper 5

In this paper the author has suggested a hierarchical, service level agreement (SLA) based resource management solution for cloud data centers. This solution considers the energy non-proportionality of existing servers, peak power constraints, and cooling power consumption. The goal of this resource manager is to minimize the operational cost of the data center. The proposed resource management solution simultaneously considers server and cooling power consumption, guarantee-based SLA and complexity of the decision making in the resource management of the cloud computing systems. The effectiveness of the proposed management scheme compared to previous work is demonstrated using a comprehensive cloud computing simulation tool. The proposed resource management algorithms reduce the operational cost of a datacenter by about 40 percent while satisfying SLA constraints and decrease the run-time of the management algorithms by up to 86 percent with respect to the state of the art centralized management solution.

3. Need of Load Balancing in Cloud Computing

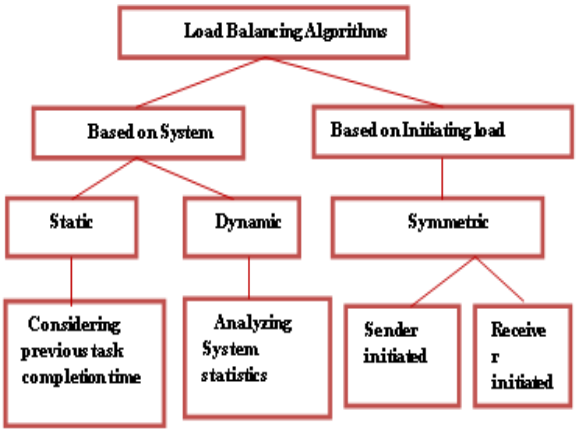
Load balancing in clouds is a mechanism that distributes the excess dynamic local workload evenly across all the nodes. It is used to achieve a high user satisfaction and resource utilization ratio [15], making sure that no single node is overwhelmed, hence improving the overall performance of the system. Proper load balancing can help in utilizing the available resources optimally, thereby minimizing the resource consumption. It also helps in implementing fail-over, enabling scalability, avoiding bottlenecks and over-provisioning, reducing response time etc. Apart from the above-mentioned factors, load balancing is also required to achieve Green computing in clouds which can be done with the help of the following two factors:

• Reducing Energy Consumption - Load balancing helps in
avoiding overheating by balancing the workload across all
the nodes of a cloud, hence reducing the amount of energy
consumed.

• Reducing Carbon Emission - Energy consumption and carbon emission go hand in hand. The more the energy consumed, higher is the carbon footprint. As the energy consumption is reduced with the help of Load balancing, so is the carbon emission helping in achieving Green computing.

Load Balancing Algorithms Depends upon the need of application the practices of load balancer also changes. So the metric used to distributing the traffic among the servers are

also varied with user applications, this makes the users to apply different mathematical programs on SLB devices. Thus several algorithms are created, in this part we reviewed those algorithms. and their Classification On the basis of SLA policy, the load balancing algorithms are classified into static, dynamic and symmetric load balancing algorithms and the hierarchy was shown below in figure.



Static: It won't consider the current state of the system or were the system standing. It precedes its algorithm only by considering the prior knowledge of the system.

Dynamic: It applies the mechanism by considering current system information. Prior knowledge of system state is not needed.

Symmetric: It works on the basis of sender and receiver initialization. It considers the priority of sender, receiver and transfer the load. When they need they can initialize any type of algorithm.

Algorithm Categorization From the approach, we conclude Dynamic load balancing algorithms serve much better than static load balancing algorithms.

3.1 Load Balancer

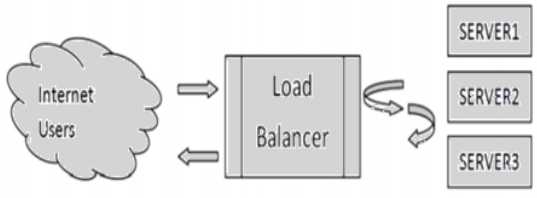


Figure 2. Load Balancer

Achieving Green Computing from the review, we can justify all the cloud load balancers works on following features, Dynamic Provisioning: It supports on-demand services, prevents idle of resources and unwanted installation of new resource components.

Multi-tenancy: It uses the concept of central server and sharing. By this several cost cutting factors are enabled in computing infrastructure.

Increased Utilization: It helps to balance load requirement with less hardware and utilizing more server computational power.

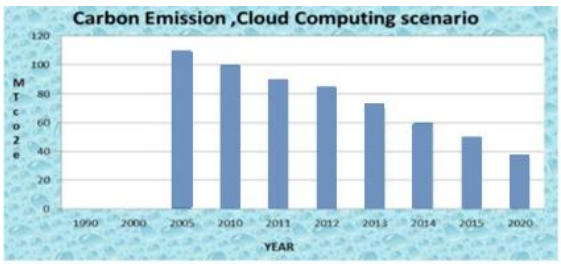
4. Proposed algorithm

Need to design hybrid algorithm which uses statistics of existing algorithm .

Steps

1. Find out procedure for checking existing carbon emission status using Co2 analyser
2. Implement monitoring agent to monitor nodes in cloud
3. Find out highly loaded node
4. Measure Co2 emission percentage of this node
5. Find out task assigned to that node
6. Find out method to reduce load on that node
7. Monitoring agent will send request to master node
8. Master node will find out less loaded node
9. Task of busy node will be ported less loaded node
10. Measure carbon emission status of heavily loaded after porting task to another node
11. Compare results of carbon emission status after balancing load on node.

5 Conclusions



Carbon Emission Graph

Another aspect shows increase in day by day usage of cloud the amount of carbon emission also multiplied. By maintaining proper load balancing algorithm helps to increase cloud performance and reduces carbon proficiency from that we can maintain dirty free computing. This type of system also helps us to increase utilization of available resources. In this paper we reviewed several load balancing algorithms and shown the tendency of load balancer to maintain the green effect on computational platforms. Load balancing stands in irreplaceable position on cloud computing scenario.

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