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COMPREHENSIVE SURVEY OF TECHNIQUES USED TO ACHIEVE GREEN COMPUTING WITHIN ADVANCED COMPUTING

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ABSTRACT

Green Computing is need of the hour presently used in order to protect environment from harmful effects. Technology is working towards this critical aspect. Cloud computing is widely used technique used to provide users with the resources they need beyond the capacity of physical machines they possess. Energy is consumed during allocation and de-allocation of resources to jobs. This proposed work studies techniques used to reduce load over the virtual machines which in turns reduces consumption of energy and reduce emission of CO_2. Load balancing is one such mechanism widely used for this purpose. Comparative study is presented in order to select optimal techniques for load balancing that can be used in future for further enhancement.

Keywords: ***Green Computing, Cloud Computing, CO_2, Load Balancing, energy***

1. INTRODUCTION

Cloud Computing is the need of the hour. Cloud provides mechanism in order for physical machine to utilize resources beyond the capacity of machine. Cloud computing environment requires physical machines to utilize resources present within cloud in efficient manner. Secure transmission of data is provided within cloud so client does not have to worry about secrecy of information flow. Internet is an integral component of cloud. In fact cloud computing cannot be dealt with without internet. Both have critical property that centralized ownership is missing. The physical machines having desired resources can utilize this form of technology. Energy consumption is the issue which is required to be tackled while using cloud computing. Resource and platform sharing requires energy to be consumed. This energy causes overhead in the process of cloud computing. These paper studies techniques utilized to enhance resource consumption with minimizing energy.

Rest of the paper is organised as next section provides introduction of various techniques utilized to enhance resource sharing with minimal possible energy consumption. Next we describe research gap. After that comparison of various techniques are presented. Last section provides conclusion and future scope.

1. TECHNIQUES USED TO MINIMIZE ENERGY CONSUMPTION IN CLOUD COMPUTING

Techniques are devised to reduce energy consumption within cloud system. Some of techniques are discussed in this section.

1.1 GREEN CLOUD COMPUTING

Green Cloud computing is mechanism by which energy consumption is reduced. In order for minimizing energy ant colony optimization mechanism can be utilized. High energy consumption by data centre is a great problem. In order to rectify the problem the data centres which are under used can be switched off or can be put to low power consumption mode. This entire process should not degrades the quality of service (QoS). In order to achieve all these requirements Ant Colony optimization are proposed. The VMs having problems can be switched to some other VMs to reduce the load and enhance resource utilization. (1).

Cloud Computing requires that high quality of service is ensured with minimum energy consumption. Also CO_2 Consumption has to be minimized. The heuristic which can be followed in this case is Tabu Search. The objective of this system is to minimize CO_2, enhance performance and minimize capital expenditure. Ant colony optimization technique used to seek best possible path out of the available paths to reduce the cost associated with it. (2)

Network based cloud computing is widely expanding as compared to office based cloud computing. Energy is consumed as well as wasted in such systems. This consumption underpin the cloud. The energy consumption has to be minimized in order to properly utilize the cloud. Information and communication technology is utilized for this purpose along with transmission and switching technology. Switching technology greatly enhance resource utilization with minimal power consumption. (3)

With the increase in popularity of cloud computing more and more users begin interacting with cloud hence forth emitting CO_2 and polluting the environment. The studied technique deals with reducing CO_2 from utilization aspect of cloud. Hence eco aware approach is proposed through this research methodology. Scheduling and

adaption is devised based on emission of CO_2 and energy consumption through cloud utilization. Overall mechanism enhances utilization of resources and energy consumption is minimized. (4)

Green cloud computing is basic mechanism to reduce energy consumption by enhancing resource utilization with optimality principal. Optimality principal enhances performance by minimizing energy consumption.

1.2 Offloading to minimize energy consumption

The energy consumption is reduced by the use of offloading also. There exist data centre within cloud computing. Each data centre is allocated a particular load. If that load exceeded performance degrades. The offloading mechanism ensures that data center utilization is not over burden. Hence forth when utilization enhances beyond threshold value offloading comes into picture. Mobile applications generally support this feature. One of such technique is Mobile edge technique. 5G heterogeneous network is followed in this case. Radio resource allocation and offloading in combination enhance the performance of the system in this approach. (5)

Cloud provides computing and infrastructure facility to the clients. Virtualization strategy is the backbone of cloud computing. It ensures that multiple virtual machines can be hosted by physical machine. In order to minimize the energy consumption characteristic of resource is considered. Energy consumption and performance analysis are the parameters utilized in the research. The core characteristics of offloading in this case are energy consumption and average resource utilization. These factors are efficiently optimized using proposed system (6)

1.3 ENERGY AWARE SCHEDULING

Energy aware scheduling enhances the performance by making the job executes in a order which optimal for cloud. The jobs are allocated to data center in order which is performance resource optimal. Scheduling schemes could be many. The workflow partitioning is utilized for scheduling in the researched paper. The researched technique utilize swarm partitioning algorithm is utilized. In the beginning Workflow Partitioning For Energy Minimization (WPEM) computation that sanction decrease in the network energy use of the workflow and the entire quota of data transmission stint a high degree of conformity .In the second agenda we use the heuristic of Cat and Swarm accession to docket the engender allotment in order to reduce the workflow's global energy consumption as well as execution time. We assay the adduce advent using three real crating of data intensive workflows and analyze it with other computation from literature. (7)

Energy aware scheduling is also performed in heterogeneous environment. Abstract- present fast extension of mobile different embedded systems had led to auspicious hardware upgrade that supports multiple core processors. The energy use is becoming greater along with the computation capacity grows. Cloud computing is gauged one of the remedies to mitigating energy price. However the simply offloading the computations to the remote side cannot efficiently decrease the energy use when the energy price caused by wireless transmissions are greater than it is on mobile devices. In the researched paper we concentrate on the problem of energy wastes when tasks are allocated to remote cloud servers or different core processors. Our remedy aims to reduce the entire energy cost of the mobile different embedded system by using a best task assignment to different cores and mobile clouds. The nominated model is named as Energy-Aware Heterogeneous Resource Management model (EA-HRM2), which is supported by a main computation Optimal Heterogeneous Task Assignment (OHTA) computation .Our experimental evaluations have verified our approach is effective to save energy when deploying different embedded systems in mobile cloud systems. (8)

The techniques discussed above are efficient to handle the desired tasks. Next section describes the research gap that exists in the researched papers.

2. RESEARCH GAP

The existing approach does not reduce CO_2 and energy consumption up to marked levels. Stress is paid towards migration rather CO_2 and energy consumption. The performance evaluation is reduced since only singleton technology is utilized in order to handle every situation. The hybrid approach is missing in every researched paper analysed. So energy consumption can be further reduced by enhancing the performance of the system.

3. COMPARISON OF TECHNOLOGIES USED

The techniques are used to enhance the performance of the existing system. The system utilized offloading, green computing etc. All these techniques are discussed in the comparison table as

TABLE 1: Comparison of Techniques used for energy efficiency

AUTHOR(s)	JOURNAL	YEAR	Technique	CO_2	COST	POWER	DELAY
(Larumbe & Sanso, 2013)	IEEE	2013	Tabu Search	3559ton	309.5M	34.6mw	4.4ms
(Baliga, Ayre, Hinton, Tucker, & Ieee, 2011)	IEEE	2011	Green Cloud Computing	No value for this parameter is specified	High Cost with no value specification	87.5mw	High Transmission rate with no specific value specified
(Wajid et al., 2015)	IEEE	2015	Green Computing	9.315ton	This parameter is not considered	Not applied	Transmission rate is slow to tackle CO_2 Levels
(Zhang et al., 2016)	IEEE	2016	Energy efficient offloading	Not Utilized	Cost encountered is low	3.5GHz/sec Average	Rate of transmission is high
(Ranjana, 2016)	IEEE	2016	Resource aware energy efficiency	Not utilized	Cost increases linearly as number of VM request increases	On an average 200mw	Rate of transmission slows as request increases
(Bousselmi, 2016)	IEEE	2016	Energy Efficient partitioning and scheduling	Not Utilized	Cost is optimized	Approximately 100mw	Rate of transmission is high
(Computing, Gai, Qiu, Zhao, & Liu, 2016)	IEEE	2016	Energy Aware task assignment	Not Utilized	Cost is decreased	Power Consumption is low	Rate of transmission is high

4. CONCLUSION AND FUTURE SCOPE

The proposed paper studies one of the critical parameter energy efficiency in order to judge techniques that can be used to enhance the performance of the system. The CO_2 levels are also considered in some of the techniques. But these parameters are not merged with energy efficiency to achieve optimal performance along with CO_2 levels degradation.

In future hybrid approach can be followed to minimize energy consumption along with CO_2 level degradation.

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