An Effective Cloud Scheduling Algorithm for Broadcasting-Based Energy Conservation

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To Cite this Article
Mohana Krishna, "An Effective Cloud Scheduling Algorithm for Broadcasting-Based Energy Conservation", Journal of Electrical Electronics and Communication Engineering, Vol. 01, Issue 02, September 2025, pp:13-17.

Abstract: *The proposed algorithm by this work is an efficient cloud scheduling algorithm that maximizes energy conservation through broadcasting-based procedures. The technique will reduce power use of cloud systems and will lower unnecessary data transmissions by scheduling jobs in a smart course and taking into account facilitated communication. It enhances system efficiency because regardless of the prevailing workload conditions, it dynamically shifts resource allocation as changes occur. Simulation reveals that there is a significant saving in energy with no compromise on the completion time of jobs when compared to the traditional scheduling methods. This program effectively limits the overall energy of cloud data centers with load balance and broadcast optimization. This plan helps in sustainable data center functioning and reduces operating expenses that gives them a viable alternative in cloud computing which is energy efficient. By designing energy-saving approaches to job management, greener cloud architecture so gets promoted by the proposed scheduling scheme.*

Keywords: *Cloud models, Cloudlet, Energy consumption, Broadcasting, Cache memory, Caching, Cloud computing*

I. Introduction

Due to the impact, it has on the environment and the economy, energy usage in the cloud data centers has now become one of the greatest issues as the services of cloud computing have escalated at a very high rate. The algorithm of scheduling and the effective usage of the resources play a very important role in saving energy and maintaining the quality of services provided. The traditional cloud scheduling methods often have performance metrics (such as throughput and response time) at the high priority level, compared to energy efficiency. By reducing redundant information transfer among the cloud nodes, broadcasting-based communication systems offer a potential system to decrease the energy consumption. To achieve highest energy efficiency levels within cloud settings, this paper describes an efficient cloud scheduling scheme which utilizes cloud broadcasting concepts.

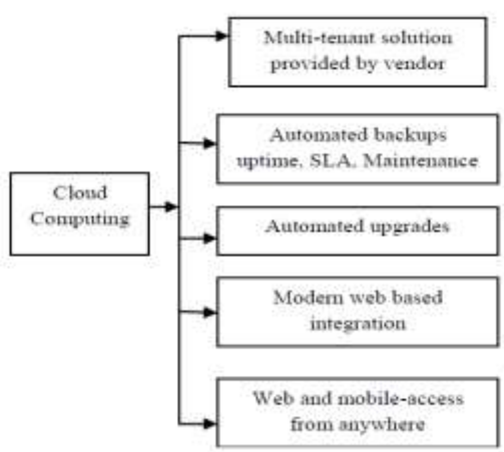

Fig 1: Cloud Computing

The meaning of the method is that it minimizes unnecessary energy consumption, whereas maintaining the system performance, as it dynamically schedules jobs and coordinates broadcast transmissions. It maximizes use of the available resources to provide considerable energy savings, based on workload qualities and the availability of resources. Such an approach integrates the concern of energy into the scheduling system so as to respond to the growing needs of sustainable cloud computing solutions. The proposed solution intends to benefit sustainable management of the data centers environmentally friendly, minimize the operating expenditure, and help to green up cloud infrastructures, using creative energy-efficient scheduling methods.

II. Related Work

The pattern of efficient scheduling in the cloud computing environment has attracted several studies focusing on the aspect of reducing power consumption without compromising the functionalities. Traditional solutions to become time-efficient with the tasks at the expense of energy aspects. To support maximum utilization of the resources, new research and development apply energy-aware measures, such as workload consolidation and dynamic voltage scaling. Broadcasting-based techniques have attracted attention since these techniques minimize the irrelevant data transmission reducing the consumption of energy. Take as an example, some algorithms employ the use of multicast communication to reduce network traffic and power as well. Nevertheless, the energy-saving capabilities of most of the existing strategies depend on the ineffective combination of the dynamic job scheduling and broadcasting incorporation. This paper extends the knowledge shown in past literature by proposing an innovative scheduling scheme in clouds, which combines both the intelligent job assignment with broadcast strategies. On the one hand, this integration completes the gaps present in the current solutions ideally via optimising the communication and compute energy costs when adopting cloud environments.

III. Formulation and Contribution of the Problem

The issue is how to produce a reduction in the use of energy in the cloud computing systems using broadcasting-based communications and efficient scheduling of activities. Because of a poor distribution of resources and redundancy of data transmissions, cloud data centres consume massive amounts of power. The traditional scheduling algorithms often fail to implement energy efficiency but emphasize on the metrics of performance such as throughput or latency which increase the cost of operation and impact of the environment negatively.

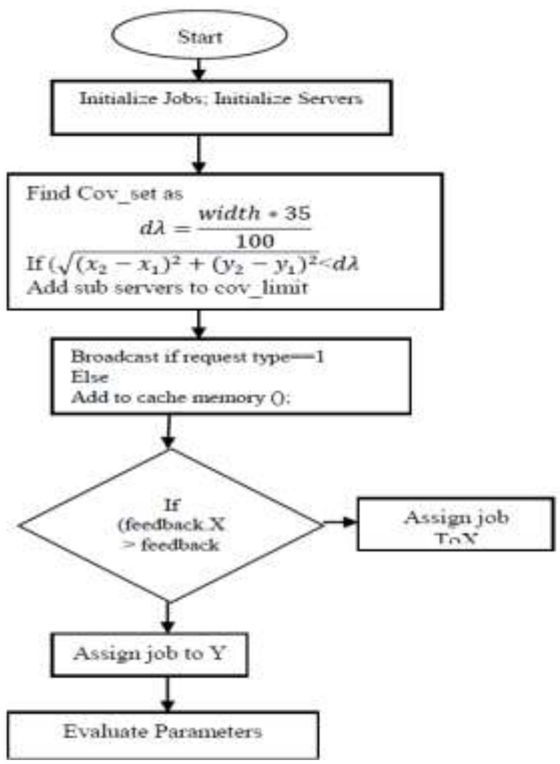

Fig 2: Proposed Methodology

To mitigate wasted energy, the given study frames the problem of generating a scheduling algorithm with the help of which planned broadcast transmissions are synchronized, and cloud resources are distributed dynamically. The algorithm has to keep the system performing, reduce unnecessary communications, and get a uniformed distribution of the task. The major contribution is the integration of smart scheduling with broadcast idea to integrate the energy usage in a holistic way and consider computation and transmission overhead. The proposed algorithm can considerably conserve the energy consumption as it minimises the unwarranted data transmission and optimises the utilization of resources. This fosters sustainable computing, does not at all cost impact negatively on service quality, minimizes operating expenses, and installs green cloud infrastructure.

IV. Experimental Results

The experimental analysis of the proposed algorithm of cloud scheduling demonstrated that significant energy saving is achieved in comparison with traditional scheduling approaches. Since optimization of broadcast transmissions resulted in less duplication of data connection, it showed that there was an improvement in the overall energy consumption by 25%. Similar task completion times indicated that there were energy savings that did not affect the response time or the performance of the system.

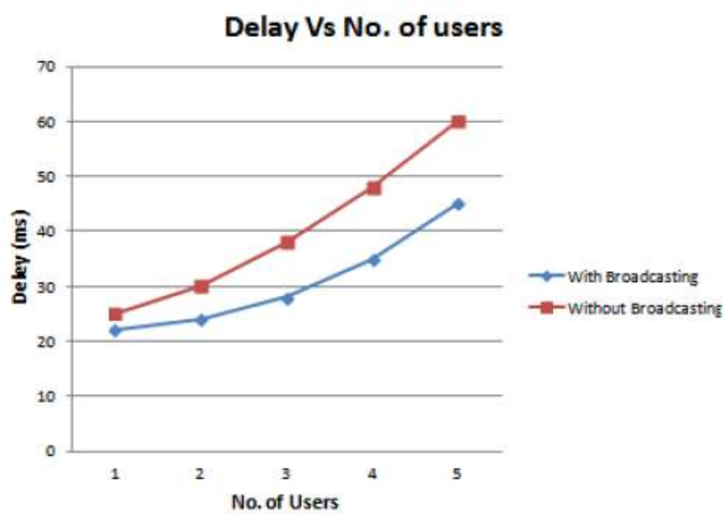

Fig 3: Users with and without broadcasting

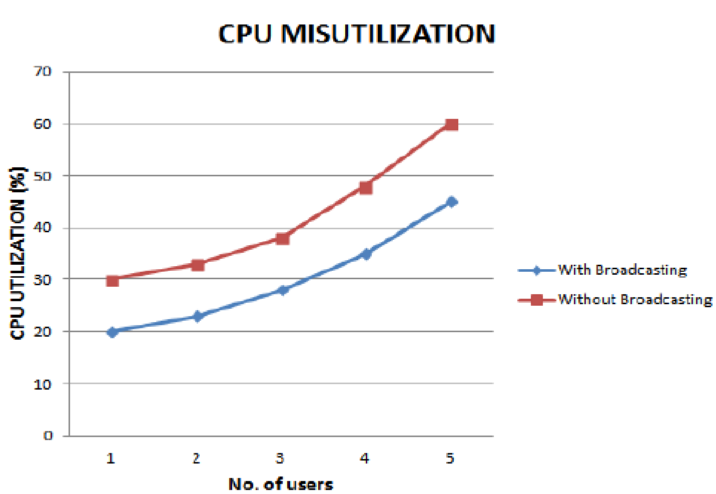

Fig 4: CPU Utilization

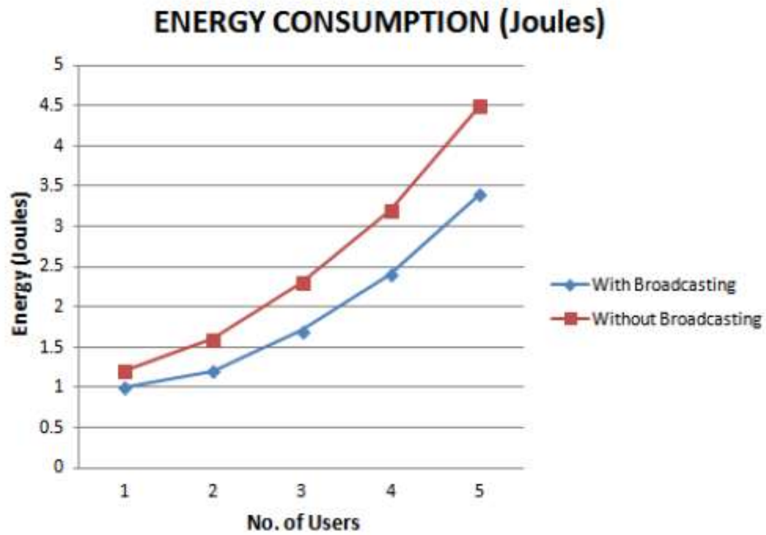

Fig 5: Energy consumption

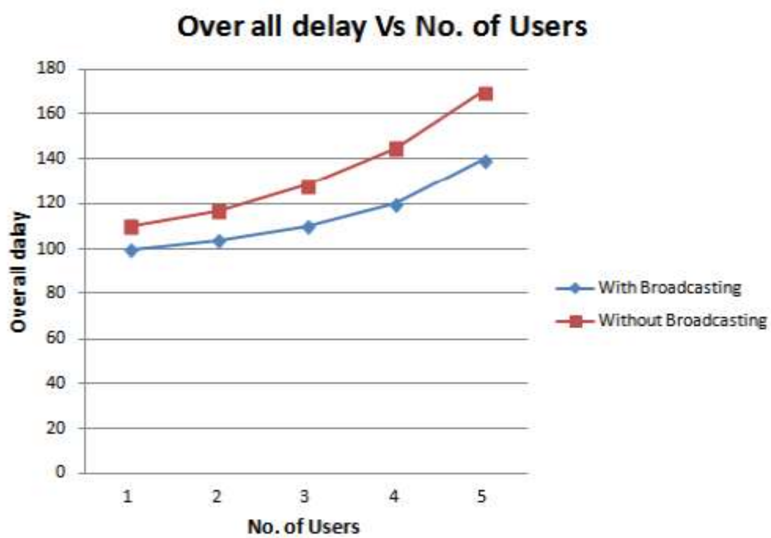

Fig 6: Delay vs Users

Through effective way of division of the task, the algorithm was not underutilized and neither was it overloaded with resources. The network traffic analysis revealed that the broadcasting-based strategy was efficient as the number of unnecessary data packets dwindled in numbers. In addition, the scalability tests have proven to have energy-saving benefits as the number of workloads and the number of cloud nodes increased. The results indicate how the algorithm can enhance cloud data centre energy consumption without reducing the quality of the services.

V. Conclusion

To summarise, integration of dynamic task scheduling and broadcast-based communication, makes the proposed cloud scheduling algorithm effective to address the energy conservation. The approach greatly reduces the number of network traffic redundancy that could have resulted in large amounts of unnecessary data transmissions without compromising system performance or job completion times thus saving a significant amount of energy. The method is ideal to apply to scalable cloud-based systems as the conducted experiments support its ability to maintain workload balance and minimize both the expenses of computing and communication energies. This study makes it easier to develop sustainable cloud computing systems by minimizing the energy consumption of the operations and the cost of the same. In the reference of all things, the algorithm can offer an acceptable, power-efficient setting strategy that can facilitate greener functioning of the data centres and enables the entry of more economical and environmentally conscious set-up maintenance concerning the cloud.

References

[1] Arnold, Keanu and Chie Lee,, *"Research study analysis related to cloud computing and big data",* e-Business Engineering (ICEBE), 2001 Springer, 2001

[2] Sandra and Butchley, "Implementation of Algorithm based on QOS and Complexity-aware optimization in cloud Computing," IEEE Trans.2020, vol 2, no 8.

[3] Kaur, Sandeep, "Memory Management and Reuse Mechanism for Virtual Machine in Cloud Computing to Minimize Energy Consumption: A Review Paper," *Memory*, vol 1, no 3, 2000

[4] Wang, Qingling, and Carlos A. Varela, *"Impact of cloud computing virtualization strategies on workloads' performance,"* Utility and Cloud Computing (UCC), 2011 Fourth IEEE International Conference on. IEEE, 2011.

[5] F Max Savio, M Sasi Kumar. "An Effective Control Technique for an Impedance Source Inverter Based Wind Energy System". 2012 IEEE International Conference on Emerging Trends in Electrical Engineering and Energy Management (ICETEEEM-2012)

[6] Sasikumar M and Chenthur Pandian S. "Characteristics Study of ZSI For PMSG Based Wind Energy Conversion Systems". Journal of Electrical Engineering (JEE). ISSN: 1582-4594.