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Hybrid Scheduler for Minimum Energy Consumption and Optimised Job Management in Data Centre

Suman Kumar Mishra[1], Sachin Majithia[2]
[1]*Student*, [2]*Assistant Professor*
Chandigarh Engineering College, Landran, 140307

Abstract – Today cloud data centers play an very important role in Information Technology sector (ITC). Power consumption and utilization is the major problem in data centers. High use of energy rise the temperature in data centers which arises many big problems like hardware failure, network failure, unfriendly working environment and rise in various technical problems. So, cooling of data centers is an important need for easy working condition. So, Green Computing can be used to handle this problem. Green Cloud Computing (GCC) reduces the operational cost and save the energy. Dynamic consolidation of Green Cloud Computing presents a significant opportunity to save energy in data centers. A Green Cloud Computing (GCC) consolidation approach uses live migration of VMs so that some of the under-loaded Physical Machines (PMs) can be switched-off or put into a low-power mode. On the other hand, achieving the desired level of Quality of Service (QoS) between cloud providers and their users is critical. Therefore, the main challenge is to reduce energy consumption of data centers while satisfying QoS requirements. With Green Cloud Computing it is possible to maintain the task scheduling in a perfect manner which cause a high quality difference in the present conditions of data centers. The current research concern is the unwanted power utilization, energy consumption and more time consumption in data center which is exceptionally gaining attention of researchers with respect to scheduling of the computing resources.. In this research proposal hybridization of multilevel feedback queue scheduling and weighted round robin is used to achieve above problem. With this approach we can maintain the minimum consumption of energy and providing a better response time.
Key Words - Infrastructure as a service, Platform as a service, Software as a service, Quality Of Service, Service Level Agreements, , Data Centre Efficiency, Dynamic Voltage Frequency Scaling.

I. INTRODUCTION

Cloud Computing is a computing technology where computing is moved away from personal computers to a "cloud" of computers. It is abstraction for the complex infrastructure. It is on demand network access and internet based development. It is an extension of distributed computing, parallel computing and grid computing. Cloud computing can be defined as "a model for enabling on demand network access that can be dynamically provisioned and released with minimal management efforts and minimal involvement of service providers" [1]. As depicted by the Figure 1.1, cloud computing provides services like storage, server application and network components [4]. Hence, cloud computing is a technology that uses internet to deliver its services.

A. characteristics of cloud computing

Cloud computing have some characteristics as shown in Figure 1.2 to provide qualitative services. These services are as follows [1]: On-demand self-service: - A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider. Broad network access: - Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (mobile phones, tablets, laptops and workstations). Resources pooling: - The providers computing resources are pooled to serve multiple users using a multitenant modal, with different physical and virtual resources dynamically assigned and reassigned according to user demand. Rapid elasticity: - Capability can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward with demand. The capabilities available for provisioning often appear unlimited and can be appropriated in any quantity at any time. Measured service: - Cloud system automatically control and optimize resource use by

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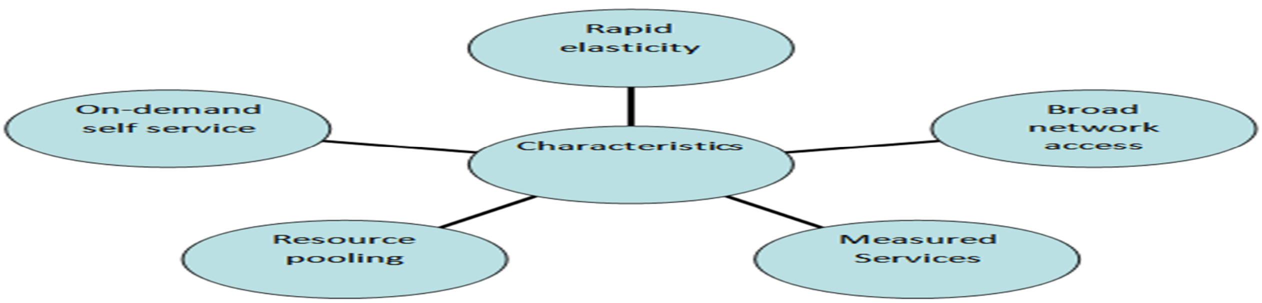
leveraging a metering capability at some level of abstraction appropriate to the type of service.

1) *Service Models Of Cloud Computing:* Three services are provided by cloud namely: infrastructure as a service, platform as a service, and software as a service [1]. Infrastructure as a service: - In this model user has control over the operating system, storage and networking components. Host firewall is a common example of this. It is also known as hardware as a service. It offers the hardware as a service to an organization so that it can put anything into the hardware according to its will. Infrastructure as a service allows the user to rent resources as: Server space, Network equipment, Memory, CPU cycles and Storage space. Platform as a service: - In this model platform is provide to the users to build, their own application. Applications are created using programming languages, libraries and tools, provide by the provider. The examples are Microsoft azure, Google application engine. Its services are software design, development, testing, deployment, and hosting. Other services can be team collaboration, database integration, web service integration, data security, storage and versioning.It has some of the disadvantages like. (1) Lack of portability among different providers. (2) If the service provider is out of business, the user's applications and data will be lost. Software as a service: - In this model running applications are used by the users. The infrastructure is managed and control by the cloud provider. The examples are Google.com and Salesforce.com. In this model the user uses different software applications from different servers through the Internet. The user uses the software as it is without any change and doesn't require integration to other systems. The provider does all the upgrades and patching while keeping the infrastructure running. The client will have to pay for the time he uses the software. Some successful applications of software as a service is described as (1) Customer resource management (CRM),(2) Video conferencing



B. *Green Cloud Computing*

Green computing refers to the study of using computing resources, infrastructure in an efficient way [5]. It also reduced energy consumption. The greatest environment challenge is global warming caused by carbon emissions. Green computing minimizes the carbon emissions. The resources provided by data centres must be managed to drive green computing. The goal of green computing is to increase energy efficiency. It also recycles factory waste. Large amount of power is required for running cooling fans of processor, monitor, network devices and light system. Total power consume by all the data centre in 2012 was around 38 Giga Watt. According to mark hachman, all data centres consumed 30 billion watts of electricity in 2012 that is equal to 30 nuclear power plants.

1) *Approaches Of Green Cloud Computing*

a) *Virtualization:* It is an abstraction over the physical resources to make them shareable. It allows multiple operating systems, to run concurrently on a single computer. It is a very useful concept in context of cloud systems. In other words virtualization means something which isn't real, but gives all the facilities of a real. It is the software implementation of a computer which will execute different programs like a real machine. The remote datacenter will provide different services in a full or partial virtualized manner. Full virtualization:-In case of full virtualization a complete installation of one machine is done on another machine. It will result in a virtual machine which will have all the software's that are present in the actual server. Para virtualization:-In para virtualization, the hardware allows multiple operating systems to run on single machine by efficient use of system resources such as memory and processor. E.g. V M ware software. Here all the services are not fully available, rather the services are provided partially.

b) *Resource allocation:* It means routing of data to different data centre based on the cost.

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c) *Power management:* It is power saving aspects in hardware system automatically turn off components such as monitors when not in use

II. RELATED WORK

Lizhe Wang, et al, "Review of Performance Metrics for Green Data Centers: A Taxonomy Study," [6] gave an idea to categorization of green computing conformance measurement in data centres, such as power metrics, thermal metrics and extended performance metrics. According to the paper two methods are used to make a green data centres. That is Green, Greenfly. It also identified carbon emission per unit time.

Andrew J. Younger et al, "Efficient Resource Management for Cloud Computing Environments," [7] Described a frame work for efficient green enhancement in cloud architecture. It is based on power aware scheduling, variable management and minimal virtual machine design. It has improved overall system efficiency. It is used to evaluate the performance and overall capacity of virtual machine by using power based scheduling of virtual machine.

Antow Beloglazov et al, "Energy Efficient Resource Management in Virtualized Cloud Data Centers," [8] have explained efficient resource utilization. They have proposed best fit decreasing that is modification best fit algorithm. This method is more efficient, but it is complex as it provides quality of service by dynamic reallocation of virtual machines.

Wang et al, "Task scheduling with ANN-based Temperature Prediction in a Data Center: A Simulation-based Study," [9] explained the method to predict a workload on a data centre. The researcher used artificial natural networks that is, a machine learning technique. To perform experiment, data is collected from data centres. It decreases the complexity of data centre by using thermal impact matrix. ANN based prediction technique reduce power consumption by using thermal aware workload scheduling algorithm.

Yuetsu Kodama et al. "Imbalance of CPU Temperature in a Blade System and Its Impact for Power Consumption of Fans," [10] developed a new metric for data centre power efficiency to fairly evaluate the contribution of each improvement for power efficiency. In order to develop it, they built a test bed of a data centre and measured power consumption of each components and environmental variable in some detail, including the power consumption and temperature of each node, rack and air conditioning unit, as well as load on the CPU, disk I/O and the network. In these measurements, they found that there was a significant imbalance of CPU temperatures that caused an imbalance in the power consumption of fans. In this paper they clarified the relationship between CPU load and fan speed, and showed that scheduling or rearrangement of nodes could reduce the power consumption of fans.

Delavan et al. "HSGA: A Hybrid Heuristic Algorithm for Workflow Scheduling," [12] proposed a hybrid heuristic method to find scheduling for workflow graph. So to obtain quick response genetic algorithm is used. It also described load balancing of resources. Round Robin and Best Fit methods are used to create initial population.

Zhou Lei et al. "An Energy Efficient Scheduling Approach Based on Private Cloud," [13] has explained an energy efficient scheduling approach. It is based on private cloud. To achieve multiple objectives, it is very difficult to schedule virtual machine. Virtual machine has many applications like virtual desktops and virtual libraries. This paper proposed an energy efficient scheduling algorithm based on least load first algorithm. It balances the load when data centre is running on low power mode. But the problem is to powering down the busy nodes due to some threshold value is not feasible.

Amit et al. "Efficient Optimal Algorithm of Task Scheduling in Cloud Computing Environment," [14] explain the method to reduced execution time by using generalized priority scheduling algorithm and compare with FCFS and Round robin. To obtain quick response, cloud sim toolkit is used. IAAS provide service in the form of VMs. In this paper, job scheduling is used to control the order of work performed by the computer. Its main advantage is high performance computing and best system throughput. In this paper, VM scheduling is used for dispatching jobs. The main disadvantage of FCFS is that its response time and turnaround time is slow. Round robin is used for internal scheduling. Its main drawback is that largest job takes enough time.

Sudha Sadhasivam et al, "Improve Cost-Based Algorithm for Task Scheduling in Cloud Computing," [27] proposed an algorithm of mapping of tasks efficiently to available resources in cloud. This algorithm measures both cost of resources and computation performance. The problem with traditional task scheduling is to avoid the relationship between the various application bases. Tasks are grouped and sorted according to their calculated priority levels. They are placed in three different priorities lists namely, high, low and medium priority.

Zhang Kai et al. "The Research on Cloud Computing Resource Scheduling Method Based on Time Cost-Trust Model," [19] proposed an algorithm on time-cost based model. The time cost trust is based on subset tree algorithm. The subset tree algorithm is

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based on the principal of economics. This method mainly concerns with reliability factor. Only one factor from time, cost and trust cannot meet the user's demand. So, the time-cost model has been introduced to improve users demand.

Dipti Bhansali et al. "An Optimistic Differentiated Job Scheduling System for Cloud Computing," [31] explained the mechanism of an Optimistic Differentiated Job Scheduling System. This algorithm is developed to serve the multiple requests. This method is proposed to handle multiple requests of services like uploading and downloading. Multiple requests are processed by use of non-primitive algorithm. Its main goal is to provide optimistic value of service. The users get the quality of service and service providers gain maximum profit. It exploits the under-utilized resources at non-peak times. Utilization of resources is done in transient way. This paper implements static load balancing based on size of files.

Isam Azawi Mohialdeen. "Comparative Study of Scheduling in Cloud Computing Environment," [24] surveyed about the scheduling algorithm used in cloud computing. Scheduling is an important aspect to schedule the jobs on virtual machines. In cloud, single scheduling algorithm is not sufficient because single algorithm does not consider all performance metrics and Maintain quality of service. Many scheduling algorithm have been proposed to enhance the systems performance in terms of throughput and cost. This paper compares 4 types of scheduling algorithms under cloud namely Round Robin (RR), Minimum Completion Time, Random Resource Selection and Opportunistic Load Balancing. These algorithms have been evaluated in terms of their ability to provide quality of service and to maintain fairness amongst all jobs. Each scheduling algorithm have performed superior on some metrics. All measuring characteristics are not provided by each and every algorithm. The selection of good scheduling is based on characteristics that fulfil the needs of customers as well as service provider.

Huankai Chen et al. , "User-Priority Guided Multiple Min-Min Scheduling Strategy for Load Balancing in Cloud Computing," [32] studied about the genetic algorithm it was developed to scheduled task on virtual machines in efficient manner. This algorithm was made by the combination of Min-Min and Max-Min in Genetic algorithm. This technique was adopted to schedule task in order to reduce the execution time. This mechanism has achieved better performance than standard Genetic algorithm.

This survey, "Survey on Optimization Techniques for Task Scheduling in Cloud Computing," [33] explained about the various algorithms to obtain optimal solution in job scheduling. The job scheduling was evaluated by cost and execution time. The various optimization techniques in this paper were based on these evaluations. These techniques are ant colony optimization and modified bee's life algorithm.

Kun Li et al. "Cloud Task Scheduling Based on Load Balancing Ant Colony Optimization," [34] represents a task scheduling policy in cloud base on load balancing ant colony optimization (LBACO) algorithm. The major goal of the entire system is to balance load while trying to reduce the performance of given task set. Ant colony optimization is an efficient dynamic task scheduling in a cloud. ACO is random search algorithm. The ant search for food and to connect each other by pheromones that is laid on paths travelled. ACO is used to solve many problems like travelling salesman problem, graph colouring problem. LBACO algorithm is proposed is used to find optimal resource allocation for each task set in dynamic cloud environment. LBACO outperformed FCFS and basic ACO. It is achieved good system load balance in any situation in any specific moment and take less time to execute.

Wang et al. "Min-Min Scheduling Algorithm for Heterogeneous Cloud Servers," [35] proposed an improved load balance is introduced to reduce the make span and increase the resource utilization. It also improves Min-Min. But at same time cloud providers provide service as per demand of different users. Services were provided in terms of different levels of quality of services. This paper focused on efficient resource utilization, total completion time of task and user priority in a cloud.

This survey "Analysis and Performance Assessment of CPU Scheduling Algorithm in Cloud Sim," [40] analyzing and evaluating the performance of various CPU scheduling in cloud environment using Cloud Sim, the basic algorithm of operating system like FCFS, Priority Scheduling and Shortest Job First test under different parameters that which scheduling policy perform better.

In , "Priority Based Dynamic resource allocation in Cloud computing", [41] author proposes a priority based dynamic resource allocation in cloud computing. This paper considers the multiple SLA parameter and resource allocation by pre-emption mechanism for high priority task execution can improve the resource utilization in cloud. The main highlight of the paper is that it provides dynamic resource provisioning and attains multiple SLA objectives through priority based scheduling. Since cost is the important aspect in cloud computing.

Sheikh Alisha hi et al., "A General purpose And Multi-level Scheduling Approach in Energy Efficient Algorithm" [43] proposed multi-level and general-purpose scheduling approach for energy efficient computing through software part of the green computing. The consolidation are well defined for IaaS cloud paradigm, however it is not limited to IaaS cloud model. The policies, models, algorithms and cloud pricing strategies are being discussed in general. The big improvement in utilization and energy consumption is found as workloads are running with lower frequencies. The coincidence of energy consumption and utilization is improved.

Zhigang Wang et al. “The Hybrid Scheduling Framework for Virtual Machine Systems,”[44] present hybrid scheduling framework for the CPU scheduling in the virtual machine monitor. Two types of applications are high-throughput type and concurrent type. Virtual machine sets concurrent type when majority of workload is concurrent applications in order to reduce cost of synchronization. Otherwise it is set to high-throughput type by default. Experiments and results show that framework and scheduling strategy is flexible to improve performance of virtual machine.

Bo Li et al. “An Energy-saving Application Live Placement Approach for Cloud Computing Environments” [45] states energy aware heuristic algorithm on base of distributes workload in virtual machine with minimum number of virtual machines or nodes required that workload. So that workload migration, workload resizes virtual machine migration these approaches are used in algorithm.

Qura-Tul-Ain Khan et al. “Usage & Issues of Cloud Computing Techniques in Small & medium Business Organizations,” [46] explained about a computing platform that exists in large data centre is cloud computing. Cloud computing is dynamically able to provide servers the ability to address wide range of needs in almost every field. Many problems are involved to deliver cloud computing resources if they were utilities like electricity, privacy issues, security, and access, regulations, reliability and other issues.

R. Suchitra “Efficient Migration –A Leading Solution for Server Consolidation,” [47] provides their overview as server consolidation of virtual machines is very much essential in a cloud environment for energy conservation and cost cutting. Consolidation can be achieved through live migration of virtual machines. They propose a modified been packing algorithm for server consolidation that avoids unnecessary migrations and minimizes the instantiation of new physical servers. They implement ideas from the First Fit algorithm for live migration of virtual machines. They have simulated our algorithm using java with multiple test cases. The proposed system consequently results in server consolidation through minimal migration.

N. Gupta et al. “A Survey on Cloud Providers and Migration Issues”, [48] discuss the work of various cloud providers and research groups that are working ahead in adding the advantages of cloud services. In spite of all the progress and technology enhancements that cloud computing brings, enterprises still face some challenging problems while reaching to a decision of whether to or not to adopt cloud.

III. PROBLEM FORMULATION

Most data centers, by design, consume vast amounts of energy in an incongruously wasteful manner, interviews and documents show. As a result, data centers can waste 90 % or more of the electricity they pull off the grid, there more energy consumption and wastage of time. So there is a strong need of optimisation above three factors CPU utilization, response time and no. Of jobs executed per time. The current research concern is the unwanted power utilized, energy consumed and more time consumed in data center which is exceptionally gaining attention of researchers with respect to scheduling of the computing resources. In reality, Service providers make high quality use of IaaS and PaaS for developing their services without consideration of physical hardware, while users also can access on-demand and pay-peruse services anywhere in Cloud computing. But one of major issue in datacenters found is to manage optimum energy, power usage in the systems.

A. Green Cloud Energy Model

In data centers the energy consumption is depends upon the three basic things CPU, memory, disk storage and the network interfaces, by the perfect scheduling methods we can minimise the extra consumption of the energy. There are some modes of server energy consumption [4], **Active mode:** In this mode, the power consumption *pi* of a server *i* has both the constant and variable parts. According to previous models we approximate *pi* by *pi, active* = $\delta i + \alpha_i\ f_i^3$, where δi denotes the constant power consumption which includes the base power consumption of the CPU and all other components such as memory, disks, and I/O resources, $\alpha_i\ f_i^3$ denotes the variable power consumption that is varied with CPU operating frequency *fi*, and αi stands for the proportionality constant;. **Idle mode:** Possible idle time between the executions of different VMs allocated on the same server also consumes energy. In this mode, server *i* consumes the base power consumption δi;. **Sleep mode:** Sleep mode to reduce the total energy consumption. In this mode, the power consumption by the server *i* is *pi,sleep,* where *pi,sleep* << δi;. **Transition mode:** Transitions between the active mode and the sleep mode also consumes energy. We assume that the power consumption in this mode is equal to the one in the active mode. The time required to change the power state in either mode is set to 100 ms. As the power consumption may change over time according to the power mode, the power consumption of server *i* is a function.

$$p_i(t) = \begin{cases} \delta_i + \alpha_i f_i^3(t) & active\ mode \\ \delta_i & idle\ mode \\ p_{i,sleep} & sleep\ mode \\ \delta_i + \alpha_i f_i^3(t) & transition\ mode \end{cases}$$

In this research work we are working on energy consumption during scheduling on a network of nodes over cloud environment. For this the energy consumption calculations having the sum of energy consumption of all tasks with some addition factors that is call a waiting energy of the particular task and the waiting of task. For energy consumption the scheduler calculates the task like if the tasks are as P and nodes are as S the energy of all the tasks over a network is as:

PERIMETERS AND EQUATIONS [4]

Parameters	Definition
$(f_i\ min, f_i max)$	CPU frequency range of server i
COP_K	Coefficient of performance factor
c_K	Electricity prise (\$/hour)
$r_K^{CO_2}$	co_2 emission rate (kg/kWh)
ξ_K	Execution prise (\$/hour)

Energy consumption

$$(EC)=\sum_i^r\{(\text{waiting time of execution} \times \text{task ideal energy}) + \text{task energy}\}$$

Time (T): $\sum_i^r(Total\ time\ consumption + wating\ time)$

Total energy consumption of all the servers:

$$EC_k^{server} = \sum_{i=1}^r EC_i$$

Where r is the number of servers in the data canter;

Total energy consumption of cooling system:

$$E_k = (1 + 1 / COP_k) EC_k^{server}$$

Energy cost:

$$C_k = E_k \times c_k$$

CO_2 emission:

$$CO_2\ E_k = E_k \times r_k^{CO_2}$$

B. Task Generation System

The below session provides a complete step by step knowledge of implementation of the hybrid algorithm and it is also providing the basic formulas for the calculation of different parameters of green cloud computing and related one. This session describes the implementation setups and methodology used for implementing data security using hybrid of multilevel feedback scheduling and waited round robin algorithms in cloud computing.

This is the first step of the execution that initializes the process of execution and task for selection.

It is called by user after the submission of the tasks for execution. Scheduler gets all the tasks selected by user and manage them into queue for the execution. It call next step for further execution.

Scheduler gets all tasks detail from cloud server those initialize for execution. It manages them with their configuration in task matrix. This process is under looping condition so that it collects all information about those entire tasks which initialize for execution.

Scheduler find system for execution after checking job status.

On the other hand scheduler arranges systems by getting their specification from the cloud server for generate the execution environment. The whole data and specification stored inside system matrix for manage network of systems and task execution on them.

Scheduler execute task with systems threads those are used to execute task as high priority and low priority. These tasks pattern reduce waiting time and energy consumption.

Calculate executed tasks and consumption of their energy. If task not execute due to some specification miss match. Than the task stored in unexecuted task list and publish results with consumption of their energy on cloud environment.

C. Algorithm Design

START

INITIALIZE start.job.count=1

System.comfigure.algorithms=true.

Scheduler.initilize.look_upTable=true;

Jobs.add.scheduler=Selected.jobs.user

While(Jobs.count.hasValue==true)

Allocate.job.specified.system

Parameters.calculate.jobs=true,

If (jobs.execution=false)

Process and update .value.system selection

If value.exceeds .system.capabilites--- broadcast system.list

Scheduler.update_lookup_table

if (Scheduler.find.system==false)

Scheduler.generate(lookup_list)

Else Update.lookUp_list();

Repeat until(tasks.execute.all==true)

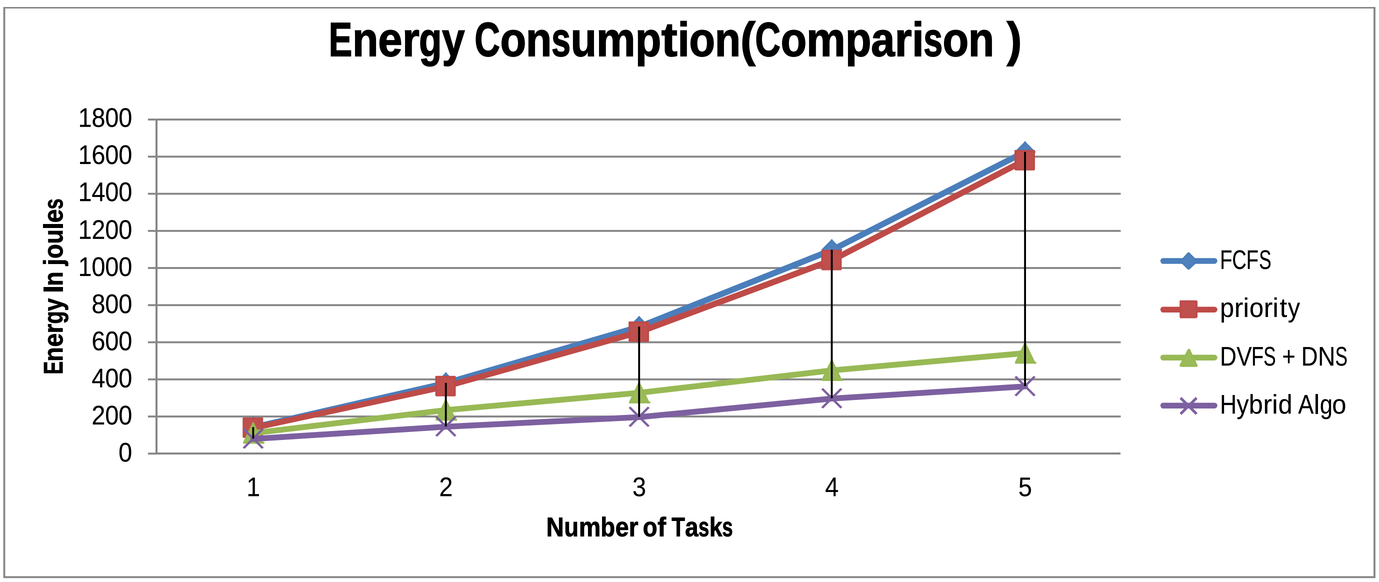
End

Stop

Analysis of Results.

Total Number of Tasks	1	2	3	4	5
FCFS	144	381	685	1097	1623
Priority	138	362	656	1042	1580
DVFS + DNS	112	237	329	449	543
Hybrid (proposed)	82	147	199	299	363

Representing The Comparision Of Total Energy Consumption (Energy In Jouls)



Graph showing the comparative results

IV. CONCLUSION AND FUTURE SCOPE

In this research proposal, we will deploy hybridization of multilevel feedback queue scheduling and weighted round robin to achieve above problem. The hybrid of the two algorithm gives a better scheduling result and low time consumption. The given technology allows the data centre to give its optimal performance and high quality of result.

In our future work, we will develop the algorithm which would help us solving the problem occurring in data center job scheduling and can also use in data over loading. We will work on the implementation of the new algorithm which helps us reach the objectives and further increases the task scheduling for various huge amount of data and for big data centers.

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REFERENCES

[1] "NIST Definition of Cloud Computing," vol. 15, csrc.nist.gov/groups/SNS/cloud computing/cloud- def v15.doc.
[2] Y. Ghanm, J. Ferrira and F. maurer, "Emerging Issues and Challenges in Cloud Computing -A Hybrid Approach," Journal of Software Engineering and Application, vol. 5, no. 11A, pp. 923-937, 2012.
[3] M. Sajid and Z. Raza, "Cloud Computing Issues and Challenges," IEEE International Conference on Cloud, Big Data and Trust, pp. 35-41, 2013.
[4] Fei Cao, Michelle M. Zhu, Chase Q. Wu, "Energy-Efferentfor resource management scientific work flow in cloud'' IEEE 10th World Congress on Services,2014
[5] A. Jain, M. Mishra and S. Peddoju, "Energy Efficient Computing- Green Cloud Computing," IEEE International Conference on Green Cloud Computing, 2012.
[6] L. Wang and S. Khan, "Review of Performance Metrics for Green Data Centers: A Taxonomy Study," The Journal Super Computing, vol. 63, no. 11, pp. 639-656, March 2003.
[7] J. Younge, G. Laszewski and L. Wang, "Efficient Resource Management for Cloud Computing Environments," IEEE 10th International Conference on Cloud Computing, pp. 1-8, 2010.
[8] A. Beloglazov and R. Buyya, "Energy Efficient Resource Management in Virtualized Cloud Data Centers," IEEE 10th International Conference on Cluster, Cloud and Grid Computing, pp. 1-2, 2010.
[9] L. Wang, G. Laszewski, F. Huang, J. Dayal ,T. Frulani and G. Fox, "Task scheduling with ANN-based Temperature Prediction in a Data Center: A Simulation-based Study," Springer Journal of Engineering with Computers , vol. 27, no. 4, pp. 381-391, February 2011.
[10] Y. Kodama, S. Itoh, T. Shimizu, S. Sekiguchi, H. Nakamura and N. Mori, "Imbalance of CPU Temperature in a Blade System and Its Impact for Power Consumption of Fans," IEEE International Conference on Green Computing, pp. 81-87, 2011.
[11] J. Fontan, T. Vazquez, L. Gonzalez, R. Montero, and M. Llorente, "Open NEbula: The Open Source Virtual Machine Manager for Cluster Computing," IEEE Conference on Open Source Grid and Cluster Software, San Francisco, CA, USA, May 2008.
[12] A. Delava and Y. Aryan, "HSGA: A Hybrid Heuristic Algorithm for Workflow Scheduling," Springer Conference on Cluster Computing, pp. 1-9, 2013.
[13] J. Li, J. Peng, Z. Lie and W. Zhang, "An Energy Efficient Scheduling Approach Based on Private Cloud ," Journal of Information and Computational Science, vol. 8 , no. 4 , pp. 716-724, 2011.
[14] A. Agarwal and S. Jain, "Efficient Optimal Algorithm of Task Scheduling in Cloud Computing Environment," International Journal of Computer Trends and Technology, vol. 9, no. 7, pp. 1-6, March 2014.
[15] G. Ning and H. Lei, "Genetic Simulated Annealing Algorithm for Task Scheduling based on Cloud Computing Environment," In Proceedings of International Conference on Intelligent Computing and Integrated Systems, pp. 60-63, 2010.
[16] The Green Grid Consortium, http://www.thegreengrid.org
[17] K. Rajamani and C. Lefurgy, "On Evaluating Request Distribution Schemes for Saving Energy in Server Clusters," IEEE International Symposium on Performance Analysis of Systems and Software, 2003.
[18] R. Buyya, C. Yeo, and S. Venugopal, "Market-oriented Cloud Computing: Vision, Type and Reality for Delivering IT Services as Computing Utilities," IEEE 10th International Conference on High Performance Computer Communication, pp. 13, Sep. 2008.
[19] Z. Kai and G. Z. Wen, "The Research on Cloud Computing Resource Scheduling Method Based on Time Cost-Trust Model," IEEE-International Conference on Computer Science and Network Technology, pp. 939-942, 2012.
[20] R. Yamini, "Power Management in Cloud Computing Using Green Algorithm," IEEE-International Conference On Advance In Engineering, Science And Management (ICAESM -2012) March 2012.
[21] S. Harjit, "Current Trends in Cloud Computing a Survey of Cloud Computing System," (IJECSE-2012) pp. 1-4.
[22] C. Hung, H. Wang and Y. Hu, "Efficient Load Balancing Algorithm for Cloud Computing Network," onlinepresent.org/proceedings, vol. 2, pp. 251-253, 2012.
[23] C. Yogita and M. Bhonsle, "Dynamically Optimized Cost Based Task Scheduling in Cloud Computing," International Journal of Emerging Trends and Technology in Computer Science, vol. 2, Issue 3, 2013.
[24] I. Mohialdeen, "Comparative Study of Scheduling in Cloud Computing Environment," Journal of Trends Computer Science, vol. 9, pp. 252-263, 2013.
[25] A. Garg and C. R. Krishna, "A Review on Scheduling Algorithms in Cloud Computing," International Conference on Computer Networks and Information Technology, NITTTR. Chandigarh, 20-21 March, pp. 309-314, 2014.
[26] A. Gupta and K. Mann, "Sharing of Medical Information in Cloud Platform," Journal of Computer Engineering, vol. 16, pp. 8-11, March 2014.
[27] S. Selvaranil and G. Sadhasivam, "Improve Cost-Based Algorithm for Task Scheduling in Cloud Computing," IEEE International Conference on Computational Intelligence and Computing Research, pp. 1-5, 2010.
[28] L. M. Zhang, Y. Q. Zhang and L. Keqin, "Green Task Scheduling Algorithm With Speed Optimization on Heterogeneous Cloud Servers," IEEE/ACM International Conference on Green Computing and Communication 2010.
[29] R. Yamini, "Power Management Cloud Computing Using Green Algorithm," IEEE International Conference on Advances in Engineering, Science and Management, 30-31 March, 2012.
[30] X. M. Cui, H. Wang and Y. Bi, "A Multiple Qos Constrained Scheduling Strategy of Multiple Workflows for Cloud Computing," IEEE International Conference on Parallel and Distributed Processing with Application, pp. 629-634, 2009.
[31] D. Bhansali, S. Ambike, J. Kshirsagar and J. Bansiwal, "An Optimistic Differentiated Job Scheduling System for Cloud Computing," International Journal of Engineering Research and Applications, vol. 2, no. 2, pp. 1212-1214, 2012.
[32] H. Chen, F. Wang, N. Helian and G. Akanmu, "User-Priority Guided Multiple Min-Min Scheduling Strategy for Load Balancing in Cloud Computing," IEEE International Conference on Parallel Computing Technologies, pp. 1-8, 2013.

[33] R. A. Preethima and M. Johnson, "Survey on Optimization Techniques for Task Scheduling in Cloud Computing," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, no. 12, pp.413-415, 2013.

[34] K. Li and D. Wang, "Cloud Task Scheduling Based on Load Balancing Ant Colony Optimization," IEEE International China Grid Conference, pp. 3-9, 2011.

[35] F. Wang and G. Akanmu, "Min-Min Scheduling Algorithm for Heterogeneous Cloud Servers," International Journal of Computer Engineering, vol. 2, no. 4, pp. 15-16, 2012.

[36] http://www.tutorialspoint.com/cloud_computing/ cloud_computing_architecture.htm

[37] R. Bajaj and D. P. Agarwal, "Improving Scheduling of Tasks in a Heterogeneous Environment," IEEE Transactions on Parallel and Distributed Systems, pp. 107-118, 2004.

[38] J. Li, M. Qiu, X. Qin, "Feedback Dynamic Algorithms for Preemptable Job Scheduling in Cloud Systems", IEEE 2010.

[39] C. H. Hsu and T. L. Chen, "Adaptive Scheduling based on QoS in Heterogeneous Environment", IEEE 2010.

[40] M. Gahlawat and P. Sharma, "Analysis and Performance Assessment of CPU Scheduling Algorithm in Cloud Sim," International Journal of Applied Information System (IJAIS), vol. 5, no. 9, July 2013.

[41] Pawar, C. S. Wagh and R. B, "Priority Based Dynamic resource allocation in Cloud computing", IEEE International Symposium on Cloud and Services Computing, pp. 1-6, 2012.

[42] A. Jangra and T. Saini, "Scheduling Optimization in Cloud Computing," International Journal of Advanced Research in Computer Science and Software Engineering, vol. 3, no. 4, pp. 62-65, 2013.

[43] M. Sheikhalishahi, M. Devare and L. Grandinetti, "A General purpose And Multi-level Scheduling Approach in Energy Efficient Algorithm", CLOSER Conference, 2011.

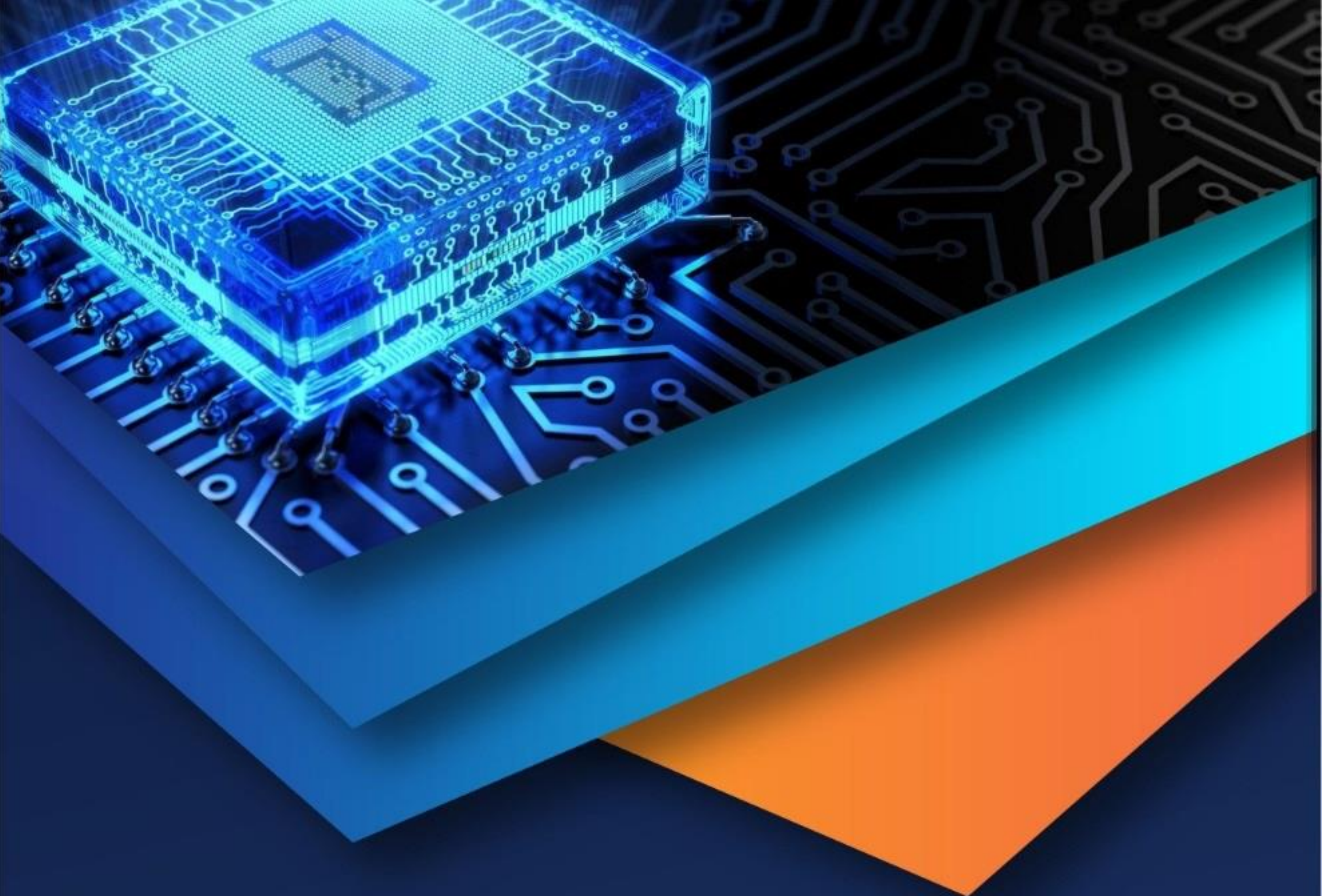
[44] C. Weng, Z. Wang, M. Li, and X. Lu, "The Hybrid Scheduling Framework for Virtual Machine Systems,"Proc. Conf. VEE09, pp. 113-120, 2009.

[45] B. Li, J. Li, J. Huai, T. Wo, Q. Li and L. Zhong, "An Energy-saving Application Live Placement Approach for Cloud Computing Environments", IEEE International Conference on Cloud Computing, pp. 17-24, 2009.

[46] Q. Khan, S. Nasser, F. Ahmad and M. Khan, "Usage & Issues of Cloud Computing Techniques in Small & medium Business Organizations," International Journal of Scientific & Engineering Research, vol. 3, May 2012.

[47] R. Suchithra, "Efficient Migration –A Leading Solution for Server Consolidation," International Journal of Computer Applications, vol. 60, no.18, December 2012.

[48] N. Gupta, Jyoti and Abhay, "A Survey on Cloud Providers and Migration Issues", International Journal of Computer Applications, vol. 56, no.14, pp. 38-43, October 2012.



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