Multilayer Hybrid Energy Efficient Approach in Green Cloud Computing

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ABSTRACT
Cloud computing is an important paradigm in Information Knowledge field. The main aim of Green Cloud computing is to reduce the energy consumed by physical resources in data center and save energy and also increases the performance of the system. There are several scheduling algorithms such as Adaptive Min-Min Scheduling Algorithm; Multilevel Feedback Queue Scheduling Algorithm etc. are utilized in green cloud computing to lower the energy consumption and time. In proposed work, one scheduling algorithm will be implemented which is Multilevel Feedback Queue Scheduling algorithm. On its basis, energy consumption taking place will be reduced after using improved Adaptive Min-Min Scheduling Algorithm.

Keywords
Multilevel Feedback Queue Scheduling algorithm; Adaptive Min-Min Scheduling Algorithm; Cloud Computing; Data centers.

1. INTRODUCTION
In the origin of Computing revolutionized post-industrial society, Green Computing was portrayed and perceived as a new technology but it was also widely accepted as an evolution in various technology areas such as data centre networking, data centre-hosted-services, request performance-measurement etc. This was also known as green technology. In the end of 1970s, the world saw revolution and by the starting of 1990s green computing came into limelight. Then business starts using environment friendly ways to do business. Since, there has been fast rate in the increase of the high energy consumption rate. As given the evolutionary nature of Green Computing, it could mean different things and thus it is wise to pay attention to definition of Green Computing.

Green Computing is a model for enabling convenient, environment sustainability in IT sector that can be rapidly provisioned and released with minimal management effort or green provider interaction". Green computing has been widely accepted from individual to official employee of government.

Green-computing has been enabled by the availability of broadband networks and low-priced end-user devices, along with commodity-computing nodes that can be simply interconnected and controlled, as well as virtualization to make available the advent of isolating processes that share computers by reducing CO_2 emission rate.

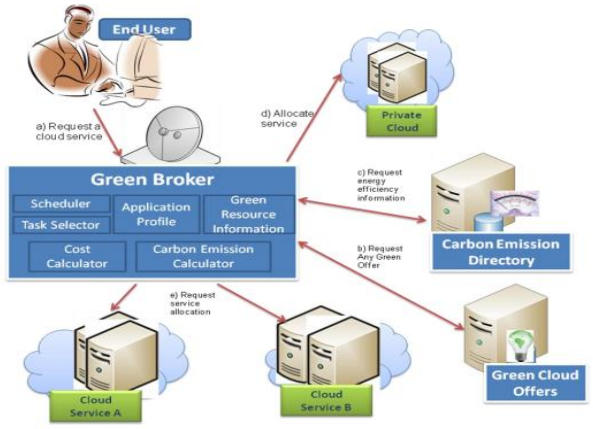

Figure 1: Green Cloud Architecture [1]

2. NEED FOR GREEN CLOUD COMPUTING
- Modern datacentres, operating below the Cloud computing model are hosting a variety of applications ranging from those that run for a few instants (e.g. serving requests of web applications such as e-commerce and social networks portals with transient capacities) to those that run for longer periods of time (e.g. simulations or large data set processing) on shared hardware stages.
- The essential to manage multiple applications in a data centre creates the challenge of on-demand resource provisioning and apportionment in response to time-varying workloads.
- Normally, data centre resources are statically assigned to applications, based on peak load characteristics, in order to maintain isolation and provide performance guarantees.
- Until newly, high presentation has been the sole concern in data centre deployments and this demand has been fulfilled without paying much consideration to energy consumption. Data centres are not only expensive to maintain, but also unfriendly to the environment.
- High energy costs and huge carbon footprints are incurred due to massive amounts of electricity required to power and cool frequent servers hosted in these data centres. Cloud service providers need to adopt measures to ensure that their revenue

margin is not dramatically reduced due to high energy costs.

3. METHODS OF GREEN COMPUTING

- **Lower Power Hardware**

Computers can be made less energy consumption devices by using lower power processor, using cooling devices as well as using spinning SSD of small size rather than large size [16]. Intel has developed a process that is going to use less power. Low power PCs are green saver so they don't allow fast gaming.

- **Virtualization**

Virtualization is the process of makes use of efficient system resources. Virtualization fits in green computing by combining servers and maximizing CPU throughput. With virtualization several physical computers can be made one virtual computer on single computer [2].

Advantages of Virtualization:

- Efficient utilization of proper re-sources
- Superior degree of abstraction
- Replication
- Scalable and flexible infrastructure

This enables frequently accessed files to be warehoused on high-performance, low-capacity drives; whilst files in less use are placed on more power-efficient, low-speed, larger capacity drives [3].

- **Internet based Applications**

Green computing is not just like government services that are encouraging to reevaluate their use in IT sector. But it has become reality in many countries. In internet based applications, it helps network managers in reducing CO_2 emission.

- **Storage**

There are three routes available for storage of data that makes efficient use of resources. In order to have less power consumption, there is need for optimization of power devices. So it can be achieved by 3.5' hard drive usability or either 2.5" hard disk usability. Lowest power consumption is also achieved by using SSD cards.

4. PROBLEMS ENCOUNTERED

Cloud computing is an important paradigm in Information Knowledge field. In Data center, where all physical resources are available, machine consumes power and emits heat which affects the conservational conditions. The Green Cloud computing solves the problem of global warming by providing eco-friendly atmosphere. We calculated that the heat emission increases with increase in energy consumption. The main aim of Green Cloud computing is to reduce the energy consumed by physical resources in data centre and save energy and also increases the performance of the system. There are several scheduling algorithms such as Adaptive Min-Min Scheduling Algorithm; Multilevel Feedback Queue Scheduling Algorithm etc. are utilized in green cloud computing to lower the energy consumption and time.

5. PROPOSED SOLUTION

In proposed work, one scheduling algorithm will be implemented which is Multilevel Feedback Queue Scheduling algorithm. On the basis of it, energy consumption taking place will be reduced after using improved Adaptive Min-Min Scheduling Algorithm.

5.1 Multi-Level Feedback Queue Scheduling

Multi-level feedback queue scheduling permits a process to move between queues. This movement is facilitated by the typical of the CPU burst of the process. If a process uses too much CPU time, it will be encouraged to a lower-priority queue. This scheme leaves I/O-bound and interactive processes in the higher priority queues. In addition, a process that waits too long in a lower-priority queue may be moved to a higher priority queue. This form of aging also helps to avert starvation of convinced lower priority processes.

Multiple FIFO queues are used and the action is as surveys:

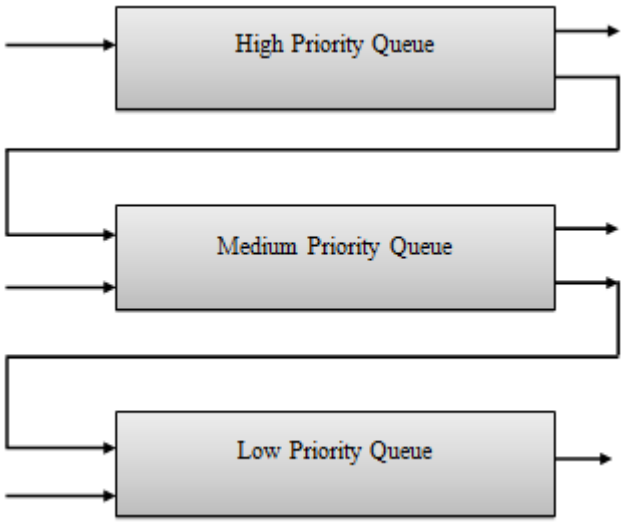

Figure no: 2 Multi-level feedback Queue Scheduling

1. A new process is inserted at the end (tail) of the top-level FIFO queue.
2. At some stage the process extents the head of the queue and is assigned the CPU.
3. If the process is complete within the time quantum of the given queue, it leaves the system.
4. If the process voluntarily abandons control of the CPU, it leaves the queuing network, and when the process develops ready again it is inserted at the tail of the same queue which it abandoned earlier.
5. If the process uses all the quantum time, it is pre-empted and inserted at the end of the next lower level queue. This next lower level queue will have a time quantum which is more than that of the previous higher level queue.
6. This scheme will endure until the process finalizes or it reaches the base level queue

- At the base level queue the processes circulate in round robin fashion until they complete and leave the arrangement. Processes in the base level queue can also be scheduled on a first come first served basis.
- Optionally, if a process blocks for I/O, it is 'promoted' one level, and placed at the end of the next-higher queue. This allows I/O bound processes to be favored by the scheduler and allows processes to 'escape' the base level queue.

For scheduling, the scheduler always starts picking up processes from the head of the highest level queue. If the highest level queue has become unfilled, then only will the scheduler take up a process from the next lower level queue. The same policy is implemented for picking up in the succeeding lower level queues. Meanwhile, if a process comes into any of the higher level columns, it will pre-empt a process in the lower level queue.

Also, a new progression is always inserted at the tail of the top level queue with the statement that it would be a short time consuming process. Long processes will mechanically sink to lower level queues based on their time ingestion and interactivity level. In the multilevel feedback queue, a process is given just one chance to complete at a given queue level before it is compulsory down to a lower level queue.

5.2 Adaptive Min-Min Scheduling Algorithm

- The approval of the Internet and the availability of powerful computers and high-speed networks as low-cost commodity mechanisms make it possible to construct large-scale high performance Grid computing systems.
- These technical chances enable the distribution, selection, and aggregation of geographically distributed heterogeneous resources for solving large-scale problems in science, engineering, and commerce [4].
- To achieve the promising potentials of tremendous distributed properties, effective and efficient scheduling algorithms are fundamentally important. The scheduling problem deals with the management and allocation of resources so as to efficiently execute the users' applications.
- Task routing as the system that tasks are dispensed to processors and task scheduling as how tasks are scheduled on the assigned computer. Task routing procedures may be either static or adaptive. The former uses only information about the average performance of the system, ignoring the current state, while the latter reacts to system state.
- Adaptive policies are more difficult but produce significantly better performance results than static policies. Static policies are separated into deterministic and probabilistic. Probabilistic procedures adjust the routing decision to a probability distribution.
- In deterministic strategies once the set of currently ready tasks has been specified, the routing discipline is applied. Task routing processes can also be separated into immediate mode and batch mode routing algorithms.
- Immediate mode algorithms advancing the tasks of each job as soon as they arrive in the system. On the contrary, batch mode algorithms distribute a batch of tasks of many jobs which are in the queue of the scheduler.
- The scheduling of the resources many factors such as CPU operation rate, throughput, turnaround time, waiting time, and response time should be focused for all the processors when assigned with the jobs. The jobs are assigned to the resources considering the system's presentation. Thus the scheduling productions an important role in achieving the best utilization of resources and the better completion of the submitted jobs.

6. METHODOLOGY

1. Cloud Consumer: Cloud consumer are the user of cloud server. Cloud server interacts with millions of users at same time. Users send request to the server for processing and server return result accordingly.

2. Cloud Environment: Cloud environment which provides various services to the user. These are as IaaS, PaaS, SaaS. These services are the modules of cloud server which provide data processing environment to their users. IaaS is the first layer of the system which provides way to access the other layer and facilities.

3.**Cloud service centre:** Cloud service centre is responsible for check the user service area and their access bounds. User communicates with server for start processing with cloud server. It has various phaseswhich used to check validation, process management, resource management, response handling etc. First layer of this process is Authentication and authorization.

4.**Authentication and Authorization:**This layer used to check user identity with cloud server. Due to various roles over cloud server cloud used third party authentication system to separate user data and access control over all the services.

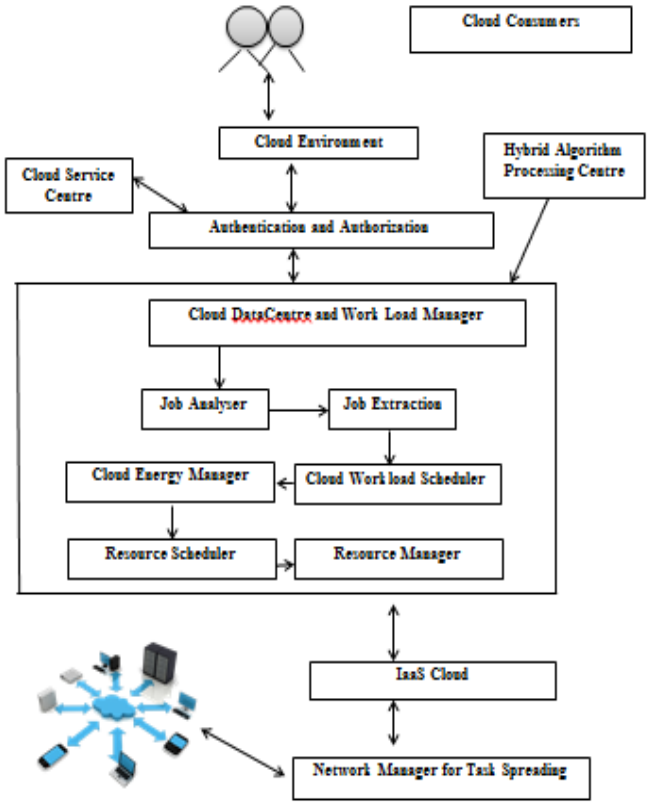

Figure no: 3 Proposed Methodology

5.**Hybrid algorithm process centre:** This process is sub-module which provides service to handle request by users and process them to provide results accordingly.

6.Cloud DataCentre and workload manager: It checks the userrequests and resource allotment for the processes. This phase responsible for queue management and result calculation according to the user queries.

7. Job analyser: Job analyser extract job from user queue and check the validation for processing. It creates server side job slots to detect and trace the jobs at the time processing at cloud network.

8.Job Extraction: Job extraction used to extract and develop the requirements for process job. It gets the requirement from metadata and binds with the execution slot and passes it for processing in the cloud network.

9.Cloud Workload scheduler: It checks the network status and conditions over a cloud server. Data flow through this provides optimized results because server uses feedback technology to manage network status.

10. Cloud energy manager: It checks actual energy consumption of the tasks for give a priority to the jobs based on their energy consumption. It reduces waiting energy over a cloud server and optimizes response time also.

11.Resource scheduler: Resource scheduler collects all the information from the network and arranges the resources according to the job requirement. It also checks availability of the network and traffic over a network for speed optimization.

12.Resource manager: Here this layer process all the requirement provide by resource scheduler. This layer processes the scheduled processes by previous step.

13.IaaS Cloud: IaaS layer record all the execution and process setup over a cloud network because here all the information process and provide to user according to their allotted slot.

14.Task Spreading: All the Jobs spreading execute here. It spread all the jobs according to previous management and processes all the results over cloud network.

15. Stop: Clear all the object which don't have reference in the memory for optimize the speed of network and generate response to user as result of their process.

7. CONCLUSION

In this paper two techniques i.e. Multilevel feedback queue scheduling Algorithm and Adaptive min-min Algorithm have been taken into consideration by replacing the already existing techniques. The system was planned with the prime focus on optimization so as to achieve accurate results.

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