International Journal of Advanced and Innovative Research (2278-7844) /

Volume 12 Issue 01

A Cloud Scheduling Algorithm using VM Aware Resource Request Utilization (VMRRU) in Cloud Computing

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ABSTRACT: ***Cloud computing and its components make use of their combine efforts to process input request to any cloud architecture. Cloud components such as virtual machine VM, Cloud Data center DC, Broker request BR and their configuration combinely configure a cloud scenario. Cloud computing component make use of request , resource and its utilization analysis to process any of the algorithm. It make usage of resource in proper optimization manner. In order to provide better quality of services and proper cloud component scheduling many algorithms were proposed. Algorithm such as round robin, throuttle, Genetic algorithm etc were proposed by the existing research work. Limitations with such algorithms are of monitoring single level of utilization. They are either concentrating on resource utilization or in energy consumption by their resources for that request process. Further the internal process does not compily with parallel process of monitoring such utilization. In this research, An Advance Algorithm named VMRRU (Virtual machine resource request utilization) is proposed. The approach also make use of utilizing monitoring of energy , resource usage count, input request requirement and matching requirement of assigning DC, VM to it. Thus an optimal request handling algorithm with parallel computation is proposed. An implementation is performed using CloudSim API cloudanalyst simulator and further computation shows the efficiency of proposed algorithm.***

Keywords: Resource Optimization, Cloud Sim, Data Sharing, Virtualization, VMERRU, Parallel Computing, Request Analysis, Cloud component scheduling.

INTRODUCTION

Cloud computing platform is away to get increases the capacity or add capabilities dynamically with zero investing in newest infrastructure, training to the new person, or licensing completely software driven , which extends IT existing work capabilities.In the previous years, cloud has grown with promising configuration setting and concept to one option from the available fast growing area of the IT [6-9]. Cloud computing platform is acombination of distributed system, utilization components and its grid structure. In Cloud environment data store & its Computation we use combination of all these three in virtualized manner. Cloud converts desktop computing into service based computing using configuration setting cluster and huge databases at data center. Discussion point from Cloud environment data store & its Computation is proposed by Google. Through the connected nodes and its communication the cloud provides users the computation power, storage space, software function and information services, etc.

TECHNOLOGIES RELATED

Here, we are going to be explained some technologies that are attached to Cloud environment data store & its Computation.

1.2.1 Web Services

Web Services have been used in a variety of applications and have become a key technology in developing business operations on the Web. Normally two applications written in different languages and executed in different operating systems are not able to communicate between them, but exists a group of protocols and standards for exchanging information between different applications, no matter in which language are written or in which operating system are running [10-12].

1.2.2 Virtualization Of Computers

Virtualization is the technology that abstracts the coupling between the hardware and the operating system. It is found that the large category of attacks is launched through malicious Virtual

Machines allocated to the cloud users [13]. In Cloud environment data store & its Computation environments, virtualization is an important technique to abstract the underlying infrastructure usable entitiess to clients [14]. It point for the abstraction of logical usable entitiess away from their underlying physical usable entitiess in order to improve agility, flexibility, reduce costs and thus enhance business value [13]. The mobile host can use cloud services and run multiple detection engine in parallel by hosting them on emulated device. The use of virtualization to run multiple detection engines increases the coverage malware detection [15]. The VM hosting the events database is backed up by another VM in the other zone to avoid a single point of failure. Each Snort configuration setting is connected to the central database and to the VM that backups the database [13], [16].

1.2.3 Cloud Storage

It‘s the virtualization of the storage of data using the net and usually by third parts. There are many companies that have huge data centers[17] that allow to others to store on them their date by using virtual configuration settings and storage pools. Cloud environment data store & its Computation gives range from storage to computing power or database infrastructure[19].So the client sees their files, which are organized among in different locations in the data center, as if they were located physically in the same place. This is very useful because enterprises need not worried about the infrastructure from its originated data center but also they pay the costing component data they are storing there. The smart phone and device usable by your employees- Bring Your Own Device (BYOD) [20].

SCHEDULING IN CLOUD

Cloud computing has recently received considerable attention, as a promising approach for delivering Info and Communication Technologies (ICT) services as a utility. In the mechanism of providing these services it is necessary to improve the utilization of datacenter resources which are operating in most dynamic workload environments. Datacenters are the essential parts of cloud computing. In a single datacenter generally hundreds and thousands of virtual servers run at any instance of time, hosting many tasks and at the same time the cloud system keeps receiving the batches of task requests. During this context, one has to notice few target servers out many powered on servers, which can fulfil a batch of incoming tasks. So Task scheduling is an valuable issue which is greatly influences the performance of cloud service provider. Traditional approach that are used in optimization are deterministic, fast, and give perfect answers but often tends to get stuck on local optima. Complexity of the task scheduling problem belongs to Non Polynomial -complete involving extremely large search space with correspondingly large number of potential solutions and takes much longer time to find the optimal answer. There is no readymade and well outlined methodology to solve the problems under such circumstances. However in cloud, it is tolerable to find near best solution, preferably in a short period of time. In this framework IT practioners are focusing on heuristic methods.

In the cloud there are numerous and distinct resources available. The cost of performing tasks in cloud depends on which resources are being used so the scheduling in a cloud environment is different from the traditional scheduling.In a cloud computing environment task scheduling is a biggest and challenging issue. Taskscheduling problem is NP-Complete problem. Many heuristic scheduling algorithms havebeen proposed, but more improvement is needed to make system faster and more responsive. The traditional scheduling algorithms like First Come First Serve (FCFS), Shortest Job First (SJF), Round Robin (RR), Min-Min, Max-Min algorithms are not much better solution to scheduling problems with cloud computing. So we need the better solution to this heuristic problem.

- Types of Scheduling

The scheduling can be distinguished as Static Scheduling and Dynamic Scheduling.

Static Scheduling: In Static Scheduling all information are known to scheduler about tasks and resources before execution. It has less runtime overhead. [3]

Dynamic Scheduling: In Dynamic Scheduling information about task components is not known before execution. Task execution time may not be known. It has more runtime overhead. [3

LITERATURE REVIEW

This section discuss about the literature survey and algorithm proposed by previous author for load sharing over multiple virtual machines. There are various data workload sharing & balancing Approach are used to manage load in Cloud Approach and its computation scenario usable components. Approachs like ACO (Ant Colony Optimization) [6], Genetic Algorithm, etc. are used to provide optimal solution for the resource allocation problems. A brief review over the Approachs which used to conduct the data workload sharing & balancing operation in Cloud Approach and its computation scenario.

The following scheduling algorithms are currently prevalent in cloud computing facilities. The main motivation of these scheduling algorithms is to reduce energy consumption within the cloud environment.

[15] proposed three algorithms that mainly focus on handling a request from the users in heterogeneous systems. The primary calculation is an advantage driven one, in which the undertakings are alloted on the best server machines dependent on a determined advantage esteem. This calculation works for heterogeneous systems. The suitable techniques for homogeneous frameworks are the power best fit calculation, which considers the machine with the least power utilization increase for booking an undertaking, and the heap adjusting approach, which depends on the power recurrence proportion of every asset. Power recurrence proportion demonstrates the figuring limit of a server.

[16] proposed DENS or server farm vitality productive system mindful planning. In this framework, the planning of assignments is performed by consolidating system mindfulness and vitality productivity. Lairs fulfills QoS prerequisites and improves work execution. This framework diminishes the quantity of registering servers and keeps away from hotspots. System mindfulness is acquired by utilizing criticism channels from the primary system switches. This strategy has less computational and memory overhead.

[17] proposed e-STAB or Energy-Efficient Scheduling for Cloud Computing Applications with traffic burden adjusting. The analysts essentially centered around vitality proficient employment booking that considers traffic burden adjusting in cloud datacenters. They additionally took a gander at the traffic prerequisites of cloud applications. e-STAB limits blockage and correspondence delays in the system.

[18] Proposed an environmentally friendly power vitality effective strategy for booking utilizing the Dynamic Voltage Frequency Scaling (DVFS) system. DFVS lessens the power utilization of foundation. Limiting the quantity of processing servers and time diminishes vitality use and improves asset usage. The servers are kept running at various blends of frequencies and voltages. This technique proficiently plans the undertakings to assets without bargaining the presentation of the framework. This strategy meets the SLA necessities and spares vitality.

[19] Proposed two online powerful asset assignment calculations for the foundation as-an administration (IaaS) cloud framework with pre-emptable undertakings. The asset streamlining component with pre-emptable errand execution can build cloud usage. These calculations improve execution circumstance where asset dispute is furious. These calculations depend on the refreshed data of the present errand executions, and they powerfully alter asset distribution.

[20] Presented the Adaptive Energy-proficient Scheduling (AES) procedure, which consolidates the Dynamic Voltage Scaling (DVS) system with the versatile assignment duplication methodology. In the principal stage, a versatile edge based undertaking duplication system is proposed, which can acquire an ideal edge. In the second stage, the gatherings are booked on DVS-empowered processors to diminish processor vitality at whatever point undertakings have slack time because of errand conditions. This calculation can adequately spare vitality while keeping up great execution.

PROBLEM DEFINITION

The following points are the major problem formulation taken for the direction usage and improvement:

1. Working with the input data usage and their storage with appropriate architecture, such that an efficient storage and accessing can be performed.
2. The existing solution does not cover up the facts to provde better and fast request granted.
3. The allocation for the resources to the particular request has been performed in order to provide fast processing with the help of the proposed algorithm along with the round robin scheduling.
4. An Advance Algorithm named VMERRU (Virtual machine energy resource request utilization) is proposed. The approach also make use of utilizing monitoring of energy , resource usage count, input request requirement and matching requirement of assigning DC, VM to it.

Thus the given limitations of the previous approaches are further taken into consideration in the research work.

PROPOSED METHODOLOGY

This paper research compares the performance of existing Round Robin and Throttle load balancing with proposed load balancing algorithm. To measure the performance of any algorithm in virtual environment some parameters like throughput, response time and waiting time are considered. These parameters can affect the executing time and waiting time of the jobs. For analysing the performance of the proposed algorithm CloudAnalyst simulation tool is used. CloudAnalyst facilitates the virtual environment to measure the performance of proposed algorithm. Configuration of CloudAnalyst

simulation tool is briefly explained in chapter 5. CloudAnalyst provide an environment where virtual machines, data centers and user base can be created virtually. Each data center in this virtual environment can have multiple virtual machines where various requests/jobs (usually called Cloudlets in CloudAnalyst tool) are executed. After execution the effective execution time and effective cost, energy utilization for proposed algorithm, Round Robin is measured. The performance of proposed load balancing is compared with existing Round robin and Throttle load balancing algorithm.

ALGORITHM FOR PROPOSED VMERRU FOR CLOUD COMPUTING

In order to provide an efficient outcome, the proposed algorithm VMRRU is proposed. The algorithm execution pseudo code, its flow diagram and execution steps is shown in the section. Thus the algorithm execution steps clarify the simulation performed by the given proposed work.

Pseudo Code VMRRU Approach

VMRRU Parallel Computing Algorithm:
Inputs : DC i-n, VM i-n, Internet Characteristic, hardware configuration Hw, Broker setting Br
Outputs: Request processing, simulation execution , result observation, result analysis.
Steps: Begin [
Initializing cloud components;
Foreach(DC, VM, Br)
{
Configuration and commutation of VMi,DCi and Bri;
}
T1=Computing time;
Execution of request processing();
Process request();
Thread1: Resource utilization storage();
Thread 2: Input request credibility();
Thread 3: Cost and time estimation();
requestProcess(Th1,Th2,Th3);
return requestProcess outcome;
T2 = finishing time;
Computing Computation time T2-T1;
Energy and Cost computation();
Return;
Exit;
]End;

The above Pseudo code shows the multiple steps functions which are participating in the communication and virtual machine selection.

EXECUTION STEPS:

There are following step wise explaining of pseudo code and algorithm computation used for the simulation purpose –

Steps of the above pseudo code:
Step 1: in this step the initialization o the variable and the internet characteristics will take place along with the Initializing cloud components.
Step 2: in this step the Configuration and commutation of VMi, DCi and Bri will held for the further use in order to achieve better results.
Step 3: in this step the initialization of the time will be taken place.
Step 4: in this step the requesting function will run ***request processing();***in order to process the request.
Step 5: in this step the multiple threads will tends to run simultaneously as to achieve the output.
Step 6: the calculating finish time for all threads will be sent to the main function.
Step 7: in this step the energy and the cost computation function will proceed to calculate the energy and the cost computation and will return the output to the main.
Step 8: EXIT;
The below are the steps which mainly contribute in the proposed algorithm and its analysis work.

Algorithm Architecture:

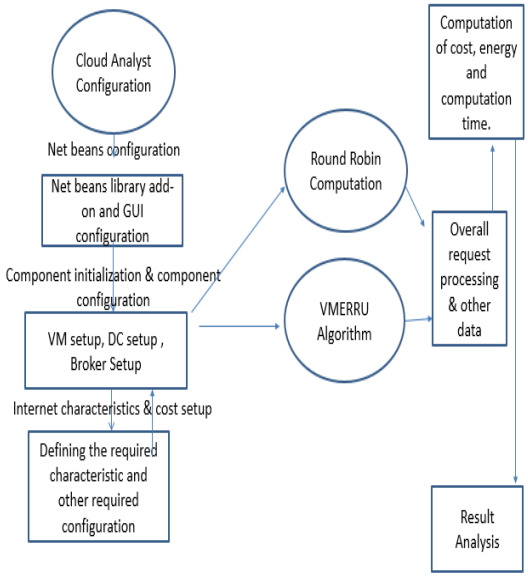

Figure 1: Algorithm Architecture Of Complete Workflow.

In the figure 1 above, An overall architecture of flow is given, the figure shows the initialization of component and finally processing it with algorithms and thus monitoring of utilization comparison parameters.

EXPERIMENTAL SETUP & RESULT ANALYSIS

In order to process the experimental setup simulation, programming language as Java is used and cloud sim api including chart api is used for experiment .As per discussion of proposed algorithm and experimental setup, there is an observation is performed using simulation analysis. Following is the proposed algorithm VMERRU and other existing solution such as Round Robin , Throttle solution is presented. The outcome observation shows the efficiency of proposed algorithm over traditional cloud load scheduling solutions.

Result Comparison Analysis

Multiple number of cloud scenario is configured and presented by the help of proposed approach and existing given algorithm:

Computation Time : It is the time difference between the finishing of algorithm execution request and initial time monitored before starting of execution.

Computation time = Finishing time – Initializing time;

Table 1: Time Comparison Among Algorithms.

TIME COMPARISON	VMRRU TIME (ms)	ROUND ROBIN TIME (ms)
Min Time	226	251
Avg Time	267	290
Max Time	301	376

Table 1 shows the comparison with different unit and comparison with previously available approach.

Computation Cost : It is the total cost which takes for each component utilization the cost counts using the utilization resources and their handle charge per request between the finishing of algorithm execution request and initial monitored before starting of execution.

Computation cost = Summation of (Cost per VM Hour , Cost per 1Mb Memory Hour , Storage cost per Gb , Data Transfer cost per Gb (both in and out));

Table 2: Cost Comparison Among Algorithms.

Cost Comparison	VMRRU Algorithm TIME (INR)	Round Robin Algorithm (INR)
Min	1.23	1.37
Avg	0.85	1.22
Max	1.90	2.60

Energy Consumption : it is the total energy consumption utilization while using VM and Data center along with internet characteristics.

Table 3: Energy Comparison Among Algorithms.

Energy Comparison	VMRRU ALGORITHM Energy Consumption (J)	ROUND ROBIN APPROACH Energy Consumption (J)
Min	2.34	3.58
Avg	2.67	2.89
Max	3.09	3.77

Table 3 shows comparison among different considered algorithms with respect to energy consumption.

Graphical Results Analysis:

- **Time Based Comparison:**

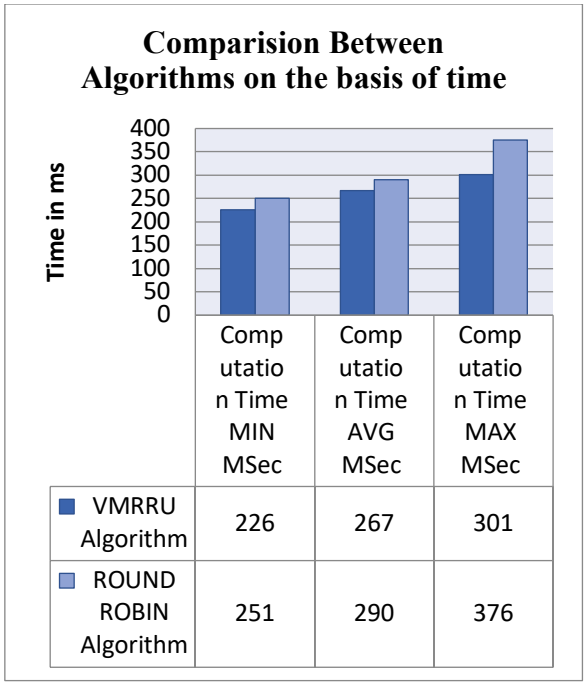

Figure 2: Comparison of algorithm VMRRU Vs Round Robin Scheduling.

In the figure 2 above, it shows the comparison of data scheduling algorithm round robin on cloud while comparing with VMRRU algorithm with parallel processing unit. The given comparison in graph shows the computation time efficiency while comparing with traditional algorithm analysis.

Cost Based Comparison:

Figure 3 shows the graph among algorithms with respect to cost.

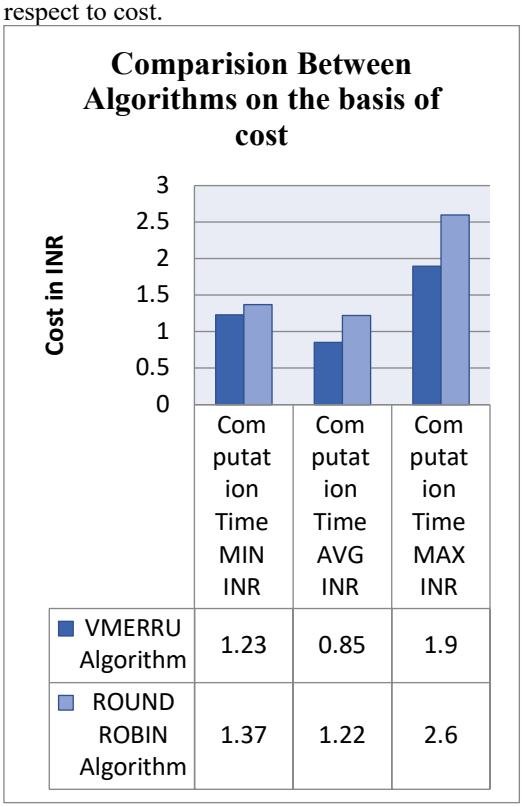

Figure 3: Comparison of algorithm VMRRU Vs Round Robin Scheduling using cost.

In the figure 3 above, it shows the comparison of data scheduling algorithm round robin on cloud while comparing with VMRRU algorithm with parallel processing unit. The given comparison in graph shows the computation cost efficiency while comparing with traditional algorithm analysis.

Thus the proposed work with parameter as computation time, computation cost and energy consumption is performed. Outcome results shows the efficiency of proposed algorithm VMRRU over the traditional scheduling approach.

CONCLUSION & FUTURE WORK

Cloud computing component create an architecture for handling input request from the users. It enable processing of input request using the combine efforts of components such as Virtual machines, Data centers and their hardware configuration. Availability of multiple components required an approach which can optimally utilize these components. This research deal with the component analysis, analysis of previously used algorithms and finding limitations with them in component monitoring. Upon finding the problem definitions, the proposed algorithm with parallel computing monitoring of multiple factors involve in request processing is executed. An Algorithm VMRRU Virtual machine resource request utilization is proposed by the given work. This algorithm make use of request analysis, its utilization estimation and then finally status of current resources, thus an better decision of redicting the request. Thus an appropriate scheduling algorithm is proposed utilization of multiple factor and processing parallel manner to them. The algorithm is implemented on Java and simulated using the Cloud sim Cloud Analyst simulator. This simulation contains configuration of all the components and applying algorithm with it. Simulated results shows the efficiency of proposed algorithm while compare with existing Round robin, throttle approach for component cloud scheduling. Results are efficient and computed with computation time, computation cost and Energy utilization.

FUTURE WORK

As per discussion of past work, proposed algorithm VMRRU with parallel processing concept is performed. The algorithm outperform well while working with simulation scenario and generates effective results for processing the input request arises with the simulator. There are further following are aspects for future work which are given in below points:

1. Cloud simulation can be deployed over the real time cloud configuration where large request and real time request can be process.
2. An utilization analysis at real time can be done with the parallel computing VMRRU Algorithm.
3. The algorithm can be extended by providing additional Map reduce algorithm and Database of NoSQL for data storage and processing at their data center for more faster process.
4. Monitoring more about the other component utilization and detail statistics is also one of the further aspect.

Thus an further improvement can again give an boost to proposed algorithm for cloud component scheduling.

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