SCHEDULING OF HETEROGENOUS CLOUD COMPUTING SYSTEMS

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Abstract: Cloud computing is quickly becoming a dominant model for end-users to access centrally managed computational resources. Through our work in extending OpenStack, we have demonstrated the feasibility of providing technical computing users with access to heterogeneous computing resources using a cloud computing model.the motive of this paper is to study and analyze the existing DSJF scheduling algorithm for cloud computing. To implement proposed Task grouping based DSJF comprises of grouping using K-means to reduce the overall processing of execution of jobs assigned to the resources. To apply load balancing to the task scheduling algorithm for cloud resources. To evaluate and compare the performance of existing DSJF with the proposed algorithm with respect to following parameters as span time, Processing Time, Processing Cost and Execution Time

Keywords: cloud computing, hetrogeneous,

Introduction

cloud computing: Cloud computing is defined as the use of various computing services from the Internet. To individual users and businesses to use software and hardware that are managed by third parties at remote locations and also and this is done by cloud computing. The cloud computing uses cloud (Internet) that will provide the way to deliver the services whenever and wherever the user of the cloud will need. computing database to overcome all the needs of their customers or users & providers.

The cloud environment has a number of heterogeneous resources hosted in data centers in different locations. These data centers contain a large number of physical machines, which contain Virtual Machines (VM). Each VM has a specific configuration of processing power, RAM, communication bandwidth and storage associated with it. So customers do not require purchasing several hardware and software [1]

Scheduling computing

Scheduling computing is the way by which work is assigned to resource for completion of work. The work may be virtual computation elements such as threads , processes or data flows, which are in turn scheduled onto hardware resources such as processors, network links or expansions cards.

Homogenous vs hetrogenous clouds homogenous cloud is one where the entire software stack, from thr hyprvisor or remote cloud provider, through various intermediate management layrs, all the way to the end user portal , is provided by one vendor. On other hand heterogeneous cloud integrates components with various vendors , either at different levels as a management tool from one vendor running a hypervisor from another or even at the same level multiple different hypervisors, all driven by the same management tool.

Job Scheduling

Job Scheduling is utilized to assign definite jobs to specific assets specifically time. In environment of

cloud computing, issue of scheduling of job is a greatest and testing issue. Subsequently the job scheduler ought to be rapid. The scheduling of job in cloud computing is principally centers to enhance the effective utilization of resource like lessening in completion time, memory and bandwidth. A productive strategy of job scheduling must intend for yielding less time of response in such a way that the execution of jobs submitted happens inside a conceivable least time and hence there would be a happening of event of in-time where reallocation of jobs is done. Subsequently, few dismissals of jobs happens and additional quantity of jobs could be put forward to the cloud by the customers which at last show expanding results in quickening the business execution of the cloud. [1]

There are distinctive categories of scheduling dependent upon distinctive norms, like static vs. Dynamic, centralized vs. Distributed, offline vs. Online etc. are defined below:

Static Scheduling The jobs which are pre scheduled, knowledge of all information is about resources which are available and a task is appointed to a resource at a time, hence it's less demanding to adjust in view of perspective of scheduler.

Dynamic Scheduling

The jobs are accessible dynamically for purpose of scheduling over certain time with the help of scheduler. It is more flexible than static scheduling, having capability of deciding run time ahead of time. It is more significant for incorporating load balance as a fundamental element for obtaining scheduler algorithm which is efficient,
accurate and stable.

Centralized Scheduling: As specified in dynamic scheduling, it's an obligation of distributed/ centralized scheduler for making a decision which is global. The fundamental advantages of centralized scheduling are monitoring and control on resources, efficiency and ease of implementation.

On another hand; such type of scheduler face shortage of efficient performance, fault tolerance and scalability. Due to this demerit it's not prescribed for the grids at large-scale.

Distributed / Decentralized Scheduling: This scheduling type is additionally sensible for real cloud in spite of its effectiveness which is weak contrasted with centralized scheduling. There is no entity which is having control which is central, so local schedulers' solicitations to oversee and keep up condition of queue of jobs.

Pre-Emptive Scheduling: This scheduling type permits interruption of every job during execution and a migration of job could be done to some another resource putting away its resource which is initially allocated to it, available for different jobs. On the off chance that limitations, for example, priority are taken into account, this scheduling type is more useful.

Non Pre-Emptive Scheduling

It is a scheduling procedure, in which there is no permission to resources to be re-allocated till the time when scheduled and running job completed its execution.

Co-operative scheduling: In this scheduling type, framework have numerous schedulers, everyone is in charge for doing some definite activity in the process of scheduling towards wide range of common system in light of the cooperation of users of current system, given rules and procedures.

Immediate / Online Mode: In this scheduling type, scheduling of any job is done by the scheduler which is arriving recently at an instant it arrives having no waiting for interval of next time on the resources accessible at that point of time.

Batch / Offline Mode: The piling up of jobs arriving as gathering of issues which are to be solved over progressive intervals of time is done by scheduler, in such as way that it is ideal for mapping a job for appropriate resources relying upon its characteristics.

Paper organisation

Section 1 includes introduction regarding cloud computing.

Section 2 include general information about cloud computing and heterogeneous clouds.

Section 3 is composed of literature review lighting on the work already done.

Section 4 includes conclusion representing proposed method and objectives.

Related work

In this paper [1], the author has described an optimized scheduling algorithm which uses K-Means Clustering Algorithm for grouping of tasks and Virtual Machines (VM). The proposed system categorizes the virtual environment based on the available applications in each machine. it has outperformed other job scheduling algorithms.

In this paper [2], author has discussed the working of the scheduling algorithms. The algorithms studied in the paper are First Come First Serve, Shortest

Job First, Opportunistic Load Balancing, and Generalized Priority Algorithm. They were put to test under the different condition and situations and were assessed dependent on parameters, for example, Cost and Make span. In light of these investigations, an intelligent tool was developed which takes in the user preferences, such as the number of jobs, their preference of time metrics and cost metrics and suggests the scheduler about the number of VMs, and the Scheduling calculation which ought to be utilized to suit the client prerequisites.

This paper[3] studies the delay-optimal virtual machine (VM) scheduling problem in cloud computing systems, which have a constant amount of infrastructure resources, such as CPU, memory, and storage in the resource pool. The cloud computing system provides VMs as services to users. Cloud users request various types of VMs randomly over time, and the requested VM-hosting durations vary vastly.

[4] The main concept of the AMS is to allocate the tasks to server nodes by comparing the SV value, MSV value, and average value of expected completion time of the server nodes between each task. Basically, the AMS algorithm can obtain better task completion time than previous works and can achieve loadbalancing in cloud computing network.

The proposed [5] algorithm also ensures that no virtual machine is overloaded and its resources are utilized to the maximum level by minimizing make span. An extensive experiment is designed and simulation is done on heterogeneous computing dataset available from open source. Results indicate the superiority of proposed approach over existing approaches.

In this paper,[6] we present a novel scheduling algorithm for a bounded number of heterogeneous computing nodes with an objective to minimize the computing cost for scheduling DAGs (Directed Acyclic Graph) on the heterogeneous cloud platform, which is called the Search and Earliest Finish Time (SEFT) algorithm. The SEFT algorithm comprises two phases: 1) search and build the set of computing nodes with the cheapest cost; 2) plan task scheduling. Furthermore, the algorithm assigns tasks by their decrease order of the rank values to the computing node that minimizes EFT (Earliest Finish Time) of tasks based on insertion policy. The experimental results show that our proposed approach can not only guarantee the service quality of the application, but also obtain the lower computing cost than the existing approaches.

In this paper,[7] we utilize the Bipartite Graph modelling to propose a new MapReduce Scheduler called the BGMRS. The BGMRS can obtain the optimal solution of the deadline-constrained scheduling problem by transforming the problem into a well-known graph problem: minimum weighted bipartite matching. The BGMRS has the following features. It considers the heterogeneous cloud computing environment, such that the computing resources of some nodes cannot meet the deadlines of some jobs.

In this paper,[8] we have proposed an improved harmony search algorithm based approach to solve task scheduling problem to minimize the total completion time measured as makespan and maximize the resource utilization of virtual machine, assuming that tasks are non-preemptive and independent. The proposed algorithm also ensures that no virtual machine is overloaded and its resources are utilized to the maximum level by minimizing make span. An extensive experiment is designed and simulation is done on heterogeneous computing dataset available from open source. Results indicate the superiority of proposed approach over existing approaches.

The focus of this paper[9] is on optimized scheduling of resources, an NP hard problem is the vital part of cloud computing. Composite applications commonly are represented as workflows. The effective solution of workflow scheduling, a crucial aspect of cloud computing has gained continuous attention and dynamic provision is considered here. In this research heuristic heterogeneous algorithm (HEFT) has been novelly optimized (MHEFT). The proposed MHEFT efficiently reduces the makespan time, by mainly focusing on the reduction of communication cost. In addition to this energy consumed for scheduling is also reduced.

This paper[10] proposes a delay-based workflow scheduling algorithm for cost optimization in the heterogeneous cloud system. The proposed scheduling heuristic works in two phases. In the first phase, the proposed heuristic introduces a new priority scheme for the tasks. The prioritized tasks are then assigned to the appropriate VMs in the next phase. The algorithm is simulated on various synthetic workflows and two benchmark scientific workflows with different range of tasks. The experimental results of the proposed algorithm supercedes the existing scheduling algorithms in terms of makespan, schedule length ratio (SLR) and cost.

CONCLUSION

The main objective of the scheduling technique is to assign users task and minimize cost and make span of the system. The multi-objective

optimization approach is used to improve the scheduling performance compared to single function

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