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Scheduling Algorithms for Allocation of Resources in Cloud Computing Environment

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ABSTRACT
Cloud computing technology facilitates computing intensive applications by providing virtualized resources which can be dynamically provisioned. Virtualization plays a significant role for managing and coordinating the access from the resource pool to multiple virtual machines on which multiple heterogeneous applications are running. The use of virtualization techniques allows exible assignment of resources to virtual machines enabling elastic, on demand resource provisioning. Various dynamic scheduling algorithms are used for allocation of virtualized resources. In this paper, compare three different scheduling algorithms such as converging algorithm, skewness algorithm and synthetic heuristic algorithm. The converging algorithm converges resource into private cloud resource pools and global resource pools and enables real time maintenance for the dynamic variation of resource to ensure continuity and reliability. Skewness algorithm is used to allocate data center resources dynamically based on application demands and optimizing the number of servers in use. The synthetic heuristic algorithm is based on genetic algorithm, for independent task scheduling in cloud computing systems.

Keywords:- Scheduling, Cloud Computing, Skewness algorithm, Virtualization, Resource provisioning, Converging

I. INTRODUCTION

Cloud computing is the use of computing resources that are delivered as a service over the internet Cloud Computing is a recent trend which arises with Internet based technology. It is a new technology raised with the intention to share the resources like software, hardware, OS etc. Cloud computing is essentially composed of a large-scale distributed and virtual machine computing infrastructure. This new paradigm delivers a large pool of virtual and dynamically scalable resources including computational power, storage, hardware platforms and applications to users via Internet technologies.
Cloud offers each organization with different model of operation. Even though it satisfies the users by providing the resources based on their demands, the unique aspects which exacerbates the cloud computing is security and privacy challenges. The security issues of cloud computing become enormous since it encompasses with many technologies including networks, databases, operating systems,

Virtualization, resource scheduling, load balancing and memory management. Therefore, security issues meant for these systems and technologies are applicable to cloud computing. Cloud computing has become a more popular with the concept of virtualization. It is the fundamental parts of cloud computing through this the services are hosted for a large number of users. It is a technology where multiple Operating Systems can run simultaneously on a single physical machine, sharing the resources of that single machine.

Cloud computing virtualization environment classified into six categories based on Scheduling-based, Load distribution-based, Energy-aware-based, Operational-based, Distribution pattern-based and Transactional-based.

In Scheduling-based Environment, the Round Robin scheduling process broadens the VMs across the pool of host resources as evenly as possible.One physical machine can host multiple virtual machines. If anyone these VMs has _nished its work and the remaining others are still working on the same physical machine.when a physical machine does not wait for the VMs to finish and goes to the retired state for a long time, then it will be forcefully migrated to the other active physical machines and will shut down after the completion of the migration process [3].

In Energy Aware-based Environment, energy-efficiency issues are considered. Watt per core policy wants to seek the host taking the minimum additional wattage per core, sinking overall power consumption. It is assumed that no additional power will be consumed during shut down or hibernating mode.The Cost per core policy is energy-aware policy and also minimizes the cost estimation by seeking the host that would capture least additional cost per core.

In Load balancing-based environment, the load-balancer has the responsibility to reduce the load overhead.The Free-CPU-Count policy wants to minimize the CPU load on the hosts.

In operational-based procedure, we explain the general movement of the virtual machines from the local sites to the remote sites in the same cloud or between the cross

clouds.Virtual Machine migration is the process of transferring a VM from one host physical machine to another host machine which is either currently running or will be running or may be booted up after placing the new VMs.

Distributed Pattern-based Environment, a virtual machine deployment pattern which helps the distribution of the virtual machines making it more e_cient in faster response time, minimizing communication latency, avoiding congestion and dynamic updation. In Transactional-based environment, deals with different architecture based virtualizations and deployment of different operating systems new applications.

II. LITERATURE SURVEY

A. Converging Algorithm for Resource Virtualization

The resource converging algorithm based on resource virtualization model (RVM) as well as maintenance algorithm of resource pool which can timely reflect the dynamic variation of private cloud and resource. The algorithm converges resources into private cloud resource pools and global resource pools and enables a real-time maintainance for the dynamic variation of resource to ensure the continity and reliability of resources.

The model must reect the features of cloud computing environment as well as its inherent mechanism. Cloud computing taking advantage of processing ability of grid distributed computing along with other highly-sophisticated technologies like sever virtualization technology and storage virtualization technology converges all sorts of resource into a resource pool to facilitate a real-time supervision and allocation of resource for users. All cloud computing resource which can be considered as a massive virtualized resource pool with a great power are transparent to users. The resource may be deployed in any place but can be gathered together to serve for the users through the technology of resource converging and virtualization. The resource in the management model of cloud computer is in support of task migration to maintain the load equilibrium. The logical relationship in the resource converging and organization of cloud computing can be demonstrated which makes possible the establishment of a Resource Virtualization Model based on cloud computing (RVM).

Resource converging in cloud computing environment is in demand of gathering up resource to set up a virtualization categorized resource pool for the purpose of a unified deployment and application of resource. In this algorithm, resource pools for each private cloud which can be further converged into the global pool of the cloud computing system. After a good search for each private cloud, resource converging algorithm directly converges each resource pool of private cloud into a larger categorized resource pool which are further combined into global pool for the purpose of a unified allocation and virtualization.

Since the random resource of global pool are represented by resource edges which record the resource type, resource quantity, private cloud to which the resource belongs and the corresponding nodes, global pool can give a clear description of orderly-organized structure of resource in the overall cloud computing system thus makes it possible to provide users with a transparent and virtualized resource service with ease and convenience [2].

The dynamic changes exists normally in cloud computing environment where private cloud and global pool obviously need timely updating in accordance with these dynamic changes in order to maintain the reliability and availability of resource pool, which is of great importance. The dynamic updating of the global resource can be done by means of periodic polling, namely by setting up the modi_able periodic time Tglobal. Every other period of global, an inquiry signal will be sent to each private cloud pool for the knowledge that whether some updating has happened to each private cloud. If some updating has occurred to private cloud, the message of updating will be sent back to global resource pool for the sake of modifying corresponding resource. It is the same case with private cloud pool which can adopt a similar way by setting up a modifiable periodic time, during which period of time an inquiry signal should be sent to each node for the information of updated resource. When the resource updates, send this particular message to private cloud resource pool for the sake of an overall modification.

B. Synthetic Heuristic Algorithm

Synthetic heuristic algorithm is de_ned by some goal oriented operations such as, making an optimize initial population, dual step evaluation, and also, running the tasks by a special ordering considering resource load balancing and quality of service, achieves the optimize makespan. It also decreases the probability of task failure rate on running, based on the resource failure frequency rate, and also decreases the task starvation problem. It supports the scheduling for new entered tasks in system by a dynamic method.

The virtualization is one of main techniques to improve the utilization of physical resources in cloud environments. It allows abstraction and isolation of underlying physical resource and reduces the number of hardware equipment. These virtualization techniques include network virtualization

and allow the operator to create several Virtual Machines (VMs) on a single physical server. In order to efficiently utilize the virtualized resources to execute computing intensive application, the effective metajob scheduling algorithms are needed. The traditional job scheduling problem schedule metajob of applications across computation resources in order to reduce the jobs completed time while ignoring the specific shared nature of the network resource. In a super computer data center, the scheduling problem is enhanced by scheduling a set of applications from different users to the set of computation resources while maximizing system utilization.

In cloud computing, the objective of job scheduling algorithm is to achieve high system throughput, improve the load balance and minimizing the meta-job total processing time while matching the meta-job requirements with available virtualized resources. Job scheduling is a general problem of mapping a set of jobs to a set of VMs to fulfill the user's requests within cloud environment. The objective of job scheduling is to achieve high system throughput and minimizing the meta-job total processing time while matching the meta-job requirements with available virtualized resources.

In synthetic heuristic method, it tries to obtain an optimal tasks mapping on resources by minimizing completion time of tasks or, completion time of the last task (makespan). Furthermore, it decreases the task failure rate on running based on the resource failure frequency rate, and also increases the quality of responding using a special task ordering to run and to decrease the task starvation rate by proper parameters in it.

The features in this approach are:
(1) Tasks are entered in system, each time.
(2) All tasks are independent.
(3) Each resource can process more than one request.

In the cloud computing environment, there are data-center system that is assumed to collect and save the information. The collectors in data-center in the each work-node are responsible for collecting the static and dynamic information of resources and tasks. Some key static information such as: physical memory storage space, virtual memory storage space, disk storage space, and etc are collected, and some dynamic information such as: the load average of the node itself, the number of the running tasks, the current running tasks number of threads, and the status of these tasks, CPU usage and etc, are captured periodically or based on the polling strategy or others, and are sent to the Data Receiver of the master node through the communication component. These data are updated frequently, and in real-time form.

Sorting the tasks using workload ascending (like the _rst step in Min-Min), and making a virtual list from available resources with updated characteristic (by data-center), the algorithm (SHIS) starts. Then the SHIS scheduling algorithm

Uses the GA method. It makes a goal oriented initial population using combining the MMC and Round-Robin algorithm, and some good tests, according to description. Also it performs the cycle crossover and targeting mutation. Finally, after the best solution (candidate resources) is obtained by GA, the algorithm, sorts the tasks by special ordering using efficient parameters in descending to run, and the tasks are dispatched on candidate resources [4].

C. Skweness Resource Allocation Algorithm

Cloud computing allows business customers to scale up and down their resource usage based on needs. Many of the touted gains in the cloud model come from resource multiplexing through virtualization technology.The concept of skewness to measure the unevenness in the multidimensional resource utilization of a server. By minimizing skewness, we can combine different types of workloads nicely and improve the overall utilization of server resources.

We aim to achieve two goals in our algorithm:

- Overload avoidance: the capacity of a PM should be sufficient to satisfy the resource needs of all VMs running on it. Otherwise, the PM is overloaded and can lead to degraded performance of its VMs.

- Green computing: the number of PMs used should be minimized as long as they can still satisfy the needs of all VMs. Idle PMs can be turned off to save energy.

The concept of skewness to quantify the unevenness in the utilization of multiple resources on a server. The skewness algorithm consists of three parts: load prediction, hot spot mitigation, and green computing.

Load prediction based on the past external behaviors of VMs. The prediction algorithm plays an important role in improving the stability and performance of our resource allocation decisions.

The hot spot solver in VM Scheduler detects if the resource utilization of any PM is above the hot threshold (i.e., a hot spot). If so, some VMs running on them will be migrated away to reduce their load. The cold spot solver checks if the average utilization of actively used PMs (APMs) is below the green computing threshold. If so, some of those PMs could potentially be turned off to save energy. It identifies the set of PMs whose utilization is below the cold threshold (i.e. cold spots) and then attempts to migrate away all their VMs. Sort the list of hot spots in the system in descending temperature. Our goal is to eliminate all hot spots if possible. Otherwise, keep their temperature as low as possible. For each server, first decide which of its VMs should be migrated away. We

sort its list of VMs based on the resulting temperature of the server if that VM is migrated away.

We aim to migrate away the VM that can reduce the server's temperature the most. In case of ties, we select the VM whose removal can reduce the skewness of the server the most. For each VM in the list, we see if we can find a destination server to accommodate it. The server must not become a hot spot after accepting this VM. Among all such servers, we select one whose skewness can be reduced the most by accepting this VM. Note that this reduction can be negative which means we select the server whose skewness increases the least. If a destination server is found, record the migration of the VM to that server and update the predicted load of related servers. Otherwise, we move on to the next VM in the list and try to find a destination server for it. As long as we can find a destination server for any of its VMs, we consider this run of the algorithm a success and then move on to the next hot spot. Each run of the algorithm migrates away at most one VM from the overloaded server.

Our green computing algorithm is invoked when the average utilizations of all resources on active servers are below the green computing threshold. We sort the list of cold spots in the system based on the ascending order of their memory size. Since we need to migrate away all its VMs before we can shut down an under-utilized server, we define the memory size of a cold spot as the aggregate memory size of all VMs running on it. Recall that our model assumes all VMs connect to a shared back-end storage. Hence, the cost of a VM live migration is determined mostly by its memory footprint. The complementary file explains why the memory is a good measure in depth.

III. PERFOMANCE ANALYSIS

The SHIS proposed algorithm, gains an optimal solution using genetic algorithm by decreasing the task failure rate on running based on the resource failure frequency rate, and also increases the quality of responding using a special task ordering to run and to decrease the task starvation rate by proper parameters in it and optimizes the completion time of tasks.The goal of the skewness algorithm is to mix workloads with different resource requirements together so that the overall utilization of server capacity is improved.In Resource converging algorithm , there is an increase in the data quantity, algorithm only increase its computing volume a bit without enlarging the search for private cloud or nodes, consequently the increase of time perfomance is relatively low.

TABLE I
ADVANTAGE AND DISADVANTAGE

Method	Advantage	Disadvantage
Resource converging Algorithm	good performance	less efficient
Synthetic Heuristic Algorithm	optimize task completion time	not useful in increase in population
Skewness Algorithm	good stability	computationally Expensive

IV. CONCLUSIONS

The Synthetic heuristic algorithm compared with others, decreases the running time of tasks.in various iteration of generations, the produced makespan using SHIS are more uniform and reliable than others, and this issue demonstrates reliability of produced solution by SHIS. The design and implementation of an automated resource management using skewness algorithm that achieves a good balance between the two goals. In the future of skewness algorithm, we plan to explore using AI or control theoretic approach to find near optimal values automatically.Resource converging algorithm can converge different kinds of resource with relatively good time performance in a reliable way. Resource distribution affects Resource converging algorithm a lot though it has no Influence on the correctness of algorithm execute.

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