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A Systematic Review of Different Task Scheduling Algorithms in Cloud Computing

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Abstract: Cloud computing is an internet based Technology in which application, data, and Information services are provided over the internet. Cloud Computing is useful to share data and offer services transparently among its various users. As the number of users increases in cloud the task to be schedule also increase. The performance of the cloud depends on the scheduling algorithm use in task scheduling. One of the fundamental issues in this environment is related to task scheduling. Task scheduling in cloud computing is NP-Hard optimizations problem and number of different proposed algorithm are applied to solve the task allocation and scheduling. Here in this paper, a systematic review of various task allocation and scheduling techniques are presented. These algorithms have different view and working principles. This study concludes that all the existing techniques mainly focus on reducing makespan, service response time and improving performance etc. There are many parameters can be observed as factor of scheduling problem to be debated such as makespan, virtual machine allocation, load balancing, throughput, reliability, resource cost, service utilization and so forth.

Keywords: Cloud Computing, Task scheduling, Allocation, Makespan, Load balancing

I. INTRODUCTION

Cloud computing has been established in recent years as an important area of research. This reality has been strengthen because, currently, tasks such as obtainment, manipulation, sharing, and development of large amount of data are common and require many computation resource, therefore cloud are common and require large computational resources, thus cloud computing can contribute because it can provide this resource indefinitely, including storage, processing, memory and others, all them for immediate use. NIST defines cloud computing as " a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."[1]

Cloud computing is the combination of the several concepts from resource pooling, virtualization, dynamic provisioning, utility computing, on-demand deployment, Internet delivery of services, to enable a more flexible approach to deploying and scaling applications. There are mainly three services provided by cloud computing, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), cloud services have attributes associated with cloud computing, such as a pay-per-use model, self-service usage, flexible scaling, and shared underlying IT resources.[1]

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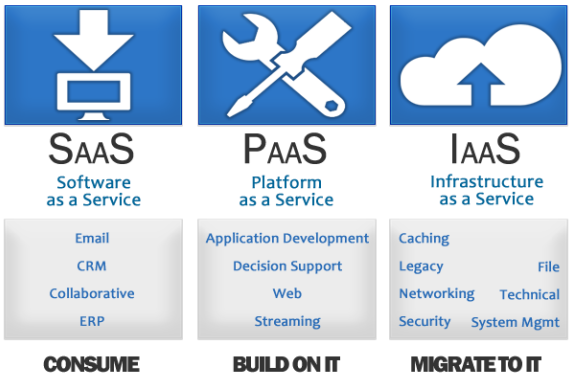

Fig 1: Cloud Computing Services

Fig 1, IaaS (Infrastructure as a Service) is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components. The service provider owns the equipment and is responsible for housing, running and maintaining it. The client typically pays on a per-use basis. PaaS (Platform as a Service) is a way to rent hardware, operating systems, storage and network capacity over the Internet. The service delivery model allows the customer to rent virtualized servers and associated services for running existing applications or developing and testing new ones. SaaS (Software as a Service) is a software delivery method that provides access to software and its functions remotely as a Web-based service. Software as a Service allows organizations to access business functionality at a cost typically less than paying for licensed applications since SaaS pricing is based on a monthly fee. Also, because the application software is hosted remotely, users don't need to commit in additional hardware.

Cloud services can be deployed in different ways depending on the organizational structure and the provisioning location. Four deployment models are discovered, namely as follows: Public cloud, Private cloud, Community cloud, Hybrid cloud. Public cloud is available freely for access based on the standard and the service providers makes resources such as application and storage, available to public over the internet. Private cloud allows the usage of services by a single client on a private network. Private cloud is also used by the organization, which provides IT services to its client and the data of organization are highly important. Community cloud provides a number of benefits, such as security and privacy. This model, which is quite expensive, is used when the organizations have common goals and requirements are ready to share the benefits of the cloud service. Hybrid cloud consists of multiple service providers and basically a combination of public cloud and private cloud. When a company has requirements of both public cloud and private cloud, the hybrid cloud is used.

II. GUIDELINE FOR TASK SCHEDULING

As the number of users in cloud computing increases, the task to be schedule also increases, so the performance of the cloud computing depends on the scheduling algorithm used to schedule the task. Therefore better algorithms are used to schedule the task in cloud computing. Task Scheduling algorithms in cloud computing aim at minimizing the makespan of tasks with minimum resources efficiently. Cloud computing is to utilize the computing resources (service nodes) on the network to facilitate the execution of complicated tasks that require large-scale computation. Thus, the nodes selection for executing a task in the cloud computing must be considered. Every application is completely different in nature and independent where some require more CPU time to compute complex task, and some others tasks may need more memory to store data. Different scheduling algorithms can be used depending on the type of the task to be scheduled. The scheduling algorithms

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can utilize better executing efficiency and maintain the load balancing of system. The efficiency of the cloud depends on the algorithms used for task scheduling. [2]

III. VARIOUS TASK SCHEDULING TECHNIQUES IN CLOUD

Following task scheduling techniques are currently prevalent in clouds

A. Cloud Task Scheduling Based on Ant Colony Optimization [3]

The main idea of Ant Colony Optimization is to stimulate the foraging behavior of ant colony. When groups of ants try to find the food, they use special kinds of chemical to communicate with one another. This chemical is known as pheromone. When ant tries to search the food arbitrarily, once the ants find the path to the food source, they leave pheromone on the path, so the other ants follow the track by sensing the pheromone and get the food source. The same concept is applied to task allocation, when the task arrived to the VM, the intensity of the VM increasing so more and more task are arrived to this VM.

B. Cloud task scheduling based on load balancing Ant Colony optimization [4]

Like other evolutionary algorithm, Ant colony optimization is a random search algorithm and it copies the behavior of the real ant colony to search for food and to connect to each other by using pheromone placed on the traveled paths. This paper represents the proposed Load balancing Ant Colony Optimization algorithm (LBACO) for optimal resource allocation for every task in cloud system. This algorithm is not only for minimizing the makespan of the task set but also adjust the dynamic cloud computing system and balance the entire system load.

C. BAR: An efficient data locality driven task scheduling algorithm for cloud computing[5]

In the recent year, large scale data processing is increasingly in cloud computing system. In these types of systems, files are split into many small blocks and all blocks are replicated over many servers. To process this file efficiently, the given job is divided into many tasks and each task is allocated to server to deals with a file blocks. Here, network bandwidth is a resource in this system, enhancing task data locality is essential for the job completion time. Even though there have been many approaches on improving data locality, most of them either greedy or suffer from high computation complexity. To address this problem, we proposed a task scheduling algorithm called Balance-Reduce (BAR). In this algorithm, an initial task allocation will be produced at first, and then the job completion time can be reduced gradually by tuning the initial task allocation. BAR can adjust data locality dynamically according to network state and cluster work load.

D. An Agent-Based Emergent Task Allocation Algorithm in Clouds [6]

Scheduling algorithm plays a significant role in Cloud computing. Many scholars have come up with different strategies to allocate tasks, but few paid attention to agent based technologies, which shows great advantages in dealing with problems in distributed systems. This work adopts agent based approaches to accomplish allocation of emergent tasks in Clouds. Agent based technology is derived from distributed artificial intelligence (DAI) [6], A multiagent system consists of multiple agents that interact with each other to accomplish the goal of the system. Communication technologies between agents are of great importance, and communication rules are to be introduced by users, which makes agent-based technology flexible enough to meet totally different requirements. To reference this issue, we put forward a novel agent-based allocation algorithm (ABAA for short). The algorithm employed the reasonable competition principle of a roulette to accomplish load balancing, and adopted the dynamic principle of a buffer pool to accommodate the diversification of task arrival.

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E. PACO: A Period ACO_based Scheduling Algorithm in Cloud Computing [7]

The core technology of cloud computing is task scheduling. Task Scheduling problem in cloud computing is NP-hard problem and it is difficult to attain an optimal solution because of complexity of cloud resources. For this reason, we can use intelligent optimization algorithm to guess the optimal solution i.e. an ant colony optimization algorithm (ACO). When a task is assigned to a resource, the pheromone intensity of the selected resource is increased, so the more tasks will select the resource and lead to imbalance the load. If there are too many tasks to assign, the total tasks size assigned to each resource will be increased, which will reduced the performance of the in makespan and load balance. An improved Ant Colony Optimization (ACO) is referred to as period ACO_based scheduling Algorithm (PACO), which improves the update of the pheromone intensity and the scheduling period strategy. In PACO, whenever a task is assigned to a resource, the pheromone intensity of that resource will be reduced. For this reason there will be lower chance that other tasks select that resource and promote the load balance. If all the resource's pheromone intensity reduced to the minimum value, all the task that are not assigned will select the resource which has the largest natural pheromone intensity, this will lead to load balance and increase the execution time.

F. Improved cost-based algorithm for task scheduling in cloud computing. [8]

The cost of task in cloud resources is different with one another, scheduling of user task is not same as in traditional scheduling method in cloud. The goal of this paper is to schedule the task groups in cloud computing platform, where resources have different costs and computation performance. The proposed scheduling approach in cloud employs an improved cost-based scheduling algorithm for making effective mapping of task to available resources in cloud computing. This scheduling algorithm measures the cost of resource as well as the computation performance. By grouping the tasks according to a particular cloud resource's processing capability, the algorithm also improve the computation/communication ratio and sends the grouped jobs to the resources. Activity-based costing is a way of measuring the cost of the resources as well as the computation performance. Each application will run on virtual machine in cloud computing, where the resources will be distributed virtually. This application is completely different and independent and there is no link between each other, for example, some application requires more CPU time to compute complex task, and some other application may require more CPU time to store the data. In order to measure direct costs of single use of resources (such as memory cost, CPU cost, I/O cost etc.) must be measured. When the direct data of each individual resources cost has been measured, and more precise cost and profit analysis based in it.

VI. CONCLUSION

Task scheduling is one of the major issues in cloud computing environment. Many meta-heuristic algorithms are applied to solve these issues. In this paper, I have surveyed the various existing task scheduling algorithms. The efficiency of the cloud computing system depends on the algorithm used during the scheduling task. ACO achieve the good result to scheduling the task but load balancing factor not considered. LBACO results well with different tasks and have the capacity to balance the load of the entire system. BAR schedules tasks by taking a global view and adjusts data locality dynamically according to state of the network and cluster workload. ABAA employs a contract net protocol for bidirectional announcement mechanism, and the roulette wheel mechanism for completeness and load balancing. The adjustability of the algorithm is adopted by the buffer pool mechanism. The active based costing is used where the resources have different costs and computation performance. This scheduling algorithm measures the resource cost and computation performance. PACO can acquire a better performance in cloud computing task scheduling. This algorithm proposed the update strategy of the pheromone intensity and improves the period strategy. Improved cost based algorithm measures both the cost of resources and the computation performance.

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REFERENCES

[1] Huaglory Tianfield, "Cloud Computing Architectures", School of Engineering and Built Environment, Glasgow Caledonian University Cowcaddens Road, Glasgow G4 0BA, United Kingdom ©2011 IEEE

[2] Vijayalakshmi A. Lepakshi, Dr. Prashanth C S R, "A Study on Task Scheduling Algorithms in Cloud Computing" International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 11, May 2013

[3] Medhat A. Tawfeek, Ashraf El-Sisi, Arabi E. keshk,Fawzy A. Torkey, "Cloud Task scheduling Based on Ant Colony Optimization", ©2013 IEEE

[4] Kun Li, Gaochao Xu, Guangyu Zhao, Yushuang Dong, Dan Wang, "Cloud task scheduling based on load balancing Ant Colony optimization." College of Computer Science and Technology Jilin University ChangChun, China" © 2011 IEEE

[5] Jiahui Jin, Junzhou Luo, Aibo Song, Fang Dong and Runqun Xiong, "BAR: An Efficient Data Locality Driven Task Scheduling Algorithm for Cloud Computing", School of Computer Science and Engineering, Southeast University, Nanjing, P.R. China. © 2011 IEEE

[6] Chao Chen, Xiaomin Zhu, Weidong Bao, Lidong Chen, Kwang Mong Sim "An Agent-Based Emergent Task Allocation Algorithm in Clouds", © 2013 IEEE

[7] Weifeng Sun,Ning Zhang, Haotian Wang, Wenjuan Yin, Tie Qiu, "PACO: A Period ACO_based Scheduling Algorithm in Cloud Computing", School of Software Technology Dalian University of Technology Dalian, China, © 2013 IEEE

[8] Mrs.S.Selvarani, Dr.G.Sudha Sadhasivam. "IMPROVED COST-BASED ALGORITHM FOR TASK SCHEDULING IN CLOUD COMPUTING", Coimbatore, India, ©2010 IEEE

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