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A Literature Survey in Cloud Access Control Using Novel Optimization Algorithm

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ABSTRACT: Cloud computing is a recent and modern technique of computing in which dynamically scalable and other virtualized resources are provided as a service over the Internet. The energy consumption and make span associated with the resources allocated should be taken into account. This paper proposes an improved optimization algorithm based on time cost and energy consumption models in cloud computing environment. We have analyzed the performance of our approach and investigational results show that our approach has immense potential as it offers significant improvement in the aspects of response time and makespan, demonstrates high potential for the improvement in energy efficiency of the data center, and can effectively meet the service level agreement requested by the users. This paper describes the cloud service architecture and key technologies for optimization algorithm. Cloud computing is a hot topic on software and distributed computing based on Internet, which means users can access storages and applications from remote servers by web browsers or other fixed or mobile terminals. Because the constrained resources of fixed or mobile terminals, cloud computing will provide terminals with powerful complementation resources to acquire complicated services. The paper discusses the cloud service architecture, access control and optimization algorithms about service selection with adaptive performances and minimum cost. The cloud service architecture is reasonable and the proposed optimization algorithms are available, scalable, and adaptive to different types of environments of services and clients.

KEYWORDS: Cloud computing, Dynamic voltage and frequency scaling, Resource allocation, Service level agreement, Clonal selection algorithms, Optimization algorithm.

I. INTRODUCTION

Cloud computing is a hot topic of the computer field as an emerging new computing model. It is a style of computing in which dynamically scalable and other virtualized resources are provided as a service over the Internet. It is the traditional computer and network technology including distributed computing, parallel computing, utility computing, network storage technologies, virtualization, load balance, etc. combined with other products. Cloud computing is a model for enabling ubiquitous, on-demand network access to a shared pool of configurable computing resources by setting up basic hardware and software infrastructures in a data center. The main objective of cloud computing is to design a high-performance, low-power computing infrastructure while meeting an energy-efficient and safe service mode. Resource allocation is the key technology of cloud computing, which utilizes the computing resources in the network to facilitate the execution of complicated tasks that require large-scale computation. Resource allocation needs to consider many factors, such as load balancing, makespan, and energy consumption. Selecting favorable resource nodes to execute a task in cloud computing must be considered, and they have to be properly selected according to the properties of the task. In particular, cloud resources need to be allocated not only to satisfy quality of service (QoS) requirements specified by users via service level agreements (SLAs) but also to reduce energy consumption.

With the rapid development of cloud computing and network communication technology, many computing service providers including Google, Microsoft, Yahoo, and IBM are rapidly deploying data centers in various locations around the world to deliver cloud computing services. However, data centers hosting cloud applications consume huge amounts of electrical energy, contributing to high operational costs and carbon footprints in the environment. Therefore, we need cloud computing solutions that can not only minimize operational costs but also reduce the

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environmental impact. There is also increasing pressure from governments worldwide aimed at the reduction of carbon footprints, which have a significant impact on climate change. Lowering the energy usage of data centers is a challenging and complex issue because computing applications and data are growing so quickly that increasingly larger servers and disks are needed to process them fast enough within the required time period.

In the business application process of cloud computing, the energy consumption and makespan associated with the resources allocated should be taken into account. Therefore, resource allocation should be carefully coordinated and optimized jointly in order to achieve an energy-efficient schedule. The main objective of this work is to develop an energy-efficient resource allocation algorithm for virtualized data centers so that cloud computing can be more sustainable. cloud computing not only achieves the efficient processing and utilization of a computing infrastructure but also reduces energy consumption. An efficient resource allocation algorithm allocates resources to tasks in a way that improves energy efficiency of the data center while taking into account minimization of makespan.

II. RELATED WORKS

A parallel-machine scheduling involving both task processing and resource allocation was studied by using an improved differential evolution algorithm (IDEA). The proposed IDEA combines the Taguchi method and a differential evolution algorithm (DEA). Beloglazov et al. defined an architectural framework and principles for energy-efficient cloud computing. Based on this architecture, the paper presented our vision, open research challenges, and resource provisioning and allocation algorithms for an energy-efficient management of cloud computing environments. The proposed energy-aware allocation heuristics provision data center resources to client applications in a way that improves energy efficiency of the data center. Kessaci et al. presented an energy-aware multi-start local search algorithm (EMLS) that optimizes the energy consumption of an OpenNebula-based cloud.

The key idea is to find a trade-off between reducing the energy consumption and preserving the performance of resource nodes. A traditional data center has many distinguished features including heterogeneous hardware, heterogeneous workload, focus on average load rate, and consumption of time and human effort for administrative tasks. Quan et al. proposed a way of saving energy in traditional data centers considering all the above features. The basic idea was rearranging the allocation in such a way that energy is saved with suitable human effort.

Quarati et al. presented a cloud brokering algorithm delivering services with different levels of non-functional requirements, to private or public resources, on the basis of different scheduling criteria. With the objective of maximizing user satisfaction and broker's revenues, the algorithm pursues profit increases by reducing energy costs through the adoption of energy-saving mechanisms. Kołodziej et al. defined independent batch scheduling in computational grid as a three-objective global optimization problem with makespan, flow time, and energy consumption as the main scheduling criteria minimized according to different security constraints.. The effectiveness of these algorithms has been empirically justified in two different grid architectural scenarios in static and dynamic modes.

III. RESOURCE ALLOCATION OPTIMIZATION MODELS

To generalize the discussion, the assumption is that there is a set of tasks and each task has many subtasks with precedence constraints. Each subtask is allowed to be processed on any given available resource. A cloud resource has a given level of capacity (e.g., CPU, memory, network, storage). A subtask is processed on one resource at a time, and the given resources are available continuously. In the process of resource allocation in a cloud computing environment, the application of ICSA to the general process is as follows:
Inputs: Let $R = (R_1, R_2, \ldots, R_j, \ldots, R_m)$ be the set of m available resources which should process n independent tasks denoted by the set $T = (T_1, T_2, \ldots, T_i, \ldots, T_n)$, $i = 1, 2, \ldots, n$, $j = 1, 2, \ldots, m$.
All the resources are unrelated and parallel, and each task T_i can be executed on any subset $R_j \in R$ of available resources.
Outputs: The output is an effective and efficient resource allocation scheme, including scheduling tasks to appropriate resources and makespan.

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Constraints: The execution time of each task on a resource depends on the actual situation, and the value cannot be fixed in advance. Each task must be completed without interruption once started, and resources cannot perform more than one subtask at a time.

Objectives: The main objective is to improve energy efficiency of the data center and minimize makespan so as to achieve an energy-efficient schedule.

Since many real-world design or decision making problems involve simultaneous optimization of multiple objectives, we designed a resource allocation optimization model that will fully integrate the two factors of energy-efficient optimization and makespan optimization.

IV.CLASSIFICATION OPTIMIZATION ALGORITHM

1. Energy Efficient Optimization: We propose the energy-efficient optimization model based on the dynamic voltage and frequency scaling (DVFS) that the capacitive power of a given resource node depends on the voltage supply and resource frequency. Dynamic power consumption is done by the node capacitance caused by charging and discharging; its basic expressions can be defined as follows:

$P = \gamma \times v 2 \times f$ (1)

where $\gamma = A \times C$, A is the flip frequency that denotes the number of switches per clock cycle, C is the load capacitance, v is the supply voltage, and f is the frequency of the resource node.

2. Makespan Optimization: The makespan is the overall task completion time, which is the time difference between the start and end of a sequence of tasks on a resource. Cloud computing deals with assigning computational tasks on a dynamic resource pool according to different requirements from a user request. The proposed makespan is the time that comprises overall task completion on resources including receiving, processing, and waiting time. We denote the completion time of task T_i on resource R_j as C_{ij}. The main purpose is to reduce the makespan that can be denoted as Ms. Then, the Ms can be defined as follows:

$Ms = \max \{ C ij \mid T i \in T , i = 1 , 2 , \dots , n , \text{and } R j \in R , j = 1 , 2 , \dots , m \}$ (5)

The proposed algorithm chooses the resources based on the least makespan.

3. Multi-objective optimization model: we combine energy-efficient optimization and makespan optimization and propose a multi-objective optimization model for resource allocation in green cloud computing.

$E i = \gamma \times f \times \{ \sum j \in T i , k \in L j \{ v k i j 2 \times CT i , j \} + v \min i \times f \min i \times Idle i + \lambda \} Ms = \max C ij \mid T i \in T , i = 1 , 2 , \dots , n , R j \in R , j = 1 , 2 , \dots , m \min E i \min Ms$

IV. CONCLUSIONS

Cloud computing, a pool of virtualized computer resources, is an innovative perception. cloud computing is the future development trend and main research object. Reducing energy consumption is an increasingly important issue in cloud computing, more specifically when dealing with a large-scale cloud. In this paper, we propose an improved clonal selection algorithm based on time cost and energy consumption models in cloud computing environment. The experimental results show that our approach has immense potential as it offers significant improvement in average execution time, demonstrates high potential in improving energy efficiency of the data center, and can effectively meet the service level agreement requested by the users. In the future, we will improve the proposed algorithm by considering other operators and computational complexity to make further works more practical in green cloud computing.

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