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Energy Aware Job Scheduling in Cloud for EFFD

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ABSTRACT: Cloud computing infrastructures are designed to support the accessibility and deployment of various services oriented applications by the users. Cloud computing services are made available through the server firms or data centers. To meet the growing demand for computations and large volume of data, the cloud computing environments provides high performance servers and high speed mass storage devices. These resources are the major source of the power consumption in data centers along with air conditioning and cooling equipment. Moreover the energy consumption in the cloud is proportional to the resource utilization and data centers are almost the world's highest consumers of electricity.

I. INTRODUCTION

Due to the high energy consumption by data centers, it requires efficient technology to design green data center. On the other hand, Cloud data center can reduce the the total energy consumed through task consolidation and server consolidation using the virtualization by workloads can share the same server and unused servers can be switched off. The total computing power of the Cloud data center is the sum of the computing power of the individual physical machine. Clouds uses virtualization technology in data centers to allocate resources for the services as per need. Clouds gives three levels of access to the customers: SaaS, PaaS, and IaaS. The task originated by the customer can differ greatly from customer to the customer. Entities in the Cloud are autonomous and self-interested; however, they are willing to share their resources and services to achieve their individual and collective goals. In such an open environment, the scheduling decision is a challenge given the decentralized nature of the environment.

Each entity has specific requirements and objectives that need to achieve. Server consolidation are allowing the multiple servers running on a single physical server simultaneously to minimize the energy consumed in a data center. Running the multiple servers on a single physical server are realized through virtual machine concept. The task consolidation also know as server/workload consolidation problem. Task consolidation problem addressed in this thesis is to assign n task to a set of r resources in cloud computing environment. This energy efficient resource allocation maintains the utilization of all computing resources and distributes virtual machines in a way that the energy consumption can minimize. The goal of these algorithms is to maintain availability to compute nodes while reducing the total energy consumed by the cloud infrastructure.

Resource Allocation

Cloud computing resources are managed through the centralized resource manager. The centralized resource manager assigned the tasks to the required VMs. The resources of cloud data center are available to the users/applications through Virtual Machines (VMs). Virtual Machines are used to meet the resource requirement and run time support for the applications. In particular executing an application for required resource can be made available through two steps: creating an instance of the virtual machine as required by the application (VMs provisioning) and scheduling the request to the physical resources otherwise known as resource provisioning.

The VM here is to describe the operating system concept: a software abstraction with the looks of a computer system's hardware (real machine). A virtual machine is sufficiently similar to the underlying physical machine running existing software unmodified. The VM technology has become popular in recent years in data centers and cloud

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computing environments because it has a number of benefits including server consolidation, live migration, and security isolation.

Cloud computing is based on the concept of virtualization that encapsulates various services that can meet the user requirement in a cloud computing environment. Virtual machines (VMs) are designed to run on a server to provide a multiple OS environment with the support of various applications. One or more VM(s) can be placed or deployed on a physical machine that meet the requirement for the VM. The task can be scheduled dynamic load balancing between the host in cloud computing environments are achieved using visualization technology.

Task consolidation is a method to maximize utilization of cloud computing resources. Maximizing resource utilization improves the various benefits such as the rationalization of QoS, IT service customization, maintenance, and reliable services, etc. Improvements in physical host's hardware, such as solid state drives, low power CPUs, and energy efficient computer monitors can helped to reduce the energy consumption issue to a certain degree. There have been a considerable amount of research conducted using resource allocation and software approaches, such as scheduling and server consolidation and task consolidation.

Motivation

Energy efficiency is increasingly important for cloud computing, because the increased usage of cloud computing infrastructure, together with increasing energy costs. There is a need to reduce the greenhouse gas emissions call for the energy efficient technologies that decrease the overall energy consumption of computation, storage and communication equipment. Optimum utilization of energy is increasingly important in data centers. The power dissipation of the physical servers is the root cause of power consumption, which leads to the power consumption of the cooling systems. Many efforts have been made to make data centers more energy efficient. One of these is to minimize the total power consumption of these servers in a data center, through task consolidation and virtual machine consolidation. The current research trends on energy efficient resource allocation have identified the following key area for energy-saving techniques in cloud computing infrastructure:

- **Powering down:** Switching off the entire system when not in use or in idle state can be considered a key area of Energy Aware Computing [9].
- **Dynamic voltage and frequency scaling (DVFS):** The DVFS technique is used to reduce the heat generated by the chip in two different way. The power saving can be possible by adjusting automatically the operating frequency of the processor with the help of system clock available on board. Which also reduces the heat generated by the chip on operation.
- **Task Consolidation:** Srikantaiah et al. [32] have discussed an approach to switch off the idle machine by finding the minimum number of appropriate machine to which the task to be allocated.
- **Resource Scaling:** In this approche the minimum number of resources are assigned to the set of tasks to meet the deadline in such a way that the task will completed before the deadline to minimize the energy.

A cloud infrastructure, which integrates many efficient techniques such as First-fit decreasing, VM reuse and VM live migrations in order to achieve multiple objectives in terms of reduced energy consumption, high resource utilizations under certain QoS. Much of the previous research works did not consider all these objectives simultaneously. Sharing and migrating Virtual Machines (VMs) for a bag of cloud tasks is designed and developed to reduce energy consumption within certain execution time and high system throughput. This approach is derived from an Enhanced First Fit Decreasing (EFFD) algorithm combined with our VM reuse strategy.

To reduce energy consumption within certain execution time. High system throughput.

II. SYSTEM ARCHITECTURE

Design is a multi- step that focuses on data structure software architecture, procedural details, algorithm etc... and interface between modules. The design process also translate the requirements into presentation of software that

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can be accessed for quality before coding begins. Computer software design change continuously as new methods; better analysis and border understanding evolved. Software design is at relatively early stage in its revolution.

Therefore, software design methodology lacks the depth, flexibility and quantitative nature that are normally associated with more classical engineering disciplines. However techniques for software designs do exist, criteria for design qualities are available and design notation can be applied.

INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

The output form of an information system should accomplish one or more of the following objectives.

- ❖ Convey information about past activities, current status or projections of the
- ❖ Future.
- ❖ Signal important events, opportunities, problems, or warnings.
- ❖ Trigger an action.
- ❖ Confirm an action.

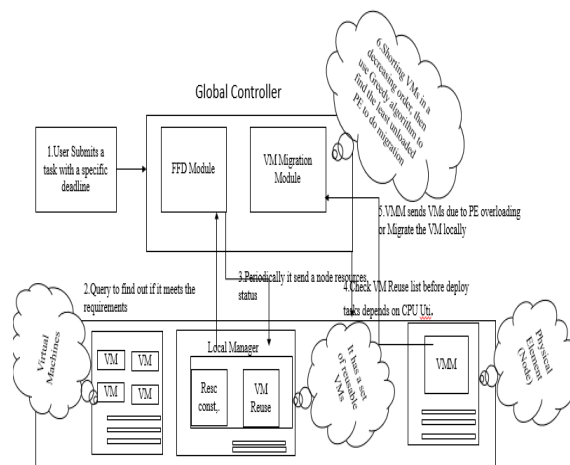


Fig. 1 System architecture.

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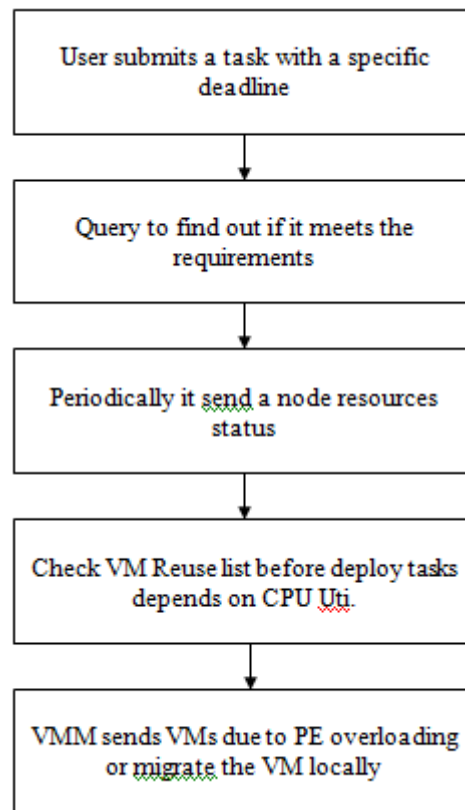


Fig. 2 Data Flow Diagram

III. CONCLUSION

Resource (VMs) allocation and scheduling is a key issue in the cloud computing environment. In this paper we survey and compare three existing VM scheduling algorithm which is mainly based on reduce energy consumption. The comparison and analysis of different existing VM scheduling algorithm or framework in the cloud computing environment has carried out depending upon various parameters used by that algorithm. Currently, we are just compare parameters that are given by the author of that algorithm or framework, no implementation is done to evaluate the performance of algorithm.

VM scheduling framework / algorithm should include user and service provider's benefits. In the above study of different VM scheduling we found that no paper has specified dynamic VM allocation means no one VM is available for user's request than user has to wait for VM became free in the case of priority request based on reservation or on-demand. Our future work will be based on the above study to develop an auto scheduler which manages VMs as per the users request based on the reservation or on-demand which reduces power consumption and saving energy of data centers in cloud environment.

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