ISSN (Online) : 2278-1021
ISSN (Print) : 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 3, Issue 3, March 2014

Resource Provisioning in Cloud Computing Based on Virtual Machines

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Abstract: In Cloud computing multiple cloud users can request number of cloud services simultaneously. Provision must be provided such that all resources are made available to user's request in efficient manner to satisfy their needs. This resource provisioning can be done by using virtual machines that handles user's request and provide appropriate services to the requested users. Service interruption occurs when the virtual machine is overloaded. To overcome this problem, black/gray box algorithm is proposed which will automatically migrate to the next low loaded virtual machine without service interruption. By using this, the total physical machine's load is balanced. Based on the application demands, green computing is used to optimize the number of servers which are in use to reduce the over utilization of power. By making these two approaches to be integrated within CloudSim which enables Cloud computing environment and supports creation of one or more virtual machines on a simulated server facility in a data center, jobs, and their mapping to suitable VMs to achieve load balancing and less energy consumption.

Keyword: Cloud Computing, Virtual Machine, Black/Gray box, Green Computing, CloudSim

I. INTRODUCTION

Instead of individuals and businesses using their own PCs and other IT resources to perform their daily work, they can use the services offered by Cloud Computing at a reasonable cost, and leave the maintenance and cost of ownership to the cloud providers.

There are many definitions of Cloud Computing suggested by different IT experts; each definition focuses on certain aspects of the Cloud. Vaquero et al argue that to offer a comprehensive definition of Cloud Computing is like "a large pool of easily usable and accessible virtualized resources, such as hardware, development platforms, and/or services.

These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Providers by means of customized Service Level Agreements (SLAs)".

Therefore, the main Cloud Computing characteristics and features, which can be derived from the definition above, are virtualization, dynamic scalability, and resource utilization and a business model of on-demand services based on SLAs.

Therefore, Cloud Computing can be seen as providing useful opportunities for some businesses. Basically, it can offer economical and technological benefits.

In terms of economic benefits, organizations can reduce the huge costs of large capital investments in IT resources by simply paying only for offered on-demand services (during peak time) from a Cloud provider, as well as lowering the cost of labour and IT resources maintenance.

In terms of technological benefits, Cloud Computing can offer easier group collaboration, such as sharing documents between users from anywhere, regardless of their operating systems. Also, it can offer on-demand scaling of resources, such as acquiring unlimited storage capacity.

II. EXISTING SYSTEM

How can a cloud service provider best multiplex its virtual resources onto the physical hardware? This is important because much of the touted gains in the cloud model come from such multiplexing. Studies have found that servers in many existing data centers are often severely underutilized due to over provisioning for the peak demand.

The cloud model is expected to make such practice unnecessary by offering automatic scale up and down in response to load variation. Besides reducing the hardware cost, it also saves on electricity which contributes to a significant portion of the operational expenses in large data centers.

Disadvantages

Virtual machine monitors (VMMs) like Xen provide a mechanism for mapping virtual machines (VMs) to physical resources. This mapping is largely hidden from the cloud users. Users with the Amazon EC2 service, for example, do not know where their VM instances run. It is up to the cloud provider to make sure the underlying physical machines (PMs) have sufficient resources to meet their needs. VM live migration technology makes it possible to change the mapping between VMs and PMs While applications are running. The capacity of PMs can also be heterogeneous because multiple generations of hardware coexist in a data center.

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III. SYSTEM ARCHITECTURE

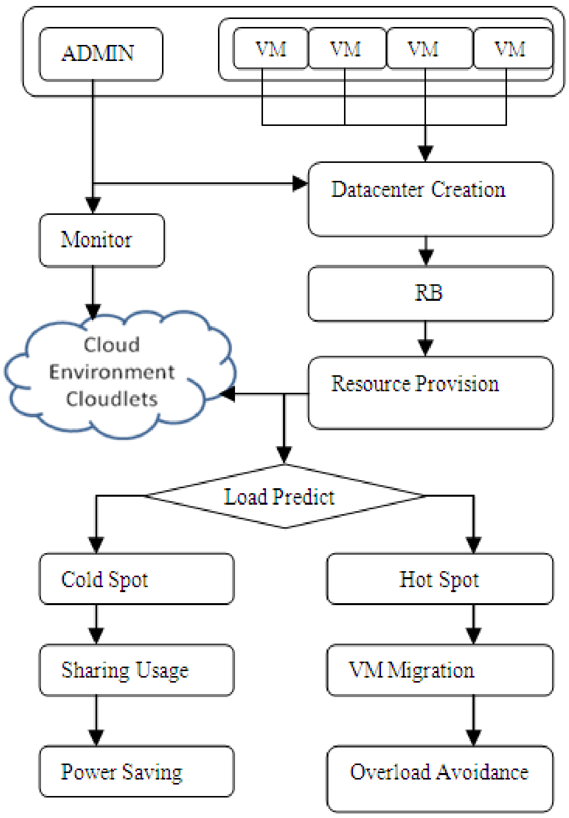

Fig 1.Overall System Architecture

First, Admin is going to create Datacenter by means of adding collection of virtual machine 1, 2…n. and monitor the Cloud Environment simultaneously. Second, Resource Broker provisioning the tasks (cloudlets) to Cloud Environment. Then, task's load is predicted by black/gray box algorithm. Based upon the load prediction they classified as hotspot and cold spot. Hotspot specifies overload. Then that particular overloaded virtual machine's task is migrated to next low loaded virtual machine. so the load get balanced. Cold spot specifies idle state of virtual machine. Then resources are shared. With the help of DVFS (Dynamic Voltage Frequency Scaling) mechanism decreases the energy consumption of the CPU by controlling and reducing the supply of voltage and frequency.

IV. PROPOSED SYSTEM

Virtualization

Virtualization is a vital technology of Cloud Computing which offers two important features abstraction and encapsulation. It is about creating an abstract layer between hardware and software. Usually, the virtualization layer is set above the physical layer of the Cloud's architecture.

Virtualization technology is used widely in Cloud Computing data centers owing to the benefits offered, such as utilizing resources, lowering costs, easier management of servers, server Consolidation and live migration of virtual machines. Virtualization is mostly used in Cloud Computing platforms as means to optimize resource usage. Through virtualization, the number of hardware resources used in Clouds can be reduced to minimize the capital cost as well as the cost of power consumption and cooling systems. For instance, through server consolidation, multiple (virtual) servers can be allowed to run simultaneously on a single physical server.

Also, live migration of the virtual machine to the not fully utilized physical servers would allow more and more physical servers to be turned off, which would lead to better achievement of energy efficiency for data centers. Furthermore, virtualization in Cloud Computing can offer dynamic configurations for different applications' resource requirements, and aggregate these resources for different needs.

Eco-efficient data center management

Eco-efficiency can be directly linked to being environmentally friendly. It is about how to manage the data centers of the Clouds in ways that have less impact on the energy consumed, as well as on carbon dioxide (CO_2) emissions. Therefore, mechanisms and policies should be put in place to help understand how green the data centre of a Cloud is.

The dramatic increase in greenhouse gas emissions is having a detrimental effect on the global climate, like increasing temperatures, dryness, and floods. Cloud infrastructure is likely embodied by enormous and power-consuming data centers that generate large amounts of heat when processing. Therefore, there is great pressure on Cloud providers to improve such mechanisms for the energy efficiency of Cloud data centers to both reduce costs and support the prices offered to Customers, as well as to ensure meeting QoS to satisfy the customers' expectations.

Black/Gray box algorithm

Step1: Start Algorithm

Step2: Sort the list of cloudlets (tasks) on the basis of the size of cloudlets

Step3: Cloudlets to be scheduled

Step4: Pick the cloudlet C(i) from the list VM Detection , Where i={1,2,3,……n}

Step5: Find the VM V (j) that may run the cloudlet successfully, Where j={1,2,3,… … ….m}

Step6: Bind VM V (j) to the cloudlet C (i)

Step7: If there are mo re cloudlets in the list

Step8: Check the threshold Th

Step9: If C (i) > Th is Hot spot then migrate VM from V (1) to V (2) and go to step3

Step10: Else C (i) < Th is Cold s p o t terminate the VM

Step11: Return control to the simulation

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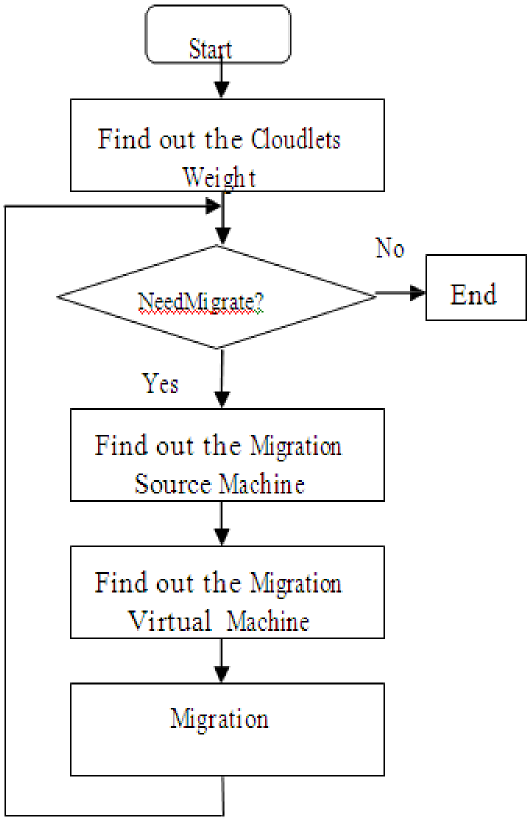

Fig 2. Algorithm Flow Diagram

VMallocation

Virtual Machine (VM) consolidations can be used as a means of reducing the power consumption of cloud data centers. To illustrate, this technique tries to allocate more VMs on less physical machines as far as possible to allow maximum utilization of the running of physical machines. For instance, when there are two VMs, instead of allocating each one to a physical server that has not been fully utilized, this technique tries to allocate both VMs on one physical server and switch the other server off to save energy. Therefore, using this technique in a data centre can reduce the operational costs and increase the efficiency of energy usage.

Management of Power Consumption

The energy supplied in data centers is consumed for computational operation, cooling systems, networks, and other overheads. In terms of computational operations, there are some energy-saving techniques that can be deployed to monitor and control energy consumption. These eco-efficient energy techniques have become one of the hot topics in the IT business these days because of the benefits gained, not only from an economic perspective, but also from an Environmental perspective. Cloud service providers can save huge costs by efficiently utilizing their data centre to its maximum capacity. Also, governments pressure companies to conduct their businesses with less impact on the environment, in terms of the emission of CO_2. Hence, Clouds service providers can also improve their SLAs by being friendly to the environment to attract more customers.

Technique Used

DVFS

Dynamic Voltage and Frequency Scaling (DVFS) can be used as one of the eco-efficiency techniques to reduce the energy consumed in computing servers. This technique observes the workload offered and then alters the CPU power consumption accordingly, which would then change the performance level. Usually, the idle servers consume two-thirds of the peak load in order to keep the other components, like memory and disks, up and running; and the remaining one- third of the consumption is based on the CPU utilization, which can be managed by DVFS. On the other hand, the DPM (Dynamic Power Management) technique may be more efficient by powering down the servers, including all the components. DPM would consume a greater amount of energy compared to DVFS when there is a need to turn these servers back on to run. A DVFS technique is designed in a way that decreases the energy consumption of the CPU by controlling and reducing the supply of voltage and frequency.

V. IMPLEMENTATION

CloudSim Toolkit

IT companies who are willing to offer some services in the Cloud can use a simulation- based approach to perform some benchmarking experiments with the services to be offered in dependable, scalable, repeatable, and controllable environments before real deployment in the Cloud.

Therefore, they can test their services in a controlled environment free of cost, and through a number of iterations, with less effort and time. They can carry out different experiments and scenarios to identify the performance bottlenecks of resources and develop provisioning techniques before real deployment in commercial Clouds.

Usability

In order to use the CloudSim toolkit, users need to have a basic background in Java programming language because it is written in Java. Also, it requires users to write some code to use the components from its library in order to simulate the desired scenarios. Therefore, it is not just about setting the parameters, running the program, and collecting the results, but it also requires a deep understanding of how the program works. In addition, a little knowledge about Integrated Development Environments (IDEs), like Net Beans or Eclipse, will be useful to ease installing the toolkit and the development of scenarios. Furthermore, CloudSim provides a library that can be used to build a ready-to-use solution, such as Cloud Analyst which is built on top of CloudSim, to offer an easy to use graphical user interface.

Capabilities

CloudSim has some compelling features and capabilities that can be extended to model a custom Cloud Computing environment. CloudSim can offer flexibility and applicability and with less time and effort to support initial performance testing. It can support simulating, from

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small-scale up to large-scale cloud environments containing data centers, with little or almost no overheads in terms of initialization and consumption of memory. Also, it has a virtualization engine that allows the creation of multiple virtualized services that can be independently managed on a single node of the data centre. Moreover, it supports, in addition to other features, energy-awareness provisioning techniques at resource, VM, and application level, such as VM allocation and DVFS. For managing the energy conscious techniques in a data centre, CloudSim architecture contains the key components Cloud Coordinator, Sensor, and VMM. The Sensor component, which is attached to every host, is used by the Cloud Coordinator to monitor particular performance parameters, like energy consumption and resource utilization. Thus, through the attached Sensors, Cloud Coordinator passes real-time information, like load conditions and processing share, of the active VMs to the VMM.

Then, VMM uses this information to perform the appropriate application of DVFS and resizing of VMs. Also, according to VMs' policy and current utilization of resources, Cloud Coordinator constantly issues VM migration commands and changes the power state of nodes to adapt the allocation of VMs.

Limitations

CloudSim is a powerful tool for modeling and simulating Cloud computing, but it has some limitations. Firstly, it is not a ready-to-use tool that that would just require setting parameters only. Actually, it does require writing some Java code to use its library, as discussed earlier. Also, the capabilities of CloudSim are sometimes limited and require some extensions. For instance, Cloud Analyst has been developed as an extension of CloudSim capabilities to offer a separation of the simulation experimentation exercise from the technicalities of programming, using the library in order to ease modeling by simply focusing on the complexity of the simulated scenario, without spending much effort and time on the language in which the simulator is interpreted.

VI. CONCLUSION

It multiplexes virtual to physical resources adaptively, based on the changing demand. Service Interruption can be avoided and the services are provided to the respected users based on the user's request. Green computing can be achieved by terminating the idle virtual machines and to adjust the CPU power dynamically. It achieves both overload avoidance and green computing for systems with multiresource constraints.

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BIOGRAPHIES

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