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RESOURCE MANAGEMENT IN DEALING WITH SECURITY CHALLENGES IN CLOUD BASED ENVIRONMENT

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Abstract:

Cloud Service Brokers includes technology consultants, business professional service organizations, registered brokers and agents, and influencers that help guide consumers in the selection of cloud computing solutions. Service brokers concentrate on the negotiation of the relationships between consumers and providers without owning or managing the whole Cloud infrastructure. Moreover, they add extra services on top of a Cloud provider's infrastructure to make up the user's Cloud environment.With the emergence of many new data centers around the globe; energy consumption by those data centers has been tremendously increased. Dynamic capacity provisioning is a promising approach for reducing energy consumption by dynamically adjusting the number of active machines to match resource demands.

Key Words: Dynamic Capacity Provisioning, Heterogeneity & K-Means Clustering Algorithm

1. Introduction:

There are various reasons for organizations to move towards IT solutions that include cloud computing as they are just required to pay for the resources on consumption basis. In addition, organizations can easily meet the needs of rapidly changing markets to ensure that they are always on the leading edge for their consumers [1]. Cloud computing appeared as a business necessity, being animated by the idea of just using the infrastructure without managing it. Although initially this idea was present only in the academic area, recently, it was transposed into industry by companies like Microsoft, Amazon, Google, Yahoo! and Salesforce.com. This makes it possible for new startups to enter the market easier, since the cost of the infrastructure is greatly diminished. This allows developers to concentrate on the business value rather on the starting budget. The clients of commercial clouds rent computing power (virtual machines) or storage space (virtual space) dynamically, according to the needs of their business. With the exploit of this technology, users can access heavy applications via lightweight portable devices such as mobile phones, PCs and PDAs.Clouds are the new trend in the evolution of the distributed systems, the predecessor of cloud being the grid. The user does not require knowledge or expertise to control the infrastructure of clouds; it provides only abstraction. It can be utilized as a service of an Internet with high scalability, higher throughput, quality of service and high computing power. Cloud computing providers deliver common online business applications which are accessed from servers through web browser [2]. Cloud computing has risen as a new computing paradigm to bring unparalleled flexibility and access to shared and scalable computing resources. Cloud services are usually implemented in one or more data centers where a large number of servers, storageunits, and a telecommunication infrastructure are provisioned.As these data centers rise from hundreds to hundreds of thousands of servers to meet the increasing demand, the energy cost of these large-scale data centers contributes to a major portion of the operating costs. Cloud computing is computing in which huge groups of remote servers are networked to allow the centralized data storage, and online access to computerservices or resources. Clouds can be classified as public, private or hybrid. A data center is a centralized repository forthe storage, management, and dissemination of data and information. Typically, a data center is a facility used to house computer systems and related components, such as telecommunication and storage system.Often times, there are redundant and backup power supplies, redundantdata communication connections, environmental controls, and security devices.

Reducing energy consumption has become a primary concern for today's data center operators [3]. One promising technique that has received significantattention is Dynamic Capacity Provisioning (DCP). The goal of this technique is to dynamically adjust the number of active machines in a data center in order to decrease energy consumption while meeting the resource requirements of the workloads.Security within cloud computing is an especially worrisome issue because of the fact that the devices used to provide services do not belong to the users themselves. The users have no control of, nor any knowledge of, what could happen to their data. This is a great concern in cases when users have valuable and personal information stored in a cloud computing service. Users will not compromise their privacy so cloud computing service providers must ensure that the customers' information is safe. This, however, is becoming increasingly challenging because as security developments are made, there always seems to be someone to figure out a way to disable the security and take advantage of user information. Some of the important components of Service Provider Layer are SLA Monitor, Metering, Accounting, Resource Provisioning, Scheduler& Dispatcher, Load Balancer, Advance Resource

Reservation Monitor, and Policy Management. Some of the security issues related to Service Provider Layer are Identity, Infrastructure, Privacy, Data transmission, People and Identity, Audit and Compliance, Cloud integrity and Binding Issues.

Some of the important components of Virtual Machine Layer create number of virtual machines and number of operating systems and its monitoring. Some of the security issues related to Virtual Machine Layer are VM Sprawl, VM Escape, Infrastructure, Separation between Customers, Cloud legal and Regularity issues, Identity and Access management Some of the important components of Data Center (Infrastructure) Layer contains the Servers, CPU's, memory, and storage, and is henceforth typically denoted as Infrastructure-as-a-Service (IaaS). Some of the security issues related to Data Center Layer are secure data at rest, Physical Security: Network and Server.

2. Review of Existing Strategies:

Some organizations have been focusing on security issues in the cloud computing. The Cloud Security Alliance is a non-profit organization formed to promote the use of best practices for providing security assurance within Cloud Computing, and provide education on the uses of Cloud Computing to help secure all other forms of computing. The Open Security Architecture (OSA) is another organizations focusing on security issues. They propose the OSA pattern, which pattern is an attempt to illustrate core cloud functions, the key roles for oversight and risk mitigation, collaboration across various internal organizations, and the controls that require additional emphasis.

For example, the Certification, Accreditation, and Security Assessments series increase in importance to ensure oversight and assurance given that the operations are being “outsourced” to another provider. System and Services Acquisition is crucial to ensure that acquisition of services is managed correctly. Contingency planning helps to ensure a clear understanding of how to respond in the event of interruptions to service delivery [4]. The Risk Assessment controls are important to understand the risks associated with services in a business context. National Institute of Standard and Technology (NIST), USA (http://www.nist.gov/) has initiated activities to promote standards for cloud computing [5]. To address the challenges and to enable cloud computing, several standards groups and industry consortia are developing. Reducing operational cost and providing required reliable QoS (Quality of Service). Energy savings are achieved by constant consolidation of VMs according to currentutilization of resources.The VM reallocation problem can be divided in two: selection of VMs to transfer and determining new placement of these VMs on physical hosts. The first part has to be considered individually for everyoptimization stage. The second part is solved by application of a heuristic for semi online multidimensional bin-packing problem. At the first optimization stage, the exploitation of resources is monitored and VMs are reallocated to reduce the number of physical nodes in use and thus reduce energy consumption by the system. However, aggressive consolidation of VMs may lead to violation of performance requirements.It has been proposed that several heuristics for selection of VMs to migrate and investigated the trade-off between performance and energy savings. To simplify the problem for the first step they have considered only exploitation of CPU

The main idea of the policies is to set upper and lower utilization thresholds and keep total utilization of CPU created by VMs sharing the same node between these thresholds. If the consumption exceeds the upper thresholds, some VMs have to be transfer from the node to reduce the danger of SLA violation. If the utilization goes below the lower thresholds, all VMs have to be transferred and the node has to be switched off to save the energy consumed be the idle node. Recently, Energy Based Efficient Resource Scheduling Algorithmhas also been used for minimizing the cost and energy consumption of cloud application and paving the way for greencomputing technology.More and more cloud computing services are managed by different Internet operators in distributed Internet data centers (IDCs) [6], which incurs huge electricity costs. Today, the power usage of data centers supplies to more than 1.5% market share of electricity consumption across the United States. Reduction in these costs benefits cloud computing operators, and attract growing attentions from many research groups and industrial sectors. Along with the exploitation of smart grid, the electrical real-time pricing policy promotes power consumers to adaptively schedule their electricity utilization for lower operational costs.It proposes a novel approach to enable electrical energy buffering in batteries to predicatively reduce IDC electricity costs in smart grid. Batteries are charged when electricity price is little and discharged to power servers when electricity price is high. A power management controller is used per battery to arbitrate the charging and discharging actions of the battery. The controller is designed as a MPC-based (model predictive control) controller. To this end, an MPC power minimization problem is formulated based on discrete state-space model with states of battery power level and cost. Wide-ranging simulation results show the effectiveness of this approach based on real-life electricity prices in smart grid.Most of the energy in data centers has been used for cooling the servers rather than processing or activating the server.

So the countries with fluctuating electricity prices can employ this method to save the electricity cost provided that the cost for batteries and battery maintenance does not exceed the electricity consumption cost of servers without using batteries. Electricity prices in some country will vary from one place to another .Total electricity cost minimization of an ISP having multiple data centers with energy storage under time varying and

location varying electricity prices are also been solved using Laypunov optimization technique. C. Peoples, G. Parr, S. McClean, P. Morrow and B. Scotney, [7]. Many scheduling strategies have been proposed regarding energy awareness. In 2008, IBM estimated that up to 85% of computing capacity in distributed environments may be idle. It was also estimated that up to 20% of power consumed in data centres can be minimized without impact on runtime as devices, in general, remain powered-on to respond, whether job requests arrive or not. Data centres therefore present an area in whichreductions in power drawn have long been achievable.Cloud computing consists of applications, platforms and infrastructure segments. Each segment performs different operations and offers different products for businesses and individuals around the world. The business application includes Software as a Service (SaaS), Utility Computing, Web Services, Platform as a Service (PaaS), Managed Service Providers (MSP), Service Commerce and Internet Integration. There are numerous security issues for cloud computing as it encompasses many technologies including networks, databases, operating systems, virtualization, resource scheduling, transaction management, load balancing, concurrency control and memory management. Therefore, security issues for many of these systems and technologies are applicable to cloud computing. For example, the network that interconnects the systems in a cloud has to be secure and mapping the virtual machines to the physical machines has to be carried out securely. Data security involves encrypting the data as well as ensuring that appropriate policies are enforced for data sharing.

3. Proposed System:

Proposed system addresses the heterogeneity present in both workload and machines at the data centers. Moreover it uses the BFDA (Best Fit Decreasing algorithm) to reduce the processing time of the active machines in the IDC. The overview of the proposed system's workflow has been discussed below, Cloud service required by the user will be sent to ISP (Internet Service Provider). ISP will submit the request in terms of tasks along with the required resource demand and SLA (Service Level Agreement) duration for each task to the Task analysis module. Task analysismodule groups the tasks into specified number of task groups or clusters using K-means algorithm.

Average and total resource requirement of each task class is computed and send to the resource provisioning module. Monitoring module will update the statistics regarding resource capacity details of every VM (Virtual Machine) and the various possible resource combination details about the machines present in the data center to the scheduler and the resource provisioning module respectively.

Resource provisioning module will select the optimum combination machines which are necessary for the current workload and activate those necessary machines and deactivate other machines in the datacenter. Then all the details regarding the Tasks (resource demand of each task) along with task class details (tasks present in each task class), Total resources required by each task class and the Activated machines for respective task classes will be send to the scheduler. Scheduler will allocate tasks to the VMs of the respective activated machine in an optimistic manner (best fit) i.e., response time for each task must be within its own SLA time duration. The system architecture diagram has been given below, figure.1. The overall procedure tominimize the number of active machine and to optimistically allocate the tasks to the respective activated machine is divided into four modules.

Task analysis module receives cloud service required by the user in terms of set of tasks along with resource requirement for each task from the ISP. The resource requirement will be given in the form of required CPU capacity and required memory capacity. Number of clusters or task classes to be formed must be mentioned. Using the K-means algorithm centroid for each task class will be calculated. Centroid of each task class denotes the average CPU and memory required for the respective task class.

Then total number of CPU and memory units required for each task class will be computed and send to the resource provisioning module. Tasks with task class details will be sent to scheduler module. The algorithm for grouping the tasks into task classes and calculating the average CPU and memory requirement for each task class has been given below. Based on the number of task in each task class and average CPU and memory requirement values total CPU and memory requirement of each task class will also be computed by the below given algorithm as follows,

4. Conclusion:

One of the biggest security worries with the cloud computing model is the sharing of resources. Cloud service providers need to inform their customers on the level of security that they provide on their cloud. In this paper, we first discussed various models of cloud computing, security issues and research challenges in cloud computing. Data security is major issue for Cloud Computing. There are several other security challenges including security aspects of network and virtualization. This paper has highlighted all these issues of cloud computing. We believe that due to the complexity of the cloud, it will be difficult to achieve end-to-end security. New security techniques need to be developed and older security techniques needed to be radically tweaked to be able to work with the clouds architecture. As the development of cloud computing technology is still at an early stage, we hope our work will provide a better understanding of the design challenges of cloud computing, and pave the way for further research in this area.

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