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MANAGING ACTIVE RESOURCES IN DISTRIBUTED ENVIRONMENT ON CLOUD COMPUTING

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ABSTRACT:

In the present days, cloud computing has turned out to be the most popular among the community of cloud users by means of providing several resources. The allocation of dynamic resource in cloud environment has been paying attention for the past few years. Virtualization is a promising solution that functions as a backbone for provisioning needs of cloud-based solution and provides virtualized vision of resources utilized to instantiate virtual machines and it dynamically allocates the resources of data center on basis of application demands. The problem of dynamic resource allocation was considered as one of the most challenging problem among the resource management problems concerning cloud environment. Technology of live migration of virtual machine shifts virtual machine state from one physical machine to other, and mitigates overload conditions and facilitates continuous maintenance activities. We present an automated resource management system that uses virtualization technology for dynamic allocation of resources and moreover supports green computing by means of optimizing the servers which are in usage. Skewness notion was introduced for the purpose of measuring uneven use of server. By means of minimizing skewness, overall utilization of servers can be improved in multi-dimensional resource constraints. The resource allocation system can avoid overload in system efficiently while minimizing number of servers utilized.

Keywords: Cloud computing, Dynamic resource, Virtualization, Live migration, Virtual machine, Green computing, Skewness.

1. INTRODUCTION:

Cloud computing is technology, where resources are associated in private as well as public networks and provides these scalable infrastructures for application. Cloud computing permits customers to enhance and down their resources on basis of requirements [1]. In cloud allocation of resources is on the basis of infrastructure as a service. Virtualization is an important concept in facilitating the vision of computing-as-a-service concerning cloud-basis solutions. Dynamic allocation of resources were considered as one of the challenging problem among difficulties of resource management [2][3]. In cloud computing there are mostly two important classifications of models such as service models along with deployment models. Service models as shown in fig1 include three models such as software as a service, Infrastructure as a service and Platform as a service. In software as a service, applications that are running on a cloud platform are accessible by means of a thin program interface. In platform as a service, user can host and build up applications by using programming language on the computable platform. In infrastructure as a service networking as well as mass storage services were provided by the cloud based virtual server. Models of deployment include public, community, private and hybrid types. Any person containing Internet connectivity and necessary credentials can utilize Public cloud from anywhere and anytime. Private cloud is managed by single organization. For the purpose of sharing in various organizations we can utilize Community cloud. Combination of a one or additional public, private and community cloud specifies hybrid cloud. Cloud computing is service oriented and not application oriented. We introduce a system of automated resource management employing virtualization technology for dynamic allocation of resources and support green computing by means of optimizing the servers which are in usage.

Allocation system of resources can avoid system overload resourcefully while minimizing number of servers utilized. Skewness measures uneven use of server and by of minimizing skewness, overall utilization of servers can be improved in multi-dimensional resource constraints.

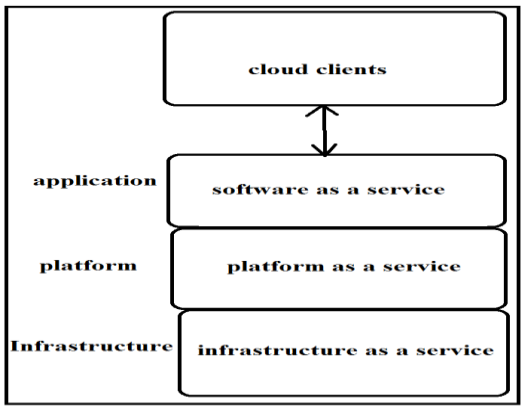

Fig1: Overview of cloud infrastructure

2. RESOURCE ALLOCATION IN CLOUD SYSTEM:

Cloud computing is an environment which is intended for sharing of resources with no knowledge of infrastructure and can access applications from anywhere at any point in time. In cloud computing, process of assigning existing resources to required cloud applications over the internet denotes resource allocation. The major advantage of resource allocation is that user neither has to set up software nor hardware for accessing and developing the applications [4].

In cloud allocation of resources is on the basis of infrastructure as a service and occurs at two levels on cloud platforms such as: after the uploading of an application to the cloud system, requested instances were assigned to physical computers by load balancer for balancing computational load of numerous applications across physical computers; when several incoming requests were received by an application, they have to be assigned towards a definite application instance for balancing of computational load across a set of instances. The allowance of dynamic resource within cloud environment has been considering for the past few years.

Allocation of dynamic resource allocation was considered as major problem among the resource management problems with reference to cloud setting. Several researchers who are working on cloud computing globally have come up with novel ways of solutions for facing this challenge.

3. OVERVIEW OF VIRTUALIZATION TECHNOLOGY:

Cloud computing presents virtualized resources towards cloud users. Cloud computing is on the basis of virtualization knowledge. Virtualization is an important concept in facilitating the vision of computing-as-a-service concerning cloud-basis solutions. Virtualization functions as a support for providing requirements of cloud-based solution and offers virtualized vision of resources utilized to instantiate virtual machines.

Concept of virtualization with dynamism allocates data center resources on basis of application demands. Virtual machine monitor controls access to physical resources, and maintains isolation among virtual machines continuously. While the physical resources are virtualized, a number of virtual machines independent with its individual operating system, executes on a physical machine.

Virtual machine monitor can influence the extent of access towards a resource. Provisioning of flexible resources and migration of machine state has enhanced effectiveness of using resources and capabilities of dynamic resource provisioning. Live migration concerning virtual machine reallocates virtual machine state and moderates overload conditions and assist constant maintenance actions. Mapping between virtual and physical machines was made possible by live migration of virtual machine at the time of running applications [5]. Live migration improves the resource utilization and provides results of higher performance. In overload avoidance viewpoint, capacity of a physical machine has to be satisfactory for assuring resource requirements of virtual, machines that are functioning on it. If not the physical machine is overloaded and leads to degraded performance of virtual machines. For avoiding of overload, we have to maintain low usage of physical machines to reduce overload in case resource requirements of virtual machines enhances later on. In green computing, number of physical machines used has to be reduced as long as satisfying the requirements of virtual machines. The physical machines which are used should be turned off for saving of energy. For green computing, we have to maintain the high utilization of physical machines to make use of their energy resourcefully.

4. DESIGNING STRUCTURE OF PROPOSED SYSTEM:

The system architecture was shown in fig2. In the system each physical machine runs virtual machine monitor such as Xen hypervisor that supports several domains such as privileged domain 0 and additional domain as D. The most important logic of introduced system is put into practice as a set of plug-ins towards Usher. Usher framework manages the multiplexing of virtual machine to physical machine. Usher local node manager was run by each node on domain 0 and collects statistics of resources

for every virtual machine on that node. A working set prober was put into practice on every hypervisor for estimating running set sizes of VMs functioning on it. At every physical machine the collected statistics are forwarded to the Usher central controller where the operation of virtual machine scheduler takes place; and it receives history of virtual machines from Usher local node manager. The scheduler of virtual machine holds several components such as: predictor that predicts the future demands of virtual machine resource as well as future load of physical machines on basis of past information. The hot spot solver detects whether the resource utilization of any physical machine is exceeding hot threshold and if so, various virtual machines functioning on them are migrated away for reducing their load. The cold spot solver ensures whether the normal utilization of dynamically used physical machines is less than the green computing threshold and if so then several of physical machines are potentially turned off for saving energy. Cold spot solver recognizes physical machines whose usage is below cold threshold and then migrates away every bit of virtual machines and finally compiles a migration list of virtual machines and forwards them to the Usher CTRL for the purpose of execution.

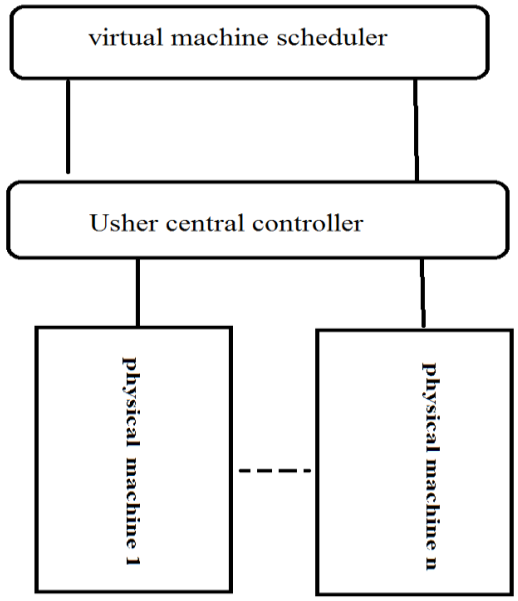

Fig2: An overview of system architecture

5. INTRODUCTION TO SKEWNESS ALGORITHM:

For the intention of measuring uneven use of several resources on server, Skewness notion was introduced. In general overall utilization of servers can be improved in multi-dimensional resource constraints by minimizing skewness. Objective of skewness algorithm is to combine workloads with several resource needs collectively so that overall usage of server capacity is enhanced. Our algorithm performs periodically for assessing the status of resource allocation on basis of future demands of predicted virtual machine

resources. When the usage of resources is beyond hot threshold limit is known as hot spot which specifies the overloading of server and consequently some of virtual machines working on it has to be migrated away. Temperature of hotspot reveals its overload degree. When the usage of resources are less than cold threshold limit is known as cold spot which specifies that sever is inactive and should be turned off for saving energy. When average usage of resource of the entire actively used servers in the system is less than green computing threshold then sever should be turned off for savIng energy. Our aim is to get rid of the entire hot spots if possible or else, maintaining their temperature as low as achievable. We sort list of virtual machine on basis of resulting temperature of server if when the virtual machine is migrated away [6]. Our aim is towards migrating away virtual machine that reduces the most of server temperature. For each VM within list, a destination server was found which should not turn into a hot spot after accepting virtual machine. One sever was chosen whose skewness is utmost reduced and it can be also be negative denoting the server whose skewness enhances the least was selected. Migration of virtual machine to that server was recorded after finding a destination and brings up to date the predicted load of associated servers. Or else, we try to find out a destination server for it. Run of algorithm is a success as long as destination server was found for virtual machine. Every run of the algorithm migrates away not more than one virtual machine from overloaded server which does not eliminate hot spot, but at any rate decrease its temperature. If it remains a hot spot in subsequent decision run, algorithm will repeats this procedure.

6. OVERVIEW OF GREEN COMPUTING ALGORITHM:

In current environment (pun intended), equipment costs have been reduced, putting focus on energy costs. Initiatives in this area include Server virtualization and Consolidation, storage consolidation and desktop virtualization. These projects typically improve cost and energy efficiency through optimized use of existing and new computing and storage capacity, electricity, cooling, ventilation and real estate.

Three phases of Green computing

There are three long phases in the evolution of the much hyped green Computing. The first phase is known as the ecological phase,

in this phase, all the activities are carried out in order to assist the ever increasing environmental problems and offer solutions for these problems. The second phase is called the environmental phase as after the environmental problems, the entire focus is shifted on the implementation of cleaner technologies. The last phase is termed as the sustainable phase which is still prevalent.

Framework:

Designers plan to make future computer more eco-friendly across its entire lifespan, from manufacture to recycling:

1) By replacing petroleum-filled plastic with bio plastics plant-based polymers require less oil and energy to produce than traditional plastics with a challenge to keep these bio plastic computers cool so that electronics won't melt them.

2) Landfills can be controlled by making best use of the device by upgrading and repairing in time with a need to make such processes (i.e., up gradation and repairing) easier and cheaper.

3) Avoiding the discarding will not only control e-waste out of dumps but also save energy and materials needed for a whole new computer.

4) Power-sucking displays can be replaced with green light displays made of OLEDs, or organic light-emitting diodes

5) Use of toxic materials like lead can be replaced by silver and copper.

6) Making recycling of computers more effective by recycling computer parts separately with a option of reuse or resale.

Algorithm Description:

In green computing, number of physical machines used has to be reduced as long as satisfying the requirements of virtual machines. For saving of energy, physical machines which are used should be turned off. Reducing the number of active servers at some point in low load without sacrificing performance is challenge at present. Algorithm of Green computing: was carried out in several steps such as in S**tep 1:** When average utilizations of the entire resources on active servers are less than the green computing threshold then green computing are invoked.

Step 2: On the basis of ascending order of memory size, list of cold spots in the system were sorted. Since we have to migrate virtual machines earlier than shutting down an under-utilized server, memory size of cold spot was defined as an aggregate memory size of running virtual machines.

Step 3: for a cold spot, we verify if there is any possibility of migrating virtual machines somewhere else and moreover search for a destination server to hold it. A level of resource utilization that is satisfactorily high for justifying server running but not as high as a threat towards becoming a hot spot in temporary fluctuation of application resource demands describes warm threshold.

Step 4: After accepting virtual machine resource utilizations of the server have to be below the warm threshold. As we can save energy by combining under-utilized servers, overdoing it might generate hot spots in future and the warm threshold was intended to put off that.

Step 5: We choose a destination server whose skewness can be decreased the most by means of accepting virtual machine. When destination servers are located for all virtual machines on a cold spot, the sequence of migrations was recorded and bring up to date predicted load of associated servers.

Step 6: List of cold spots is moreover updated since some of them might no longer be cold due to projected migrations of virtual machines in the above process. Several cold spots that are removed in each run of algorithm were restricted to be not more than an assured percentage of active servers in system and known as consolidation limit. When the average load of active servers is less than green computing threshold then cold spots are eliminated in the system if not, cold spots were left as potential destination machines meant for future offloading. Hence green computing have to be performed conventionally.

7. RESULTS:

We have developed an automated resource management system that employs virtualization technology for dynamic allocation of resources and avoid overload in system successfully while minimizing number of servers used. We have introduced the overview of skewness concept that measures uneven use of server. By means of minimizing the *skewness*, different types of workloads are combined and progress overall utilization of server resources. By declining of skewness, utilization of servers can be superior in constraints of multi-dimensional resources. When the resource usage of active servers is excessively low, some of them are turned off to save energy and this is handled in green computing algorithm.

7.1 Analysis and Interpretation

A similar incident happened about four months earlier due to an electrical storm that caused some disturbance to the same data centers. These data centers are located in Northern Virginia (USA) and the company's cluster of cloud computing services in Virginia were "currently experiencing degraded performance" as indicated on the Amazon website.

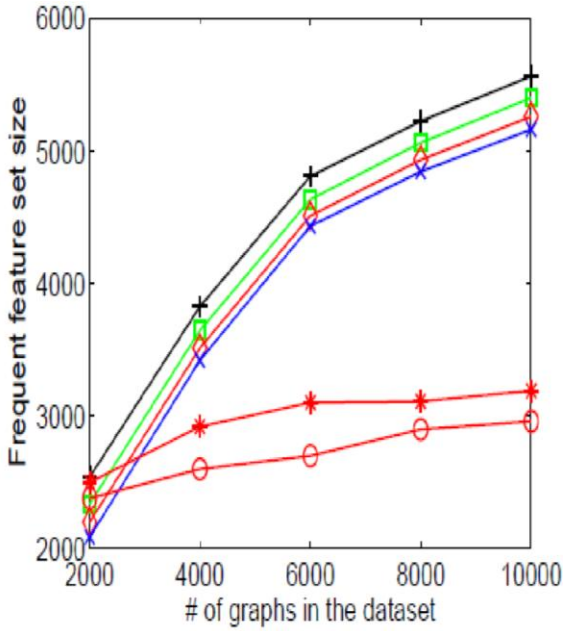

Fig.7.1.1 Comparison of Dataset and Security feature with Size

Thus, cloud customers are enthusiastic to be allowed to store their data in the cloud and at the same time they would like to be able to check by themselves that their data is protected. As we has seen above different approaches are there for resource allocation but somehow all the techniques which used affinity method to grouping the virtual machine and then host into single physical machine forget one things about resource contention. We know that grouping of virtual machine gives reduction of network bandwidth as well as time but somehow there should be threshold limit for grouping. Otherwise our motive to make a group is destroying by resource contention.

The goal of the skewness algorithm is to mix workloads with different resource requirements together so that the overall utilization of server capacity is improved. In this experiment, we see how our algorithm handles a mix of CPU, memory, and network intensive workloads. Resource allocation status of three servers A, B, C has total memory allocated 500KB and resource used memory for serverA 80KB,serverB 170KB and serverC 80K. In each cloud users provide cloud service Resource allocation in green computing. In Fig.5 display Server usage and resource allocation status for user1 using Bar Chart. The cloud computing is a model which enables on demand network access to a shared pool computing resources.

Cloud computing environment consists of multiple customers requesting for resources in a dynamic environment with their many possible constraints. The virtualization can be the solution for it. It can be used to reduce power consumption by data centers. The main purpose of the virtualization is that to make the most efficient use of available system resources, including energy. A data center, installing virtual infrastructure allows several operating systems and applications to run on a lesser number of servers, it can help to reduce the overall energy used for the data center and the energy consumed for its cooling. Once the number of servers is reduced, it also means that data center can reduce the building size as well. Some of the advantages of Virtualization which directly impacts efficiency and contributes to the environment include: Workload balancing across servers, Resource allocation and sharing are better monitored and managed and the Server utilization rates can be the results are clear and having good contribution:

1. Allocation of resource is done dynamically.
2. Saves the energy using the green computing concept
3. Proper utilization of servers and memory utilization is taken care using skewness.
4. Minimize the total cost of both the cloud computing infrastructure and running application.

Cloud Computing is a promising technology that is speedily strengthening itself as big move in the development of vast distributed applications. The notion of cloud computing is on the basis of virtualization knowledge which is a significant perception in facilitating vision of computing-as-a-service concerning cloud-basis solutions. Virtualization distributes resources of data center dynamically on source of application demands. Dynamic resource allocation within cloud environment has been paying attention for the last decade. Monitoring of controls access to physical resources is by means of virtual machine and maintains isolation among virtual machines continuously. Among virtual and physical machines, mapping was made possible by live migration of virtual machine at the time of running applications. An approach of automated resource management was introduced in our work that employs

virtualization technology for dynamic allocation of resources. It supports green computing in which number of physical machines used has to be reduced as long as satisfying the requirements of virtual machines by means of optimizing used servers. Turning off physical machines which are in usage has to be performed for saving of energy. In the perspective of avoiding of overload, capacity of a physical machine has to be satisfactory for assuring resource requirements of virtual, machines that are functioning on it. Introduction of skewness conception measures uneven use of server and the main intention of it is to merge workloads with several resource needs collectively so that overall usage of server capacity is enhanced. By means of dropping of skewness, utilization of servers can be superior in constraints of multi-dimensional resources. The load prediction algorithm can capture growing trend of resource usage patterns and assist to decrease placement churn significantly. Thorough examination on prediction algorithms which plays an important role in recovering stability as well as performance of resource allocation decisions were left as future work.

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