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CloudSim's Virtual Machine Allocation Policy in a Cloud Computing Environment

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Abstract*: In the present paper we are examining the CloudSim, a cloud computing scenario framework simulator and the Virtual Machine (VM) Allocation Policy. The process of virtually allocating the machines is an essential part of the cloud resource management that depends on its capability of changing the performance and energy cost-effectiveness of a system and how costly a cloud resource can be. CloudSim enables the generality of customizing the virtual machine allocation policies, hence, enabling several simulation scenarios to be formulated depending on different resource delivery procedures as well as the workload status. This article reviews the same as concerns the functionality as well as the effects of various allocation strategies like the time-shared or space-shared rules on how resources are used and tasks executed. In the investigation, it is established that the increase in performance and scalability of cloud infrastructure may be optimized by the virtual machine allocation algorithms. Researchers can model new methods and test systems and thus because of flexibility, it is important to know that CloudSim is a useful tool in efficient allocation of virtual machines in dynamic clouds research.*

Keywords*: Step topology, UML, Cloud analyst, CloudSim, Energy consumption*

I. Introduction

The management of resources is quite important to any system in cloud computing so as to achieve cost-effectiveness, scalability and optimum performance. The most critical aspect of this kind of management will be the issue of Virtual Machine (VM) allocation that will dictate/enforce the extent, to which, physical resources might be shared by a given number of virtual instances. CloudSim toolkit provides a popular framework in which the researcher or a new developer can evaluate a set of different distribution policies of virtual machine in a deterministic and flexible environment. The allocation policies of the virtual machine (VM)in CloudSim direct the way the virtual machines (VMs) are allocated to different hosts depending on factors of interests such as workload, availability of resources, scheduling strategy which are instrumental to a model of the behavior of the cloud infrastructure. These policies may greatly influence the general performance of cloud services like the time to accomplish the assignment, energy consumption and service level agreements (SLAs). Through the CloudSim, the user will be able to evaluate the strengths of the different types of planning schemes like the time-shared and space-shared rules and finally be able to create smarter and more adaptable systems to control the resources found within the clouds.

II. Literature Survey

In order to better the effectiveness of the system and resources that work in the cloud computing environments, certain scholars have considered the Virtual Machine (VM) allocation with the application of the CloudSim. To reduce the power consumptions in data center, Beloglazov and Buyya (2012) proposed the addition of energy superior resource allocation regulations to CloudSim. In case of improving load balancing by minimizing SLA hits, the focus has been given to further research of the dynamic allocation algorithms as well as heuristic-based allocation algorithms, such as Modified Best Fit Decreasing (MBFD). Singh and Chana (2015) provided an analysis of assured quality, virtual machine deployment policies that adapt to varied workloads.

Moreover, there have been efforts of implementing priority and predictive methods of allocations based on user-determined priorities and past data. These projects demonstrate how flexible CloudSim could be used in simulating various real-life scenarios and evaluating trade-offs between cost, energy efficiency, and performance. This

has been evidenced by the current development of VM allocation algorithms using CloudSim to enhance cloud resource management as it has been important in not only academic research but also in industrial research.

III. UML Modelling

The organization and the functioning of cloud resource management of the simulator can be observed and understood with the help of the UML modelling of the CloudSim Virtual Machine (VM) Allocation Policy. Key types of UML diagrams are class diagrams, sequence diagrams and activity diagrams. All their connections as well as core classes such as Datacenter and Host, Vm and Vm Allocation Policy have been represented in the class diagram. The abstract Vm Allocation Policy interface stipulates the way virtual machines (VMs) to the hosts are allocated, and its sub-classes (such as Vm Allocation Policy Simple) implement specific strategies.

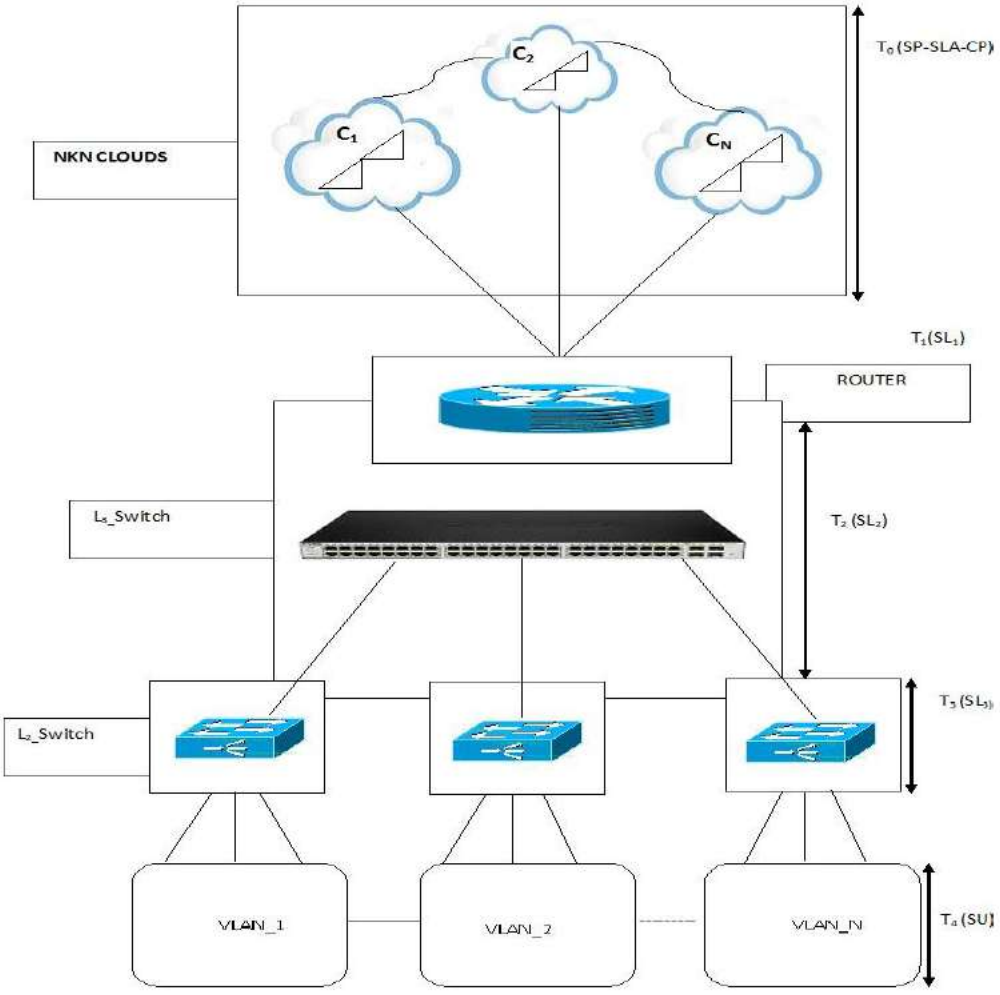

Fig 1: Accessing of cloud servers

The sequence diagram represents the process of requesting the creation of VM by a Datacenter Broker and the assignment of VMs to a pool of available hosts made by the policy to describe the dynamic interaction between the components when the task of allocating VM occurs. The decision-making process that involves host selection and resource checks of such an allocation process is illustrated in the activity diagram. Academics may use these UML models in order to expand the capability of CloudSim to simulate various allocation algorithms in complicated cloud systems, simplify the clarity of design and facilitate the policy customization.

IV. Methodology

The research methodology on CloudSim has involved several important steps towards performing the research about the Virtual Machine (VM) Allocation Policy. First, the simulation environment is initialized by creation of datacenters, hosts, VMs and cloudlets (tasks). Each host is assigned specific resource parameters such as CPU, RAM and bandwidth. Then a VM allocation policy should be implemented by utilizing CloudSim Vm Allocation Policy class, e.g., time-shared, space-shared, own policy. Datacenter Broker makes a scheduling of cloudlets to virtual machines based on set rules. Performance indices like the amount of energy consumed, time of execution and also the utilisation of resources are monitored during the simulation. Finally, the results are reviewed to determine the performance of the allocation approach in terms of effectiveness and efficiency. The methodology allows measurement and a comparison of different strategies of VM allocation within a virtual cloud computing environment on the basis of controlled and repeatable studies.

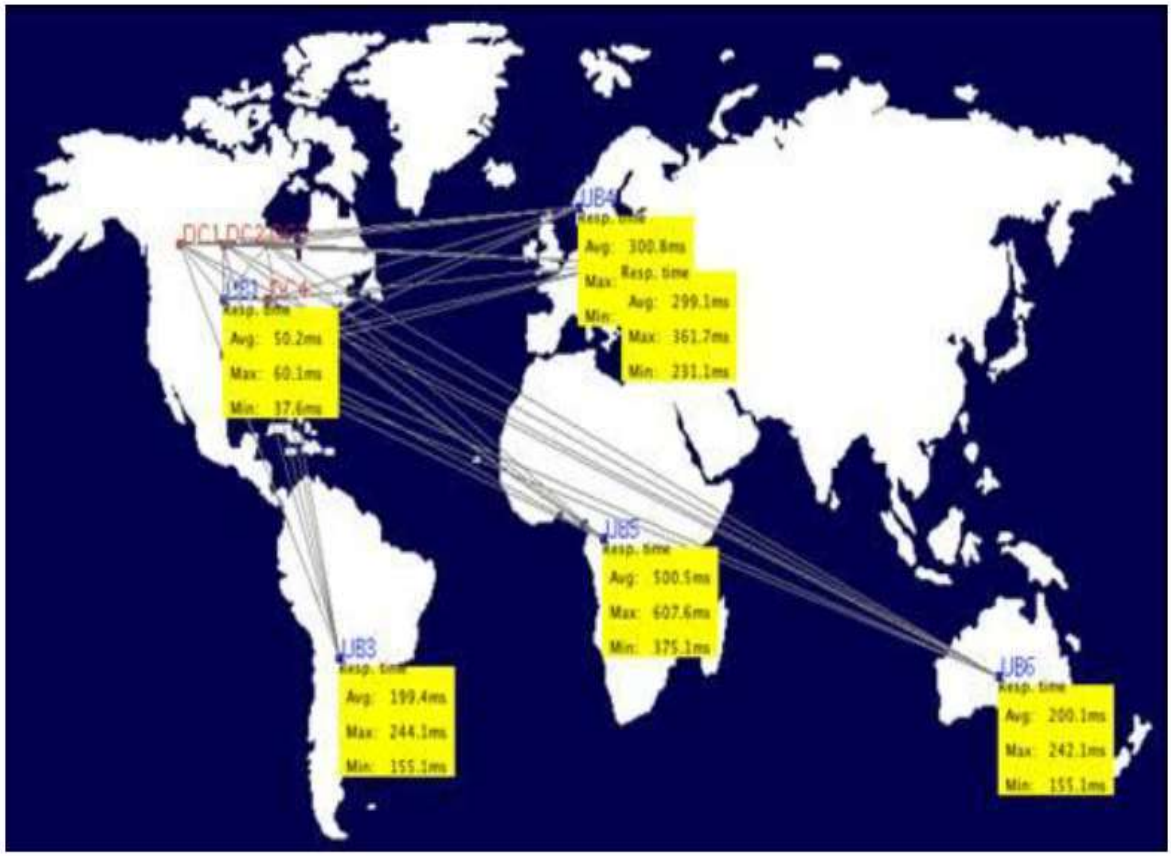

Fig 2: A view of geographical

V. Results and Analysis

Results and discussion of the Virtual Machine (VM) Allocation Policy of CloudSim are concentrated on assessing the success of various types of allocation policies in terms of simulated workloads. Interesting metrics are the number of CPU time used by the host, the number of virtual machine migrations carried out, the use of power, makes pan (total execution time) and use of SLA violations [1-4]. As an example, space-shared policies can achieve higher utilisation and possibly a decreasing performance, time-shared policies can probably achieve higher resource utilisation and decreasing task isolation. Specifically, such custom policies as load-balanced or energy-aware ones are usually more efficient and power-efficient. Comparative investigations reveal the existence of trade-offs amid costs, energy efficiency and performance. Based on the graphs and the statistical findings of CloudSim, the researchers can choose the most appropriate or create the most efficient allocation policies of the particular cloud settings and requirements of applications, which they wish to be presented [5].

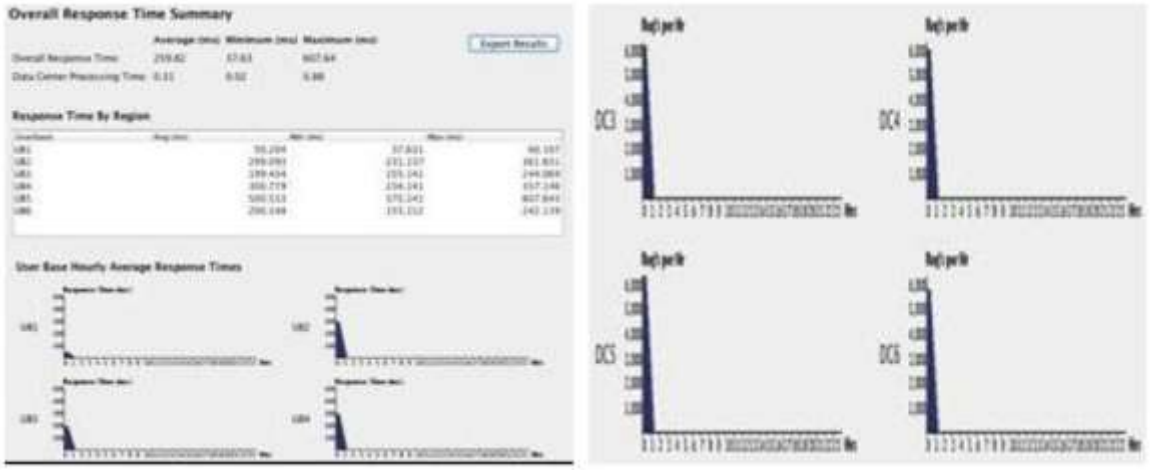

Fig 3: Loading on DC

VI. Conclusion

Lastly, when modelling and examining Virtual Machine (VM) Allocation Policies in cloud computing environments CloudSim provides a reliable and flexible platform. In order to maximize the use of resources, reduce consumption of energy and meet the performance requirements, allocating virtual machines (VMs) effectively becomes a necessary activity. The provision of the CloudSim modelling ability and configurable policies can enable researchers to conduct evaluations of various policies on a range of workloads of such allocation strategies as time-shared, space-shared, and energy-aware. The knowledge accumulated related to the simulation outputs assist in deducing the benefits and limitations of each policy that would assist in the development of more effective and flexible resource management strategies. Still, taking everything into account, not only CloudSim can help the cloud computing research grow due to the affordable and expandable test environment well-suited to testing scheduling and virtual machine allocation algorithms but also it can effectively be used to test the algorithms themselves.

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