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AUTOMATED VM MIGRATION USING INTELLIGENT LEARNING TECHNIQUE

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Abstract - *Cloud computing is an on-demand technology that comes with numerous benefits. The main advantage of cloud computing is that it doesn't require high-end machines to run. When a virtual machine is created or rented on a cloud service, it can be accessed anywhere and at any time. Cloud computing is great for security and safety purposes as the user doesn't have direct access to the hardware. A Virtual Machine Hosting Server is often created as a cluster, and the resources are underutilized due to a vulnerability in the load balancing software. Our goal is to develop LBaaS software that provides the best QoS. In order to achieve this, fuzzy logic is used to decide what action should be taken on the live virtual machine or a newly requested virtual machine. The data collector feeds the current state of the Virtual Machine Hosting server to the fuzzy logic, which uses the predefined rules to decide what action to take. The live migration technique is used for load balancing the Servers to ensure uninterrupted service to the user if the virtual machine is active.*

Key words: Cloud Computing, Load Balancer as a Service (LBaas), Live Virtual Machine Migration, Fuzzy logic.

1. INTRODUCTION

Cloud computing is a technology that uses the internet for storing and managing data on remote servers and then access data via the internet. Migration is the process by which a running virtual machine is moved from one physical host to another, with little or no disruption in service The VMs migration is providing fast network data sharing by keeping regular content pages in the destination machine. Usually, it can visualize the entire hardware feasibility study by external operating system (OS). The VM migration is providing fast network data sharing by keeping regular content pages in destination machine. Usually, it can visualize the entire hardware feasibility study by external operating system (OS). Thereby, the OS process consolidated into VMs which is to be referred as virtual machine migrations (VMM). By viewing hardware abstract, a user utilizes the VMs effectively. Hence, it generates distinct equipment layer on basics of system capacity. Thereby, it has conveyed that the proper support of VMs induces significant improvement in the resource management and migration efficiency. In case of offline VMs migration, allows memory sharing between two distinct machine and support to each other at any downtime. However, it faces a lot of issues when it undergone with live VM migration. Because it seems to be live for all time until the client stops their perspective and it may come difficult to hold the entire data in concurrently used in workload balancing, low energy retains and dynamic VM resizing to enhance bandwidth availability and hardware stability. Sometime, data Centre uses advance tools to transfers OS instantly over multiple machines. Thus, suffers large number of unnecessary memory transferring which results in conquering long migration time and downtime. In addition to this, locality information of different data canters is being identified to turn effective VMs migration and shared most common data page towards destination machine. Further, user's authentication for faster VM migration present closer to other VMs access location. The most attractive features of the VMs migration are to identify the system locality. Generally, existing VMM techniques significantly decrease system reliability and increase the transmission end-to-end latency of the huge volume of the VMs. To resolve the above-mentioned problem, reduce unnecessary pre-copy of repeated content page and minimize number of VM migration. To prevent that a good Load Balancer as a service should be created to split the load between two hosts. The Fuzzy logic is used to make decision to migrate the VM or keep it as it is for maximum performance of the virtual machine host servers. In order to give a good user experience the VM migration is done as live so that it can be done with minimum downtime.

Main Objective of the project:

- Bandwidth availability and hardware stability.
- Workload balancing.
- Low energy consumption.

When the load between two Virtual Machine hosting server is imbalanced it can cause inefficient use of resources. VM load balancing is a feature that allows you to optimize utilization in your cluster. It identifies over-committed servers and live migrates VMs from those servers to under-committed servers. Our goal is to create a Load Balancer as a service (LBaas) to properly maintain load between a clusters of VM servers. To achieve that a load balancing software is developed using a suitable decision-making technique. The Fuzzy logic is used for the decision-making technique. Two Virtual Machine Servers

are created and connected via network and made as a cluster. Every time a virtual machine is requested or created the data collector checks the status of both the Virtual Machine servers for available resources such as RAM and Processor counts. Those data are sent to the fuzzy logic to make the decision to migrate the VM or keep it as it is for maximum performance. To make is easy for the users using the virtual machine the live migrating technique is used for minimal downtime

2. RELATED WORK

This section presents previous work related to our proposed architectures and highlighted some of them to identify the significant attributes of these systems.

Rekha A Kulkarni et.al [1] Virtual Machines as processing elements. The workflow with number of tasks will be submitted to cloud by end users. These tasks will be run on VMs for completion of given job Using of fuzzy logic has shown the improvement in the results of meeting the deadline of tasks and using of fuzzy logic has shown the improvement in the results of meeting the deadline of tasks. Mehiar Dabbagh et.al [2] The cloud scheduler creates a virtual machine (VM), allocates to it the exact amounts of CPU and memory resources requested by the client, and assigns it to one of the cluster's minimizing Physical Machine (PM) overload occurrences via VM resource and reducing the number of active PMs via efficient VM migration.Chi Xu et.al [3] We for the first time performed a comprehensive measurement study to quantify the impact of self-interference with hybrid workloads. Hybrid workloads such as transcoding and streaming tasks experience up to 32.1% reduction of network. The overall performance through real-world workloads largely improves I/O performance and accelerate. Manikandan N et.al [4] the complexities involved in direct hardware management are taken care by moving data into the cloud, thereby making it convenient for the users.

The algorithm Improved Weighted Round Robin has been comparatively efficient in balancing the load. Matheus Torquato et.al [5] flexible and can consider other threat models and be used in other modeling frameworks. The results show that reducing the risk associated with the Man-in-the-middle attack is incompatible with reducing the risk related to Denial of Service, security evaluation approach is flexible and can consider other threat models and be used in other modeling frameworks. Yaodong Yang et.al [6] SnapMig is an ongoing research project that offers several directions for future research. Intuitively, the key to the reduction of storage migration time is how to maximize the effective migration bandwidth and minimize the amount of data transferring. First, we will exploit the data redundancy or similarity within VM live storage migration of VMM to eliminate unnecessary transferring of redundant and similar data. Seunggyun Lee et.al [7] This paper investigates the feasibility of live VM migration with SGX enclaves. Traditional pure stop-and-copy scheme is simple to implement, but it has long VM downtime. Migration with pre-copy reduces the downtime by keep alive VM state during the migration. However, dirty-pages tracking is impossible unless we compromise the integrity of EPC region. Nikos Tziritas et.al [8] proposed two algorithms (ALG and RALG) to solve in an online manner the problem of live VM migration with the target of optimizing both migration time and downtime once weighting preferences among the two are given. We showed that ALG results in a strong competitive ratio, while RALG achieves significantly better results against ALG regarding competitive ratio. Preeti P. Thakre et.al [9] Live Migration is a very effective approach in datacenters for increasing the performance level by managing the resources dynamically of distinct datacenters or within the datacenter. But still while migrating due to huge amount of data along with its duplication and performance level decreases. pooja Tandel et.al [10] Migration methodology is used for balancing load in data centers without interrupting other running virtual machines. This paper illustrates the varieties of migration techniques which contributed to minimizing the migration time, downtime and increasing the performance. It is tough to judge the different methods as each of them is implemented in various architecture and platforms. Jyoti Thaman et.al [11] Cloud computing proved a technology, information, and platform on rentals. Amongst many critical issues in clouds, energy efficiency and SLAs are two concerns that if achieved simultaneously; prove beneficial for both cloud enterprises and cloud clients. To reduce the carbon footprints and ensure SLA, we have proposed VMS, variance-based heuristic for VM selection scheme.

3. PROPOSED WORK

3.1 Fuzzy Logic

Fuzzy logic is an approach to variable processing that allows for multiple truth values to be processed through the same variable. Fuzzy logic attempts to solve problems with an open, imprecise spectrum of data and heuristics that makes it possible to obtain an array of accurate conclusions. So, we used this fuzzy logic to make decisions for migrating VMs or to keep the VMs in the current host. We prepared sixteen rules to help the fuzzy logic to take the decision. Fuzzy membership is used to convert the crisp output provided to the fuzzy inference system. Fuzzy logic itself is not fuzzy, rather it deals with the fuzziness in the data and this fuzziness in the data is best described by the fuzzy membership function. Following figures represents our membership functions:

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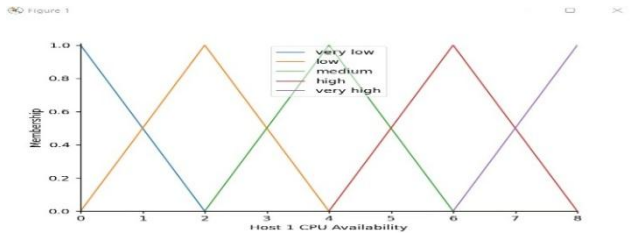

Fig-1 Membership function for Host 1 CPU Availability

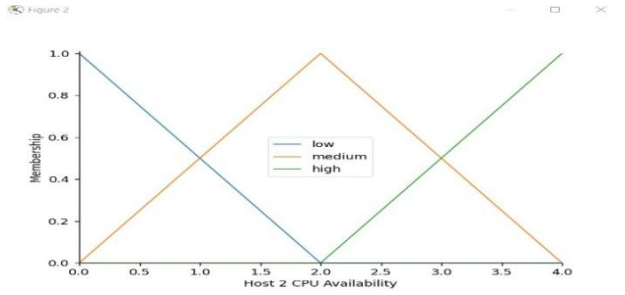

Fig-2 Membership function for Host 2 CPU Availability

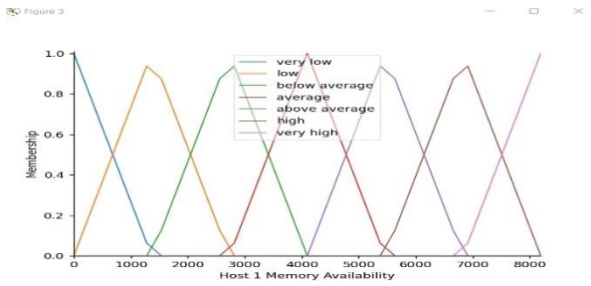

Fig-3 Membership function for Host 1 Memory Availability

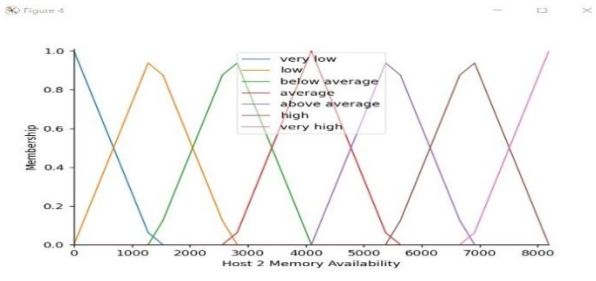

Fig-4 Membership Function for Host 2 Memory Availability

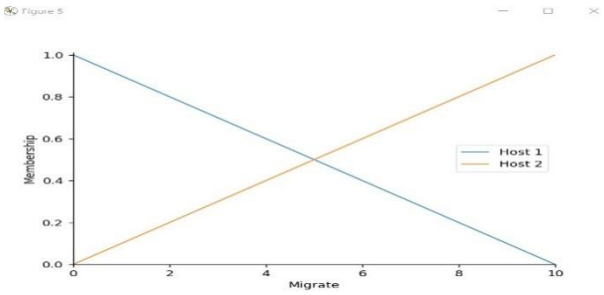

Fig-5 Membership function for Migration

3.2 Live Virtual Machine Migration

Live Migration is the process of transferring a live virtual machine one physical host to another without disrupting its normal operation. Live migration enables the porting of virtual machine and is carried out in a systematic manner to ensure minimal operational downtime. This methodology is used to provide best QOS (Quality of Service).

4. METHODOLOGY

4.1 Hosting Virtual Machines

Two virtual machine hosting servers are connected with a shared storage server (NFS / ISCSI). Whenever a user request for a virtual machine the request is sent through the fuzzy logic to decide where the requested virtual machine should be hosted. If the user request for a newly configured virtual machine necessary files are created in both the virtual machine hosting server and the shared folder storage server. To balance the hosting server and to provide a good QOS (Quality of Service). Live migration technique is used for minimum down time in the user's VMs.

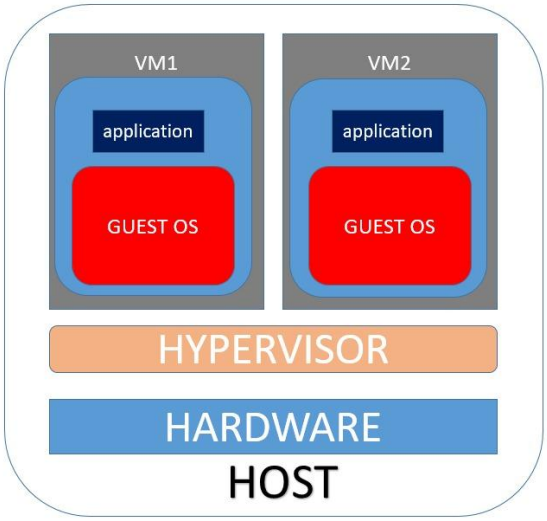

Fig-6 Architecture of Virtual machine Hosting server

4.2 Load Balancing the Host

It communicate with the virtual machine host servers and get continues data such as Current live virtual machines running on each host the CPU usage of each host and the memory utilization of each host. These data are provided to the fuzzy logic to decide whether to live migrate the virtual machine or keep the virtual machine at the current host.

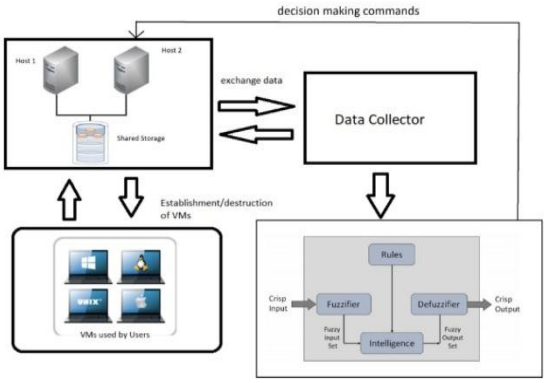

Fig-7 Architecture of the system

5. HARDWARE AND SOFTWARE COMPONENTS

5.1 Hardware Requirements

Virtual Machine Hosting Server 1

- Processor - intel i5-10300H @2.50ghz
- HDD - 1TB
- Ram - 8gb

Virtual Machine Hosting Server 2

- Processor - intel i5-6300U @2.40ghz
- HDD - 1TB
- Ram - 8gb

5.2 Software Requirements

- Oracle Virtual Box
- Windows/Mac OS
- Visual Studio code

6. RESULTS

The status of the virtual machine hosting server is observed, and the live migration is triggered accordingly.

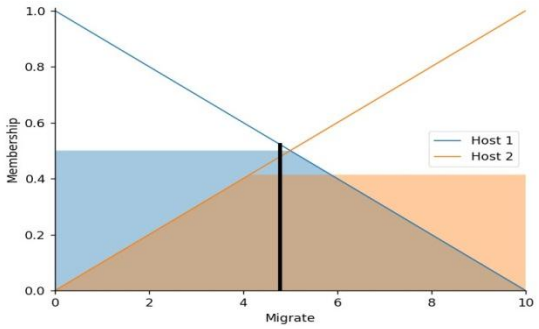

Fig-8 The fuzzy logic calculated the data and decides to place the VM in Host 1.

From the figure 8 we can see that the data collector collected data from the virtual machine hosting servers and sent to fuzzy logic and the fuzzy logic calculated the rules and decides to push the machine in Virtual machine hosting server 1. From the figure 9 we can see that the same process is carried out but putting more weight in virtual machine server 1 so that the fuzzy logic says the virtual machine that is requested or currently live should be created in virtual machine hosting server 1 or the live virtual machine should be live migrated to virtual machine hosting server 1. Many pre-defined scenarios are tried out and tested the outputs for maximum accuracy

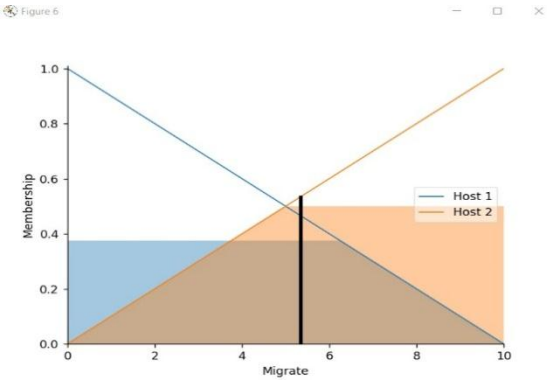

Fig-9 The fuzzy logic calculated the data and decides to place the VM in Host 2.

7. CONCLUSIONS AND FUTURE ENHANCEMENT

The project is aimed for the balancing of virtual machine hosting servers, and it is observed that the virtual machine hosting severs are balanced for optimal performance with the decision-making abilities of the fuzzy logic. This system can be enhanced by finely tuning the rules of the fuzzy logic. Thus, a powerful virtual machine hosting service can be built with good hardware and load balancing service driven by fuzzy logic.

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