A Performance based Model for Physical Virtual Machine to Speed up Migration using Genetic Algorithm

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Abstract— Virtual Machine Migration is a great management technique that gives data centre operators the ability to adapt the placement of VMs in order in to better satisfy the performance of objectives, improve resource utilization and statement locality, mitigate presentation hotspots, achieve fault tolerance, reduce energy consumption. Many techniques were implemented for saving the energy of data centres. But these techniques were not so effective because of performance degradations of services and improper utilization of resources. Our proposed work focuses on developing a hybrid resource allocation algorithm using SLA parameters, optimizing those using Genetic Algorithm and finally comparing the proposed scheme with the existing scheme.

Key words: Virtual Machine Migration, Load Balancing, Offline Migration, Genetic Algorithm

I. INTRODUCTION TO VIRTUAL MACHINE MIGRATION

Virtualization plays a main role in the cloud computing technology. Usually in the cloud computing, users share the data there in the clouds like application etc., but with Virtualization users share the communications. The main tradition in Virtualization Technology is that usually the cloud providers offer the applications with the normal versions to their cloud users, if the next version of that claim is released, then cloud supplier has to provide the newest version to their cloud users and virtually it is possible but it is more costly. To overwhelm this difficulty we use virtualization technology. By using virtualization, all sever and the software function which are compulsory by other cloud providers are maintained by the third party people, and the cloud providers have to pay the money on magazine or annual basis [1]. Mostly Virtualization means, organization of multiple operating systems on a single machine but allocating all the hard ware resources. And it helps us to give the pool of IT resources so that we share these IT resources in order get profit in the business [2].

The vital virtualized model consists of cloud users, service prototypes, virtualized model and its host operating System and their hardware. The service models consist of software as service which is used for providing the applications that are interrelated to the cloud users. Then the next service model is platform as a service. It is one of the most central service model in cloud for providing successful services to the cloud users. In this, cloud provider provides a computing stage for accessing their applications. So, users develop their program and execute in the implementation environment provided by the cloud provider. In this the capital that are existing with cloud users, such as computers storage resources, are mechanically matched with the application of particular computer platforms whereby they do not need to lodge the resources manually. Then the further replica in the virtualized model is Infrastructure as service, it is one of the most significant service model as far as security to the public cloud is concerned. It provides computer machines which are used for maintaining the clouds and other capital for maintaining the cloud with security.

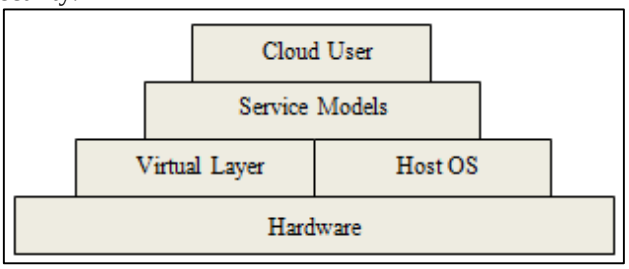

Fig. 1: Virtual Model

A. *Load Balancing*

The aim of load balancing is to advance the performance by balancing the load among various possessions such as network links, central processing units, disk drive to achieve optimal resource application, maximizing throughput, maximizing response time [3], and avoiding overwork and under load situations.

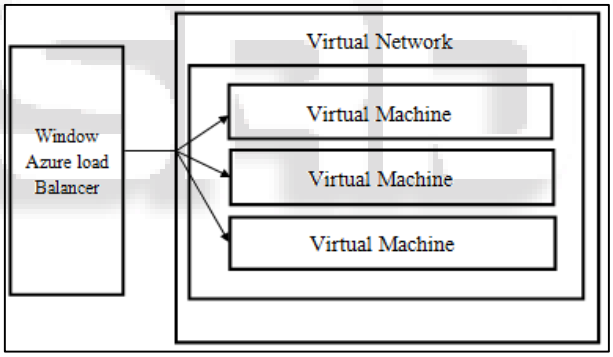

Fig. 2: Creation of Load Balancing in Virtual Machine

Load balancing is required to share the dynamic load across several nodes to make sure that no single node is loaded or idle.

1) Problems Encountered in VM Migration

Cloud computing allows hosting of multiple services on a globally shared resource pool where resources are allocated to services on demand. It uses virtualized environment for functioning services, because without virtualization computing is inefficient and not flexible. But it has some performance degradations of services and also has energy overheads and large amount of power consumption. In past, many researchers worked on making energy efficient algorithm for reducing energy consumption. Many algorithms were implemented for saving energy of data centres by turning off or by putting idle servers to sleep mode of servers. But these techniques were not so effective because of performance degradations of services and improper resources utilization. A, Beloglazovet al. proposed an idea for making energy efficient algorithm for data centres. They proposed Virtual machine placement algorithm that is minimization of migration (MM), which

consider utilization of host cpu and according to that list of virtual machines in decreasing order of CPU utilization. The performance of algorithm is better than other placement algorithms but they did not consider SLA parameters while selecting virtual machine for migration, which might be effected by live migration. Most of the violations occur during live migration of virtual machines, migration impact the parameters of SLA (like power consumption, response time, throughput, completed jobs etc.).

2) Proposed solution

Our proposed work takes one technique into consideration. Our goal is to overcome the above limitations and based on it we have developed a new approach for SLA aware parameters for resource allocation in data centres using Genetic Algorithm.

II. TECHNIQUES USED GENETIC ALGORITHM

Genetic algorithm is a computer program that simulates the processes of natural evolution in order to solve difficulties and to model evolutionary systems.

Different types of three operators [4]:

- The selection operator selects those chromosomes in the populace that will be allowed to replicate with better chromosomes producing on average more spring than less ones.
- Crossover exchanges subparts of two chromosomes, roughly replicating biological re-combination between two single gene organisms,
- Mutation casually changes the values of some positions in the chromosome, and transpose reverses the order of a connecting section of the chromosome, thus re-arranging the order in which genes are organized.

The Genetic Procedure is a model of machine knowledge which derives its performance from image of the processes of Evolution in environment. This is done by the creation within a machine of a Populace of Individuals represented by Chromosomes, in spirit a set of character strings that are similar to the base-4 chromosomes that we see in our own DNA. The individuals in the populace then go through a process of evolution [4].

We should note that Evolution is not a purposive or directed process. That is, there is no evidence to support the declaration that the goal of evolution is to produce Mankind. Indeed, the procedures of nature seem to boil down to different Individuals competing for resources in the Environment. Some are healthier than others. Those that are better are more likely to survive and disseminate their genetic material. In nature, we see that the programming for our genetic information is done in a way that admits genderless Reproduction typically resulting in offspring that are genetically identical to the PARENT. Sexual Reproduction allows the creation of genetically complete different offspring that are still of the same general flavor (species).

At the molecular level what occurs is that a pair of Genes bump into one another, exchange the chunks of genetic material and drift apart. This is the Recombination operation, which GA generally refers to as Crossover. Because of the technique those genetic substantial crosses over from one chromosome to another.

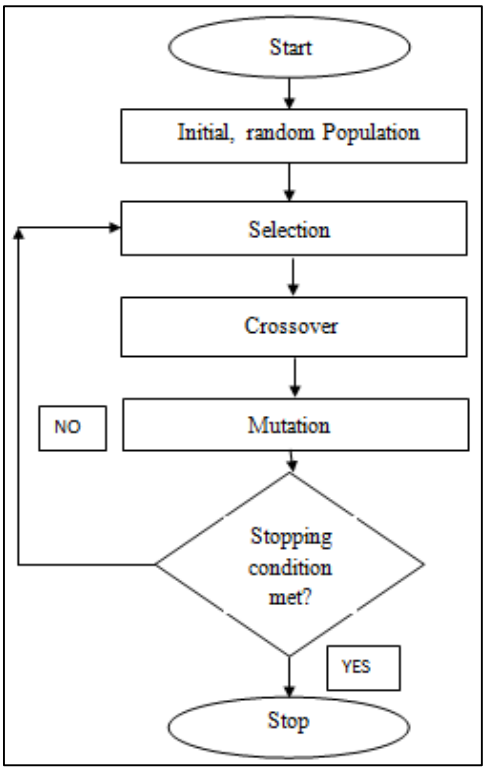

Fig. 3: Genetic Algorithm Flowchart

III. METHODOLOGY

Firstly, implement existing minimization of migration (MM) by varying parameters like SLA (response time, execution time, and throughput), no. of customers, virtual machines and no. of request for checking the performance of this technique. Secondly, implement the proposed scheme based on three different SLA parameters: response time, execution time, and throughput using GA algorithm. And check the performance of these three options. At the end compare the results to check which option is efficient in terms of energy consumption.

A. Step: 1

It defines the Simulation Specification, Virtual Machine Specification and System Specification for Migration.

1) User Code

The User Code is a computer ID that is used to approve your Scheme Product. Although the user code comprises no personal information about you or your computer, each User Code is unique to a detailed computer.

B. Step: 2

Virtual Machine: Arrange VM specification like no. of VMs and simulation time. Then check what load has been put in every repetition, check how much power is getting consumed in every repetition and check that how many jobs are getting completed in every repetition. Then generate job specification on the basis of alive VM id, alive VM power and alive VM load. Then keep track of jobs that are getting completed. Also keep path of VM that will get job. Then track the total time for the execution of job which is getting consumed. After this check that which VM has completed how many jobs and make sure that total number of provided jobs to one VM does not exceed with the amount of data provided to it

- Step: 2 Repeat step 2 for System Specification and calculate the migration.
- Step: 3 After minimization, we apply the Evolutionary Algorithm like Genetic Algorithm.
- Step: 4 Optimization Technique will generate the reduced Index and add the fitness function to provide the fit value.
- Step: 5 Fit values provide the evidence for Optimized Result in Virtual Machine.
- Step: 6 Then Calculate following parameters,
  - Power_Overall_Consumed
  - Jobs_Overall_Iteration
  - Percentage of The Completion of Jobs

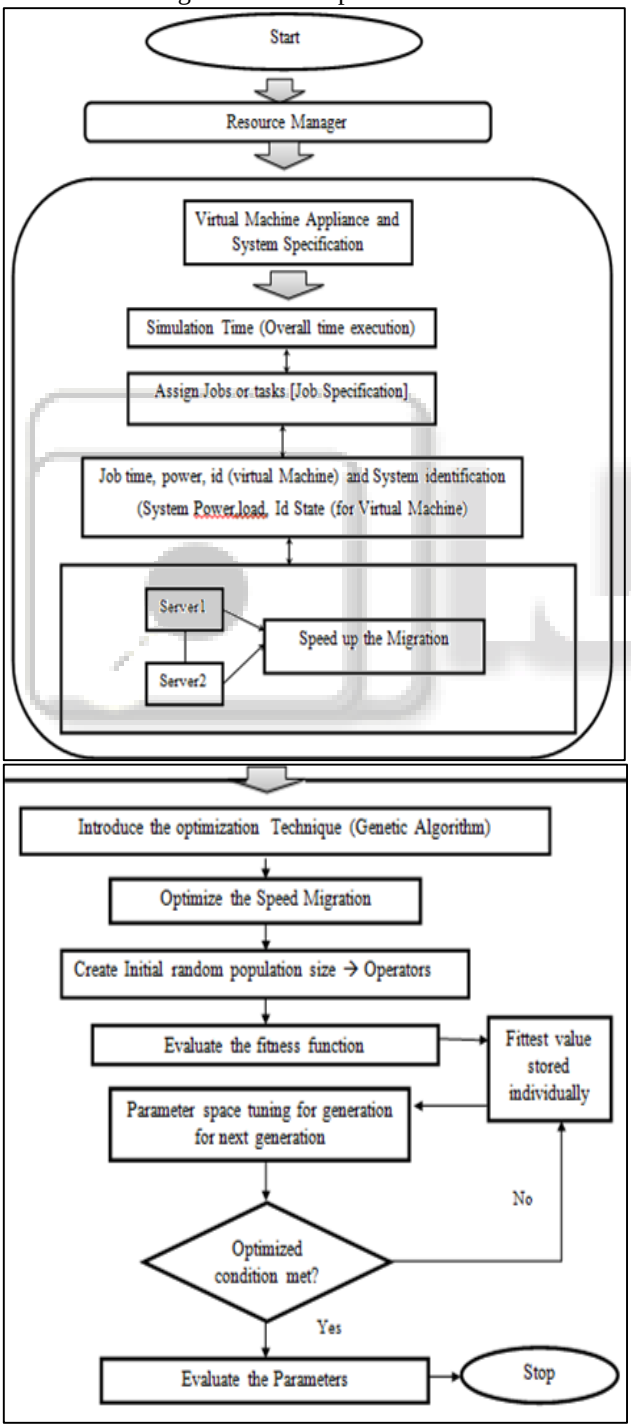

Fig. 4: Methodology

IV. Conclusion

In this paper we have taken Genetic algorithm into consideration by replacing the already existing techniques. The system was planned with the prime focus on optimization so as to achieve accurate results.

References

[1] Ian Foster, "Developing Models", http://www.mcs.anl.gov/~itf /dbpp/text/ node29. html, last accessed on 31 july,2013.

[2] K.Ye, D.Huang, X.Jiang, H.Chen, S.Wu, "Virtual Machine Based Energy-Efficient Data Center Architecture for Cloud Computing: A Performance Perspective", IEEE/ACM International Conference on Green Computing and Communications, 2010, pp.171-178.

[3] DivyaKapil, Emmanuel S. Pilli and Ramesh C. Joshi "Live Virtual Machine Migration Techniques: Survey and Research Challenges" Proceedings of 2012 IEEE and 2013 3rd IEEE International Advance Computing Conference (IACC).

[4] Goldberg, David E., and John H. Holland. "Genetic algorithms and machine learning." Machine learning 3.2 (1988): 95-99.

[5] Hu, Jinhua, et al. "A scheduling strategy on load balancing of virtual machine resources in cloud computing environment." Parallel Architectures, Algorithms and Programming (PAAP), 2010 Third International Symposium on. IEEE, 2010.

[6] D.Jayasinghe, C.Pu, T. Eilam, M.Steinder, I.Whalley, E.Snible, "Improving Performance and Availability of Services Hosted on IaaS Clouds with Structural Constraint-aware Virtual Machine Placement", IEEE InternationalConference on Services Computing, 2011, pp.72-79.

[7] Frank Schulz , "Towards Measuring the Degree of Fulfillment of Service Level Agreements", Third International Conference on Information and Computing, 2010,pp.273-276.

[8] Grace Lewis, "Basics about Cloud Computing", Software Engineering Institute, September 2010.

[9] RaghavendraAcharet. al. "Load Balancing in Cloud Based on Live Migration of Virtual Machines" 2013 Annual IEEE India Conference (INDICON).

[10] Bäck, Thomas. Evolutionary algorithms in theory and practice: evolution strategies, evolutionary programming, genetic algorithms. Oxford university press, 1996.

[11] .S.Cheten, J. J.Geevarghese, Karthik R, "Placement Algorithm for Virtual Machines", 2010, pp.1-6.

[12] S.Esfandiarpoor, A.Pahlavan, M.Goudarzi, "Virtual Machine Consolidation for Data center Energy Improvement", Computer Engineering Department, Sharif University of Technology, Tehran, Iran,9 feb 2013.

[13] C.Lin, P.Liu, J. Wu, "Energy-Aware Virtual Machine Dynamic Provision and Scheduling for Cloud Computing", IEEE 4th International Conference onCloud Computing, 2011, pp.736-737.

[14] A. A. Patel, J. N. Rathod, "Reducing Power Consumption & Delay Aware Resource Allocation in

Cloud Data centers", Journal of Information, Knowledge and Research in Computer Engineering, V.02, 2010, pp.337-339.

[15] B.Wei, C.Lin, X.Kong, "Energy Optimized Modeling for Live Migration in Virtual Data Center", International Conference on Computer Science and Network Technology, 2011, pp. 2311-2315.

