LOAD BALANCING USING IMPROVED GENETIC ALGORITHM (IGA) IN CLOUD COMPUTING

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Abstract- Nowadays, cloud computing is rising field in information technology, next generation of computing. It provides large scale measure of computing and storage Service gave to users through the online which follows pay-as-you-go model. In cloud computing, the applications and services are provided over the online. the numerous users send requests for accessing resources and applications. Such sizable amount of requests increase the load on the cloud. For balancing the load, an Improved Genetic Algorithm (IGA) has been introduced during this paper for allocating the user's tasks to the virtual machines (VMs). The algorithm thrives to balance the load of the cloud infrastructure at the same time as trying minimizing the make interval of a given tasks set. The proposed load balancing approach has been simulated using the CloudAnalyst simulator. Si-mulation results for a classic sample application shows that the proposed algorithm outperformed the prevail-ing approaches like First Come First Serve (FCFS), Round Robing (RR) and a part search algorithm Stochastic Hill Climbing (SHC).

Index Terms— Cloud computing; virtual machine resources; load balancing; genetic algorithm; scheduling strategy

INTRODUCTION

Cloud computing has become the foremost popular way within the recent time to access online computing resources and user fulfilment in a very low cost manner. Because it allows user to access pool of resources and provides a straightforward thanks to storage of knowledge in keeping with its re-quirement pay per use concept without worry about the hardware needed. The cloud supports the virtuali-zation concept which shows virtualized data centres. Cloud computing provide various advantages over the standard computing in terms of security, reliability, scalability, fault-tolerance. Basically cloud computing provides three sorts of services, which are application, platform and infrastructure. These services is ca-tegorized into three types, namely, software-as-a-service (SaaS), infrastructure-as-a-service (IaaS) and platform-as- a-service (PaaS). The main objective behind load balancing is to distri-bute the local workload to entire cloud. Load balanc-ing is centralized or decentralized. Load balancing is that the approach of redistributing the entire load into separate nodes to ensure that no node is overloaded, doing little work, or idle. Load balancing qualifies system assets for best reaction and presentation and provides high gratification to end user. As a result, providing effective load balancing techniques is vital to the success of cloud computing. Balancing became one in all the mandatory interest in cloud computing since it's unimaginable to predict the requests number that's rolled at each second. the shortcoming to predict is because of changing the behaviour of the cloud. Therefore, load balancing algorithms is classified looking on the system state as static and dynamic.

This paper introduces an improvement to load balancing. A Load Balancing algorithm is proposed to improve Load Balancing in a heterogeneous cloud computing environment through improving the overall response time, DC Processing Time, and the maximum resource utilization.

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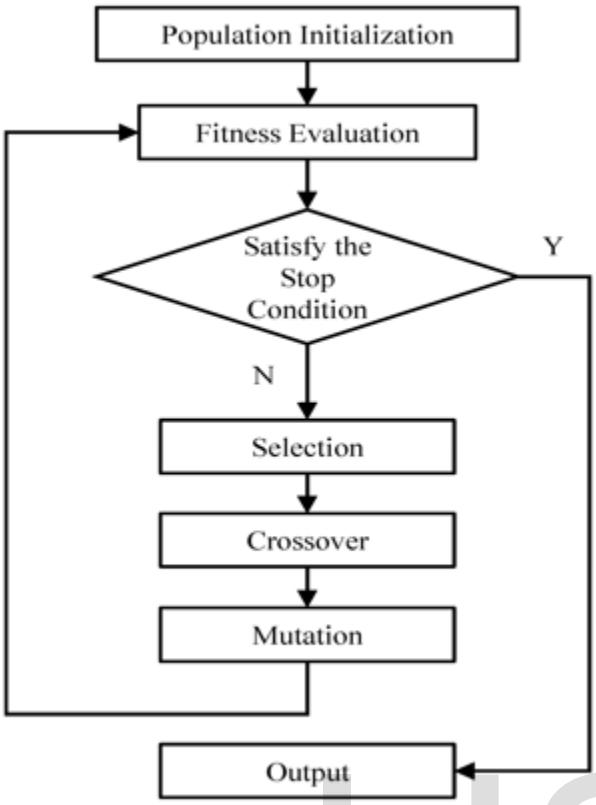
METHODOLOGY:



Existing Genetic Algorithm:

A simple Genetic Algorithm (GA) consists of three operations: initial population generation, mutation, and crossover. These operations are explained below:

1. Initial population
2. Fitness function
3. Selection
4. Crossover
5. Mutation

Initial Population

The process begins with a collection of people which is named a Population. Each individual may be a solution to the matter you would like to resolve. a personal is characte-rized by a collection of parameters (variables) called Genes. Genes are joined into a string to create a Chromosome (solution)

Fitness Function

The fitness function determines how fit a personal is (the ability of a personal to compete with other individuals). It gives a fitness score to every individual. The probability that a personal are selected for copy relies on its fitness score.

Selection

The idea of selection phase is to pick the fittest individuals and allow them to pass their genes to the following gener-ation. Two pairs of people (parents) are selected supported their fitness scores. Individuals with high fitness have more chance to be selected for copy.

Crossover

Crossover is that the most important introduce a genetic algorithm. for every pair of fogeys to be mated, a crossover point is chosen haphazardly from within the genes.

Mutation

In certain new offspring formed, a number of their genes may be subjected to a mutation with a coffee random probability. this means that a number of the bits within the bit string may be flipped.

In the existing algorithm the matter of load balancing is defined for allocating N number of user tasks to M number of virtual machines. Two vectors are considered: one is processing unit vector (PUV) which represents processing unit's current status and other one is job unit vector (JUV) which represents the user tasks. PUV vector contains MIPS which signify mil-lion instructions executed by that machine per second, α, cost of execution of instruction and delay cost L [1]. the value function is calculated using the subsequent equation:

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Cost=w1*ProcessingCost()*(NIC/mips)+w2*Delaycost();
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Where, NIC denotes the quantity of instructions present within the job, w1 and w2 are predefined weights. The weights are considered as w1 = 0.8 and w2 = 0.2 such their summation is 1. This algorithm allo-cates the simplest suitable virtual machine to employment.

Figure: Flowchart of Genetic Algorithm

The Proposed Improved Genetic Algorithm (IGA):

The existing Genetic Algorithm balances the load in cloud computing by transmission tasks to the virtual machines. But it isn't effective in resource utilization which suggests it fails to utilize all the available virtual machines. It repeatedly assign tasks to variety of the VMs. thanks to which some machines remains idle while some machines are overloaded. The resources don't seem to be properly utilized. So this problem is tackled by mod-ifying this algorithm. The proposed Improved Genetic Algorithm keeps path of all the free virtual machines. When a replacement task arrives, first it's checked that whether a free machine is obtainable or not and if a machine is obtainable then task is assigned thereto par-ticular machine. If no free virtual machine is obtainable then the task is assigned thereto machine whose current task goes to be completed in lesser time as com-pared to other machines. The cost is improved by making the next changes within the price function:

Cost=w1*ProcessingCost()*(FreePesGenetic() /NumberOfPes())+w2*Delaycost()

Where the values of the weights w1 and w2 are the identical as of the bottom Genetic Algorithm which are w1 = 0.8 and w2 = 0.2. The Improved Genetic Algorithm gives better output in terms of energy efficiency, cost and also all the VMs are allocated tasks in such how that the load is correctly balanced.

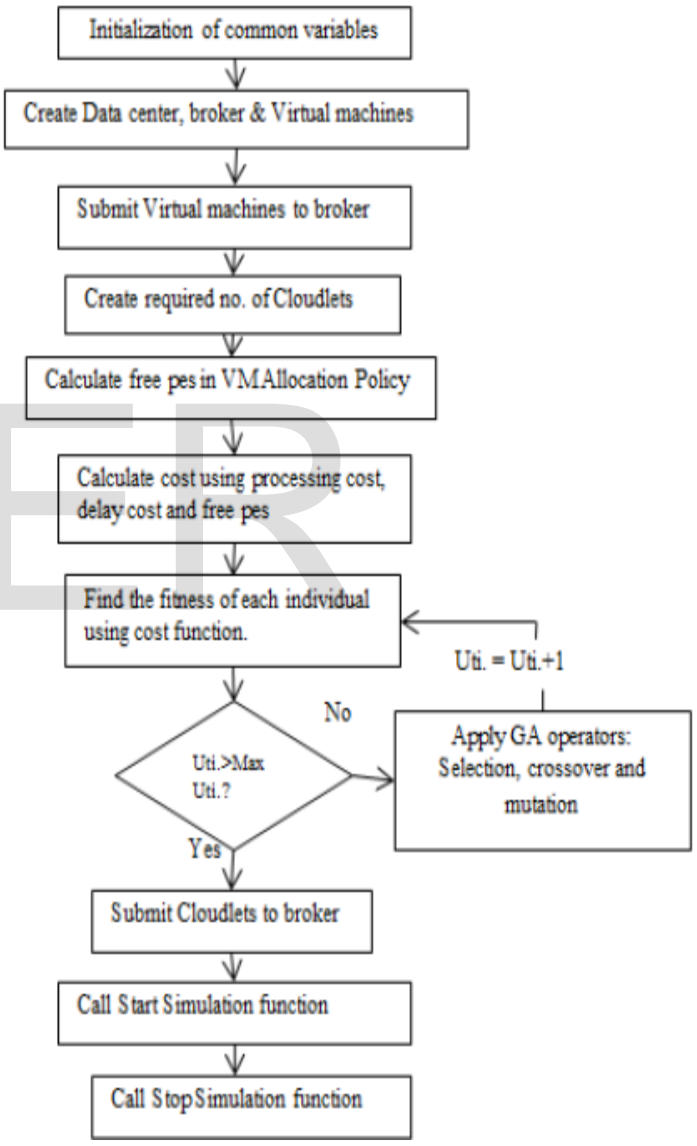

Figure: Flowchart of Steps for Improved Genetic Algorithm

Cloudlets are the user tasks.
Uti: Utlization

pes: processing elements

CONCLUSION:

The cloud computing has the dynamic nature and thanks to which cloud network has various issues like securi-ty, quality of service and fault occurrence, etc. The load balancing is that the major issue of cloud network which reduce its efficiency.

The existing Genetic Algorithm balances the load in cloud computing by assigning tasks to the virtual machines. But it's not effective in resource utilization because it fails to utilize all the available virtual machines. This difficulty is tackled by proposing an Improved Genetic Algorithm (IGA). The Improved Genetic Algorithm gives better output in terms of energy efficiency, cost and also all the VMs are allocated tasks in such some way that the load is correctly balanced. The graphical representation of the simulation results show that the Improved Genetic Al-gorithm is more efficient than the present Genetic Al-gorithm in terms of several parameters used. These parameters include energy efficiency and price. The graphical outcome clearly depicts that every one the VMs are allocated to the cloudlets in Improved Genetic algorithm while in Genetic Algorithm some VMs don't seem to be allocated to any of the Cloudlet. In future, Improved Genetic Algorithm should be implemented in actual instance environment. This algorithm are often further improved in terms of time interval and finish time etc.

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