International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 10 Oct 2023, pp: 198-201 www.ijaem.net ISSN: 2395-5252

Dynamic Resource Allocation Scheduler in Cloud Computing using MOO and GA

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Date of Submission: 20-10-2023 Date of Acceptance: 30-10-2023

ABSTRACT: One of the areas of the many computer science-related disciplines where cloud computing may be used is for on-demand dynamic resource allocation to give customers dependable, assured services. Dynamic resource allocation should be carried out in a way that minimizes energy use and resource waste. The evolutionary algorithm idea with many objectives is significantly quicker than conventional other algorithms for resource prediction and allocation when it comes to scheduling dynamic resources for maximum resource utilization. This paper offers a thorough explanation of the dynamic resource allocation scheduling approaches for cloud computing, and the comparison analysis offers the precise information about the various approaches

KEYWORDS: Dynamic Resource Allocation, MOO- multi objective optimization, GA – genetic algorithm. VM- virtual machine, PM- physical machine

I. INTRODUCTION

1.1 Cloud computing : Without physically being present at the customer's location, cloud computing delivers computing resources like CPU, memory, and RAM across a network. Computing resources are made available as a service through cloud computing. It includes three different service kinds, including software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).And all of these services are offered on one of the four different types of clouds: public, private, hybrid, or community.

1.2 Dynamic Resource Allocation scheduling: In cloud computing, many cloud users submit a variety of service requests in response to their continuously changing demands. Therefore, it is the responsibility of cloud computing to provide all of the desired services to cloud users. According to the cloud service providers, cloud resources must be allocated in a reasonable manner. Additionally, it is appealing to prevent resource waste due to under- and over-utilization, as well as to prevent slow reaction times. Regarding the assignment of dynamic resources, there are a number of problems, including Resource Provisioning, Job Scheduling, Resource Overbooking, Scalability, Load Adjusting, Pricing, Availability, Overheads in Network I/O Workloads, and Quality of Service (QoS). The resource is handled by the dynamic resource allocation scheduler to get the most extreme

II. EXISTING METHODS FOR DYNAMICRESOURCEALLOCATIONSCHEDULER

Dynamic Resource Prediction and Allocation for Cloud Data Centre Using the Multi objective Genetic Algorithm[1]
In this system it works with MOO formula, proposed GA and VM placement algorithm.
Where,

MOO: Formulate maximizing both CPU and memory of each active PM and minimizing the energy consumption of data canter.
The MOO problem of resource allocation in data center is defined as follows:

$$\mathbf{G(x)} \begin{cases} \mathbf{g1(x)} = \mathbf{g_{cpu}\,(x)} = \mathbf{max\ C^{avg}} \\ \mathbf{g2\,(x)} = \mathbf{g_{memory}\,(x)} = \mathbf{max\ M^{avg}} \\ \mathbf{g3\,(x)} = \mathbf{g_{energy}\,(x)} = \mathbf{min\ E} \end{cases}$$

III. PROPOSED SCHEME

As mention above work they didn't calculate any function regarding storage. Storage is also one kind of resource which should be utilize maximum. So I added storage calculation in MOO problem for getting maximum storage facility and also use MFD technique which makes easy and

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faster initialization of GA.So, in these proposed work we have done following two task

1 Applied MFD before GA initialization
2 Added storage calculation using MOO in fitness function

The fitness function chromosome is designed to fit in with the survival of the fittest. It represents the deviation between prediction and reality, which is designed as follows:

FC (t) =α fcpu (t) +β * fmem (t) + γ * feng (t)

Where,

fcpu (t) = |Cavg(t') – Cavg (t)|

fmem (t) = |Mavg (t') – Mavg (t)|

feng (t) $= \frac{|E(t')-E(t)|}{Emax} * 100\ \%$

by adding storage calculation in fitness function and it is like

fstorage (t) = | savg (t') – savg(t)

PROPOSED ALGORITHM:

STEP1: Get VM details, PM Details
STEP 2: Apply MFD
a. Sort PM List (Increasing order)
b. Sort VM List (Decreasing order)
c. Apply First Fit
STEP3: Apply GA for VM Placement
a. Use Output of First fit as Initial Population.
b. Follow algorithm 2 for VM placement.

ALGORITHM 2: VM Placement Algorithm.

Input: V, P, $_{Cmax}$,M_{max}, E_{max}, S_{max}

1 Ω1 = vm, Ω2 = pn, Δ= ϕ
2 while Ω2 ≠ ϕ
3 repeat
4 y = f (j) = max$j\epsilon$ {1….n}[Cmax -pjcpu) +(Mmax -pjmem)] + [smax – pjstorage]
5 y∗ = arg max f (j)
6 S = fd (Ω2, pj, y∗)
7 Δ=ΔU S [1]
8 if (pS[n] CPU <Cmax) and (p S[n]mem <Mmax)
9vi,j = vi,n
10 pS [1] = ϕ
11 end if
12 until vi,j =Δ
13 end

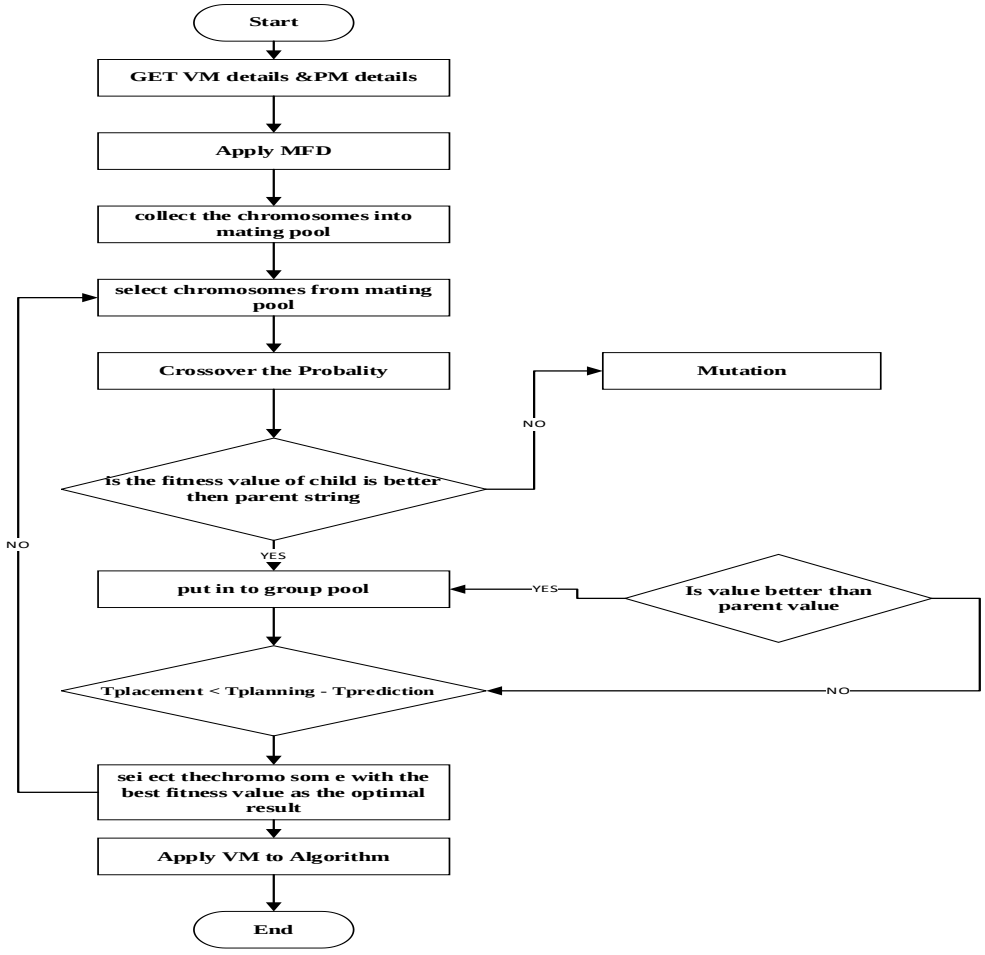

Fig. 1: Flowchart for Proposed Algorithm

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IV RESULT

CloudReports is a graphic tool that simulates distributed computing environments based on the Cloud Computing paradigm to enable researchers to model multiple complex simulation scenarios through an easy to use graphical user interface. The application simulates an Infrastructure as a Service (IaaS) supplier with a subjective number of datacentres. Each datacentre is totally customizable. The client can effectively set the amount of computational nodes (hosts) and their resource setup, which incorporates handling capacity, sum of Ram, accessible bandwidth, power utilization and scheduling algorithms. Those clients of the IaaS provider require help moreover reproduced besides really movable. The client seem arranged those number from claiming virtual machines each client claims, a specialist liable for designating these virtual machines Besides resource utilization calculations. Each virtual machine require its claim setup that comprises for its hypervisor, picture size, planning calculations for assignments (here known as cloudlets) moreover required changing capacity, Ram What's more data transfer capacity.

Upon implementing the suggested algorithm using the cloudReport simulator, we obtained the following outcomes. Incorporating MFD within GA led to an enhanced overall utilization of CPU, memory, and storage, alongside a reduction in energy consumption. Additionally, it resulted in an increase in the resource allocation's execution time.

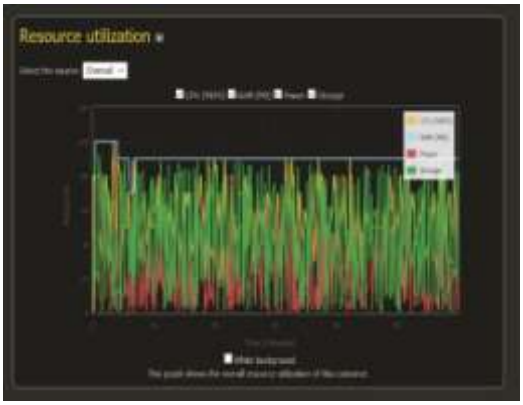

Fig 2 : overall Resource Utilization

Execution time Analysis :

Here, we compare the execution time of Normal GA and GA with MFD. Average value of execution time of GA is shown in following graph**.**

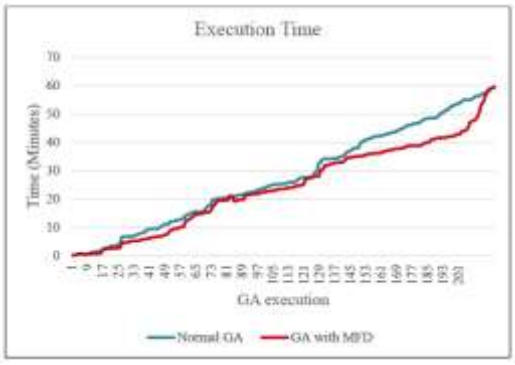

Fig 2: Execution time analysis

V CONCLUSION

Allocating resources is a critical endeavour in the realm of cloud computing. The total cost is determined by how efficiently resources are employed, making maximum utilization imperative. Tackling the complexities inherent in cloud resource optimization, we've introduced a Genetic Algorithm (GA) combined with the Multi-Objective Fitness Distribution (MFD) to expedite GA execution within cloud data centers. We've also integrated a storage function into the multi-objective framework and applied it to our Virtual Machine (VM) placement algorithm, thereby enhancing average resource utilization and diminishing energy consumption in data centers, leveraging predictive outcomes from GA.

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