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A Study On Integration Of Elastic Optical Networks Into Virtual Networks With Cloud Computing

Research Scholar - Nagul Meera Sayyed[1], Dr. Pramod Pandurang Jadhav[2]

Department of Computer Science & Engineering, Dr. A.P.J. Abdul Kalam University, Indore (M.P.) - 452010

Abstract

In elastic optical networks, a frequency is partitioned into recurrence spaces (FS) and optical signs are exchanged at numerous FS stretches. In this paper, we Propose a unique virtual organization implanting calculation to diminish the dismissal pace of virtual optical Network demands us and arising Internet applications are increasingly turning out to be superior execution and organization based, depending on optical organization and cloud computing administrations. Because of the sped up advancement of these applications, the flexibility and efficiency of the underlyingopticalnetwork foundation as well as the cloud computing in-restructure [i.e., server farms (DCs)] become more and more significantTo look at the exhibition of this proposed work, the Cloud Load Distribution Variance is broke down with 50 cycles and the comparing results are introduced and the individual qualities are classified.

Keywords: optical networks,virtual networks,cloud computing, organization, Cloud Load

1. Introduction

1.1 Title Definition

To improve resource consumption in a Cloud IaaS setting, the authors here design and create an Elastic Resource Framework with powerful algorithms. The elasticity of a cloud infrastructure allows for its resources to be expanded or contracted as needed. (et.al, 2017) The resources in a cloud computing environment are pooled, non-standard, and can be accessed from any device. If cloud resources aren't shared properly, there will be a catastrophic waste of materials. The goal of this study is to supply cloud servers with resources efficiently in response to requests from cloud users and the availability of those resources, and elastic resource allocation with the aid of scheduling is discussed to achieve

this goal. In order to guarantee that cloud resources are distributed flexibly among servers, those in charge of scheduling do so by taking a cloud elasticity approach, which is based on the Cloud Computing environment. This is done by increasing Resource Utilization, boosting Cloud Load Distribution, decreasing the number of VM migrations, and shortening Response Time.

1.2 Background of Issue/ Problem

In Mobile Cloud Computing, an effort has been made to, using a mobile ad hoc network, discover the effects of mobility. Better computational processing could be offloaded from mobile devices to a cloud server by employing offloading strategies. (al, 2018)To overcome this scalability barrier, W. Min et al. presented the Particle Swarm Optimization technique, which is grounded in the concept of a "domain partition." However, the present mobility paradigm for locating the ODC did not deliver the expected results. Mobile cloud optimises power consumption by matching spots along a cell-ID sequence with the distance travelled. However, when determining the best Datacenter from which to allocate resources, the works did not prioritise QoS factors.

1.3 Basic Concepts of the Subject related to work

Cloud Computing stand out enough to be noticed in the business area as of late. It is another plan of action zeroing in on asset on demand, pay-more only as costs arise and utility computing It alludes to a cooperative Data Technology (IT) climate, which is arranged with the goal of quantifiable and remotely providing adaptable IT assets for compelling and proficient use The fundamental inspiration for business associations to think about making another one or moving their current computing foundation on top of Cloud Computing framework is the adaptability it guarantees to give also, their rating model

The fundamental contrast between a Cloud Computing approach and a traditional methodology is fixed foundation. Cloud is utilizing each assistance on the web where as traditional methodology is utilizing a proper foundation. (A.Tzanakaki, 2017)In old style approach, the associations initially contribute specific sum for equipment and programming for offering support in light of their client prerequisites.

Be that as it may, to foresee the clients administration or dynamic responsibility is very troublesome in a brief timeframe. (al C. C., 2018) The association takes a chance with that it

will either pay sum for extra equipment assets then again that the assets may not be sufficiently adequate to fulfil the responsibility interest as of now, the association might get the opportunity to deter potential clients in light of the bad Quality of Service (QoS).

1.4 Key concept on which further work will be carry out

Overseeing assets is a significant test in Cloud Computing and it makes cloud suppliers and heads to devote more power on getting to the next level the asset usage while using cloud assets like VM, stockpiling, memory, processor, transfer speed, stage and application. In addition, to deal with assets in elastic way is another difficult errand. Previously, asset allotment is finished with the assistance of versatility procedures. (El –Samie, 2019) In place of truth, the significant component in cloud is the elasticity, which supplies cloud assets in an elastic way as for the interest responsibility changes. Elasticity upholds the capacity to increase and downsize the cloud framework assets. Cloud Computing assets are shared, heterogeneous and stage autonomous. Thus, the assets will be most certainly crushed if the cloud assets are not partaken in correct request. Asset designation is a huge way to deal with further develops asset usage in cloud and portable cloud climate.

2. Review of Literature

These days, the vast majority of the associations are moving towards Cloud Computing climate for overseeing on-request prerequisite of clients. The associations utilize rental assets as opposed to purchasing extra assets. (G. Keiser, 2019) Distribution of Virtual Machines in view of the essential of cloud clients is a testing pivotal errand in cloud benefits particularly in Infrastructure as a Administration. At the point when the solicitations for Virtual Machines are either expanded or diminished, the assets must be adjusted to achieve ideal asset use. In this section, a broad writing study on the different asset allotment procedures utilized in typical Cloud and Mobile Cloud It is introduced to compute climate.

2.1 Basic research work that establish some basic or key theorems or laws

(Pursue, et al. 2016) considered the difficulties towards energy arranged homogeneous asset the executives in cloud. The principal objective of the work was to give on-request assets to the client's necessity in the most helpful way. (G. Zhang, 2018)Estimating the utilizations of assets is vital in request to compute elastic asset utilization rating for giving best evaluating model to cloud clients. The suppliers had utilized the charge-back model which is liable for

surplus capacitance required to help an on-request shared utilization.Elasticity is one of the focal aspects in Cloud Computing which keeps up with great affinity with cloud clients and suppliers. RajkumarBuyya, et al. zeroed in on the dealing with and observing of cloud assets energy utilization in view of elasticity.

(Zhu, et al. 2015) depicted the asset limit and cloud responsibility conspires, which consolidates different asset restrainers in mechanized asset designation way by applying three flexible time scales and degrees. Three sorts of time scales, for example, most limited time scale, more limited time scale and longest time scale were utilized in the work. The regulators specifically, hub regulator, unit regulator and case set regulator were intended to oversee Virtual Machine asset portion and responsibility movement. (J. Sócrates-Dantas et al., 2018)Also, they thought on applying different limit methods for dynamic responsibility varieties in cloud.There are different efforts used to scale elastic cloud application systems P. Martin, 2011 which lighten elastic asset utilization utilizing elastic administrations in cloud. These systems were created to deal with elastic administrations in view of autonomic computing statutes and proficiencies. Notwithstanding, there were no prescient procedures used to deal with asset portion and make due enormous amounts of information in elastic cloud administrations.

2.2 Work in the relevant field

(A. Vouk 2008) researched load adjusting as the principal challenge of Cloud Computing. (Jinno, 2019)It was broadly taken by the undertakings and the scholarly community to use assets in a viable manner.

(Duy, et al. 2009) proposed asset expectation of host load use level utilizing Back proliferation Artificial Brain Network (ANN) expectation approach. Planning Virtual Machines involving Genetic Algorithm in cloud was proposed by Gu, et al. [60] and it was contrasted and Least-load strategy.

(Yang Xu, et al. 2008) proposed another model for load adjusting to improve the presentation of Cloud Computing in circulated application level. Four distinct asset designation approaches and three calculations were made sense of by (K. Abedin et al., 2016)these methodologies were state based, precautionary, non-replanted and model based. The goal is to limit the correspondence working expense of closeouts in both non replanted and state based framework model.

2.3 Common methodology / experimental setup/ materials, in others work

BadrOuladNassar (2018) To reduce the number of denied requests for virtual optical networks, we present a technique for dynamically embedding virtual networks. In this paper, we outline four distinct node mapping strategies. The primary path, the shortest route between mapped nodes, is determined during link mapping. Path splitting is executed and FSs are assigned at links in primary and alternate paths if there are insufficient FSs. For NSFNET and ARPA2, we simulate the use of path splitting and assess its efficacy.

Peng et al. (2013), discusses the function of high-performance dynamic optical networks in cloud computing settings. It is envisaged that data centres in the cloud eventually take the form of a service. The suggested architecture relies heavily on the synchronised virtualization of optical networks and information technology resources of remote data centres (DCs) (VIs). The specifics of optical networks (such optical layer restrictions and impairments) are considered and dealt with during the composition process of the various, coexisting but separate VIs. (K. Christodoulopoulos, 2020) In this section, we compare the performance of the suggested VI composition methods over a range of network topologies and application contexts.

In nearby view L. Yang, 2012 the asset parcel and offloading assurance for each cloudlet or work were independently handled to decrease handling cost in cloud as opposed to customary information transmission.

2.4 Tool used in past to solve similar problems and their results

BadrOuladNassar (2018) through numerical analysis, we can see that path splitting effectively lowers the rejection rate. (M. Jinno et al., 2019)At the end of the day, the lowest rejection rate is achieved by the LLNL method, which takes both node and link resources into account.

Peng et al (2013) The findings produce a set of rules for the providers of optical networks and DC infrastructure to follow in order to effectively and optimally supply VI services to customers and meet their needs.

In worldwide view approach L. Yang, J 2012 asset calculation parcel and off loading components were interlinked with each cloudlet in the application. Parcelling and offloading

difficulties in versatile cloud climate are melded as advancement issues where these issues were planned to centre around the elements, for example, energy usage cost, information transmission cost, booking standards and dormancy. (M. Jinno, 2020)Versatile cloud calculation parcelling and offloading issue were thought about from the perspective on single client to save energy usage and to further develop application exhibitions.

The current strategies which were applied for elastic asset allotment were viewed as deficient in taking care of difficulties, for example, apportioning, offloading, asset designation in IaaS and responsibility assessment. Subsequently, this work has been spurred to zero in on these issues and especially, this examination work focuses on the productive asset allotment in IaaS with elasticity.

2.5 Research gap

A research gap is an inquiry or a problem that has not been replied by any of the current examinations or research inside your field. (M. Pickavet et al., 2017)Once in a while, a research gap exists when there is an idea or novel thought that hasn't been learned by any stretch of the imagination. There is limited number of existing studies available on this topic. So the main aim of this study to discuss integration of elastic optical networks into virtual networks with cloud computing in which we cover all the aspects of the variables.The foregoing review of literature focuses to the limited number of studies on elastic optical networks into virtual networks with cloud computing, so forth Studies on guidance are discovered to be specific regarding center around parts of guidance on elastic optical networks with cloud computing, among specific objective gatherings.

2.6 Problem Statement

Cloud clients as well as cloud specialist co-ops are developing tremendously, consistently in the Internet world and thusly the cloud climate turns out to be exceptionally unique in nature as far as the client demand and the accessibility of assets. (O.Pedrola, 2017) This elevated degree of instability makes the asset the executives in Cloud Computing as a perplexing issue. Further, guaranteeing the security of the cloud framework is troublesome under the elevated degree of clients demand also, besides, it makes hard to ensure the elasticity in cloud. Existing research work on asset portion had neglected to focus on the elastic asset allotment in cloud IaaS Environment and has a few downsides. Consequently, the elastic asset assignment issue is engaged in this work. Lining models were utilized in asset scaling

techniques which contains three levels, for example, data set, capacity plate and application. Each level is utilizing lining model outcome examination which estimates Throughput, Response Time and Asset Utilization of a cloud server.

2.7 Objective of work

- To Improve Cloud Load Distribution Variance.
- To propose a framework called Elastic Resource Framework (ERF) which uses vertical and horizontal elastic resource allocation techniques to improve resource utilization in both Cloud and Mobile Cloud Computing environment.

3. Research Methodology

The strategies proposed for the versatile asset designation in Cloud Computing climate.

3.1 Details of experimental setup and material/ instrument used

The proposed system focuses on working on the flexible asset portion in ordinary Cloud and Mobile Cloud Computing climate. There are three sorts of cloud administrations like IaaS, PaaS and SaaS in Cloud Computing climate. Asset portion is one of the significant difficulties in IaaS, in which versatility assumes a fundamental part to make due cloud IaaS assets. Particularly in IaaS, portion and timetable of VMs in light of the essential of cloud clients is a difficult pivotal errand in cloud administrations.

This exploration work proposes an Elastic Resource Framework (ERF) which contains Vertical Elastic Resource Allocation Technique (VERAT), Flat Elastic Resource Allocation Technique (HERAT) and Mobility Based Cloudlet-Optimal Data enter Allocation Technique (MBC-ODCAT) to further develop asset use in Cloud and Mobile Cloud Computing climate. In addition, this system contains versatile burden balancer, improved heuristic scheduler, client versatility example and flexible need asset allocator.

VERAT

In VERAT, proficient cloud asset distribution is finished utilizing Enhanced Hereditary Algorithm, which coordinates to achieve better virtual machine distribution across cloud servers by giving vertical flexibility. The EGA furnishes proficient burden appropriation with vertical flexibility in Cloud Computing climate. The proposed approach centers around the

VM Scheduling with the backing of vertical flexibility to further develop asset distribution in Cloud Figuring.

HERAT

HERA Technique utilizes Adaptive Fuzzy Multi Objective Genetic Calculation (AFMOGA) for proficient asset assignment utilizing Horizontal Flexibility approach This proposed procedure centres around limiting the Cloud Load Dispersion Variance and amplifying the Resource Utilization Rate. The proposed work likewise utilizes the even flexibility rather than vertical flexibility for the dealing with the client demands which lessens the expense for cloud specialist co-ops as well as cloud clients.

3.2 Details of new amendment in material/ design/ or mathematical correlation/ Chemical formula/ parts or product design as per new research requirement

Three distinct calculations are proposed in this work to be specific, Enhanced Hereditary Algorithm (EGA), Adaptive Fuzzy Multi Objective Genetic Algorithm (AFMOGA) and Mobility Based Cloudlet-Optimal Data enter Allocation Calculation (MBC-ODCAA). Initial two calculations are applied for effective asset portion in typical Cloud Computing climate. The third calculation is applied for finding the ideal data enter and allots assets for portable clients in Mobile Cloud climate. Appropriate trial and error and correlation are convinced to assess the presentation of proposed methods.

The asset designation issue is formed as allocating „N‟ number of VMs demands presented by cloud clients to „M‟ number of servers in the Cloud Computing framework. Each cloud server will have handling unit and memory usage vector showing current memory and handling unit usage status. Each VM is dispensed by the server in light of SLA and asset accessibility of cloud supplier. There are different imperatives included on the allotment of VMs in the servers.

1. All VMs should be assigned in the given server

2. Each Virtual Machine kept up with by flexible line

3. Virtual Machine size to be facilitated ought to be not exactly the particular server size

4. One Virtual Machine ought to be set in one server

In this manner the issue of versatile asset designation in cloud is improved as an advancement issue for further developing the heap circulation is numerically communicated:

$$Minimize\ CLDV \sqrt{\frac{\sum_j m=1(AASS_j - AASS)^2}{m}} 3.1$$

Subject to,

$$AASS_j = Hs_j + AR_j \qquad \forall\, j$$

$$Hs_j = \sum_{i=0}^{n} X_{ij}\, B_{ij} \qquad \forall\, j$$

$$s_j \geq Hs_j \qquad \forall\, j$$

$$B_{IJ} = \{1\ if\ VM_i\ is\ running\ on\ Server\ 0\ Other\ wise$$

$$\overline{\boldsymbol{AASS}} = \frac{\sum_{j=1}^{m} AASS_j}{m}$$

Here, CLDV indicates the Cloud Load Distribution Variance, AASS alludes to the Actual Allocation Size of the Server variable which works out the size of running VMs and new approaching VMs of size in the wake of booking in cloud server. Sj signifies the leftover space in the cloud server j. ARj signifies the size of running VMs in server j. HSj alludes to the size of new demands of VM portion from holding up line or cloud client. Xij represents the memory space involved by VM I in server j. Bij is a double factor which demonstrates either the VM I is running on server j (1) or not (0). The reaction of VM asset designation on the accessible server is referenced as a timetable.

3.3 Implementation of methodology/ experimental setup establishment

Comparisons are made between the proposed algorithms and several already-existing methods in order to gauge their efficacy. Performance indicators such as Cloud Load Distribution Variance, Response Time, the number of migrated virtual machines (VMs), the amount of time such migrations took, and Throughput are used to evaluate the effectiveness

of the proposed approach. The diagram shows how ERF can be used in a Cloud Computing setting to make good use of available resources.

4. Experimental Study

The Cloud IaaS framework handles a few difficulties like asset designation, Virtual Machine distribution, versatility, resource usage, security etc. By and large, Cloud Computing research centres on these difficulties with different viewpoints.

4.1 Data generated through various experimentation

The Cloud IaaS handles the gigantic number of framework assets like very good quality servers, stockpiling supplies, organization arrangement, and so forth. Progressively, it handles the different jobs with on-request through unique furnishing or deprovisioning from cloud suppliers. Considering every one of these, to do the new tests in genuine Cloud Computing framework isn't basically imaginable. In this way, there is an interest for a decent test system for research trial purposes. One of the most mind-blowing test systems is Clouds which is a summed up recreation structure that grants reproduction, demonstrating and testing the cloud foundation and application administrations. The CloudSim toolbox gives displaying of Cloud Computing framework parts like Data enters, servers, Virtual Machines, booking mad provisioning approaches. It permits cloud client or specialist to test their administrations at liberated from cost, and see as the bottlenecks prior to sending on genuine Cloud Computing climate.

In addition, it is intended for breaking down various asset the executives techniques furthermore, booking calculations in Cloud Computing climate. In this part, the exhibition of proposed calculation is examined based on the reproduction results utilizing Clouds 3.0.3 test system. The class of Clouds test system is reached out to recreate the proposed calculation. The re-enactment was led on Intel(R) centre (TM) i5 processor 2.6 GHz, 8GB memory, windows 7 stage. This work thinks about Data enter, Servers, Virtual Machines, Processing speed from Clouds for execution examination of calculations. The servers are considered as assets and Virtual Machines are treated as occupations. The Clouds boundary setting is displayed in Table 1

Table: 1 Clouds Parameter

Parameter	Value
Number of Data Centre	2
Number of Host	6
Type of Management	Time Shared , Space Shared
Number of PE per Host	3-11
Host Memory (MB)	5.96-10241
Total number of VMs	11-52
MIPS of PE	1000-2100
Number of PE per VM	2
VM Memory (MB)	513-5096

5. Result and Discussion

This segment gives graphical portrayal of results acquired for the VERAT. The proposed EGA furnishes an effective asset assignment with vertical versatility in Cloud Computing climate.

5.1 Cloud Load Distribution Variance

To look at the exhibition of this proposed work, the Cloud Load Distribution Variance is broke down with 50 cycles and the comparing results are introduced in Fig. 2where the individual qualities are classified in Table 2. The Cloud Load Distribution Variance is continuously decreased which shows that the wellness is great

Table: 2 Variance in Cloud Load Distribution Evaluation

Cloud Load Distribution Variance	Iterations
5	0.1
10	0.15
15	0.2
20	0.25
25	0.3
30	0.35
35	0.4

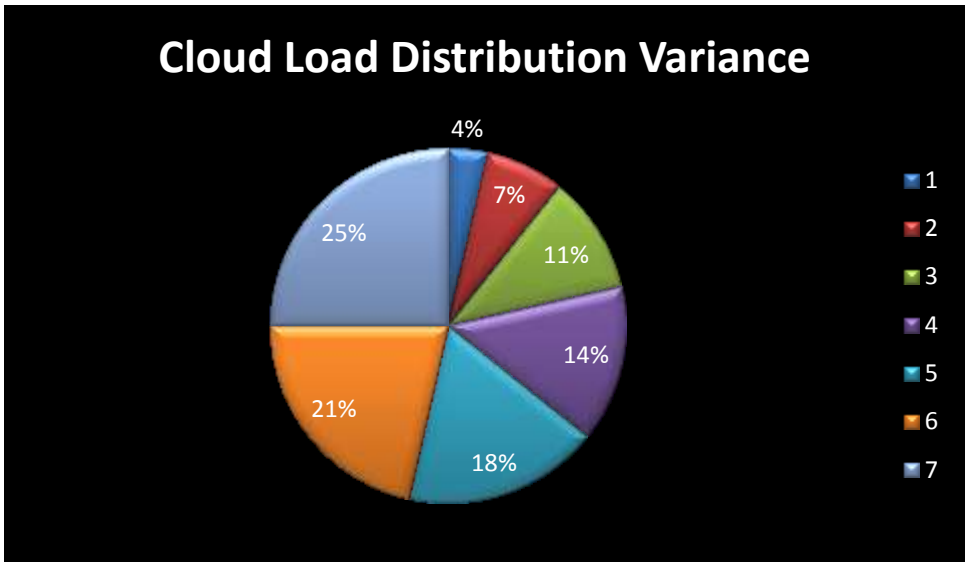

Figure: 1 Variance in Cloud Load Distribution Evaluation

5.2 Comparison charts and their analysis

Instead of comparing VERAT and HERAT, this study compares the proposed scheduling algorithms EGA and AFMOGA to the SGA and RRA that are already in use. In Fig.2, we see

how well four distinct algorithms—the AFOMGA, EGA, SGA, and RRA—perform in terms of minimising the CLDV value.

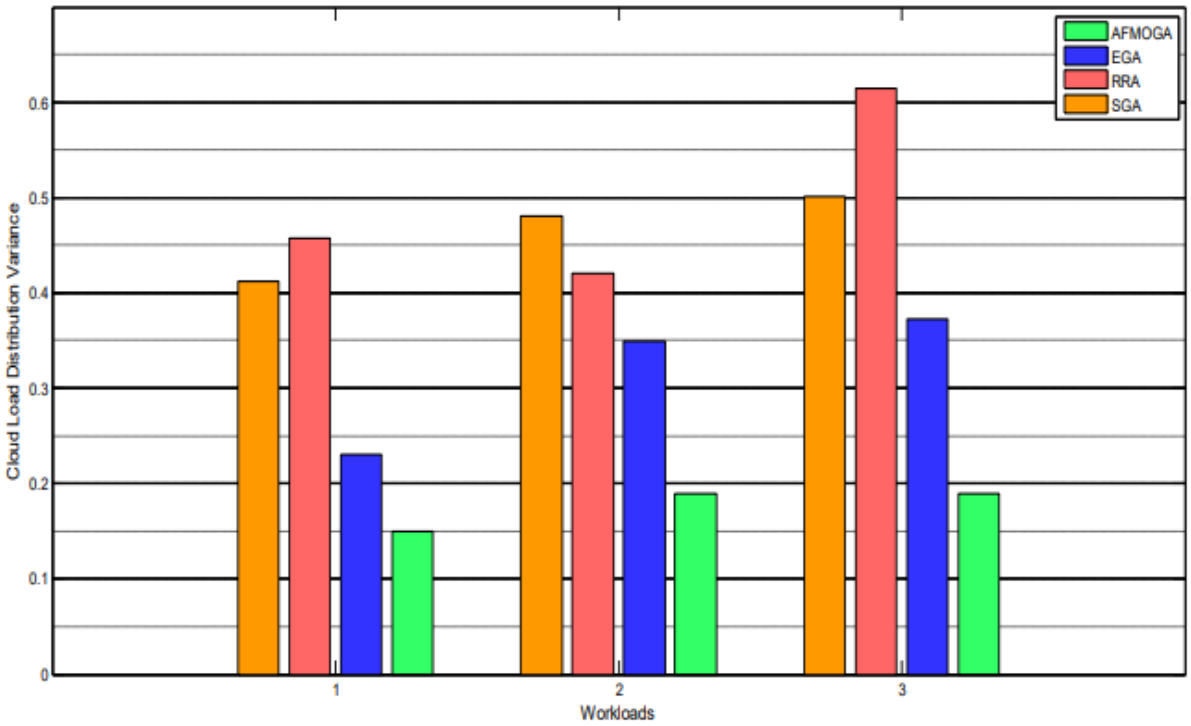

Figure 2 Cloud Load Distribution Variance for Various Workloads

Figure 2 shows that AFMOGA was able to reduce the CLDV value from 0.4600 in Workload 1 to 0.1499 in Workload 2 and from 0.6140 in Workload 3 to 0.1892 in Workload 2. Load distribution was improved by AFMOGA from 55% to 87% in Workload 1, and from 49% to 79% in Workload 2. These decreases in CLDV value reflect these increases. The workload 3 load distribution has also been enhanced, rising to 79% from 40%. Consequently, it is plain to see that the AFMOGA is superior to the other three algorithms across the board, while the EGA is superior to the SGA and RRA.

6. Conclusion

Large numbers of the associations are moving towards Cloud Computingclimate for their unmistakable organization necessities to think aboutthe on-request prerequisite of their clients. Flexible asset allotment in CloudFiguring worldview works with asset accessibility flexibly from anyplacefurthermore, whenever naturally. Flexible asset allotment assumes the vital part foroverseeing cloud assets proficiently, where the appropriate asset use is ansignificant issue to be tended to.

6.1 Quantitative display of results in order to justification of Research objective

In the main commitment VERAT, Enhanced Genetic Algorithm is proposedto distribute assets with the guide of vertical flexibility in cloud IaaS climate.Conversely, the level versatility is upheld in the subsequent commitmentHERAT where the Adaptive Fuzzy Multi Objective Genetic Algorithm isproposed for asset portion. At last, Mobility Based Cloudlet-OptimalData Centre Allocation Algorithm is proposed in commitment for seeing as theideal Datacentre and Cloudlet for Mobile Cloud Users.

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