Elastic Resource Management in Cloud Computing Environment –A Survey

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Abstract: For information technology services cloud computing has become a popular service provider, resources from the internet through web applications can be provided on-demand. The resource provisioning procedure becomes more challenging and hard now the days . Elasticity is also a major concern in the cloud environment due to increasing the user demands everyday, which provides the facility of remove and add resources frequently to overcome the load variation in cloud platform .To full fill the users demand and allocation of these resources appropriately, there are required a flexible and efficient mechanisms for this purpose. The main motive of this literature review is how to generate a better solution for this process.

IndexTerms **- Cloud computing, Elasticity, Systematic review, Challenges.**

I. INTRODUCTION

In recent years, CLOUD computing has become more popular and also a leading widely used technology in industrial as well as academic worlds [1]. The ability to provide the services according to the customer's needs so that customer can obtain resources dynamically and elastically [2] is the reason to increasing the demand of cloud platforms. Thus Elasticity is the main features that dynamically adjust the amount of allocated resources to fulfill the changes in demands of workloads in cloud computing technology. It is fact that it can provide resource flexibility to get customers need without obstacle at run time also. The cloud elasticity concept is the important power to grade down and grade up of system resources based on workload. For improving the quality of service (QOS) of cloud service the Elasticity maintenance is very important. Even though the concept of elasticity is frequently related to the scalability but both are different and cannot relate to each other, an elusive difference occurs between the cloud elasticity and cloud scalability [3]. By observing the time interval the common and easy way to evaluate the differences between elasticity and scalability. For determining the processes and mechanisms employed to a system workload with properties such as proper capacity planning, predictable approach and modifications scalability is frequently used. In the conception of elasticity, frequently and dynamically the resources can be utilized and changes of workload occur in a short period of time. Moreover, elasticity is a dynamic property wherein resources can be allocated lithely with fully automated and should consider how well and how fast a system will perform on demand without obstacle at runtime [4]. In other way, scalability is a static property and a time free notion which can not consider for the system that consumes lots of time to achieve the desired performance level. Whereas for elasticity, time is a focal phase which depends upon the speed of response to certain changed in workload demands. There are many Aspects related to elasticity have gained a lot of concern. Providers need to add and remove resources according to the workload to avoid service level agreement (SLA) violations that is why in cloud environments these aspects are important. Elasticity can take place in cloud environment [5] by the virtualization technique and the virtual machine created by this technique by abstraction the system resources. This technique is the central part of the cloud computing which increase the efficiency scale of the elasticity.

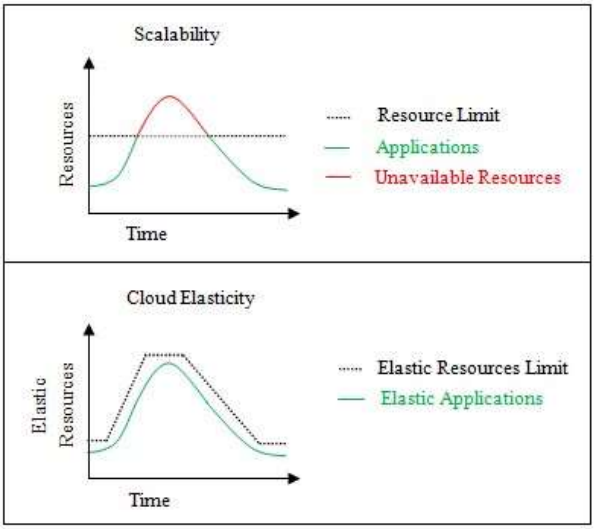

Fig. 1: Scalability Vs Cloud Elasticity

Another section is related as follows: Section II presenting works which includes the related works about elastic resource management in cloud. The summery of resource allocation approaches based on various parameters are described in Section III. Section IV includes the conclusion and also gives future direction of research.

II. SURVEY OF ELASTIC RESOURCE MANAGEMENT IN CLOUD ENVIRONMENT

The review of research works is presenting by this paper is related to elastic resource allocation in cloud computing. We have surveyed most frequent research works mainly concentrated on resource provisioning on cloud environment. One imperative point of our review is the unique sorts of workloads that are perfect for distributed computing. Various algorithm based on the effective resource allocation scheme in the cloud environment have been identified in this paper. We described following survey result in this section.

The combination of ACBLA with queue algorithm has been proposed by K Prasanna Kumar et. al. [6] the load balancing in cloud computing environment by their dividing the nodes into two category idle node and busy node with help of this portioning queue monitoring algorithm has been done by using ACBLA algorithm, this algorithm will send out the job according to priority of the task and will provide the resource dynamically. In this approach they are reducing the communication overhead and queue waiting time by monitoring the idle and completion time of targeted virtual machine this time can be calculated by using start and completion time of resource. In this paper there should be also develop load balancing in dynamic based web site and work scheduling in any operating system.

Chao-Tung Yang et. al. [7] presents a system which is implemented with a combination of optimization with dynamic resource allocation performing with virtualization machines on physical machine. By this system as a result they confirm the automatic migration of the load from overloaded virtual machines to another low level physical machine when the virtual machine becomes overloaded. This approach overcomes the load variation in the cloud environment. Further there should be expand this approach for reduce the workload of resources in cloud computing environment.

Dmitry Duplyakin et.al. [8] Proposed an implementation which recommends that an effective approach to share assets among these different applications is to not shoehorn them all into a similar asset administration system, however to segment a typical equipment substrate among different structures. It enables each management framework to separately maintain the resource within its own domain, scheduling jobs, virtual machines etc. according to its requirements. there additionally actualized elastic manager that help numerous elastic clients and are running it in a limited utilize mode on the APT cluster of the cloud lab test bed, where it is utilized to share that cluster between test bed and HPC clients. In this paper this work provide the less accuracy as much as Another point to further upgrade PAP+ is to present an job prioritization that progressions after job surpass their asked for divider clock times.

Bhaskar. R et al. [9] proposed a method, the resources based on the load of Virtual Machines (VMs) on Infrastructure as a service (IaaS) can be achieved by the dynamic scheduling and consolidation mechanism. By this method user can add and remove resource one or more period of time on the basis of the load and the condition specified by the users. To build up a compelling load balancing algorithm utilizing Virtual Machine Monitoring to amplify or limit diverse execution parameters(throughput for instance) for the Clouds of diverse sizes is the main aim of this paper.

C.V.Tejaswini et.al. [10] proposed a study about energy aware operation for load balancing in dynamic cloud computing in application scaling in cloud. in this study they noticed the study about scheme for power effective management in cloud and focused in cloud computing, energy is a powerful useful resource commandment technique and provide the standard of quality of service outlooks. The applied tentative presenting dominant reducing the value and electricity consumption of cloud application in accomplishment of inexperienced cloud. On the preface without bounds figuring we have exceptional how to execute cloud workloads to accessible resources remembering the stop reason to low power vitality of the loose cloud let.

Zijian Cao et. al. [11] proposed a novel cost oriented model to optimally provide the coud computing resources on the basis of demand side control think over the work load outside of the cloud computing applications and also consider the features of cloud computing instances. Basically this paper proposed a CoM model which include mainly two applications, network analysis and power flow calculation to secure the operation of the system. in this paper there should be concentrate to demonstrate the scalability and impact on decreasing cost by utilizing the model proposed there.

Manish Verma et. al. [12] proposed a framework of dynamic resource demand prediction and allocation in multi-tenant service clouds. This approach includes the administration inhabitants to coordinated virtual machines and provides the virtual machines to physical host machines utilizing a best-fit heuristic approach. Execution comes about exhibit how our best-fit heuristic approach could efficiently provide virtual machines to host with the goal that the hosts are used to their fullest limit. Limitation of this proposed work is that the proposed work can not consider on larger data sets in various domain in cloud environment. There should be also examining integrated dynamic asset allotment for benefit structures that represent to administrations cooperating as part of a business procedure execution.

Massimo Ficco et. al. [13] proposed a approach that is a meta-heuristic approach for cloud resource allocation based on the bio-motivated coral-reefs advancement worldview to show cloud elasticity in a cloud data center, and on the great Game Theory to upgrade the asset reallocation pattern as for cloud supplier's stream lining targets, and client prerequisites, communicated through Service Level Agreements formalized by utilizing a fluffy phonetic technique. There is a hardily need to outcome accurate result and a sensible heuristic solution that is more complex in elastic cloud resource provisioning.

Yi-Hsuan Lee et. al. [14] are proposed a distributed resource allocation approach (DRA) to solve the resource rivalry in the federated cloud environment. In cloud computing environment a Single cloud by and large can't fulfill the all demand services with restricted physical assets; in this manner, the alliance of various cloud might be one conceivable arrangement. In federated cloud each job is consist of one and more task and the communication manner between tasks are also profiled. an another approach that is used in this paper is “skewness” by which we can join various sorts of workloads enough and we can improve the whole use of server resources. In this approach a issue remains as how to pick the mapping adaptively with the goal that the benefit solicitations of VMs are met while the amount of PMs used is constrained. This is trying when the assets needs of VMs are heterogeneous as a result of the varying arrangement of employments they run furthermore, vacillate with time as the workloads create and wither.

Yi-Hsuan Lee et. al. [15] proposed a approach based on the distributed resource allocation to solve the resource rivalry in the federated cloud environment. By using pricing strategy this approach tries to gain equilibrium implicitly. When the resource conflict take place the pricing strategy think over the marginal cost and competition degree. This study likewise receives an undertaking grabbing way to deal with limit the exertion of correspondence inactivity between various clouds in the federated cloud. To improve the further performance there improved 0/1 knapsack algorithm are also used. As a result this approach improves the resource utilization and has excellence in the benefits in the federated cloud. This work is not enough in a large scale simulation environment that can not consider for the different resource types.

Germán Moltó et. al. [16] proposed a system that integrated by CPM to provides the vertical elasticity to adjust the memory size of the VMs to their present memory utilization, highlighting live migration to counteract over-burden situations, without downtime for the VMs. This empowers an upgraded VM-per-host solidification proportion while keeping up the Quality of Service (QoS) for VMs, since their memory is progressively expanded as essential. There should be consider for memory bursting and also focusing to altering the O rate on a per VM level considering the solidness of each VM.

Xiaoming Nan et. al. [17] proposed a queuing model to represent the various services in cloud. In this paper they focused about resource provisioning problem for various multimedia services. On the basis of proposed queuing model they research resource provisioning in two scenarios first one is FCFS and second is priority individually. In FCFS scenario all types of requests are processed in FCFS manner by the separated cluster. In priority scenario request are served by the mutual cluster yet favored request have primitive need to get service. In every situation they detailed and solve the accurate resource provisioning problem to overcome the cost of the resources and response time imperatives. Result produced that the proposed resource provisioning plans can ideally use cloud resources to give tasteful administrations for various classes of request at the insignificant resource cost. The proposed scheme only guarantees the resource utilization limits however neglects to consider the various necessities on response time.

Ashkan Pashaie et. al. [18] proposed a water distribution system as an example of resource allocation and focused the use of population game for its control. They utilize an game theoretic approach in view of two developmental progression, the Brown– von Neumann– Nash and the Smith flow. They demonstrate that the closed loop criticism interconnection of the water distribution framework and the game theoretic-based controller has a Nash harmony as an asymptotically stable balance point. The stability investigation is performed in light of latency ideas and the Lyapunov dependability hypothesis. In this paper there should be focus about potential conflict in the proposed system.

Parvathy S. Pillai [19] proposed a mechanism based on the resource allocation for machines on the cloud based on the principle of game theory as coalition formation principles and the uncertainty principle. Through this work, they have appeared the utilization of the vulnerability standard of game theory to show coalition development among machines on the cloud. This is finished to fulfill demands requiring abilities past that of a solitary machine. Virtualization of the required resources is encouraged by shaping coalitions of host machines. The upside of this approach is that the upside of our approach is that, by taking care of the optimization issue of coalition development, we maintain a strategic distance from the complexities of number programming. Also, our resource provisioning system, when sent, is found to perform better concerning lower task allotment time, bring down resource wastage.

Muhammad Shiraz et. al. [20] proposed a model. Novel distributed and elastic application processing (DEAP) for strong application in mobile cloud computing. There are presented a analytical model to enumerate the DEAP model and check up a ideal application in the MCC environment to point out the availably features of DEAP model.

the fuse of distributed application design encourages in the straight forward application formative methods and light weight component for getting to the preconfigured benefits in cloud datacenters on request premise. The double working nature of DEAP system adds to the flexibility and power of the disseminated and flexible model for escalated versatile mobile application for MCC. As a result we consider that DEAP framework is a lightweight and ideal model for leveraging application processing service of computation cloud in mobile cloud computing(MCC). Further, the versatile idea of DEAP customer adds to the destinations of offline ease of use, smart customer and rich web applications for MCC

A. D. Gawali et. al. [21] implemented skewness algorithm for measuring and at last diminishing the uneven usage of cloud resources. by the use of skewness algorithm we are measuring the random uses of the resources and also trying to decrease it .they also utilized the live migration technique for load balancing in cloud computing environment. Proposed framework multiplexes virtual to physical resources adaptively in light of the evolving request. Framework utilizes the skewness metric to consolidate VMs with various asset attributes suitably with the goal that the limits of servers are all around used we accomplish green computing by moving the heaps on the servers. Green computing is accomplished by limiting the heap by relocating the heaps on servers which are underutilized. There the proposed system is not well utilized for resource provisioning purpose in cloud environment.

Ye Tao et. al. [22] proposed a schedule algorithm that is based on the fuzzy inference system, for resource allocation by evaluating nodes using FIS. For resource provisioning in a light weighted atmosphere there proposed a fuggy logic based approach in which the workload are encapsulated in the containers. With a low cost and resource constrains platform this proposed work provide a superior performance than another proposed container based schemes. In this paper there are wanted to address a portion of the confinements of this work, and also to expand these proposed system in more ways. The correspondence components of work processes, task and examined should be additionally examined, to give a cross-layer between operation design for complex workload checking and expectation.

Nuo Yu et. al. [23] proposed an efficient low-complexity algorithm along with a context aware strategy to dynamically choose active RAUs and merge virtual machines to CUs. We propose an efficient low-many-sided quality calculation alongside a context aware methodology to progressively choose dynamic RAUs and merge VMs to CUs. Along these lines, we can significantly lessen the vitality utilization of C-RANs, while don't acquire excessively overhead because of VM relocations. There also proposed a resource allocation scheme to solve the JRP problem. This calculation can improve the choice of dynamic RAUs and the VM union in the CU pool, as indicated by the UE dispersion and traffic stack in the system. Limitation of the proposed DRP algorithm is, there are required a large range of threshold value to combines the VMs to CUs properly.

Xiaoqun Yuan et. al. [24] proposed a resource provisioning model for the geo-distributed datacenter cloud system and also proposed an optimum resource allocation scheme that allocates the resources among various links. in cloud computing environment, Geo distributed data center are the most effective technology for internet of thing but provide the bandwidth resources among Geo-distributed data center are the great challenge to achieve the better performance. In this paper they proposed a effective bandwidth resource allocation scheme between various datacenter for Geo distributed data center cloud. With the exception of Geo-conveyed Datacenter Mists, there are numerous new cloud-based answers for IOT, for example, Cloud Federation, Fog Computing and Portable Edge Computing. Like Geo-conveyed Datacenter Clouds, these cloud-based arrangements are additionally geo-disseminated models, which imply that content exchange among geo-distributed benefit nodes is additionally the administration bottleneck. Further There should be focused to explore the bandwidth resource provisioning scheme.

III. COMPARATIVE ANALYSIS OF ELASTIC RESOURCE ALLOCATION APPROACHES

This section present the analysis of resource allocation schemes which compared by the various parameters mention in table1 and table2.

We are consider their total 19 approaches in both table1 and table2 and consider the comparison basis on the various parameters such as execution time, response time, throughput, cost, scalability, trust, reliability, resource utilization, energy consumption, and load balancing. These parameters are responsible for increase the QOS in cloud for elastic resource provisioning. By considering the performance of all system approaches there are provided some values to all parameters based on high, low, and medium performance factor. There some parameters such as response time, throughput, scalability, trust, resource utilization, and load balancing have a 1 value as a high performance factor, 3 as a medium and 5 as a low performance factor. As much as just apposite, execution time, cost and energy consumption have 5 values as a high performance factor, 3 as a medium and 1 as a low performance factor are considered.

Table1 –Evaluation of Resource allocation approaches (1-10) on QoS Parameters

Approaches	Execution time	Response time	throughput	Cost	Scalability	Trust	Reliability	Resource utilization	Energy consumption	Load balancing
ACBLA WITH QUEUE	1	1	3	1	3	3	3	3	3	1
DRA	3	1	1	3	3	3	3	1	3	5
SLURM	1	3	3	3	1	1	3	5	1	3
DRA	3	1	1	1	1	1	3	1	3	1
RESOURCE SCHEDULING	3	1	3	3	1	3	1	3	1	3
MPL	3	3	1	1	1	3	3	3	3	3
BEST-FIT HEURISTIC	3	1	1	1	3	3	1	1	3	3
META-HEURISTIC	3	3	1	3	3	3	3	1	3	3
SKEWNESS	3	1	3	3	1	1	1	1	3	3
DRA	1	3	1	3	3	1	1	1	3	1

Table2 - Evaluation of Resource allocation approaches (11-19) on QoS Parameters

Approaches	Execution time	Response time	throughput	Cost	Scalability	Trust	Reliability	Resource utilization	Energy consumption	Load balancing
CLOUD VAMP	3	1	1	5	3	1	1	1	3	1
QUEUEING	5	3	1	1	1	1	1	1	3	1
GAME-THEORETIC	3	3	3	3	1	1	1	1	3	3
UPGT	3	1	1	1	1	1	1	1	3	3
DEAP	5	1	1	1	1	1	1	1	3	1
SKEWNESS	3	1	1	1	1	1	1	1	3	1
FIS-SCHEDULE	3	1	1	1	1	1	1	1	3	3
C-RANS (RAUS & CUS)	3	1	3	3	1	1	3	3	1	1
GAME-(CRA)	1	1	1	3	1	1	3	3	3	1

IV. RESULT COMPARISONS

Fig. 1 are representing the performance ratio about total of 10 algorithm based on above maintained parameters. We can consider their algo1,3,10 are taken less time to execute any task and behalf on the another parameter such as low cost, algo1, 4 and 6 are considered. With the low energy consumption, algo5 are considered in graph1 that take low energy for completion the task. A better load balancing can be considered in algorithm 2 compared to another but fewer throughputs cannot ignore. Another parameter such as higher throughput, scalability, response time etc provides medium performance ratio. As compared to another algorithm, there algorithm3 can consider as a better approach which provide higher resource utilization with low execution time and medium cost as well as higher reliability.

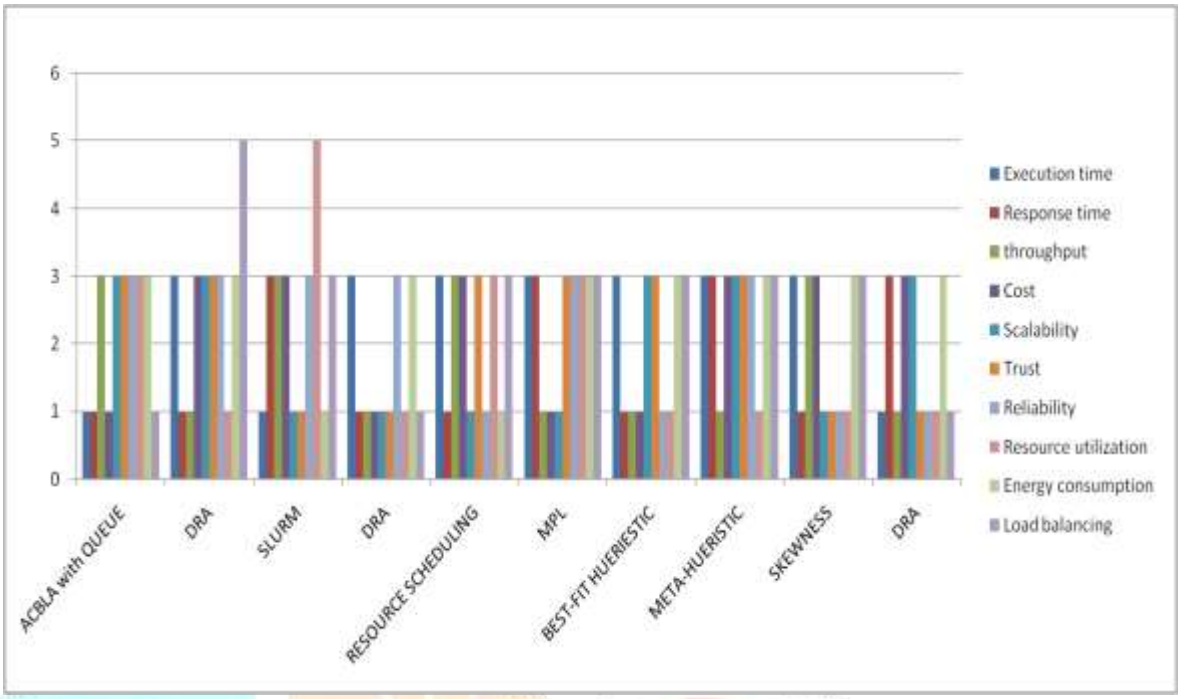

Fig.1- Comparisons of approaches (1-10) on QoS parameters

Fig. 2 are representing the performance ratio about total of 19 algorithm based on maintained parameter. We observed the algo19 are taken less execution time with nice energy consumption compared to another algorithm. Algorithm12, 14, 15, 16 and 17 considered with low cost which is a important factor to achieve. Algorithm 15 and 18 are considered with low energy consumption, nice throughput and execution time but algorithm 18 also provides higher cost as a drawback. There we cannot take to any algorithm as a perfect point of view which provides accuracy for efficient output. But as a comparison point of view we can take algo15 and 18 algorithms which fulfill some pointed parameters.

If we consider to both fig1 and fig2 then we can conclude the approaches 3, 15 and 18 are provides better performance as compared to another. If we consider the comparison between these three elected approaches then we observed the algorithm 3 is a best approach which achieving the most parameters.

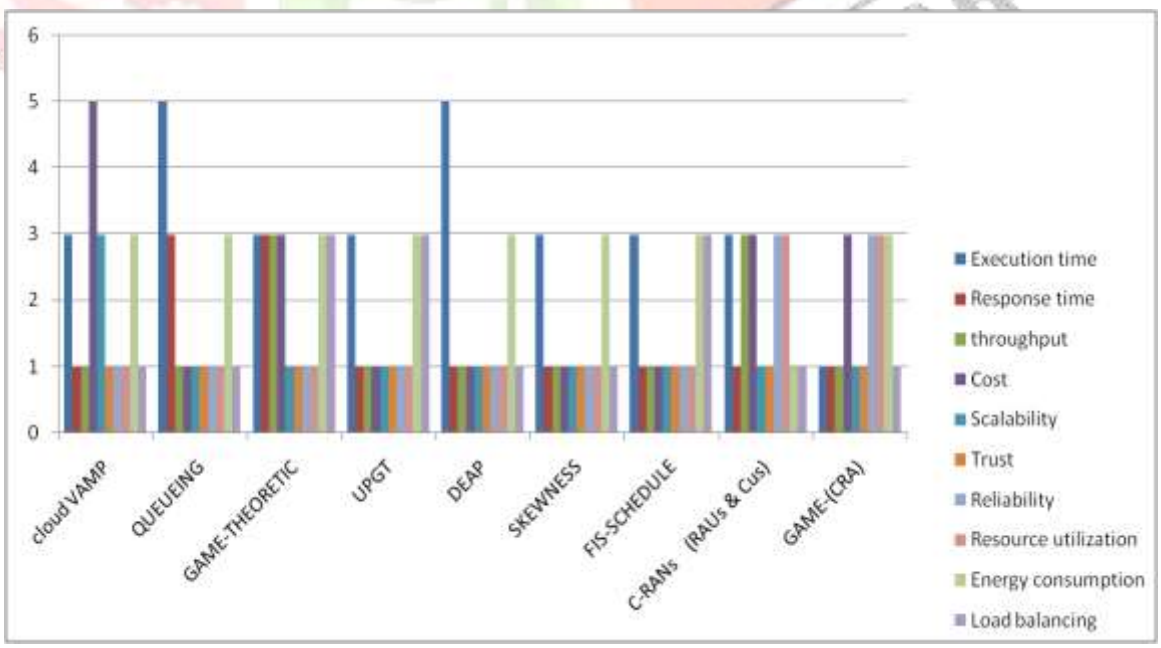

Fig.2- Comparisons of approaches (11-19) on QoS parameters

V. CONCLUSION AND FUTURE SCOPE

The overview of the Elastic resource allocation in cloud computing have been exhibited in this paper. The selected studies based on the elastic resource allocation approach, such as game-theory, load balancing, optimization and heuristic approaches etc have been examined. Elasticity is very important in technology of cloud computing that dynamically adjust the amount of allocated resource to fulfill the changes in workload demands. The dynamic and heterogeneity of cloud makes elasticity more complicated. In cloud computing environment there are various parameter which leads to elasticity such as higher throughput, low cost, resource utilization, load balancing, response time, execution time, reliability, low energy consumption and scalability. We have studies various approaches in this survey which are unable to achieve all above maintained parameter based on the elasticity. Therefore in the future work we will implement a approach which addresses almost parameters based on elasticity.

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