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# Approach for Client Awareness, Resource Allocation, Optimizing Social Groups and Task Scheduling in Heterogeneous Clouds

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**Abstract***: Resource allocation in parallel clouds is a challenging task due to various requirements of cloud providers and cloud customers. As the workload size on the server changes from time to time, client demands and application actions remain different. The main challenge and focus is to deliver incoming workloads to VMs that are available from the physical system. In this study, the distribution of customer awareness and customer demand planning using an optimization method called SGOCARAJS algorithm is introduced to reduce the gap between constantly changing customer needs and available resources.*

**Keywords:** Virtual machines, Resource allocation, social groups, heterogeneous, optimization method

## I. INTRODUCTION

In the same domain, if each machine has a similar processing limit, there is little interest in scheduling. To solve the scheduling policy, only data and network layout need to be considered. To check whether all job requests receive the required number of resources, it is sufficient to calculate the number of machines allocated to each job. The equivalent is used when a client requests a resource. You just need to determine the number of machines needed to process the job. However, it is very important to plan work based on the resources needed to achieve high performance in different situations. Cloud servers do not provide unlimited resources to use dynamic scaling. Consumers with complex applications generally use multiple events for highly scheduled execution. A real issue that has been raised by research, industry and the scientific community in this area is the allocation of workloads to VMs. Deployment of VMs includes two steps, namely planning and mapping or allocation. Mapping involves assigning tasks to computing devices and sending requests for assigned tasks. An algorithm called SGOCARAJS was introduced in this study. The SGOCARAJS strategy is divided into two main phases, which are called resource allocation and task planning for implementation. Finally, it was shown that the proposed methodology can outperform available calculations in terms of time and customer loyalty.

## II. METHOD

Take into account a multi-cloud architecture where every cloud has a separate data centre comprised of an arrangement of servers to set up the VMs [1]. Every cloud service provider has a separate planning strategy that appoints the job requests to the VMs utilising its own independent policy. Generally, the planning policies of the clouds might be dissimilar from those of the others. For instance, Amazon Elastic Compute Cloud (EC2) and Microsoft Azure utilise diverse planning policies. Cloud computing in the future could have numerous cloud suppliers to execute different applications [2, 3]. If that is the case, the service supplier may use an incorporated administrative way to deal with accomplishing shared objectives [4, 5].

The proposed model for the heterogeneous cloud is shown in Figure 1. The projected cloud model here comprises the major components like:

Client: Clients are the customers of the service in the clouds who will submit the job requests with the support of a cloud agent.

Cloud Agent: The Cloud Agent receives job requests from clients. At the same time, he also identifies the number of dynamic VMs on every cloud. In the next, the cloud agent follows the planning policy adapted for every cloud.

Because the computing potential and specifications such as storage, network, etc. are difficult to address, VMs are heterogeneous in characteristics.

Cloud Service Suppliers (CSS): CSSs are the owners of the clouds. They offer the services by considering VMs on the dynamic servers. The allotted VMs will process the job requests by following the planning policy. Yet, the planning policies of the service suppliers may or may not be the same.

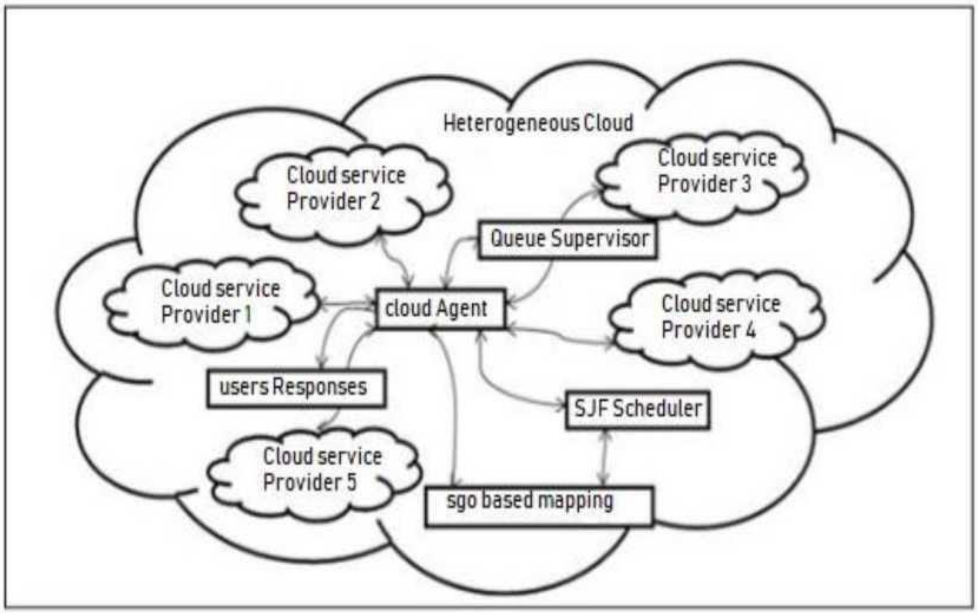


**Fig. 1 : A Model for Heterogeneous Cloud Architectures**

## III. SGOCARAJS ALGORITHM

The proposed strategy comprises of "m" clouds and assigns "p" independent job requests to "q" virtual machines with the end goal of processing every job with the minimum make-span time and the highest level of user satisfaction.

For efficient resource allocation using SGO-based assigning, the number of job requests are mapped to virtual machines and job requests are planned using the SJF procedure. In the experimentation, the results of SGO-based assignment of resources are judged against those of Teaching Learning Based Optimization [6] and Customer Oriented Job Scheduling Method [7]. With the expansion of outside applications, the scheduling of job requests and the multifaceted nature of asset assignment increases.

Here, a methodology is introduced for the planning of job tasks in an architecture with servers of diverse nature, using the SGO technique with necessary changes corresponding to the problem description. Resource allocation is done by using the technique of mapping. It incorporates identification of the best pair of job requests and virtual machines by minimizing the make-span time, getting a high customer fulfillment rate, and adjusting the load among all accessible resources. When the size of the heterogeneous cloud and the number of job requests increases, SGO efficiently discovers the best pair of tasks and virtual machines with a reduced make-span time and a high rate of client fulfillment.

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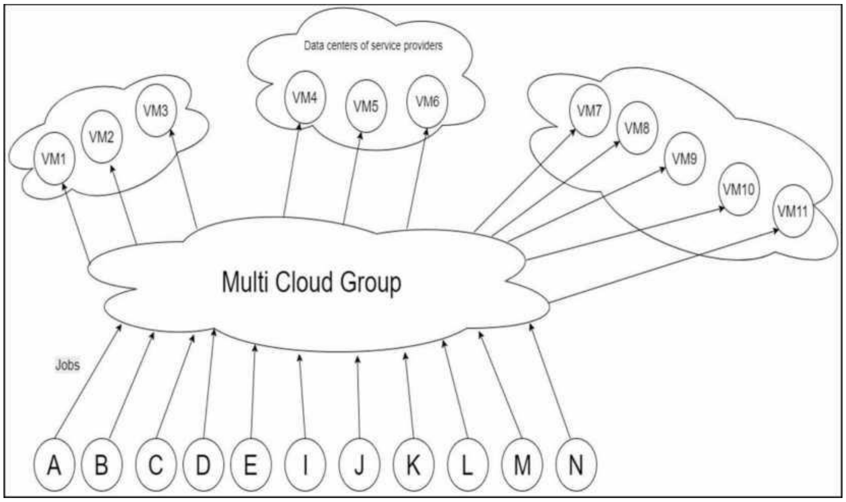


**Figure 2: Heterogeneous Cloud Architecture with VMs and Job Requests**

The proposed algorithm, which is customer-aware distribution of resources and planning of job requests in a heterogeneous cloud, is given in Algorithm Fig 1. Initially, the algorithm saves all the allotted incoming application requests in a queue. The proposed algorithm is repeated until the main queue of the application is empty. Before starting the process, the make span time is set to zero. Every application in the queue is divided into the number of job requests.

For a particular virtual machine, the proposed SGO-based algorithm selects a job from the queue of the jobs related to an application. The algorithm recognises the requirements of job requests that are not assigned to VMs. The finishing times of other promptly accessible job requests are compared to recognise the finest virtual machine with the least amount of make-up time.

In the method of scheduling, assigned jobs are to be planned successively so as to reduce the make-up time and the rate of client fulfilment is high. In this strategy, job requests are equally dispersed, with the end goal that servers are not overloaded. The job requests on a particular virtual machine are processed based on priority scheduling. High-priority processes are executed first when compared to low-priority processes. With an SGO-based algorithm, a higher rate of client fulfilment is achieved. Adjusting job requests equally has two benefits: amplifying the rate of consumer loyalty and reducing the number of steps required to allot the jobs to virtual machines.

## IV. RESULTS AND DISCUSSION

For implementation of the proposed algorithm is done in cloudSim version 3.0.3. The simulation of the cloud Sim software is done on a system with general configuration. The experimentation has done with different values for the number of clouds, number of job requests. The different values used in the experimentation are shown in Table 1. To prove the efficiency of the projected mechanism, the results are compared with respect to the measures of performance client satisfaction rate and make span time. Experimental results of the proposed algorithm SGOUARAJS are compared with two of the existing methods TLBO [8], COTS [9].

Table 1: Different values used in the Experimentation

| Type | Values |
|---|---|
| Number of Clouds | 20, 30, 40, 50 |
| Number of Job Requests | 128, 256,512,1024 |
| Data Sets consideration | Jobs * Virtual Machines |

If the client states certain conditions such as cost, due dates and postponements and so forth then cloud service suppliers must necessarily plan the execution of job requests with client conditions in to consideration. This sort of assignment planning is called Constraint Oriented Task Scheduling (COTS). COTS provide a one-sided opportunity to cloud service suppliers to arrange SLA with clients based on their conditions. The customers who present their job requests with conditions are considered first when compared to the clients with no conditions on their job requests. [9]. Another algorithm that is considered for comparison of the results is resource allocation by means of teaching learning-based optimization (TLBO). It is a populace supported technique that mimics the education paradigm with a set of learners. The technique comprises with two important steps teaching phase and learn phase. In the phase of teaching, the teacher who was the best learner in the class will share the knowledge to the other learners. In the second phase learners will discuss themselves to improve their knowledge. Resource allocation based on TLBO give the benefit of allocating the task to the resource to which it is most suitable with an aim of reducing the make span time [10].

The make span time and client satisfaction rate of the proposed SGOCARAJS algorithm are measured with different combinations of number of job requests and number of virtual machines. The results are compared with COTs algorithm and TLBO based resource allocation algorithm. For demonstrating all the results, the data sets are considered with notation of X * Y where X stands for number of job requests from the clients and Y represents the number virtual machines considered on a particular cloud server. Figure 3 shows the comparison of the results for 126 * 20 data set i.e., 126 job requests from clients and 20 virtual machines on a cloud server. Among the three different simulations done, simulation 2 gives the higher satisfaction rate for the customers when compared to the other two simulations. From all the three simulation it is clearly understood that the proposed SGOCARAJS algorithm attained enhanced client satisfaction rate when compared to the existing COTs based resource allocation and TLBO based resource allocation.

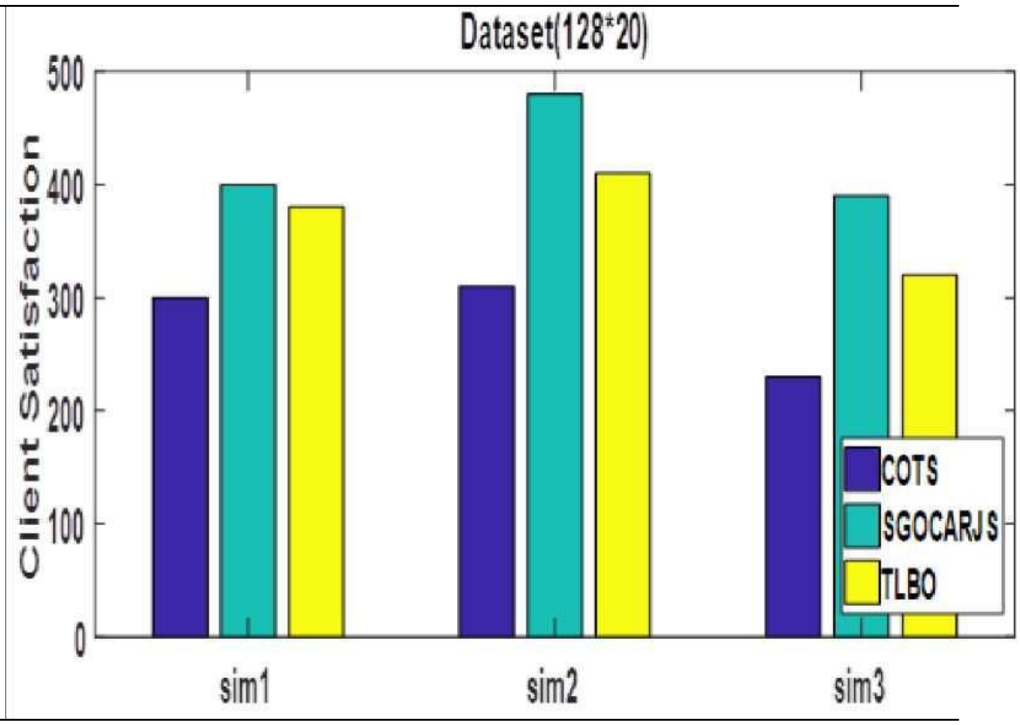


Figure 3: Comparison of Customer Satisfaction Rate with 128 * 20 Configuration

Figure 4 shows the comparison of the results for 256 * 30 data set i.e., 256 job requests from clients and 30 virtual machines on a cloud server. Among the three different simulations done, simulation 3 attains the higher satisfaction rate of the customers when compared to the other two simulations. From one and three simulations it is clearly understood that the proposed SGOCARAJS algorithm attained enhanced client satisfaction rate when compared to the existing COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs and proposed algorithm are having the same satisfaction rate.

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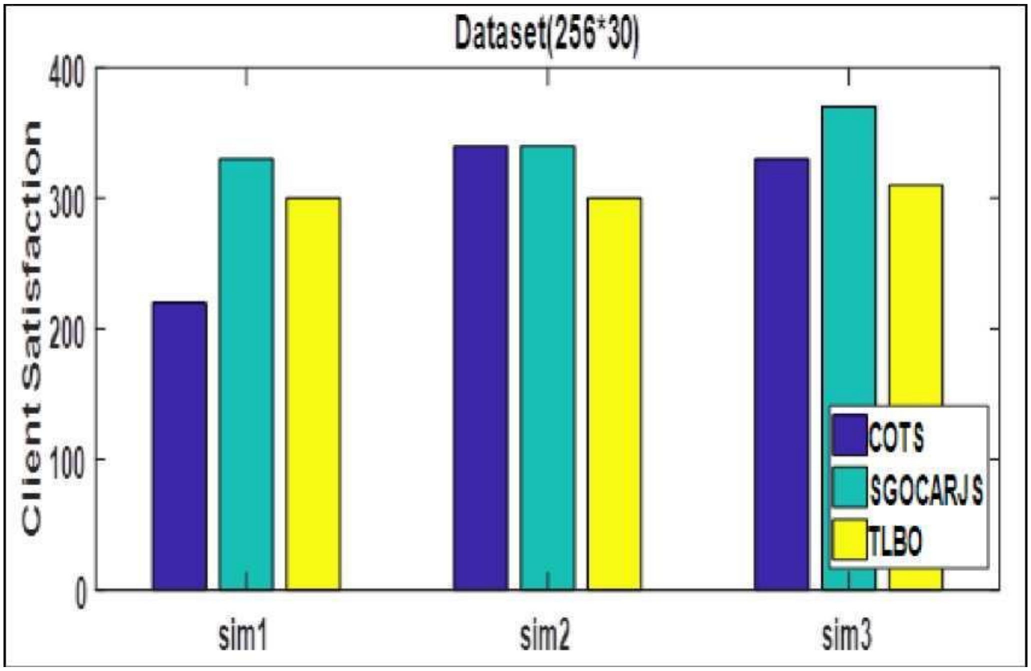


Figure 3: Comparison of Customer Satisfaction Rate with 128 * 20 Configuration

Figure 5 shows the comparison of the results for 512 * 40 data set i.e., 512 job requests from clients and 40 virtual machines on a cloud server. Among the three different simulations done, simulation 1 attains the higher satisfaction rate of the customers when compared to the other two simulations. From one and two simulations it is clearly understood that the proposed SGOCARAJS algorithm attained enhanced client satisfaction rate when compared to the existing COTs based resource allocation and TLBO based resource allocation and for simulation 3, COTs and proposed algorithm are having the same satisfaction rate.

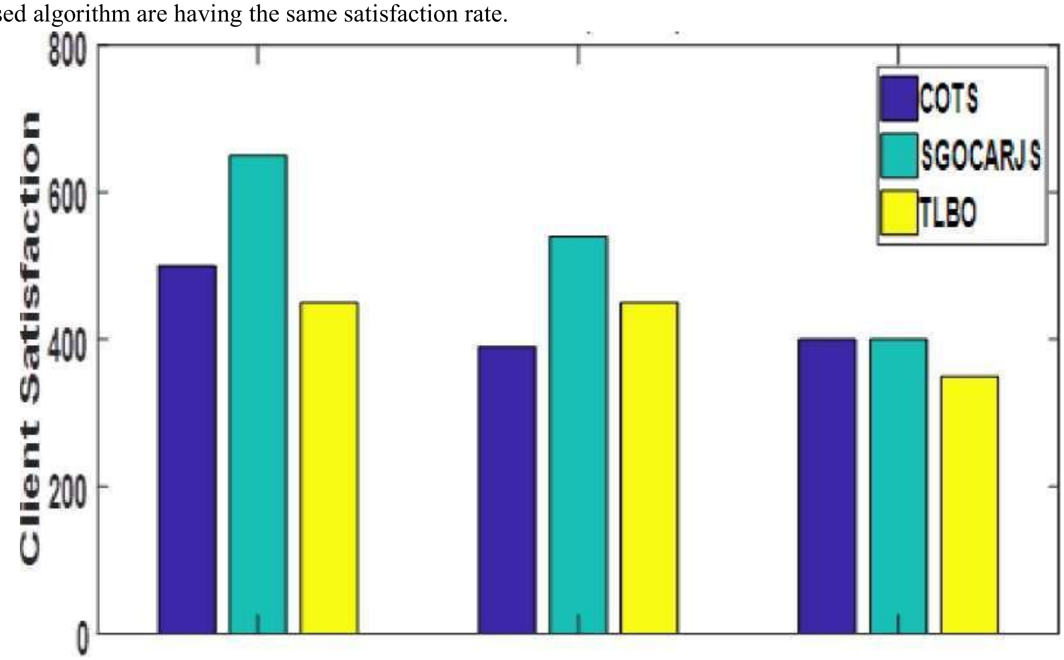


Figure 5: Comparison of Customer Satisfaction Rate with 512 * 40 Configuration

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Figure 6 shows the comparison of the results for 1024 * 50 data set i.e., 1024 job requests from clients and 50 virtual machines on a cloud server. Among the three different simulations done, simulation 2 and 3 attains the higher satisfaction rate of the customers when compared to the other simulation. From one and three simulation it is clearly understood that the proposed SGOCARAJS algorithm attained enhanced client satisfaction rate when compared to the existing COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs and TLBO based algorithm are having the same satisfaction rate.

Figure 7 shows the comparison of the results for 128* 20 data set. Among the three different simulations done, simulation 1 attains the least make span time for customers when compared to the other simulations. From one and three simulations it is clearly understood that the proposed SGOCARAJS algorithm attained minimum make-span time in comparison with the COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs, TLBO based algorithm and the proposed algorithm are having the same make span time.

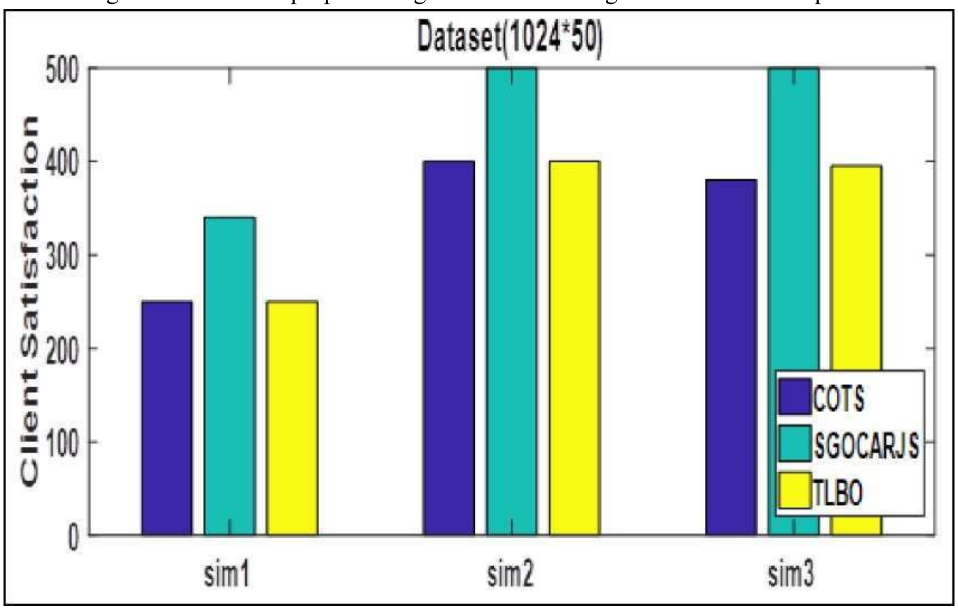


Figure 6: Comparison of Customer Satisfaction Rate with 1024 * 50 Configuration

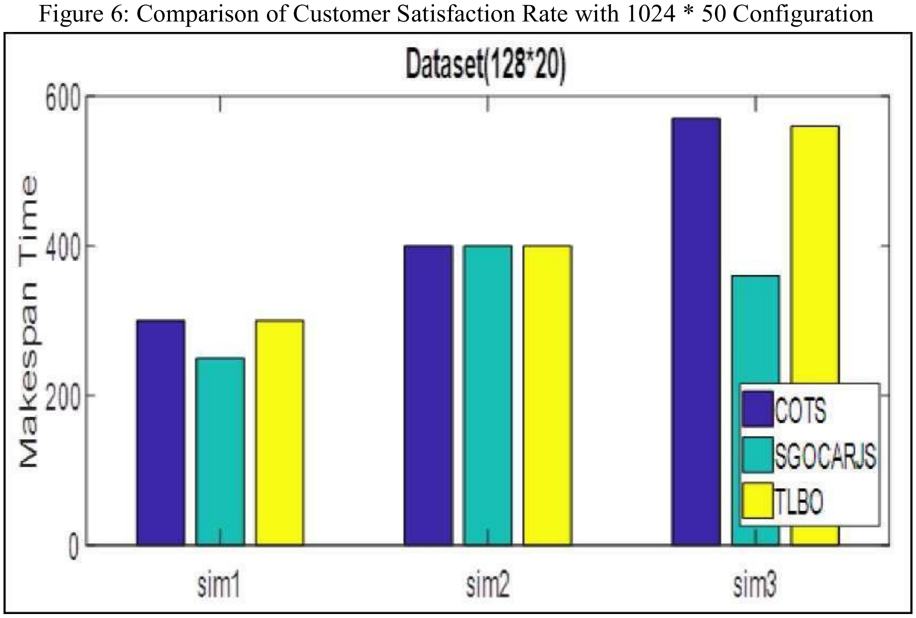


Figure 7: Comparison of Total Make Span Time of Job Requests for 128 * 20 Configuration

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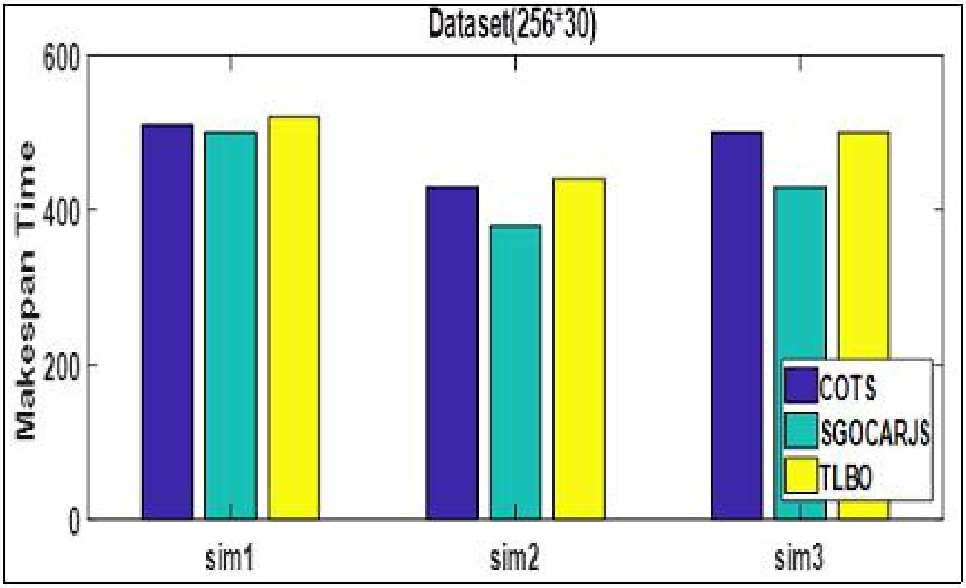


Figure 8: Comparison of Total Make Span Time of Job Requests for 256 * 30 configuration

Figure 8 shows the comparison of the results for 256* 30 data set. Among the three different simulations done, simulation 2 attains the least make span time for customers when compared to the other simulations.

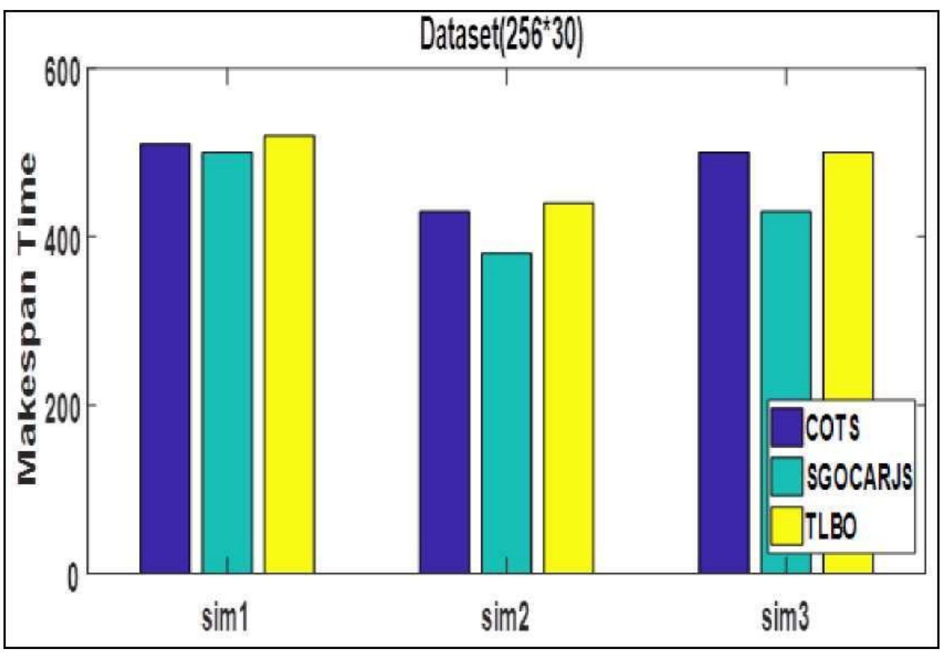


Figure 9: Comparison of Total Make Span Time of Job Requests for 512 * 40 Configuration

From two and three simulations it is clearly understood that the proposed SGOCARAJS algorithm attained minimum make-span time in comparison with the COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs, TLBO based algorithm and the proposed algorithm are having the approximately the same make span time.

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Figure 9 shows the comparison of the results for 512* 40 data set. Among the three different simulations done, simulation 2 attains the least make span time for customers when compared to the other simulations. From two and three simulations it is clearly understood that the proposed SGOCARAJS algorithm attained minimum make-span time in comparison with the COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs, TLBO based algorithm and the proposed algorithm are having the approximately the same make span time.

Figure 10 shows the comparison of the results for 1024* 50 data set. Among the three different simulations done, simulation 3 attains the least make span time for customers when compared to the other simulations. From all the three simulations it is clearly understood that the proposed SGOCARAJS algorithm attained minimum make-span time in comparison with the COTs based resource allocation and TLBO based resource allocation and for simulation 2, COTs, TLBO based algorithm and the proposed algorithm are having the approximately the same make span time.

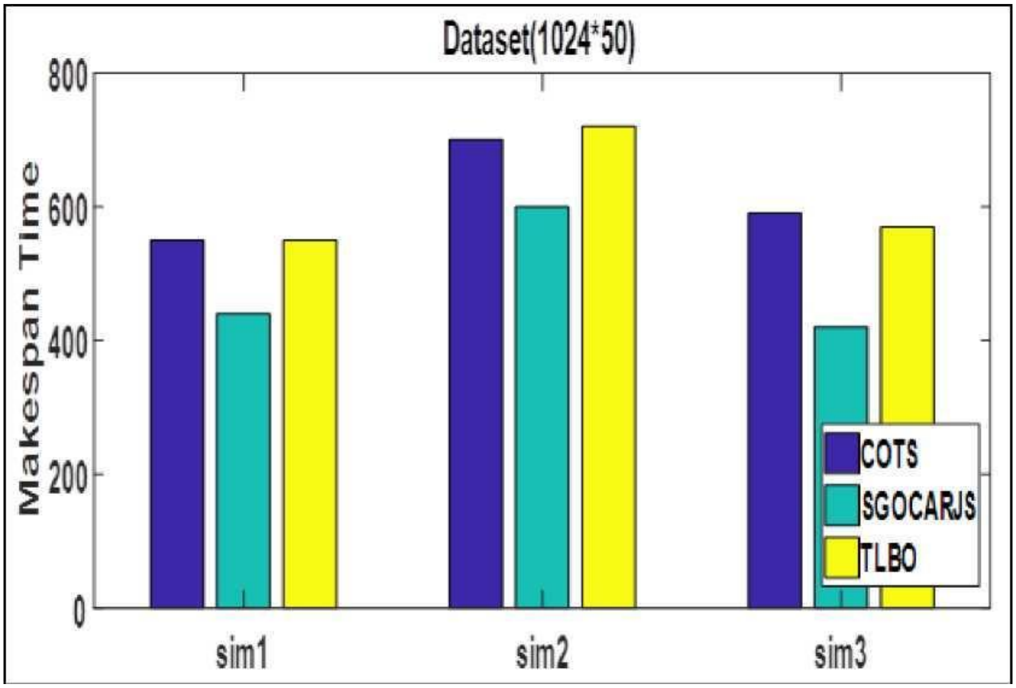


Figure 10: Comparison of Total Make Span Time of Job Requests for 1024 * 50 Configuration

Table 2: Comparison for Client Satisfaction Rate for All the Data Sets

| Datasets | Algorithms | Simulation(i) | Simulation (ii) | Simulation (iii) |
|---|---|---|---|---|
| 128*20 | COTS | 3.180e — 02 | 3.121e —02 | 2.352e-02 |
| | TLBO | 3.6940 — 02 | 4.159e-02 | 3.2780-02 |
| | SGOCARAJS | 4.159e — 02 | 4.7S3e —02 | 3.8690-02 |
| 256*30 | COTS | 3.1960 — 02 | 4.387e —02 | 4.2990-02 |
| | TLBO | 4.097e - 02 | 3.967e —02 | 4.1590-02 |
| | SGOCARAJS | 4.2830 - 02 | 4.555e —02 | 4.9630-02 |
| 512*40 | COTS | 5_891e — 02 | 4.9140 — 02 | 4.9980-02 |
| | TLBO | 5.624e-02 | 5.5890-02 | 4.5990-02 |
| | SGOCARAJS | 7.441e - 02 | 6.501e —02 | 5.2230-02 |
| 1024*50 | COTS | 3.879e - 02 | 5.223e —02 | 4.7200 - 02 |
| | TLBO | 3.909e — 02 | 5.334e — 02 | 4.995+ 02 |
| | SGOCARAJS | 4.534e - 02 | 5.776e-02 | 5.3210-02 |

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Table 2 shows the numerical results of client satisfaction rate .The SGOCARAJS algorithm results of client approval rate is judged against with COTs and TLBO based resource allocation methods. The outcomes are indicated for three different simulations.

Table 3: Comparison for Make Span Time of All the Data Sets

| Datasets | Algorithms | Simulation (i) | Simulation (ii) | Simulation (iii) |
|---|---|---|---|---|
| 128* 20 | COTS | 4.2250-02 | 5.312e + 02 | 6.3320 - 02 |
| | TLBO | 4.1100-02 | 5.2200 + 02 | 6.11340-02 |
| | SGOCARAJS | 3.5120-02 | 4.5670 + 02 | 4.5910-02 |
| 256* 30 | COTS | 6.2290-02 | 5.5670 + 02 | 6.7420 - 02 |
| | TLBO | 6.1230-02 | 5.4530 + 02 | 6.5930-02 |
| | SGOCARAJS | 5.8990-02 | 4.7640 + 02 | 5.8990-02 |
| 512* 40 | COTS | 5.9140-02 | 4.823e + 02 | 5.876e —02 |
| | TLBO | 5.7620-02 | 4.6790 + 02 | 5.6780-02 |
| | SGOCARAJS | 5.3290-02 | 4.2390+02 | 4.8160-02 |
| 1024 *50 | COTS | 6.4000-02 | 8.4920+02 | 6.9830-02 |
| | TLBO | 6.3780-02 | 8.3900+02 | 6.6790-02 |
| | SGOCARAJS | 5.1560 | 7.7770+02 | 5.4350-02 |

Table 3 shows the numerical results of make span time of the jobs .The proposed algorithm results of client satisfaction rate is measured against COTs and TLBO based resource allocation methods. The outcome values are indicated for three different simulations.

The proposed algorithm generates the results with two performance parameters likely clients' satisfaction rate and makes span time. Figure 11 shows the effect on make span time as number of job requests increases for a given number of virtual machines. The results illustrate that as the number of job requests increases the amount of make-span time also increases. In comparison with the COTs and TLBO based resource allocation algorithms, the proposed algorithm is having the minimum make span time as the number of job requests changes.

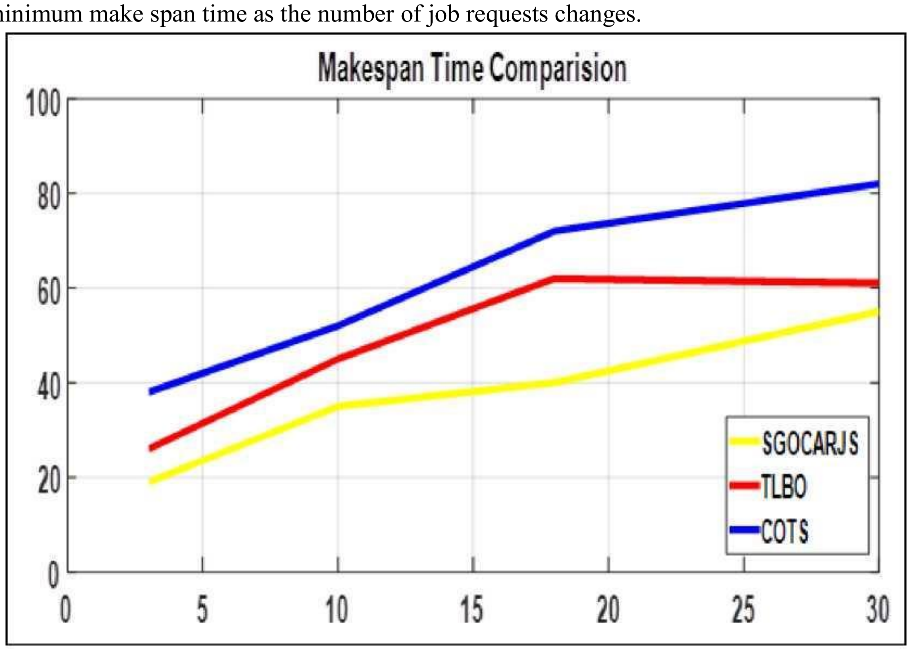


Figure 11: comparison of Make Span Time as the Number of Job Requests increases

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Figure 12 shows the effect on Clients satisfaction rate as number of job requests increases for a given number of virtual machines. The results illustrate that as the number of job requests increases the percentage of clients satisfaction rate also increases. When compared to the COTs and TLBO based resource allocation algorithms, the proposed algorithm is having the maximum client's satisfaction rate as the number of job requests changes.

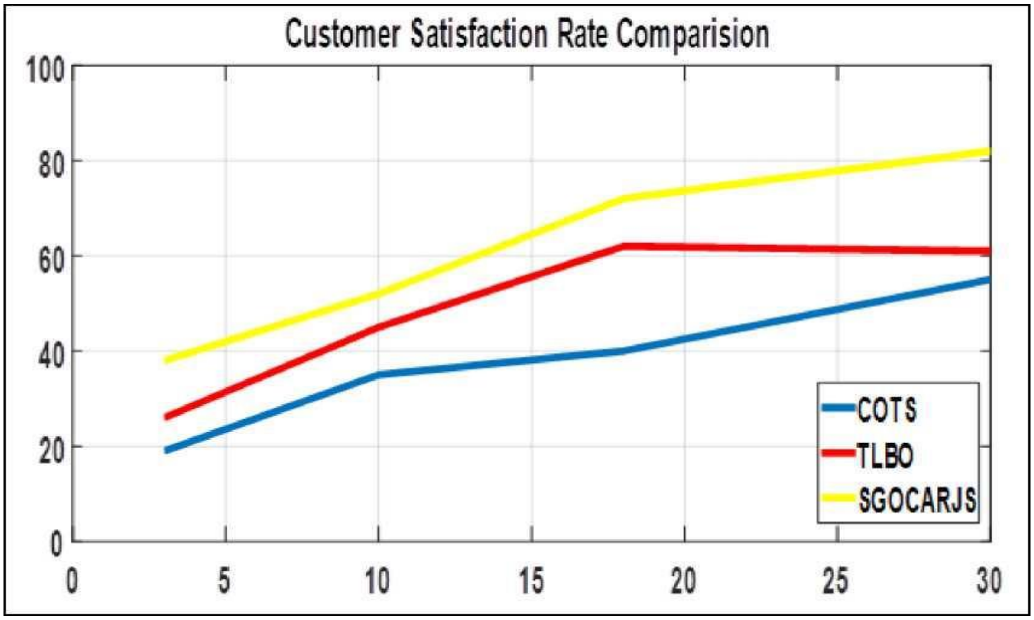


Figure 12: Comparison of Clients Satisfaction Rate as the Number of Job Requests Increases

## V. CONCLUSION

A resource allocation strategy named SGOCARAJS in the cloud is explained in this study. Client-Situated Task Scheduling intends to enhance customer fulfilment. TLBO is utilised to recognise the effective job-virtual machine combination with the aim of reducing the make span time, while the SGOCARAJS algorithm centres on decreasing the make span time of the job requests and enhancing client fulfilment. The algorithm essentially incorporates two stages, i.e., allocation and planning. Numerous simulations are prepared in CloudSim with different combinations of job requests and virtual machine values. The outcomes demonstrated that the proficiency of the proposed algorithm beats existing available strategies.

## REFERENCES

**[1].** N. Kano, N. Seraku, F. Takahashi, S. I. Tsuji, "Attractive quality and must- be quality", J. Japanese Soc. Qual. Control, vol. 14, no. 2, pp. 39-48, Apr. 1984.

**[2].** J. Mei, K. Li and K. Li, "Customer-Satisfaction-Aware Optimal Multiserver Configuration for Profit Maximization in Cloud Computing," in IEEE Transactions on Sustainable Computing, vol. 2, no. 1, pp. 17-29, 1 Jan.- March 2017. doi: 10.1109/TSUSC.2017.2667706

**[3].** Mousavi, Seyedmajid, Amir Mosavi, and Annamaria R. Varkonyi-Koczy. "A load balancing algorithm for resource allocation in cloud computing." International Conference on Global Research and Education. Springer, Cham, 2017.116

**[4].** Misra, Sudip, et al. "Mils-Cloud: A Sensor-Cloud-Based Architecture for the Integration of Military Tri-Services Operations and Decision Making." IEEE Systems Journal 10.2 (2016): 628-636.72

**[5].** Satapathy, Suresh & Naik, Anima. (2016). Social group optimization (SGO): a new population evolutionary optimization technique. Complex & Intelligent Systems. 2. 10.1007/s40747-016-0022-8.

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**[6].** V. Subramani, R. Kettimuthu, S. Srinivasan, and S. Sadayappan, "Distributed job scheduling on computational grids using multiple simultaneous requests," in 11th International Symposium on High Performance Distributed Computing, HPDC, pp. 359-366, IEEE, 2002.

**[7].** A. R. Butt, R. Zhang, and Y. C. Hu, "A self-organizing flock of condors," Journal of parallel and distributed computing, vol. 66, no. 1, pp. 145-161, 2006.

**[8].** Y. Demchenko, C. Ngo, C. de Laat, and C. Lee, "Federated access control in heterogeneous intercloud environment: Basic models and architecture patterns," in International Conference on Cloud Engineering (IC2E), pp. 439- 445, IEEE, 2014.

**[9].** F. Sabahi, "Secure virtualization for cloud environment using hypervisor- based technology," International Journal of Machine Learning and Computing, vol. 2, no. 1, pp. 39-45, 2012.

**[10].** H. Liu, H. Jin, C.-Z. Xu and X. Liao, "Performance and energy modeling for live migration of virtual machines," Cluster computing, vol. 16, no. 2, pp. 249-264, 2013.