Presentation of a new strategy for choosing optimal resources of processes by multi-parametric function and developmental algorithms in cloud computing networks

Sakineh mirzaei† ,Mojtaba Seyedzadegan ††*

† Department of Computer, Buinzahra Branch , Islamic Azad University, Buinzahra , Iran
†† Department of Computer and Electrical Engineering , Buein Zahra Technical University, Buein Zahra, Qazvin , Iran
* Corresponding Author: zadegan@bzte.ac.ir; Tel.: +989203186280

Summary

The most important issue about Cloud Computing, is process scheduler. Process scheduler means allocation of limited resources to the activities by time passing. Prioritizing, is one of the most significant issues in process scheduler, in a way that, some works should be handed down to the server earlier, so in a Cloud Computing network, the way that processes are allocated to the resources are very important. The number of these allocations will vary in different times. In a Cloud Computing network, energy consumption is another significant issue that it should has a great attention and its reason lies in the fact that, energy production costs highly. So for this, we will compare and contrast Stimulated Annealing (SA) with optimized virtual machine, energy consumption level and the decrease in the numbers of missed processes with genetic algorithms in order to solve the process allocations optimally. The goal of this survey is investigation and suggestion of new method on works process scheduler according to Prioritizing and energy consumption which is focused on the work priorities and time reduction of service responses and function improvement. In conclusion, the results showed a better function of SA in comparison to genetic algorithms based on consumed costs for allocation and also the number of evaluation is dependent on costs.

Key words:

Cloud Computing network, process scheduler, Prioritizing, SA.

1. Introduction

Cloud Computing network prepares a different virtual platform that helps the user to do its tasks in the lowest and cheapest possible ways. By applying Cloud Computing network, access to information technology is in a flexible and scalable mode in demanding time and based on the user's request level by platforms like internet [1]. So, Cloud Computing network prepares a suitable environment for its users and they can use all needed software and hardware resources with a lower cost. In such an environment, suitable timing speeds up the responding process to user's needs, so in recent years, research on management and process scheduler of resources in Cloud environment, has been extended theoretically and functionally and has attracted the researchers' attentions toward itself. Some researches about process scheduler have been tested on Cloud Computing network. Process scheduler algorithms should organize the works in a way to keep balance between the optimization of functions and the quality of services while retaining the work efficiency and justice. This chapter is organized to study various process scheduler algorithms that have been suggested in Cloud Computing network recently. In this assay, the serving to users is speeded up by presenting suitable solutions and process scheduler methods throw developmental algorithms. In this thesis, the main goal is formulating the relationship between request citations to present resources (processors) in Cloud Computing network based on the priority. By optimizing these citations and processing queue management smartly, it can have a great impact on decease of computational costs and increase in efficiency of Cloud Computing networks. The most significant functional goals are as following in this study:

1. Application of new cost function for optimization of some mentioned parameters synchronically.
2. Application of developmental algorithms for solving a multi-parametric problem with a lot of virtual machines in order to choose the virtual machine optimally and optimization of energy and computational cost.
3. Application of queue length criteria for each processor in order to handle the priority of each processor management in cost function and its effect on processes' mapping.

2. Related works

Various process schedulers have been suggested in Cloud Computing network [2] [3] [4], a cost-based algorithm was presented for effective mapping of responsibilities to available resources of Cloud Computing network [5]. This process scheduler measures the cost of using resources and

Manuscript received November 5, 2016
Manuscript revised November 20, 2016

also efficiency of calculations. In addition, the presented algorithms improve the proportion of calculations to communication by grouping of user's duties according to process capacity of Cloud Computing resources and delivering the grouped works to the resources. Another presented algorithms reevaluates each functional unit in its own scheduling unit and computes the priority again and finally it reaches to an optimum state.

The main structure of this algorithm is comprised of queues that its number is dependent on the tasks priority. Another scheduling algorithm that it can be mentioned, is the scheduling algorithm for the decrease in consuming energy [4]. Decrease in energy consumption should be in a level that the contract of service level based on efficiency is not breached. In [6], the scheduling is investigated, considering the efficiency from the point of energy and according to private Cloud Computing network. In the present article, 3 scheduling criteria are expressed and a useful combinational energy scheduling method are presented. The presented algorithms usually are based on the priority of energy consumption or if the priority in tasks are considered, only some criteria of scheduling are focused [7] [8]. In [9], for load balance in Cloud Computing networks, genetic algorithms are exploited. The results of this study indicate that, in comparison to round-robin scheduling and the first input of first service, the genetic algorithm has much better results. In [10] [11], have applied genetic algorithm for process scheduler optimization and load balance in Cloud Computing networks. In [12], most of those algorithms that have been applied for scheduling of the processes with developmental algorithms up to now, were analyzed and observed. But in all of these algorithms, only some relationships for diagnosis of the optimized resource and the quality of service have been focused. In this article, some strategies for process scheduling as constant scheduling and variable scheduling are discussed and also scheduling is presented by means of developmental and smart methods and organization of wait queue of the processes are declared. In [13], a procedure is introduced for dynamic control of processor's voltage in virtual machines of cloud computing networks. These methods are based on DVFS that can control the speed of a processor in hardware platform and can control the energy consumption level in computing networks significantly.

3. Scheduling model in the proposed method

From the point of view of systems, we can assume cloud computing environment as a large server with endless resource. This implies that the system will allocate a series of resources according to user's needs for a specific duty. By virtualization technology, the virtual machine can be used as a resource-supplier node in cloud. For schematic explanation pay attention to figure 1. In Cloud Computing network, the users have various requests for the process in different episodes. In fact, these requests are the processes that are transferred to cloud computing network for performance. As it is clear in figure 1, the input processes have a queue that, this queue keeps all processes in order of reaching time for delivering to citation unit of virtual machines.

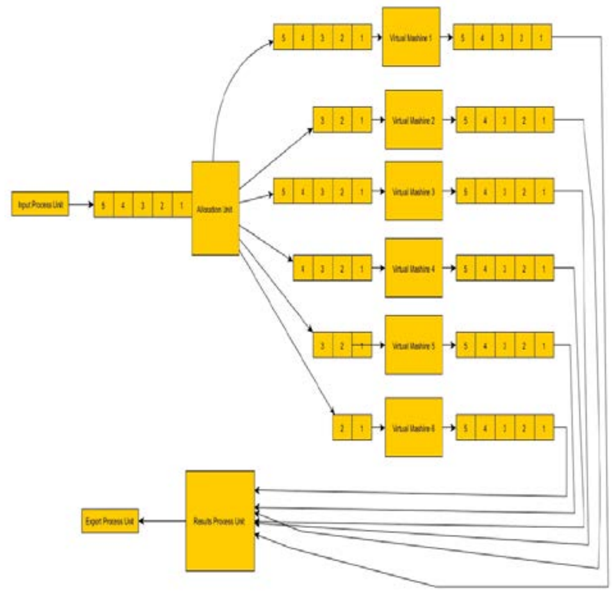

Fig. 1 The reference citation structure for virtual processor machines

4. The description of suggested method

In this article, a strategy was introduced for virtual machines based on the processors' voltage control that according to this control, the consuming energy level is controllable in 3 different modes. These 3 modes define different modes of the processor and it makes the developmental algorithm to decide about the optimization of energy consumption and to adjust the processor on which mode for conduction of each process. By presenting a new cost function, we have tried to optimize all known criteria of cost function and finally, we have attempted to optimize the general cost of developmental algorithms for solving the problem of sources' processes optimization.

5. The structure of Cloud Computing networks' core

For modeling, 4 main theories are considered that we will explain them here:

5-1 The theory of the processing’s reaching time

If we pay attention to cloud computing networks, about the processing’s, we will understand that the time of creation and the reaching time of these requests to the input unit of processes happen in different times. So that's why, when we are going to process that processing’s which have been delivered to process input inquiry unit and have been entered to the processes queue, we should use equation 1

$$Min_{time}process_i = MinWait(Queue) + MaxSpeedVirtualMashine \quad (1)$$

$$Min_{Total}process = Min\left(\sum_{i=1}^{i=n} Min_{time}process_i\right) \quad (2)$$

and 2 for time minimization of each process that at last, this will lead to the time minimization of all processes.

Min time $process_i$: The shortest time that the process is allocated to the virtual machine

Min wait (queue): The shortest wait queue for the requests

Max speed virtual machine: The maximum speed that a virtual machine can process the request

Equation1 presents that when a process will be conducted in a minimum time, that the allocation unit choose a machine for citation of the processes in a virtual machine that it has a shorter queue length for the processing’s. Meanwhile, the speed of the processing machine also should be the fastest among other virtual machines and when it would be dependent on the minimum time of all processes conduction, or equation 2 is perfect that all processes are allocated to the best possible virtual machine.

5-2 Processes priority in Cloud Computing network

In cloud computing network, specific conditions can be drawn for the processes that in this way, every process has its own specific priority for conduction. In such a network, the issue of shaping the primary queue or in another word, processes enquiry is very important because the priority of a process in fact means its priority for conduction. It means that how much the priority of a process is much it should be done faster so the time issue is always reverse with the priority of each process. In this assay, the priority of each processing is depicted by λ .

Another issue about the primary queue of processing’s, before coming to the process allocation unit, is that, if we assume the queue of input processes based on the process's priority organized, in some conditions, possibly shortage can happen for some of the processes, this condition will happen in a state if there are some processes with low priority in the queue. It is possible that the processes with more priority enter to the primary processing queue constantly, so maybe this processing’s don’t reach to allocation unit not at all, or they may reach there too late. All delivered processing’s to cloud computing network have useful conduction episode or they are conducted with time limitation. This time limitation can be assumed based on this performance priority because the maximum level of process usefulness is calculated by the user who applies to do a processing. So, in modeling and stimulation of the condition, we considered the maximum of time's usefulness according to performance priority by using priority weight which is a number between 0-1. The main reason of priority application is to decrease the number of missed processes desirably because most of those present processes in cloud computing networks, have different useful conductive episodes from the point of view of the machine applicants and the maximum processing should be done and sent at this time, otherwise the processing would be lost and the efficiency will be decreases and energy consumption will increase. So for optimization of some criteria, cost function should be presented in a way to consider the priority issue as well.

5-3 processing queue of each virtual machine

Since each virtual machine has a queue for process conduction, the length of queue should be considered as a part of optimization issue for optimized citation of processes to virtual machines because those processes that have been placed before one process in a queue of a virtual machine, each will need a time for a process. On the other hand, according to the priority of these processes, some conditions should be presented for optimization of process allocations to the virtual machines in a way to consider the priority of each process according to the waiting time on the queue of virtual machine or the same queue length of virtual machines processing’s.

5-4 Numerous virtual machines and the stimulation of these machines

In cloud computing network, it is possible that the number of these virtual machines would be more a lot of computing time and cost will be calculated for all of these machines compared to the condition that some of these machines are placed in searching environment. The more the number of these virtual machines are, the cost of resolving optimized allocation of the requests to virtual machines in cloud computing networks will be more so for this reason, we will use the developmental algorithms like genetics and simulated annealing (SA) for solving of optimized allocation issue.

6. Transformation of process citations to virtual machine processing in cloud computing network

The processes reach to the process allocation unit at different times and there are different numbers of processors in cloud computing network, figure 2 illustrate the issue of mapping better:

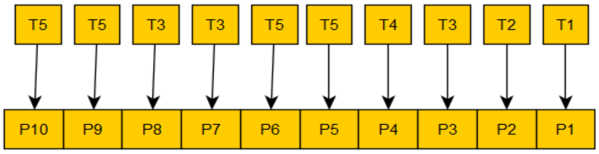

Fig.2 The display of different processes that enter to processing queue at different times

Table1. The display of input processes to the first line of process management at different times

The process which enters to the queue	The process which enters to the queue	The process which enters to the queue	The process which enters to the queue	Process entering time
			P1	T1
			P2	T2
	P8	P7	P3	T3
			P4	T4
P10	P9	P6	P5	T5

According to figure 3 and table 1, the issue explanation for transformation of permutation issue is in a way that, the processes arrival at different times and the best resources are conduction of these processes are a permutation. Furthermore, the discovery of permutation changes every time, the reason of this issue is that the number of processes which in every moment enter to the queue of the processes for allocation to the virtual machines of cloud computing networks, will be different. So in fact, the optimized allocation of the processes to the virtual machines' processors is an optimization issue with the format of permutation.

7. The applied objective function in the proposed method

The objective function which is also named as fitness function, is the computing basis for the suitability of an answer for a solution. Since, these criteria based on the solved problem for optimization algorithm, is different, objective function should be implemented for each kind of problem separately. In fact, the main art of objective function is in a way that all criteria of the user are considered.

8. Time estimation for the citation of each request to the virtual machines processors

Each process is investigated and answered based on the priority that the processing applicant applies. In suggested model, we considered the maximum time length that takes to answer to the process and also we assumed the speed of virtual machine in the possible lowest state. The reason of that lies in the fact that, we want to calculate that, in the worst condition for answering to the processes, how much time we need and in this episode, we can miss how many requests.
The cost computing for time conduction of each process is for allocation of the requests to the resources by investigating the 3-4 equation. So the volume of each processing is calculated by one million commands unit in second divided to processing speed based on one million commands unit in second. The units of process and
Process speed: million commands in second (mips)

9. Modeling of processes allocations to virtual machines as an optimization problem

For presenting multi-criteria cost function, we should define cost equation that can optimize all criteria. Firstly, we will define all criteria and then present the cost equation:

$T_{Run_j i}$: The essential time for conduction of each process is based on the slowest speed of present processor in cloud computing network and its usage reason is that, we want to measure the maximum time for performance among present virtual machines but along this factor, the length of queue is very important too, but since the length of queue is all the time changing based on the allocated processes to virtual machines, we consider the maximum time that doing a process needs to do a task on the most slowest processor in order to decrease the effect of queue length on in time conduction of a process. In addition, as the process priority leads to the change in queue length, the

$$ProcessorSpeed_j = Min(\prod_{f=1}^{f=n} ProcessorSpeed_f)$$

$$T_{Run_j i} = \frac{Process_i}{ProcessorSpeed_j} \quad (3)$$

speed of processes cannot be the only determinant factor so because of this reason, for lowering the possibility of process missing, the slowest speed of virtual machine is considered as the minimum time needed for conduction of a process. This factor is calculated by 3 equations:

To give a multi-criteria cost function, a cost equation should be defined that can optimize all criteria, so at first, we define the criteria and then present the cost equation:

t_{wait} Queue: the expected time for each process is placed in the queue of virtual processor machine that in various times, this episode changes according to present processes in the queue. The reason of change in length of queue is two different factors:

1. New processes: new processes are allocated to virtual machines by means of allocation unit.
2. The priority of processes: when the processes with higher priority enter to the processing queue at cloud computing networks, so organization of processes queue is done again. But another outstanding issue in this subject is time partition. As the processes can enter to the process queue at various times or some processes can enter to this queue in a single time, in such a condition, the situation changes because those processes done in second 1, all should be allocated and processed until second 2 but in many cases, when the input processes are allocated in second 1 and are being processed, they don't finish until they reach to second 2. So that's why, in 2nd second, those processes that are placed in process queue for allocation, if they are placed in a queue that is involved in conduction of a process or processes which are allocated to that at second 1, in such a condition, those processes which are allocated at second 2 will be longer. The most significant subject is when if high priority processes enter to the queue, the process queue is aligned again and in such a condition, the conducting time of the processes that have entered to the previous queue, changes. If these changes make the conducting time of present processes in queue equal or bigger than the maximum level of time usefulness, these processes get lost.

$T_{Run_j\,i}$: The essential time for conduction of each process is based on the speed and mode of processor for present process in Cloud computing network. These criteria are calculated by equation 4.

The way to calculate the conducting time is in a way that, each processes that enter to the primary queue divide with the virtual machine's speed and these number multiples

$$T_{Run_j\,i} = \frac{Process_i}{ProcessorSpeed_{Mode_j}} * Energy_{USE-ProcessSpeed} + t_{WaitQueue_j} \quad (4)$$

$$\min_{ProcessorSpeed} = \frac{1}{3} * \max(ProcessorSpeed_j) \Rightarrow \min_{Energy-USE} \quad (1-4)$$

$$medium_{ProcessorSpeed} = \frac{2}{3} * \max(ProcessorSpeed_j) \Rightarrow medium_{Energy-USE} \quad (2-4)$$

$$\max = \max(ProcessorSpeed_j) \Rightarrow \max_{Energy-USE} \quad (3-4)$$

$$ProcessorSpeed_{Mode_j} = [\min - medium - \max] \quad (4-4)$$

with consumed energy (it is consumed for energy supply by virtual machine and management center which is responsible for request allocation) and we sum the result with expected time when it is going to be placed in the queue and allocated to that resource. The waiting time of each process in virtual machine's processing queue that changes according to the present processes in queue at different times and affects the cost function. Another issue that should be considered carefully, is the modes that the processor (virtual machine) can be placed in it. Here, we supposed that each virtual machine can work in 3 modes that they are as following: the slowest speed of processor which is 1.3 of the maximum speed of processor, the medium speed of processor which is 2.3 of the maximum speed of processor and 3.3 is equal with the maximum speed of processor. These modes are divided to 3 parts based on their energy consumption and each processing:

Minimum, medium and maximum. If the time condition of process or $T_{Run_j\,i} < Max(T_{RunDefination_{j_{source-mashine}}})$ is supported, the virtual machine would be allocated to the processing, but if this condition is not supported, it means that the processes is lost. To support this condition and minimization of energy consumption, we introduce 5 equations.

$$T_{Run_j\,i} = \frac{Process_i}{ProcessorSpeed_{Mode_j}} + t_{WaitQueue_j} \quad (5)$$

$$\begin{aligned}
&if\ (ProcessorSpeed_{Mode_j} = \min)\ \&\ T_{Run_j\,i} < Max(T_{RunDefination_{j_{source-machine}}}) \quad (1-5)\\
&ProcessorSpeed_{Mode_j} = \min\\
&else\\
&if\ (ProcessorSpeed_{Mode_j} = medium)\ \&\ T_{Run_j\,i} < Max(T_{RunDefination_{j_{source-machine}}}) \quad (2-5)\\
&ProcessorSpeed_{Mode_j} = medium\\
&else\\
&if\ (ProcessorSpeed_{Mode_j} = \max)\ \&\ T_{Run_j\,i} < Max(T_{RunDefination_{j_{source-machine}}}) \quad (3-5)\\
&ProcessorSpeed_{Mode_j} = \max\\
&else\\
&Cost_i^{\,j} = \inf\\
&end
\end{aligned}$$

The equation (5) will be applied for optimization of energy consumption because it pushes the processor of virtual machine to be placed in a mode to have the possible lowest speed by retaining the time limitation condition and by this, the energy consumption is optimized during the process conduction meanwhile the processing is banned on virtual machine and the process is lost. In two ways, the processing can be lost and does not reach to the virtual machine:

Among the resources that are chosen by developmental algorithms, all should have a processing queue that the process can only reach to lower time of usefulness even by their on-time conduction, this means that the condition fails and in this condition, the process is lost.

$$T_{Run_j}i < Max(T_{RunDefination_{j_{source-mashine}}})$$

In a condition that the cited processing's have a very little time for conduction and it wants to be conducted in the shortest possible time, the losing probability of processing increases, in this condition too, the process is lost.

$$T_{Run_j}i < Max(T_{RunDefination_{j_{source-mashine}}})$$

In order to decrease the probability of losing a process for finding a suitable answer by developmental algorithms, a significant change should be created in cost function. The most significant change that should be created in such a condition in cost function, is a significant increase in amount of cost during the time that the solution and the selection of the present resource lead to the loss of process. So by means of this definition, synchronically, we can do the condition of multi-parametric optimization like: reduction in energy consumption of processors, reduction in number of missed processors, discovery of the optimized processor for process conduction and optimized scheduling.

These criteria are very important for calculation of processes citation cost, because the speed of processor can not only be a suitable criteria for process citations to virtual machines processors in cloud computing network.

$$T_{Waitqueen_j}i = \sum_{j=1}^{j=n} TimeWait_{Queue_j}i = \sum_{j=1}^{j=n} T_{Run_j}i \quad (6)$$

10. Presentation of cost relationship for each citation and conduction of each process

As in previous part, the parameters were explained, for consideration of all criteria in cost function, we will present equation (7):

$$Cost_i^j = \frac{T_{tad_j}{}^i = \frac{Process_i}{ProcessorSpeed_{Mode_j}} + t_{WaitQueue}, \forall T_{tad_i} < T_{tad_{WaitQueue}}{}^i}{\lambda_i} + Cost_p^j \quad (7)$$

The equation 7 shows that, for calculation of cost, each dependent process on time, should calculate the time of processing according to the slowest resource and then it should add it to the queue length of present processes (time of processing) and then, divide it to the priority amount of the process. This equation Relation considers the time and it can calculate queue length, it is the result of essential time for present processing in that queue.

Also, the denominator of this equation, $ProcessorSpeed_{Mode_j}$ is in fact various speeds that the processor of virtual machine can switch on them. These speeds work in 3 different modes by using this capacity to control different voltages of the processors that the speed of processors directly affect the energy consumption in allocation and conduction of the processes in cloud computing networks. The resolving of optimized allocations of processes for virtual machines processors is possible optimally by means of this function. The most significant criteria for calculation of cost are queue length processing, the priority of each process and energy consumption level that are all considered in this equation. In addition, this equation shows the cost of each process conduction which chooses developmental algorithm among the present processors of virtual machines in cloud computing network and finally, it delivers the process to the most suitable processor with the lowest process conduction cost.

λ : The priority of process conduction which is presented based on the maximum usefulness level by each process applicant, is considered a number between 0 -1 in modeling.

11. Results and evaluation

11.1 Comparison of genetic developmental optimization methods and simulated annealing method

The given cost function (7) is done for calculation of optimized algorithms cost and then at the best possible condition, (lowest cost), the process citation is done to the processor. So now, to investigate optimization algorithms methods, at first we use equation 5-1.

$$Cost_i^j = \frac{T_{tad_j}{}^i = \frac{Process_i}{ProcessorSpeed_{Mode_j}} + t_{WaitQueue}, \forall T_{total_i} < T_{total_{WaitQueue}}{}^i}{\lambda_i} + Cost_p^j \; (7)$$

$$Quality_{Evaluation} = Min(\sum_{Alo=1}^{Alo=n} \sum_{Process=1}^{Process=n} Cost_{Alo}{}^j)(8)$$

Equation (8) shows the total sum of processes allocation costs to the virtual machine processors, how much the sum of these costs are lower, it will show the better function of developmental algorithms for solving the issue of optimized allocation of processes to the processors of virtual machines in cloud computing networks.

11-2 Cost evaluation criteria of process citation queue to the processors

As it is clear in equation (5), the cost amount should be calculated for each resource based on the cost of process queue. If the allocations of the citation unit for the processes to the processors in virtual machines of cloud computing networks are optimized, the costs of these queues get lower, the cost of these queue will be decreased and we will compare these two algorithms by means of (8) equation which is the result of costs sum of comprised queues.

11-3 Evaluation criteria of evaluation numbers of cost function

One of the evaluation criteria and comparison of developmental optimization algorithms can be the numbers of conduction of cost algorithm for request citation to the processors in cloud computing network. So we will compare two developmental algorithms with each other. How much the evaluation number of cost function is less, the algorithm works better.

11-4 The comparison of changes among the best received costs for developmental algorithms

As it is depicted in figure 3, the best received costs for optimized citation of the processes to the processors in virtual machines of cloud computing network was presented by genetic algorithms. As it is seen in this figure, 300 processes with the best different costs have referenced to the processors of virtual machines.

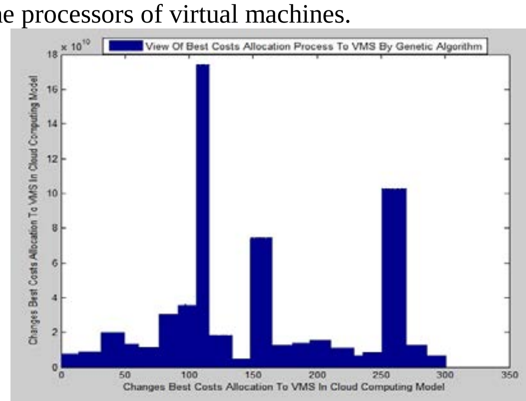

Fig. 3 The variations of the best received costs in process citation by genetic algorithm

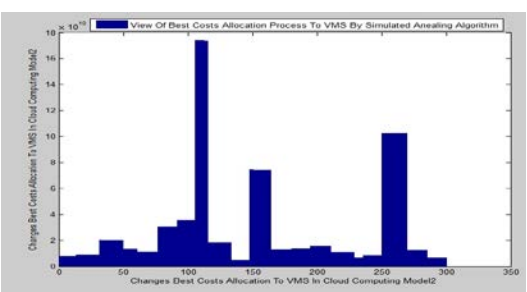

Fig.4 The variations of the best received costs in process citation by SA algorithm

As it is depicted in figure 4, the variation of the best received costs for requests citation is performed by SA algorithm. It is completely clear that, the function of SA algorithms is better than genetic algorithms which is based on the best found cost's variations and this efficiency is clear by comparing these figures 3 and 4 compared to the costs. The most and best genetic algorithm are: 17.5*1010 and the most and best SA algorithm are: 17* 1010, we will understand the better function of SA in comparison to the genetic algorithm, differing 5000 cost unit.

Figure5 shows the process queue cost for processors in cloud computing networks by genetic algorithm. As it is clear from the figure, the increase in process queue cost for the processors of virtual machines has increased gradually. This increase is due to the use of aggregative method in algorithm conduction and allocation of 300 processes to 30 different machines. If we pay attention to figure 5 carefully, we will understand that the maximum level of aggregation cost in 20th episode which is the last time of simulation, has reached to 6.5 * 104 and in figure6, the level of aggregation cost of the best received costs of processing queue of virtual machine processors by SA algorithm is 5.5 * 104 and this number shows better function of SA, differing 1000 cost unit. The comparison of these two algorithms show this function in figure7.

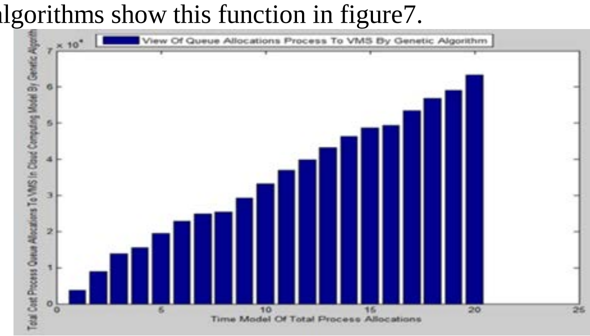

Figure5. Variation trend of process queue cost in process citations by genetic algorithm

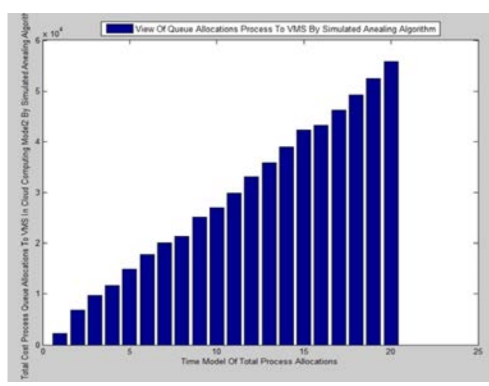

Figure6. Variation trend of process queue cost in process citations by SA algorithm

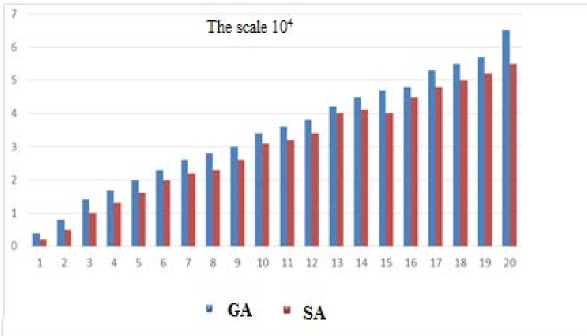

Figure7. Comparison of process queue cost variation in process citation by SA and genetic algorithms.

In figure 8, amount of costs that genetic algorithm has created for optimized citation of processes to virtual machines processors are depicted. As it is obvious, the variation of total costs of genetic algorithm is 11* 100000 that, it is a very big number for cost production compared to SA algorithm. But as it is clear in figure 9, total cost by SA algorithm for process citation to the virtual machines processors is 9.5*100000 that, it is a smaller number compared to produced cost by genetic algorithm and this proves the better function of SA algorithm compared to genetic algorithm for process citations to virtual machines processors in cloud computing networks.

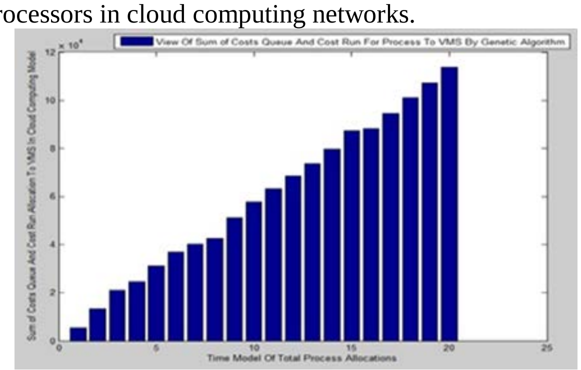

Figure8. Produced cost of processes citations to virtual machine processors by genetic algorithm

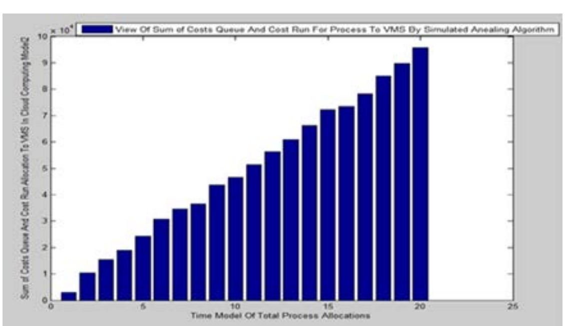

Figure 9. Produced cost of processes citations to virtual machine processors by SA algorithm

Another parameter that can be used for comparison between genetic and SA algorithms, is the number of missed processes out of 300 present processes. If this number is less, it indicates a better function of this algorithm. In figure 10, the number of missed processes by genetic algorithm are displayed. As it is clear from the comparison of this figure with figure 11, the number of missed processes of genetic algorithm is much more than SA algorithm. This 21-unit difference in missed processes are for allocations by genetic algorithm. Considering this difference, the number of missed processes are completely clear. Genetic algorithm could not resolve the allocation issue as well and this issue presents that the chosen processors for citation could not answer to the processors but SA could distinguish the suitable sources very well. 14 missed processes among 300 processes is a very smaller number compared to 35 missed processes out of 300 present processes.

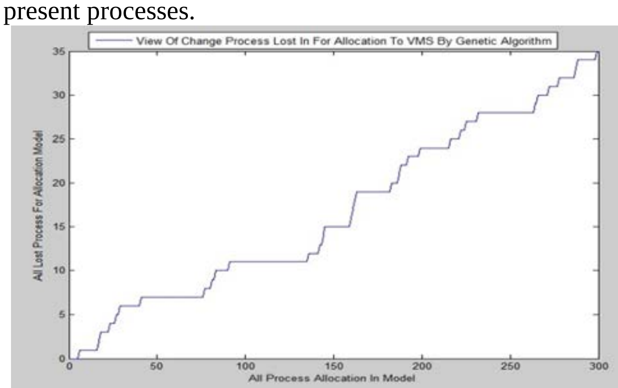

Figure10. The number of missed processes for processors by genetic algorithm

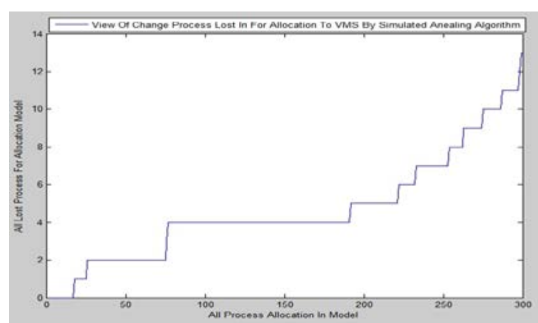

Figure11. The number of missed processes for processors by SA algorithm

The most important parameter that in this research has a great importance for us, is the energy consumption level, which are compared in figures 12 and 13 for comparison of two algorithms. The calculation of consuming energy is presented during 20 episodes of simulation aggregative. As it is seen in figure 12, the energy consumption level for allocation and process conduction is 4* 108 by means of genetic algorithm that, it is a very big number. But as it is clear in figure 13, SA and genetic algorithms with fewer missed processes have reached to 16* 107 that the consumed energy difference for process allocations is equal with 24* 107 that, it is a very big difference. All mentioned numbers in energy consumption are based on Joule unit, so the function of SA for the optimization of energy consumption, had a better function in comparison with genetic algorithm.

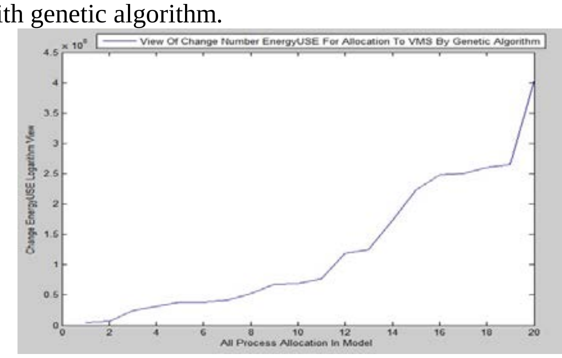

Figure12. Level of consumed energies for allocation by genetic algorithm

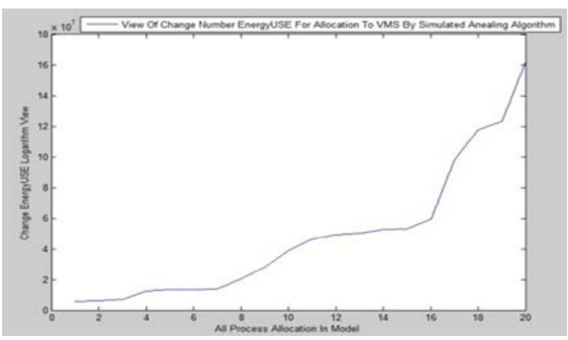

Figure 13. Level of consumed energies for allocation by SA algorithm

13. Conclusion

SA algorithm was compared with genetic algorithm in order to optimize process allocation to optimized virtual machine and energy consumption and the reduced number of missed processes. This algorithm has shorter queue length for evaluation of cost function, optimization of energy consumption, and decrease in response time of service for input processes in queue for processors in comparison to genetic algorithm. By considering special condition, process allocation to the processors are very important in terms of time, solving of this issue needs a lot of cost and time by means of a non-developmental algorithms method. If the selection of the processors is performed by means of accidental methods, allocation issue of optimized processes is not solved optimally. Even precise solving methods of mathematics will increase the needed time and cost because of the need for complete information about the issue. For more precise search of optimum sources, developmental algorithms in combination with searching method like TS and CSP or decreasing algorithms can be applied.

References

[1] Yun c, Hyun j Moon, Hakan h, Junichi t. 2011. SLA-Tree: A Framework for Efficiently Supporting SLA-based Decisions in Cloud Computing, EDBT/ICDT' Proceedings of the 14th International, pp 129-140.

[2] Isam Azawi Mohialdeen. 2013. Comparative Study of Scheduling Algorithms in Cloud Computing Environment", Journal of Computer Science ISSN 1549-3636, pp 252-263.

[3] Jing l, Xing-Guo l, Xing-Ming z, Fan z and Bai-Nan l. 2013. Job Scheduling Model for Cloud Computing Based on Multi-Objective Genetic Algorithm, IJCSI International Journal of Computer Science Issues, January 2013,ISSN (Print): 1694-0784 | ISSN (Online): 1694-0814,pp 134-139.

[4] Rohit O. Gupta, Tushar Champaneria. 2013. A Survey of Proposed Job Scheduling Algorithms in Cloud Computing Environment, International Journal of Advanced Research in Computer Science and Software Engineering, Vol 3, Issue 11, pp 782-790.

[5] Huankai c. 2013.User-priority guided Min-Min scheduling algorithm for load balancing in cloud computing, Parallel Computing Technologies (PARCOMPTECH), 2013 National Conference on, PP.1-8.

[6] Q. Cao, B. Wei and W. M. Gong. 2009. An optimized algorithm for task scheduling based on activity based costing in cloud computing, In International Conference on eSciences, Tavel, P. 2007 Modeling and Simulation Design. AK Peters Ltd, pp. 1-3.

[7] Upendra b, Purvi N. r. 2013. Enhanced Max-min Task Scheduling Algorithm in Cloud Computing, International Journal of Application or Innovation in Engineering and Management (IJAIEM), ISSN 2319-4847.

[8] Aarts, E.H.L. Korst, J.H.M. 1989. Simulated Annealing and Boltzmann Machines. Wiley, Chichester, pp 187-210.

[9] Uma s, Sanjeev j. 2015. An Analysis of Swarm Intelligence based Load Balancing Algorithms in a Cloud Computing Environment, International Journal of Hybrid Information Technology Vol.8, No.1. pp. 249-256.

[10] Yogita c, Mansi b. 2012.A Study on Scheduling Methods in Cloud Computing, international Journal of Emerging Trends & Technology in Computer Science (IJETTCS) October.vol1, pp 12-17

[11] Youwei d, Xiaolin q, Liang l, Taochun w. 2015. Energy efficient scheduling of virtual machines in cloud with deadline constraint. Future Generation Computer Systems Science Direct Journal.vol 50, pp 62–74

[12] C. Wang, K.Q. Yan, Sh.Sh. Wang, Ch.W. Chen. 2011. A Three-Phases Scheduling in a Hierarchical Cloud Computing Network, 3th International Conference on Communications and Mobile Computing (CMC), Qingdao, pp. 114-117.

[13] Kokilavani.T and George Amalarethinam.D.I. 2011. Load Balanced Min-Min Algorithm for Static Meta-Task Scheduling in Grid Computing, International Journal of Computer Applications, Vol, 20, pp 43-49.