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Performance Evaluation and Implementation of Tasks in Virtual Machines

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Abstract: In the present situation, it may be essential to build a simple data sharing environment to monitor and protect the unauthorized modification of data. In such case, mechanisms may be required to develop to focus on significant weakened networking with proper solutions. In some situations, block chain data management may be used considering the cloud environment. It is well understood that in virtual environment, allocating resources may have significant role towards evaluating the performance including utilization of resources linked to the data center. Accuracy towards allocation of virtual machines in cloud data centers may be more essential considering the optimization problems in cloud computing. In such cases, it may also be desirable to prioritize on virtual machines linked to cloud data centers. Consolidating the dynamic virtual machines may also permit the virtual server providers to optimize utilization of resources and to focus on energy consumption. In fact, tremendous rise in acquiring computational power driven by modern service applications may be linked towards establishment of large-scale virtualized data centers. Accordingly, the joint collaboration of smart connected devices with data analytics may also enable enormous applications towards different predictive maintenance systems. To obtain the near optimal as well as feasible results in this case, it may be desirable to simulate implementing the algorithms and focusing on application codes. Also, different approaches may also be needed to minimize development time and cost. In many cases, the experimental result proves that the simulation techniques may minimize the cache miss and improve the execution time. In this paper, it has been intended towards distribution of tasks along with implementation mechanisms linked to virtual machines.

Keywords : Data Center, Virtual machine, Blockchain, Data analytics, Metaheuristic

I. INTRODUCTION

Sometimes, in the virtualized system, the computing resources may be associated with the resources on-demand without intervention of information technology as well as incurring maximum cost with the data centers and maximum nodes with the data centers. This may not only be directly linked to the computing resources but also linked towards application of the resources.

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Many times the servers may be responsible to operate maximum up to 50% of their full capacity. But managing and maintaining the over provisioned resources may result towards total cost of ownership. So, keeping the servers underutilized may be highly inefficient from the energy consumption perspective. Sometimes the opportunities may be observed towards energy conservation via techniques utilizing switching servers off or to low-power modes. The virtualization technology in general may allow the service providers to obtain the number of virtualized systems on a single physical server to improve the utilization of resources. The minimization of consumption of energy may be achieved by switching idle nodes to low-power modes and ignoring the idle power consumption as well as consolidating dynamically the number of physical nodes according to their current resource requirements.

Many times it has been observed that submitted tasks may have the interdependent relation. So it may be very essential to schedule the tasks while being associated with the cloud environment. Accordingly, these tasks may be executed only when their parent tasks have been executed, and when they have been linked to their subtasks. In this context, the whole process may be sequenced and the number and the length of tasks sometimes may be stochastic. The relationship between tasks is also random, that is which task is subtask and which task is the parent task is random.

II. REVIEW OF LITERATURE

Wajid U et al.[1] in their work have projected on deployment of the commercial and scientific applications. It has been observed that the rapid increase of cloud computing may need installation of big data centers linked to huge number of computing nodes.

Calheiros et al.[2] in their work have focused towards exploration of optimal virtual machine allocation solutions. They intended towards simulation engine and integrate the system and minimize the execution time of virtual server allocation solutions.

Paya et al.[3] during their study observed the sustainability computing associated with cloud service providers due the rapid growth of cloud computing along with energy consumption and operational cost.

Corradi et al.[4] in their work have focused on virtual environment to optimize virtual machines considering power consumption, host resources, and networking.

Xu et al. [5]in their work have focused on energy consumption model for cloud computing applications and they proposed various approaches towards conduct of scientific workflow executions in an energy-aware manner.

Dai et al. [6]

during their study have investigated various greedy approximations to focus on energy while satisfying the service level agreements. To evaluate the effectiveness of their approach, they have done simulations with different virtual machine requests.

Li et al. [7] in their work have investigated the arrival time, capacity, and execution time of virtual machines as these may be significant factors which may affect the performance of cloud systems. They have also generated a large set of stochastic virtual machine requests for the simulation.

Yu, L et al.[8] in their work have focused on enhancing the performance of task scheduling implementing the strategies along with linking the task allocation in clouds. They observed that adoption of Bayes classifier principle may classify tasks based on historical scheduling data coordinated with virtual machines.

Zhang et al.[9] in their work have utilized the resource managers towards prioritizing user tasks. Implementing the simulation, they observed marginal convergence rate and poor capability of local search. Therefore, they proposed hybrid optimization algorithm which may combine cuckoo and harmony search algorithms to enhance the scheduling process. Usually, the tasks may initially be assigned to the virtual machines and the search algorithms may be used to update the fitness function.

Kumar et al.[10] during their study focused the basis hybrid algorithms linked to fuzzification and swarm optimization towards improvement of task scheduling performance in cloud computing. These may be implemented to minimize task waiting time. The primary intention of these algorithms may be to utilize resources, optimize performance metrics to achieve good load balancing.

Arabi E et al.[11] in their work have focused towards cloud computing services linked to virtual systems from large-scale data centers operated by service providers. They observed that most cloud service providers use machine virtualization to provide flexible and cost effective resource sharing. So it may be difficult to physically assign tasks to computing resources in clouds.

Shagufta Khan etal.[12] in their work have focused on the concepts of implementing the load-balancing algorithm and optimizing the entire system load while trying to maximize and minimize different factor constraints. They observed that the technique is efficient to obtain the overloaded node in less time along with maximum utilization of resources.

Vidhya M et al.[13] in their work have discussed about parallel particle swarm optimization algorithm to obtain the optimal mapping of tasks linked to process completion time. They observed that it may reduce the execution time of tasks in cloud. The main motivation of the work may be to improve the quality of services using optimization techniques.

Jemina Priyadarsini R et al.[14] in their work have proposed improved Particle Swarm optimization algorithm to obtain the near optimal solutions with global & fast violation rate and enhance the efficiency. This technique may produce better performance in resource utilization and improve solution.

R. N. Calheiros et al.[15] in their work focused on allocation of virtual machines along with processing cores. They have also pointed towards space shared scheduling strategy linked to assign specific processing elements to a specific virtual machine.

E. Feller et al.[16] in their work have adopted the ant colony optimization approach to schedule virtual machine linked to energy consumption. They focused on multi-dimensional bin-packing problem towards resource scheduling. In this work, it was intended to put as many as virtual machines to conserve the number of operating physical machines.

Y. Gao et al.[17] during their work have focused on basic approaches towards efficient virtual machine scheduling and to conserve energy in a large scale cloud infrastructure. In this scenario, it may be intended to decrease the overall resource wastage and energy consumption.

M. Tang et al.[18] in their work have focused on hybrid genetic algorithm approach with local search procedure used for decreasing the energy consumption by considering the communication network in addition to physical machine in a data center.

X.-F. Liu et al.[19] in their work have focused on the approach based on ant colony optimization to minimize the number of physical machines. In such scenario, they may be able to achieve more efficient resources with large number of virtual machines.

III. PRELIMINARY ANALYSIS

(i) Assuming a number of virtual machines to be linked with the system, initialize a set of job queues concurrently along with t no. of tasks with different sizes.

(ii) Focusing on the turnaround time of the tasks, the short term scheduler may be instructed Considering the execution time of tasks, the short term scheduler may be instructed to assign the tasks with maximum burst time to the virtual machine towards execution.

(iii) The operating cost as well as processing cost linked to virtual machine may not be unique as there may be different virtual machines with different execution patterns and the virtual machines may have dissimilar outcomes.

(iv) The execution cost linked to the virtual machines may also be linked to the tasks during scheduling and assuming the implementation of non preemptive scheduling, the processing speed of each processor of the virtual machine may also be represented as MIPS and the corresponding collection of the processing speed may also be as MIPS. As the size of tasks may be randomly assigned, the virtual machines linked to the tasks may also be randomly assigned. Assuming t tasks and n number of virtual machines, the total length of the tasks may be distributed in the nth virtual machines.

IV. TASKS DISTRIBUTION ON VIRTUAL MACHINES

Initially the tasks may be submitted to the virtual data center, and accordingly the virtual machines may be selected. It may also be observed that the number of systems may affect the implementation of the scheduling. In this regard, it may be thought of implementing particle swarm optimization technique.

4.1 Implementation using PSO

Implementing particle swarm optimization to analyze the computation cost along with data transmission cost, it may be very clear that by varying its costs it may be used for workflow application which may result towards better distribution of workload between resources .The allocation of tasks to the system in such cases may be confined within task Buffer, task Information, resource Information and virtual machines.

Algorithm 1 : implementation tasks using particle swarm optimization technique

Input: Allocation of tasks

Output: Average response time with utilization of virtual machines

Step 1 : initialize the particle

Step 2 : calculate fitness parameter of each particle implementing the function Step 3 : if the fitness value of the particle is greater than the obtained fitness parameter locally pbst, set current value as the pbest

Step 4 : else compare the particle with the fitness value of all the particles , gbst

Step 5 : evaluate the parametric value for each particle and update particle position

Step 6 : iterate till achieving global maxima or global minima

Also the algorithm may be represented as follows.

Step 1 : Initialize the of particle swarm, quantity of tasks along with virtual machines

Step 2 : Initialization the position and velocity of particles

Step 3 : Define the strategies of task allocation and evaluate the fitness parameter of tasks. Towards acquiring the particles with low cost tasks, it may be required to find the particles of a high adaptability.

Step 4 : Achieve the local and global optima and find the near optimal of fitness values.

Step 5 : Compare these parameters for each particle and update the particle's speed and position.

Algorithm 2 : Task validation implementing particle swarm optimization technique

Step 1 : Assigning the set of tasks by validation

Step 2 : Estimate the completion time of tasks along with cost of execution of tasks

Step 3 : Initialize the population and iterate number of times ,t with no. of iterations ,k

while(t<tmax) and (k<100){

do for each particle

for each task

do

Step 4 : Compute the fitness value of each particle

Step 5 : if the fitness value is greater than cost of each task, then using fitness value estimate the cost of tasks

Step 6 : modify the velocity of each particle and update the position

Step 7 : Regenerate the optimal solution of the existing iteration, t=t+1. If the result of the existing iteration is not equal to the solution, the reinitiate it, else update the iteration.

4.2 Experimental analysis

To carry out the scheduling process, the non preemptive scheduling algorithm, first come first serve may be chosen. Accordingly, the simulation may be carried out in the cloud environment to verify the effectiveness of the algorithm. In this scenario, the length of tasks, the numbers of tasks and the relation between tasks may be random. The optimal solution may be achieved after attainment of maximum iterations.

Population size: 100

Inertia factor: 0.7

Largest number of iterations: 100

V. EXPERIMENTAL RESULTS AND PERFORMANCE ANALYSIS

Cost of tasks at different proportions

AS shown in the table, along with the proportion of the tasks within 200, the estimated completion time of tasks may be minimized considering the non preemptive scheduling algorithm. But along with the proportion of tasks in between 200 and 400, the estimated completion time of tasks may be little bit enhanced.

Table 1 : Allocation of virtual machines

No. of tasks	100	200	300	400
VM1	4	10	7	15
VM2	3	6	9	16
VM3	5	8	18	24
VM4	3	7	10	15

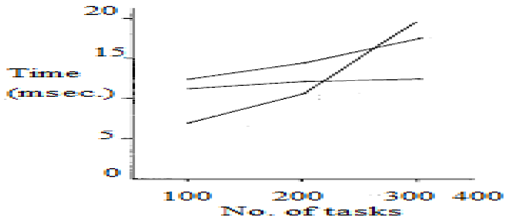

Figure 1 : Task allocation in virtual machines

As per experimentation, while simulating it may be observed that the virtual machines may be functional with different capabilities. In such situation, the attribute values of the resources also may be similar. Also the cost of tasks considering the process of execution may be in the similar domain.

Table 2 : Process of execution(Virtual Machine)

Virtual machines(Category)	Process of execution	Cost of tasks in the system(msec)
VM1	290	0.03
VM2	415	0.06
VM3	477	0.07
VM4	577	0.09

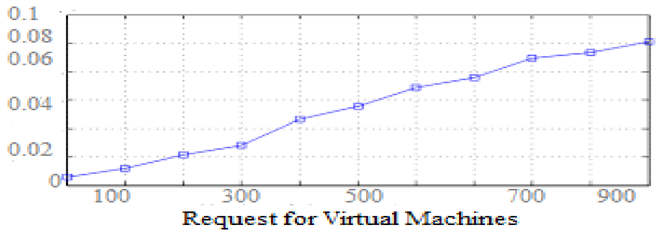

Figure 2 : No. of request for VM with access time

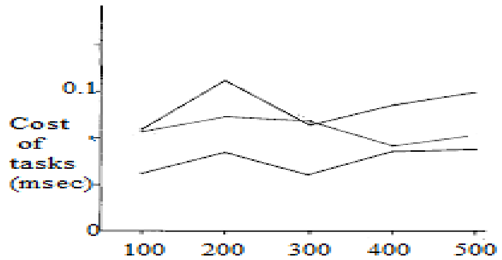

Figure 3 : Process of Execution (Virtual Machines)

Considering the maximum number of 700 numbers of tasks and the length of tasks ranging from 1000 million instructions per second to 9000 million instructions per second, and conducting the tests 100 number of times, it has been observed that the total number of tasks and the virtual machines are in proportional allocation along with adequacy of mapping data.

VI. DISCUSSION AND FUTURE DIRECTION

It has been observed many contributions linked to optimization of task scheduling implementing metaheuristic approaches. In this work techniques along with algorithms for efficient task scheduling have been adopted to obtain the average execution and response time along with effective utilization of virtual machine in virtual environment. It has been observed that particle swarm optimization technique may be much better to produce better results in context of response time and utilization of virtual machines.

VII. CONCLUSION

Sometimes it may not be easy to obtain the local optima and due to the same the effect of convergence may be unsatisfactory. Also implementing the metaheuristic approach it may be easier to schedule the tasks and it may not affect to the total time towards completion of the tasks. It may also schedule the execution tasks on the basis of computing power of the virtual machines in the data centers. In this context, it may be essential that all tasks may be mutually dependent. Also the tasks may be computationally intensive, considering the virtual environment. The virtual platform may transform the physical resources to dynamically scalable virtual resources implementing virtualization technologies.

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