A Critical Review on Load Balancing, Task and Resource Scheduling in Cloud Environment

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Abstract—**Reviewed the literature article by considering load ba-la-ncing, task and resource scheduling method for efficient cloud service provisioning.There is a possibility to minimize the total cost of computation by new scheduling method on the basis of bio-inspired heuristics. Single objective- and multi-objective-based task scheduling method for making multidimensional task and resource scheduling modelTested the suggested system performance using CloudSim simulator toolkit.**

Index Terms— **Cloud platform, task scheduling, resource management, load balancing**

I. RESEARCH PAPERS

A. *Resource scheduling algorithm with load balancing for cloud service provisioning*

A research by Priya et al. (2018) presented a load balancing (LB) and resource scheduling (RS) approach for efficient cloud service provisioning. Specifically, they have effectively scheduled the resources using Fuzzy-based Multidimensional Resource Scheduling model. Moreover, by utilizing a Multidimensional Queuing Load Optimization algorithm, they attained fair load balancing and increased the utilization of the virtual machine (VM) through selecting a request from a class in a dynamic manner. The suggested load balancing system is developed toward improving latency time for each class of request and avoiding overutilization and underutilization of cloud resources. The simulated results (tested using CloudSim simulator toolkit) shown that attained better performance with respect to high resource scheduling efficiency (7%), average success rate (9%) and reduced the response time (35.5 %). **But the primary criteria called, scheduling of task not addressed. Also, need to consider LB and RS of intermediate data toward enhancing the system performance by considering privacy-preserving as a metric together with other metrics like average response time and success ration.**

B. *OPFT:A New Online Scheduling Approach for Enhancing QoS in Cloud*

A research by Nasr et al. (2018) suggested an Online Potential Finish Time (OPFT) task scheduling method for enhancing the scheduling performance and resolve the QoS issues. They have allocated a group of a task through specific rules whereas the allocated task to specific VM which is proportional to the power processing of this VM. The performance of OPFT method is assessed via CloudSim, and the simulated results indicate that this method better efficient when related with the Round-Rob-in, Minimum Completion Time, First Come First Serve and Min-Min with respect to schedule cost, response time, schedule length, balancing degree and resource utilization. **However, the scheduling performance is poor; hence there is a need to improving the scheduling efficiency which gives low time complexity and low schedule length. Also, integrity of virtual machine and overhead, multidimensional resource scheduling was not addressed.**

C. *Meta heuristic-based task deployment mechanism for load balancing in IaaS cloud*

A study by Adhikari et al. (2019) suggested a load balancing resource clustering method approach toward attaining optimal resource clustering and their cluster centers for faster convergence via meta-heuristic Bat-algorithm. Also, suggested dynamic task assignment policy toward attain less execution cost, makespan within the given constraints. The suggested method has been evaluated (CloudSim simulator toolkit) by considering synthetic datasets, as a resulted shown superiority than the traditional approach. **But, the integrity of VM and overhead remain unaddressed. Also, needs to validate its performance for the multidimensional resource scheduling process. Then, will scrutinize the trade-off amongst different nature-inspired algorithms with task deployment policies for various types of service level agreements (SLA) with their penalties and load balancing policies.**

D. *An efficient symbiotic organisms search algorithm with chaotic optimization strategy for multi-objective task scheduling problems in a cloud computing environment*

A work by Adhikari et al. (2019) proposed a chaotic symbiotic organisms search (CMSOS) method for resolving multi-objective large scale task scheduling optimization issues on cloud computing environment. They have generated the initial ecosystem population by employing chaotic optimization method. Then, confirmed the diversity among organisms for global convergence by random sequence-based components of SOS which is replacing with a chaotic sequence. The suggested model performance has been evaluated on CloudSim simulator toolkit using synthesized workloads, and standard workload traces for huge instances, i.e. up to 5000. The simulated results of CMSOS shown better optimal trade-offs amongst financial cost (cost) and execution time (makespan) with no computational overhead. **However, the resource management, integrity of VM remains unaddressed. Also, needs to handle QoS requirements like security and reliability for very large workload instances.**

E. Cost-optimized hybrid genetic-gravitational search algorithm for load scheduling in cloud computing

A research by Chaudhary and Kumar (2019) presented a Hybrid Genetic-Gravitational Search Algorithm (HG-GSA) based load scheduling technique for minimizing the computation cost. The computational cost measured by considering transfer and execution cost. Also, they calculated a force by best position of particles and tested the performance using CloudSim simulator. The simulated results have shown that they minimized the computation cost which significantly improved the system performance than the traditional method namely CloudyGSA, particle swarm and Linear Improved Gravitational Search Algorithm in Cloud (LIGSA-C) method. **But the suggested method is not suitable for multidimensional resource scheduling strategies. The task scheduling and resource management remain unaddressed. Also, there is possibility to minimize the total cost of computation by new scheduling method on the basis of bio-inspired heuristics.**

F. Task scheduling techniques in cloud computing: A literature survey

A work by Arunarani et al. (2019) reviewed the available task scheduling methods and related metrics which is appropriate for a cloud platform. They have conducted a review on the basis of three perspectives such as parameter-based measures, methods and application were utilized. **At the end of research they have recommended enhancing the effectiveness of scheduling by combining virtual machine consolidation and task scheduling strategies. Also, will consider the different input parameters, namely deadlines, running costs. Then, there should be a need for single objective- and multi-objective-based task scheduling for enhancing the system performance by hybrid combination of earlier algorithms. But the major concern like integrity of virtual machine and overhead, load balancing, resource management remains unaddressed.**

TABLE I
Summary of the literature article

S.No	Work By	Method	Implementation tool	Findings and conclusion	Limitation / Future Scope
1	Priya et al. (2018)	LB and RS method	CloudSim simulator toolkit	1. high resource scheduling efficiency 2. reduced the system response time	1. scheduling of task not addressed 2. Needs to validate the performance of success ration
2	Nasr et al. (2018)	OPFT task scheduling method	CloudSim simulator toolkit	Task Completion Time has been minimized	1. scheduling performance is poor 2. multidimensional resource scheduling was not addressed
3	Adhikari et al. (2019)	load balancing resource clustering method	CloudSim simulator toolkit	Attained less execution cost, makespan within the given constraints	1. multidimensional resource scheduling was not addressed 2. Needs to scrutinize the trade-off amongst different nature-inspired algorithms with task deployment policies
4	Adhikari et al. (2019)	CMSOS method	CloudSim simulator toolkit	1. better optimal trade-offs amongst financial cost (cost) and execution time 2. There is no computational overhead	resource management, integrity of VM remains unaddressed To validate the performance for large workload instances
5	Chaudhary and Kumar (2019)	HG-GSA based load scheduling technique	CloudSim simulator toolkit	minimized the computation cost	task scheduling and resource management remain unaddressed
6	Arunarani et al. (2019)	Reviewed the task scheduling methods and related metrics	NA	Suggested to enhance the system performance by single and multi-objective-based task scheduling	To enhance of scheduling performance by combining VM consolidation and task scheduling strategies

II. CONCLUSION

- From these point I have concluded that some of the researchers consider the load balancing strategies and some of them considered task scheduling process over cloud computing. By considering a load balancing strategies, a work by Priya et al.(2018) suggested LB and RS approach for efficient cloud service provisioning. But the primary criteria called, scheduling of task not addressed.
- Similarly, a study by Adhikari et al. (2019) suggested a load balancing resource clustering method approach toward attaining optimal resource clustering and their cluster centers for faster convergence via meta-heuristic Bat-algorithm. But, the integrity of VM and overhead remain unaddressed.
- A research by Chaudhary and Kumar (2019) presented an HG-GSA based load scheduling technique for minimizing the computation cost. But the suggested method is not suitable for multidimensional resource scheduling strategies. Also, task scheduling and resource management remain unaddressed.
- For scheduling, the task of research by Nasr et al. (2018) suggested an OPFT task scheduling method for enhancing the scheduling performance and resolve the QoS issues. They have effectively scheduled the task, but there is need of effective method for minimizing the time complexity and schedule length.
- Similarly, research by Adhikari et al. (2019) proposed a CMSOS method for resolving multi-objective large scale task scheduling optimization issues on cloud computing environment. However, the resource management, integrity of VM and overhead remains unaddressed. A work by Arunarani et al. (2019) reviewed the available task scheduling methods and related metrics which is appropriate for cloud platform.
- At the end of research they have recommended enhancing the effectiveness of scheduling by combining virtual machine consolidation and task scheduling strategies. But the major concern like integrity of virtual machine and overhead, load balancing, resource management remains unaddressed.

III. RECOMMENDATIONS

There is a possibility to enhance the cloud system performance by considering the below criteria:

- To scrutinize the trade-off amongst different nature-inspired algorithms with task deployment policies for various types of service level agreements (SLA) with their penalties and load balancing policies.
- To minimize the total cost of computation by a new scheduling method on the basis of bio-inspired heuristics. Also will enhance the system performance by hybrid combination of single objective- and multi-objective-based task scheduling method
- To enhancing the cloud system performance for the multidimensional dataset by considering integrity of virtual machine, overhead and multidimensional resource scheduling strategies
- To handle various QoS requirements like security and reliability for very large workload instances.

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