Workflow Scheduling in the Cloud by Grey Wolf Optimization with Normal Distribution

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Abstract- In cloud computing Normally the resources allocated to the users are based on their request time and available resources. The problem arises when the large number of requests comes to the cloud for the single resource and it is very difficult to decide which request gets the resource at that time.approach prevents from the prematurity and enhances the convergence. The proposed approach is compared with existing algorithms on the simulator at 4 different workflows. The results show that the total execution cost is reduced in this approach.

Keywords- Cloud, scheduling, optimization, time, cost.

I. INTRODUCTION

To enhance the scalability, flexibility, and reliability of the cloud computing it is important to use the cloud resources effectively and efficiently. Cloud provides the computation, storage, and wide bandwidth to the users for effective computation. Normally the resources allocated to the users are based on their request time and available resources. The problem arises when the large number of requests comes to the cloud for the single resource and it is very difficult to decide which request gets the resource at that time. This situation increased the traffic on the cloud network and effect on communication process [1].

Load balancing of workflows requires huge computation and communication cost. It is the procedure of interdependent mapping tasks on the available resources to such an extent that work process application can finish its execution with user-characterized quality of service [2]. This work target random work process asks for after some time, so it must calendar work process execution with no learning of future solicitations. There are two types of workflow load balancing in the cloud [3]:

- **Best Effort Based:** It refers to finish execution at the earliest time or to limit the makespan of the work process application. It is the maximum time among the start and complete of a succession of tasks.
- **Quality of service:** This attempts to minimize execution cost while satisfying Quality of Service requirements [4].

II. RELATED STUDY

Following are the algorithms and techniques that are used n the workflow scheduling process. Each algorithm has its own merits and demerits that helps to enhance the knowledge in the field of workflow scheduling and help to enhance the research work in future. This is the review of latest algorithms and techniques which helps to find out the best approach for scheduling on less cost and less time.

Approach based on Meta heuristic algorithms:

Alkhanak et al. presented a cost optimisation approach for scientific progress scheduling in cloud computing. The proposed approach employs the four meta-heuristic algorithms which are based on the population. It helps in reducing value and time of suppliers. The execution time and cost are reduced as compared to existing approaches [1]. Anubhav, et al. introduced a gravitational search algorithm for workflow scheduling in the cloud environment. The optimizations in workflow reduce the cost and make span. In this process, two algorithms are hybridized GSA and HEFT for workflow scheduling. The performance evaluation is done on the basis of two metrics that are monetary cost ratio and schedule length ratio. The validation of result is also tested by ANOVA test and it shows that the proposed approach outperforms [2].Sagnika et al. Proposed BAT algorithm for workflow scheduling in cloud computing which helps to handle the large size of data. The scheduling process decides that which task is executed first and which is last according to their requirement of the resources. It manages the resources according to the task size and execution time. The result of the proposed algorithm is compared with particle swarm optimization algorithm and Cat swarm optimization algorithm. The convergence of proposed calculation is superior than the existing [3].Vinothina et al. proposedAnt Colony OptimizationACO for workflow scheduling in cloud computing. This model is presented for heterogeneous distributed systems. The service level agreements are used to check the quality of service of the service providers. The problem of workflow scheduling is solved by using parameters cost, makespan and resource utilization. The ACO algorithms reduce the cost and makespan and enhance the resource utilization [4].

Approaches based on the genetic algorithm: Liu, Li, et al. [5] proposed the genetic algorithm for workflow scheduling in cloud computing with deadline-constrained. The crossover and mutation probability is adjusted by using convolution approach. This approach prevents from the prematurity and enhances the convergence. The proposed approach is compared with existing algorithms on the simulator at 4 different workflows. The results show that the total execution cost is reduced in this approach.Garg, et al. [6] formulated the scheduling problem in cloud by using the Genetic Algorithm. The proposed work is done to reduce the computation time, execution value of task. This work is done on the cloudSim simulator and it maximizes the resource utilization. The performance evaluation is done on the different parameters and performs well.

Shuffled Frog Leaping Algorithm: Kaur, et al. the proposed work is done on the Infrastructure as a service platform of the computer for scheduling and resource provisioning. The scheduling process is done by using the Shuffled Frog Leaping Algorithm (ASFLA). Performance evaluation done by comparing the result or proposed algorithm with PSO (Particle Swarm optimization). The experiment is performed on different workflows by using Java Simulator and it gives outcome at low cost and completes the task on deadline [9].

Approaches based scheduling algorithm:

Kaur, et al. the proposed work is done on the Infrastructure as a service platform of the computer for scheduling and resource provisioning. The scheduling process is done by using the Shuffled Frog Leaping Algorithm (ASFLA). The performance evaluation is done by comparing the result or proposed algorithm with PSO (Particle Swarm optimization). The experiment is performed on different workflows by using Java Simulator and it gives outcome at low cost and completes the task on deadline[9].Bölöni, et al. proposed the concept of computation scheduling which is used for prediction of computation cost and financial cost. It also predicts the benefit of the output and it is called as value of information. This work is based on the analysis process of real-estate investment opportunities. The scheduling algorithm used in this work is called as volume based scheduling algorithm [10].Ghose, Manojit, et al.have given the energy efficient scheduling approach in cloud environment. In this work six different scheduling strategies are proposed for a collection of scientific workflows. The performance evaluation of the scheduling approaches is compared with existing policies and presented the average energy reduction.Li, Yibin, et al. introduced the concept of Dynamic Voltage Scaling for maintaining the power and lowering provision of voltage and frequency of processor. During this work, Energy aware dynamic task scheduling algorithm is to reduce the energy consumption. This algorithm reduces more energy consumption as compare to parallelism and critical path scheduling algorithm [12].

Inference from the literature survey

Author's Name	Year of Publication	Algorithm/ Technology Used	Summary
Alkhanak et al. [1]	2018	Meta-Heuristic Algorithms	The proposed approach uses the four population-based meta-heuristics algorithms. The approach helps reduce costs and time for service providers. Running cost and time are reduced compared to basic approaches
Anubhav, et al. [2]	2018	GSA based hybrid algorithm	The optimizations in workflow reduce the cost and makespan. In this process, two algorithms are hybridized GSA and HEFT for workflow scheduling. The performance evaluation is done on the basis of two metrics that are monetary cost ratio and schedule length ratio.
Sagnika et al. [3]	2018	Bat Algorithm	The scheduling process decides that which task is executed first and which is last according to their requirement of the resources. It manages the resources according to the task size and execution time.
Vinothina et al. [4]	2018	ACO algorithm	Ant Colony Optimization algorithm is presented for heterogeneous

			distributed systems. The service level agreements are used to check the quality of service of the service providers. The problem of workflow scheduling is solved by using parameters cost, makespan and resource utilization.
Liu, Li, et al. [5]	2017	Genetic Algorithm	This approach prevents from the prematurity and enhances the convergence. The proposed approach is compared with existing algorithms on the simulator at 4 different workflows. The results show that the total execution cost is reduced in this approach.
Garg, et al. [6]	2017	Genetic Algorithm	The proposed work is done to reduce the computation time and execution cost of the task. This work is done on the cloudSim simulator and it maximizes the resource utilization.
Rimal, et al. [7]	2017	Workflow Scheduling Policy	In this work, the cloud-based workflow scheduling policy is proposed for efficient cloud computing. This strategy reduces the overall execution time of the workflow, the cost of execution, and uses the resources correctly.
Casas, Israel, et al. [8]	2017	Balanced and file Reuse-Replication scheduling. (BFRR)	BFRR scheduling is used to schedule the scientific application workflows. It splits the workflows into sub-workflows which help in proper utilization via parallelization process. This approach provides the facility if data reuse and replication which helps in optimization of data and transfer it at run time.
Kaur, et al. [9]	2017	Shuffled Frog Leaping Algorithm	The scheduling process is done by using the Shuffled Frog Leaping Algorithm (ASFLA). The performance evaluation is done by comparing the result or proposed algorithm with PSO (Particle Swarm optimization).
Bölöni, et al. [10]	2017	Volume based scheduling algorithm.	This work is based on the analysis process of real-estate investment opportunities. The scheduling algorithm used in this work is called as volume based scheduling algorithm.
Ghose, Manojit, et al. [11]	2017	Energy Efficient Scheduling	Energy efficient scheduling approach in cloud environment. In this work six different scheduling strategies are proposed for a collection of scientific

			workflows.
Li, Yibin, et al. [12]	2017	Dynamic Task Scheduling	In this work, Energy aware dynamic task scheduling algorithm is used to reduce the energy consumption. This algorithm reduces the more energy consumption as compare to parallelism and critical path scheduling algorithm.

III. CONCLUSION

scheduling is used to schedule the logical application work processes. It parts the work processes into sub-work processes which help in proper utilization via parallelization process. This approach provides the facility if data reuse and replication which helps in optimization of data and transfer it at run time.service level agreements are used to check the quality of service of the service providers. The problem of workflow scheduling is solved by using parameters cost, makespan and resource utilization.

IV. REFERENCES

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