Novel Approach of Workflow Scheduling In Cloud by Pheromone Base Optimization

Muneer Ali[1], Dr. Rahul Malhotra[2]
[12]*Swami Devi Dyal Institute of Engineering and technology*

Abstract- To maintain and utilization of the resources on the cloud computing scheduling mechanism is needed. Many algorithms and protocols are used to manage the parallel jobs and resources which are used to enhance the performance of the CPU on the cloud environment. In the proposed work ACO (Ant Colony Optimization) and for effective scheduling. This work is based on the optimization of Total execution Time and Total Execution Cost. The results of the proposed approach are effective as it compare with existing methods.

I. INTRODUCTION

These days, Cloud computing is a developing zone in distributed computing that conveys progressively versatile administrations on demand over the web through the equipment and programming virtualization. The greatest preferred standpoint of the cloud is its adaptability to rent and discharge resources according to the client necessity. Besides, the cloud supplier offers two sorts of plans to be specific on demand short-term plan and long-term reservation plan. It has good framework i.e. Scalability, Transparency, Security and Monitoring.

Not at all like Grids, Scalability, adaptability, the dependability of Cloud assets permitting the continuous handling of assets so with respect to meeting the application prerequisite. At bring down cost administrations of cloud, for example, register, stockpiling, and transmission capacity are accessible. Typically endeavors are planned by customer essentials. New arranging procedures ought to be proposed to overcome the issues acted by framework properties amidst customer and resources. New reserving philosophies may use a level of the standard arranging thoughts to solidification them together with some framework careful procedures to give answers for better and more compelling work booking.

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. This work target random work process asks for after some time, so it must calendar work process execution with no learning of future solicitations.

II. LITERATURE REVIEW

Alkhanak et al. proposed a cost optimization approach for scientific workflow scheduling in cloud computing. The proposed approach employs the four meta-heuristic algorithms which are based on the population. The approach helps in reducing cost and time of the service providers. The execution cost and time are reduced as compared to baseline 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 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. 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 the proposed algorithm is better than the existing algorithms [3].Vinothina et al. proposed Ant Colony Optimization algorithm 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].

Liu, Li, et al. 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 [5]. Garg, et al. formulated the scheduling problem in cloud by using the 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. The performance evaluation is done on the different parameters and performs well [6].

Netjinda et al. focused on optimizing the value of buying infrastructure-as-a-service cloud competencies to attain clinical work goes with the flow execution in the unique closing dates. Authors considered the quantity of purchased times, example types, buying options, and venture scheduling as constraints in an optimization technique. Particle swarm optimization augmented with a variable community seeks approach turned into used to discover the superior solution. Results display promising performance from the views of the total fee and fitness convergence when in comparison with other trendy algorithms [7].

Verma et al. recommended that the users put up their workflows alongside a few QoS constraints like closing date, budget, and consider, reliability and so on. For computation, Authors considered the two constraints: closing date and finances and recommend cut-off date and finances Due date and Budget Distribution based cost-Time Optimization (DBD-CTO) work process scheduling set of rules that points of confinement execution regard while get together time diagram for giving over outcomes and separate the direct of the estimation [8].

Xu et al. recommended a various Quality of services compelled scheduling strategy of multi-work processes (MQMW). The procedure can plan different work processes which are begun whenever and the QoS prerequisites are considered and ready to build the planning achievement rate essentially [9].Mao et al. offered a procedure whereby the major figuring elements are virtual machines (VMs) of various sizes/costs, employments are exact as work processes, clients indicate execution prerequisites by method for allotting (delicate) time points of confinement to occupations, and the reason for existing is to ensure all employments are finished inside their due dates at negligible money related charge. Creators finish their objective by utilizing progressively dispensing/deal locating VMs and scheduling duties at the most extreme esteem green cases [10]

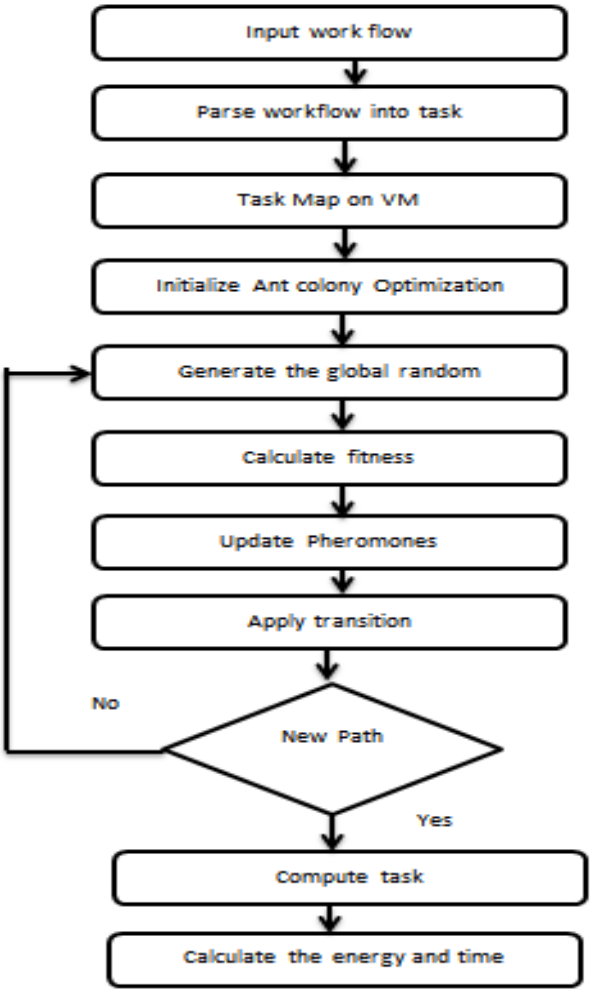
Nancharaiah et al. displayed hybrid routing algorithm, Ant Colony Optimization algorithm and Particle Swarm Optimization (PSO) is utilized to enhance the different measurements in MANET routing. The ACO algorithm utilizes portable specialists as ants to distinguish the most possible and best way in a system. Likewise ACO algorithm finds ways between two hubs in a system and gives contribution to the PSO strategy. The PSO finds the best answer for a particle's position and speed and limits cost, power, and end to end delay. This hybrid routing shrewd algorithm has an enhanced execution when contrasted and basic ACO algorithm as far as delay, power, consumption, and communication cost [11].

III. PROPOSED WORK

In this section, the proposed methodology is explained in detail and also the algorithm which is used in it in hybridized form.

Proposed Algorithm

ACO: Ant colony optimization is a biological algorithm which is used for the optimization and finds the optimal path by using weighted path. The algorithm follows the basic idea of finding the shortest route between the source and nest. Ants find the shortest path by using the pheromones and communicate by using pheromones. In this algorithm firstly pheromones and trials are initialized then calculate the fitness function and find the best position. By using position determine the best global ant and update the trial. Below given is the pseudo code for the ACO.



Step 1: Parameters is set; pheromone trails are initializing.
Step 2: On path segments, theVirtual trail is accumulated.
Step 3: ACO - Construct Ant Solutions

From node i to node j an ant will move with probability

$$P_{i,j}=\frac{(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}{\Sigma(\tau_{i,j}^{\alpha})(\eta_{i,j}^{\beta})}$$

Where,

On edge i, j the amount of pheromone is $\tau_{i,j}$

To control the influence of $\tau_{i,j}$ α is a parameter

In edge i, j (typically $1/d_{i,j}$) $\eta_{i,j}$ is the desirability

To control the influence of $\eta_{i,j}$ β is a parameter

Step 4: ACO - Pheromone Update

According to the equation amount of pheromone is updated

$$\tau_{i,j} = (1-\rho)\tau_{i,j} + \Delta\tau_{i,j}$$

Where,

On a given edge i, j the amount of pheromone is $\tau_{i,j}$

ρ is the rate of pheromone evaporation is ρ

The amount of pheromone deposited is $\Delta\tau_{i,j}$, typically given by

$$\Delta\tau_{i,j}^{k} = \begin{cases} \frac{1}{L_k} & \text{if ant k travels on edge i, j} \\ 0 & \text{otherwise} \end{cases}$$

Where,

The cost of the k^{th} ant's tour (typically length) is L_k.

IV. RESULTS

In this section we analyze the parameters of different algorithms on the basis of parameters Total execution cost, Size and total execution time of the task.

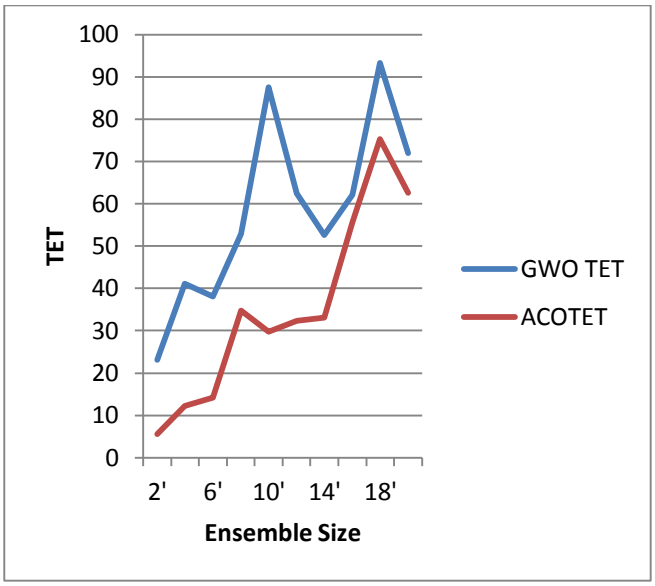


Fig.1: Comparison graph of TET of GWO and ACO using SIPHT workflow

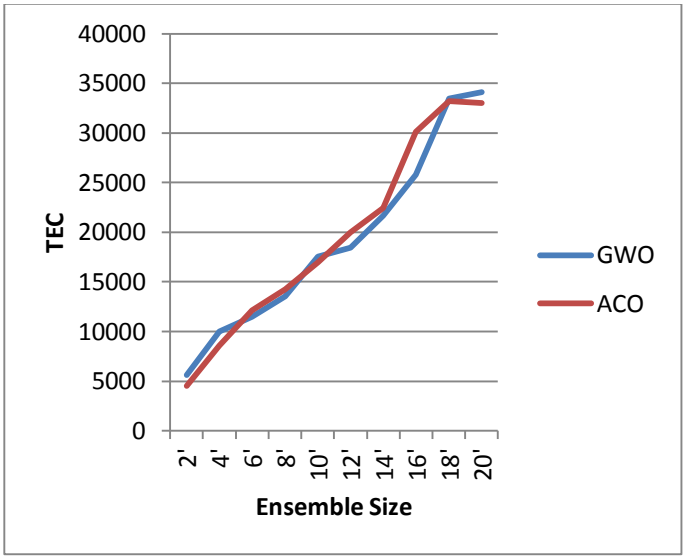


Fig.2: Comparison graph of TEC of GWO and ACO using SIPHT workflow

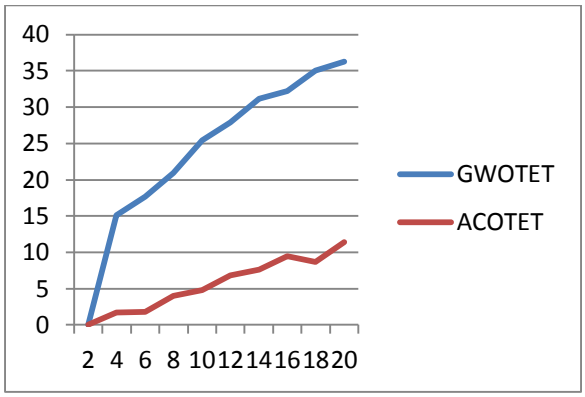


Fig.3: Comparison graph of TET of BAT and PSO_GWO using MONTAGE

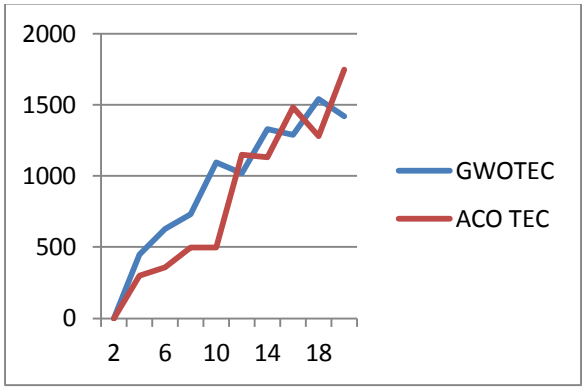


Fig.4: Comparison graph of TEC of BAT and PSO_GWO using MONTAGE

V. CONCLUSION

In this Paper ACO algorithm is used for the optimized result in the cloud environment for scheduling. The performance evaluation of this work is based on the metrics TET and TEC. The total execution time and total execution cost in ACO is less as compare to GWO algorithm. The GWO algorithm is used for the comparison of the results. The total response time of the proposed approach is faster than the existing approach.

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