

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

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**Abstract-** Workflow scheduling in scientific computing systems for logical figuring frameworks is a standout amongst the most difficult issues that centers around fulfilling client characterized nature of administration necessities while limiting the work process execution cost. In this way, to decrease the cost we use cloud condition. In cloud condition, sources will increment however it's use is another test while utilizing cloud condition. In the thesis, to maintain and utilization of the resources on the cloud computing scheduling mechanism is needed. random distributions are used, more time will be taken to converge and sometime enforces the convergence by iteration but enforcing of convergence will increase the computation and execution time therefore does not meet the deadline condition. So, task initialization is an important task as defined in this paper. Another thing represented in these graphs and tables is that GWO performs better in comparison to Round Robin for reduction of cost and time because of the random crossover. 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 PSO (Particles swarm Optimization) and GWO (Grey Wolf Optimization) 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. We use insight advancement Particle Swarm streamlining which is introduced by Pareto. GWO is utilized to join the choice of Virtual Machine (VM) movement by its union to minima of expense and time. In our trials, we utilize Total execution time (TET) and Total execution cost (TEC) by GWO.

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

## I. INTRODUCTION

Workflow scheduling in scientific computing systems is for logical frameworks is a standout amongst the most difficult issues that centers around fulfilling client characterized nature of administration necessities while limiting the work process execution cost [1]. Neighborhood figuring condition when we are managing logical calculation utilizing logical work process planning condition under due date requirement, QoS is a standout amongst the most difficult errand for any framework utilized in logical registering

frameworks [2]. Since when we are concentrating on limiting the work process execution cost just as time, at that point we ought not neglect to consider the client characterized nature of administration prerequisites while limiting the work process execution cost and time. Along these lines, to diminish the expense and time we use cloud condition.

A workflow management system (WFMS) gives an infrastructure to the set-up, performance, and checking of a characterized grouping of tasks, arranged as a work process. Work process can be automated with software devices that utilization business guidelines to choose when one stage has been finished effectively and the following stage can start. Some work process management software programs can also coordinate ward relationships between individual strides, an idea known as workflow orchestration [3].

## Operational Aspect of Workflow in the Cloud

- how to structure the task
- who executes them
- what is their relative order
- how synchronized are they
- how to support the tasks through information flow and
- how to track the task[7]

Hence, from the above points we come to know different operational aspects of workflow in the cloud, which can be helpful in the implementation of the algorithm as per the operational aspects.

## II. RELATED STUDY

Alkhanak et al. [1] researched and investigated different cost mindful difficulties of WFS in cloud computing, for example, Quality of administration, execution, framework usefulness and framework engineering. In this they additionally talked about different WFS cost mindful methodologies from the accessible pools of options. Different WFS challenges influencing particular WFS execution cost has additionally been thought about. Zhan et al. [2] proposed progressed PSO based venture scheduling set of rules in Cloud Computing which can lessen the assignment common jogging time and raises the supply of sources which complements the convergence price and improves the efficiency. They investigated that is the fact in each generation worldwide

convergence of simulated annealing algorithm is applied to particle swarm optimization algorithm.

Bilgaiyan et al. [3] focused that in computing environment there is a large amount of data that is processed every second, so there is a time where scheduling plays a vital role which helps to manage the cost and make span. They analyzed down the different swarm optimization algorithm that recommended that scheduling guideline expect to mean to lessen the measure of information exchange with slightest cost and guarantee balanced dispersion of errands according to handling capacity. Nancharaiah et al. [4] displayed hybrid routing algorithm, Ant Colony Optimization algorithm and Particle Swarm Optimization (PSO) is utilized to enhance the different measurements. 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.

Sridhar et al. [5] foreseen that in a tremendous scale flowed condition high correspondence cost achieves in fogs which check undertaking schedulers in that condition. So they proposed a hybrid Particle Swarm Optimization (PSO) which performs better in execution proportion and normal timetable length. Alkhanak et al. [6] researched and investigated different cost mindful difficulties of WFS in cloud computing, for example, Quality of administration, execution, framework usefulness and framework engineering. In this they additionally talked about different WFS cost mindful methodologies from the accessible pools of options. Different WFS challenges influencing particular WFS execution cost has additionally been thought about.

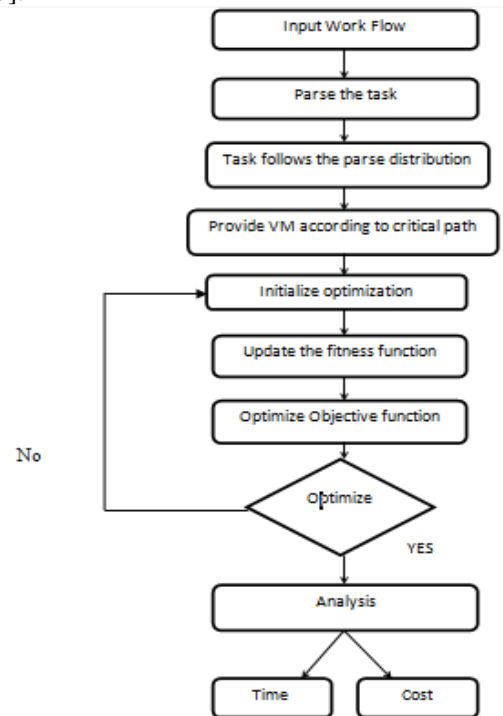
A.Bala and I. Chana [7] discussed workflow in business process management system. They mainly focused that existing workflow scheduling algorithm does not go for reliability and availability. Multiple workflows have multiple instances of workflow so there is need to improve the availability and reliability in Cloud Environment. Zhan et al. [8] proposed progressed PSO based venture scheduling set of rules in Cloud Computing which can lessen the assignment common jogging time and raises the supply of sources which complements the convergence price and improves the efficiency. They investigated that that is due to the fact in every generation worldwide fast convergence of simulated annealing algorithm is applied to combine particle swarm optimization algorithm.

Bilgaiyan et al. [9] focused that in computing environment there is a large amount of data that is processed every second, so there is a time where scheduling plays a major role which helps to manage the cost and make span. They analyzed down

the different swarm optimization algorithm that recommended that scheduling guideline expect to mean to lessen the measure of information exchange with slightest cost and guarantee balanced dispersion of errands according to handling capacity. Li Liu et al. [10]: In their paper, firstly they give a study of workflow cloud application and therefore the cloud work flow primarily based design is given for sensible town. Then, a work flow programming algorithms diversity is assessed. The motivation behind this paper is for creating taxonomy of work flow programming and management during a cloud atmosphere, and conjointly applying this work flow primarily based cloud design for sensible town environments, any many analysis challenges is given during this field.

### III. PROPOSED METHODOLOGY

**GWO:** Grey Wolf optimization algorithm is a bio-inspired algorithm based on the leadership and hunting behavior of the wolves in the pack. The grey wolves prefer to live in the pack which is a group of approximate 5-12 wolves. In the pack, each member has social dominant and consisting according to four different levels. The below-given figure shows the social hierarchy of the wolves which plays an important role in hunting [5].



Steps of the methodology

1. Input the workflows and parse the tasks
2. Provide the virtual machines according to critical path.
3. Initialize the optimization of Grey wolf algorithm.
4. Update the fitness function.

5. Optimize objective function and check it is optimized according to problem or not.
6. Analysis the time and cost.

IV. RESULTS AND DISCUSSION

The proposed work is performed on the CloudSim simulator for the use of virtual workflows in the cloud environment. CloudSim provides a platform for cloud computing modeling, simulation and experimentation. This simulator provides the user cloud system and studied without addressing the low level details. CloudSim is essentially a library for simulating cloud scenarios. It provides the functionality in which useful classes are available to describe data centers, virtual machines, applications, and users. CloudSim also provides scheduling and provisioning capabilities to manage cloud resources. It is also used as a cost, runtime, and application perspective.

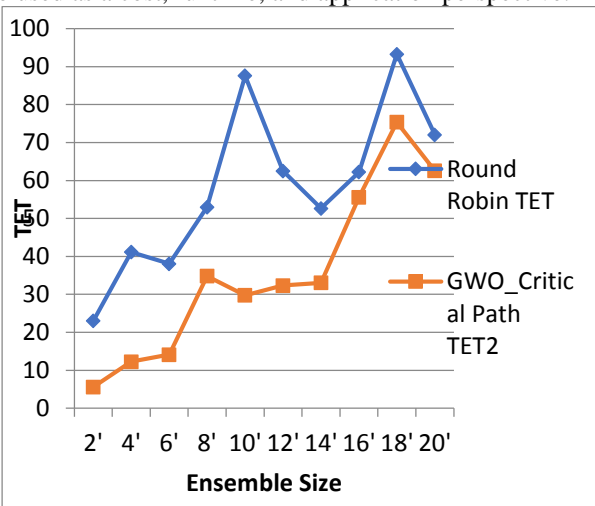


Fig.1: Comparison graph of TET on FCFS and Round Robin using SIPHT

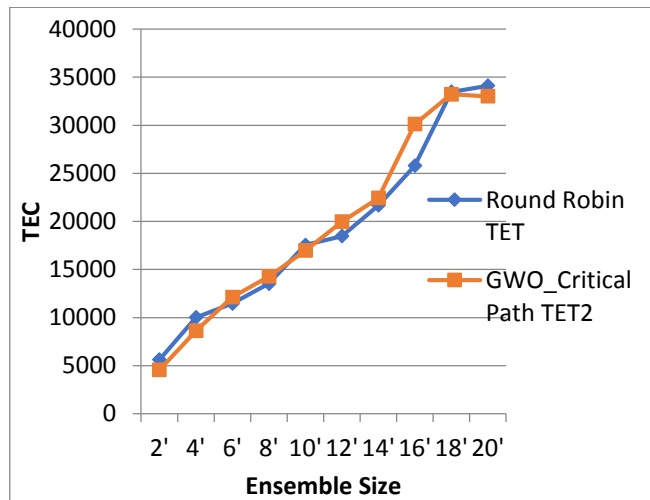


Fig.2: Comparison graph of TEC of FCFS and Round Robin using SIPHT

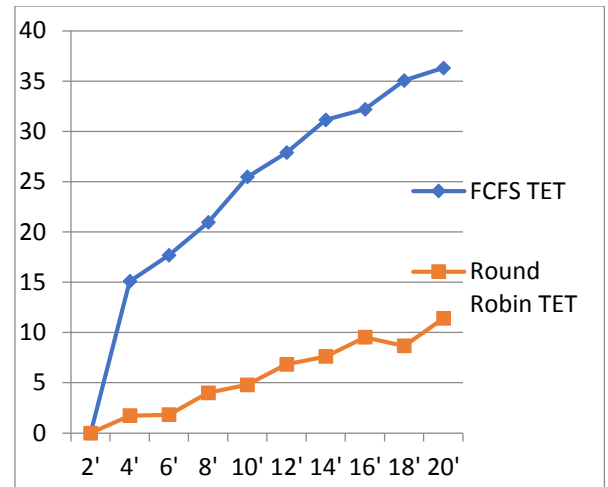


Fig.3: Comparison graph of FCFS and Round Robin using MONTAGE

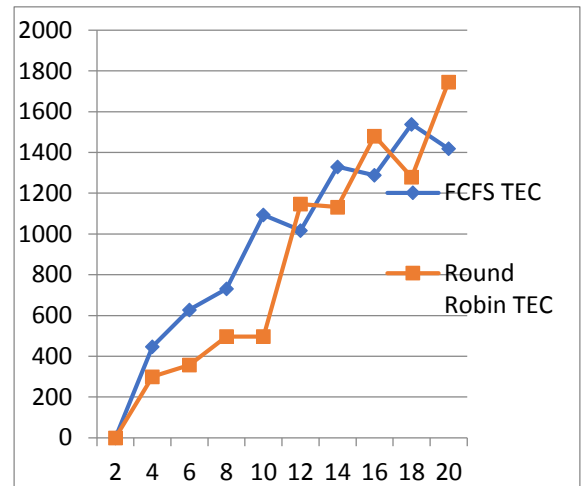


Fig.4: Comparison graph of TEC of FCFS and Round Robin using MONTAGE

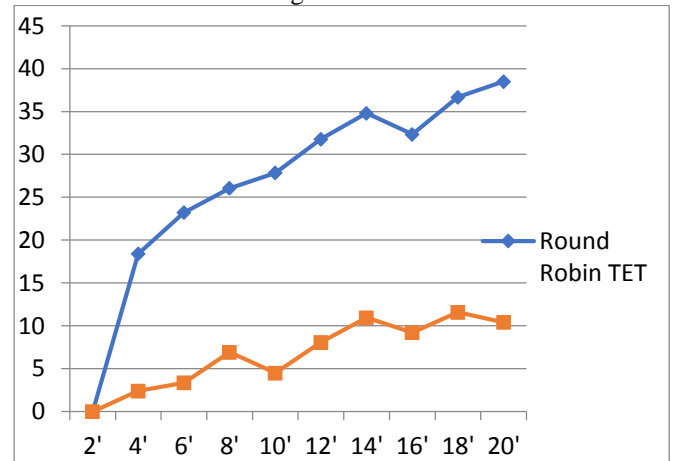


Fig.5: Comparison of TET using FCFS and Round Robin Algorithm on Cybershake Workflow

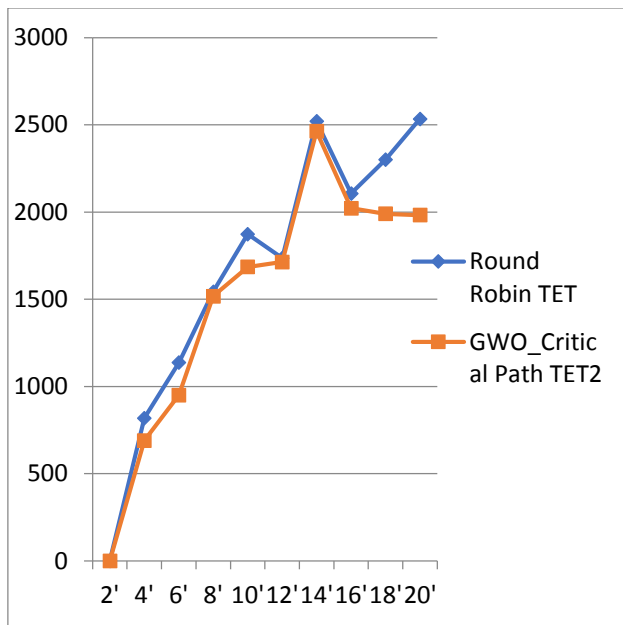


Fig.6: Comparison of TEC using FCFS and Round Robin Algorithm on Cybershake Workflow

## V. CONCLUSION

In this work, we proposed the scheduling mechanism for execution of the sensible forms on the IaaS clouds. The main issue in the cloud computing while decreasing makespan is execution cost. This issue is solved by using Hybrid PSO with GWO. The tests were directed by mimicking four surely understood work processes (Cybershake, Ligo, Genome, Montage) on Cloudsim, which demonstrates that our answer has a general more beneficial execution than other existing algorithms. The worthy results are achieved because PSO (particle swarm optimization) play important role in global optimization and GWO optimize locally and we have merge the two algorithms by taking the best out of them. With the proposed approach in most of the work processes we can deliver bring down cost efficient schedule then additionally decreasing the time delay.

## VI. REFERENCES

- [1]. Alkhanak, EhabNabiel, and Sai Peck Lee. "A hyper-heuristic cost optimisation approach for Scientific Workflow Scheduling in cloud computing." *Future Generation Computer Systems*(2018).
- [2]. Sagnika, Santwana, SaurabhBilgaiyan, and Bhabani Shankar Prasad Mishra. "Workflow Scheduling in Cloud Computing Environment Using Bat Algorithm." *Proceedings of First International Conference on Smart System, Innovations and Computing*. Springer, 2018.
- [3]. G. J. Rathanam, and A. Rajaram. "Trust-Based Meta-Heuristics Workflow Scheduling in Cloud Service Environment." *Circuits and Systems* 7.04: 520 (2016).
- [4]. Sridhar, M. and Babu, G.R.M ,“ Hybrid Particle Swarm Optimization scheduling for cloud computing” in *IEEE International Advance Computing Conference (IACC)*, pp. 1196- 1200 , June 2015.
- [5]. Zhang, Yudong, Shuihua Wang, and Genlin Ji. "A comprehensive survey on particle swarm optimization algorithm and its applications." *Mathematical Problems in Engineering* 2015 (2015).
- [6]. Alkhanak, Ehab Nabiel, Sai Peck Lee, and Saif Ur Rehman Khan. "Cost-aware challenges for workflow scheduling approaches in cloud computing environments: Taxonomy and opportunities." *Future Generation Computer Systems* 50 (2015): 3-21.
- [7]. Bilgaiyan, Saurabh, Santwana Sagnika, and Madhabananda Das. "Workflow scheduling in cloud computing environment using cat swarm optimization." *Advance Computing Conference (IACC)*, 2014 IEEE International. IEEE, 2014.
- [8]. S.Xavier and S.P.J Lovesum“ A Survey of Various Workflow Scheduling Algorithms” in Cloud Enviroment” in *International Journal of Scientific and Research Publications*, vol. 3, no.2, Feb. 2013.
- [9]. S.Tilak and D. Patil “ A Survey of Various Algorithms in Cloud Environment” in *International Chen, Wei-Neng and Jun Zhang, “An Ant Colony Optimization Approach to a GridWorkflow Scheduling Problem With Various QoS Requirements” in IEEE Transactions on systems, man and cybernatics-Part C: Applications and reviews*, vol. 39, no. 1, Jan. 2009.