Review of Workflow Scheduling by Optimization

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Abstract- Workflow scheduling in scientific computing systems is one of the most challenging problems that focuses on satisfying user-defined quality of service requirements while minimizing the workflow execution cost. So, to reduce the cost we use cloud environment. In cloud environment, resources will increase but its utilization is another challenge while using cloud environment. This paper presents the workflow scheduling techniques which helps to found the best approach and opportunities for the further research.

Keywords- cloud, workflow, optimization, scheduling

I.   INTRODUCTION

In cloud computing scheduling is the way toward plotting errands onto assets and the frameworks (e.g. CPU time, bandwidth and memory) effectively. In cloud computing numerous unpredictable applications require parallel preparing to execute the occupations adequately. Because of the correspondence and synchronization between relating forms there is a decline in usage of CPU assets. Thusly it is vital for a server farm to accomplish the usage of hubs while keeping up the level of responsiveness of parallel occupations [1]. Due to the availability of vast data on the internet and growing number of user's day to day, it almost impossible to assign the various tasks manually to the virtual machines. Hence, to allocate the resources to each job effectively, scheduling plays an important role in cloud computing. Thus various scheduling algorithms are proposed so that they can help in achieving the order of jobs in such a way that balance between improving the performance, cost , makespan, load balancing and more over quality of service can be improved. For appropriate scheduling many undertaking parameters should be considered which a fundamental angle in successful working of cloud is. The open assets ought to be used productively without influencing the administration furthest reaches of cloud. Scheduling process in cloud can be broad into three phases [2].
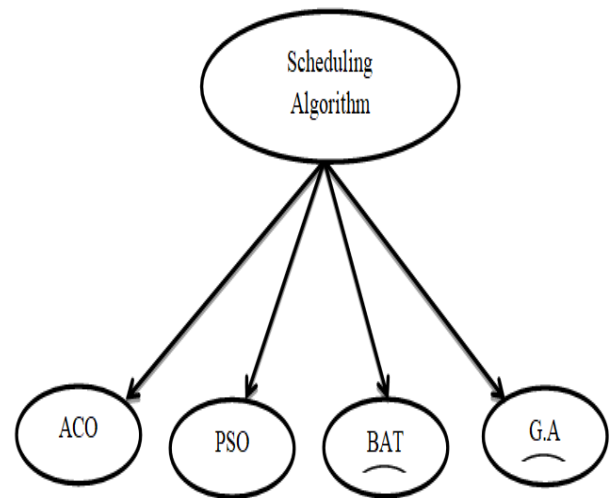
A. Workflow Scheduling

Workflow scheduling is a major worry in the time of figuring. Fundamentally it is the worry identified with the plotting of each assignment to a fitting asset and enabling the errand to fulfill some execution limitations. It is a succession of associated guidelines. Point of workflow scheduling is to mechanize the strategies particularly which are included during the time spent passing the nformation and the documents between the members of the cloud, keeping up the limitations.   A workflow empowers the organizing of utilizations in a coordinated non-cyclic chart structure where every hub speaks to the undertaking and edges speak to the conditions between the hubs of the applications.

B. Scheduling Algorithms and Metrics

In this section we study the scheduling algorithms and metrics that are used in the cloud computing. Different researcher used different parameters for optimization and scheduling. Some parameters that are mostly used in scheduling are Makespan (describe the finishing time of the last task), Economic cost (represents the total cost paid by the user for service), Flow time (define the sum of finishing times of all tasks).

II.   RELATED STUDY

C. Genetic Algorithm

Casas, Israel, et al.proposed a scheduling approach called Balanced and file Reuse-Replication scheduling. This approach 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. The optimization process is based on execution time and monetary cost of workflows [3]. Cloud supports the Multi-tenancy feature and provides the scalability and other benefits to the other users. Resource management is an important task in the multi-tenant cloud computing which is done by using the scheduling process. In this work cloud based workflow scheduling policy is proposed for efficient computing in

cloud. This policy reduces the overall workflow completion time, cost of execution and properly utilize the resources. The result of the proposed work is compared with existing approaches and algorithms. The simulation result of the proposed approach shows more effective results than the existing approaches [4].

D. PSO Based

Zhan 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 [5].

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 [6].

Suraj Pandey et al.has worked on reducing the computing cost of the application by using particle swarm optimization algorithm which is basically a meta-heuristic algorithm used for scheduling. PSO is used for calculating the fitness function. The total cost calculated is the cost of execution and the transfer cost of data. This algorithm ensures the cost of the highest task is reduced by heuristic scheduling. This algorithm helps to schedule the resources and mapping [7].

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 [8].

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].

Shashank Shukla et al. [2016][10]: Clarifies all difficulties, the services quality is the most detectable test and influences the services of cloud computing. The service quality can be upgraded with consideration of the few elements, workload scheduling for appropriate resources of cloud computing one of them. If the cloud computing resources are reserved precisely, it influences the services reaction time, add up to cloud resources cost, the imperativeness utilization decreased, diminish the CO_2 discharge and upgrade the execution of entire cloud system.

On the base of past considerations; they have given that algorithms built up as indicated by the customer require parameters. Parameters that upgrades security issues, the aggregate cost issues, imperativeness utilization issues, execution issues, QoS issues in the Multi-target workflow territory.

Inferences from the literature review

Authors Name	Year	Algorithm	Summary
Casas, Israel, et al.	2017	Genetic Algorithm	This approach provides the facility if data reuse and replication which helps in optimization of data and transfer it at run time. The optimization process is based on execution time and monetary cost of workflows.
Rimal et al.	2017	Genetic Algorithm	In this work cloud based workflow scheduling policy is proposed for efficient computing in cloud. This policy reduces the overall workflow completion time, cost of execution and properly utilize the resources. The result of the proposed work is compared with existing approaches and

			algorithms.
S.Xavier et al.	2017	PSO Algorithm	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.
Sajid et al.	2013	PSO Algorithm	Presented the challenges and issues faced in the cloud computing scheduling. The workflow scheduling techniques also presented in it for future research opportunities.
Pandey, Suraj, et al.	2013	PSO Algorithm	PSO is used for calculating the fitness function. The total cost calculated is the cost of execution and the transfer cost of data. This algorithm ensures the cost of the highest task is reduced by heuristic scheduling.
Bölöni et al.	2017	Computation scheduling	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.
Kaur, Parmeet et al.	2017	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). The experiment is performed on different workflows by using Java Simulator and it gives outcome at low cost
Shukla, Shashank, et al	2016	Multi-objective workflow scheduling	The service quality can be upgraded with consideration of the few elements, workload scheduling for appropriate resources of cloud computing one of them. If the cloud computing resources are reserved precisely, it influences the services reaction time, add up to cloud resources cost, the imperativeness utilization decreased, diminish the CO_2 discharge and upgrade the execution of entire cloud system.

III.   CONCLUSION

The proposed paper represents the different methods of scheduling and algorithm used for the optimal results in the workflow scheduling process.To allocate the resources to each job effectively, scheduling plays an important role in cloud computing. Thus various scheduling algorithms are proposed so that they can help in achieving the order of jobs in such a way that balance between improving the performance, cost , makespan, load balancing and more over quality of service can be improved.

IV.   REFERENCES

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