MULTIREGION ORIENTED FIREFLY ALGORITHM SCHEDULING IN CLOUD ENVIRONMENT

[1]Davinderjeet Kaur, [2]Dr. Rajesh Kumar Bawa
[1]Student, [2]Associate Professor
[1]Department of Computer Science and Engineering,
[1]Punjabi University, Patiala, India

Abstract : ***In order to resolve the large scale scientific workflows the cloud computing conveys the high performance computing resources on the web.To execute these large scales scientific application cloud computing makes appropriate provisioning and scheduling decision in such a manner that total execution cost is minimized while meeting the deadline constraint. Toward this, several methods have been used. The conventional mechanisms majorly centered on decreasing the Makespan as well as cost even as obtaining the quality of service necessitations. But the delay parameter was not considered in the existing work. In this work less delay as well as minimum cost is taken into an account by the projected mechanism. The Firefly algorithm is taking guarantee of acquiring better results in comparison with any optimization algorithms and offer quick results. On various famous scientific workflows like Montage, Ligo and Cybershake of diverse sizes the performance calculation shows that the projected mechanism presents better results comparative to the conventional mechanism.***

IndexTerms - Cloud Computing, Load Balancing, Resource Utilization, Round Robin Algorithm.

[1] INTRODUCTION

Cloud computing is an innovation that uses the web and central remote servers to give scalable services to its clients. It utilizes a huge measure of heterogeneous dispersed assets to convey endless diverse services to its clients with particular equality of service (QoS) prerequisites. AmazonEC2, Go Grid, Google App Engine, Microsoft Azure and Aneka are a portion of the important cloud computing stages.

Basically, clouds are delegated public clouds, private clouds, community clouds, hybrid clouds and cloud federation. A public cloud can be available through any subscriber however private clouds and their foundation are claimed and available by a few associations. Likewise, community clouds are shared between a few associations and can be kept up by them or other specialist organizations. Hybrid clouds manage assets from both public and private clouds. Likewise, because of the accessibility issue of the single clouds, a development towards multi-clouds has risen which centers around the organization of various clouds.

Additionally, the administrations given by cloud can be named software (SaaS), platform (PaaS), or infrastructure (IaaS) suppliers. SaaS supplier leases enterprise software as an administration to clients and PaaS supplier presents access to the required segments over the web to create applications.

Likewise, IaaS clouds give foundations assets, for example, processing, storage, systems, and soon. Virtualization is one of the key empowering advancements of distributed computing which permits various Virtual Machines (VMs) to live on a solitary physical machine. A Virtual Machine (VM) copies a specific PC framework and executes the client issued undertakings. By utilizing the instantiation of the VMs, clients can convey their applications on assets with different execution and cost levels. In each physical machine or server, the VMs are overseen by a product layer called hypervisor or the VM screen which encourages the VMs creation and confined execution.

[2] WORKING SCHEDULING

Workflow scheduling is one of the major problems in the cloud computing which endeavors to delineate workflow assignments to the VMs in view of various useful and non-useful prerequisites. A Workflow comprises of a progression of interdependent assignments which are limited together through information or functional dependencies and these dependencies ought to be considered in the scheduling. In any case, Workflow scheduling for the cloud computing is a NP-hard advancement issue and it is hard to accomplish an optimal schedule. Since there are various VMs in a cloud and numerous client errands ought to be scheduled by thinking about different scheduling objectives and factors. The main goal of the Workflow scheduling strategies is to limit the make span by the best possible designation of the assignments to the virtual assets. For instance, a scheduling scheme may endeavor to help the guaranteed SLAs; the client indicated due dates and cost limitations. Likewise, scheduling solutions may consider factors, for example, resource usage, load balancing and accessibility of the cloud resources and administrations in the scheduling choices.

[3] PROBLEM FORMULATION

Cloud computing delivers high performance computing resources over the internet to solve large scale scientific workflows. To execute these large scales scientific application cloud computing makes appropriate provisioning and scheduling decision in such a manner that total execution cost is minimized while meeting the deadline constraint. Toward this, several methods have been used. However, the existing system faces a problem of working in a single region. Moreover, meta-heuristic based Genetic algorithm was used which minimized the execution time and cost. But with the advancement in the technology, more advanced optimization algorithm comes into existence that can be used for the evaluation. Moreover, Genetic algorithm can only perform well for discrete problems. The application of advanced meta-heuristics algorithm can reduced cost as well as delay efficiently and effectively in the system.

[4] PROPOSED WORK

To execute these huge scales logical application cloud computing settles on suitable provisioning and planning choice in such a way, to the point that aggregate execution cost is limited while meeting the due date requirement. Toward this, a savvy meta-heuristics Cost Effective Genetic Algorithm (CEGA) have been proposed earlier that work has been suffering from several issues that enforce the introduction of novel approach which can schedule the workflow in a cloud significantly. The proposed work is using the conceit of priority which helps in reducing the complexity and increase the effectiveness of the system. Furthermore, delay parameter was not considered in the existing work. So the proposed technique ensures less delay as well as minimum cost in the system. Additionally, Genetic algorithm is replaced with the firefly optimization algorithm in the proposed work. The firefly optimization algorithm is one of the latest artificial intelligence algorithms developed. This algorithm is taking guarantee of acquiring better results in comparison with any optimization algorithms. In addition to this, FA returns extremely fast results. Consequently, the proposed approach can produce efficient result while considering data transferring cost and minimizing makespan time.

[5] METHODOLOGY

[1] The first step is to get the dag for the work flow which is to process.
[2] Extract the information for the selected DAG that is connection between the process, layers of the process in the DAG, cost, processing time of the processors.
[3] After the required information initialize the random priority of the processes .
[4] Evaluate the makespan time of the process according to the priority given in the previous step
[5] Next step is to initialize the FA optimization parameters as
  a. Number of iterations
  b. Population size
  c. Other factors related to updation using FA
[6] Start the iterative process of updation of the priorities of the process in the DAG
[7] Get the best fitted priority table of the processes
[8] Once the priority is finalized allot the process to the processors with the least cost and least Makespan time.
[9] Finalize the table of process with least makespan time and this will behave as the final scheduling achieved using the proposed FA approach.

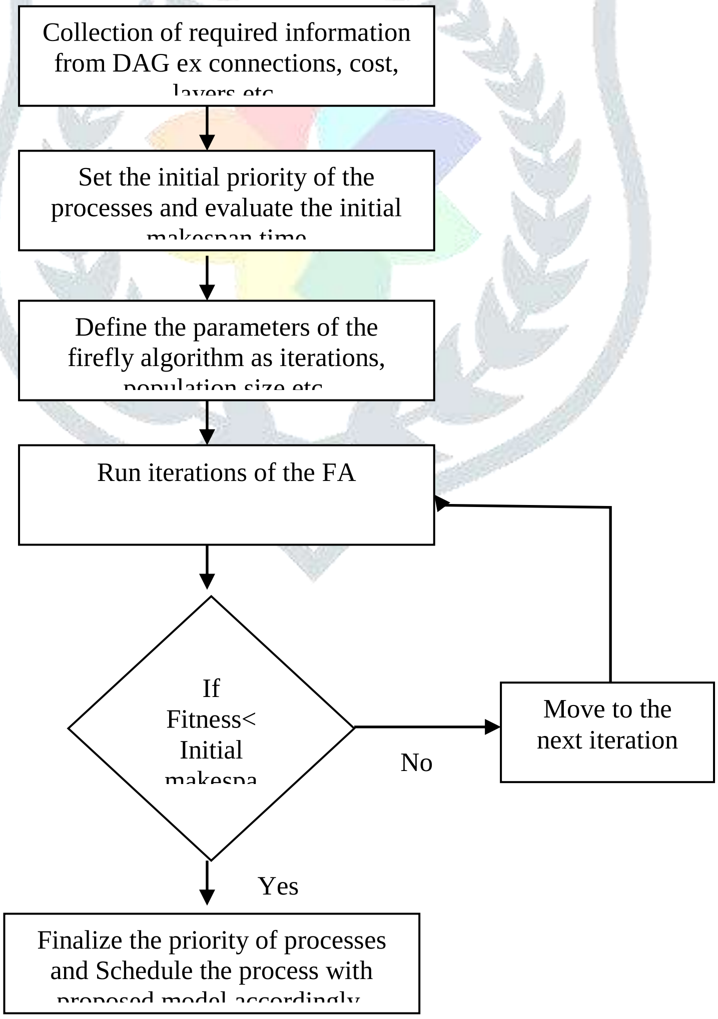

Figure 1 Flow chart of FA based proposed scheduling algorithm

[6] RESULT ANALYSIS

The graph of Figure 2 illustrates the Makespan for Montage work flow of the proposed work. In which the range of Makespan varies from 0 to 1000 and the range of Hard and Soft threshold varies from 0to 3.2. The average Makespan time in seconds is illustrated in the graph. In this graph it is illustrated that the proposed paradigm for Montage workflow under deadline values offers lower Makespan comparative to the ICPCP, CEGA, PSO, RCT and RTC.

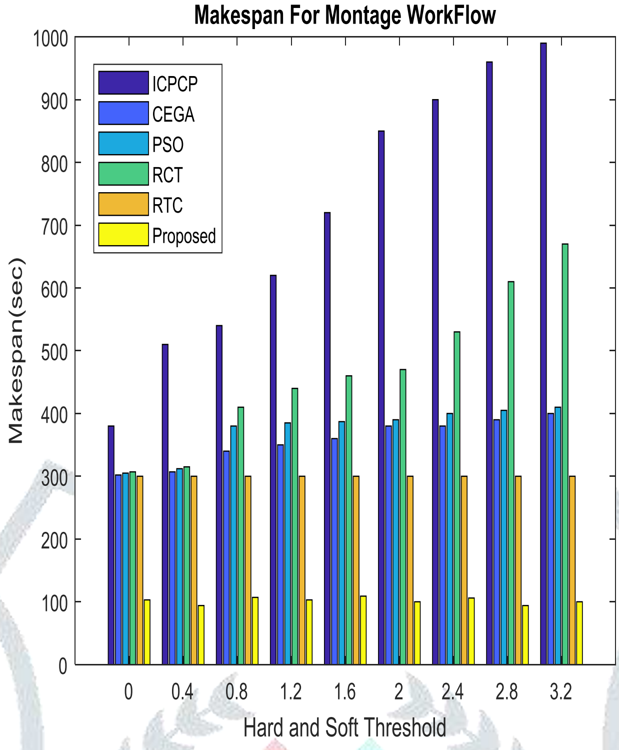

Figure 2 Comparison analysis of Makespan for Montage workflow

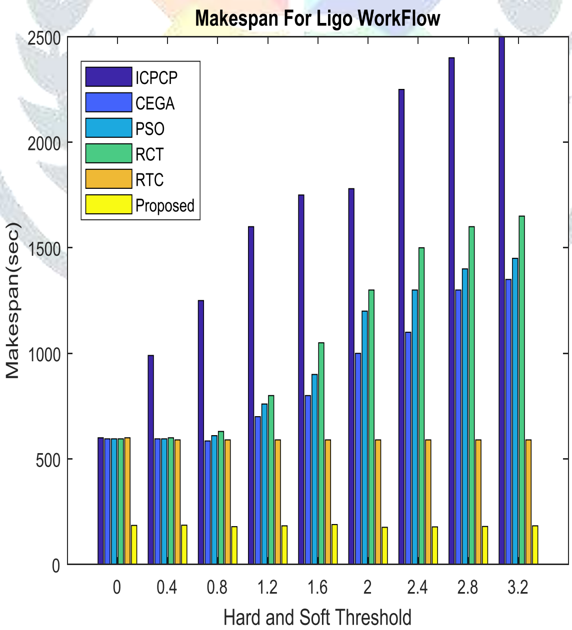

Figure 3 Comparison analysis of Makespan for Ligo workflow

The graph of figure 3 depicts the Comparison analysis of Makespan for Ligo workflow of the proposed work to the conventional mechanisms. The average Makespan time in seconds is illustrated in the graph. In this graph it is illustrated that the proposed paradigm for Ligo workflow under deadline values offers lower Makespan comparative to the ICPCP, CEGA, PSO, RCT and RTC. In this the range of Makespan varies from 0 to 2500 and the range of Hard and Soft threshold varies from 0to 3.2.

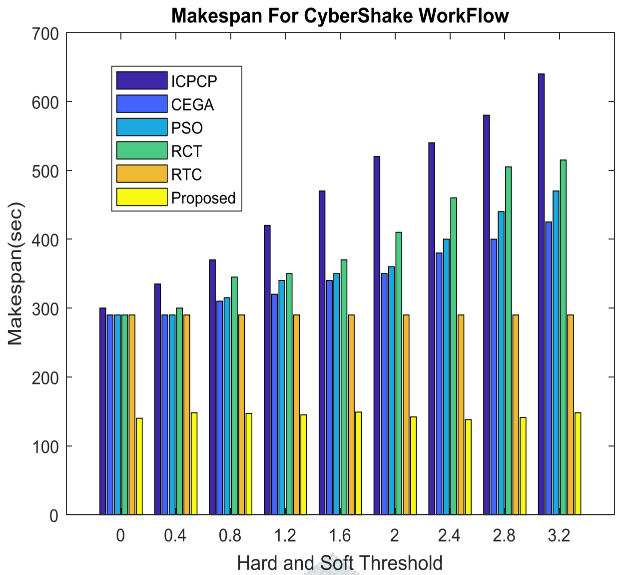

Figure 4 Comparison analysis of Makespan for Cybershake workflow

The graph of figure 4 depicts the Comparison analysis of Makespan for Cybershake workflow of the proposed work to the conventional mechanisms. In this the range of Makespan varies from 0 to 700 and the range of Hard and Soft threshold varies from 0to 3.2. The average Makespan time in seconds is illustrated in the graph. In this graph it is illustrated that the proposed paradigm for Cybershake workflow under deadline values offers lower Makespan comparative to the ICPCP, CEGA, PSO, RCT and RTC.

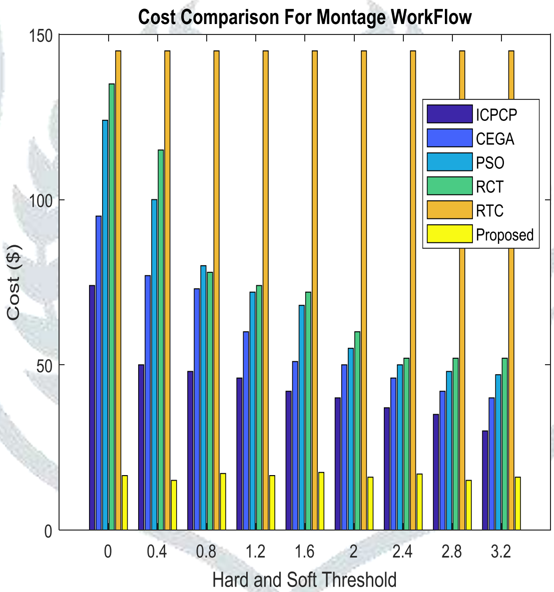

Figure 5 Comparison analysis of Cost for Montage workflow

The graph of Figure 5 illustrates the Comparison analysis of Cost for Montage workflow of the proposed work to the conventional mechanisms. In which the range of cost varies from 0 to 150 and the range of Hard and Soft threshold varies from 0to 3.2. In this graph it is illustrated that the proposed paradigm for Montage workflow under deadline values offers lower cost comparative to the ICPCP, CEGA, PSO, RCT and RTC.

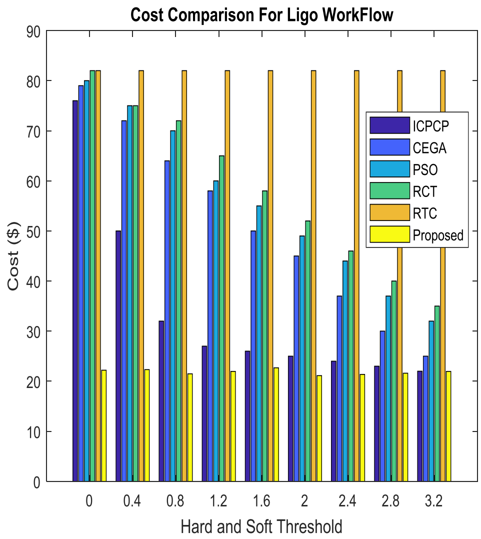

Figure 6 Comparison analysis of Cost for Ligo workflow

The graph of figure 6 depicts the Comparison analysis of Cost for Ligo workflow of the proposed work to the conventional mechanisms. In this graph it is illustrated that the proposed paradigm for Ligo workflow under deadline values offers lower cost comparative to the ICPCP, CEGA, PSO, RCT and RTC. In this the range of cost varies from 0 to 90 and the range of Hard and Soft threshold varies from 0to 3.2. The Table 2 shows the values of the dataset for Ligo workflow.

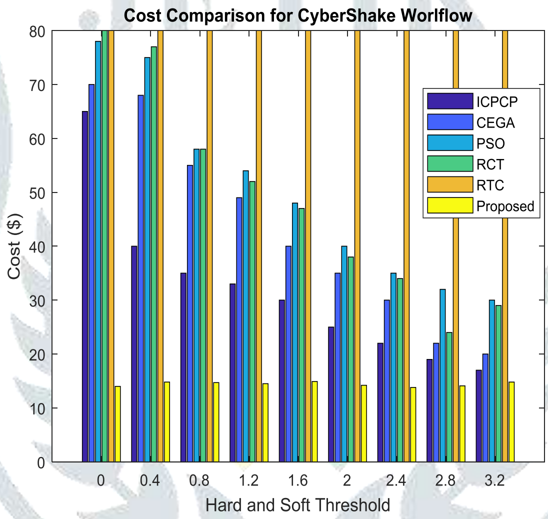

Figure 7 Comparison analysis of Cost for Cybershake workflow

The graph of figure 7 depicts the Comparison analysis of Cost for Cybershake workflow of the proposed work to the conventional mechanisms. In this the range of cost varies from 0 to 80 and the range of Hard and Soft threshold varies from 0to 3.2. In this graph it is illustrated that the proposed paradigm for Cybershake workflow under deadline values offers lower cost comparative to the ICPCP, CEGA, PSO, RCT and RTC. The Table 3 shows the values of the dataset for Cybershake workflow.

[7] CONCLUSION

Cloud computing conveys high performance computing resources over the web to understand huge scale logical work flows. To execute these huge scales logical application cloud computing settles on suitable provisioning and planning choice in such a way, to the point that aggregate execution cost is limited while meeting the due date requirement. To overcome the issues in the existing mechanism the projected mechanism is introduced which schedule the workflow in a cloud effectively. The data transfer costs between different data centers have been decreased in this work as well as the delay is also decreased by the proposed paradigm. The firefly paradigm assures to obtain better results in comparison with any optimization algorithms and also produce quick outcomes. Subsequently, the proposed paradigm can generate effective outcome while considering data transferring cost and minimizing Makespan. Hence the better results are obtained by the proposed paradigm comparative to the conventional paradigms as verified in the results.

As the proposed mechanism is very effective to offer better results but the new results can be generated by using a new techniques. So in future the hybridization of the metaheuristic techniques can be used or the artificial intelligence can also be used to achieve better optimization results.

References

[1] Jasraj Meena, Malay Kumar, and Manu Vardhan, "Cost Effective Genetic Algorithm for Workflow Scheduling in Cloud Under Deadline Constraint", IEEE Access, Vol. 4, Pp. 5065-5082, August 2016

[2] Navjot Kaur, Taranjit Singh Aulakh and Rajbir Singh Cheema, "Comparison of Workflow Scheduling Algorithms in Cloud Computing", International Journal of Advanced Computer Science and Applications, Vol. 2, No. 10, Pp. 81-86, 2011

[3] Fuhui Wu, Qingbo Wu and Yusong Tan, "Workflow scheduling in cloud: a survey", The Journal of Supercomputing, Vol. 71, No. 9, Pp. 3373-3418, September 2015

[4] Mohammad Masdari, Sima ValiKardan, Zahra Shahi and Sonay Imani Azar, "Towards workflow scheduling in cloud computing: A comprehensive analysis", Journal of Network and Computer Applications, Vol. 66, Pp. 64-82, 2016

[5] Fairouz Fakhfakh, Hatem Hadj Kacem and Ahmed Hadj Kacem, "Workflow Scheduling in Cloud Computing: A survey", 2014 IEEE 18th International Enterprise Distributed Object Computing Conference Workshops and Demonstrations, Pp. 372-378, 2014

[6] S. Abrishami, M. Naghibzadeh, and D. J. Epema, "Deadline-constrained workflow scheduling algorithms for infrastructure as a service clouds," Future Generation Computer Systems, Vol. 29, No. 1, Pp. 158–169, January 2013

[7] C. Jianfang, C. Junjie, and Z. Qingshan, "An optimized scheduling algorithm on a cloud workflow using a discrete particle swarm," Cybernetics and Information Technologies, Vol. 14, Pp. 25–39, 2014.

[8] K. Bessai, S. Youcef, A. Oulamara, C. Godart, and S. Nurcan, "Bicriteria Workflow Tasks Allocation and Scheduling in Cloud Computing Environments," in IEEE Cloud, Pp. 638–645, 2012.

[9] L. Singh and S. Singh, "A Genetic Algorithm for Scheduling Workflow Applications in Unreliable Cloud Environment," in Proceedings of the second international conference on Security in Computer Networks and Distributed Systems, ser. SNDS'2, Vol. 420, Pp. 139–150, 2014.

[10] M. Xu, L. Cui, H. Wang, and Y. Bi, "A Multiple QoS Constrained Scheduling Strategy of Multiple Workflows for Cloud Computing," in Proceedings of the 7th International Symposium on Parallel and Distributed Processing with Applications, ser. ISPA'7. Chengdu, China: IEEE, Pp. 629–634, 2009

[11] Cui Lin, Shiyong Lu, "Scheduling Scientific Workflows Elastically for Cloud Computing", ICCC, Pp 746-747, 2011.

[12] Weifeng Sun, Ning Zhang, Haotian Wang, Wenjuan Yin, Tie Qiu, " PACO: A Period ACO Based Scheduling Algorithm in Cloud Computing" ICCCBD, Pp 482-486, 2013.

[13] Xiangang Zhao ; Lizi Xie ; Lan Wei ; Manyun Lin ; Zhanyun Zhang ; Cunqun Fan, "A Cloud Computing Platform for FY-4 Based on Resource Scheduling Technology", ICACBD, Pp 122-126, 2016.

[14] Amin Rezaeian ; Hamid Abrishami ; Saeid Abrishami ; Mahmoud Naghibzadeh, "A Budget Constrained Scheduling Algorithm for Hybrid Cloud Computing Systems Under Data Privacy", ICCE, Pp 230-231, 2016.

[15] S. Selvarani ; G. Sudha Sadhasivam, "Improved cost-based algorithm for task scheduling in cloud computing", ICCICR, Pp 1-5, 2010.