ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Efficiently Resource Allocation In Cloud Scheduling Using Differential Evolution

Dolly, Er. Suchitra

M.Tech Student, Dept. of CSE, Galaxy Global Group of Institution, Kurukshetra University, Dinarpur, Ambala, India

Assistant Professor, Dept. of CSE, Galaxy Global Group of Institution, Kurukshetra University, Dinarpur, Ambala, India

ABSTRACT: Scheduling of jobs is a foremost and difficult issue in Cloud Computing. Utilizing cloud computing resources efficiently is one of the Cloud computing service provider's ultimate goals. Today Cloud computing is on demand as it offers dynamic flexible resource allocation for trustworthy and definite services in pay-as-you-use manner, to Cloud service users. So there must be a provision that all resources should be made available to demanding users in proficient manner to satisfy their needs. In this dissertation author has proposed DE algorithm for scheduling. it is an evolutionary algorithm that is used to optimize the problem iteratively by improving the candidate solution. These are Meta heuristics types methods for optimizes the problems. Differential Evolution (DE) not only the diversity of the algorithm was improved, but also particle's falling into local optimum was avoided. The simulation results indicate that the proposed algorithm can effectively avoid the premature convergence problem. The proposed model aims to reduce the make-span and to increase the resource utilization .A comparison with PSO algorithm in terms of make-span, resource utilization and load balancing level is performed. Simulation of work has been done on CLOUDSIM.

KEY WORDS: Cloud Computing, scheduling, Genetic Algorithm, ACO Algorithm, PSO Algorithm, Differential evolution algorithm

I. INTRODUCTION

Cloud is that where data and services resides in massively scalable data centers and can be accessed from any where from any connected device over the internet. As a cloud defined as distributed system so there are lots of compute power and storage capability residing in distributes environment of cloud. in cloud there are inter-connected computer which provide services to user according to infrastructure of cloud.

resource allocation strategies[1] and their challenges and overcoming those challenges for both user as well as for researchers. In cloud effective resources allocation strategies (RAS)are required for user satisfaction and maximization of the profit. Author find out some smarter solution and succeed optimal resource allocation algorithms for strengthen the cloud computing paradigm. In the terms of cloud[2], characters of cloud and issues in cloud platform like as performance, continusly high availability, confidentiality, and synchronization. In [4]firstly find the several group of solution using ACO algorithm according to the update pheromone after that pso algorithm is applied to find more effective solution to do crossover operation and mutation operation is used so as to avoid the local optimal solution.This improved algorithm not only accelerated the convergence speed, but also avoided the local optimum solution. Resource utilization is improved as the user task were efficiently provided appropriate resources in cloud computing.consideration objective of optimizing[5] task scheduling and resource allocation using an improved differential evolution algorithm (IDEA). This is based on the proposed cost and time on cloud computing. The proposed DEA shows the powerful global exploration on micro space and uses fewer control parameters.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

in cloud for mapping [15]the task to virtual machines author described a multi-objective task scheduling algorithm to improve the throughput of datacenter and reducing the cost without violating SLA(service level agreement) for an applications in cloud Saas environment.

SCHEDULING IN CLOUD

In computing, **scheduling** is the method by which work specified by some means is assigned to resources that complete the work. The work may be virtual computation elements such as threads, processes or data flows, which are in turn scheduled onto hardware resources such as processors, network links or expansion cards.

A **scheduler** carries out the scheduling activity. Schedulers are often implemented so they keep all computer resources busy (as in load balancing), allow multiple users to share system resources effectively, or to achieve a target quality of service.

SCHEDULING PROCESS

In cloud scheduling process can be categorized into 3 stages:

- **Resource discovering and filtering**: Brokers search the resources from network system and gathering the status information of these resources.
- **Resource selection**: Target resource is selected based on certain parameters of task and resource.
- **Task submission**: at the end task is submitted to selected resource.

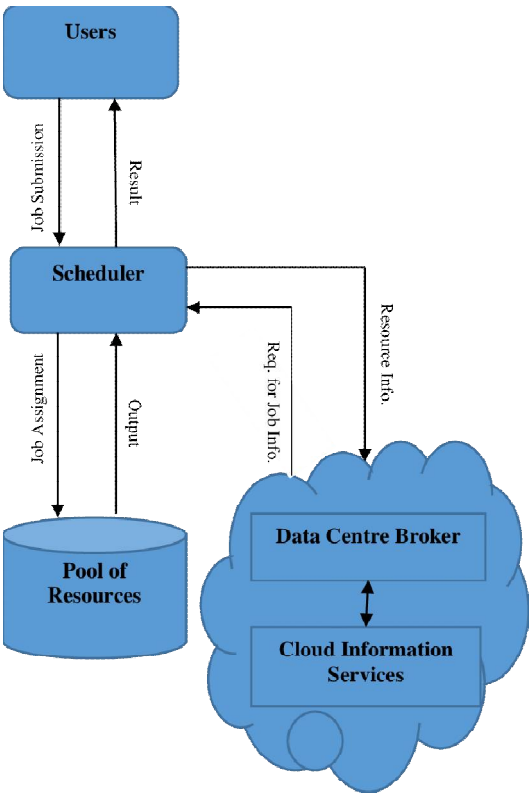

Figure1: Scheduling In Cloud

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

II. RELATED WORK

PSO provide the possible solution regarding the performance issue in cloud computing.pso provide optimal solutions in many areas. Performance improvement can made in terms of make-span and result show minimization in execution of time. Pso based[18] task and workflow scheduling schemes proposed for the cloud environment. In this pso suffer from problem such as local optima. So this is improving the pso and creating its new variants or by combining pso[21] has been improved. In each scheme it has been integrated to solve the task/ workflow scheduling problems

Quality of services(QoS) in cloud computing assures to give satisfactory results with the algorithm QoS[12] is an important indicator to measure the performance of the task scheduling in various algorithm. MQoS-GAAS with multi-QoS constraints are proposed , which considers the time-cinsuming,security and reliability in scheduling process.N- dimenstional QoS abjectives are evaluated. For solving the NP-Hard problem[15] some parameter are taken as there is no efficient method to solve it.template based genetic
ACO has proved to be more beneficial in cloud computing as it enhance the over all results. Ant colony optimization problem (ACO) in cloud[3] computing prove to be area of interest for researchers.it covers the characterstic of cloud computing. In[3] crossover and mutation strategies of genetic algorithm are described. It is not only accerelated the convergence speed but also improves the resource utilization ratio.virtulized resource can also be provisioned dynamically by using ACO. ACON[6] method described as N contains two ways ant mechanism.resource utilization and management of scheduling in cloud computing is a bif challenge. In AcO that is used to determine the processing order of each resource. In larger search space ACO algorithm reduced the search space and give the better solution.

III. PROPOSED ALGORITHM

DIFFERENTIAL ALGORITHM: A basic variant of the DE algorithm works by having a population of candidate solutions (called agents). These agents are moved around in the search-space by using simple mathematical formulae to combine the positions of existing agents from the population. If the new position of an agent is an improvement it is accepted and forms part of the population, otherwise the new position is simply discarded.
The process is repeated and by doing so it is hoped, but not guaranteed, that a satisfactory solution will eventually be discovered. differential algorithm can be represent by a four steps process shown in to figure. only first step is performed once, the other steps are performed while an iterative process does not terminated by stop criteria.

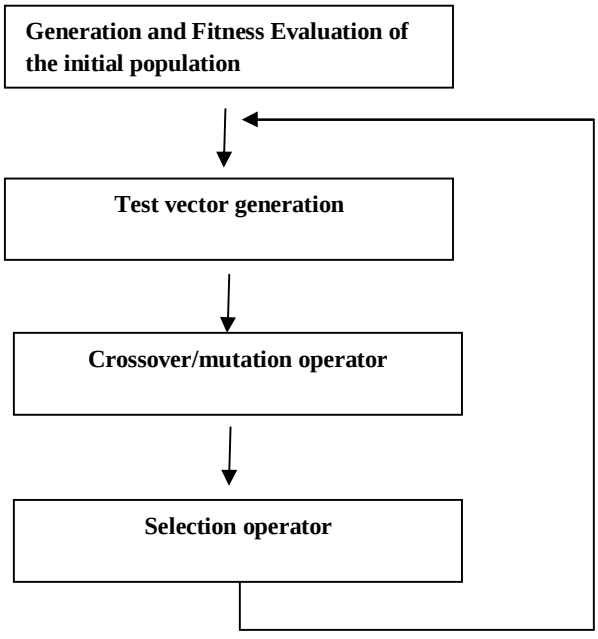

Figure 2: Differential Evolution Steps

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Formally, let $f : R^n$ R be the cost function which must be minimized or fitness function which m must be maximized. the function takes a candidate solution as argument in the form of vector of real numbers and produces a real number as a output which indicate the fitness of given candidate solution. the gradient of f is not known. The goal is to find a solution m for which $f(m) < f(P)$ for all p in the search space, which would mean m is global minimum. maximization can be performed by considering the function $h:= - f$ instead.

let $X \in R^n$ designate a candidate solution (agent) in the population. CR € [0,1] is called crossover probability. let F [0,2] called differetial weight. The basic DE algorithm can then be described as follows:

step1: initialize all agents X with random position in search space.
step2 :utill a termination creterion is met, repeat the folllowing:

- for each agent X in the popution do:
  - pick three agents **a,b and c** from population at random.
  - pick a random inder **R** € { 1…..n}
  - compute agent's new position **Y**=[y_1....,…y_n] as follows:
    - for each i € {1…..n},pick uniformally number $r_i \equiv U(0,1)$
    - for $r_i < CR$ or i=R then set $y_i = a_i + F \times (b_i - c_i)$ otherwise $y_i = x_i$
    - the new position is the outcome of binary crossover of agent x with intermediate agent $Z = a + F \times (b-c)$
  - if $f(y) < f(x)$ then replace the agent in population with the improved candidate solution that is replace x with y in population

step 3 :pick the agent from population that has the highest fitness or lowest cost and return it as the best found candidate solution.

IV.EXPERIMENTAL SETUP

The performance measurement has been gathered by using the cloudsim framework. The goal of experiment is to show that the proposed algorithm (DE) for the scheduling in cloud computing gives the better results as compared with the PSO algorithm .To accomplish this, recommended following situations. We lable the identical datacenters composed of hosts .Each processing elements has speed of 1000 MIPS,. Available bandwidth 10Gbits/s. Storage capacity 1 TB. A Random access memory (RAM) 2048 MB.
We processed 10000 cloudlets on earlier datacenters using two policies PSO and DE approaches. The length of cloudlets are in different range from1000-10000. In this five tests are conducted for testing our result. From these test cases we conclude that proposed algorithm beats the earlier PSO Algorithm in term of reduce the make-span and higher the resource allocation..

V.SIMULATION RESULTS

The proposed algorithm is implemented with Cloudsim. Proposed algorithm DE is compared with PSO algorithm in terms of make-span , resource allocation and load balancing level factors. Our results shows that the Makespan, Resource Allocation of proposed algorithm gives better results as compare to PSO algorithm.

TEST: The number of cloudlets scheduled on VM is 100.we are considering 10 VMs scheduled on the Hosts and datacenters used for this.

1.Makespan

Makespan is an important performance criterion of scheduling heuristics in grid computing systems. It is defined as the maximum completion time of application tasks executed. DE task scheduling algorithm work efficiently than PSO aalgorithm. We compare number of Tasks completed by each approach for given set of cloudlets. in fig 3 we can see the result or experiments. On the X-axis it shows number of tasks of cloudlets and on Y-axis indicates the make-span.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Makespan is calculated by using the following equation where C is the computed completion time matrix:

Makespan=$\mathbf{max(Cij)}_{i\in [1....n],\ j\in[1..m].}$

.

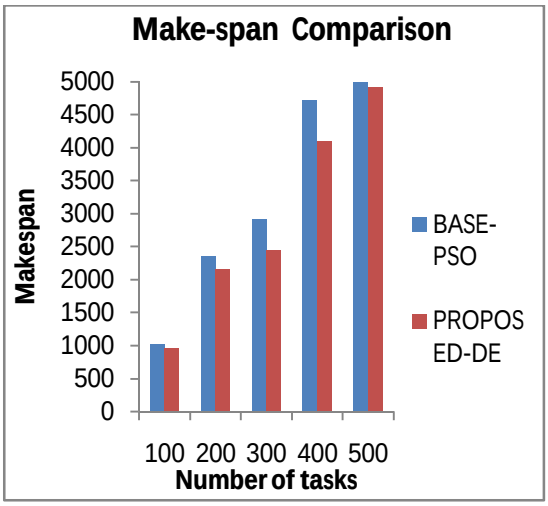

Figure3 :Makespan Comparison

Table 1: Result for 100-500 tasks

TASKS	BASE-PSO	PROPOSED-DE
100	1030.193	960.1567
200	2360.1	2160.1
300	2909.947	2449.948
400	4719.902	4109.888
500	5160.023	4919.897

Table 1 results of extracted data from the experiment. We noticed that, both the approaches seems to be quite indistinguishable but DE execution time of tasks is less. so the proposed algorithm approach is better than PSO **Resource Utilization:** Resource utilization is the most essential performance metric. The resource's utilization (*RU*) is defined as the amount of time a resource is busy in executing tasks. utilization U is the average of resource utilization. They computed as follows:

$$U = \frac{\sum_{j=1}^{m} MU_j}{M}$$

$$MU_j = \frac{r_j}{makespan} \quad ; j \in [1..m]$$

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

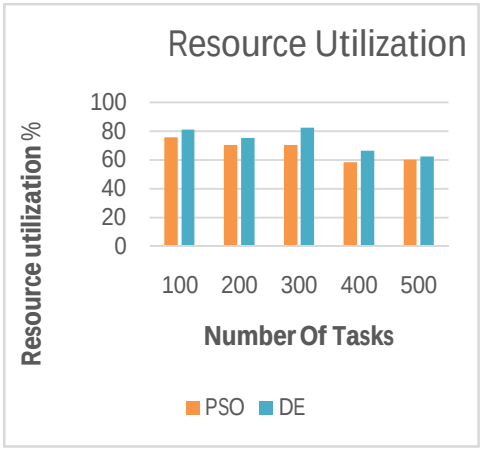

Figure 4: Resource Utilization Comparison

Table 2: Result for 100-500 tasks

TASKS	BASE-PSO	PROPOSED-DE
100	76.00936	81.06989
200	70.42074	75.32059
300	70.40406	82.5476
400	58.61121	66.60322
500	60.31063	62.39283
AVERAGE	74.06961	73.58683

By this table we analysed that in proposed approach resource utilization nearly increased as compare to PSO. DE give the assurance that in this utilization is better than that of PSO.

Load Balancing Level: Cloud Load Balancing Is The Process Of Distribution Of Work Load Across Multiple Computing Resources.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

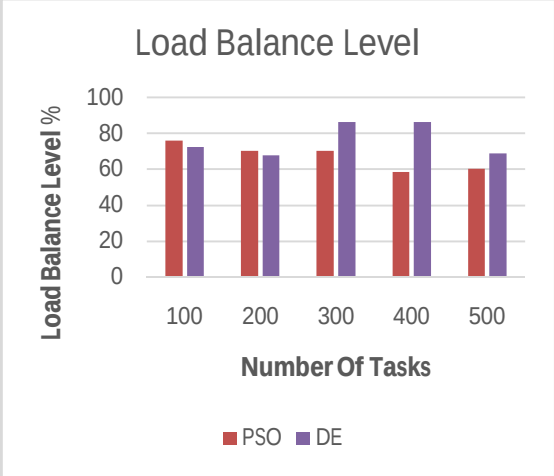

Figure 5:Load Balancing Level Comparison

Table 3: Result for 100-500 tasks

TASKS	BASE-PSO	PROPOSED-DE
100	76.00936	72.34228
200	70.42074	67.87099
300	70.40406	86.29166
400	58.61121	86.29166
500	60.31063	69.09839

by making the comparison in this factor we find that the load balancing efficiently work if number of tasks are increased but not perfectly work in less number of tasks.

VI. CONCLUSION

Cloud computing is a computing service paradigm that charges under the basis of the amount of resources consumed i.e. pay per use constraint.. in this discuss about the various types of resources allocation and task scheduling algorithm. Although, there are various algorithms and methods were existing to solve the problem of resource allocation but none of these algorithms could be extended. Efficiency of cloud depends on the type scheduling algorithm used in environment. All above discussed algorithm used for resource allocation completely depends on types of task to be scheduled. Time driven based resource allocation gives better response time and increase resource utilization. Depending on surveying the various algorithm it can be concluded that, make span can be reduced by grouping the task. Since cloud computing systems have a high degree of unpredictability with respect to resource availability.

Diffrential algorithm is meta-heuristic technique use for task scheduling technique to reduce the makespan and complexity of base technique. Resource utilization is maximize by using DE. In Study GA we observed that it is easy to fall into local optimum in high-dimensional space and has a low convergence rate in the iterative process. We use Differential Evolution (DE) not only the diversity of the algorithm was improved, but also particle's falling into local optimum was avoided. Complexity of GA is higher so we use DE to reduce the complexity.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

VII. FUTURE SCOPE

Future work involves implementation of algorithm on actual cloud environment. we comparison workload traces in cloud environment anf find out that LBL factor give the better result if number of tasks are increased but in smaller task it does not perform as in larger task so this enhancement can be done in future.It can also check out access of cost and priority level be assigned for each task.Deadline cost based algorithm can be implemented with this proposed algorithm.

REFERENCES

[1].V.Vinothina, Sr.Lecturer, Dr.R.Sridaran, Dean, Dr.PadmavathiGanapathi,"A Survey on Resource Allocation Strategies in Cloud Computing", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol.3, No.6, June2012
[2]. Shyam Patidar, Dheeraj Rane, Pritesh Jain," A Survey Paper on Cloud Computing", 2012 Second International Conference on Advanced Computing & Communication Technologies, 2012 IEEE DOI 10.1109/ACCT.2012.15
[3] Xiaotang Wen1, Minghe Huang1, Jianhua Shi1," Study on Resources Scheduling
Based on ACO Algorithm and PSO Algorithm in Cloud Computing", 2012 IEEE
DOI 10.1109/DCABES.2012.63
[4]. Dervis Karaboga,Beyza Gorkemli, Celal Ozturk ·and Nurhan Karaboga," A comprehensive survey: artificial bee colony (ABC) algorithm and applications",2012 DOI 10.1007/s10462-012-9328-0
[5] Jinn-Tsong Tsai1*, Jia-Cen Fang1, and Jyh-Horng Chou2, "Optimized Task Scheduling and Resource Allocation on Cloud Computing Environment Using Improved Differential Evolution Algorithm,"
[6] Yue Zhou, XinLi Huang. "Scheduling Workflow in Cloud Computing Based on Ant Colony Optimization Algorithm", 2013 Sixth International Conference on Business Intelligence and Financial Engineering, 2014 IEEE DOI 10.1109/BIFE.2013.14
[7] M.Gokilavani, S.Selvi, C.Udhayakumar, "A Survey on Resource Allocation and Task Scheduling Algorithms in Cloud Environment", International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 4, October 2013
[8] Fazel Mohammadi 1, Dr. Shahram Jamali 2 and Masoud Bekravi 3," Survey on Job Scheduling algorithms in Cloud Computing", International Journal of Emerging Trends & Technology in Computer Science (IJETTCS) Volume 3, Issue 2, March – April 2014
[9] Jing Xue, Liutao Li, SaiSai Zhao, Litao Jiao," A Study of Task Scheduling Based On Differential Evolution Algorithm in Cloud Computing", 2014 Sixth International Conference on Computational Intelligence and Communication Networks 2014 IEEE
DOI 10.1109/.14263810.1109/CICN.2014.142
[10] Lipsa Tripathy, Rasmi Ranjan Patra, "scheduling in cloud COMPUTING", International Journal on Cloud Computing: Services and Architecture (IJCCSA) ,Vol. 4, No. 5, October 2014 DOI : 10.5121/ijccsa.2014.4503
[11]. .Himani , Harmanbir Singh Sidhu," Comparative Analysis of Scheduling Algorithms of Cloudsim in Cloud Computing", International Journal of Computer Applications (0975 – 8887) Volume 97– No.16, July 2014
[12] Yangyang Dai1, Yuansheng Lou2, Xin Lu3, "A Task Scheduling Algorithm Based on Genetic Algorithm and Ant Colony Optimization Algorithm with Multi-QoS Constraints in Cloud Computing", 2015 7th International Conference on Intelligent Human-Machine Systems and Cybernetics, 2015 IEEE DOI 10.1109/IHMSC.2015.186
[13] Tingxi Wen, Zhongnan Zhang*, Meihong Wang," A Parallel Bee Colony Algorithm for Resource Allocation Application in Cloud Computing Environment", 2015 IEEE International Conference on Data Science and Data Intensive Systems 2015 IEEE DOI 10.1109/DSDIS.2015.36
[14] Mohammad Sadaqaa*, Reinaldo J. Moragaa," Scheduling Blocking Flow Shops Using Meta-RaPS", review under responsibility of scientific committee of Missouri University of Science and Technology doi: 10.1016/j.procs.2015.09.211
[15] Atul Vikas Lakraa, Dharmendra Kumar Yadavb," Multi-Objective Tasks Scheduling Algorithm for Cloud Computing Throughput Optimization, International Conference on Computer, Communication and Convergence (ICCC 2015)
doi: 10.1016/j.procs.2015.04.158
[16] Xiaodong Sheng, Qiang Li," Template-based Genetic Algorithm for QoS-aware
Task Scheduling in Cloud Computing", 2016 International Conference on Advanced Cloud and Big Data 2016 IEEE DOI 10.1109/CBD.2016.37
[17] Sushant Nair,2 P. Akilandeswari, "ANALYSIS OF TASK SCHEDULING FOR PRIVATE AND PUBLIC CLOUD IN REAL-TIME ENVIRONMENT", Sushant Nair*et al. /International Journal of Pharmacy & Technology IJPT| Dec-2016 | Vol. 8 | Issue No.4 | 5198-5204
[18] N.C.Brintha ,J.T.Winowlin Jappes, nd Shajulin Benedict" A Modified Ant Colony Based Optimization for Managing Cloud Resources in Manufacturing Sector", 2016 2nd International Conference on Green High Performance Computing (ICGHPC)
[19] Deepika Saxena, Scholar and Dr. R.K. Chauhan, Dr. Ramesh Kait ," Dynamic Fair Priority Optimization Task Scheduling Algorithm in Cloud Computing: Concepts and Implementations",I. J. Computer Network and Information Security, 2016, 2, 41-48 Published Online February 2016 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijcnis.2016.02.05
[20] Naoufal Er-Raji*, Faouzia Benabbou, Ahmed Eddaoui," Task Scheduling Algorithms in the Cloud Computing Environment: Survey and Solutions", Er-Raji et al., International Journal of Advanced Research in Computer Science and Software Engineering 6(1), January - 2016, pp. 604-608
[21]Mohammad Masdari, Farbod Salehi, Marzie Jalali and Moazam Bidaki2," A Survey of PSO-Based Scheduling Algorithms in Cloud Computing", Springer Science+Business Media New York 2016 J Netw Syst Manage DOI 10.1007/s10922-016-9385-9
[22] R. Durga lakshmi 1, n srinivasu2* , "A dynamic approach to task scheduling in
Cloud computing using genetic algorithm", Journal of Theoretical and Applied Information Technology 20th March 2016. Vol.85. No.2

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

[23] Esma Insaf Djebbar(&) and Ghalem Belalem," Tasks Scheduling and Resource Allocation for High Data Management in Scientific Cloud Computing Environment", Springer International Publishing AG 2016 S. Boumerdassi et al. (Eds.): MSPN 2016, LNCS 10026, pp. 16–27, 2016.DOI: 10.1007/978-3-319-50463-6_2
[24]. Raja Manish Singh#1, Sanchita Paul*2, Abhishek Kumar, "Task Scheduling in Cloud Computing: Review", Raja Manish Singh et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (6) , 2014, 7940-7944