Standard Deviation Based Modified Cuckoo Optimization Algorithm for Task Scheduling to Efficient Resource Allocation in Cloud Computing

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Abstract—The Cloud Computing has an epochal technology now a day. Managing the incoming request (tasks) to available resources is a challenge for scientist and researchers. This paper proposes a Standard Deviation based Modified Cuckoo Optimization Algorithm (SDMCOA) for task scheduling to efficiently manage the resources. The proposed sys-tem works, in two phases. In the first phase, the sample initial population have been calculated among the available number of task's population. Rather to take the sample randomly, if an appropriate population's sample for an experiment are chosen then there are more chances to get optimal result. In second phase, the Cuckoo Optimization Algorithm has been modified with respect to immigration and laying stage. This helps to improve the performance of the system. The experimental results using Cybershake Scientific Workflow shows that the proposed SDMCOA performs better than existing methods BATS, COA in terms of finish time and response time.

Index Terms—Cloud Computing, task scheduling, modified cuckoo optimization, resource utilization

Manuscript received July 16, 2017; revised November 28, 2017. formed Service Level Agreement [1]. The Cloud Computing system which is based on "pay-as-you-go" model makes it more powerful than others. The Virtualization [2] is the technology which adds strong corner

to Cloud Computing. The Virtualization is actually abstracts the computing resources such as CPU, memory and other physical devices. Whenever, user submits a request to the cloud computing then such virtualization generates virtual machines to fulfil it. The Cloud Computing is basically providing any type of service (software or hardware) over Internet. To provide soft-ware or hardware services to the service user the Cloud Computing should balance thencoming request load with avail-able infrastructure. The 1and1 [3] developed a load balance system where user has the provision to shift one server to another manually. The Amazon Web Service (AWS) cloud provider [4] implemented task placement strategies by Bin-pack algorithm. This Binpack algorithm placed tasks based on the demanding percentage of computing resources such as CPU and memory. It randomly placed the tasks for execution. The Microsoft Azure Scheduler [5] schedules the jobs by kept the job execution result history. The scheduler REST (Representational State Transfer) API is responsible to man-age the interactions between scheduling activities. Round Robin and Least Connection Algorithms are developed by the Century Link [6] Cloud Service Provider. The Rackspace has utilized the Random, Round Robin or Least Connection algorithm to manage the incoming traffic over the avail-able computing infrastructure. If computing resources such as CPU or RAM were not sufficient to incoming tasks demanded then a weighted algorithm has used to handle such situation [7]. In this paper, we focused on task scheduling and resource allocation in Cloud Computing. From the © 2017 J. Adv. Inf. Technol. 210 Journal of Advances in Information Technology Vol. 8, No. 4, November 2017 doi: 10.12720/jait.8.4.210-218 performance and profit point of view these two are milestones of Cloud Computing. We have used scientific applications [8] as an input to the proposed system. In order to minimized the response time and maximize the utilization of Cloud Computing resources the scheduling has performed the keen role. Scheduling is properly managed the incoming request (tasks) over the available resources with having some constraints. As far as scheduling is concerned lot of work have been noted on it, but still there is scope for improvement. Further, nature-inspired techniques such as Particle Swarm Optimization (PSO) [9], another nature-inspired Ant Colony Optimization [10] apart from this Honey Bee optimization [11] are some of existing optimization methodologies utilized to solve the scheduling and resource allocation problem in Cloud Computing to minimized the makespan, response time, throughput and maximized the utilization of computing resources such as CPU, memory and bandwidth etc. Basically, we focused and modify the scheduling of tasks by using Cuckoo Optimization Algorithm [12]. Our proposed SDMCOA has given more fruitful result in terms to minimize response time and finish time. The pro-posed SDMCOA approach also more efficient to maximize utilization of Cloud Computing resources. Our key contributions in this paper are as

follows: 1. Mathematical based population selection adds strong corner in proposed system. 2. Iteration method has been developed in proposed SDM-COA. 3. The modified operators such as immigration and laying are utilized to schedule the tasks in optimal way. 4. The performance has been evaluated of proposed SDM-COA with existing system by Cloudsim Simulator. The rest of this paper is organized as follows. Section II focuses up on related work of scheduling. Section III elaborates the proposed system architecture. Section IV form the task scheduling problem. Section V describes the steps of Standard Deviation based population selection. Section VI de-scribes the proposed SDMCOA for tasks scheduling. Section VII evaluates the SDMCOA approach. Demonstrates the simulation result and valuation with existing system in Section VIII. Finally, we conclude with future direction in respective Section IX.Cybershake performs lot of computation on very huge datasets which is generated from simulation Strain Green Tensor (SGT). Such generated data in the form of "master" SGT files for x and y dimensions. This master SGT data quantifies the relationship between motion at a site and motion throughout the region. The ExtractSGT jobs may therefore be considered data partitioning jobs. In next level Synthetic seismogram are generated for each iteration variation by the Seismogram Synthesis jobs. The Peak intensity values are calculated by the PeakValueCalcOkaya jobs for each synthetic seismogram. The resulting synthetic seismogram and peakintensities are collected and compressed by the ZipSeismo-grams and ZipPeakSA jobs to be staged out and archived. These jobs may be considered as simple data aggregation jobs. Of the computational jobs, seismogram synthesis jobs are the most computationally intensive [27]. As shown in Fig. 1 a scheduling of task in Cybershake Scientific workflow in which every node represents a task and each edge represents the dependency between the tasks. Fig. 2 is the Cybershake Scientific Workflow tasks. The task which has no predecessor is represented as Tstart and the task which has no successor is represented as Tend. The Cloud Computing has executed various tasks based on virtual machines. The Virtual Machine is basically formed by combination of computing resources such as CPU, memory and bandwidth.]I. INTRODUCTION Now days, industry and academia both are shifting their traditional way to utilize services offline to online. The technology which can make it possible is known as Cloud Computing. The Cloud Computing centres are responsible to hosts the applications and services such as Software as a Service, Platform as a Service, and Infrastructure as a Service. The Cloud Computing centres are builds of various specification computers or servers which are connected together. The Cloud Computing is the next paradigm of parallel and distributed computing to provide the resources. Utilization of the services by the service user and service provider both collectively

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revised November 28, 2017. formed Service Level Agreement [1]. The Cloud Computing system which is based on "pay-as-you-go" model makes it more powerful than others. The Virtualization [2] is the technology which adds strong corner to Cloud Computing. The Virtualization is actually abstracts the computing resources such as CPU, memory and other physical devices. Whenever, user submits a request to the cloud computing then such virtualization generates virtual machines to fulfil it. The Cloud Computing is basically providing any type of service (software or hardware) over Internet. To provide soft-ware or hardware services to the service user the Cloud Computing should balance thencoming request load with avail-able infrastructure. The 1and1 [3] developed a load balance system where user has the provision to shift one server to another manually. The Amazon Web Service (AWS) cloud provider [4] implemented task placement strategies by Bin-pack algorithm. This Binpack algorithm placed tasks based on the demanding percentage of computing resources such as CPU and memory. It randomly placed the tasks for execution. The Microsoft Azure Scheduler [5] schedules the jobs by kept the job execution result history. The scheduler REST (Representational State Transfer) API is responsible to man-age the interactions between scheduling activities. Round Robin and Least Connection Algorithms are developed by the Century Link [6] Cloud Service Provider. The Rackspace has utilized the Random, Round Robin or Least Connection algorithm to manage the incoming traffic over the avail-able computing infrastructure. If computing resources such as CPU or RAM were not sufficient to incoming tasks demanded then a weighted algorithm has used to handle such situation [7]. In this paper, we focused on task scheduling and resource allocation in Cloud Computing. From the © 2017 J. Adv. Inf. Technol. 210 Journal of Advances in Information Technology Vol. 8, No. 4, November 2017 doi: 10.12720/jait.8.4.210-218 performance and profit point of view these two are milestones of Cloud Computing. We have used scientific applications [8] as an input to the proposed system. In order to minimized the response time and maximize the utilization of Cloud Computing resources the scheduling has performed the keen role. Scheduling is properly managed the incoming request (tasks) over the available resources with having some constraints. As far as scheduling is concerned lot of work have been noted on it, but still there is scope for improvement. Further, nature-inspired techniques such as Particle Swarm Optimization (PSO) [9], another nature-inspired Ant Colony Optimization [10] apart from this Honey Bee optimization [11] are some of existing optimization methodologies utilized to solve the scheduling and resource allocation problem in Cloud Computing to minimized the makespan, response time, throughput and maximized the utilization of computing resources such as CPU, memory and bandwidth etc. Basically, we focused and modify the scheduling of tasks by using Cuckoo Optimization Algorithm [12]. Our proposed SDMCOA has given

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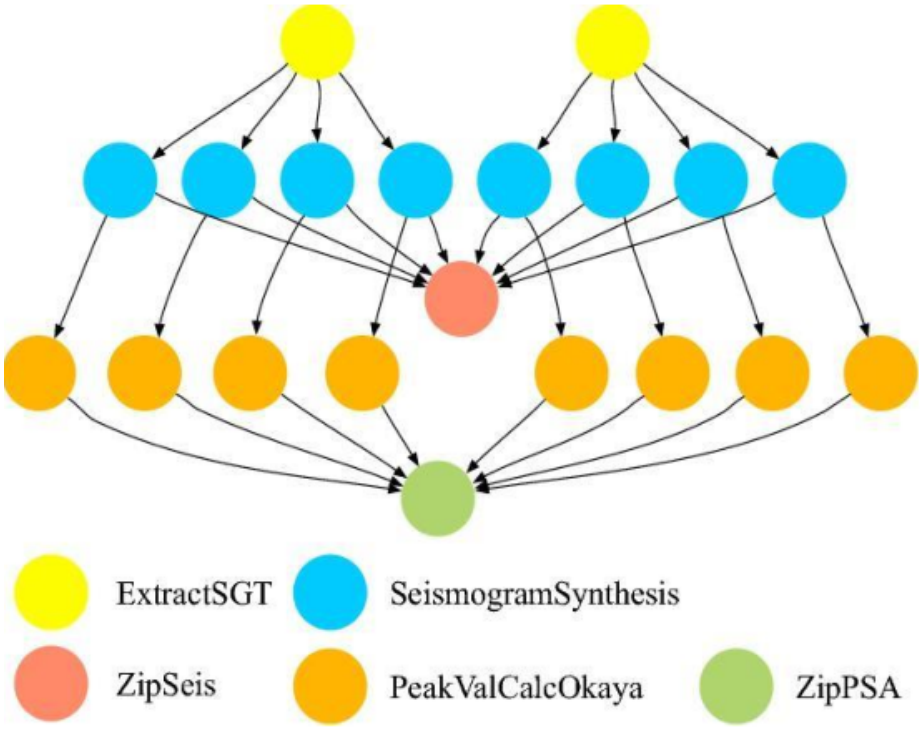

Figure 2. Cybershake scientific workflow

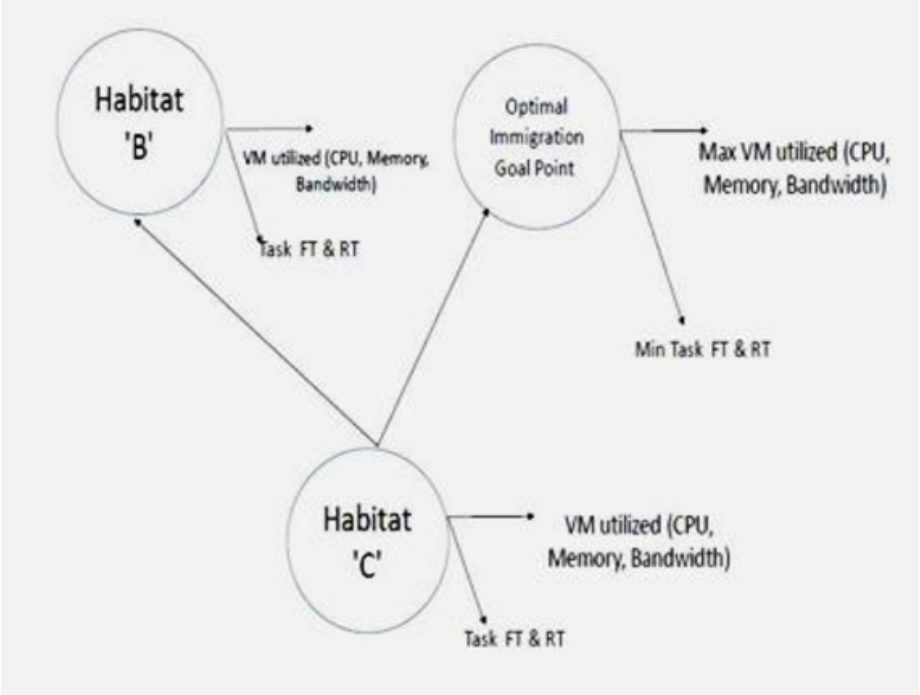

Figure 4. Optimal immigration habitat.

TABLE VII. COMPARISON OF PROPOSED SDMCOA WITH MABBLDC, COA, BATS ON FT IN MS WITH 20 VMS

Tasks	SDMCOA	MABBLDC	COA	BATS
Task 3	2613.79	2832.94	2913.79	3599.29
Task 5	2613.07	2914.42	2913.07	3599.29
Task 7	2611.02	2913.87	2911.02	3599.29
Task 9	2606.93	2911.75	2906.93	3599.29
Task 11	2636.78	2907.67	2936.78	3599.29
Task 14	2556.36	2772.11	2856.36	3599.29
Task 16	2554.44	2857.89	2854.44	3599.29
Task 18	2537.48	2855.97	2837.48	3599.29
Task 20	2533.36	2833.36	2833.36	3599.29
Task 22	2540.06	2834.72	2840.06	3599.29
Task 24	2563.70	2841.49	2863.70	3599.29
Task 26	2532.86	2832.86	2832.86	3599.29
Task 28	2535.37	2833.96	2835.87	3599.29

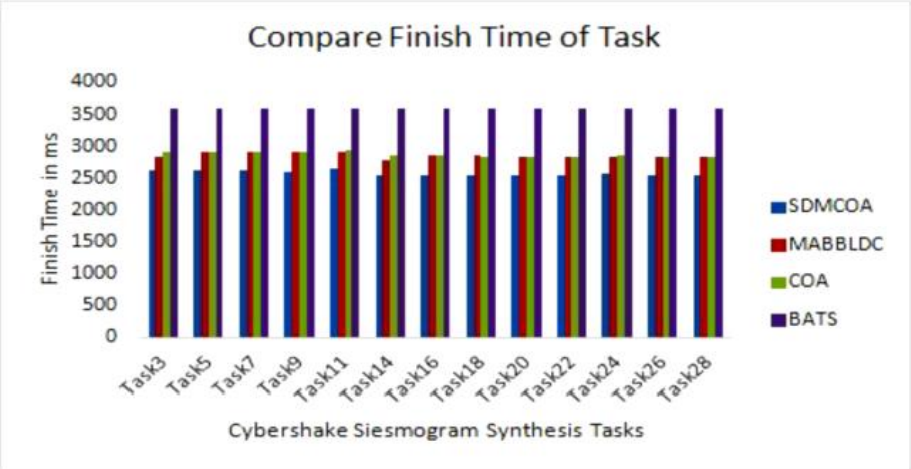

TABLE VIII. COMPARISON OF PROPOSED SDMCOA WITH ON RT IN MS WITH 20 VMS

Tasks	SDMCOA	COA
Task 3	2832.44	2832.44
Task 5	2832.44	2832.94
Task 7	2832.44	2832.94
Task 9	2832.44	2832.94
Task 11	2832.44	2832.94
Task 14	2771.61	2772.11