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**MapReduce Scheduling for Deadline-Constrained Jobs in Heterogeneous Cloud Computing Systems**

**Abstract:**

MapReduce is a software framework for processing data-intensive applications with a parallel manner in cloud computing systems. Some MapReduce jobs have the deadline requirements for their job execution. The existing deadline-constrained MapReduce scheduling schemes do not consider the following two problems: various node performance and dynamical task execution time. In this paper, we utilize the Bipartite Graph modelling to propose a new MapReduce Scheduler called the BGMRS. The BGMRS can obtain the optimal solution of the deadline-constrained scheduling problem by transforming the problem into a well-known graph problem: minimum weighted bipartite matching. The BGMRS has the following features. It considers the heterogeneous cloud computing environment, such that the computing resources of some nodes cannot meet the deadlines of some jobs. In addition to meeting the deadline requirement, the BGMRS also takes the data locality into the computing resource allocation for shortening the data access time of a job. However, if the total available computing resources of the system cannot satisfy the deadline requirements of all jobs, the BGMRS can minimize the number of jobs with the deadline violation. Finally, both simulation and testbed experiments are performed to demonstrate the effectiveness of the BGMRS in the deadline-constrained scheduling.

**Existing System:**

Originally, the slots of a MapReduce framework system are not distinguished with each other, which are assumed with the homogeneous performance. In practice, a slot represents a portion resource of a node, which can be also regarded as a virtual machine (VM). In the slot is instead of the VM. In a cloud computing system, the node heterogeneity is inevitable since there are a large number of nodes in the system [9]. It is difficult to ask all nodes with the same performance and capacity in their CPUs, memory, and disks. Due to the sake of node heterogeneity, the slots in different nodes have different amount of computing resources. From the viewpoint of a short-deadline job, if its map (reduce) tasks are allocated in the fewer-resource slots, the job may not be completed within its specified deadline. Note that, the fewer resource indicates the slot with low CPU performance (in terms of MIPS) and memory size. The more-resource slot represents the slot with more resources in CPU performance and memory size than the fewer-resource slot.

**Proposed System:**

We propose a new scheduler that utilizes the Bipartite Graph modelling to integrate the above four concerned points in the MapReduce Scheduling. The proposed MapReduce scheduler is called the BGMRS. Compared to the previous schemes, the BGMRS can dynamically adjust the map and reduce task deadlines of a job according to the execution time of already run map and reduce tasks.

We propose a graph-based MapReduce scheduling scheme which considers the cloud computing system with various node performance and the running jobs with different deadline requirements.

We present an adaptive deadline partition method to dynamically regulate the execution time of the map (reduce) tasks of the job. If a map (reduce) task takes longer execution time over its task deadline, the deadlines of the pending map (reduce) tasks will be shortened to avoid violating the whole job deadline.

We transform the deadline-constrained MapReduce scheduling (DCMRS) problem as the well-known graph problem: minimum weighted bipartite matching (MWBM). Then, we proposed an efficient heuristic algorithm to solve the DCMRS problem.

Our scheduling scheme also resolves the resource contention problem. If there are not enough resources to meet the deadlines of all concurrently running jobs, our scheme can minimize the number of deadline-over jobs.