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**Term Project:** Dynamic Task Scheduling

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## 1. What is Dynamic Task Scheduling?

Dynamic task scheduling is an algorithm which priorities are calculated during the execution of the system. The goal of dynamic priority scheduling is to adapt to dynamically changing progress and form an optimal configuration in self-sustained manner.

It depends on two things management of task and the resource allocation system. Task management is also known as job scheduling which is the primary concern of cloud computing. Dynamic task scheduling can be divided into two types static scheduling & dynamic scheduling. In static scheduling, the entire task information is known before scheduling & they are statically assigned to available resources. When the information of the task is not known to the scheduler then it is called as dynamic task scheduling. Hence, the more efficient scheduler, the more efficient service will provide by the cloud.

The idea of real-time scheduling is to confine processor utilization a task's processor utilization is defined as execution time over period under schedulable utilization of a certain scheduling algorithm. Higher schedulable utilization means higher utilization of resource and the better the algorithm for elegant service to the tasks, there is a need for an efficient scheduling algorithm. Many algorithms have been developed for scheduling. However, most of the developed algorithm has conflicting objectives and its own limitation.

To out-way the limitations there is “pay as you go " principle which is used to provide the IT services to the user in the flexible and dynamic manner with minimal management effort. The most important feature is the ability to dynamically schedule the application on the best resource according to the load.

## 2. How Dynamic Task Scheduling works?

With the growing influence of cloud computing, the provision of services which are now essential to people has increased. However, scheduling workload in a diverse cloud environment is very challenging due to limited cloud resources with varying capacities and functionalities. The major problem is how to allocate user tasks to maximize the profit of cloud service providers while guaranteeing quality of service for all the tasks. In a dynamic environment, how to successfully schedule tasks and make high implementation of cloud resources is an important issue.

Task scheduling is to implement the reasonable deployment of cloud resources to meet user requirements while maximizing the economic benefits of cloud service providers. As a service business model, task scheduling strategies in clouds are needed to meet the quality of service requirements of user tasks which include deadlines and cost. At the same time, service profit and energy cost for cloud service providers should be fully considered. Improperly matching applications at some hardware platforms can degrade the overall performance of clouds and may violate the quality of service guarantees that many user tasks require.

## 3. What are the benefits of Dynamic Task Scheduling?

As the name implies, the technique is considered to be dynamic, non-preemptive, adaptive, and it uses a mixed centralized and decentralized policies. Based on the divide and conquer principle, the algorithm models the cluster as hyper-grids and then balances the load among them.

It is said to be Dynamic because it is a method in which the hardware determines which instructions to execute, as opposed to a statically scheduled machine, in which the compiler determines the order of execution. In essence, the processor is executing instructions out of order.

It is Non-preemptive because it is used when a process terminates, or a process switches from running to waiting state. In this scheduling, once the resources (CPU cycles) is allocated to a process, the process holds the CPU till it gets terminated or it reaches a waiting state.

It is considered to be adaptive because the performance is measured in terms of Success Ratio and Effective CPU Utilization. Execution Time taken by each scheduling algorithm is also

measured. From analysis and experiments it reveals that the proposed algorithm is fast as well as very efficient in both under loaded and overloaded conditions.

It is said to be adaptive because it is a combination of the Ant colony optimization (ACO) algorithms and Earliest Deadline First (EDF) algorithms. Basically the new algorithm uses EDF algorithm but when the system becomes overloaded, it will switch to ACO based scheduling algorithm. Again, when the overload disappears, the system will switch to EDF algorithm. Therefore, the proposed algorithm takes the advantages of both algorithms and overcomes the limitations of each other. The proposed algorithm along with EDF algorithm and ACO based scheduling algorithm is simulated for real-time system and the results are obtained. The performance is measured in terms of Success Ratio and Effective CPU Utilization. Execution Time taken by each scheduling algorithm is also measured. From analysis and experiments it reveals that the proposed algorithm is fast as well as very efficient in both under loaded and overloaded conditions.

Dynamic scheduling policies were introduced and are designed to achieve goals such as efficient utilization of process elements, minimization of resources idleness, or determining the total execution time and because this study introduces an efficient strategy to schedule users' tasks by using dynamic dispatch queues and particle swarm optimization with simulated annealing algorithms. Moreover, it incorporates the priority issue in the scheduling process.

**4. What are the types of Dynamic Task Scheduling?**

Dynamic task scheduling is one of the most important aspects of cloud computing systems as the performance of the cloud services depends on the task scheduling algorithms.

**The following are the most common task scheduling algorithms used to dynamically schedule tasks in cloud computing to increase system efficiency:**

**1. First come, first served (FCFS) algorithm:** One of the most common and simplest task scheduling algorithm that process tasks based on a first come, first served basis. If the tasks arrival time is less than the rest, then this task would be processed first.

**Common Uses:** The FCFS algorithm makes it possible to allocate the Virtual Machines to resources within the Cloud based environment on a first come first serve basis.

**2. Round Robin algorithm:** This type of algorithm ensures fairness among the tasks in the waiting queue by ensuring that each task has the same amount of execution time. Should a task not complete processing, it is moved to the back of the queue until its turn of processing comes again. This process ensures that each task get processed at least once.

**Common Uses:** It also ensures that the servers work load are equally balanced by randomly selecting a task from its rounded queue and loading it into CPU servers that are less loaded.

**3. Priority Scheduling algorithm:** A scheduling algorithm that assigns a priority value to each task based on the demand of the task. This demand ranges from system resources such as bandwidth, memory size, storage etc. The task with the highest priority value is therefore executed first. In case the system detects tasks with the same priority values, the tasks will be executed based on a first come, first served (FCFS) basis.

**Common Uses:** Virtual Machines that have the highest value of Million Instructions Per Second (MIPS), will be given the highest priority since they access the servers resources more often.

**4. Min-Min Scheduling algorithm:** This type of algorithm assigns each task to a virtual machine. The shortest tasks are assigned to faster resources while the large tasks are assigned to slower resources. Its main aim is to minimize the waiting time of short tasks as well as improve the simultaneous implementation of the tasks on system resources.

**Common Use:** Virtual machines will be assigned tasks based upon their performance. Shortest tasks will be assigned to high performing virtual machines while larger tasks will be assigned to low virtual machines.

**Website link:** https://20164910.github.io/Cloud-Computing-Project/

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