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Performance Evaluation of Scheduling Algorithms for Real Time Cloud Computing

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Abstract: ***Cloud computing shares data and offers services transparently among users. With the increase in number of users of cloud the tasks to be scheduled increases. The performance of cloud depends on the task scheduling algorithms used in the components or brokering components. Scheduling of tasks on cloud computing systems is one of the research problems, where the matching of machines and completion time of the tasks are considered. Fault-tolerance becomes an important key to establish dependability in cloud computing system. In task scheduling, if task not completed in its deadline, then it is one type of fault in scheduling of tasks. In this thesis this type of faults are taken and try to overcome it.***

Keywords: Scheduling Algorithms, Real Time Cloud Computing

1. Introduction

The computer scientists and mathematicians studied the problem of scheduling for several decades [1][2][3].The data centers are having hosts. Suppose there are 'x' number of tasks 'y' number of hosts and each virtual machine having 'z' number of virtual machines. So these tasks are mapping to the virtual machines in $(y \times z)$ x ways. So the scheduling of tasks is a NP Hard problem. The general scheduling problem schedules the tasks according to the various conditions. A task is characterized by ready time, execution time, deadline and requirement of resources. However the fault may occur either in the task or in the machine. If the failure occurs in the tasks then the task restart job execution from the check points. If the fault may occur in the machine then the task assigned to that machine will migrate to another machine. I have presented a lazy evaluation algorithm for executing the tasks. In this approach, the task will wait for some idle period before it starts its execution. Task migration can be done in two ways, either the copy of the task may be migrated to another machine or the entire task will migrate to another machine. For the temporary faults there is no need to do migration. The task will execute on the same machine. In our proposed algorithm, if any failure occurs then the fault detection and recovery algorithm is used to avoid the failures. The characteristics of the cloud computing are the virtualization, distribution and dynamic extendibility.

1.1 Real Time Tasks Scheduling: Case Study

Missile Guidance System [4]: In the missile guidance system the computers are placed on the missile. A guided missile has the capability of sensing or tracking the target place. The deviation is calculated by the mounted computer and placed on the missile from the required trajectory and changes the track of the missile to guide it onto the target.

Computer On board an Aircraft [5]: The modern aircraft has the auto pilot option selected by the pilots. After selection the aircraft switches to auto pilot mode then the control of the aircraft is taken by the on board computer. The computer takes the control of take off, navigation, landing the aircraft. The computer checks the acceleration and velocity of the aircraft.

2. Principles of Cloud Computing

Cloud computing provide the computing resources to the users over the internet. Instead of storing the data in the hard disk, we store the data in virtual resources available in the cloud. Cloud services provide the software's from third party service providers and users can use this software without installing the software in their local machines. The cloud services include online file storage, web mail, social networking sites and enterprise applications. Cloud computing models can access the data from anywhere in the world. The Architecture of the cloud computing is shown below. The five essential characteristics of cloud computing that offers businesses today. They are on-demand self service, broad network access, resource pooling, rapid elasticity, measured service.

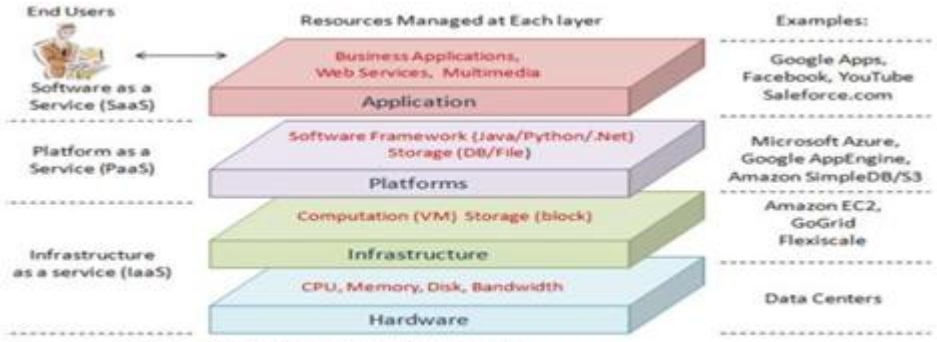

Figure 1: Cloud Computing Architecture

On-demand self service: This is mostly done though a web based self service portal. The customers can manage their own computing resources are the on-demand self service. We have access to your services and we have the power to change cloud services through an online control panel or directly with the provider.

Broad network access: The resources are accessible over the Internet and supporting heterogeneous client platforms such as mobile devices and workstations in the cloud.

Resource pooling: From the pool of resources the customers can access their own resources. The logical level separates the resources.

Rapid elasticity: To suit our business models the cloud should be flexible and scalable. The resources, users and software's are can be added or removed in the future. At any point of time the application will have the exactly capacity it needs.

Measured service: The measured service is the customer can pay the bill based on their usage. Your bill based on the measures of the usage, and the number of user accounts. The resources can be monitored from the user side and provider side, based on this the users can pay their bill.

3. Service Models

There are basically three type of this

3.1 Software as a Service (SaaS)

This comprises as software as service where preinstalled application is present with infrastructure, using this one need only browser and device this service is controlled by centralized architecture, this is very much popular among startup some example are yahoo mail, Google docs, Jio cloud etc. this also don't need update.

3.2 Platform as a Service (PaaS)

Second service named as platform as service in the user get the freedom to represent its application on an available infrastructure, the main advantage is the user don't have to worry about investing in hardware.

3.3 Infrastructure as a Service (IaaS)

The last one where infrastructure is present as a service where the user can customize their entire work with the help of virtual machine, memory and virtual network. The user can customize the virtual software as per their use programmatically.

4. Deployment Model

Based on ownership deployment model [5] comprises of three model [5]

4.1 Private Cloud

Private firm is owned by private firm, sometimes known as company or internal cloud and controlled by individual or firm.

4.2 Public Cloud

It's nothing but controlled or managed by two or more organization and the extension of private cloud .

4.3 Hybrid Cloud

It combination of at least one public and one private cloud.

5. Scheduling

Scheduling is the creation of a schedule ordered list specifying how contending accesses to one or more sequentially reusable resources will be granted. A schedule is intended to be optimal with respect to some criteria Number of algorithm proposed for scheduling real time tasks, main classes of algorithms are defined as follows:

Preemptive: The running task will be interrupted at any point of time after assigning the task to the processor for active any other task is called preemptive. This will be according to a predefined scheduling policy.

Non-preemptive: If any task will starts it execution on the process, it will execute until the task is completed by the processor.

Static: The scheduling decisions are based on the fixed parameters before submitting the tasks to their execution.

Dynamic: The scheduling decisions are based on the dynamic parameters that may change during the execution of the tasks. This will improve the resource utilization.

Off-line: The scheduling algorithm executes the entire task before their actual execution in the off-line. The schedule obtained in this way will store in to a table and then executed by the dispatcher.

Optimal: An algorithm minimizes the cost function defined over the task set is called optimal algorithm. If there is no cost function defined then there is the only concern to achieve a feasible solution.

Heuristic: Heuristic algorithm provides a feasible solution but it may or may not be an optimal.

6. Schedulable and Non-Schedulable Entities

Schedulable entities are scheduled by the scheduler. Non-schedulable entities are most often in the system software and can include interrupt handlers, operating system commands, packet-level network communication services, and the operating systems scheduler. Non-schedulable entities can execute continuously, periodically, or in response to events; their timeliness is a system design and implementation responsibility. Now, we present the following definitions for the scheduling which are available in the literate.

Valid Schedule
Valid schedule of a set of tasks which satisfy the following properties [6]

1) Each process can only start execution after its release time.
2) All the precedence and resource usage constraints are stained.
3) The total amount of processor time assigned to each task is equal to its maximum or actual execution time.

Feasible schedule
A feasible schedule of a set of tasks is a valid schedule by which every task completes by its deadline a set of tasks is schedulable according to a scheduling algorithm if the scheduler always produces a feasible schedule [6].

Optimal schedule
An optimal schedule of a set of tasks is valid schedule of with minimal lateness. A hard real-time scheduling algorithm is optimal if the algorithm always produces a feasible schedule for a given set of tasks [6].

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