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RESOURCE ALLOCATION IN CLOUD COMPUTING USING IMPROVED ROUND ROBIN ALGORITHM

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Abstract- Cloud computing is a delightful computing model. It allows for the provision of resources on-demand. Over the years cloud computing has evolved as a new technology which has a great capability in current market and in organizations. Cloud gives a way in which we can access our applications and associated data from anywhere at any time. When companies need a storage facility and other computational processes, they rent resources from cloud so that their working cost can be reduced. Hence, they don't have to buy or get license for individual products. Cloud computing provides different solutions for software development and there is an unambiguousness underlying infrastructure locality for accessing the contents. The Cloud infrastructure is usually comprised in several data centers and consumers get a small amount of computational power over a large network. There is a provider to control over these computational resources who allocates these resources to the consumers in a flexible manner. However, there is a main drawback related to optimizing the resources which is being allocated and the energy efficiency in cloud computing. In this paper, Improved Round Robin resource allocation algorithm is proposed to satisfy customer demands by reducing time complexity.
Keywords – Cloud, Cloud Computing, Cloud Users, Cloud Services, Resource Allocation, Customer Demand, Infrastructure, Resource Allocation Algorithm.

1. INTRODUCTION

Presently Cloud Computing [3,4] is an evolving computing technology which is trending in development and deployment of a cumulative number of distributed applications. Cloud Computing is defined as the computing model that operates based on Clouds. The Cloud is defined as an intangible layer[11] that manages above an infrastructure to provide services in an appropriate manner. Cloud computing evolve as a new computing paradigm whose purpose is to provide for end-users with reliable, bespoke and QoS (Quality of Service) warranted computing dynamic environments[2]. Distributed processing, parallel processing and grid computing together evolved as cloud computing[18.] According to the NIST definition[15], Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Today Cloud computing has become quite popular among community of cloud users by offering different resource. Developers obtain the benefits of a managed computing platform, with no commit resources to design to build and sustain the network. The term ³cloud´ has been used as an allegory for the Internet, and there are many standard services and Web sites which you may already be using, without knowing that they are cloud-based sites. There is a number benefits of cloud computing the most basic ones being lower charges, reprovisioning[16] of remote access and resources. Cloud computing reduces cost by eluding the capital expenses by the company in leasing the physical infrastructure from a third party. Due to the malleable nature of cloud computing, we can easily and quickly access more resources from cloud providers when we need to enlarge our business. The remote accessibility allows us to access the cloud services from anywhere. To setback the maximum degree of the above-mentioned values, the services presented in terms of resources should be allocated finest to the applications running in the cloud.

2. CLOUD DEPLOYMENT MODEL

2.1 Public Cloud –

Public clouds [4]' as shown in fig 1, are maintained and functioned by companies that use them to offer rapid access to reasonable computing resources to other organizations or any individuals. One advantage of public cloud is users don't need to purchase hardware or software which is managed by cloud providers. Public cloud functions on the major principle of storage demand scalability.

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Figure 1. Public Cloud

2.2 Private Cloud –

Private cloud [4] is a cloud infrastructure used to build completely for a single organization, deployed within certain boundaries whether managed internally or by a third-party. Private Cloud is shown in fig 2.

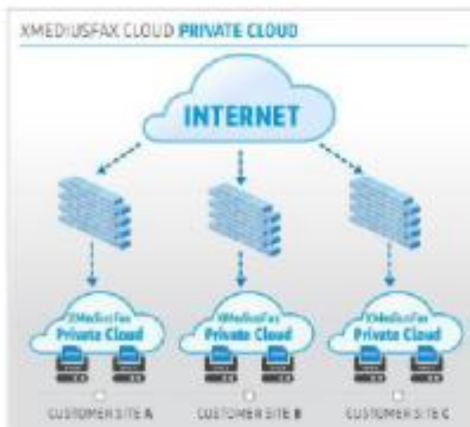


Figure 2. Private Cloud

2.3 Hybrid Cloud –

The cloud infrastructure can be of private cloud and public cloud which helps in retaining the organizational or others data and information in need. This also helps in moving the data from one cloud to another. This is useful when we want to transfer the data. Hybrid Cloud is shown in fig 2.

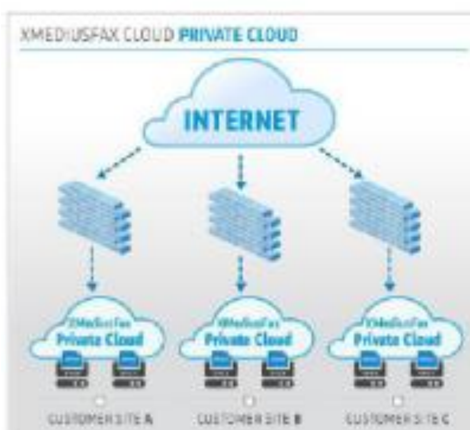


Figure 3. Hybrid Cloud

2.4 Community Cloud –

Cloud frame is shared between the businesses with similar benefits and requests. It can be managed internally or by a third-party and hosted externally or internally. The expenses are spread over fewer users than a public cloud. so only some of the cost stash potential of cloud computing are realized and is shown in bellow fig 4.

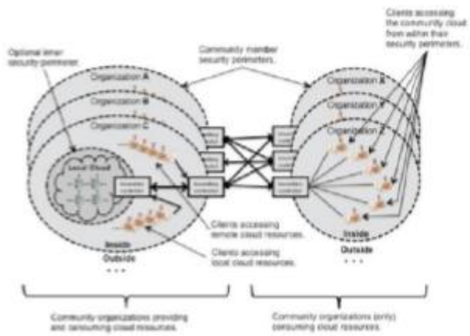


Figure 4. Community Cloud

3. CLOUD DEPLOYMENT MODEL

In cloud computing, Resource Allocation [2,5] (RA) is the method of assigning accessible resources to the desirable cloud applications on the internet. Resource allocation famishes services if the allocation is not achieved and managed precisely. Resource provisioning resolves that delinquent by allowing the service providers to manage and maintain the resources for each different module.

In Resource Allocation Strategy (RAS), the resources are allocated to the cloud applications when they need through Web. RAS is a combination of cloud providers activities which utilizes the resources and allocates within the boundaries of the cloud users or environment Recourse allocation might starve services if the allocation is not done accurately. RAS deals with combining cloud provider activities for better utilization and allocating lacking resources within limited cloud environment to meet the needs of the cloud application. It requires the type and amount of resources needed by each application in order to complete a user job. The best RAS should avoid the following criteria as given below:

1) Resource contention situation ascends when two applications try to access the same resource at the same time.
2) Lack of resources ascends when there are limited resources.
3) Resource fragmentation situation arises when the resources are inaccessible.
4) Over-provisioning of resources ascends when the application gets additional resources than the demanded one.
5) Under-provisioning of resources happens when the application is assigned with little number of resources than demanded.

The allocation time and order of the resources are also an input for an optimal RAS. From the perspective of a cloud provider, predicting the dynamic nature of users [3], user demands, and application demands are unreasonable. For the cloud users, the job should be completed on time with minimal cost. Hence due to limited resources, resource heterogeneity, locality restrictions, environmental necessities and dynamic nature of resource demand, we need an efficient resource allocation system that suits cloud environments.

4. ROUND ROBIN ALGORITHM

It is one of the most widely used scheduling algorithms, designed especially for time-sharing systems. A small unit of time, called time slice or quantum [1] is distinct. All the processes which are runnable are kept in a circular queue. The CPU scheduler goes all over this queue, allocating the CPU to each process for a time interval of one quantum. The processes which comes later are added to the tail of the queue.

The CPU scheduler takes the first process from the queue, sets a timer to interrupt after one quantum, and transmits the process. If the process is still running at the end of the quantum, the CPU is pre-empted and the process is added to the tail of the queue. If the process finishes before the end of the quantum, the process itself releases the CPU voluntarily. In any of the case, the CPU scheduler assigns the CPU to the next process in the ready queue. Every time a process is given the CPU, a context switch occurs, which adds overhead to the process execution time.

An example of Round Robin algorithm is given below:

CPU order in queue & job burst times.

P1: 20
P2: 12
P3: 8
P4: 16
P5: 4

The Gantt chart shown as in fig 5:

(Let time quantum of 4)

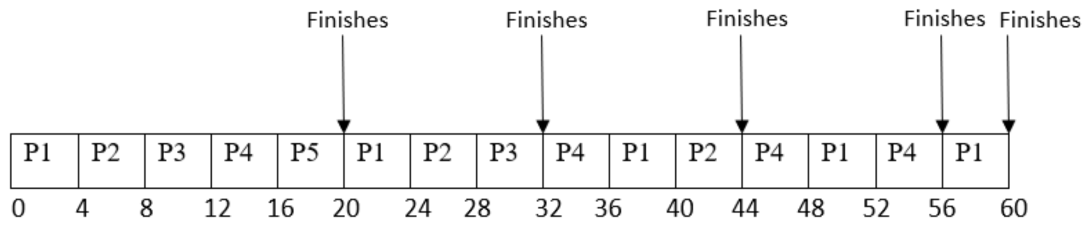
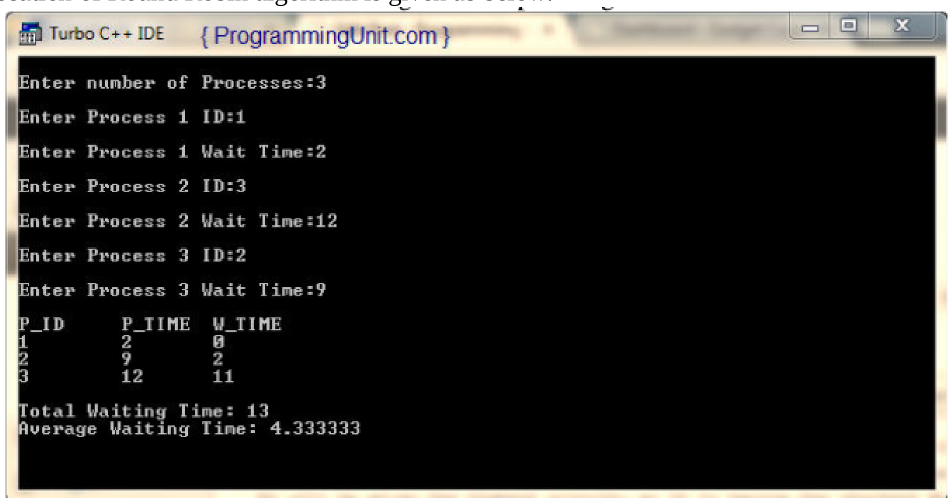


Figure 5. Gantt chart of RR Algorithm

Then the Waiting times are:
P1: 60 - 20 = 40
P2: 44 - 12 = 32
P3: 32 - 8 = 24
P4: 56 - 16 = 40
P5: 20 - 4 = 16
Average wait time: 30.4
A snapshot of the execution of Round Robin algorithm is given as below:



5. IMPROVED ROUND ROBIN ALGORITHM

The proposed algorithm changes after the end of first request and begins with the time equals to the time of first request. When a new request is added into the ready queue in order to be decided, the algorithm calculates the average of sum of the times of requests found in the ready queue and the new arrival request.

It needs two registers:

(i)SR: Which stores the sum of the remaining burst time in the ready queue.

(ii)AR: 1Which store average of the burst times. It divides the value found in the SR by the count requests which is found in the ready queue. After execution, when or if request finishes its burst time, then it will be moved from ready queue or else it will move to the end of the ready queue. SR will be updated by subtracting the time consumed by this request. AR will be updated according to the new data. The algorithm is as follows:

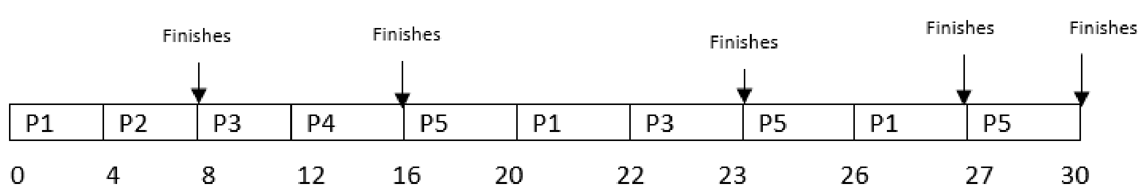


Figure 6. Gantt chart of IRR Algorithm

Algorithm 1: Improved Round Robin Algorithm

Begin

I/P : SR , AR , P_n , BT(P) , TQ , Ready Queue

```
New request P arrives
P Enters ready queue
Update SR and AR
Allocate the resource to new or another process
Request P is loaded into queue to be executed
    While (Ready Queue! = NULL) do
            Put the Process P in the Ready Queue
            Update SR and AR
            Load P    // P will Execute
            Allocate the Resource to Process P
    end while
    For Each Process P in the Ready Queue
            Free Resource
            If (Ready Queue = NULL) then
                    TQ   =BT (P)       //burst time if the process is added to the total burst time in the queue
                    Update SR & AR
            else
                    TQ = AVG (BT) // of all request in Ready Queue
                    Update SR & AR
                    // executes Process P by total queue time TQ
            end if
            If (P is terminated) then
                    Update SR & AR
                    Allocate resource to the next process
            else
                    Return P to the Ready Queue with its updated Burst Time
                    Set the resource to the next Process in the queue
                    Update SR & AR
            end if
    Next P
```

6. COMPARISON STUDY OF ROUND ROBIN ALGORITHM AND IMPROVED ROUND ROBIN ALGORITHM

If the time quantum is large, RR will behave just like the FCFS policy as the performance of RR[9] depends on the size of the time quantum. In general, we need the time quantum to be hefty with respect to context-switch time.

In IRR, when the process P is waiting for other resource it is send back in the queue and other processes in the queue are continued. The process P continues from where it has stopped when it came out of the queue as it has completed its half of the work. This saves the waiting time of the other processes as well as it helps the allocation of resources efficiently when one process does not hold on to the resource till it finishes. It reduces the turnaround and waiting time and the quantum is considered as dynamic.

7. CONCLUSION

In this paper, we have discussed Improved Round Robin algorithm for obtaining an optimal scheduling model. The essential requirement of a market oriented energy efficient resource management is to reduce the energy consumption in the datacenters and to reduce the imbalance level of the datacenter to make all the resources equally loaded. The algorithm does impact the systems efficiency. However, scheduling algorithms should not affect the behaviour of the system.

8. REFERENCES

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