A Comparative Review on Energy Aware Job Scheduling Methods in Cloud Computing

[1]Gurpreet Singh Sandhu, [2]Dr. Sawtantar Singh Khurmi, [3]Dr. I.S.Hudiara
[1]PhD Scholar, Dept. of CSE, Desh Bhagat University, Punjab, India
[2]Professor, Dept. of Computer Sciences, Desh Bhagat University, Mandi Gobindgarh, Punjab, India
[3]Director Research, Chitkara University, Punjab, India

Abstract
The cloud platform is the upcoming platform of development and database storage. As the world is working on the conservation of energy, it is also necessary that the platform we are choosing to save our data should be energy efficient. So, this paper will present various job scheduling methods in cloud computing as well three cloud storage services like MICROSOFT, GO DADDY and RACKSPACE. In the end comparison between various parameters, i.e. Jobs Completed, System Crash, Performance Ratio, Processing Time, Energy Consumed, Job Grouping has been presented.

Keywords
Cloud Computing, Energy Efficiency, Microsoft, Job Scheduling, Go Daddy, Rackspace.

I. Introduction

Cloud Computing is the evolving paradigm with changing their definitions, but in this research project, it is defined in the term of a virtual infrastructure which provide the shared information and services of communication technology, via the internet "Cloud" for access of "external multiple users" through use of the Internet or the "large-scale private networks". Cloud Computing is providing a computer user access to the Information Technology services, i.e., data servers, storage, applications, without requiring understanding of a technology or even the ownership of infrastructure.
Recently, the emerging cloud computing has offers new computing models where resources such as online applications, computing power, storage and network infrastructure can be shared as services through the internet [1]. The popular utility computing model adopted by most cloud computing providers (e.g., Amazon EC2, Rackspace) is inspiring features for customers whose demand on virtual resources vary with time. Energy consumption is the key concern in the content distribution system and most distributed systems. These demands and accumulation of network computing resources from one or multiple providers on datacenters extended throughout the world. This consumption is a censorious design parameter in the modern datacenter and cloud computing systems. The power and energy consumed by the computer equipment and the connected cooling system is a major constituent of these energy costs and high carbon emission.

The energy consumption of date centers worldwide is estimated at 26GW corresponding to about 1.4% of worldwide electrical energy consumption with a growth rate of 12% per year [2]. The Barcelona medium-size Supercomputing Center (a datacenter) pays an annual bill of about £1 million only for its energy consumption of 1.2 MV [3], which is equivalent to the power of 1, 200 houses.

However, minimizing this energy consumption can result to conceal cost reduction. Moreover, apart the enormous energy cost, heat released increases with higher power consumption that increases the probability of hardware system failures [4].

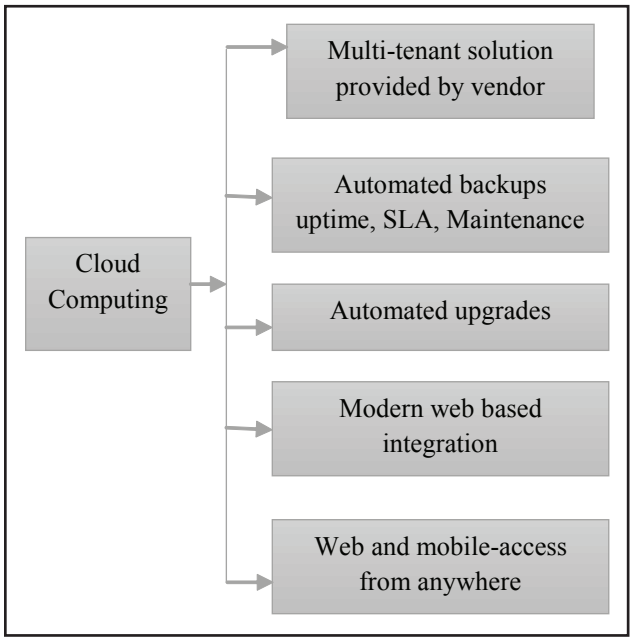

Fig. 1: Cloud Computing Applications

Therefore, minimizing the energy consumption has a momentous outcome on the total productivity, reliability and availability of the system. Therefore, minimizing this energy consumption does not only reduce the huge cost and improves system reliability, but also helps in protecting our natural environment [5].
So, this paper makes a comparative study of scheduling policies and application experiences to reduce energy consumption in cloud computing [6].

A. Energy Consumption in cloud computing

Following equations will represent the energy dissipation from clouds. There are mainly two types of energy dynamic E_Dynamic and static energy E_{static} consumption [7].

$E = E_{Dynamic} + E_{static}$

Dynamic energy consumption can also be computed as:

$E_{Dynamic} = A.C.v^2.f$

Where:
A= active gates
C= capacitance load
v^2= supply voltage
F= frequency
Then it can be written as:

$E_{Dynamic} = \sum E_{Dynamic}.\Delta t$

Where:
$E_{Dynamic}$=*dynamic energy*
Δ t = dynamic time
As;
$E_{Dynamic} \Rightarrow E_{static}$
Thus whole energy consumption computed as:
$E = E_{Dynamic}$

B. Job Scheduling in Cloud Computing

Due to the developing applications, parallel figuring has turned into the best system to meet the prerequisites these applications [8-9]. As a parallel processing has no doubt understood points of interest also it has an expansive number of weaknesses like:

1. Designing of parallel programs
2. Partitioning of the large tasks into small tasks
3. Coordination among communication
4. Synchronization in communication
5. Scheduling of tasks

C. Cloud Storage Services

Users store their data in the cloud in the cloud storage system. The exactness and the accessibility of the data files usually stored on the cloud servers that must be definited. Because of the server compromises and the Byzantine failures, it has become the vital issue to detect the unwanted data modifications. When the inconsistency are detected, to find whether the error lies in the server ,is the first step to recover the storage errors/ identification of the threats come under the external attacks [8].

Window Azure is an internet scale cloud platform which is used for storing the data in the clouds. This platform serves as the development, service hosting and service management environment [9]. Window Azure platform executes on a machine in Microsoft data centers and enables its own windows copy. Third party tools and languages like Eclipse, Ruby, PHP and Python are welcomed by Window Azure. Window Azure helps to store the data of any amount or of any time length.

Go Data is a foremost domain registrar as well as hosting supplier having another viewpoint about clouds. The Virtual Private servers (VPS) are also offered by the Go Daddy that is targeted at the user who needs to run the applications on the server. Go daddy also supports online web user data transfer and third party website support for the end users [10].

Rackspace Cloud is the brand name for Rackspace Hosting Inc.'s cloud storage services. Rackspace Cloud includes Cloud.

II. Scope of Comparative Study

We have divided this section into six separate categories: - Jobs Completed, System Crash, Performance Ratio, Processing Time, Energy Consumed, Job Grouping. Below these parameters have been discussed to check the comparison between them [11-12].

A. Jobs Completed

No. of jobs completed are the jobs {J1, J2….Jn} that are assigned to various processors {P1, P2….Pn}.

B. System Crash

System crash is defined as the no. of jobs that remains unexecuted during processing at processors {P1, P2…Pn}.

C. Performance Ratio

Performance Ratio is defined as the total no. of jobs completed to the total number of jobs assigned to processors.

$$PR = \frac{T_J}{J1P1, J2P2, \ldots\ldots\ldots\ldots JnPn}$$

D. Time

Time is the total time taken by one processor {P1, P2,P3…….. Pn} to execute a job (J1, J2, J3……Jn}

E. Energy

Energy consumption has become one of the greatest challenges in the field of high performance computing and it defines as the total energy consumed in running of parallel tasks. Energy consumption does not only reduce the huge cost and improves system reliability, but also helps in protecting our natural environment. Thus, reducing the energy consumption of cloud computing system and data center is a challenge.

F. Job Grouping

Job grouping is defined as the no. of jobs that are assigned to single processor ($\sum$ Pn).

III. Comparative Review

Author	Paper Title	Advantages	Parameter
Cvadar et.al [12]	A Survey of Research on Greening Data Centers	Overview the green metrics that are applicable to data centers	Nil
A.Jain [13]	Energy Efficient Computing-Green Cloud Computing	Balance the system by getting the same computing speed at decreased energy consumption	Energy = good accuracy
Truong et.al [14]	Performance Evaluation of a Green Scheduling Algorithm for Energy Savings in Cloud Computing	Reducing the energy consumption in cloud.	Energy consumption = less
Fumiko et.al [15]	Total Energy Management system for Cloud Computing	Results shows that it will save 30% of energy	Energy saving = 30%
C.Belady [16]	How to Minimize Data Centre Utility Bills	Gave a cloud computing metrics to make the cloud green in terms of energy efficiency	Nil

IV. Conclusion and Future Scope

Recently need of energy consuming reduction in cloud computing has been enhanced due to the utilization of large scale devices. In this paper various main techniques have been presented like job scheduling and other methods. In addition to this various performance parameters has also been presented to show the energy consumption in cloud computing. The future scope of the work lies in the utilization of the job scheduling (First Come First Serve, Priority Scheduling) for energy minimization.

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Er. Gurpreet Singh Sandhu obtained his Bachelor's degree in Computer Science and Engineering from Punjab Technical University, Jallandhar in 2006 andreceived the Master's Degree in Computer Science and Engineering from Punjab Technical University, Jallandhar in 2012. He is currently pursuing Ph.D., in Computer Science and Engineering, at DeshBhagat University, MandiGobindgarh, Punjab, India. His research interests include Cloud Computing, Web Technologies and Digital Image Processing. At Present, he is working as Assistant Professor in Computer Science & Engineering Department at Rayat Institute of Engineering and Information Technology.