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Optimization for Co2 Emission on Datacenter in Cloud Environment

Vasanthakumari S, Swornalakshme D, Yuvarani C, Keerthana Priyadharshini G

Department of Computer Science and Engineering,

Knowledge Institute of Technology, India

Abstract— In today's Information and Communication Technology (ICT), Cloud Computing is one of the emerging technologies for delivering various services over the internet. When the usage of cloud services are more, then there exists increased number of Data Center. Increasing Data Centers [DCs], stimulates energy cost making performance very expensive. The Data Center needs high energy ingestion for data storage and network traffic. So it emits massive amount of CO2. Thus, the reduction of CO2 emission is a key study topic in Green Computin[3]g. Our main contribution of this paper is to reduce CO2 emission by using energy consumption algorithm[2].

Keywords— Cloud Computing, EIGRP, Data Center, Energy consumption.

I. INTRODUCTION

The Cloud Computing [CC] is the computing device which is based on utility computing or on-demand computing service. The Data Center is the centralized repository storage device which is used for data storage and transmission. It may be either virtual or physical device. The public Data Center maintains the whole world information. The private Data Center maintains only the information within the organization. When the usage of various cloud services like private, public and hybrid cloud is getting increased, the emission of CO2 in Data Center is also increased. The Data Center is the key factor for the emission of huge CO2 which causes bottleneck or menace to the Environment Example: Facebook Data Center emission of 29800 metric tons of CO2 in 2012. Recently many organizations are focusing on reducing the CO2 emission at the Data Center. There is no strong output produced to reduce the CO2 emissions with regards to overall energy consumptions. Some recent green computing have given vital improvement in energy consumption, which were proved in test bed using solar and wind energy. By using more renewable energy in the Data Center, we can condense 97% carbon emission. If the energy absorption increases continuously it will cause more environmental complications. In this paper, the Data Center can be placed near to the renewable energy plants. So the DC can be powered by using renewable energy or non-renewable energy based on the availability. Green computing is one of the most emerging technologies which mainly focused on reducing CO2 and achieves better data processing. Cloud Computing provides huge number of resources for end user based on their claim. So the cloud service requires high speed data processing with small amount of energy. The main role of our paper is to intend new routing strategies for reducing CO2.

II. LITERATURE SURVEY

A. Cloud Computing

Cloud Computing means huge number of computers connected through internet. At the same time many number of computers able to run the application. Cloud Computing services are SaaS (Software as a Service), PaaS (Platform as a Service), IaaS (Infrastructure as a Service). Cloud Computing users uses these services from cloud on the basis of utility computing which is called as Metered Services[4].

B. Types Of Cloud Computing

1) Public Cloud: In a public cloud the services are delivered over the internet. Services like storage and applications are offered on a pay per usage (i.e.) utility computing.

2) Private Cloud: This cloud is for single client. This cloud is maintained by third party providers. As it is for same scale, security is good, but bit expensive for maintenance.

3) Hybrid: It is an ideal way of utilizing Cloud Computing. Some applications are hosted on private cloud and some applications are hosted on public cloud. It is the combination of both public and private cloud. Hybrid Cloud is well suited for small and medium scale business.

4) Transport Energy Model: In Cloud Computing environment, the data is transferred between cloud users to Data Center. The energy consumption for switching and transmitting data is very high and emits large amount of CO2.

III. PROPOSED SYSTEM

In this paper we propose an algorithm for management CC service request based on current availability of renewable energy and also subsequently condense CO2 emission[5]. Our energy consumption algorithm is effective for data broadcast and handling the CC service request inside DCs[6].

A. Nonrenewable Energy

Fossil fuel is called Nonrenewable energy. This is used to power the DCs but it emits huge amount of CO2 which causes environmental problems.[1]

B. Renewable Energy

Solar and wind energy are called renewable energy. These two are natural resources and does not cause any pollution to the environment. This is used to produce power for DCs.

1) *Solar Energy:* We can get solar energy directly from Sun. It is used to power the DC. The solar energy productivity is non-zero from 6:00 to 22:00 and the extreme power acquires at 12:00.The amount of power generated is based on weather condition. In summer season the maximum power is obtained and it can be effectively utilized in Data Centers.

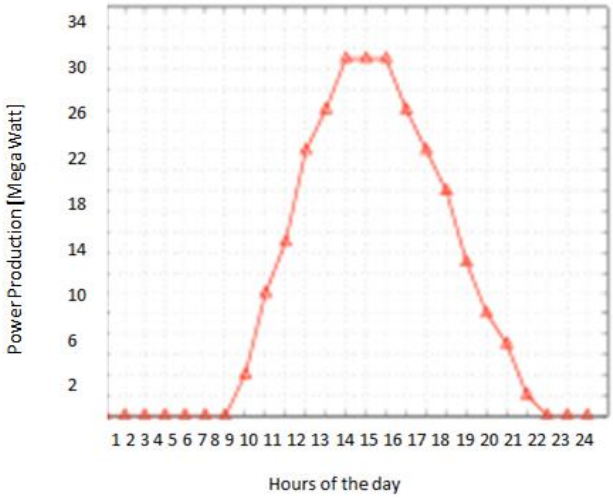

Fig. 1 Solar energy supply

2) *Wind Energy:* The wind energy can be generated by using wind turbines. The DC can be powered by using wind energy. Wind energy is difficult to predict and it has lesser availability compare to solar.it can differ based on weather condition and geographical position.

IV. RENEWABLE ENERGY ALGORITHM

EIGRP (Enhanced Interior Gateway Routing Protocol) is a network protocol that let the routers to exchange information more efficiently. EIGRP which uses diffusing update algorithm (DUAL) to find the optimal path and uses the energy efficiently. Diffusing update algorithm is used to determine the most efficient route which has shortest path to the destination and loop free. In this EIGRP algorithm, each node keeps a copy of its neighbor routing table Based on the renewable energy availability our algorithm chooses the shortest path.

For example consider user request r1 with time t seconds. In this example Dc1 is powered by sun energy, Dc2 is powered by wind energy and Dc3 is powered by fossil fuels. Our algorithms first analyze the renewable energy availability in each Dcs. Here Dc2 has the sufficient energy to process the request r1 [i.e. 100 Mega Watt].We have used to find the shortest path by using EIGRP routing protocol based on the hop count value where the hop count default value is 1and the possible routes are (1-2-3-Dc2) and (1-2-5-3-Dc2). So it chooses the first path to route the Cloud Computing request.This path make use of energy efficiently.

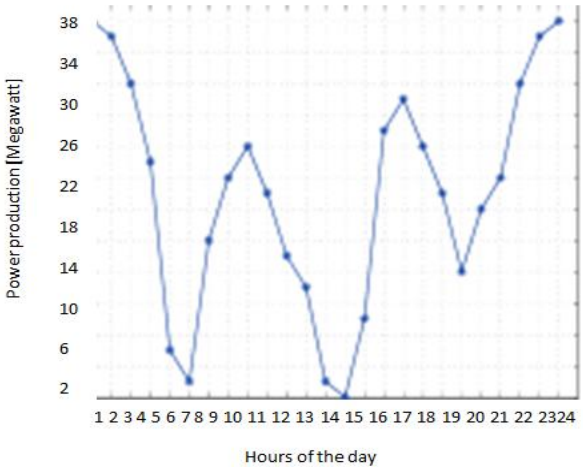

Fig .2 Wind energy supply

A. Algorithm

INPUT: Data Centers in different locations.
OUTPUT: To find the destination by using shortest path and make use of renewable energy.
The DCs process the user request.

1. Construct an auxiliary graph G= (V, E), c=(s, BW, Td), Pt.
2. For each transport link, assign hop count as 1. With transport power as TP.
3. Verifying the availability of energy in each DC.
   a. If the renewable energy satisfies the requirement, the connection will be established between source and sink.
   b. If renewable energy is not available, then the non-renewable energies are used.
4. If there is any change in routing, it notifies only the change only in the particular node not the entire table.
5. If there is no path exist, terminate the connection and exit.

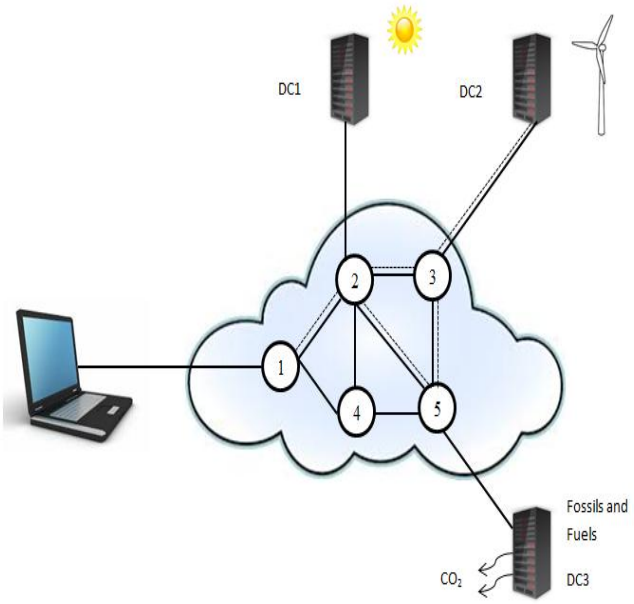

Fig .3 Example for Energy Distribution

V. CONCLUSION

In this paper, we proposed an energy consumption algorithm by using renewable energy which decreases CO2 emission and it also solves economic problems. In future, the energy efficiency or CO2 emission, can be reduced by using effective utilization of virtualization or some advanced green algorithm.

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