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GREEN CLOUD COMPUTING: SUSTAINABLE TECHNOLOGIES

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Abstract: Cloud computing is a technology that is especially well known for its extraordinary characteristics such as elasticity and remote accessibility. This paper describes how cloud computing can naturally do harm by emitting harmful gases, such as carbon dioxide, which are harmful to the environment. If resources used in cloud computing also contribute to the wastage of energy. Many processors and resources run their entire life and generate a lot of heat. Therefore, here we will explain how cloud computing green computing overcomes these problems and saves nature through environmentally friendly cloud computing methods. And at last, will discuss a few points on how green computing can be applied efficiently

Index Terms **- Green Computing, Cloud Computing Carbon Dioxide, eco-friendly.**

I. INTRODUCTION

Green computing is the efficient use of computers and related technologies by humans in an environmentally friendly way that minimizes the impact of carbon emissions on the environment. With thousands of data centers in the cloud, you can meet your customers' needs online on time. This is a way to do cloud computing with the consideration that it will not harm the environment. Processors used for cloud computing and all other resources must be properly maintained without interruption of service. This produces a large amount of carbon dioxide. Continued use of the system produces heat that needs to be cooled. This process also ultimately produces CO2. The entire process of providing service and maintenance together causes a lot of pollution in the form of carbon dioxide, which is harmful to the environment. solution. The computing power is needed for fans, hard drives, consoles, servers, and more. Meeting the day-to-day needs of customers is very high, and all these resources consume large amounts of power. Electricity consumption is increasing day by day and year by year. As the population grows and its facilities and needs grow, large amounts of carbon emissions occur. Alphabet (Google) emitted more than 10 million tons of carbon dioxide in 2020. This is an increase from over 12 million tons in the previous year [1].To support green computing every technical company should follow and practice this idea of green cloud computing. Figure 1 shows CO2 dissipation and electricity consumption in a google search given below. The company should follow and practice this idea of green cloud computing.

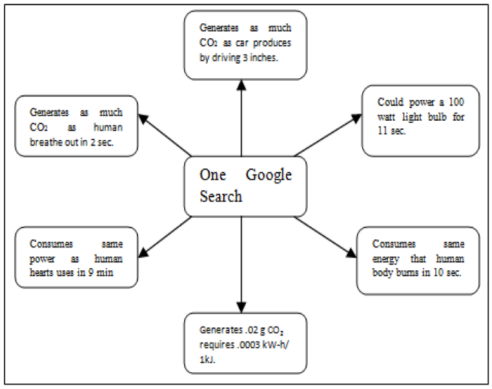

Fig.1. Energy consumption in one Google search[2]

II. LITERATURE REVIEW

In the ’90s when computers were big and power-intensive, we can not imagine how much power they consumed at that time, this is because they never sleep even if they were left idle for a long term. In short, there was no energy management, sleep, or hibernation mode which allows power saving in computing devices.

Considering the above problems, the US Environmental Protection Agency came up with an innovative labeling program in the year 1992 called Energy Star

This Energy Star program laid the basic foundation of green computing by promoting energy-efficient monitors, temperature control devices, television, and other related technologies

Computers and other electronics started adopting sleep mode where equipment can be put on the standby mode in absence of any user activity

This resulted in huge energy savings and a considerable reduction in potential CO2 emissions.

III. WHY NEED FOR GREEN COMPUTING

Nowadays, everyone is using computing devices in one or another form and the Usage of computers and computer equipment generates a lot of heat and consumes an enormous amount of power which ultimately contributes to greenhouse resulting in global warming And inefficient disposal of absolute IT equipment causes huge e-waste generation which is harmful to the environment

We cannot deny the fact that information technology has drastically improved our work and life but it is contributing to certain environmental problems that nobody realizes

As per the Associated Chambers of Commerce and Industry of India and KPMG India is now officially the world’s third-biggest e-waste generator producing over 3.23 million metric tonnes of e-waste per year(Computer equipment accounts for 70% of the waste), behind the US and China(India was rank 5th in 2016)

IV. GREEN CLOUD COMPUTING METHODS

The performance of normal cloud computing is very high, so here we will discuss different ways to reduce power consumption.

• You can reduce power consumption and CPU speed by using a powered device at home.[5]

• Minimize screen brightness to the minimum required level.

• Putting the hard disk in sleep mode can reduce power consumption.

• Data centres use diesel for energy backup purposes, and the use of diesel is a variety of harmful gases, including carbon dioxide. It pollutes the environment by producing heat. use a green generator as a backup for solar and wind power generation this reduces pollution

• Data centres use refrigerators for cooling which consumes huge energy and also generates heat. So to overcome this. You need to use the free cooling method, which basically depends on the external weather conditions. This process does not generate heat like mechanical cooling methods. Therefore, the free-cooling method is another way to practice green computing in cloud computing [4].

• You can save a lot of power by using an energy-efficient processor. The clock rate changes in the process. You can minimize and maximize the frequency according to your software and hardware needs. This saves a lot of energy as unused energy is not wasted

V. CORPORATE GREEN CLOUD COMPUTING PROGRAMS

• Dell has promoted the safe disposal of its products by coming up with an effective and efficient recycling program.

• Google has constructed energy-efficient data centers by using renewable energy

• India IT giant Wipro has already launched its eco-friendly series of computer systems called greenware

• Lenovo has also set up a new set of services called Lenovo Asset Recovery Services (ARS) for business customers in India to manage IT equipment at the end of life by offering equipment take-back, data destruction, refurbishment, and recycling services.

VI. CONCLUSION

The benefits offered by cloud computing technology are many. It not only provides convenience, adaptability, versatility, and cost-effectiveness but is also emerging as a way to innovate processes and operations that do not contribute to evolving environmental problems around the world. Many consider technological advances to be a major contributor to environmental degradation. However, technologies such as cloud computing can be a stimulus to address and support natural concerns. Reliance on green cloud computing can drive businesses to achieve positive key objectives, increase workforce efficiency, develop business cycles and improve the climate. The Green Cloud Computing Architecture plans to reduce power consumption in the data center. The main advantage of the green computing architecture is that it guarantees real-time data execution while reducing the energy consumption of the IDC (Internet Data Center). This idea is trusted to save money and keep the earth green. Green cloud computing is the now a very important aspect that corporates have to consider

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