Wireless Sensor Networks in Green Cloud Computing

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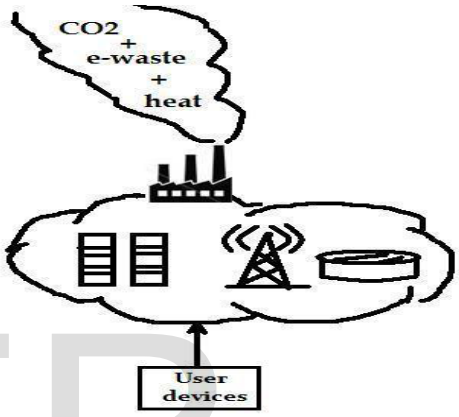
Abstract - *Cloud computing is currently a very blooming archetype in the information technology sector. This leads to a great increase in the number of cloud based data centers. This in turn is causing high energy consumption and emission of CO_2 which greatly affects the environment. Green Computing is a method to reduce these adverse effects on the environment. In this paper, a system has been proposed to implement green computing by combining a wireless sensor network to cloud computing.*

Keywords: WSN - Wireless Sensor Network; Gateway; Cloud computing.

I. INTRODUCTION

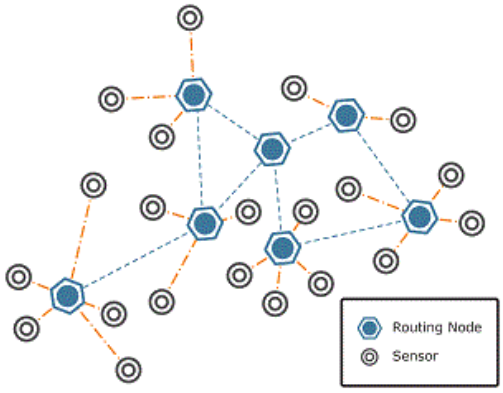
Cloud computing is a technology which reduces the need for storing data redundantly in large number of physical servers and increases ease in sharing of data. But such advantages do not come free of cost. It also has its cons. Energy consumption and environmental impacts are issues of great concern today. In addition to high energy consumption there is an additional impact on the environment in the form of carbon-di-oxide emissions. Various reports convey that the large amount of electricity consumption by these cloud data centers contribute to about 2% of the global CO_2 emissions.



CO_2 emission in Cloud Computing

II. WIRELESS SENSOR NETWORKS

It is a type of wireless networking which comprises of numerous sensors and they are interlinked or connected with each other for performing the same function collectively or cooperatively. Their main advantage is that they save physical space which is very much in demand for wired components and networks.



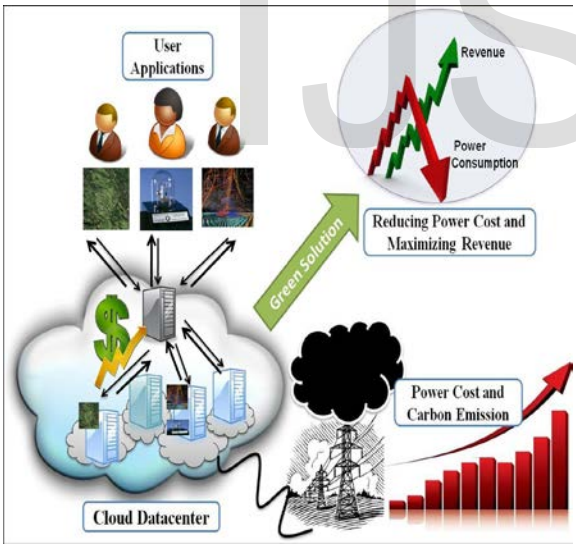
Wireless Sensor Network

III. GREEN COMPUTING

Green computing is the term given for describing the process of making use of all computational advantages and at the same time using it in such a way so as to minimize its adverse effects, especially on the environment. Most of the IT sectors have stopped turning a blind eye to these issues and have started addressing them after realizing the effect it has on public relation and cost reduction.

IV. ISSUES

Our data is held by digital clouds which may seem invisible but at the same time consume large amount of electricity. We also pay the price as high carbon footprints and climatic impacts. The components of this cloud that demand such high amounts of electric power are the thousands and thousands of servers. This electric power which is required by these servers for storing and transferring data is mostly produces from fossil fuel resources such as natural gas and coal, resulting in large amounts of carbon emission which is feared to become unsustainable soon. To address this issue the following system is proposed.

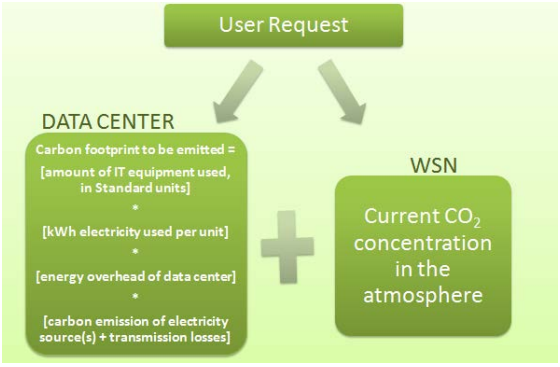


Effects of cloud computing

V. PROPOSED SYSTEM

The basic idea of this system is to bring together the perks of the two technologies - wireless sensor networks and cloud computing - hand in hand, to achieve green cloud computing. This technology is beneficial as it:

- Reduces energy consumption of computing resources during peak operation.
- Reduces harmful effects of computing resources.

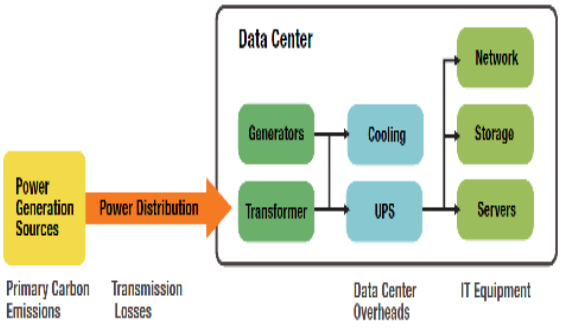


Flowchart representation of working of proposed system

VI. WORKING OF PROPOSED SYSTEM

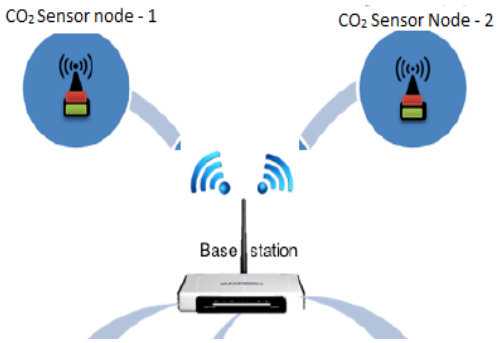
In this system, a wireless sensor network that consists of CO2 sensors is connected to the datacenters of various cloud computing networks through gateways.

Once the user places a request, it is forwarded to the datacenter where the energy required to fulfill the request and the corresponding carbon footprint is calculated as follows:



Carbon footprint to be emitted =

[amount of IT equipment used, in Standard units]
*****
[kWh electricity used per unit]
*****
[energy overhead of data center]
*****
[carbon emission of electricity source(s) + transmission losses]

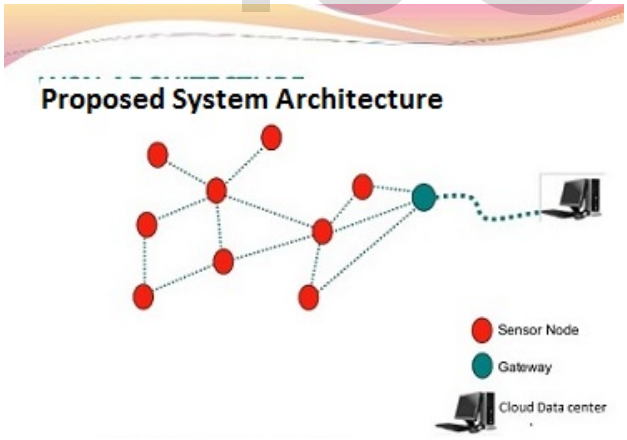


WSN architecture in proposed system

In this system, the WSN consists of CO_2 sensors which are designed to collect, process, and transmit the CO_2 gas concentration levels to the cloud data sensors through gateways.

The sum of the carbon footprint present in the atmosphere that is obtained from the WSN and the amount that will be emitted if the placed request is met immediately which is calculated using the formula, is found. If this sum is within the sustainable limits the request is served immediately.

If not, the user is provided an option as to place the request later. If the user chooses to be served immediately he has to mark the request as immediate or emergency.



One of the ways to make users responsible towards the environment is by imposing Carbon Tax. This is a way in which the carbon emitted by the requests of each user is measured using the proposed system and tax is collected from users based on it.

VII. CONCLUSION

In this paper, a comprehensive analysis of cloud computing, its adverse effects on the environment and how it can be reduced by monitoring using WSN, has been proposed. By using this technique we can reduce the emission of carbon-di-oxide to a sustainable extent.

Whatever be the technique used, we have to make some arrangements to reduce the power consumption in cloud data centers and also the emission of CO_2 should be reduced, so that the environment can be saved.

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