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Energy Saving and Cloud Computing Challenges for Green Computing

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ABSTRACT

Green computing is the study of ecological sound and competent computing. This concept helps us understand the use of computers and its associated resources.

Achieving the goal of ozone-friendly computing in the software industry required considerable efforts. Green computing emphasizes on the challenges, current trends and the future trends. The main concerns of green computing are minimizing the use of hazardous materials, maximizing recyclability or biodegradability, and maximizing energy saving. Devices that help us to achieve the goal of green computing such as energy can be used efficiently Non-toxic materials that are used in the preparation of these devices. The use of electronic devices and computers is increasing on day-by-day basis, so it directly affects the consumption of electricity and also affects the emission of CO2 in the environment.

The initiative we can take towards the green computing is to reduce the usage of non-hazardous material in making of equipment's, recycling of equipment's, power management, paper usage, reduction, cloud-computing, virtualization.

KEYWORDS:- Cloud Computing, Virtualization, Green IT metrics, Carbon Footprints

I. INTRODUCTION

In today times, digital transformation happens at rapid pace. This only happens as computing resources modernize the data usage with fascinating sectors like online education, healthcare, defense, business, analytics, etc.

Although, the use of computers were increasing in an unrestricted manner in modern era of IT revolution. If we think this kind of unrestricted practice of computers were non-polluting and consume very little energy, then we are totally wrong. As the usage of various computing appliances plays an essential role in environment pollution.

Considering above exceptions of computers, we could say this kind of computing is just like cancerous for future computing. It is also witnessed that per year expenses that incur in powering computer is not totally used (i.e. computing resources powered for 24x7 and utilized around 15 % of time). It means computer sits idle most of times.

This factor possibly equates to tons of carbon emission i.e. carbon footprints causes greenhouse effect. As computers comes under digital resource which have ubiquitous presence worldwide.

From manufacturing of electronic to desktop computing several challenges that an environment suffers are as follows:

- Consumption of massive amount of power.
- No control on capital Expenditure in powering systems.
- Pollution, heat, Noise seen as environmental problem in desk – computing.
- As variety of toxic material used in manufacturing computer causes health problem.
- Computers were emitter of Carbon monoxide and dioxides leads to global warming.

Therefore, in order to control and overcome today computing obstacles we have to adopt from world of Desk- Computing to green computing and cloud as well to get rid of from all the constraints of Traditional computing.

Green computing in addition to cloud computing could be a great deal to overcome present scenario of computing overheads by reducing CapEx, OpEx, Computer idleness, wastage of power supply at large extent.

With invoking cloud practices together w.r.t green computing revolutionize health & safety, pay as go computing, digital readiness and reduce carbon footprint that led to downfall in global warming finally as biggest advantage.

II. RELATED WORKS

This section basically describes all important research techniques to overcome the environment effect to a leading step toward digital cleanliness.

The aim of work is to find techniques that were utilized in controlling E-waste and Green IT via minimization of carbon footprints with use of Virtualization and cloud computing.

Green computing and cloud computing both have fastly grown within the last few years. The implementation and utilization is very useful. The introduction of green grid and also invention some parameters. The constraints are defined which include power usage effectiveness [3] and thermal design architecture for power [2] and data center efficiency factors and metrics[4]. The most common is PUE factor which is standard of how to systematically a computer data center utilizes the power with the values 1.0 means 100% systematically usage of electricity at IT equipment.

1. Efficient power consumption from source to implement Green Computing -

Power saving techniques which are focusing on following tradeoffs like server and network for Virtualization and hybrid Green IT. Dynamic Voltage Frequency Scaling (DVFS), Dynamic power Management and sleep mode for the network as a scope for migration and CPU power workloads.

Solar Computers nowadays are revolutionizing IT sectors which use natural resources with less E-waste to build green computing.
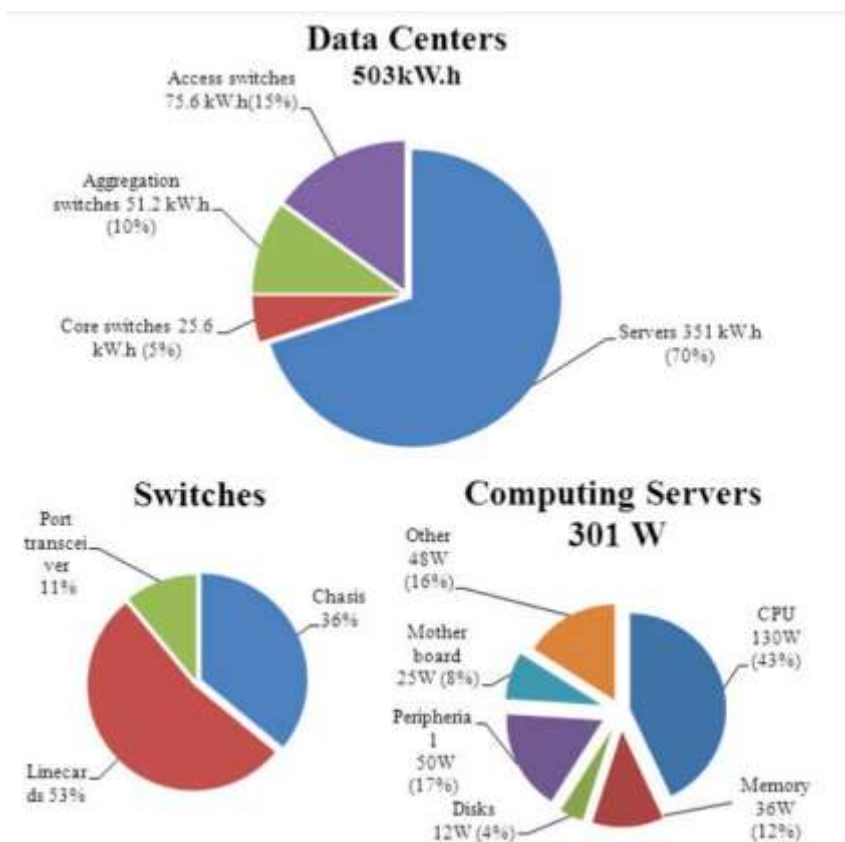

Fig1.Power Consumption in datacenters [5]

2. Minimizing risk of Traditional IT with Green IT-

The risk of using Traditional Computing was small scale integration, when a room sized computers were used having lots of energy get wasted so that as the computing era outgrown to VLSi and ULSi to reduce and minimize the risk of traditional IT in modern era where Green IT with Virtualization and Cloud computing are used. Finally, the road map strategies will be drawn beyond the traditional techniques, in order to take actions against IT negative environmental and financial influences.
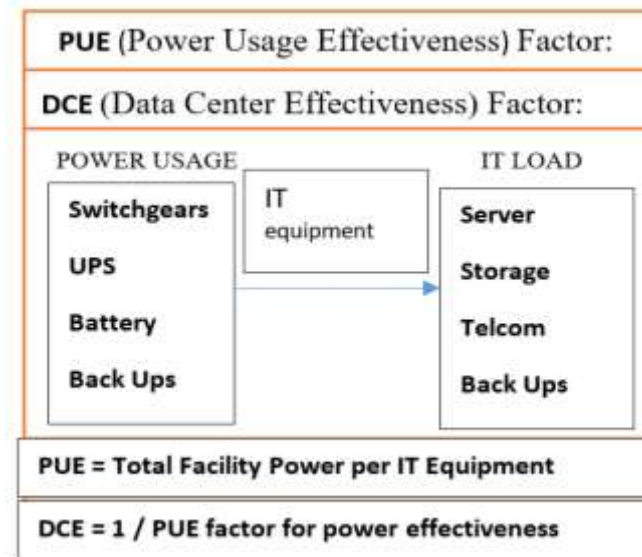
Fig 2. Total Facility Power & compute Effectiveness

### 3. Metrics to calculate efficacy of Green Computing-

These indicators are based on energy consumption measurements, such as indexes of computing resource usage, of environmental impact, and even of development costs required to (re)design an application in order to optimise its energy consumption.

Metric	Formula
PUE (energy usage of effectiveness)	PUE = Entire facility of power per entire equipment of power
CUE (carbon usage of effectiveness)	CUE = Entire CO_2 release from entire power usage for data center per Entire power consumed by equipment of IT.
ERF (energy reuse factor)	ERF = usage of reused power per entire power used equipment's of IT.
DACiEi (data center infrastructure efficiency)	DCiEi = Entire equipment's of energy per entire facility energy
DCP (Data center productivity)	DCP = Entire used work per entire resource usage for done work.
DCpP (Data centre power productivity)	DCpP = Entire used work done per entire power used to complete this work.

4. Cost effective computing with Green IT and Cloud –

The beauty of green IT, a collective term used to describe the myriad practices aimed at lowering the environmental impact of a company's IT infrastructure, is that it is one of the rare instances when you don't have to choose between the bottom line and doing right by the environment.

Virtualization software helped Steve Kolbe, CEO of Baltimore IT consulting firm Analysis, reduce his server count from 20 to four. "The cool thing is that not only are you reducing the amount of technology you're using and reducing power consumption, but you're actually increasing the reliability of the information system.
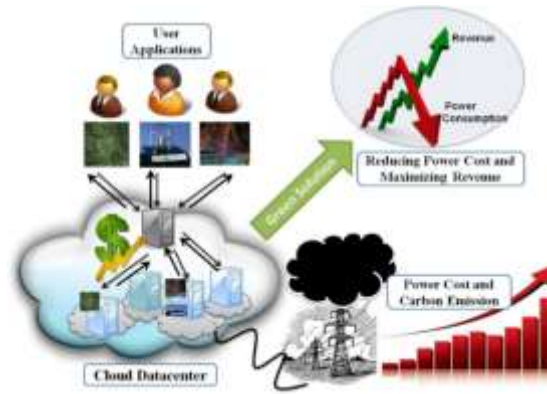
III. RESEARCH ISSUES

By summarizing above mentioned point from various research survey, we can consider following enhancements and contribution for green computing -

a. To Control all green metrics for energy rating and sustainable development of Green IT.

b. It is also about developing algorithms that have power-aware distributed systems in cloud computing environment.

c. To Come up with new dynamic, scalable, and fault tolerant power aware computing techniques.

d. To investigate and evaluate heuristics approaches for virtual machine migration.

e. To process energy as per thermodynamical rules to much greener way by moving IT from traditional era to Cloud Era.

IV. CONCLUSION

As Computers were available throughout the world and massive use of computers also require power supply at mass level that creates E-waste. A green Computing in this paper basically discuss all the shortcoming of traditional IT which to be harness using Green IT by using Cloud, Virtualization and its protocols to handle the efficacy of green computing. Here the purpose of using green IT is to optimize energy consumption by controlling parameters like ratio of compute and power i.e., flops/watt and so that from distributed computing to era of green computing. Also, power and E-waste management recent problem for business, firm, production for companies. As massive power with minimum effect in performance to process the green computing in overall computer usage.

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