

Trends and Challenges in Green Computing

A.Narang¹

¹ Computer Science Department, Amity School of Engineering and Technology, Amity University, Haryana, India
e-mail: Ashimanarang04@gmail.com

Abstract— The improvement in the present performance has always been in demand. But this leads to carbon dioxide emission in the environment which limits the performance improvement. So, the power/energy consumption needs to be optimized. Data centers play the key role in making the cloud powerful, and are in a great demand to increase in the coming days which in turn increases the consumption of energy by the data center. This paper puts the emphasis on the various trends being followed for the greener approach and also the challenges that we are facing to provide the green environment.

Keywords— Green Computing, Virtualization, data centre, eco labelling, power consumption

I. INTRODUCTION

Any industry, weather it is IT, manufacturing, business analysing company, they all use cloud computing and in turn understand that they have to be responsible about the fact that they provide eco-friendly environment in return. There are various steps to achieve green computing. The cycle works as, that the data centres contain a processor chip which produces heat and for cooling that heat, the coolers are installed which in turn again produces the heat [1]. This cycle requires to be converted to be environmentally friendly. The concept of dividing the physical server into the running virtual servers at the same time is termed as virtualization. Virtualization of the servers is one of the main concepts which help the electrical devices to contribute towards the energy efficiency.

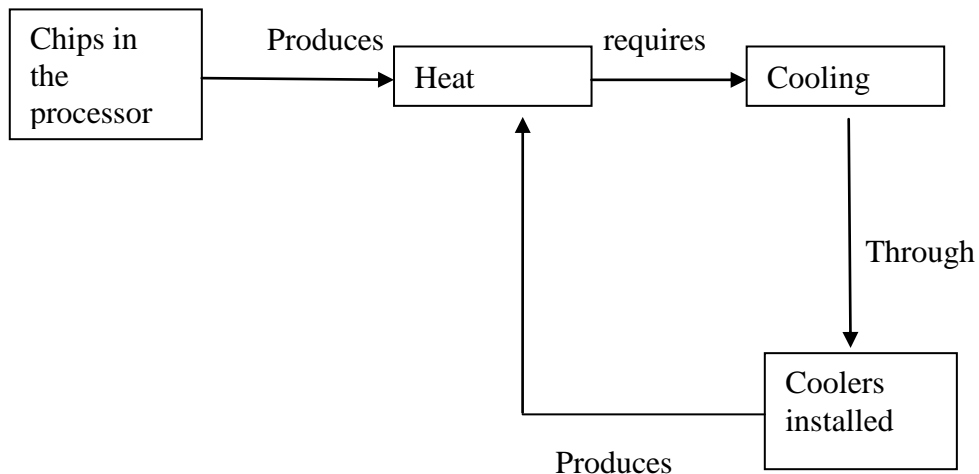


Fig.1. Continuous heat generation from DC's

The usage of resources efficiently is Green computing. Green computing has become important and vital requirement so that we can save the environment. Energy costs are the said to be most important reason for getting green IT according to IDC(International Data Corporation). For green computing, the goals are to reduce the hazardous materials and to increase the product's lifetime along with increased efficiency in the terms of energy.

II. TRENDS - GREEN COMPUTING

For the efficient use of resources, green computing is on its way. Energy is measured as the main resource then the carbon tracks are measured the major threads to environment [3]. So the emphasis is on reducing the power consumption and the emission of Carbon dioxide while computing. There are various trends that being worked upon by the researchers to achieve the preferable results such as:

A. Energy consumption

Organizations are recognizing in order that the source and amount of their energy devouring considerably provide to Greenhouse Gas (GhG) diffusion [3]. There are various organizations which believe in the equations as that the amount of compressed energy consumption is equivalent to the compressed greenhouse gas diffusion and also is equivalent to the compressed operational amounts.

B. Salvage for E-waste

Salvage is important for any kind of waste. Only 10% of the level of countries all over the world necessitate electronic companies to finance and manage salvaging plans for their products exceptionally under-developed countries [3]. Salvaging the e-waste can be easy to adapt and is amendable piece. Lead and mercury are the apparatus that allows interchanging which in turn saves the energy.

C. Data centers optimization

Data Centers are the most prominence area of green computing . The energy consumption and the salvages are being increased year after year. Affording to Doe's current report in July 2011 Data Centers are overwhelming 3% of all US electricity and this feasting will double by 2015 [4]. The following are required to persist the sinking of energy feasting:

- Information systems: The key to building the green data centers, capable and right set information systems are required. As per green computing best practices resourceful servers, storage devices, networking apparatus's and power supply miscellany play a key role in design of information systems [3].
- Cooling Systems – The cooling of the data centers is something which is necessarily required. So the cooling systems must be designed in such a way that it fulfills all the essentials for cooling even in future.
- Consistent environs on behalf of tackle are indispensable for Data Center Air Management and Cooling System.
- Think through preliminary and future loads, at the time of designing & selecting data center electrical system utensils.

D. Virtualization

Green computing and virtualization work hand in hand. Virtualization software and also the software for the management for virtualized environment are offered [8]. The best way to move on the green way and to save the space adequately or the resources or the environment can be by changing proficiency with virtualization. This particular method of Green Computing will help in Server amalgamation or in enhancing computer security [9]. Virtualization helps in running the smaller level systems to the higher level for use.

E. IT Products and eco-labeling

It is another method towards the Green computing to save the environment and to make it familiar to the world, the policies, that the companies have to design the products with the consent of eco-label [11]. There are many companies and organisations around the world which produce eco-label products in IT. There are organisations which arrange certificated for the IT products based on various factors such as reusability, noise energy, salvaging etc. [3]

III. CHALLENGES

Every field of computing is using energy which makes it the most valuable resource. There are various systems like super computers which consume a huge amount of energy and then further air conditions are required to cool them down. This is further affecting the non-renewable resources. Few of the steps are being taken towards the green computing and some challenges are being faced by the researchers on this way. These challenges can be given as below:

A. Green software

A good development is required in the field of developing the green software. Some major steps are required towards this approach for good characterization and take different metrics.

B. Green Maturity Model

To measure the greenness in terms of energy reduction, this model is used [12]. Green maturity model for virtualization [13] defines the levels which describe the degree of characterization of being green.

C. IT and Non-IT related

To achieve the green standards, there are many challenges involved. In addition to the policies, Green computing also means that the usage of the resources must be optimal in such a way that it is the mixture of knowledge of both the technologies.

- Determining the return on investment(ROI) from using green IT products
- Implementing the IT green strategy and adopting few in addition to it.
- Top management must be considerable for rolling out the strategy.
- The co-workers to be chosen wisely to get the efficient results
- Strategic Planning
- Lack of skills and equipment to move towards green.

D. Reducing architectural complexity

To maximize the efficiency of the system, the reduction of dependency of the number of tiers and the other components is done and still the research is going over this factor.

E. Wireless sensor Network for cooling of data centers

As the data centers are the most important part of any computer organisation and it has to be available all the time. But, cooling of these data centers is said to be an issue these days. Wireless sensors, play a vital role in the management of the power of data centers [15][16].

IV. CONCLUSION

The Green computing uses the concept of technologies like being eco-friendly and is developing itself as a technology. All the organizations are mostly supporting the concept of green computing and are developing the things more efficiently.

This study shows the measures and the trends that are being taken by the individuals or the companies towards greener approach and also the challenges and the hinders that we are still facing to get a Green IT. So, we get an idea that which all measures are still to be worked upon for the impactful change.

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