Chapter 62
Green Computing and Its Impact

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ABSTRACT

The mission "Saving Earth" has become need of all of us to sustain life on the earth. There are many holistic approaches for Green Computing which impact on stack holders of the computing system including hardware, software and people. There are many reasons to develop green computing like environmental friendly, saving powers, long term profit, reduce pollution, power management and increasing performance etc. Approach to develop green computing can be broadly divided into four parts: hardware device manufacturing, software techniques, people awareness and standard policies.

1. GREEN COMPUTING: THE NEW PARADIGM

The users of IT are growing exponentially per year, it has now become compulsory for IT stake holders to pay attention on the power consumption by IT resources and come up with innovative ideas and methods for reducing the energy consumption by using software approaches, hardware manufacturing and people's green practice and awareness. Latest researches have proved that even a single click of mouse on a web page hitting the server consumes energy and dissipate heat in the environment. Earth is already facing problem of global warming & green gas emission because of development of small, medium and large scale industries all over the world. (Kochhar & Garg, 2011)

After the conclusion of various research of energy consumption by IT resources, new paradigm called "Green Computing" coined. Green Computing can be defined as

Innovative approach to manufacture eco friendly hardware devices & components, innovative techniques for developing energy saving software(s) and set of practices to support the critical mission 'Saving Earth'.

Table 1. Percent of power consumption by data center device

Equipments Used in Cloud Data Center	Percentage Consumption
Cooling Device (Chiller, Computer Room Air Conditioning (CRAC))	42%
IT Equipment	30%
Electrical Equipments (UPS, Power Distribution Units (PDUs), lighting)	28%

In the article written by Murungesan (2008) defines the field of green computing as "the study and practice of designing, manufacturing using and disposing of computers, servers and associated subsystems such as monitors, printers, storage devices and networking and communication systems efficiently effectively with minimal or no impact on the environment..

In today's scenario data volumes are going to double after every 18 months, and every one want to keep their data online. For keeping huge data the hardware infrastructure need improvement in data center which is responsible for the heating and CO2 emission. Table 1 shows the percentage of consumption by various equipments of data centers. This has been explained in article by Srimathi et al. (2012).

Green Computing is the environmental saving computing paradigm under the research and development. The systematic approach of this subject is required so as to attract more researchers and scientists to contribute their ideas so that commercial productions of eco friendly hardware and software can be speed up.

Environment Regulations

Looking for high impact of green computing to save the life on the earth, government& corporate sectors also impose regulations and acts. European standards specially focused and imposed to control hazardous material used in manufacture. Such rules were explained by Riviore et al. (2007).

- **Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 in UK:** It imposes responsibility on equipment manufactures to take back the e-waste equipment free of cost.
- **ROHS (Restriction of Hazardous Substances):** It restricted on usage of six hazardous materials like lead, mercury, cadmium, hexavalent chromium, poly brominated biphenyls and polybrominated diphenyl ethers. It was adopted in February 2003 by the European Union.
- **EPEAT (Electronic Product Environmental Assessment Tool):** Tools created to check the efficiency of desktop monitors and notebook on 23 required and 34 optional environmental criteria. It is supervised by the Green Electronics Council, which itself a programme of the International Sustainability Development Foundation (ISDF).
- **Energy Star:** Energy performance is regulated by standard developed for external and internal power supplies, idle, sleep and stand by modes. It is a U.S. Environmental Protection Agency (EPA) voluntary program that assist to save money and environment through superior energy efficiency.

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