Chapter 5
Green Computing

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ABSTRACT

Green computing considers use of computers and related resources in an eco-friendly manner such as the implementation of energy efficiency in Servers, Peripherals etc. In recent years, companies in the computer industry realize that going green is in their best interest, both in terms of public relations and reduced costs. The principle behind energy efficient coding is to save power by getting software to make less use of the hardware, rather than continuing to run the same code on hardware that uses less power. This chapter first discuss features, challenges and impacts of green computing. Finally this chapter point out the standard and recommendation of green computing with suitable example.

INTRODUCTION

Computer Systems are ubiquitous and a part of the global infrastructure now, which results in large installations of computer systems to provide multiple services. With the advancement of computing applications and need of IT among people all over the world, the efficient technologies are being developed. Computers and other computing applications have certainly made a big impact globally. With technological progress, use of resource is increasing. Though it increases the efficiency, the rate of consumption of that resource is in a growing stage. This paradox is well supported in 2005 which predicts exponential growth in the power density and total power used in IT. This work is done in Armbrust et al. (2009).

Computer waste increases toxic materials such as heavy metals and flame-retardant plastics in environment. These flame-retardant plastics are easily leaked into ground water or bio-accumulates. Even manufacturing of chip uses some at the fatal gases and deadliest chemicals known to man.

Computers require power to run. They produce heat which requires cooling mechanisms. These significant consumers of electricity are becoming responsible for the production of relevant portion of overall CO_2 emission, as well as greenhouse gases (GHG). These harmful gases are easily injected to eco- system and break the ratio of gases in the ecosystem. A case study says that manufacturing of Com-

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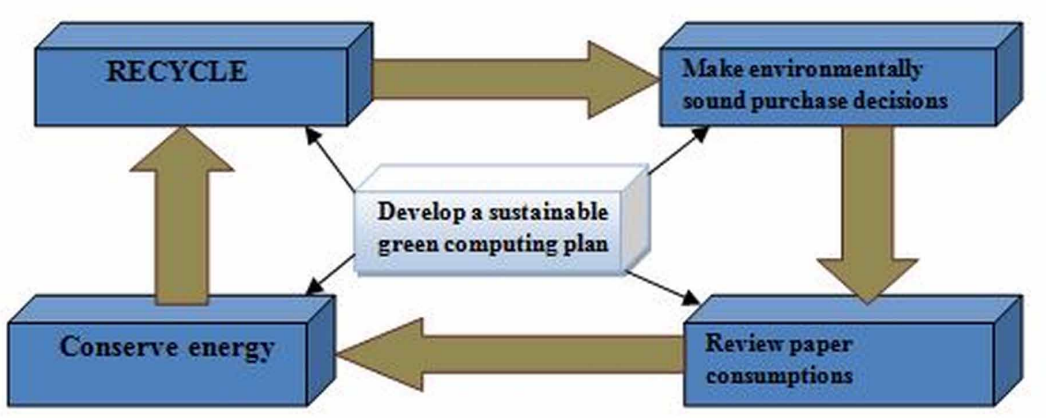
Figure 1. Green computing plan



puter consumes 1818 KW/h of electricity before getting turned on. Not only that, while running a typical computer 120 Watts of electricity is needed. This is a real problem. Recently an organization has started developing different initiatives for reducing the power consumption of both computing and networking devices for Economic Co-Operation and Development. The research and academic world initiated a new research area, which has been named as *Green Computing* (Baliga et al, 2011) and (Ahamad et al., 2012).

Radical availability of high-speed Internet and corporate IP connections is enabling the delivery of new network-based services. Internet service has been expanded recently to include Network-based storage and network-based computing whereas Internet-based mailing service has made the communication so fast. These new services are being offered both to corporate and individual end users. These types of services have been generically called *Cloud Computing* services. The Cloud Computing service model involves the provision, by a service provider of large pools of High Performance Computing (HPC) resources and high-capacity storage devices that are shared among end users as required. There are many Cloud service models. But generally, the end users who are subscribed to the service, have their data hosted by the service, and have computing resources allocated on demand from the pool. The service provider's offering may also extend to the software applications required by the end user. To be successful, the Cloud service model also requires a high-speed network to provide connection between the end user and the service provider's infrastructure.

Work done in article written by Sotomayor et al. (2009) shown energy usage in a Cloud Computing model has received a little attention. Through the use of large shared servers and storage units, Cloud Computing can offer energy savings in the provision of computing and storage services, particularly if the end user migrates toward the use of a computer or a terminal of lower capability and lower energy consumption. At the same time, Cloud Computing leads to increase in network traffic and the associated network energy consumption.

Power Consumption: A Big Issue

The issue of energy consumption in information technology equipment has been receiving increasing attention in recent years and there is growing recognition of the need to manage energy consumption across the entire information and communication technology (ICT) sector. It is estimated that data centres

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