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Power Aware Computing

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ABSTRACT

With the proliferation of portable computing devices, power consumption has become a major concern. Power consumption has posed a serious challenge to the high-performance computing systems. Power aware computing is to minimize energy requirements for computation. The main objective of power aware computing is to conserve energy for routing messages from source to destination. This paper provides a brief introduction to power aware computing.

KEYWORDS: *power aware computing, energy aware computing, temperature aware computing, low power computing*

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INTRODUCTION

Energy and powered devices are an integral part of our modern society. Power consumption is important for both mobile devices and tethered devices (connected to a power supply when in use). It is a critical parameter of contemporary integrated circuits, expecting them to consume as little power as possible.

With the proliferation of portable computing devices, power consumption has become a major concern in many research projects and commercial systems. To improve the system's power efficiency, various policies have been suggested that aim at minimizing electricity consumption and cooling by powering parts of the system during periods of low load. One current research initiative, which drew much attention to this area, is the Power Aware Computing and Communications (PAC/C) program sponsored by DARPA. The main goal of PAC/C is to improve power consumption using the awareness of power consumption of individual devices that make up the system.

CONCEPT OF POWER AWARE COMPUTING

Energy is the ability to do work, while power is the rate of energy consumption. Energy is the product of power and time. Energy and power are becoming critical components in computer systems in general, and portable systems, in particular. Energy consumption or energy efficiency has become the limiting factor in the development of faster, smaller computer systems, from smartphones to warehouse-scale computers. People are often more interested in power than energy, as it shows the rate of energy usage [1]. The energy consumption of a device is often measured via a power meter.

The notion of power aware (or low-power) computing is not new. Power awareness has increasingly become an important issue in high-performance computing (HPC), where performance is defined as speed and power consumption increases with performance.

The goal of power aware computing (or energy aware computing) is to minimize energy requirements for computation, by treating energy as a constrained resource like memory or disk. It is to save energy without compromising on performance.

APPLICATIONS

Power aware computing for heterogeneous world-wide Grid is a new track of research. Designers of **g**rid computing should take into account power and energy consumption in order to attract volunteer peers and to guarantee the success of their software. Power consumption is important for mobile devices due to limitation of their battery life. Better management of power yields longer battery life.

With the increased use of cloud computing, organizations are becoming aware of wasted power consumed by unutilized resources. The backbone of cloud computing is data centers, which consume a significant amount of energy. Data centers can leverage power management solutions to achieve the targeted computing reliability and economic efficiency. The

power management strategies for the data centers would help cloud providers to regulate electricity consumption and reduce cloud computing costs [2].

CHALLENGES

Power aware computing can achieve significant power reduction and energy savings with minimal impact on performance. However, power aware computing is challenging due to the sheer explosion of total hardware/software decisions. Power supplies and microprocessors are generally designed as separate systems. Some challenges facing power supply designers could be eliminated if there is more interaction between microprocessor designers and power supplies [3]. Direct measurements of CPU power consumption present some technical challenges.

A major challenge associated with power consumption in computing devices is the heat they generate. Such heat is often a greater problem than the amount of power consumed. Federal agencies have identified power consumption implications for air quality, national security, and climate change [4]. Since temperature is proportional to power density, methods for reducing thermal effects can also reduce power. The tradeoffs among performance, complexity, cost, and power of electronic systems have created exciting challenges and opportunities. By finding a tradeoff between performance and power consumption it would be possible to control the battery life of mobile devices [5].

CONCLUSION

Power and energy consumption have become important in computing communities.

Power aware computing has attracted the interest of researchers and users of computing systems. A lot of research has been done on the power-aware computing, leading to different techniques and approaches to minimizing power consumption. More information on power aware computing can be found in books in [6,7].

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