Chapter III
Computational Mobile Grid:
A Computing Infrastructure on Mobile Devices

Deo Prakash Vidyarthi
Jawaharlal Nehru University, India

ABSTRACT

The proliferation of the capable mobile devices has given the opportunity to utilize these devices for various purposes. The mobile devices being used as a Web portal is its short-term use as these devices have added many features and facility that does not only facilitate communication, but also adds to the huge computing power put together. The chapter proposes how a huge computational grid of these compute capable mobile devices can be formed, and the computing power from such a grid can be extracted. This kind of computational mobile grid put fourth many issues that require great attention before such a concept is fully functional.

INTRODUCTION

The recent past has witnessed the rapid increase in mobile devices. These mobile devices are varying in sizes, utility, cost etc. Some mobile devices are used only for communication purposes (voice, text or picture communication). However, there are quite a large number of mobile devices that are used for computational purposes (Laptop, PDAs etc.) apart from the bare communication. Being cost effective, these devices are getting popular, emerging very fast, and rapidly growing in numbers. A digital convergence is taking place because of the high-speed wireless network, the efficient network technologies, the cost effective compute capable devices and the user's need.

A report published in PC World (Lemon, 2005), for the year 2005, says:

Worldwide PDA sales during the first quarter totaled 3.4 million units, compared to sales of 2.7 million during the same period last year. PDAs with integrated WLAN (wireless LAN) and cell-phone capabilities accounted for around 55 percent of all PDAs shipped during the first quarter.

Computational grid is a computing infrastructure, consisting of a large number of computational hosts, which provides the computation facility to the user available anywhere on the grid in a transparent manner. In general, it is a huge computational hub with various kinds of resources. The grid is well supported by the advanced network technologies for the effective utilization and availability of the resources. Resource sharing is one of the prime objectives of the grid. Emphasis in the computational grid is over the sharing of the computational resources, though other resources are also shared. These computational resources of the grid are shared, whenever there is the higher demand of computing energy and a single machine experiences a computational crunch to serve the compute intense jobs. Grid computing is a paradigm that often deals with the aggregation of the computing power available anywhere in the grid. The grid infrastructure is even being explored for parallel computing now, as there are computing resources available that can cater the need of the parallel job. These computing resources allow the job execution in a parallel/distributed manner. The Inter Process Communication for the processes, allocated on different computing nodes, are well supported and managed by the underlying high-speed network.

In recent, grid infrastructure is being deployed for mobile devices also. In such an environment, the mobile devices are allowed to use the grid infrastructure to enable the execution of complex resource-intense applications on the resource-constrained devices. This grid infrastructure is more or less stationary in nature. An interface between the mobile devices and the Grid services is designed to enable the usage of the grid. It features the Grid environment that manages the access to distributed resources and data by the mobile devices. Quite a few models, for this, have been proposed in the literature (Bruneo, Scarpa, Zaia, Puliafito, 2003, Guan, Zaluska, Roure, 2005, Darby, Tzeng, 2007, http://www.mobilegrids.org/)

The work here proposes a framework of the computational mobile grid in which the mobile computational devices (Laptop, PDAs, Palmtop etc.) themselves will form a grid to provide general and specific computational services to the applications and the users of the mobile devices. This will be apart from the services being offered by the stationary grid environment. The underutilized computing energy of the mobile devices will be utilized towards solving a compute intense job on such a grid. Thus a grid of the mobile computational devices will be formed that will enable the applications to utilize the computational services available in the mobile grid. Eventually, such infrastructures can also fulfill the computational energy gap required for the execution of parallel/distributed jobs.

To make such a concept feasible, there are many technical issues to be addressed. Dynamic grid formation, IP addressing, resource management and scheduling, security, battery power constraint are to name a few. This chapter proposes the basic idea of the computational mobile grid and addresses some of the issues involved therein. It provides a framework for the computational mobile grid. The chapter proposes to list many research issues open and expects to explore more issues from the research community. These issues require a great deal of attention before such mobile grid comes into play.

Related Content

Design of Ultrasonic Oil Tank Level System
Yue Zhang (2017). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 1-13).*
www.irma-international.org/article/design-of-ultrasonic-oil-tank-level-system/189225

A Modified Landweber Iteration Algorithm using Updated Sensitivity Matrix for Electrical Impedance Tomography
Lifeng Zhang (2013). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 17-29).*
www.irma-international.org/article/a-modified-landweber-iteration-algorithm-using-updated-sensitivity-matrix-for-electrical-impedance-tomography/92999

Detection of Brain Tumor in MRI Images, Using a Combination of Fuzzy C-Means and Thresholding
Yousif Ahmed Hamad, Konstantin Vasilievich Simonovand Mohammad B. Naeem (2019). *International Journal of Advanced Pervasive and Ubiquitous Computing (pp. 45-60).*
www.irma-international.org/article/detection-of-brain-tumor-in-mri-images-using-a-combination-of-fuzzy-c-means-and-thresholding/224939

Pervasive iTV and Creative Networked Multimedia Systems
Anxo Cereijo Roibásand Stephen Johnson (2010). *Ubiquitous and Pervasive Computing: Concepts, Methodologies, Tools, and Applications (pp. 707-716).*
www.irma-international.org/chapter/pervasive-itv-creative-networked-multimedia/37813

Handling RFID Data Using a Data-on-Tag Approach
Sarita Paisand Judith Symonds (2009). *Auto-Identification and Ubiquitous Computing Applications (pp. 180-193).*
www.irma-international.org/chapter/handling-rfid-data-using-data/5463