Chapter II
Pervasive Computing:
What is it Anyway?

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ABSTRACT

In this chapter, we introduce the key ideas related to the paradigm of pervasive computing. We discuss its concepts, challenges, and current solutions by dividing it into four research areas. Such division is how we were able to understand what really is involved in pervasive computing at different levels. Our intent is to provide readers with introductory theoretical support in the selected research areas to aid them in their studies of pervasive computing. Within this context, we hope the chapter can be helpful for researchers of pervasive computing, mainly for the beginners, and for students and professors in their academic activities.

INSIDE CHAPTER

The recent advances in hardware and wireless technologies have leveraged the creation of the first experimental pervasive computing scenarios. Due to the belief that these scenarios will be an integral part of future living, research in this field is increasing at a fast pace. Therefore, theoretical and mainly practical studies are of great use as a way of supporting this belief.

Performing such studies, however, implies identifying the intricacies behind pervasive computing. Although its concept is quite simple, understanding these intricacies is a task which scatters across different research fields. Computer networks, distributed and cognitive systems, software engineering, and user interface design are some of these fields.

Therefore, in this chapter our main objective is to identify and discuss, at an introductory level, some of these intricacies. More specifically, we define four major research areas in pervasive computing, namely pervasive networking, context awareness, pervasive systems development, and pervasive computing middleware. Based on this view, we then take the reader on a journey through the universe of pervasive computing, discussing concepts, challenges, and current solutions.

INTRODUCTION

Today, computing is facing a significant revolution. There is a clear migration from the traditional desktop-based computing to the ubiquitous era, where computing will be spread all around us and seamlessly integrated into our lives. It is this new stage of computing that researchers have named pervasive computing. We can say that it is the accomplishment of the so-called concept of *calm technology* (Weiser & Brown, 1995), or as Weiser (1993) has said, it "envisions computation primarily in the background where it may not even be noticed" (p. 1). Not surprisingly, these ideas require us to view computers in a totally different way, not only as something we log onto, work on, and log out of when we are finished (Saha & Mukherjee, 2003). Instead, we should see a computer as a portal to a repository of computational resources, making use of them to work on the background and fulfill tasks according to our needs and preferences.

Pervasive computing, also known as ubiquitous computing (Weiser, 1991), has been recognized as the third wave in computer science, following the mainframe and the personal computer ages. Therefore, even if not fully conceived, pervasive computing will be the prevailing paradigm of the 21st century. Observing the graph shown in Figure 1[1], one can see the sales associated with ubiquitous computing devices follow a fast exponential growth. As more and more facilities, or services,

Figure 1. Sales of mainframes, personal computers, and ubiquitous computing devices
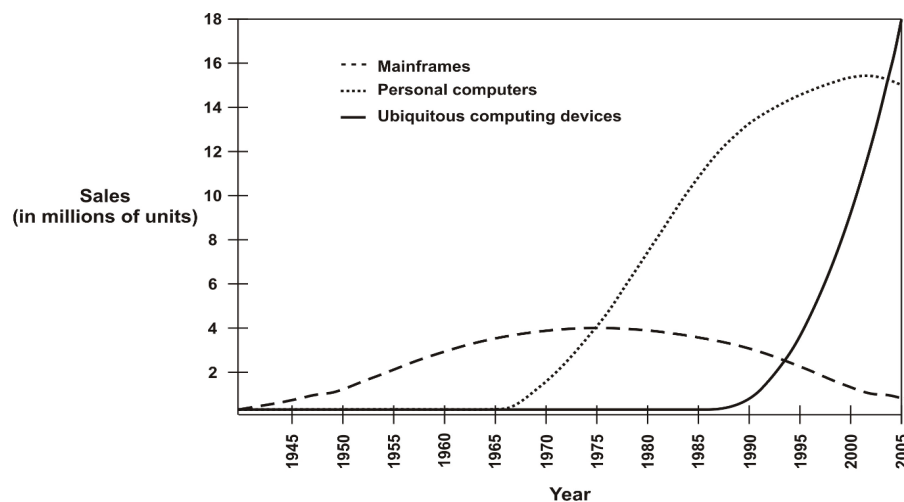
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