Chapter XII
PUM:
Personalized Ubiquitous Multimedia

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ABSTRACT

*Due to the advancement of hardware technologies and mobile communication systems, the mobile devices are transforming into multimedia devices capable of consuming multimedia data. The mobile multimedia devices having the **3G/4G mobile communication** interfaces have created the ubiquitous multimedia applications paradigm. The ubiquitous multimedia advocates that adaptable media contents should be available to users any time and any where. These ubiquitous multimedia applications have promising business potentials. The ubiquitous multimedia applications create an infrastructure for multimedia information management, where contents can be managed with interconnection and collaboration between users. The Personalized Ubiquitous Multimedia (**PUM**) is a subset of **ubiquitous multimedia applications**, where users can create, store, share and re-use the personalized heterogeneous media contents using mobile multimedia devices. Hence, PUM is an example of interconnected and collaborative multimedia content management system. This chapter illustrates the evolution of Computer-Phone and the concept of PUM. An integrated architecture is described aiming to deploy the PUM applications. The integrated architecture is composed of **Mobile Agent Systems** (MAS) and a specialized Mobile Distributed File System. A set of advantages of the integrated architecture is described.*

INTRODUCTION

The ubiquitous computing systems are composed of two main building blocks such as, mobile devices and the wireless communication systems, which form the network of mobile devices. The advancements in hardware technologies have enabled to realize miniaturized low-power electronic components, which paved the way towards the manufacturing of a variety of high-end mobile devices such as, PDA

(Personal Digital Assistant) and Smart-Phones. The 3rd Generation (3G) and 4th Generation (4G) wireless communication technologies have achieved high bandwidth and reliability of the communication link. For example, the bandwidth of 3G system is in the range from 384Kbps (urban outdoor) to 2048Kbps (indoor). The mobile devices equipped with 3G and 4G mobile communication systems have given birth of seamless ubiquitous computing. The present day mobile devices are equipped with inbuilt codec modules and thus, the mobile devices are transforming into the mobile multimedia devices capable to handle multimedia data stream. These newly evolved mobile multimedia devices offer internet services through WAP (Wireless Application Protocol) and are capable to adopt various video streaming technologies (Hartwig, 2000). The wireless-networked mobile multimedia devices have created a platform to deploy high-end ubiquitous computing applications. The set of high-end ubiquitous computing applications are comprised of the following examples (Plagemann, 1999; Bagchi, 2007):

- Mobile multimedia streaming or ubiquitous media
- Virtual enterprises or virtual organizations
- Distributed digital contents or e-briefcase

However, the ubiquitous computing paradigm has a set of resource limitations. The fundamental restriction of the ubiquitous computing paradigm is the energy limitation of the mobile devices, which limits the computing lifetime and the types of mobile applications. The set of limitations restricting the proliferation of ubiquitous computing can be summarized as (Adelstein, 2005), (a) limited battery power, (b) limited storage space, which is not enough to hold a large volume of data set, (c) intermittent wireless communication link, (d) limited computing resources available at mobile devices and (e) restricted physical size of the mobile devices.

On the other hand, there are four key technological developments, which have created the environment suitable for realizing ubiquitous computing including the mobile multimedia applications. These key developments are (Pereira, 2003; Barton, 2006), (a) increment of mobile communication bandwidth and reliability, (b) availability of higher amount of primary and secondary storage spaces at mobile devices, (c) the standardization of multimedia contents and (d) distribution of multimedia contents through the internet or WWW (World Wide Web). Due to the advancement of hardware technologies, the mobile devices are getting equipped with low-power electronic components such as, USB memory-stick, which can hold a large data volume as a secondary storage attached to the mobile devices. The availability of low-power CPU and USB memory-stick may transform the present day mobile phones into the personal computing devices in future (Barton, 2006). These personal computing devices have capability to support the ubiquitous and mobile multimedia applications. It is worth noting that, the ubiquitous multimedia applications have distinct commercial aspects and business potentials (Davidyuk, 2004; Madhavapeddy, 2005).

In this chapter, the concept and model of ubiquitous multimedia applications are illustrated, which follows the interconnected and collaborative information management architecture. The evolution of the new generation Computer-Phone (CP) is described. The CP is the new breed of mobile multimedia devices having multiple functionalities including mobile phone, codec and the personal computer. This chapter introduces the concept of PUM (**Personalized Ubiquitous Multimedia**), which is a class of ubiquitous multimedia applications. In the PUM application framework, the multimedia users can create, securely store, share and stream the personalized multimedia data in the interconnected and collaborative environment. The PUM application framework offers data security, location transparency, high availability