Supporting Adaptive Context-Aware Services and Novel Handover Scheme for Smart Ubiquitous Communication System

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Abstract   Since people communicate with each other by mobile phones more and more frequently in daily lives, they pay more attention on the quality and rating of communication and the battery consumption when using the mobile phones. In order to provide users the services with low price, high communication quality and less battery consumption in any environments, this paper selects the users' acceptable communication services upon communication quality, communication rating and battery consumption when using mobile phones according to the users' communication habits. Besides, in order to solve the problems of overhead and latency when the users switch network bases in the use of network phones, we propose a Novel Handover Scheme based on Host Identity Protocol et al. (Fan, A Novel handover scheme for HIP mobile networks. Master Thesis, National Dong Hwa University in Taiwan, 2007) to accelerate handover speed to fulfill Smart Ubiquitous Communication System.

Keywords   Context-aware · SIP · Wireless

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1 Introduction

Mobile phone is a kind of large-scope and portable communication device. Most of the mobile phones connect to the cell network of the bases which connect to the public switched telephone network (PSTN). With the advancement of cell phone communication techniques, the users have more and more demands on cell phone communication which leads to rapid growth of transmission service demands of cell phone communication [1]. General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) et al. [2] are the most commonly used ones and their communication quality is the most stable and reliable et al. [3]. However, with the development of Wireless Local Area Networks (WLAN), we gradually find the internet function in mobile phones and network phone also becomes the communication model frequently used by the users. Since the communication through network phones is based on WLAN network and the users can use it as long as they can connect to the network, the communication rating will be cheaper than that of GPRS and UMTS et al. [4]. However, switching network model on will consume extra power of mobile phones. Besides, when the user is using network phone and the mobile phones are switched to another wireless network base, the network will be stopped for re-connection and setting. The failure of Ubiquitous Communication will reduce the users' willingness to use network phones. Thus, there are two problems we have to solve: one is how the users with increasing communication time select a suitable communication model upon the considerations of communication quality, communication rating and power consumption. The other is how to prevent communication quality of Session Initiation Protocol (SIP) et al. [5] phones from being influenced by overhead and latency because of Internet Protocol (IP) address switch during the wireless network base switch in order to accomplish Ubiquitous Communication. In this paper, we propose Adaptive Context-Aware Services based on Context-Aware and combine Novel Handover Scheme based on Host Identity Protocol (HIP) to construct a Smart Ubiquitous Communication System. In order to fulfill adaptive context-aware services, the users' habits and the environments are the important factors for analysis, such as the communication quality and communication rating of the users' environments or battery consumption of mobile phones et al. [6,7]. These factors have been collected when the users use the mobile phones. We can predict the users' preferential communication models in the present environments through analyzing the set of these factors. Besides, in order to improve the users' overhead and latency when switching network bases, we try to provide a better method to save power in wireless network in order to connect with Internet et al. [8,9]. Thus, we improve the problem of excess times and the delay time of handover. We reduce the exchange of handover' signals to accelerate the handover speed to have close network switch. Based on Adaptive Context-Aware Services and Novel Handover Scheme, we can easily construct Smart Ubiquitous Communication System.

2 Related Work

2.1 Context Aware

The concept of Context Aware was proposed by Schilit and Theimer in 1994 et al. [10]. Context Aware is the service which searches for and uses varied situational information to perceive the users' needs in advance. In other words, wherever the users go, the personal information will appear with them. The proper information will also be provided according to the situations at the time by Sensor which changes the traditional computer-centric thoughts that

the users adapt to and look for the useful digital devices. After continuous development, the definition related to Context Aware was proposed by Dey and Abowd in 1999 and so-called "context" meant any messages of entities et al. [11]. Entities refer to people, places, objects or rated targets. The most important research issue is how to collect, save and integrate varied Context Information to accomplish a smart context-aware application to provide users human centered digital environment.

2.2 Host Identity Protocol (HIP)

In the beginning of Internet development, all hosts are supposed to be fixed in a particular location. Once moved to another network domain, the host has to update its IP address. There are two functions for IP address. One is to symbolize the topological position of the hosts connected to the network. IP address is used to receive and transmit the packets. If the host changes the topological position, IP address has to be changed accordingly. The other is used to symbolize the host. However, most applications are independent of the network position of the host but are bound to a particular fixed IP address. With the progress of the communication network, the mobile hosts are getting more and more. While a mobile host connects to another network, it has to update its IP address. It means that IP address can not represent the name of a host since it will cause the host's identify and topological position becoming no longer uniform. Therefore, the Host Identity Protocol (HIP) introduces a new protocol layer, Host Identity Layer, between the network and the transport layers. In the transport and the application layers, all IP addresses are replaced by Host Identity Tag (HIT). IP addresses are not used to symbolize the host. Figure 1 is the illustration of HIP and TCP/IP.

2.3 Ubiquitous Communication

The concept Ubiquitous Communication was proposed by Maniatis, Roussopoulos in 1999 et al. [12]. At the time, it aimed to improve the network management concept on people's mobile communication and did not consider the mobile environment or the accessible communication methods. However, International Telecommunication Union held a workshop with respect to Ubiquitous Network Societies in 2005. The workshop mentioned the devices transmitting the users' location and information by ubiquitous technologies (such as RFID)
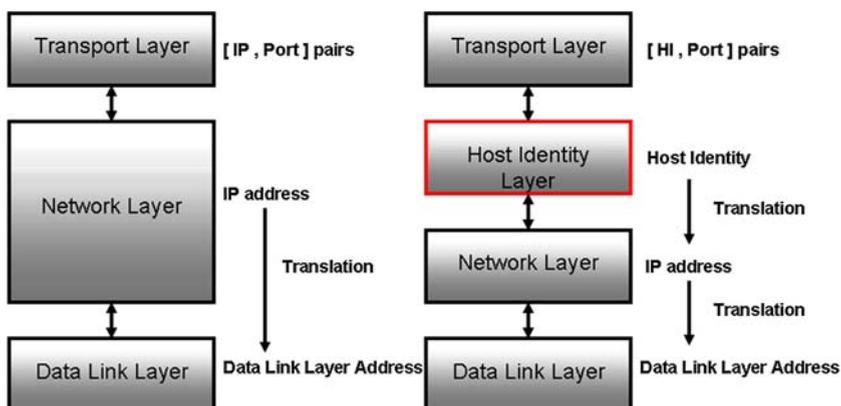

Fig. 1 Illustration of HIP and TCP/IP