Chapter 2

Simulating Game Applications in Mobile IPv6 Protocol

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ABSTRACT

This chapter proposes a novel game-based green interface/network selection mechanism that is an extension to the multi-interface fast-handover mobile IPv6 protocol and works when the mobile node has more than one wireless interface. The mechanism controls the handover decision process by deciding whether a handover is needed or not and helps the node to choose the right access point at the right time. Additionally, the mechanism switches the mobile nodes interfaces “ON” and “OFF” when needed to control the mobile node’s energy consumption and improves the handover latency.

INTRODUCTION

In recent years, we have seen an increasing demand from end-users to access network resources from anywhere and at anytime from all kinds of devices. Mobile computing has become an important area of computer networking and is expected to play a fundamental role in the ubiquitous access of Internet resources in the future. A greater degree of connectivity is almost becoming mandatory in today’s business world. In addition, mobility of end-users is placing further requirements on network systems and protocols to provide uninterrupted services.

Mobile IP (MIP) is an open standard, defined by the Internet Engineering Task Force (IETF) (RFC, 2002) that allows users to keep the same IP address, stay connected, and maintain ongoing applications while roaming between IP networks. MIP is scalable for the Internet because it is based on IP—any media that can support IP can support MIP (Cisco, 2001). Roaming is a general term in wireless communications that means the ability of Mobile Node (MN) to extend connectivity in...
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a location that is different from its home location where the service was registered. MIP provides efficient, scalable mechanisms for roaming within the Internet (Ernst, 2006; Clincy & Mudiraj, 2007). Moreover, the use of MIP, allow MN’s to randomly change their point of attachment and maintain ongoing communication with their destinations without changing their IP addresses.

Mobile network protocols such as Mobile IPv4 (MIPv4) have emerged as one of the promising solutions capable of providing uninterrupted connectivity. It allows the users to travel beyond their home network while still maintain their own home IP address. Similarly, Mobile IPv6 (MIPv6) is the protocol that deals with the mobility for the IPv6 nodes. This protocol allows an IPv6 node to be mobile, and randomly change its location on the IPv6 Internet while still maintaining its existing connections (Clincy & Mudiraj, 2007). The following sections include brief definitions of some of the most important terms used within this chapter.

RECENT DEVELOPMENT TO MIPV6 PROTOCOL

Background

Nowadays, wireless technologies are widely used in IPv6 communications (Johnson, et al., 2004). In addition to sharp increase of mobile terminals, various kinds of wireless technologies are available for MNs. Therefore, many mobile nodes begin to have multiple wireless interfaces and every user wants to use them simultaneously to reinforce connectivity to the Internet. Selection of the most efficient and suitable access network to meet a specific application’s Quality-of-Service (QoS) requirements has thus recently become a significant topic, the actual focus of which is maximizing the QoS experienced by the user. The main concept is that users will rely on intelligent network selection decision strategies to aid them in optimal network selection. Fast-Handover Mobile IPv6 (FMIPv6) (Koodli, 2005) already offers some rudimentary handover features. For instance, a MN may send a binding update to its Present Access Router (PAR). This causes the PAR to redirect packets towards the new Care-of-Address (CoA) of the MN.

In the present context, while the MN moves around a certain area, it keeps checking the around Access Routers (ARs), once it receives that there is an AR around it, it will start the handover procedure between the PAR and the New Access Router (NAR). Yet, there is no way for the user and/or the application to force the MN not to make the handover in order to stay with the AR that offers a better service. On the other hand, game theory (Rasmusen, 2006) is a set of tools developed to model interactions between agents with conflicting interests, and is thus well suited to address some problems in communications systems, which might be related to interface and/or network selection mechanisms. Game theory skills can be easily adapted for use in radio resource management mechanisms in a heterogeneous environment. Accordingly, the following sections present a mechanism for combining interface and/or network selection mechanisms and game theory. In such a way that the user and/or the application will have the ability to dynamically control which network to access while moving around different AP’s.

Recent Extensions to MIPv6

Recently, various kinds of wireless technologies are available for the MNs. MIPv6 (Cisco, 2001) describes the protocol operations for a MN to maintain connectivity to the Internet during its handover from one AR to another. As mentioned earlier that the solution of keeping ongoing connectivity on the move is by using several interfaces and use them simultaneously. However, the basic MIPv6 protocol (Johnson, et al., 2004) cannot support the simultaneous usage of multiple interfaces, because