Mobile Computing and Networking

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Introduction

With the boom in laptop computer sales and the recent popularity of cellular telephone, PCS, and pager technologies, many experts are convinced that tomorrow's computers will all be mobile. This surge in popularity is followed by the desire for continuous Internet connectivity regardless of location; in other words, users desire an Internet version of the cellular telephone. In order for us to obtain this mobile environment of the future, many problems must be solved.

For simplicity, we define the following terms. A Mobile Node (MN) is a computer that has the ability to move while retaining continuous network connectivity. Similar to the cellular telephone network, our mobile environment will be broken into cells and each cell will have a base station (Base) that is connected to the Internet. Each Base will provide a communication link between the MNs in its cell and the rest of the Internet. A wireless set of MNs are allowed to roam through the connected, adjacent, or overlapping cells defined by the Base units. To transmit a message, an MN sends the message to its current Base. The Base then routes the message on the static network to the location of the destination (mobile or static) node.

Mobile Group Communication

Our work focuses on three phases in the life of a mobile group; initialization, multicasting, and termination. Group communication is an important facility on the Internet. The MBONE (Multicast backBONE) currently transmits data to thousands of static users through numerous multicasting applications.

Our work on the initialization of a mobile group has recently been published in *Information Sciences*. The algorithm we have developed ensures that each member receives the location of each group member exactly once and that the transmission of the information is done optimally. The Internet Engineering Task Force lists multicasting as a desired service in our future mobile environment. The current proposed routing protocols for MNs, however, do not support group communication. We are currently developing this missing multicast routing protocol for MNs. The graceful termination of a group, having completed its task, is difficult in static networks. The problem is complicated by the possibility of having mobile group members. In a recent submission, we choose an algorithm, developed for determining the termination of a group in a static network, and provide practical enhancements for its use in the mobile environment.

Other Mobile Computing Networking Projects

Mobile IP suggests two techniques that an MN my use to determine when to switch its link-level point of attachment, as it roams. As stated in the standard, other techniques may be used; that is, no standard technique exists for determining when an MN should switch cells. We have simulated the performance of these two techniques with the performance of several other techniques that we have developed. Our simple techniques achieve better signal strength and overhead in switching compared to the two suggested techniques in the Mobile IP standard. We have submitted this initial work and are currently developing a second paper on this research which includes a more realistic simulation environment and incorporates several extensions to our techniques.

Other Research Interests

Prior to beginning my dissertation research in mobile computing and networking, I concentrated on distributed systems. During my research, I prepared a taxonomy of distributed termination detection algorithms. This taxonomy was accepted for publication in the *Journal of Systems and Software* last May.

Our paper, "Extended Analogy: an Alternative Lecture Method", was my first foray into educational research, and I found it to be quite enjoyable. I will present this paper on February 27th at 2:00 PM at the SIGCSE Symposium. I intend to further my research in the field of education since I intend to concentrate on teaching.