Handoff Management in the Mobile Wireless Internet *

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Abstract – Multimedia applications are gaining high popularity in the Wireless Internet. These applications are carried out over wireless mobile devices. At the same time the current proposed handoff management schemes do not support these applications effectively. The provision of a good handoff mechanism in the Wireless Internet environment remains an issue. In ensuring proper functioning of real-time applications, a smooth, fast and effective handoff mechanism that will make provision for delay sensitive applications must be in place. In this study we are going to propose a fast and efficient handoff management strategy for the wireless Internet that will enable smooth and efficient operation of real-time applications, such as Internet telephony, hybrid phones and voice over IP. In our strategy to be proposed, low handoff latencies, delay-less and interruption-free handoffs, minimum congestion from network resources would be amongst the parameters to be considered.

Key words- handoff management, real-time applications, quality of service

I. Introduction and Background

The Internet, especially in the form of its wireless perspective, is becoming a more convenient tool for information transmission. This then calls for a proper and more efficient method of keeping the active connection between communicating mobile nodes, while they roam in different cells of the network. Due to different properties of cells, when a Mobile Node (MN) moves from one network to another during their active connection, a handoff must be initiated and must take into account the next cell's resources. This handoff must try as much as possible to minimize information disruption and delay when the MN moves to the next cell in its direction.

More attention is being paid to real-time multimedia applications, as these are the most delay sensitive applications. There are varieties of handoffs that have been proposed [1], [2], [5] and [6]. Each uses a different technique depending on where it takes place in the network. In managing handoff, various schemes have been proposed [3], [4], [7], [8] and [9]. These strategies have some drawbacks such as: (1) delay, which is the time taken by a mobile node to register with a new network; (2) global updates, where each and every move the MN makes, the HA must be updated; (3) triangular routing, especially in Mobile IP, where the information from correspondent node (CN) must first pass through the home agent (HA) before reaching the mobile node (MN).

Discussions are still underway in this area of research, to find an optimum strategy in managing handoff, as this is very much required by real-time applications that are rapidly increasing over wireless devices. Vidales et al. [5] suggested that handoff buffering schemes are unable to determine the best time to handoff as they do not have enough information about what is happening in the MN. Regardless of where or what kind of handoff is occurring, the issue is whether it is effective enough to reduce packet delay and disruption.

The rest of this document is organised as follows: Section II, discusses previous related work conducted. Section III states the objectives and goals of the study. Section IV outlines the research methodology we are going to use. Finally we conclude in section V.

II. Related Work

Handoff management in the wireless Internet is still an issue. There is the need to develop a better handoff mechanism that can be employed over the wireless Internet. Various handoff schemes have been proposed [4], [7], [8], and [9].

The most basic handoff in disguise is Mobile IP [2]. Mobile IP was developed for wireless devices so as to enable them stay connected while they change their location. When a MN moves to another subnet it is assigned a care-of-address which is local to that subnet. However this does not affect the MN's permanent IP address. When the CN sends information to the MN, the information is intercepted by the HA, which then reroutes the information by tunnelling it to the FA. The advantage of this strategy is that there is no geographical limitation, and no physical connection required. The disadvantage of Mobile IP is that it uses triangular routing. The information from CN is first sent to the HA then through the FA to the MN, but the response may go directly to CN.

Takahashi et al. have proposed a method of managing handoff based on buffering and signalling [4]. On handoff initiation, the access router from the previous network starts buffering packets until the last acknowledgement for the requested handoff has been received, then it starts forwarding the buffered packets to the new location of the MN. This method has some limitations. It suffers from delay while the handoff request is being processed. It also results in congestion of network resources as a result of buffering.

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A Seamless Handoff Architecture has been proposed by Saraswady et al. [3]. In this architecture handoffs from within local subnets are localised, that is, they are not globally updated. They work under the control of Gateway Agents, assisted by Mobile Agents that keep track of the MN. This looks fine for micro mobility. But this does not solve the problem of delay and disruption when the MN moves to a different network.

Common problems with most of these schemes are two fold: (1) there are large variations in the handoff latency. (2) The buffering of data during the time the MN has not been attached to a new access point may cause congestion in the network, should the MN take longer to get a new access point.

III. Research Goal and Objective

The aim of this study is to propose a Handoff Management strategy that will minimize packet disruption and delay during handoff requests from mobile nodes over the mobile wireless Internet. The specific objectives of the proposed research study will include the following:

- To survey currently proposed handoff management strategies.
- To propose an efficient and cost effective handoff management strategy that will take into account real-time multimedia applications.
- To performance compare our strategy with some previously proposed handoff strategies.

IV. Research Methodology

Our research design technique will be undertaken as follows:
Study of related work that has been carried out.
Modeling of our scheme, Simulation of the proposed model, Performance evaluation.

A Investigation

We are going to conduct an investigation of the existing and currently proposed strategies. We shall then propose a suitable handoff management strategy for the mobile wireless Internet.

B Modeling

Based on our design objectives, a model for efficient handoff management would then be developed.

C Simulation

The proposed model would be simulated and evaluated.

D Performance Evaluation

The performance of our scheme would be compared with those of other proposed schemes, such as handoff management based on buffering and signalling.

V. Conclusion

In this paper we have looked at the importance handoff management in the mobile wireless Internet, especially when transmitting for multimedia applications. We are going to propose a fast and efficient handoff management mechanism for the mobile wireless Internet that will enable smooth and efficient operation of real-time applications.

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