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Smooth Handover over IEEE 802.11 Wireless LAN

Status of this Memo

Abstract

This memo describes, based on the experience of MIS (Mobile Internet Services, Inc.) for commercial mobile IP service over IEEE 802.11b based wireless LAN environment, how smooth handover between access points is implemented.

The major obstacle for the smooth handover is time required to scan frequency bands and latency of mobile registration is not so much a problem, both of which is solved with terminals having two transceivers.

1. Introduction

MIS (Mobile Internet Services, Inc.) is the first, and currently the only, ISP in the world to commercially provide mobile IP service.

MIS uses IEEE 802.11b based wireless LAN infrastructure and puts a lot of wireless LAN access points to let its subscribers move around with IP mobility.

MIS started public field trial in August 2001 and started commercial service in April 2002.

During the trial, a possible problem of the wireless LAN became apparent that it takes considerable amount of time, often more than a second, to scan all the possible frequency bands, which is required upon handover to find the next access point better than the current.

For some applications such as web browsing, it is not a problem.

However, for streaming applications such as Internet telephony, smooth handover with little or no service interruption is strongly desired.

The problem is solved by terminals having two wireless transceivers.

2. Smooth Handover with Two Transceivers

To prevent the service interruption, it is necessary that a terminal, which is expected to run service-interruption-sensitive applications, should have two wireless LAN transceivers, one for keeping connection to the the current access point and another for scanning frequency bands to search alternative ones.

3. Smoother Handover with Two Transceivers

With the elimination of service interruption for frequency band scanning, there still is a smaller amount of service interruption for mobility registration, which can also be eliminated.

With two wireless LAN transceivers, just after one transceiver find a new access point better than the current, a new connection to the new access point should be established through the transceiver.

Then, mobility registration for the new access point should be initiated.

Still, another transceiver should keep connecting to the current access point.

A while after the terminal confirms a successful mobility registration, the terminal should terminate the connection to the old access point and, as described in section 2, start scanning newer access points.

During mobile registration,

4. Applications of the Technique

The technique described in sections 2 and 3 was deployed in recent PHS (personal handy phone, 32Kbps mobile telephone system available in Japan and other countries) service, only after which, PHS can support stable and smooth handover.

In general, the technique requires two sets of transceivers, which increases the cost of terminals, which is welcome to wireless LAN chip vendors, it also reduce the cost of network by eliminating intelligent intermediate entities for half-hearted smooth mobility.

Note that a CDMA based wireless transceiver can simultaneously use two access points with different code without additional RF modules.

5. Security Considerations

To prevent anonymous and/or unpaid access to the Internet, access points of MIS have packet-wise cryptographical authentication mechanism to disallow unauthorized access to the Internet.

To prevent subscribers share a single subscriber ID with single payment, the mechanism disallows multiple terminals with a single subscriber ID simultaneously use access points.

As a side effect, the mechanism, basically, disallows a terminal simultaneously use multiple access points.

However, to allow for the smooth handover, a terminal is allowed to simultaneously use access points with overlapping service area.

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