RPIIH: Robust Prediction for Intra and Inter Handoff Process over CDMA2000

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Abstract

The overall performance of mobile nodes is mainly affected by the relatively considerable time spent in the handoff process. Most of the time spent is mainly consumed during the authentication process. This process could be even longer especially when the Access Points (AP's) are busy, which results in delays and/or packets loss. Many handoff techniques have been proposed to shorten the time of authentication however to-date, they have not been fully successful.

This poster introduces a more robust technique for saving the time consumed during authentication. The adopted approach is suitable within the regions that use the intra-handoff technique as well as those applying the inter-handoff technique. To validate our model, we have used ns-2 based simulations and plotted the findings.

Introduction

CDMA 2000 is defined as a special digital radio system that has a unique capability of transmitting streams of PN codes. CDMA 2000 has a potential of authorizing various user radios to share the same bandwidth and have a significant impact. It has a remarkable economic benefit compared to the Time Division Multiple Access (TDMA) method. Oldest cellular standards use Frequency Division Multiplexing (FDM).
CDMA 2000 comes with high bandwidth efficiency and multiple access capability allowing it to become a leading technology in the field. As it remediates to the spectrum congestion resulting from the ubiquitous use of wireless data terminals, fixed cellular telephones and wireless mobiles CDMA2000 supports mobile communications and speeds ranging from 144 Kbps to 2Mbps.
There have been many propositions for improvement by reviewing the fast handoff schemes and analyzing their advantages and drawbacks from the quality perspective. Also, using a cross-layer approach, a fast handoff framework which is in concordance with many applications' requirements was introduced.
The Wireless networks that are based on the IEEE 802.11 protocols are, nowadays, becoming ubiquitous and are offered in shopping centers, coffee shops, airports, libraries, campuses, etc. The connectivity speed offered by Wireless internet based on cellular networks ranges up to 11 Mbps or 54Mbps.

Predictable Intra Handoff Scheme

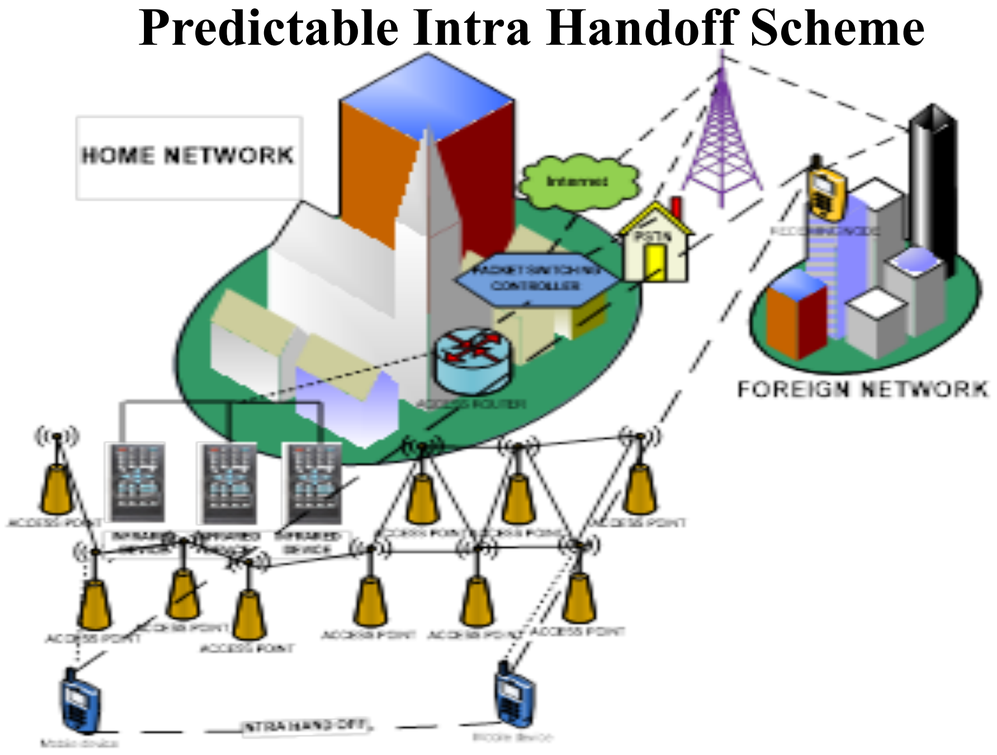

Fig.1. Intra Handoff process

Propagation Model

In our model, we propose that the relay links stuck between the tower CDMA2000 and the infrared are reliable and in the line-of-sight (LOS). We are also considering that the links between access point (AP) and infrared (IR) are in no line - of- sight (NLOS). We are introducing a new model that is differently analyzed compared to the one that was developed based on experiments realized by IEEE 802.16. For the access NLOS links. The tests applied in our model proposed under the three terrain categories path loss models recommended and modified in IEEE 802.16.
The Table below defines the land category.

Parameter	Land Type A	Land Type B	Land Type C
FBSS (ms)	4.876	3.8	2.85
HHO (ms)	0.0075	0.0065	0.0035
MDHO (ms)	11.56	17.51	22

TABLE 1. Land categories based of different handoff processes

Predictable Inter Handoff Scheme

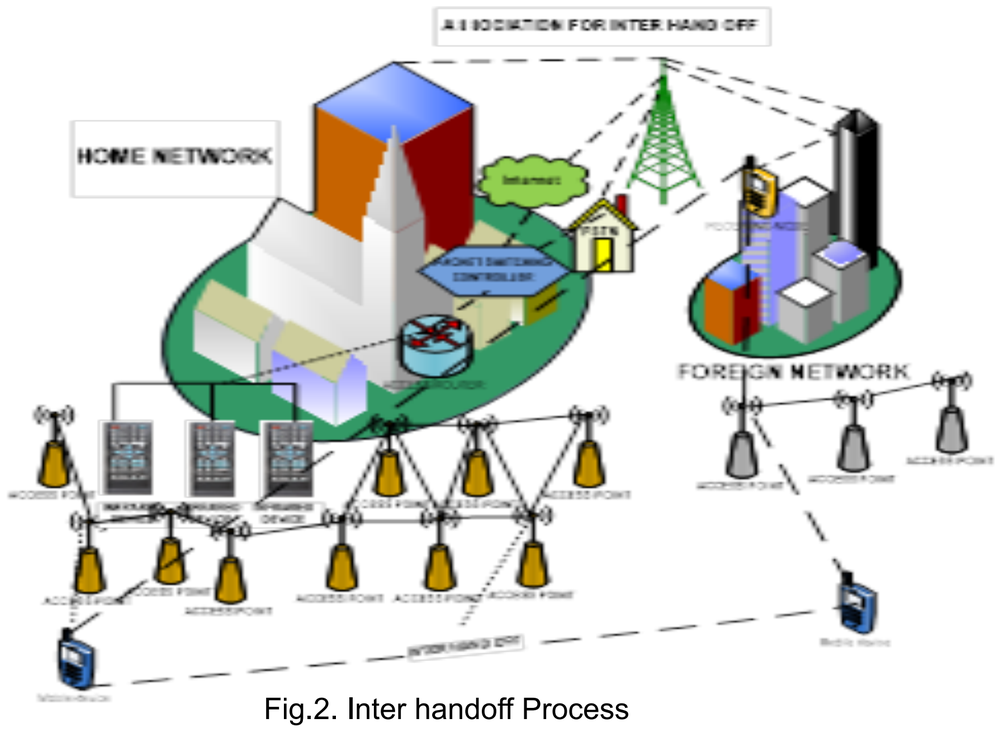

Fig.2. Inter handoff Process

Simulation Results

We have used a single mobility based scenario in our experiment. We have focused on the spectral efficiency based on the speed of the mobile nodes. In our scenario, three types of handovers are evaluated and their performance have been compared: FBSS, HHO and MDHO. The mobile nodes use intra and inter features during these handovers. Fig.3 shows an average spectral efficiency based on the mobility of nodes. It outlines the handovers using the Down Link (DL) Carrier Interference Noise Ratio (CINR). Where the signal transmitted between the relays is using the Time Division Multiplexing (TDM). The Omni-directional antenna is always used by the Relay station.
The potential mobile node is connected with the best server using AP' s (BS, MS or relays). It can be noticed that CINR level at the maximum speed of the node is moderately above than minimum requirement for all three handovers. We have used 1600 meters radius for the BS leading to a sufficient CINR at the cell radius. The analysis showed that the switching points during handovers between the BS and the relay are inside the original cell of the BS. At the maximum mobility, CINR level is still higher than 6.4dB. It shows that RPIIH is bringing a gain in terms of efficiency and optimization as it demonstrated that no data is lost in the communication between the mobile nodes. Since the CINR in the acceptable value of 6.4dB the handovers and data sending rate will not be affected. It also shows that RPIIH leads to an increased CINR at all mobility rates.

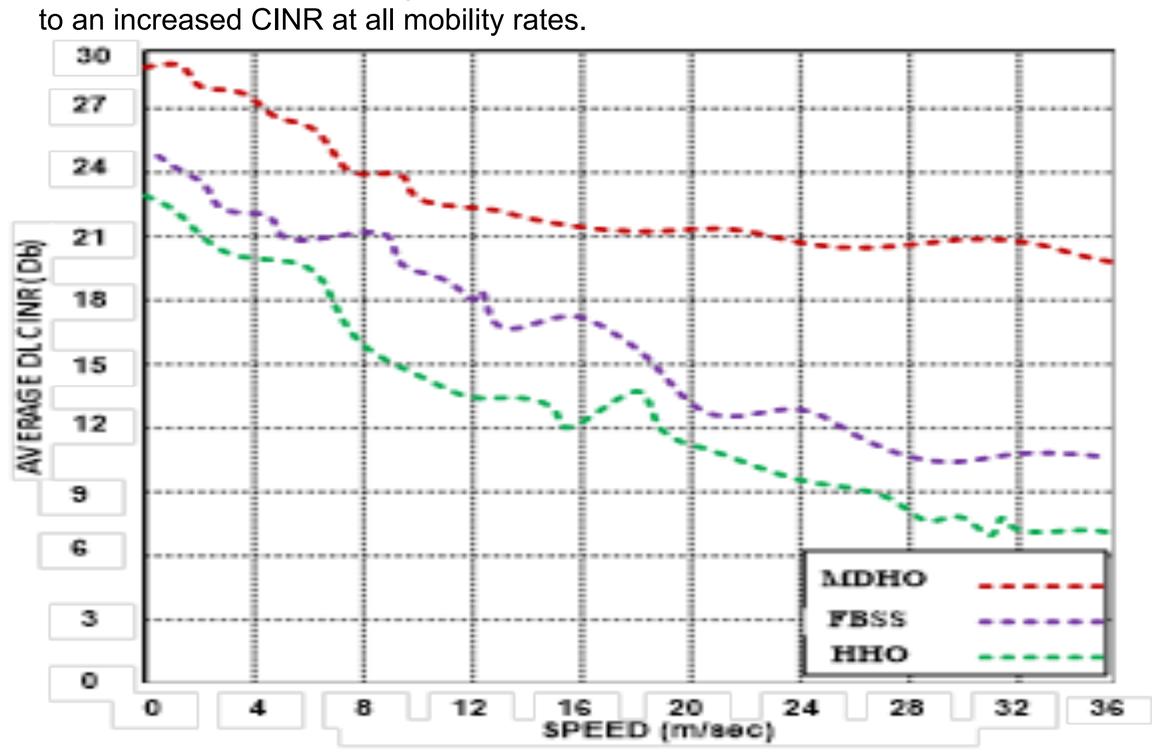

Fig.3. Average spectral efficiency vs. MS speed

In the Fig. 4, we have illustrated the probability results for the three handovers based on the cumulative distribution function (CDF) using DL. It shows the probability value of the pre-authentication process. We infer that the real-value with a *given* probability distribution is found less than or equal to epsilon which is a good indication of the success of the authentication. We have also observed that the mobile nodes gain 100% spectrum efficiency for those three handovers at 3.4 to 3.6 spectral efficiency using CDF at DL.

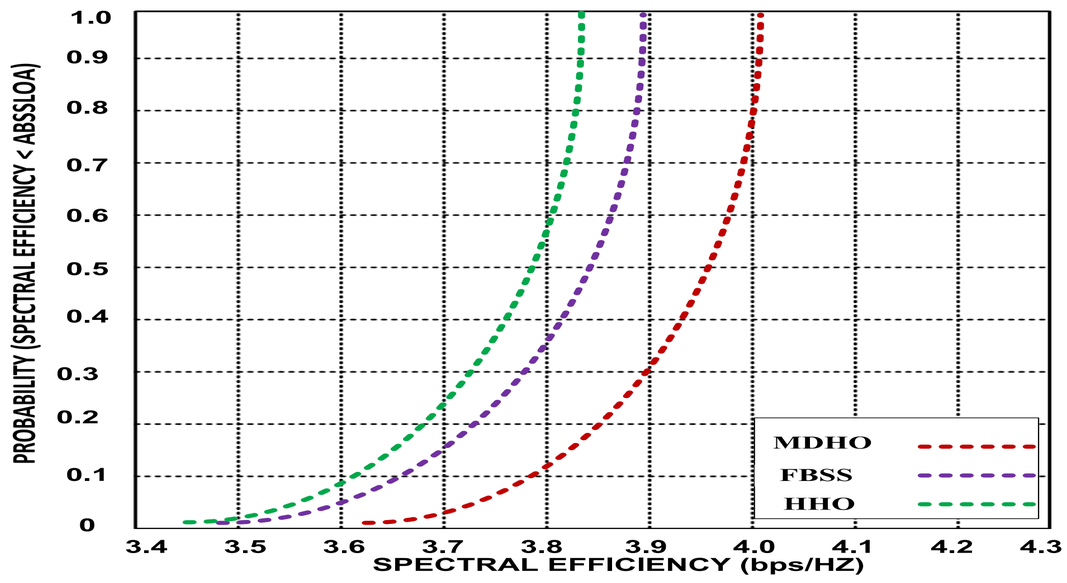

Fig.4. Cumulative Distribution Function (CDF) of Average Down-Link (DL

Conclusion

In this poster, we have introduced a robust predication intra and inter handoff (RPIIH) process for the pre-authentication of mobile nodes. The existing techniques use the post authentication process for switching the nodes from home station to foreign station which results in a waste the time and a drop in the throughput. The consequences could be even more severe when the mobile nodes are in the extreme mobility process, especially for the cases where communication is vital (military environment or during a remotely assisted surgery to name a few examples). Our proposed solution reduces the wait time for the mobile node and avoids the dropping of the data.
To demonstrate the strength of RPIIH, we have used ns-2 simulator to illustrate its performance and efficiency.
We have also evaluated the spectral efficiency of the channel by using ns2. Based on our findings, we have proved that RPIIH is an optimized technique that successfully achieves complete spectrum efficiency during mobility and cumulative distribution function *(*CDF) at an average down link (DL).
The proposed concept could be deployed in a realistic scenario to authenticate the mobile node prior leaving the home station.
In the future, we will create several scenarios to demonstrate the effectiveness and the suitability of the introduced method.

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