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A Study to Improve the Handover Algorithm on the LTE - Advanced System In Terms Of Speed

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ABSTRACT

LTE Advanced technology is not just a high-speed download rate, but an effective and successful Handover design requires careful choice of the Handover Margin (HO) variables and the optimal number of the process. The LTE-Advanced standard supports two variables to start Handover and target cell identification, namely the Handover Margin (HO) and start time. Effective Handover management is critical to wireless networks to maintain quality of service for user applications and equipment by supporting smooth Handover decisions. [2]

A Handover algorithm based on the determination of the Handover decision was determined by dynamically determining the value of the Handover Margin (HOM) according to the use of the data, in order to study the algorithm for changing the speed and checking the stability of the system. Results show improved throughput, rate packet loss and system stability.

Keywords :— Long Term Evolution-advanced system, Handover, lossless , throughput, delays

I. INTRODUCTION

In October 2010, the International Telecommunication Union (ITU-R) adopted LTE Advanced technology for mobile networks and the LTE-Advanced network divided into several parts[17] . Figure 1 shows how each part of the network is connected to each other.

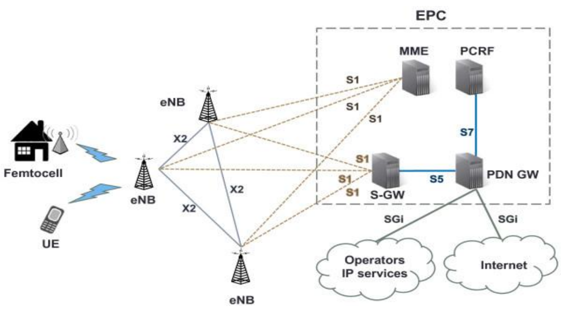


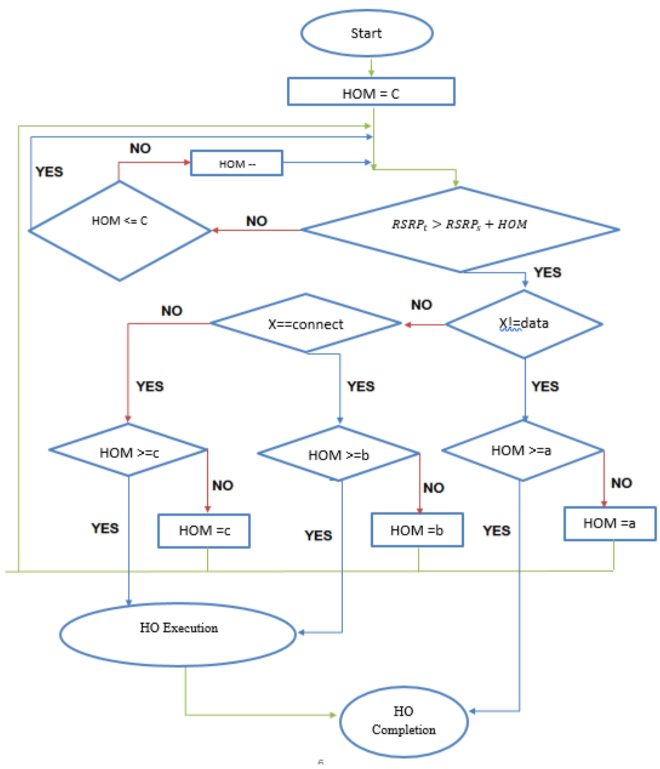
Figure 1 Structure of a sophisticated long-range system network [12]

Handover is one of the most important problems in cellular communication. Most studies show that it depends on essentially improving the implementation phase, which has increased the burden on the system or generated unnecessary random signals, resulting in increased energy consumption. All studies were aimed at limiting deliveries To improve the performance of the system, [3] [4] [5]

and some studies have identified the appropriate Handover Margin, which is one of the basic variables and very important in the process of receipt and Handover,[1] without regard to the identification of the appropriate time for Handover process as per user requirements.[9] This study was based on a study that managed receipt and Handover operations rather than relying on LTE-Advanced features to improve Handover and Handover.

II. ALGORITHM

The diagram below shows the flow chart of the proposed phase-out algorithm from the previous study [1].



III. SIMULATION AND PERFORMANCE ENVIRONMENT MEASURES

LTE-Sim simulator is used to evaluate the performance of the proposed algorithm and then compare it to the current work based on the number of deliveries, the packet delay rate, packet loss rate, and system productivity. The algorithm is evaluated by showing the algorithm's effect on the number of users and speed, and simulations are carried out within an ideal medium.

The simulation consists of 7 cells with a bandwidth of 5 MHz with 25 resource pools and a 2 GHz carrier frequency.

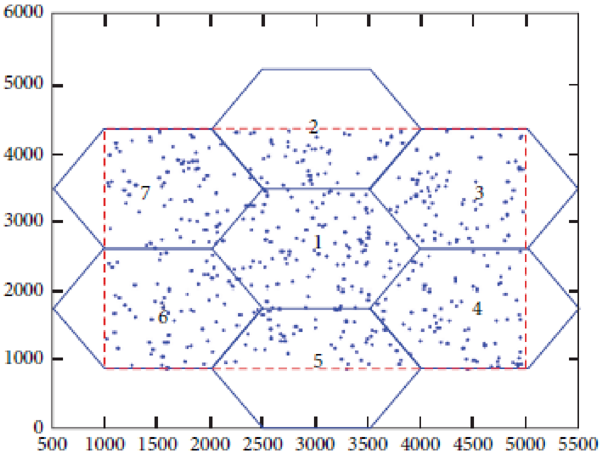


Figure 2 Planning cell network [6]

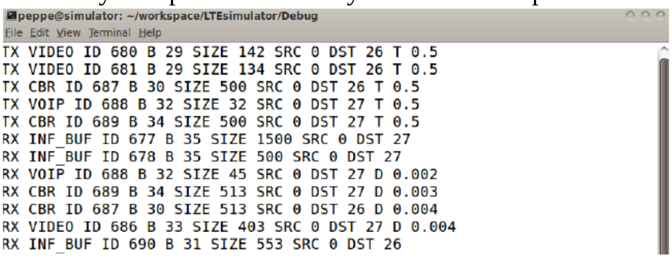
Each resource block consists of 12 sub-carriers of 15 kHz each. The time slot is 0.5 ms. In the transmission time interval (TTI) 1 ms. A fixed number of users are distributed randomly and move at constant speed in random directions. And communication cases with towers at random. In both eNB and UE, two antennas for transmission and multiple input multiples are used.

The parameters in the first and second experiments are the same as in the following table [1]:

parameters	**Value**
Cellular Layout	Hexagonal grid، wrap around(reflect)، 7 cells
Carrier Frequency	2 GHz
Bandwidth	5 MHz
Slot Duration	0. 5 ms
Number of OFDM Symbols / Slot	7
Number of RBs	25
Number of Sub-carriers per RB	12
Path Loss	Cost 231 Hata model
Shadow Fading	Gaussian log normal distribution model
Multi-path	Non-frequency selective Rayleigh fading model
Packet Scheduler	Round Robin
Scheduling Time(TTI)	1 ms
Data Traffic	1 Mbps Constant Rate
UE	30
UE's Position	Uniform distributed، fixed
UE's Direction	Randomly choose from [0، 2π]، constantly at all time
Sub-carrier Spacing	15 kHz
RSRP sampling timer interval	50 ms
UE's velocity	{3,30,120}km/h
Handover Margin	5 dB
Small value	4 dB
a	10 dB
b	8 dB
c	4 dB

IV. EQUIPMENT

LTE-Sim has been written in C++, using the object-oriented paradigm, as an event-driven simulator
At the present, the software is approximately composed by 100 classes, 450 _les, and 67,000 lines of code Release 5.0
Supported platforms: Linux i386, Linux amd64, Mac OS X; limited support for Windows[7]
The simulator provides a sophisticated tracing functionality
With reference to the _gure, the _rst _eld describes the event which has triggered the tracing.
Rows starting with TX, RX, and DROP are associated to packets that have been sent, received, and dropped, respectively.[8]
The second _eld describes the packet type to which the trace refers to. Other _elds are described in the follows:
ID = Identi_er. It identi_es the packet uniquely.
B = Bearer ID. It identi_es the bearer used to map the packet.
SRC = Source ID. It identi_es the node that sends the packet.
DST = Destination ID. It identi_es the node that receives the packet.
T = Time. It represents the instant in which the packet is created.
D = Delay. It represents the delay of the received packet.



V. EXPERIMENTAL RESULTS

The performance of the proposed algorithm was evaluated for different speeds (3,30,120) km / h, stabilizing the number of users to 30 users, and finding the results of packet delay, packet loss and productivity.

1. Comparison of productivity between the basic algorithm and the proposed algorithm for the Handover and Handover process:

Increasing productivity commensurate with the burden on the system.[9] Productivity is high when the user speeds are low, and the higher the speeds the lower the productivity due to the increase in deliveries. The difference for the basic algorithm according to the speed (3, 30, 120) Km / h is 14.83%, 14.30%, 13.39% This means that the proposed algorithm is compatible with high speeds

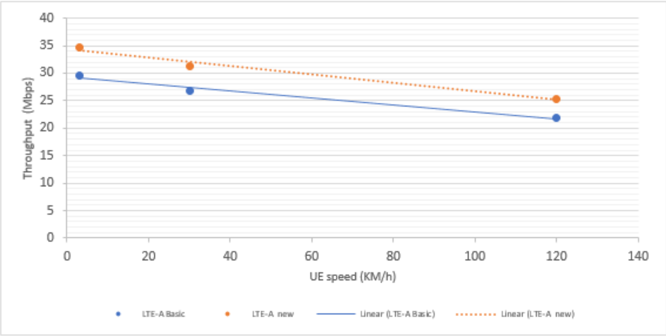


Figure 3 Average productivity between the basic algorithm and the proposed algorithm

2. Comparison of packet loss ratio between the basic algorithm and the proposed algorithm for the Handover and Handover process:

The loss of packets of communication problems in general and reduce loss of packets reduces the burden on the system and improve the quality of service[10]

The comparison showed that the speed of the users lead to increased loss of packets, and the loss rate of the basic algorithm exceeds the algorithm proposed at speeds (3, 30, 120) Km / h is 0%, 0.01%, 0.07%, respectively.

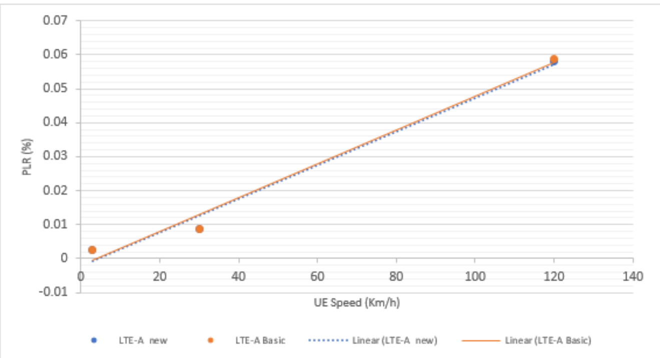


Figure 4 Loss ratio of the basic algorithm and the proposed algorithm

3. Comparison of the delay between the basic algorithm and the proposed algorithm for the Handover and Handover process:

When packets take a long time to reach their goal, these packages make them unusable. These packets are considered missing[11]

The basic algorithm has lower delay rates than the proposed algorithm with a small difference in time. The difference for the basic algorithm at speeds of 3, 30, 120 Km / h is 8.06%, 9.40% 11.20% However, the delay time is very low because the query about the data type is within the system, because of the technologies used in 4G networks and this is what distinguishes them from other networks

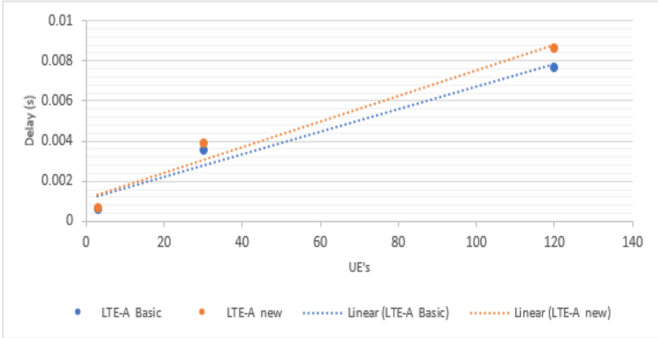


Figure 5 Delay time in the basic algorithm and the proposed algorithm

VI. CONCLUSIONS

The proposed algorithm was successful for speed in terms of throughput and rate the loss of packets due to filtering of deliveries. When the data type (connection, internet use or idle state) is included in the report sent by the user about the strength of the source cell signal and the target cell, we can change the algorithm to determine the Handover Margin before the testing process. It is also important to determine the optimum Handover Margin in each case, although this requires a study of the Handover Margin with different values and all users in the same state of connection for each simulation (if not using the network - the case of network usage in connection - the case of the use of the network to connect to the Internet).

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