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Original Article

Reduce Packet Dropping Using Strongest Cell Handover Algorithm

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Abstract: *This paper uses the strongest cell handover algorithm to increase the performance of the network. LTE module of ns3 network simulator is used for implementation. This algorithm is based on Reference Signal Received power. Hysteresis and time to trigger parameters are considered. Various researchers rely on user mobility for their project simulations. The result of the strongest cell handover algorithm is also compared with the No-op Handover algorithm. This paper analyses the performance of A3-RSRP algorithm of the Long Term Evolution module of the ns3 simulator*.

Keywords - *Long Term Evolution; handover; RSRP; simulation; ns-3.*

I. INTRODUCTION

In cellular communication networks, mobile data is continuously growing emerges the efficient technologies to meet the required quality of service of new users. One of the key parameters of a cellular communication system is mobility, which enables the user to change their point of attachment while communication is in process. This feature attachment is changed through the handover procedure. For our work, we use the LTE module of the ns3 simulator. Long Term Evolution is a standard developed by 3GPP for radio technology [1]. LTE increases the QoS by providing a high data rate, improved user mobility and simple network architecture. LTE module of ns3 is developed within the Lena project [2]. We use handover in ns3 by implementing the Reference Signal Received Power measurements and A3 event. A3 event is triggered when neighbouring cells have better RSRP measurement than the serving cell. Event A3 is defined as a reporting triggering event which is fired when there exists a neighbouring cell, measured RSRP of which is better than measured RSRP of the serving cell by certain offset [3]. In LTE network architecture Evolved NodeB are responsible for taking handover decision. Long term evolution can operate in different propagation environments [4] [5]. To enable the handover in a wide range of user equipment speed, UE -based measures should be carefully considered. In the second section of the paper strongest cell handover algorithm is described. In the third section of the paper, several simulation parameters and result is presented, and the fourth section of the paper presents the conclusion of the paper.

II. STRONGEST CELL HANDOVER ALGORITHM

The idea behind the strongest cell algorithm is to provide each user equipment with the best possible Referenced Signal Received Power. This objective is obtained by performing handover as soon as possible when a cell having better RSRP is found. This concept is realized through event A3. Handover is triggered for the UE to the best cell in the measurement. Two main parameters used in the strongest cell algorithm implementation are Hysteresis and time to trigger. Hysteresis delays the handover in regard to RSRP, and Time To Trigger delays handover in regard to time [6] [7]. The effect of both these parameters is evaluated in this paper.

In the LTE module, User equipment has to send two measurement reports named RSRP (referenced Signal Received Power) and RSRQ (referenced signal receive quality). The received power of a specific eNodeb is measured using RSRP, whereas RSRQ measures channel interference and thermal noise. The user equipment sends these two reports to the enodeb. The strongest cell algorithm uses the RSRP measure to trigger handover.

III. SIMULATION

Handover in LTE is triggered by enodeb based on UEs reports. The strongest Cell handover algorithm is simulated in the LTE module of Ns3. The effect of various parameters is analyzed using Lena handover measures and Lena dual stripe scenarios. And throughput is calculated for different parameters. And the effect of these parameters is analyzed. A3 event is to trigger event.

Table 1. Variable Parameter

Parameter	**Values**
Time To Trigger	64,100,160,640,2560
Hysteresis	2.0, 4.0,7.0,10.0

The measured report is configured as follows:

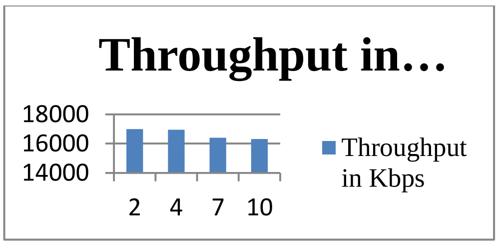
User equipment continues to take periodical measurements of RSRP from each identified cell at every time during the whole bandwidth. This report is sent to the radio resource control layer by the physical layer. And RRC layer applies time averaging to the received measurement. And each time old one is discarded when a new measurement report come. And event A3 is triggered when the RSRP result of any neighbouring cell become well than the source cell of UE. Hysteresis value defines an offset value, and this value must be true for at a specifically defined time; this value is called Time TO Trigger. Event A3 actually trigger only after the time to trigger time. Hysteresis value only defined entering condition for event a3. In reality, the handover decision is made by Enodesb. UE only sends its report to the enode of the serving cell. Based on the result of RSRP measurement reports serving cells decides whether to hand over the UE to the neighbouring cell or continue with the current cell [8].

Simulation Result: To verify various parameters behaviour, we conducted a simulation campaign in the Lena dual stripe model of NS3. Throughput in Downlink transmission is calculated for each scenario. And various parameters for simulation are defined in table 2.

Table 2. Simulation Parameters

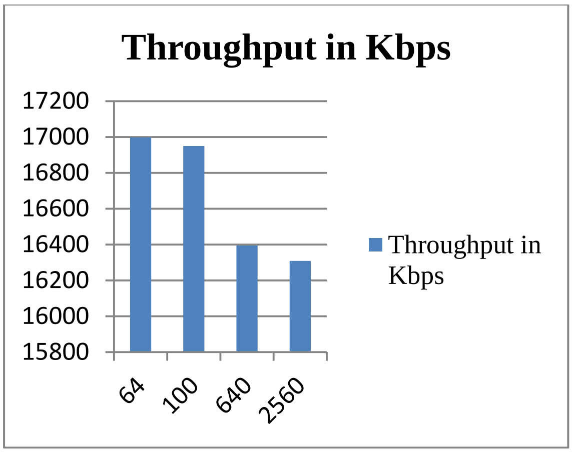
Parameter	**Value**
Number Of user Equipment	48
nMacroEnbSites	7
Number of Cells	21
Speed of UE	60 Kmph
Simulation time	50 sec
nBlocks	0
enbTxPower	46 dbm
Scheduler type	Propotional fair(Pffmac Scheduler)
EPC	1
useUDP	0
UeMobility model	Constant mobility model
Error model	None
Inter-site distance	500 m
Traffic	Only control message
Routing	Static routing
MacroEnbBandwidth	25

Figure 1 shows the throughput of simulation scenarios when the hysteresis value is kept variable. It is obvious that the increase in hysteresis parameter value significantly reduces the throughput. Throughput is also sensitive to TimeToTrigger. As seen from figure2, the increase of TimeToTrigger has the effect of reducing the number of handovers. [9] and [10] observed the same behaviour.



Hysteresis(in db)

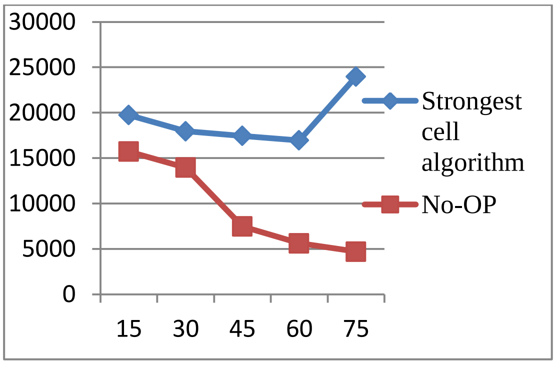
Fig. 1 Throughput when Hysteresis value is variable



TimeToTrigger(ms)

Fig. 2 Throughput when TimeToTrigger is variable

Throughput of the Strongest Cell Handover Algorithm is also compared with the No-Op handover algorithm in figure 3 with different speeds. From the figure, it is clear that the strongest cell handover algorithm works better when UE speed is high.



Speed of UE (Kmph)

Fig. 3 Throughput comparison of algorithms

IV. CONCLUSION

This paper described the handover modelling and measurements using the LTE module of ns3. Simulation results are presented in order to verify the implementation. The effect of various handover parameters like Hysteresis and time to trigger can be shown in the result clearly. From the result, it is concluded that a small hysteresis value and a short time to trigger give better throughput in the network. From the result, it can be proved that our model is sensitive to hysteresis value and time to trigger parameter of A3 RSRP algorithm and in accord with the results from many other published research work in the field. When the Strongest Cell handover Algorithm is compared with the No-Op Handover algorithm, it is found that this algorithm works better for high-speed users. In this paper, we have not considered mobility-related statics like Radio link failure.

REFERENCES

[1] Z. Albayrak and J. Toron, Recent LTE Simulation Tools, International Conference on Engineering and Natural Science, pp. (2016) 2007-2014.

[2] N. Baldo, M. Miozzo, M. Requena-Esteso, and J. Nin-Guerrero, An open-source product-oriented LTE network simulator based on ns-3 Proceedings of the 14th ACM international conference on Modeling, analysis and simulation of wireless and mobile systems, ser. MSWiM 11, New York, NY, USA: ACM,(2011)293–298.

[3] LTE; E-UTRA; RRC; Protocol specification (release 11), 3GPP Std. TS 36.331, (2013).

[4] N. Katti, S. Shivapur and M. Vijayalakshmi, Optimization of QoS in 4G Networks Using Handover Management, International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE), (2)(2015) 398-402.

[5] S. Choi and K. Sohraby, Analysis of a Mobile Cellular Systems with Hand-off Priority and Hysteresis Control, IEEE INFOCOM, (1)(2000)217-224.

[6] K. Dimou, M. Wang, Y. Yang, M. Kazmi, A. Larmo, J. Pettersson, W. Muller, and Y. Timner, Handover within 3GPP LTE: Design principles and performance, Vehicular Technology Conference Fall (VTC 2009-Fall), IEEE (70)(2009) 1–5.

[7] B. Herman, D. Petrov, J. Puttonen and A. Kurjenniemi, A3-Based Measurements and Handover Model for NS-3 LTE, The Third International Conference on Mobile Services, Resources, and Users, (2013) 20-23.

[8] M. Assyadzily, A. Suhartomo, and A. Silitonga, Evaluation of x2-handover performance based on rsrp measurement with friis path loss using network simulator version 3 (ns-3), Information and Communication Technology (ICoICT), 2014 2nd International Conference on (2014) 436–441.

[9] M. Anas, F. Calabrese, P. Mogensen, C. Rosa, and K. Pedersen, Performance evaluation of received signal strength-based hard handover for UTRAN LTE, Vehicular Technology Conference, VTC2007-Spring. IEEE (65)(2007)1046–1050.

[10] C.-C. Lin, K. Sandrasegaran, H. A. M. Ramli, R. Basukala, R. Patachaianand, L. Chen, and T. Afrin, Optimization of handover algorithms in 3GPP long term evolution system, Modeling, Simulation and Applied Optimization (ICMSAO), 2011 4th International Conference,(2011)1–5.