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Adaptive Optimal Handover Parameters Adjustment Technique for Conflict Avoidance in LTE

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ABSTRACT: LTE is the advanced network ,used for cellular network communication, Load balancing is the main problem ,to overcome the load balancing handover technology is implemented Handover Parameters Adjustment for Conflict Avoidance (HPACA) is proposed. Taking into consideration the movement of users, HPCAC can adaptively adjust handover range to optimize the mobility load balancing. The motion of users is an prime factor of handover, which has a noticeable impact on system performance. The numerical calculation of results show the proposed approach provide better results than the existing method in points of call blocking ratio, throughput, load balancing index, radio link failure ratio, ping-pong handover ratio and call dropping ratio.

KEYWORDS: Self organizing network, Long Term Evolution

I.INTRODUCTION

The speedy growth of mobile communications, deployment and maintenance of cellular mobile networks are becoming more and more complex, time consuming, and expensive. To meet the requirements of network operators and service providers, Self Organizing Network (SON), such as self- configuration, self-planning, self-optimization and self-healing are defined [2]. In the SON-based LTE system, each eNB can set the optimal parameter autonomously. There is an main function called Mobility Load Balancing (MLB) in SON. The concurrent users increase sharply, the system may reach their performance bottleneck and no longer provide the required Quality of Service (QoS). A general procedure for addressing this problem is to assign the workload among multiple networked servers. The principle of MLB is adapting the handover region to shift cell-edge User Equipments (UEs) from heavy load cells to light load neighboring cells. Accordingly, the resource utilization ratio can be increased effectively. Another important function in SON is called Mobility Robustness Optimization (MRO). After identifying the handover problems by gathering the information of UEs in a certain interval, MRO functions. According to references the impact of Time to Trigger (TTT) for different speed of UEs on performance is investigated, and can set different TTT for corresponding speed of UEs in the first step of HPACA. Point out that the context of hysteresis parameter denoted as H is important for the handover performance which is influenced by TTT. Thus, H is not invariably and adjusting the H in the same time in HPACA. In HPACA, adjustment of TTT considering of the UEs' moving speed. Generally, the adjustment of TTT may affect H. And then, various TTT and H will affect the set of C, the handover range of MLB should be affected.In HPACA, the handover range of MLB is not a tight value any more. Result shows , MLB can work more effectively to solve the network congestion problem for the dynamic handover range of MLB the resource utilization rate can be increased.
For more specific aspect, the main benefits of introducing SON functions in cellular networks are given as follows.

(i) Decreased installation time and costs.

(ii) Decreased OPEX due to reductions in manual efforts in connection with monitoring, optimizing, diagnosing, and healing of the network.

(iii) Decreased CAPEX due to more optimized use of network elements

(iv) Improved user experience.

(v) Improved network performance.

Self-optimization functions:

Every base station contains hundreds of configuration parameters that control various condition of the cell site. Each of these can be altered to change network behavior, based on observations of both the base station and measurements at the mobile station or handset. One of the first SON features establishes neighbor relations automatically, while others optimize random access parameters or mobility robustness in terms of handover

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oscillations. A very descriptive use case is the automatic switch-off of a percent of base stations during the night hours. The adjoining base station would then re-configure their parameters in order to keep the entire area covered by signal.

II.BACKROUND

Mobility Load Balancing (MLB):

MLB is part of the self-organizing network concept, which was introduced in LTE. By applying MLB in the network, rise in terms of higher network performance and a decreasing number of unsatisfied users are the optimization goal. This is assumed to be achieved by reducing highly loaded cells in the network. Usually the MLB monitors the cell load values and tries to allot the traffic of highly loaded cells among less loaded neighbouring cells in the network. This can be done by adjusting the (virtual) cell borders, e.g. adding a cell individual offset which will be taken into deliberation for handover decisions, or changing the transmit power of the cell. By doing this the area of highly loaded cells shall be made smaller, where on the other hand the area of less loaded cells will be enlarged. One outstanding example for SON algorithms is, which as already indicated, the so-called mobility load balancing (MLB). This algorithm will be alleged to reduce the amount of overloaded cells and by that means increase the network throughput and decrease the number of unsatisfied users. The algorithm is commonly simulated and evaluated based on simple simulation assumptions. Current inspection on the necessary degree of complexity in SON system level simulations have shown that the scenario has a compelling impact on the resulting performance.

Mobility Robustness Optimization (MRO):

Mobility management in LTE cover two types of procedures: idle mode and connected mode. Idle mode1 strategy include selection and reselection procedure of the unique serving cell, maintenance of tracking area registration and transitioning to connected mode. Connected mode (handover) methods in LTE. The handover procedure includes the connection of the UE between a source cell and target cell. The UE when it detects that radio quality conditions satisfy the “A3 event” entering condition, further defined below, begin the handover procedure by sending a Measurement Report (MR) in the Physical Uplink which Control (PUCCH/PUSCH) channel to the source cell. The source cell gives the report and makes a vendor-proprietary decision to request a handover from the target cell. It ultimately responds with a Handover Command carried in the PDSCH channel. The curtail time between the reception of the measurement report and the transmission of the Handover Command is enough that it only makes a small difference in the overall failure rate of handovers. A Handover Complete command will be sent by the UE to signal the successful cell change.

Conflict Avoidance Method (CAM)

The conflict is caused by the improper operation of handover parameters, this situation may happen when MLB and MRO are adjusting the same handover parameters in opposite directions and the corresponding conflict has been discussed in 3GPP standardization. To solve this conflict, CAM has been proposed.

III. PRINCIPLE OF HPACA

MLB should be maintain when it finds the traffic load which is higher than 90% and adjusts handover range by changing C to migrate the load from its cell to the neighboring cells. MRO aims at the minimizing of radio link failure and ping-pong handovers through optimizing parameters automatically. MRO should be adopted when it detects equal or more than two times radio link failures which are caused by erringly operation of MLB in 200 s, or more than two times ping-pong handovers in 50 s. HPACA target on the handover operation of MLB. Take a dynamic adjustment of TTT, H and C for various speed of UEs rather of using a fixed TTT, H and C for all the UEs. Therefore, the handover range of HPACA is adaptive giving to the UEs’ speed. Comparing with CAM, the most different considered factors in HPACA is the speed of UEs. The speed will be affecting values of TTT and H and in turn the handover range. The improvement of system performance effectively, set the handover range dynamically for different UEs. Setting up different TTT for various speed of UEs can reduce radio link failure ratio and ping-pong ratio, and thus should change the values of TTT for UEs in diverse speed. According to 3GPP, the change of TTT can be set as follows: 0 ms, 40 ms, 64 ms, 80 ms, 100 ms, 128 ms, 160 ms, 256 ms, 320 ms, 480 ms, 512 ms, 640 ms, 1 024 ms, 1 280 ms, 2 560 ms, 5 120 ms. So the exact elect values according to UEs’ speed are in these 16 values

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IV. PERFORMANCE EVALUATION

In the order to show the simulation results clear and definite, introduce the definitions of metrics:

1) Call blocking ratio (CBR)

The Total accepted calls defines the total number of calls which are accepted by eNBs in the simulation time. The Blocked callsdefines the number of calls which are not accepted by eNBs for the restriction of resource blocks.

$$\text{CBR} = \frac{\text{Blocked Calls}}{\text{Total Accepted Calls}}$$

2) Radio link failure ratio (RLF)

The Amount of Failed HOs gives the number of failed handovers which causes by received signal power is too low, or there have no enough resource blocks after the handover triggering or other reasons in the simulation time. The Amount of Total Triggered HOs means the total number of handovers which gets triggered by eNBs in the simulation time.

$$RLF = \frac{Amount\ of\ failed\ HO}{Amount\ of\ total\ triggered\ HO}$$

3) Ping-pong handover ratio

The ping-pong handover defines in two different situations. The first is that a second handover happens immediately after the finalization of the first handover. The second is defined as that the finalization time between two handovers is less than 1 s.

$$Ratio_{ping-pong} = \frac{Number\ of\ ping\ pong\ handover}{Number\ of\ Initiated\ handover}$$

In the previous part, we can get the exact setting of TTT according to the UEs' speed. Thus,it can get the proper setting of HOP after the calculation of HP. It can get the exact *H* according to the setting of TTT andthe calculation of HP. Because the value of TTT is alterable, so it can regard the most TTT as the TTT value to choose and get the exact setting of *H*.

V. RESULT AND DISCUSSION

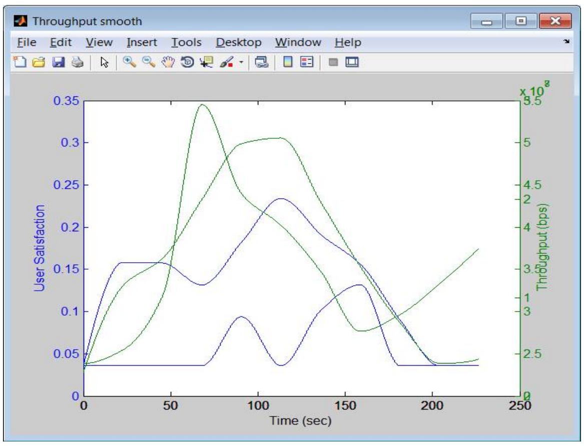

Fig. 1 Simulation time vs Throughput

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Figure 1 shows the obtain results are clearing that according to user satisfaction throughput varies. According to number of users and UE speed the various ratios varies in methods and best results given by HPACA technique

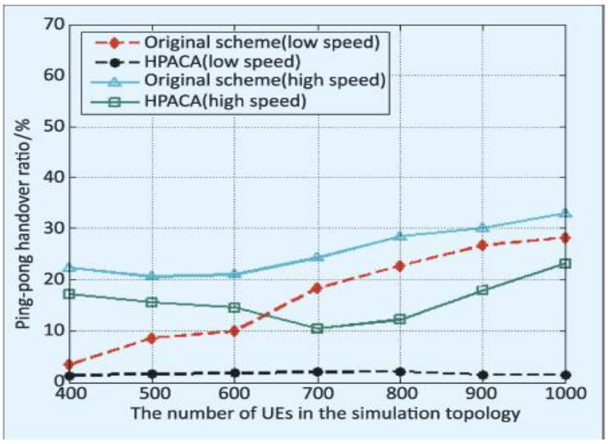

Fig. 2 The no. Of UEs in simulation topology vs Ping pong handover ratio

Figure 2 shows how the results are differing from the defining methods. The operating range also plays vital role in this technique, call selection procedure used for better performance statistics. The following are some conventional effects on parameters

- Network resource should be relieved more effectively in HPACA. Therefore, the call blocking ratio of HPACA obvious lower than that of CAM
- Especially when the UEs are in low speed, the ping-pong handover ratio much reduced in HPACA

VI.CONCLUSION

The difference between current work and the existing conflict avoidance methods is that changing the operation range of MLB dynamically according to the UEs' speed. The simulation results validate that HPACA improves the system performance in terms of throughput, call blocking , ping-pong handover ratio and radio link failure ratio

REFERENCES

[1] HU Honglin, Zhang Jian, Zheng Xiaoping, "Self-Configuration and Self-Optimization for LTE Networks [J]", IEEE Communication Magazine, 48(2): 94-100, 2009

[2] Deng Yunhua, LAU R W H, "On Delay Adjustment for Dynamic Load Balancing in Distributed Virtual Environments [J]", IEEE Transactions on Visualization and Computer Graphics, 18(4): 529-537,2012

[3] Nasri R, Altman Z, "Handover Adaptation for Dynamic Load Balancing in 3GPP Long Term Evolution System", Proceedings of the International Conference on Advances in Mobile Computing & Multimedia, Jakarta, Indonesia: 145-153,2007

[4] Konstantinou I, Tsoumakos D, Koziris N, "Fast and Cost-Effective Online Load-Balancing in Distributed Range-Queriable Systems [J]", IEEE Transactions on Parallel and Distributed Systems, 22(8): 1350-1364,2011

[5] Tian Wenhong, Zhao Yong, Zhong Yuanliang, "Dynamic and Integrated Load-Balancing Scheduling Algorithm for Cloud Data Centers [J]", China Communications, 8(6): 117-126, 2011

[6] Rodoguez J, Bandera I D L, Munoz P, "Load Balancing in a Realistic Urban Scenario for LTE Networks", Proceedings of the 73rd Vehicular Technology Conference, Budapest, Hungary: 1-5,2011

[7] Kim H, Veciana G D, Yang Xiangying, "Distributed a -Optimal User Association and Cell Load Balancing in Wireless Networks [J]", IEEE/ACM Transactions on Networking, 20(1): 177-190,2012

[8] Lee Y, Shin B, Lim J, "Effects of Time-to-Trigger Parameter on Handover Performance in SON-Based LTE Systems", Proceedings of the 16th Asia-Pacific Conference on Communications, Auckland, New Zealand: 492-296, 2010

[9] LV Weihao, LI Wenjing, Zhang Heng, "Distributed Mobility Load Balancing with RRM in LTE", Proceedings of the 2010 3rd IEEE International Conference on Broadband Network and Multimedia Technology, Beijing, China: 457-461, 2010

[10] Nihtila T, Turkka J, Viering I, "Performance of LTE Self-Optimizing Networks Uplink Load Balancing", Proceedings of the 73rd Vehicular Technology Conference, Budapest, Hungary: 1-5,2011

[11] Lobinger A, Stefanski S, Jansen T, "Load Balancing in Downlink LTE Self-Optimizing Networks[C]", Proceedings of the 71st IEEE Vehicular Technology Conference, Taipei, Taiwan: 1-5, 2011

[12] LI Zhihang, Wang Hao, Pan Zhiwen, "Joint Optimization on Load Balancing and Network Load in 3GPP LTE Multi-cell Networks", Proceedings of the 2011 International Conference on Wireless Communications and Signal Processing, Nanjing, China: 1-5.,2011,

[13] 3rd Generation Partnership Project. TR 25.913, V7.3.0, Technical Specification Group Radio Access Network, Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN) (Release 7) [S], 2006.