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Self-Organizing Network Based Handover Mechanism for LTE Networks

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Abstract:
Self-Organizing Network (SON) system made out of three segments of self-configuring, self optimization and self-healing which can relegate to enhance the deed of the edge broadband system, for example, the Long Term Evolution (LTE) systems. The purpose of this break down is to propose a self-sorting out handover subprogram observational On the Self-Organizing Network (SON) imagined for LTE arrange. The recreation situation and investigation on the execution of the Projected SON-based handover was extradited utilizing the QualNet Software. The two principle handover parameters that have been qualified are the Hysteresis (Hys) and Time-To-Trigger (TTT). The continuation of the recreation demonstrates the system execution is to enhance the in this manner advancing the Hys and TTT dissolution of the handover Parameters. In for the most part the LTE organize indicates obvious development in the system throughput and little system Delay. In the interim the transmission control alters the qualities in the base station to give the spin-off development in the system throughput and system conveyance delay. This approach will be advantageous to future research fill in as The float in the correspondence innovations are continually changing Quickly and the self-oversee component will wind up noticeably basic for the system administrators.

Keywords: Handover mechanism, hysteresis, LTE, SON, time-to-trigger.

I. INTRODUCTION

In the quick progression in portable broadband advancements, the organization and support of cell systems, for example, LTE-based femtocell systems are ending up noticeably more perplexing, tedious and costly as well. Keeping in mind the end goal to take care of such incredible demand, arrange administrators and specialists are actualizing the Self-Organizing Network (SON) instrument for their support and operation administration. The SON system contains three Parts of self-configuring, self-optimization and self healing. Self-configuration setup instrument is the capacity to design naturally a recently conveyed station to accomplish the essential fundamental arrangement for system operation. While, the self-optimize is the procedure where the User Equipment (UE) and the base station (enB) estimations can be utilized to consequently enhance the system operations.

The self-healing alludes to the capacity of the system to distinguish blame, analyze blame and perform blame recuperation. The goal of this review is to actualize the handover component with the appropriate HO parameters that duplicate the self-improvement elements of the SON. A situation was made to recreate the HO circumstance. By making the proper changes with two HO parameters to be specific; Hysteresis (Hys) and Time-To-Trigger (TTT) parameter, meanwhile the HO execution and the network execution were recorded. The underlying parameters were set to a specific qualities and the network execution was watched for examination with the situation after the streamlining stage. SON approach is prescribed in light of the fact that can limit the network administrator operational use. SON essentially actualize self-benefit operation which does not requires additionally arrange administrator mediation once the user's establishment and configuration finished. It gives new wireless network condition with enhanced nature of network administrations. SON gives three self administrations which are Self-Configuration, Self-Optimization and Self-Healing. With Self-Configure, SON should identify and gather information from the close-by base station and performed self upgrading without the intercession of the client or specialist organization. On the off chance that there is blunder or breakdown, SON Self-Healing capacity might play out the investigating and self-recuperation activities without debasing the network services. The SON self-optimize idea has been adjusted as our proposed answer for beat handover issues in LTE networks. By embracing the Self-Organizing Network (SON) highlight, the LTE handover administration for the serving cell and the neighboring cell can be optimized. These improvements were imperative so as to limit HO disappointment rate. HO handle in LTE can be seen through the Eventa3. Eventa3 is characterized as the activating occasion when a neighboring cell counterbalance turns out to be superior to the serving cell.

The parameters that characterize trigger include: a3offset, Hysteresis (Hys) and Time-To-Trigger (TTT) values. The part of a3offset is to ensure the serving cell look superior to its present measurement in comparison to neighboring cell. In the interim Hysteresisa3 part is to make the measured neighboring cell look worse than measured to ensure it is truly strong before the User Equipment (UE) decides to send a measurement answer to start a HO. Time-To-Trigger's part is to maintain a strategic distance from HO ping-pong impact.

There are three methods for optimizing HO in LTE by means of: 1) by altering the parameter a3offset and hyeresista3. 2) By changing the parameter Time-To-Trigger and 3) by altering the parameter channel coefficient for eventa3. An alteration in Eventa3 parameter may prompts an effective or disappointment in HO handle. When sending radio flag falls flat and being recognized by UE, it considers that as HO

disappointment has happens. At the point when those happen the UE will chooses the phone to be reconnected either back to the serving cell or to other closest neighboring cells.

In LTE, there are three instances of HO sorts to be specific; Too Early HO, Too Late HO and Ping-Pong HO. In Too Early HO case, the estimation of TTT is low and causes the connection association between the UE and the objective cell come up short. After distinguished the disappointment, UE will reconnect to the serving cell. The inverse of Too Early HO, the Too Late HO happens due to the high estimation of TTT. The eventa3 in serving cell trigger late and causes the HO disappointment. UE will reconnect to the objective cell. While the Ping-Pong HO happens when the UE precedes onward the edge of enB and causes pointless HO amongst serving and focusing on cell and the other way around.

II.RELATED WORK

A couple of methods have been concentrated to fathom the HO issues. In the primary instance of HO issues [5], an early reenactment testing was finished by utilizing Hata Path Loss Model to test the downlink flag intentionally to decrease the HO disappointment rate on account of the HO was performed too early or too late. The result from the testing procedure, an arrangement of threshold esteem is set as a guide for estimation answer to trigger flag to the base station whether the HO procedure should be performed or not [8]. On the off chance that the serving cell is over-burden, the flag can be exchanged to the close-by abandoned neighboring cell. A bit distinction for second case [6], a calculation called XSOM was utilized to imitate the SON strategy.

The calculation permits the eNB to take in nature of HO and after that play out the HO procedure at the point when important without anyone else's input. The handover optimization brings about increment in operational endeavors and multifaceted nature of the network [9] .For optimization of Handover component in LTE network, Handover prediction is one of the successful techniques [10]. The cross-layer optimization and mobility prediction are procedures to accomplish quick and consistent handover in LTE network [11].

LTE framework handover execution can be enhanced by Handover Parameter Optimization (HPO) [12]. Load Balancing (LB) is a system that enhances the client's fulfillment. LB may bring about the expansion of the recurrence of inter-cell handover and thus increment the likelihood of handover issues prompting lessening in handover execution. Additionally, the systems to enhance both LB and HPO don't consider the network permitted greatest radio link failure (RLF) proportion. Radio link failure would build the likelihood of call dropping.

The dynamic hysteresis-adjusting (DHA) technique can be utilized to enhance handover execution and number of fulfilled clients in LTE networks. From the work carried out in the past it is observed that most of the concentration is done on handover optimization, handover failure rates, load balancing in handover optimization. This addresses the problems of differentiating network throughput and network delivery delay performances. Hence, proposed work in this paper uses to show the network throughput performance and network delivery delay performance with different transmission power.

III. ALGORITHM

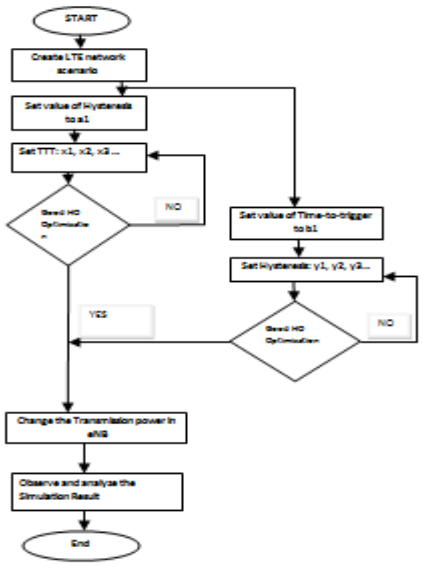

Figure.1. HO algorithm

The way toward improving the Eventa3 parameters is talked about. Figure demonstrates the proposed SON-based HO advancement calculation. This algorithm comprises of Hysteresisa3 (Hys) was fixed to 4db while the values of Time-To-Trigger (TTT) were set at 320ms. The simulations were repeated with different values of transmission power 23db until the value reached 46db. Finally, all the recorded results were analyzed to evaluate the LTE network performance in terms of throughput and delay when the handover parameters were being optimized. The underlying consequence of the HO execution is utilized as the rule to decide the best advanced HO parameters. The reasonable for behind this is the advancement esteem was set by the suggested enhancement rules:

1. A3offset esteem ought to dependably be bigger than Hys so UE should performed HO with Reference Signal Receive Power (RSRP) cell at equivalent to RSRP estimation of its serving cell.

2. Guarantee that a3offset esteem is bigger than Hys incentive to abstain from Ping-Pong HO.

3. Higher estimation of a3offset + Hys the more calls was drag to neighboring cell. This is exceptionally valuable since scope openings exist in system.

4. On the off chance that the quantity of LTE cell is vast in situation then the littler estimation of a3offset + Hys discharges the calls to neighboring cells quicker.

5. HO process is much hard to perform when estimation of a3offset + Hys is higher.

The a3offset esteem was set as settled esteem so that the contrasts amongst prior and then afterward advance can be plainly observed. In this way, just the estimation of Hys was changed in addition to the alteration of the TTT esteem. TTT adjustment was exceedingly subject to the estimation of a3offset + Hys.

IV. IMPLEMENTATION AND RESULTS

A. Recreation Scenario :

The above HO improvement has been contemplated by utilizing recreation situation that comprises of 7 radio cells composed for 3 base stations site inside the region of 1.5km x 1.5km. Fig demonstrates the LTE network recreation situation created by utilizing the QualNet network test system.

Node 1 is their SGWMME hub. SGWMME is the mix hub between the Serving Gateway (SGW) and Portability Management Entity (MME). SGW should forward the information that originated from base station and bundle information network portal. MME is utilized to control the abnormal state operation such as picking the privilege SGW for the UE and confirming them. MME additionally capable to control the portability between the LTE networks with different get to networks.

Node 2, Node 3 and Node 4 are eNB1, eNB2 and eNB3 separately that speak to the base station. In the mean time hub 6 is their core network (CN). The reason for CN is to speak with the outside world network through their parcel information network. Web, private corporate network and so forth are the case of the parcel information network of outside world.

As they approach eNB1, all UEs make radio association with base station as all UEs have a steady association with eNB1 as all are still in the eNB1 network scope. Be that as it may, in the wake of meandering far from the eNB1 station, the UE begins to lose the network scope. Right now, a UE estimation report has been sent to the closest cells all together to permit HO prepare. After the affirmation between the objective cell and the UE, all UEs begin to discharge their association and play out the HO procedure at various incredibly nearer to their objective base station. And set the LTE configuration settings.

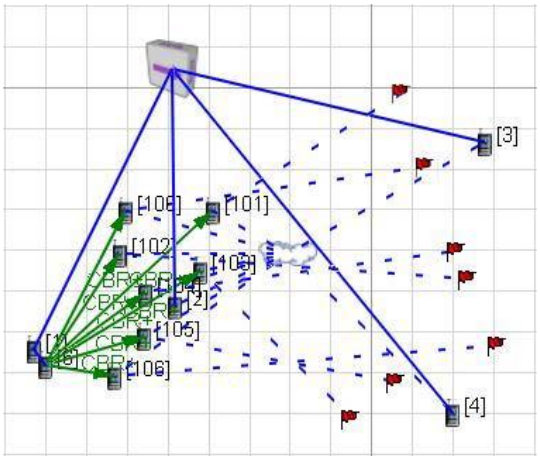

Figure.2. LTE Simulation Scenario

B. Re-enactment Scenario Result

The consequences of the HO reproduction performances were broke down also, described about in detail. The network performances were measured in term of network throughput and network delivery delay. Network throughput is measured in Kbits per second. The network throughput is the whole of the data rates that are conveyed to all eNB nodes or base station in a network.

In the interim the network convey delay performance is to look over the delivery delay rate when information was being sent to base station amid the correspondence. In the event that the delivery delay rate is high it implies that the network is in congested state. A jitter mean jitter is the variety in the time between bundles arriving, brought about by network clog, timing float, or course changes. So the network delivery delay assumes an essential part to decide the network jitter as the lower delivery delay rate, less network jitter happen.

With the modifying value of Transmission Power concatenate the network throughput performance and delivery delay performances. By default the Transmission power set to the 23dB. As per the transmission power signifies that as lower the transmission power it decreases the network performance value, and increases the packet congestion and traffic while transmitting the data and it also shows delay performance, acknowledgement.

Meanwhile the Transmission power goes on increases it shows less amount of congestion in packet sending. If the Transmission power is at 46dB, then the network performances shows higher tendency and less congestion of packets and each eNBs received and delivered all received data late to next base station at network delivery delay performance.

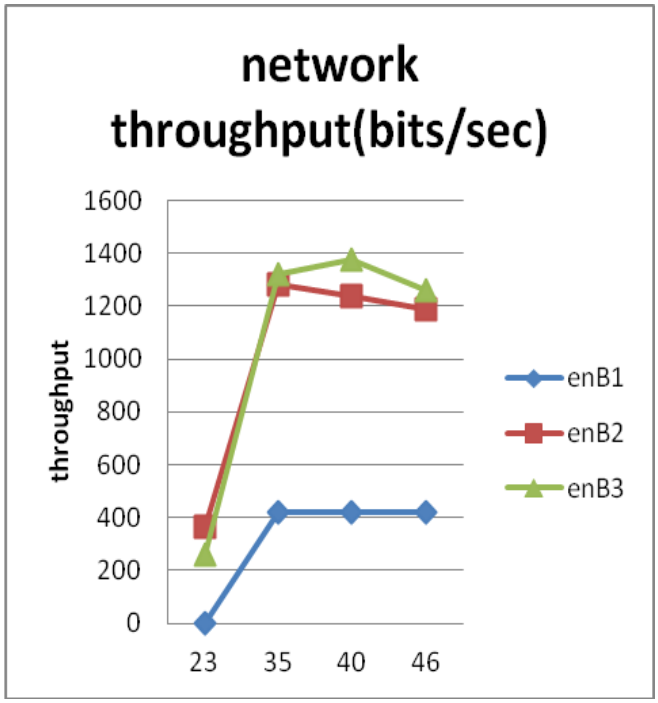

Figure.3. Network throughput with the different values of transmission power and constant hysteresis set at 4dB

From the given above figure with the different values of transmission power and constant hysteresis set at 4dB. As per the power increases the network throughput increases in the base station. At all observation of the different values of transmission power enB3 is the accurate for increasing in the network throughput. Based on the graph, the network throughput started to increase significantly from the benchmarking point at each base station perspective. Even though there is less increment at enB1. But there is tremendous increment seen at enB2 and enB3. For starting, all UEs were attached at enB1 makes the network throughput at enB1 is higher compared to enB2 and enB. As per the UE performed handover mechanism with their respective base station, the traffic at enB2 and enB3 are less congested and gives higher network performances.

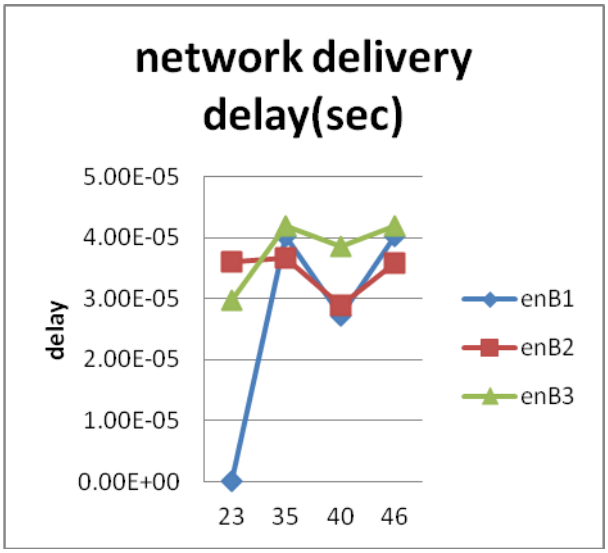

Figure.4. Network delivery delay with the different values of transmission power and constant hysteresis set at 4dB

From the given above figure with the different values of transmission power and constant hysteresis set at 4dB. As per the power increases the network delivery delay provides in the smaller amount of packet delivery delay. Here enB1is the accurate performance delivery delays. When hysteresis parameter value is fixed, Compared to the initial delivery delay, each eNBs received and delivered all receives data late to next base station. The network delivery delay rate decreases, which is worst base station trigger the handover procedure late even though all the handover mechanism were successful.

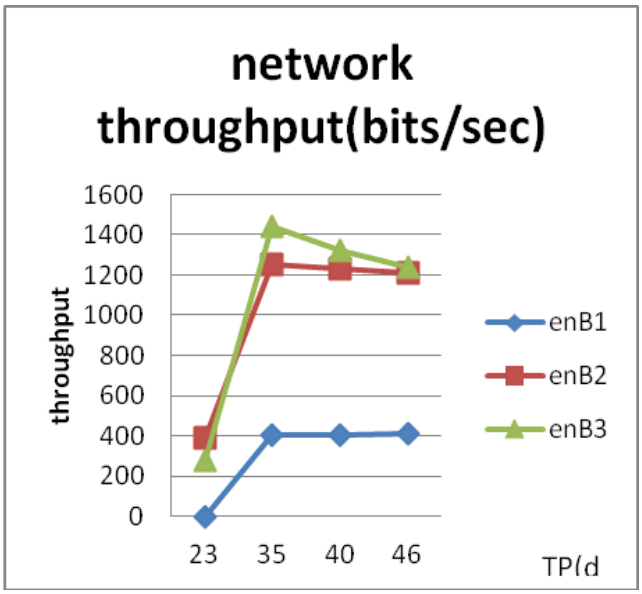

Figure.5. Network throughput with the different values of Transmission power and constant time to trigger set at 320ms.

From the given above figure with the different values of transmission power and constant time to trigger set at 320ms. As per the power increases, meanwhile the network throughput shows minimal increases with less congestion of packets. Here enB2 is the appropriate best network throughput performance in the enactment of transmission power. When the TTT setting approaches benchmark, the targeting RSRP enB is weak and difficult to perform HO procedure but fortunately all UEs still manages handover procedures at base station.

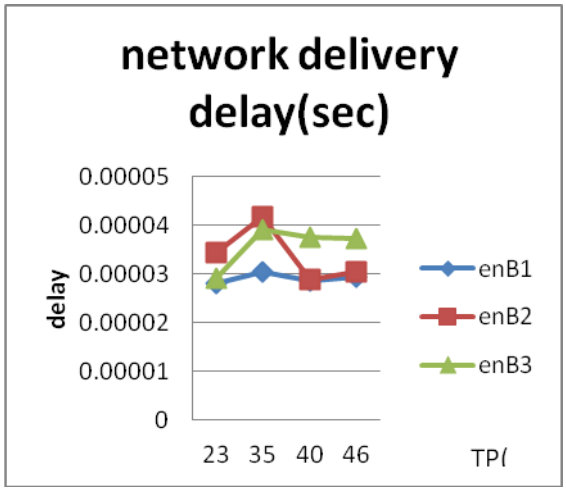

Figure.6. Network delivery delay with the distinctive estimations of transmission power and consistent time to trigger set at 320ms.

From the given above figure with the distinctive estimations of transmission power and consistent time to trigger set at 320ms. According to the power builds the network delivery delay will decrements with fewer blockages of packets. Compared to the initial delivery delay, each eNBs received and delivered all basically receives data around the same time to next base station. For small TTT value, the network delivery delay rate is not shown much difference, which is good to indicate the base station triggers the handover mechanism evenly around a little difference of time delivered.

V. CONCLUSION

This paper has exhibited the execution assessment of the proposed LTE HO algorithm with various setting of Hys and TTT parameters esteem keeping in mind the end goal to repeat the component of SON. Since proper HO parameters setting are vital for good system exhibitions, different estimations of Hysreresisa3 and Time-To-Trigger have been assessed to recognize the best ideal handover parameters esteem with the different transmission power. The proposed HO algorithm with streamlined parameter setting can enhance the network performances as far as higher throughput and limiting the system delay. In This for future suggestion, rather than utilizing one component of SON which is self-Healing, use different components of SON for the better performances.

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