Mobile Management with Hard-Handoff Criteria

Team 15, Introduction To Wireless Mobile Network (105-2)

謝秉昂（B03901195）, 謝宗宏（B02608032）, 許秉鈞 (B03901023)

I. ABSTRACT

Handover is the component that exchanges a continuous starting with one cell then onto the next as a client travels through the scope range of a cellular framework. As littler cells are deployed to meet the requests for expanded limit, the quantity of cell limit intersections increments. In this report, we will discuss some phenomena happening during handover. Firstly, we will do some experiment to explore some phenomena. Secondly, we'll try to visualize it with plots in differnt scenario. Thirdly, we'll observe this results and give reasonable explanation to fit the real world situation.Moreover, we also read some paper realted to handover. The knowledge learn by those paper will also help us gain some insight. Last, we'll make some conclusions about the work we have done in this project.

II. INTRODUCTION

One of the most handoff administration issues is introduced by the utilization of various path loss models. Our main idea is that considering different factors in handoff criteria, and use different criteria to see the results of handoff and illustrate it with plots. we've also tried to gain some insight of these simulations. If the threshold of

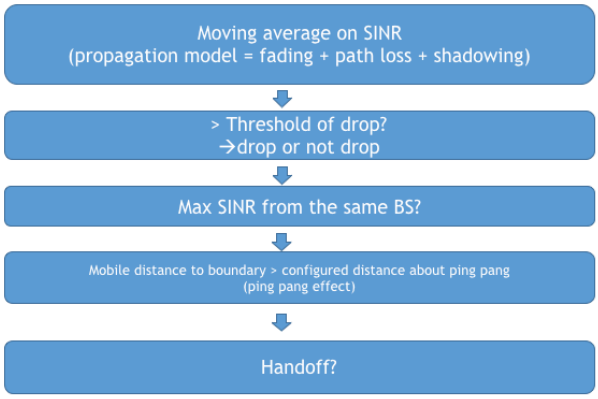

Fig. 1. Our handover machanism

drop become higher, the users drop timing will be bigger, and the sum of both will result in the number of handover events become fewer, which is what we expected.
For the possible handoff criteria, the factors are listed below:

1) signal
2) SINR
3) δ in ping pong effect
4) samples of observation(due to fading effect)

In short, We designed three criteria based on different factors and compare its performance.

III. RELATED WORK

The need to start handoff emerges when the signal of the serving base station decays underneath the threshold value. This handoff administration scheme embraces a hard handoff, which adaptively control the handoff time as indicated by the load status of cells[1]. The displayed scheme supports better administration quality for various sort of systems utilizing different calculations. In a wireless mobile communication system, mobiles moving around the service area require communication services as a remote association. In this communication system, the coverage area is partitioned into littler locales (cells) to permit the reuse of the frequency spectrum to expand the total network capacity. The total network capacity with great quality (and with minimum noise) is constantly attractive, frequencies utilized as a part of one cell group can be reused in different cells[1]. Every cell is controlled by its own transmitter and receiver to serve the mobiles inside its range. The choice to start a handover relies on upon various control factors. The estimation of received signal strength must be found the averaged value of after some time to remove the quick flucthations due to the so-called multipath propagation. Averaging windows change in their shape and length, where the received signal is excessively feeble or is perilously close, making it impossible to winding up noticeably excessively weak, and then handover is required. Thus, we must ask the following questions:

- Does a user get admitted?
- Does a call get prematurely terminated?
- How many handovers are made, and are they necessary to meet the quality of service?
- How far into the coverage area of another cell does a user drift?
- What is the duration of service interruption during a handover?

A threshold level may give a trigger to start a handover, keeping a client from bouncing forward and backward between two base stations is another important issue in handover calculation outline.

IV. EXPERIMENTS

The mobile devices moves in a fixed speed, every random period of time, they will randomly change the direction of movement. Since in the simulation process, mobile devices movements are random, in order to reduce the single experimental error, our experiments are repeated using a same set of parameters, so that the noise could be averaged.

A. Handoff Threshold

Handoff threshold is the value that when the average SINR is below this value, the handoff process is triggered.

1) Dropout decreases as the handoff threshold rises, since the earlier the handoff process starts, the more sufficient the time it has to finish the process. And the ping-pong effect can be observed increasing while the threshold rises.
2) Handoff threshold is expected to increase handoff and ping-pong (infinite Handoff threshold means that mobile device will always try to connect to the largest SINR base station)

Initially we set the experiment only with the handoff threshold = 10^{-10} to 10^{-5}. And the result seems like a random distribution, and then we redo the experiments and test to 10^{-1} we found threshold on the ping-pong and handoff actually happens. There is a significant change from the beginning of the threshold = 0.001, which may indicates that on the basis of this simulation setting, at the SINR order of the value = 0.001, it is a better value to distinguish between those who should handoff. Above this value, a large number of ping enough, no matter what the SINR difference is.

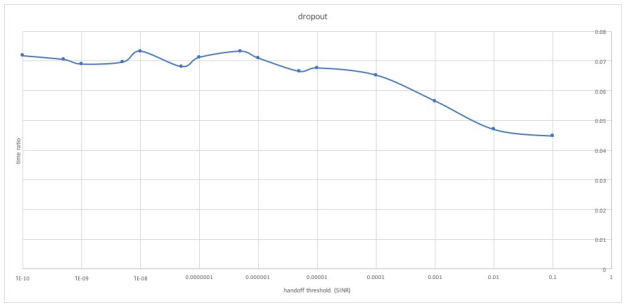

Fig. 2. Handoff Threshold - Dropout

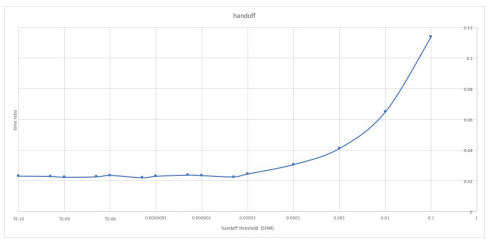

Fig. 3. Handoff Threshold - Handoff

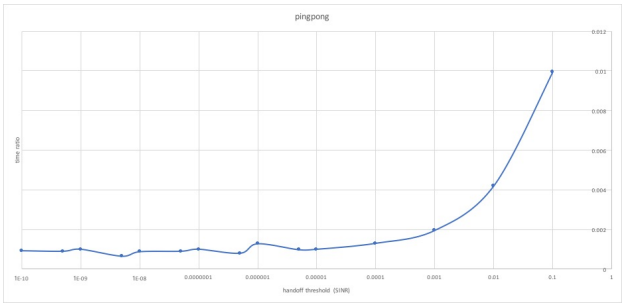

Fig. 4. Handoff Threshold - Pingpong

B. Mobility

The three values increase approximately as the mobility increases, which is consistent with the expected number of nodes because the total moving path is longer and the number of base stations passed.

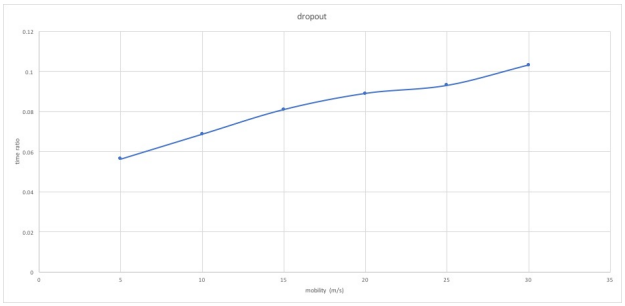

Fig. 5. Mobility - Dropout

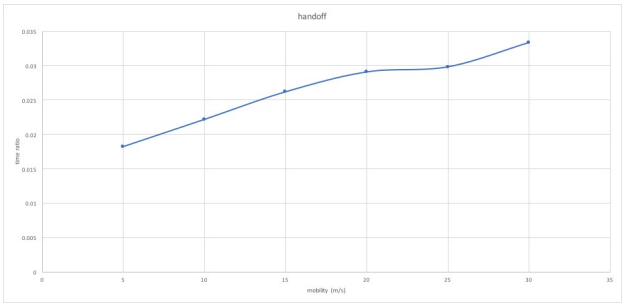

Fig. 6. Mobility - Handoff

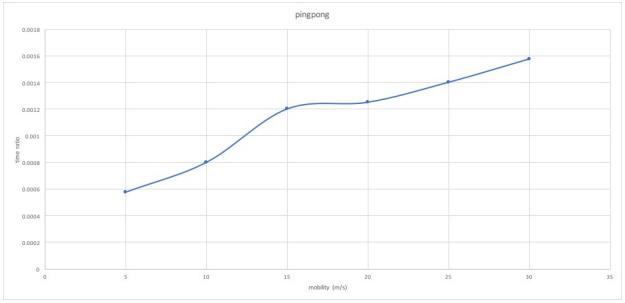

Fig. 7. Mobility - Pingpong

C. Take A Closer Look

If we take those data described above into account, says, those three values of which increase approximately as the mobility increases, which is consistent with the expected number of nodes because the total moving path is longer and the number of base stations passed. We can get the following results. As mentioned above, those simulation

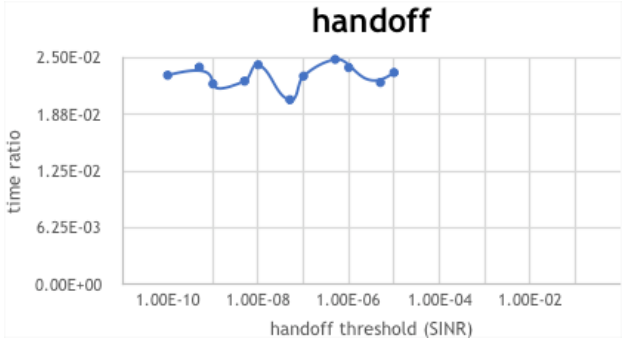

Fig. 8. Mobility - Dropout

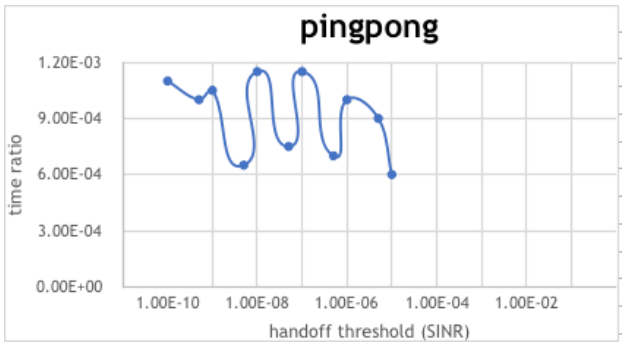

Fig. 9. Mobility - Handoff

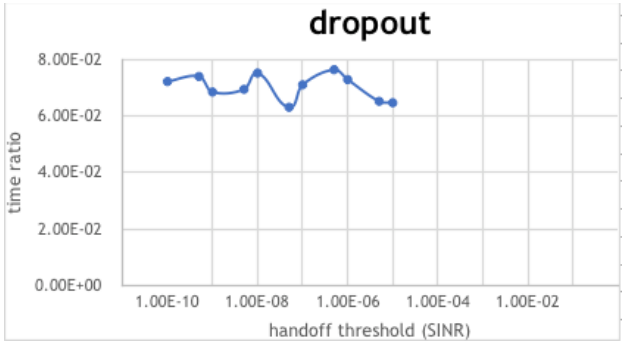

Fig. 10. Mobility - Pingpong

results reflect on the fact that when the threshold value is relatively small, the data will fluctuate in a minuscale.

D. Considering Droptime (Threshold to handover)

This experiment discusses the effect of threshold of drop on drop time, number of handover, and number of reconnection. So, we will talk about three results affected by threshold of drop respectively. Firstly, with threshold of

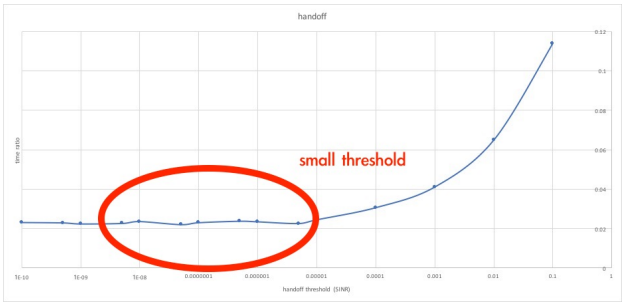

Fig. 11. The handoff result when threshold value is too small.

drop increasing, drop time gradually increase. Especially if in the extreme case which threshold of drop is very high, the drop time will reach an almost maximum point during simulation time. Secondly, as threshold of drop increasing or decreasing, number of handover will accordingly decrease or increasing. So, it should have some trend between this relation. As we can see from the plot, with threshold of drop increasing, number of handover gradually decrease. The reason why this kind of event happened is due to the fact that the drop time for each user is low. Thirdly, not like above two results. As threshold of drop increasing or decreasing, number of handover will not accordingly decrease or increasing. So, it shouldn' t have some trend between this relation.

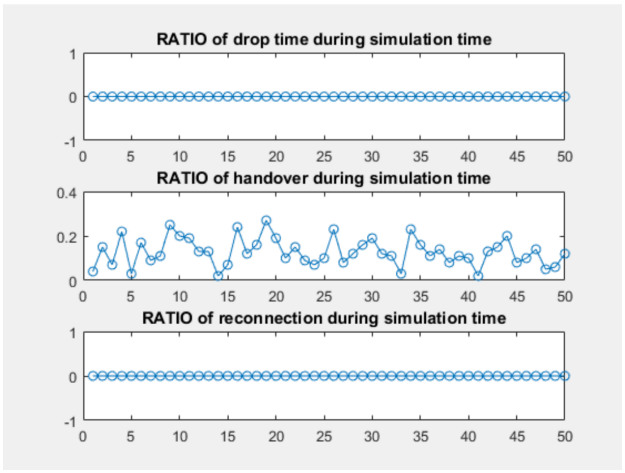

Fig. 12. Threshold to handover: drop threshold is 10^{-8}

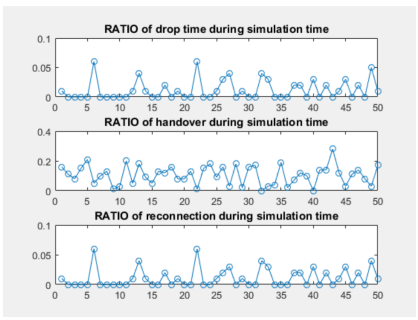

Fig. 13. Threshold to handover: drop threshold is 0.25

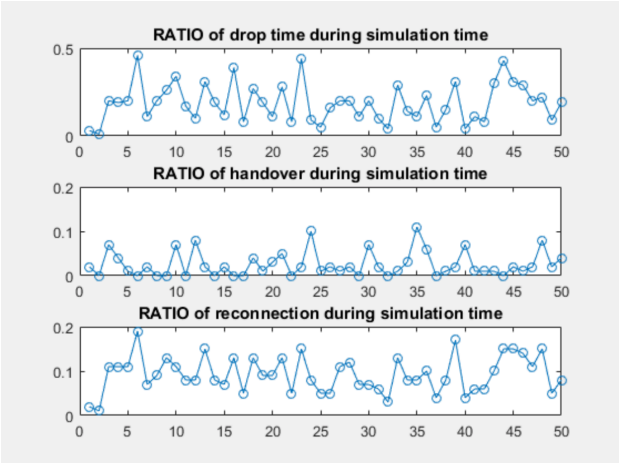

Fig. 14. Threshold to handover: drop threshold is 0.5

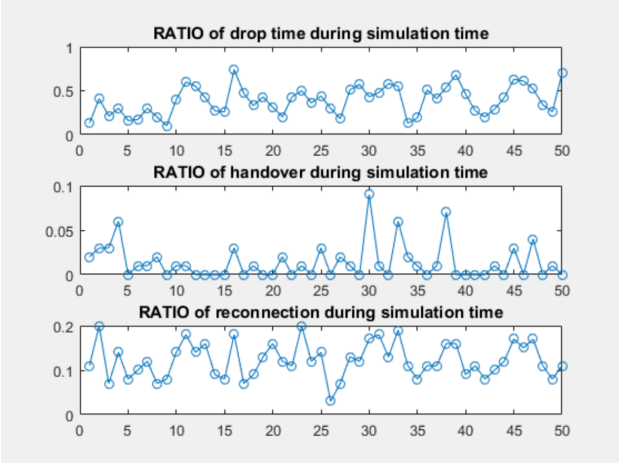

Fig. 15. Threshold to handover: drop threshold is 0.75

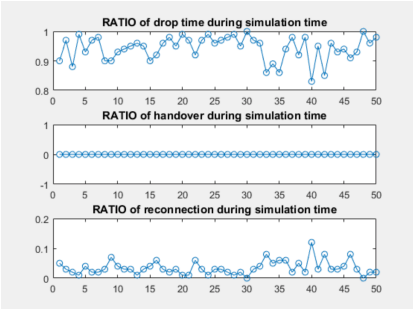

Fig. 16. Threshold to handover: drop threshold is 10

Thus, we will only discuss extreme cases and try to explain it .If in the extreme case which threshold of drop is very low, number of reconnection is almost zero for each user. It' s intuitively to understand, because drop time is almost zero for each user. So, each user doesn' t have any chance to lose its connection to its belonging base station. And, if in the extreme case which threshold of drop is very high, as we can see from the last plot, number of reconnection is very close to zero for each user. But, number of reconnection for each user still have a nonzero value. The condition of nonzero is when user is very close to the base station. The probability of event that user is very close to base station is low, so the number of reconnection is low accordingly.

E. Considering Droptime (Mobility to handover)

It is important to establish a traffic model before analyzing the performance of any mobile cellular radio system. Several traffic models have been proposed by many authors based on different assumptions on user' s distribution in the cell and their mobility. In the end we discuss about the relationship between mobility to handover, the distribution and the ratio of droptime.As we can see form the plots below, the more mobile the user is , the more drop time is , the more number of handover is, the more number of reconnection is.So, from the experiments' results, we can conclude that when user is at a high mobility condition, more issues such as drop time, handover, and reconnection should be taken care of. This situation equals to the situation that when base station' s radius get smaller which is exactly the 5G scenario. In 5G, due to adoption of mmWave, the base station will deployed more densely. So, the results done by this experiment will be more realistic in the future communication community.

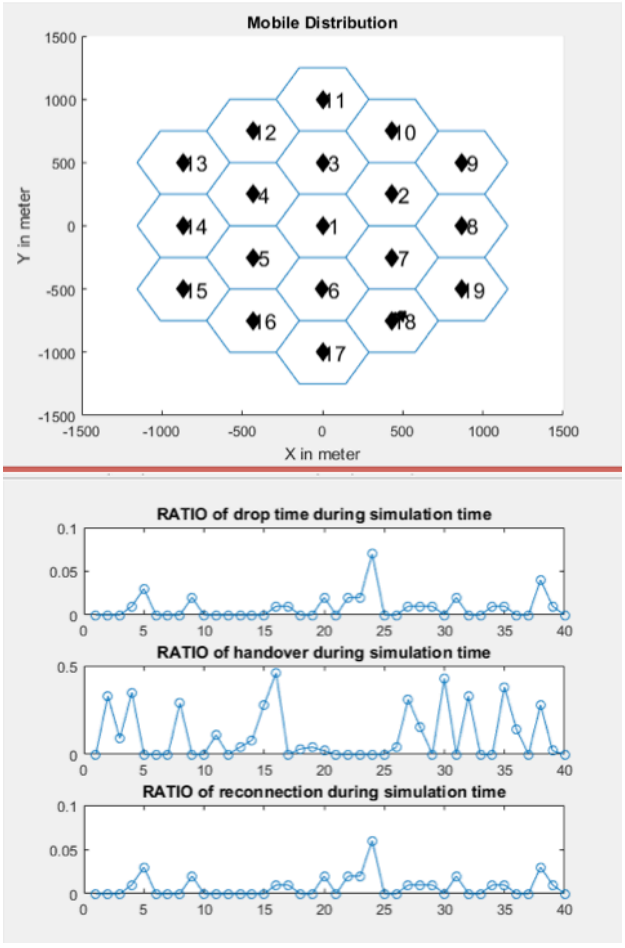

Fig. 17. Mobility to handover, 1st

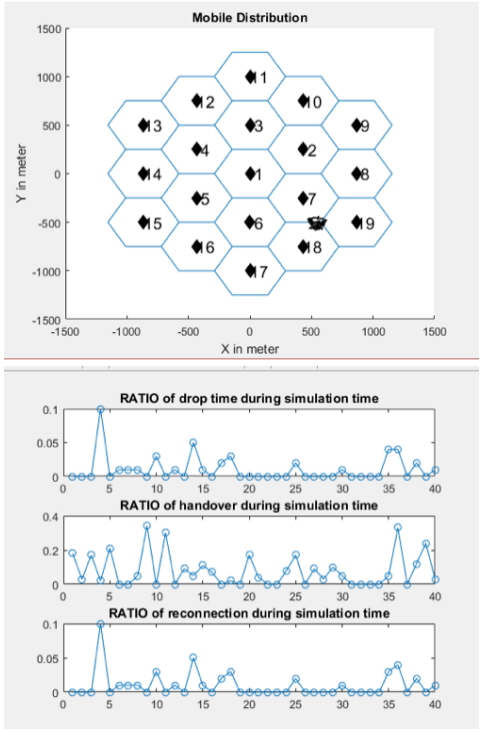

Fig. 18. Mobility to handover, 2nd

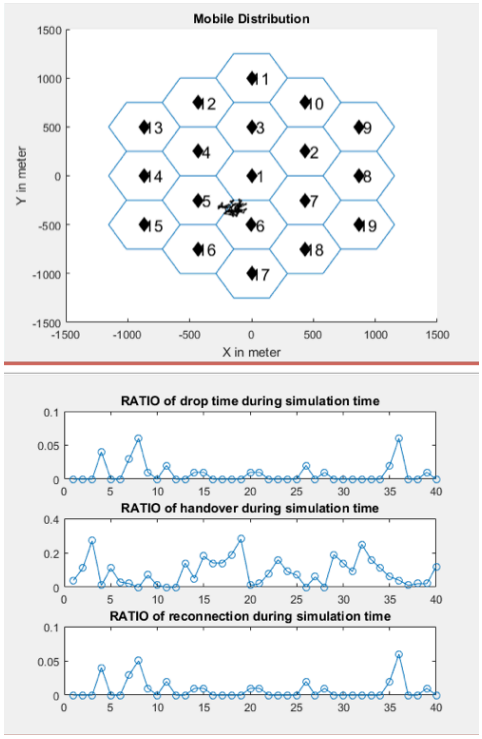

Fig. 19. Mobility to handover, 3rd

The reason why number of reconnection is nonzero value when threshold of drop is extremely high is because user have little chance that it' s very close to base station. The results done by this experiment will be more realistic in the future communication community, just as what we've expected!

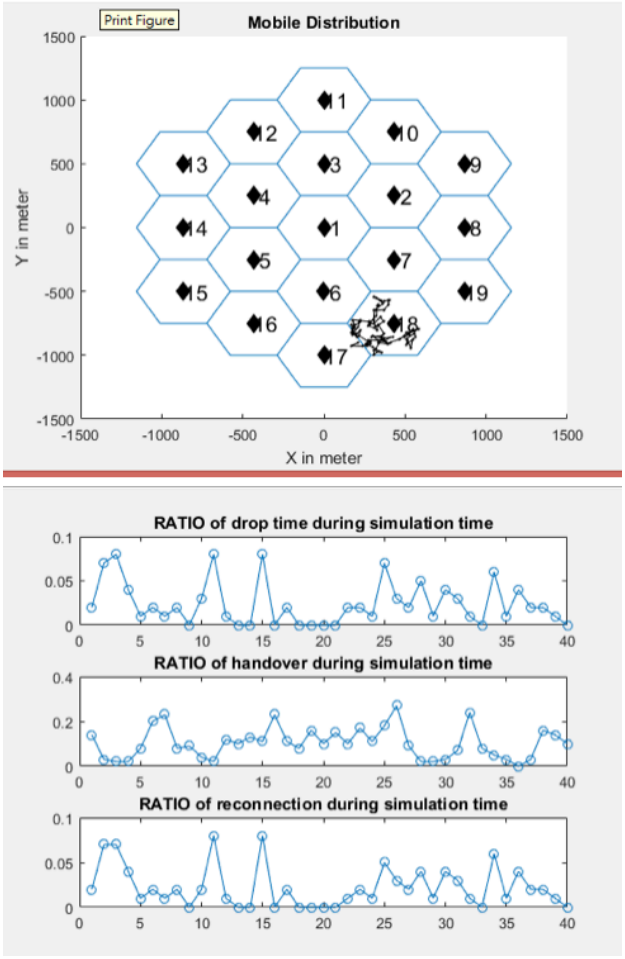

Fig. 20. Mobility to handover, 4th

V. CONCLUSION

A gathering of clients with a huge scope of versatility can access around in the general system creating substantial stream of traffic. Thus, there is a need an appropriate activity driven handoff criteria; with the goal that clients will naturally move from congested cell to enable the system to adjust itself progressively. In the project we got the following sumulation results.

A. Summary

- Drop time and number of handover has trend between threshold of drop
- Number of reconnection doesn' t has trend between threshold of drop
- Number of handover is strongly related to drop time

In brief, The necessity of efficient management of handoff calls for uninterrupted service in cellular mobile communication is discussed in this project.

VI. REFERENCES

[1] Naresh Kumar, *A Robust Handoff Approach for 4G Cellular Networks using MATLAB, 2012*

[2] Er. Gaurav Sharma, Er. Naresh Kumar and Er. Surat Singh, *Handoff Decision Analysis for Modern Heterogeneous Mobile Networks to avoid Ping-Pong, 2012*

[3] GregoryP.Pollhi, Bell CommunicationsResearch, Inc. *Trends in Handover Design, 1996*

[4] Er. Naresh Kumar, Er. Sanjeev Kumar, *A Simple and Robust EVH Algorithm for Modern Mobile Heterogeneous Networks- A MATLAB Approach, 2013*

[5] G. R. Ahmed Jamal*, Tareq U. Ahmed, N. Shahadat, M. F. Islam, Marium B, *Adjusting Blocking Probability of Handoff Calls in Cellular Mobile Communication, 2015*