ANALYSIS THE CHANNEL ALLOCATION FOR REMOVING THE TRAFFIC PROBLEMS FROM THE ROAMING SYSTEMS

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Abstract: *The number of cell user is growing up radically than before because; they have got a comfortable and easy communication facility from modern technological communication like mobile communication. This is happens because roaming system and handoff process makes the world in a hand. For that, by the help of that two systems people can join with the communication field from any position in the world. However, one hand the cell user feels happy for getting benefit from roaming system, on the other hand, traffic fall them in a problem, because it makes the handoff call drop, and so, the people cannot get idle recital from the roaming system. on the other hand the performance of roaming system depend on the number of successful handoff calls, but unsuccessful handoff request happens when there is no available idle channel in the system. Therefore, this research paper has shown by his simulation result, that, reserved channel will effect very positively for more reduce the handoff fall probability, and this study has done this experiment by Reserved Channel Allocation (RCS) and Markov Chain Model.*

Keywords: *Reserved Channel Scheme (RCS), Non-Prioritized Scheme (NPS), Fixed Channel Allocation (FCA), Dynamic Channel allocation, Hybrid Channel Allocation (HCA), Mobile Switching Centre (MSC).*

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1. INTRODUCTION

It is true that, the performance of roaming system depends on the rate of successful handoff call. If the mobile user moves from his current cell to a new cells' area, then his call will get automatic link from the old base station's channel to the new base station's channel, but if the old base station will not get an idle channel from the new cell, and for that, the call will disconnect This is known as the forced termination. Therefore, more unavailable channel makes more unsuccessful handoff call, and for that, roaming system has effected with negatively by traffic. From [1][2], it has found that, in the field of cellular mobile communication system, there has limited number of idle channel [3]. Therefore, it is a need to take more concern for ensure available channel, because this makes the traffic condition decrease.

However, this paper will analyse the handoff traffic condition against the different number of reserve channel, and it is understandable that, less traffic load makes more successful handoff call. Therefore, by the part of analysis, this paper will study for the probability of handoff dropping rate by Reserved Channel Scheme (RCS) model.

2. LITERATURE REVIEW

2.1. The Concept of Handover and Roaming System

At the point when the portable client ceaseless progressions his position starting with one phone then onto the next cell range, that time, this present client's live call must experience an exchange from old channel to another channel and this has called a handoff or handover process [4].

On the other hand, Roaming System is a process that, have a capacity for a portable customer to consequently got and send information, get and make voice calls and it is additionally take into account versatile client to utilize other worth included administration when he is in a went by range which is outside the topographically scope zone of the home system. [5]

2.1.2. Handoff Mechanism

From figure 2.1.2, the two Co-channels both have F1 frequency and the distance between them is D, and both have the same radios R. Between two Co-Channel cells C1 and C1.

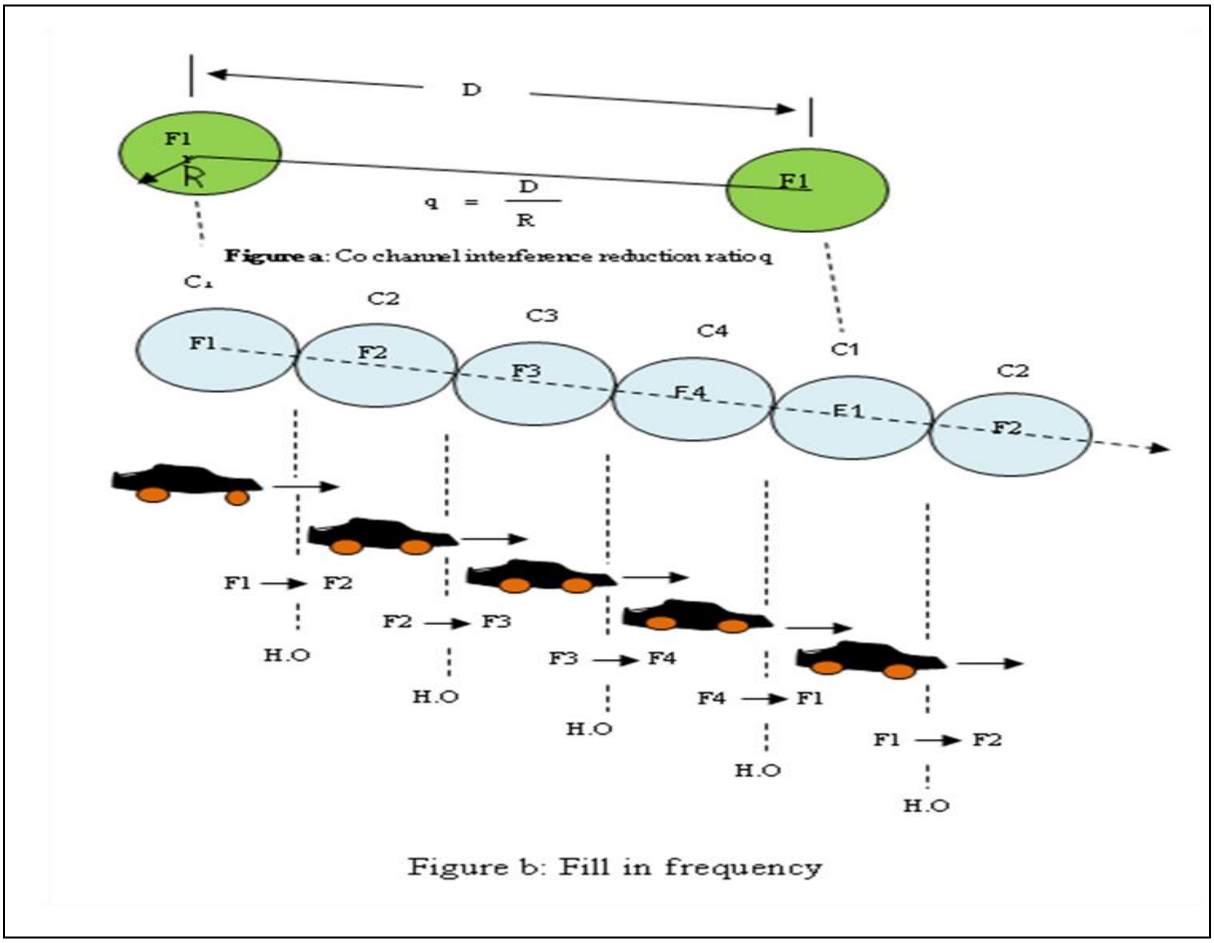

Figure 2.1.2: Handoff Mechanism [6]

There have C2, C3 and C4 cells. Now if there have to fill the frequency F2, F3 and F4, then this are clear that C2 have F2, C3 have F3 and C4 have F4 frequency. So, in that situation when the mobile user moves from cell C1 to C2 and suppose that, that user start call at C1 then the call user's cell switches from frequency F1 to F2. In this type of process have done by automatic frequency changing without any user's intervention. The cellular system has followed that type of handoff process.

2.2. Channel Allocation

The means of channel allocation in the wireless communication are that, to allocate channels to the cells. As a result, it is possible to communicate for the mobile user by using those channels. In the field, of mobile communication networks there have some important techniques which have used for dividing the provided bandwidth into channels and these important techniques used are,

a) Time Division (TD)

b) Frequency Division (FD)

c) Code Division (CD)

From TD channel, it has found that the division achieved by using put out of joint time slots for usage of channels. From FD channel, it has found that the channel division has achieved by using different scheme of modulation [7]. It is also possible to achieved some other schemes, but that is depend on upon the necessary quality of the received signal such as, mixture of TD as well as FD be able to be used in the way, that the provided radio spectrum has divided using FD, and after that it is possible to apply Time Division where each and every frequency band of an Frequency Division scheme [7]. The main three channel allocation schemes [8] will show in below:

1) FCA whose full meaning is Fixed Channel allocation

2) DCA whose full meaning is Dynamic Channel allocation

3) HCA whose full meaning is Hybrid Channel allocation

2.2.1. Fixed Channel allocation (FCA)

Generally, in the field of wireless communication network, it has found that, fixed channel allocation means to allocate a set of fixed channels to a specific cell. It is also having found in a general wireless communication that, every cell has their own group of disjoint channels. In the cellular network, it is possible to implement fixed channel allocation scheme by two strategies [8][9]. This two are describes in the below. One strategy is to assign a consistent set of disjoint channels, to every cell in the network. The strategy of that one has given the best performance when the traffic to every cell in the network is also consistent. As a result, the probability of uniform blocking has found from each cell. It is possible to implement that type of strategy in those areas where traffic is not too high such as rural areas, where the situation of traffics is not the same. There have a limitation for that model, and this is that, this model has lower performance when he has worked in the high population area. As a result, the cells with high-traffic density will affect by extra blocking probability, and after that, the cells with small traffic density [8]. The type of second strategy who is to allocates a non-uniform group of disjoint channels to every cell in the network. That type of strategy has given good performance in the area of high-traffic density. There, they have used more channels, and so the blocking probability have controlled by them. In the field of cellular network, it is also observable that the situation of rural scenario's traffic condition is not uniform [9].

2.2.2. Dynamic Channel Allocation (DCA)

In the field, of cellular network, Dynamic Channel Allocation (DCA) means to allocate channels dynamically with the cell users, and also there have no need for the cells to allocate fixed groups of channels. In the situation of adapting change in traffic, the fixed channel allocation schemes are not much flexible such as, for high-traffic intensity, the cell allocates extra channel, but sometimes low traffic. As a result, free channels are obtainable in the cell possibly will never be used. So it caused wasting the resources. In this situation, it is a need to overcome that type of wasting and for that dynamic channel allocation have not provided by a cell in dynamic channel allocation. In its place, every channels are present inside a central pool, commonly mobile switching centre (MSC), or in the network, this has distributed between base stations (BSs) [24]. The calls have used that channel when needed. In the whole network, any of those channels can be used by any incoming or outgoing call, maintains the CCI at a low level (the concept of channel reuse). Channels have allocated by the base station of the area in which cell user is present. Call borrowing strategy is another type of strategy, which has implemented in Dynamic Channel Allocation (DCA) for better performance. From that strategy, channel in the cell has allocated by fixed channel allocation, but when a call gives a request to the cell, and in that position if there have no available free channel then this cell borrowed a channel from the nearest cell. However, the schemes of dynamic channel allocation (DCA) are not giving better performance than fixed channel allocation schemes in high traffic condition [3].

2.2.3 Hybrid Channel Allocation (HCA)

The basic concept of hybrid channel allocation is that, that the scheme has made by the combination of dynamic channel allocation (DCA) and fixed channel allocation (FCA). From that scheme, the cell user's call has maintained by two sets. One set has maintained by FCA scheme that means when all the FCA channels are busy that time DCA has used for the new call request in that call [9]. In here, it is very important to need to understand the ratio of channels allocated by FCA and DC. That in the cellular network that ratio is depending on the condition of traffic. Sometimes, it is happening on a cellular network that, the traffic increase dramatically such as, a cricket stadium is covering by a cell where a favourite match is going on. In that situation that cell is coming up a hot-spot in the network. Hybrid Channel Allocation (HCA) technique has used in this situation for that hot-spot cells.

3. THE CONCEPT OF TRAFFIC

The number of traffic depends on the increasing number of cell user and technological performance. If the cell user will increase then the number of call processing in the network will increase. On the other hand, if the number of call processing will increases then more technological support will need for the success of that call process, for example, more user means, the more probability for sending and receiving call from cell area to cell area. Therefore, each and every base station needs available free channel for support all of this call otherwise, many call will be going terminate, and so, this will happen traffic.

4. PROBLEM IDENTIFY

The cell client has got numerous correspondence preferences from the correspondence of portable innovation, and wandering framework makes this region universally. Then again, activity is one of the normal obstructions for roaming system. However, the number of mobile user is increasing, and for that, each and every base station will effect by more number of handoff call than current situation. Therefore, if the base station will not available free channel for gives support the handoff call then will occurs more handoff drop, and this will makes serious traffic in the roaming system.

5. METHODOLOGY AND PROCESS

It is true that traffic is one of the major problems for the cell user and therefore, it is necessary to overcome that problem. However, more successful handoff call helps for reduce the traffic from global communication sector, and this is possible if there have available channel for serve the handoff call. Therefore, this paper will discuss by simulation result using Reserved-Channel Scheme (RCS) with the help of Markov Chain, which will be helping for reduce the result of handoff dropping probability.

6. ANALYTICAL METHOD

6.1. Reserved Channel Scheme (RCS)

RCS has two different channel field, one is normal channel that means, this sector's channel is using for serve both new calls and handover calls, and the another field is reserved channel, which is using for only handoff calls, and all of this is clearly understandable by figure (6.1).

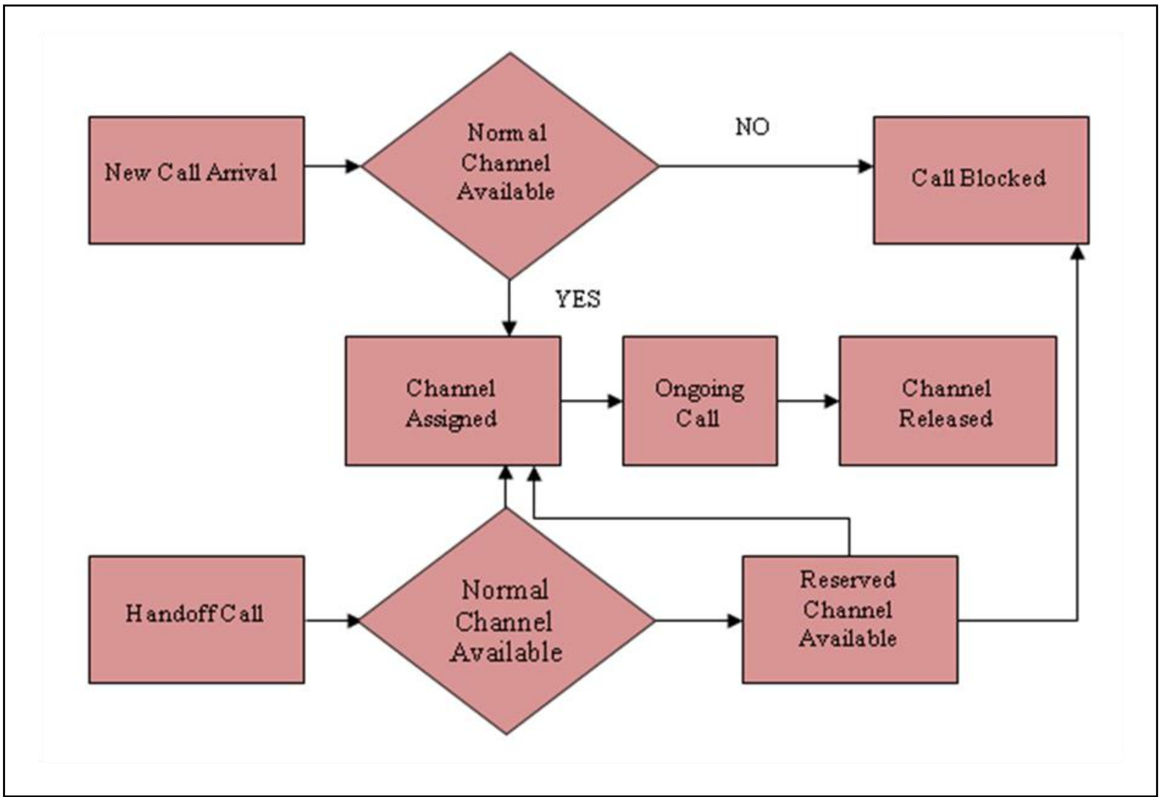

Figure (6.1): Reserved Channel Scheme Flowchart

6.1.2. Process and Parameter description

From this model, there have total channel number is μ, and μ_0 is the number of reserved channels has taken for handoff call from that total number of channels μ. Therefore, μ-μ_0 channels, who has served both new and handoff request. In here, it is the useful information is that, in the cell, if the number of idle channels is less than μ_0 or, equal to μ_0, then the call will block. On the other hand, a handover call has dropped when there is no channel is free in the target cell. This paper is showing the model of the system from below figure (6.1.2 (A)),

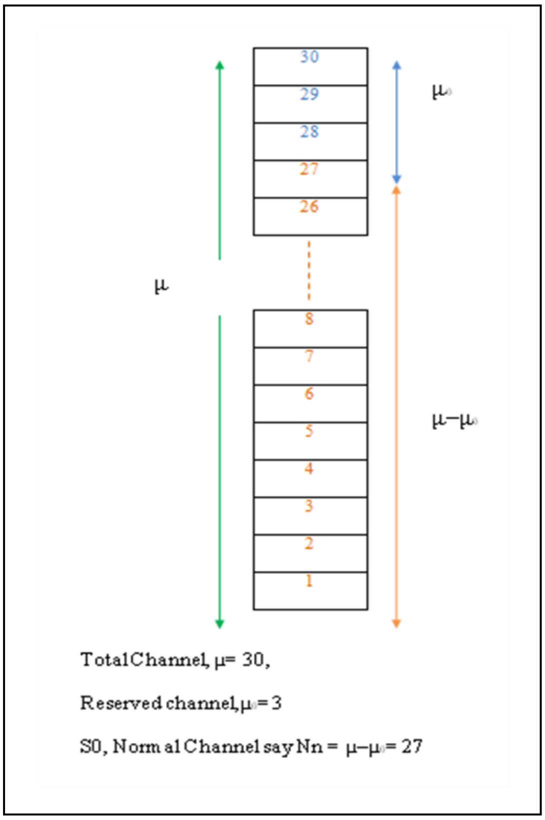

Figure (6.1.2 (A)): Reserved Channel Scheme Flowchart

In here,

λ_{nc}= the mean rate of new arrival call,

λ_{hc}= the mean rate of handoff call.

Both handover and new calls can be considered is to arriving an independent Poisson process with mean rate λ_{nc} and λ_{hc} respectively. It is also need to understand that, each and every call has a life time, and this lifetime means that, how long time a call can gat active by a base station. The important point is that, in the cell, each calls has a lifetime, and after that time, each call has to go either fall or leave from the cell and that is exponentially distributed with average 1/η. Therefore, from the function of the traffic load, this paper can determine the probabilities of dropping and blocking, when 50 percent of the total calls arriving, at the cells are handoff, and free number of channels is μ.

In here, the means of, M (T) = the number of total calls in progress in the cell at time T.

The important point is that, when a call come to the cell and he has assigned by a channel, that time it is also consider in the cell, there is no longer at any consequence to the number of calls, whether new call has come or, original this call has handed over to the cell.

However, the situation of the less-memory properties of the Poisson arrivals and the lifetime call's exponential distribution in the cell, M(T), from this paper has described that process by a chain of Birth-Death Markov with the diagram of state-transition, which is showing in figure (6.1.2 (B)).

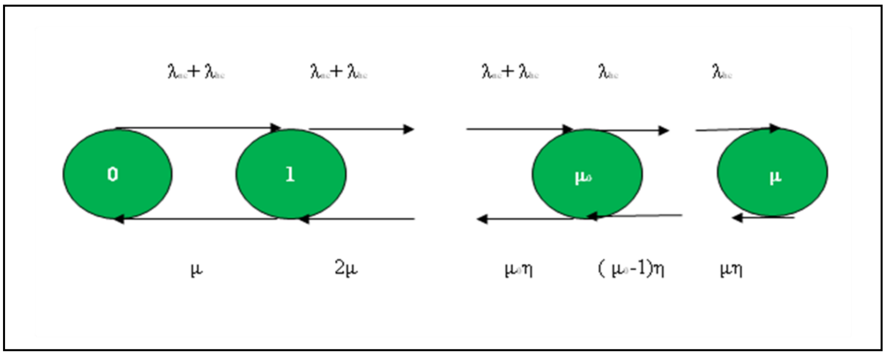

Figure (6.1.2 (B)): Markov process state diagram

The below equation has found from the means of flow cut equation,

$$(\lambda_{nc}+\lambda_{hc})Q_{S-1} = S\eta Q_S \quad ; \text{where, } 1 \leq S \leq \mu_0, \qquad \text{------------- (1)}$$

$$\lambda_{hc} Q_{S-1} = S\eta Q_S \quad ; \text{where, } \mu 0 < S \leq \mu. \qquad \text{------------- (2)}$$

Above equation yields by solving iteratively,

$$Q_S = Q_0 \left[\frac{(\lambda_{nc}+\lambda_{hc})^S}{\eta^S \, S!} \right] \quad \text{Where, } S \leq \mu_0 \quad \text{-------- (3)}$$

Else,

$$Q_S = Q_0 \left[\frac{(\lambda_{nc}+\lambda_{hc})^{\mu_0} (\lambda_{hc})^{S-\mu_0}}{\eta^S \, S!} \right] \quad \text{Where, } \mu_0 < S \leq \mu \quad \text{------- (4)}$$

For Q_0, this paper has

$$\rho_t = \left[\frac{(\lambda_{nc}+\lambda_{hc})}{\eta} \right] \qquad \text{--------------- (5)}$$

and, $\rho_{hc}= \left[\dfrac{\lambda_{hc}}{\eta}\right]$,and then this paper get, ------------ (6)

$$Q_S= \left[\frac{\dfrac{(\rho_t)^S}{S!}}{\sum_{N=0}^{\mu_0}\dfrac{(\rho_t)^N}{N!}+\sum_{N=0}^{\mu_0}\dfrac{(\rho_t)^{\mu_0}(\rho_{hc})^{N-\mu_0}}{N!}}\right] \text{, for, } S\le\mu_0 \quad (7)$$

Otherwise,

$$Q_S= \left[\frac{\dfrac{(\rho_t)^S(\rho_{hc})^{S-\mu_0}}{S!}}{\sum_{N=0}^{\mu_0}\dfrac{(\rho_t)^N}{N!}+\sum_{N=\mu_0+1}^{\mu_0}\dfrac{(\rho_t)^{\mu_0}(\rho_{hc})^{N-\mu_0}}{N!}}\right] \text{If, } S<\mu_0\le\mu \quad (8)$$

Therefore, the handover dropping and blocking probability has shown by below equation,

$$Q_{BL}= \sum_{S=\mu 0}^{\mu} Q_S, \quad (9)$$

and $Q_{DR}= Q_\mu$ -- (10)

It is also mention that, the relative mobility can be describe by below equation,

$$M=\left[\frac{\lambda_{hc}}{\lambda_{nc}+\lambda_{hc}}\right] \quad (11)$$

7 SIMULATION RESULTS AND ANALYSIS

7.1. Reserve Channel and Handoff Dropping

Handoff drop makes the communication system cut out from global network. However, simulation figure (7.1) (Simulation code available in Appendix), which is showing the simulation result for both new call blocking and handoff dropping probability.

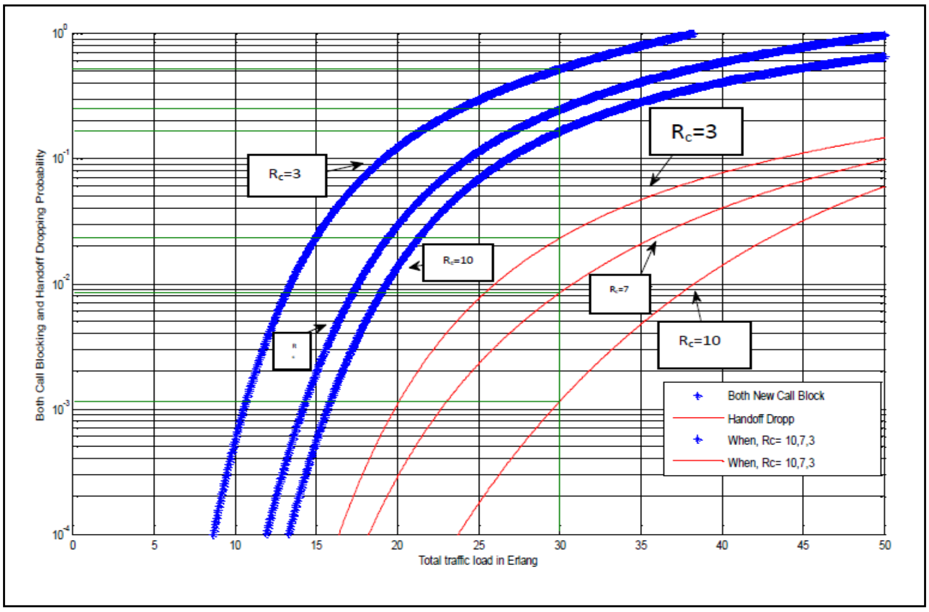

Figure (7.1): Analysis for the blocking probability of both new call and Handoff Drop by Reserved Channel

Table (7.1 (A)): Analysis data from Figure (7.1)

Both New Call Blocking Probability Result	Arriving call, load 30	Reserved Channel, Rc= 10, 7, 3	Blocking Probability, increase like below, Rc(3)>Rc(7)> Rc(10) Therefore, Rc(3)>>Rc(10)
Handoff Dropping Probability Result	Arriving call, load 30	Reserved Channel, Rc= 10, 7, 3	Dropping Probability, decrease like below, Rc(10)<Rc(7)<Rc(3) Therefore, Rc(10)<<Rc(3)

By the figure (7.1), this paper shows that, if the number of arrival call load is fixed 30, and increase the number of reservation channel like, 3,7,10 then the result shows that, the both new call blocking probability and the handoff dropping probability decreasing (table(7.1 (A)).

As a result, it is clear from the figure (7.1) that, reserved channel schemes technique has able to reduce the handoff fall drop probability which will reduce the situation of traffic from roaming system.

8 CONCLUSIONS

The deep conclusions that might be drawn by the beneath reveal sentences,

1) This paper also agree with this sentence that, the performance of roaming system depends on successful handoff call, and roaming system has affected negatively by handoff traffic when the system has not available channel for served the handoff request. Therefore it is need to choose an idle technique for supporting more handoff call.
2) From chapter 6 and 7, this paper has identified a solution by RCS (Project Model) model for removing the handoff call. On the other hand NPS model (Other Source [3]) has also able for removing the call blocking probability, but the main lacings for NPS model is that, it is follow the rules of fast in fast out process and it has no any extra channel for serve the handoff call, as a result it is making problem for handoff call, on the other hand, from RCS model (Project Model) the system gives extra benefit from reserved channel for handoff call.

9 FUTURE WORKS

Moreover, this analysis has shown clearly by the figure (7.1) that, the handoff fall probability decreases by RCS (Project Model) model. However, sometimes there are large number of cell user's movement happens, and for that it will be possible to increase the traffic dramatically by more handoff call. Therefore, may be it will need more reserve channel with queuing facility for each and every handoff call successfully, and so, when the traffic will increase strangely, this paper propose Queuing Priority Scheme (QPS) model for further investigation for reduce the handoff dropping probability.

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