ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Blocking Performance Comparison for Cutoff Priority and New Call Bounding Schemes in Wireless Mobile Cellular Networks

J.Sreya, B.Minisha, Ch.Chandini, P.Tarun, B.Vykunta Rao
Department of Computer Science & Engineering Aditya Institute of Technology and Management, Tekkali.

1. Abstract

With the growing demand for real-time connections and services, wireless networks must support connections with different traffic characteristics and different quality of service (QoS) guarantees. There are generally two types of calls, namely new calls and hands off call. Hands off call transfers an active incoming call from one cell on the cellular network to another. call forwarding have a higher priority than new calls because hand-off call is necessary to prevent the caller from missing out on service. Therefore, new calls and hands off call should be treated differently in terms of resource allocation, and some channels should be reserved for hands off calls. So, the project aims to study the two priority schemes 'New call bounding scheme' and 'Cutoff priority' and compare and estimate both schemes performance and analysis which gives the best scheme providing a low call dropping probability that provides a higher Quality of service (QOS).

Keywords: Call Admission Control; Blocking Probability; Cutoff priority scheme; new call bounding scheme;

2. Introduction

Future mobile communication networks aim to provide integrated services like voice etc. with low price and low performance mobile phones via the wireless framework. As the demand for wireless audio and media services has steadily increased in recent years, wireless multimedia networks have been an area of active research. Traffic regulation in voice communications is a key element to ensure Quality of Service (QoS) in cellular networks. In order to support various end-to-end services with a certain Quality of Service (QoS) requirement in these wireless networks, resource allocation is a major issue. Call Admission Control (CAC) is a policy for limiting the number of connections to a network to reduce network congestion and connection loss. Call admission control algorithms is a special challenge given the limited and high variable resources and mobility of these networks. In wireless networks, call admissions are possible due to user mobility. A good CAC scheme must balance blocking and call dropping and should guarantee the desired QoS requirements. call admission control for wireless networks has been little studied in recent years. Due to the user's mobility, a call forwarding that has not been completed in the current cell may have to be handed off to another cell. During this process, due to limited resources in wireless networks, the connection may not be able to acquire a channel in the new cell to continue its service, which will cause the connection to fail. Therefore, new calls and hands off calls should be treated differently in terms of resource allocation.

Cite this article as: J.Sreya, B.Minisha, Ch.Chandini, P.Tarun & B.Vykunta Rao, "Blocking Performance Comparison for Cutoff Priority and New Call Bounding Schemes in Wireless Mobile Cellular Networks", International Journal & Magazine of Engineering, Technology, Management and Research (IJMETMR), ISSN 2348-4845, Volume 10, Issue 4, April 2023, Page 10-16.

Because users are more sensitive to call dropping than to call blocking. Therefore, hands off calls tends to have a higher priority than new calls. They can be classified into two broad categories:

Guard Channel (GC) Schemes: Some channels are reserved for hands off calls. There are four different schemes.

a) The cutoff priority scheme [4],[5]
b) The fractional guard channel schemes [6].
c) Divide all channels allocated to a cell into two groups: one for the common use for all calls and the other for hands off calls only [7].
d) New call bounding scheme

2) Queuing Priority (QP) Schemes: With this scheme, calls are answered when free channels are available. When all channels are busy, new calls are queued while forwarded calls are barred, new calls are barred while switched calls are queued, or all incomingcalls are put on hold.

Related Work

Depending on the specific applications, different combinations of the CAC schemes are possible.

In a previous research paper[1], they focus on all protection channel schemes and state that the performance analysis of CAC schemes was performed under the assumption that waiting times, channel for new calls and call forwarding are distributed identically (partially with exponential distribution), i.e., it was assumed that all calls would be distributed identically with the same parameter. Therefore, a one-dimensional Markov chain was used to obtain blocking probabilities for new connections and transmitted connections. Previous studies ([2] and [3]) have shown that the latency of the new call channel and the latency of the hands-off calls channels can be distributed differently. Therefore, a one-dimensional Markov chain model may not be appropriate for some protection channel CAC schemes, provided new calls and callbacks are equally spaced. As mentioned in the previous article, the average channel latency for new calls and transferred calls is different. when cell dwell time is distributed in gamma using Form VariableParameter. In article [1] they worked on different call admission control schemes for wireless networks. They showed that the channel average waiting time for new calls and hands off call are different, the traditional one-dimensional Markovchain model may not be appropriate; the theory of the two-dimensional Markov chain must be applied. They also propose a new approximation approach to reduce computational complexity. The new approach seems to work much better than the traditional approach. As discussed, there are two types of calls in wireless cellular networks: new calls and hands off calls. Hands off calls has a higher priority than new calls because users are more sensitive to call dropping during the call than to blocking the call initially. Many researchers have been working on various schemes that prioritize hands off calls dropping. In this document we will examine only two call admission control schemes, i.e., 'The cut-off priority scheme' and 'The new call bounding scheme'. We compare both schemes and specify which scheme is better in terms of new call blocking and hands off dropping probabilities.

A. New call bounding scheme

In this scheme, we restrict the recording of new calls in wireless networks. The scheme works as follows: If the number of new calls in a cell

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

exceeds a threshold and when a new call arrives, thenew call will be blocked, otherwise it is allowed. Hands off call is only rejected if all channels in the cell are exhausted. The idea behind this scheme is that we would accept fewer customers than drop calls in progress because customers are more sensitive to the call dropping than to call blocking. In this section we give analysis results for the new call blocking probability and the call forward block probability. This is a formula for calculating the probability of a new call

$$p_{nb} = \frac{\sum_{n_2=0}^{C-K} \frac{\rho^K}{K!} \cdot \frac{\rho_h^{n_2}}{n_2!} + \sum_{n_1=0}^{K-1} \frac{\rho^{n_1}}{n_1!} \cdot \frac{\rho_h^{C-n_1}}{(C-n_1)!}}{\sum_{n_1=0}^{K} \frac{\rho^{n_1}}{n_1!} \sum_{n_2=0}^{C-n_1} \frac{\rho_h^{n_2}}{n_2!}}$$

$$p_{hb} = \frac{\sum_{n_1=0}^{K} \frac{\rho^{n_1}}{n_1!} \cdot \frac{\rho_h^{C-n_1}}{(C-n_1)!}}{\sum_{n_1=0}^{K} \frac{\rho^{n_1}}{n_1!} \sum_{n_2=0}^{C-n_1} \frac{\rho_h^{n_2}}{n_2!}}.$$

blocking and hands off call dropping.

Here,

C Number of channels in a cell.

K Threshold for new call bounding scheme. λ Arrival rate for new calls.

λh Arrival rate for call forwarding.

1/μ Average channel holding time for new calls.

1/μh Average channel holding time for hands off call

ρ Traffic intensity for new calls (i.e., λ/μ).

ρh Traffic intensity for call forwarding (i.e., λh/μh).

pnb Blocking probability for new calls.

phb Blocking probability for hands off calls.

A. Cut off priority scheme

According to the new call limitation scheme, the number of new calls will be limited, but instead of doing this we can rely on the total number of ongoing calls in the cell to make a decision whether or not to accept a new incoming call. The scheme works as follows. Let's denote the threshold when a new call arrives. If the total number of channels in use is less than the threshold, the new call is accepted; Call forwarding is always accepted unless no channels are available upon arrival. This scheme has been studied in many publications [4], [10], [11], and the analytical results for the call blocking probabilities are obtained assuming that the average waiting time of the new call channel and the average waiting times of the call forwarding channels are equal, so that the one-dimensional Markov chain theory can be used. If the channel's average wait times for new calls and call routing are different, the approach will not work. To calculate this, we have a formula which is

$$p_{nb}^a = \frac{\sum_{j=m}^{C} \frac{(\rho+\rho_h)^m \rho_h^{j-m}}{j!}}{\sum_{j=0}^{m} \frac{(\rho+\rho_h)^j}{j!} + \sum_{j=m+1}^{C} \frac{(\rho+\rho_h)^m \rho_h^{j-m}}{j!}}$$

$$p_{hb}^a = \frac{\frac{(\rho+\rho_h)^m \rho_h^{C-m}}{C!}}{\sum_{j=0}^{m} \frac{(\rho+\rho_h)^j}{j!} + \sum_{j=m+1}^{C} \frac{(\rho+\rho_h)^m \rho_h^{j-m}}{j!}}$$

Here,

C Number of channels in a cell.

m Threshold for the cutoff priority scheme.λ Arrival rate for new calls.

λh Arrival rate for call forwarding.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

1/μ Average channel holding time for new calls. 1/μh Average channel holding time for call forwarding.

ρ Traffic intensity for new calls (i.e., λ/μ).

ρh Traffic intensity for call forwarding (i.e., λh/μh).pnb Blocking probability for new calls.

phb Blocking probability for call forwarding

2.Numerical results

In this section we present the numerical for each scheme. They indicate the probability of new calls being blocked and call forwarding being abandoned. First, let's examine the new call delimitation scheme. We choose the following parameter set C=50, K=25, μ=μh=Mu=0.005,

Here for lambda value, we have taken two cases

i) lambda for new call will be varying from 1to 10 mean while lambda for hands off call will constant that is 0.05

ii) lambda for hands off call will be varying from

0.01 to 0.09 mean while lambda for new call will constant that is 0.05

These cases are applicable to the probability of blocking new calls and the probability of dropping handsfree calls. It is shown in [Fig. 2, 3,] observed that the result for Case-I and [Fig. 4,5] give the result for Case-II

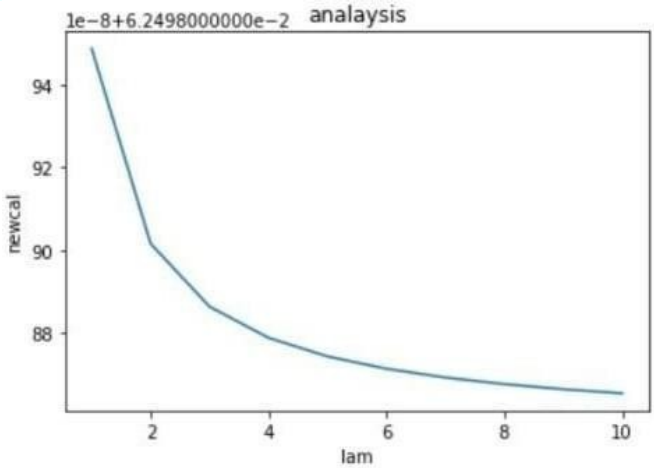

Fig: 2

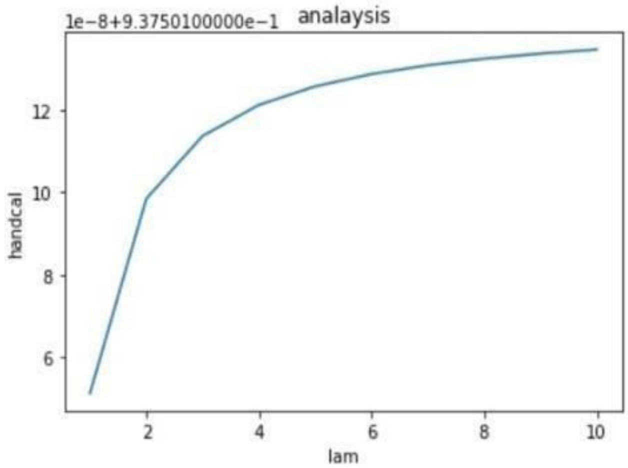

Fig: 3

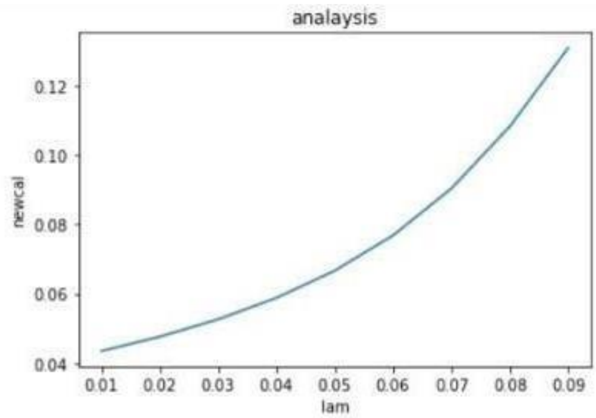

Fig: 4

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

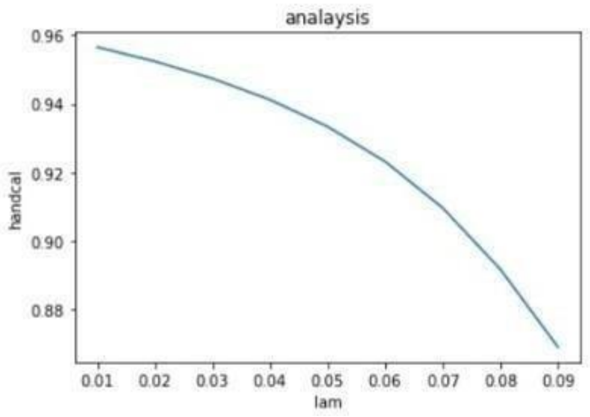

Fig: 5

Next, we examine the cutoff priority scheme, we choose the following set of parameters C = 50, K = 25, μ = μh = Mu = 0.005. Here we have taken two cases for the lambda value.

i) lambda for new call will be varying from 1to 10 mean while lambda for hands off call will constant that is 0.05

ii) lambda for hands off call will be varying from 0.01 to 0.09 mean while lambda for new call will constant that is 0.05. These cases are applicable to the probability of blocking new calls and the probability of dropping hands off calls. It is shown in [Fig. 6, 7] observed that the result for case I and [Fig. 8, 9] give the result for case II

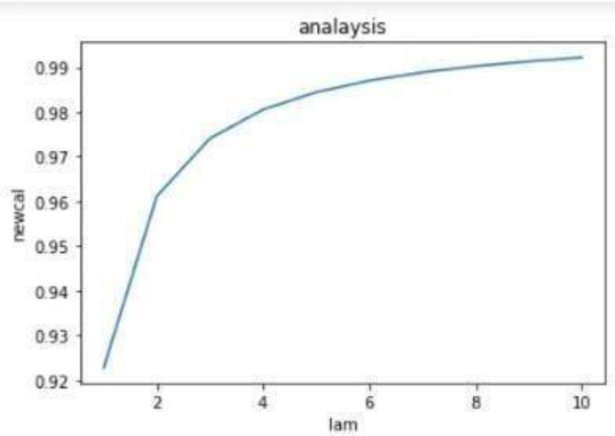

Fig:6

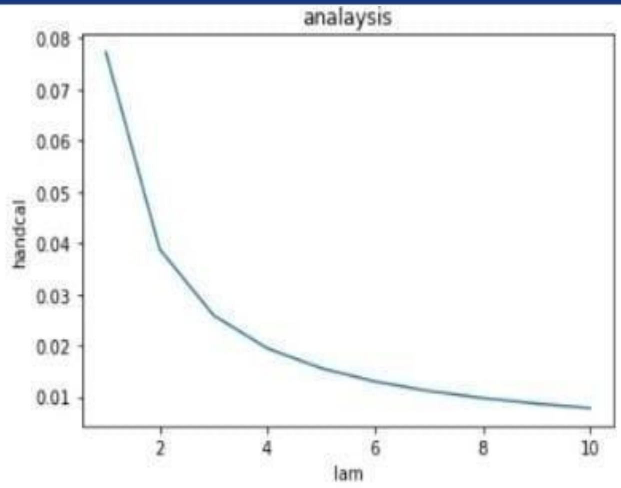

Fig:7

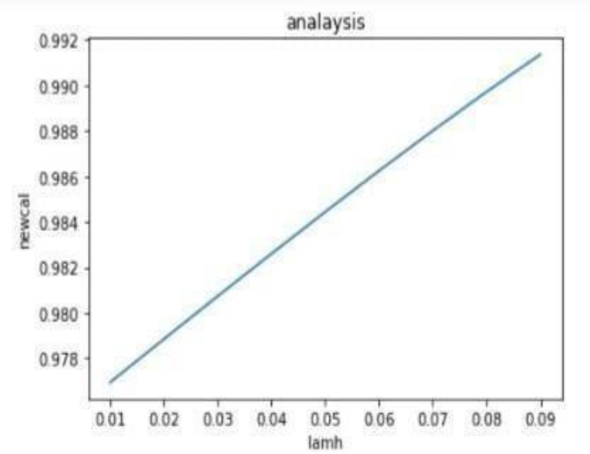

Fig: 8

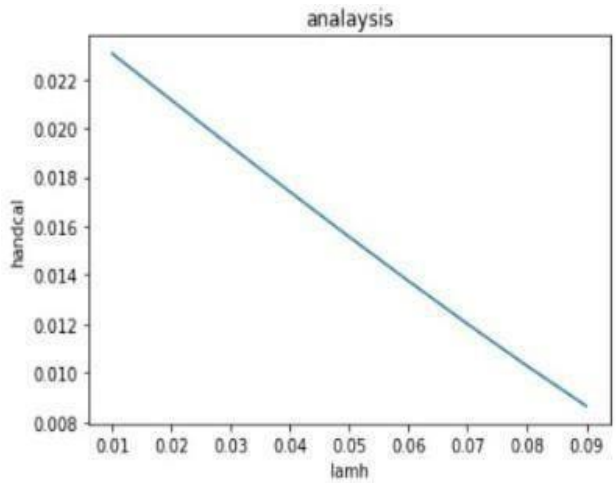

Fig: 9

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

3. Comparison of New call bounding scheme and cut off priority scheme

As we discussed in the numerical results, there are now 2 cases, we will compare case 1, i.e., varying the arrival rate of a new call and the constant value of the call without the intervention of the new call bounding scheme and the cutoff priority scheme as a result as shown in [fig10].

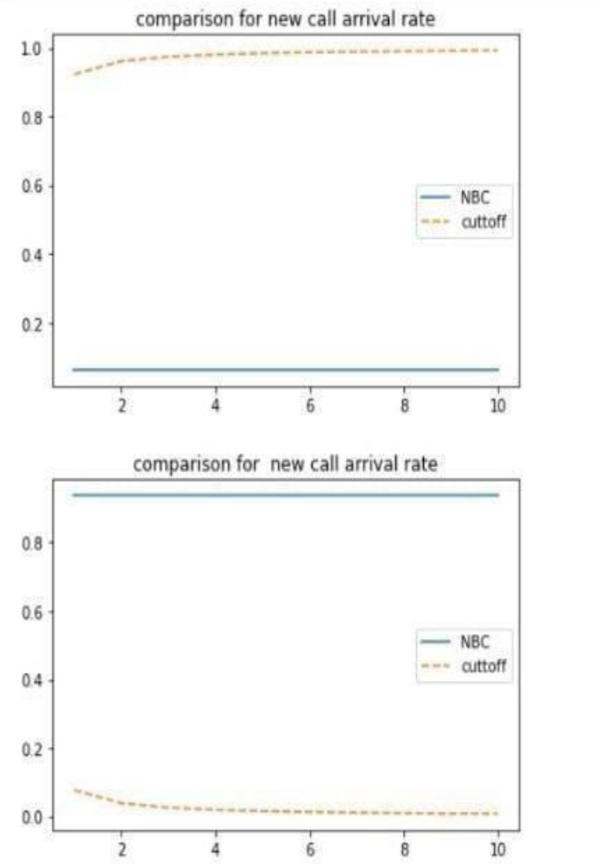

Fig: 10

We compare case 2, i.e. Varying the hands off call arrival rate and the constant value of the new call arrival rate of the new call bounding scheme and turning off the cutoff priority scheme, since we get the result shown in [Fig-11].

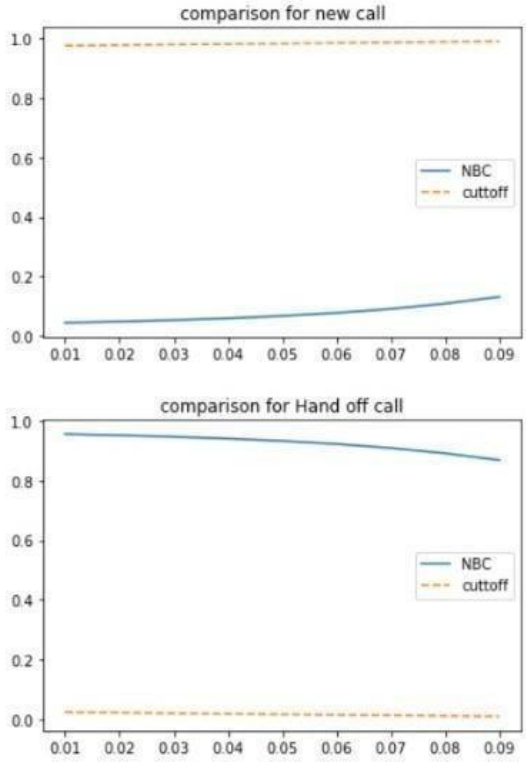

Fig:11

4. Conclusion

There are two types of calls on wireless cellular networks: hand off calls and new calls. Here we prioritize call forwarding as users are more sensitive to dropped calls than to blocked calls. So based on that there are many schematics available. We examined and compared two schemes for new call blocking probability and handover probability of disconnection, the two schemes are the cutoff priority scheme and the new call limiting scheme. From these two schemes based on your study, we know that priority cutoff is more likely to result in a new call being dropped and less likely to block call forwarding compared to the new limit call scheme.

5. References

[1] S. Tekinay and B. Jabbari, "Handover and channel assignment in mobile cellular

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

networks," IEEE Commun. Mag., pp. 42-46, Nov. 1991.

[2] Katzela and M. Naghshineh, "Channel assignment schemes for cellular mobile telecommunication systems:" A comprehensive survey" IEEE Personal commun., vol. 3,pp. 10-31 , June 1996

[3] R. Ramjee, D. Towsley, and R. Nagarajan, "On optimal call admission control in cellular networks," Wireless Networks, vol. 3, pp. 29-41, 1997

[4] Y. Fang and Y. Zhang, “Call admission control schemes and performance analysis in wireless mobile networks,” IEEE Transactions on Vehicular Technology, vol. 51, no. 2, pp. 371–382, Mar. 2002

[5] S.-H. Oh and D.-W. Tcha, Prioritized channel assignment in a cellular radio network, IEEE Transactions on Communications 40(7) (1992) 1259–1269

[6] S. S. Rappaport, "Blocking, hand-off and traffic performance for cellular communication systems with mixed platforms," in Proc. Inst. Elect. Eng. 1, vol. 140, 1993, Pp. 389-401.

[7] B. Li, C. Lin, and S. Chanson. "Analysis of a hybrid cutoff priority scheme for multiple classes of traffic in multimedia wireless networks," Wireless Networks, vol. 4, no. 4, Aug. 1998

[8] S. Tekinay, "A Measurement-Based Prioritization Scheme for Handovers in Mobile Cellular Networks," IEEE JSAC, vol. 1, 1992, pp. 1343-50.

[9] D. Hong and S. S. Rappaport, "Traffic model and performance analysis for cellular mobile radio telephone systems with prioritized and nonprioritized handoff procedures," IEEE Trans. Veh. Technol., vol. VT-35, no.

3, pp. 77-92, 1986.

[10] MD. Kulavaratharasah and A. H. Aghvami, "Teletraffic perfomance evaluation of microcellular personal communication networks (PCNS) with prioritized handoff procedures," IEEE Trans. Veh. Technol, vol. 48,

n0. 1, pp. 137-152, 1999.

[11] D. E. Everitt, "Traffic engineering of the radio interface for cellular mobile networks," Proc JEEE, vol. 82, no. 9, pp. 1371-1382, 19