



Experiment No. - 4

AIM To understand the concept of trunking and calculate blocking probability of a call for the given conditions for Erlang C system and analyze the effect of delay.

Theory Cellular system rely on trunking to accommodate a large no of users in a limited radio spectrum. Trunking allows a large number of users to share the relatively small number of channels in a cell .In a trunked radio system each user is allocated a channel on a per call request and upon termination of the call, the previously occupied channel is immediately returned to the pool of available channels.

Grade of service: It is a parameter used to measure the ability of a user to access a trunked system during the busiest hour. It is used to measure the performance of the trunking system.

Traffic intensity(a): It is defined as average channel occupancy and is measured in Erlang.

The traffic intensity offered by each user (A_u) is equal to the call request rate λ multiplied by the holding

time (H), where H is the average duration of a call

$$A_u = \lambda * H$$

If there are u users in a system. Total traffic intensity is

$$A = U * A_u$$

If the total channels in a trunked radio system are C and if the traffic is equally distributed among the channels. The traffic intensity per channel (A_c) is given by

$$A_c = U * A_u / C$$

Erlang C formula to calculate blocking probability

$$\begin{aligned} \Pr[\text{delay} > t] &= \Pr[\text{delay} > 0] \Pr[\text{delay} > t \mid \text{delay} > 0] \\ &= \Pr[\text{delay} > 0] \exp(-(C - A)t/H) \end{aligned}$$

Problem A hexagonal cell within a four-cell ($N = 4$) system has a radius of 1.56 km. A total of 80 channels are used within the entire system. If the load per user is 0.029



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Erlang and $\lambda = 1$ call/hour, compute the following for an Erlang C system that has a probability of 5% of a delayed call.

1. How many users per sqkm. will this system support.
2. What is the probability that a delayed call will have to wait for more than 20 sec?
3. What is the probability that a call will be delayed for more than 20 sec.?
4. What is the probability that a delayed call will have to wait for more than 10 sec?
5. What is the probability that a call will be delayed for more than 10 sec.?
6. What is the probability that a delayed call will have to wait for more than 5 sec?
7. What is the probability that a call will be delayed for more than 5 sec.?

Answer the following question

Define the following terms-

- | | |
|----------------------|--------------------------------|
| 1. Holding time | 3. Grade of service |
| 2. Traffic Intensity | 4. Call drop and call blocked. |

Result Analysis and Conclusion: