EXPERIMENT 2

Aim-To analyze the effect of delay on blocking probability of a call for Erlang B and Erlang C systems.

Software-Octave

Theory-

Trunking theory is based on the concept of allowing a large number of users to share the relatively small number of channels in a cell by providing access to each user on demand from a pool of available channels. In trunked radio system each user is allocated a channel on per call basis and upon termination of the call the previously occupied channel is immediately returned to the pool of available channels. There are two types of trunked systems which are commonly used-blocked calls delayed and blocked calls cleared system.

Blocked Call Cleared

1. This system does not offer queuing for call request. It is a memory less system.
2. For every user who requests service, it is assumed there is no setup time and the user is given immediate access to a channel if one is available. If no channels are available, the requesting user is blocked without access and is free to try again later. This type of system is called as Blocked Calls Delayed or Erlang B system.
3. Calls arrive as determined by poisons distribution. It is assumed that there are an infinite number of users. This system is based on following assumptions.

   a. Call requests are memory less implying that all users including blocked users may request for channel at any time.

   b. The probability of users occupying a channel is exponentially distributed. That means longer calls are less likely to happen.

   c. There are a finite number of channels available in pool.

   d. In arrival times all call requests are independent of each other.

4. This system uses M/M/m queue and leads to the derivation of the Erlang B formula. The Erlang B formula determines the probability that a call is blocked and is a measure of the GOS for a trunked system which provides no queuing for blocked calls.

$$\Pr(blocking) = \frac{\dfrac{A^C}{C!}}{\displaystyle\sum_{k=0}^{C} \dfrac{A^k}{k!}} = GOS$$

Where,

A = Traffic intensity

C = Total number of channels

K = k^{th} channel

1. Erlang B formula gives a conservative estimate of GOS as the finite users always predict smaller likelihood of blocking.

Blocked Call Delayed

1. In this a queue is provided to hold calls which are blocked. If a channel is not available immediately, the call request is delayed until a channel becomes available. This type of trunking system is called as Blocked Calls Cleared or Erlang C system.
2. Its measure of GOS is defined as the probability that a call is blocked after waiting a specific length of time in the queue. To find the GOS it is necessary to find the likelihood that a call is initially denied access to the system.
3. The likelihood of a call not having immediate access to a channel is determined by the Erlang c formula.

$$Pb(delay > 0) = \frac{A^C}{A^C + C! \left(1 - \frac{A}{C}\right) \sum_{k=0}^{C-1} \frac{A^k}{k!}}$$

Conclusion