

University of Sydney
School of Information Technologies

Simulation of Networks

Assignment 1

Due Date: 16 May 2003

This project comprises 50% of the assessment for this subject.

Projects may be performed individually, or in groups of two.

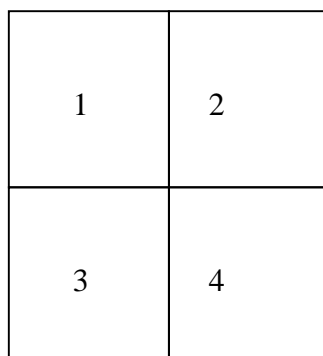
In order to pass this assignment, the “basic project specification” explained below must be fully completed. In order to obtain a higher grade than a pass, one or more of the extensions must be completed.

Submission requirements:

- *One submission per group, with names and student number of all group members.*
- *A description of how your simulation works.*
- *A flowchart of the simulation.*
- *Simulation results, indicating the input parameters (i.e. traffic per cell, number of channels, handover rate etc) as well as the output parameters (blocking probability, dropout probability).*
- *Confidence intervals for your simulation results.*
- *Your code, both a paper version and an electronic version.*

Basic Project Specification

This is a simple model of a cellular mobile communication network.



Assume 4 cells in a rectangular grid, as in the diagram above. Assume that each cell has c channels available to it.

Assume that calls arrive at cells according to a Poisson process (i.e. negative exponential interarrival times), and have negative exponential holding times.

Assume that an accepted call will attempt a handover to one of the three adjacent cells after some period of time, assumed to be negative exponentially distributed with a specified mean time. If this handover time is greater than the call holding time, the call terminates before handover, so no handover takes place.

However, if the handover takes place before the call terminates, then we try to find a channel for it in the new cell. If a channel is available, it is assigned to the handover call; otherwise the call is dropped.

Assume equal probability of handover to each of the 3 adjacent cells.

A call that has been successfully handed over is assumed to be subject to further handovers, according to the same process as described above.

Find the probability that a new call will be blocked, and also find the probability that an accepted call will subsequently be dropped. Obtain numerical results for some sensible sets of parameters. Show confidence intervals for your results.

Project Extensions

- Extensive sets of numerical results, for a range of traffics, handover rates, number of channels etc.
- Extend to a greater number of cells.
- Modify the handover criteria – if a channel cannot be found in the new cell immediately, the call remains connected in the old cell, while retrying at fixed intervals to find a channel in the new cell.
- Consider different handover probabilities between cells, rather than equal probability of handover to each of the 3 adjacent cells.
- Include a more complex mobility model.
- Any other extension that you choose, but talk to me about it first, to ensure that you choose a feasible task.

David Everitt
3 April 2003