

SENSUS Stochastic Modelling Exercise

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1 About this exercise

This exercise is on applying stochastic modelling to a service-oriented computing system. You are at liberty to choose the particular system which you model but it should have at least some of the typical features of a service-oriented computing system discussed in the course: physically distributed, large-scale, and resource sharing, with partial failure modes.

Below are examples and non-examples of Service-Oriented Computing systems.

Service-Oriented Computing	
Examples	Non-examples
A replicated Web service used by users from many locations	A printer which sometimes jams
A compute cluster such as a Beowulf or Con-dor pool	A single user device which rarely fails (e.g. an iPod)

The steps which you need to take are these:

1. consider the system which you wish to model and identify the components of interest and the activities which they undertake either individually or in co-operation;
2. describe these components behaviourally, using finite-state representations;
3. express your model as a high-level description in the PEPA stochastic process algebra;
4. count, measure or estimate quantities of interest in the model (e.g. rates, probabilities, and population sizes), adding these to the model;
5. process your model with the PEPA Eclipse Plug-in;
6. compute performance results from your model.

2 Submission description

Present your submission as a short paper (10 pages) containing:

- an abstract;
- an introduction containing an informal, but careful, explanation of the problem which you are modelling;
- the PEPA model of your system, explaining how this relates to the informal description;
- a section on parameter estimation, explaining how numerical values have been measured or estimated;
- the results obtained from the modelling tools;
- your conclusions.

3 Take home message from the course

The key to success in stochastic modelling is *abstraction*. It is essential to leave out as much detail as possible. Start with a small, but unrealistic, model and try to gradually incorporate detail to move towards a larger, more realistic model.

4 Submission instructions

Send your submission by email to `stg@inf.ed.ac.uk`.

5 Resources

As an introduction to PEPA you have the slides on stochastic modelling from the SENSUS summerschool. Key papers on PEPA are:

- *Tuning systems: from composition to performance*, Jane Hillston, Computer Journal, 2005.
— An introduction to PEPA and stochastic modelling with emphasis on applications.
- *Process algebras for quantitative analysis*, Jane Hillston, LICS, 2005.
— An introduction to PEPA and its associated theory.
- *Fluid-flow approximation for PEPA models*, Jane Hillston, QEST, 2005.
— The differential equation semantics for PEPA.

Many other papers and example PEPA models are available on-line at the PEPA Web site <http://www.dcs.ed.ac.uk/pepa>