Modelling and Simulation Approaches for Benchmark Dining Philosophers

Tamara Vobruba[1], Claudia Wytrzens[2], Ruth Leskovar[2], Johannes Tanzler[1,2]

[1]TU Wien, COCOS – Centre for Computational Complex Systems,
[2]TU Wien, ARGESIM/Mathematical Modelling and Simulation, Wiedner Hauptstrasse 8-10, 1040 Vienna, Austria

{tamara.vorbuba, claudia.wytrzens, ruth.leskovar, johannes.tanzler}@tuwien.ac.at

Abstract. Simulation Notes Europe (SNE), EUROSIM's membership journal, features a series on benchmarks for modelling approaches and simulation implementations. Up to now, 23 benchmarks have been defined, and 347 'solutions' with different modelling approaches and simulation implementations have been published in SNE. This contribution discusses the ARGESIM Benchmark C4 / C10 'Dining Philosophers' with up to now 41 'solutions' sent in (C4 is more general, C10 addresses analysis and detection of deadlocks in time domain).

The benchmark aims for modelling and simulation of a discrete system, which is very well known as benchmark in computer engineering. Described on an abstracted level, this problem consists of five Philosophers (Users) sitting in front of five bowls of rice and only one chopstick (Resources) between two bowls. Due to the need of two chopsticks per person, not all Philosophers can eat at the same time. Under certain circumstances, each Philosopher holds one chopstick in one hand which can lead to a deadlock.

A classical approach for describing the Dining Philosophers problem is use of (i) Petri nets, which can analyse the system statically, or which can be used as basis for time analysis by simulation. Other approaches are

(ii) process simulation, where the philosophers (entities) pass different servers (meditating, eating) server) where they queue in front (queues)

(iii) event modelling, where events describe change of eating phase and thinking phase of the philosopher, and

(iv) (UML) state chart modelling, where the states (eating, thinking) are the dominating modelling constructs

This contributions presents a complete solution and compares some of the sent in modelling approaches and simulation software implementations.

Keywords: Simulation, Petri net, events, Dining Philosophers