

1999 Paper 3 Question 1

Concurrent Systems

The runtime system of a concurrent programming language includes semaphore management and user-thread management modules. The design assumption was that the operating system on which the concurrent programs are to run supports only one process per address space. Outline the functionality and interaction of semaphore and user-thread management. [6 marks]

The runtime system is to be ported to run on an operating system which supports multi-threaded processes and symmetric multiprocessing.

(a) Describe how the two modules must be changed in order to support

- one kernel-thread per user-thread [5 marks]

- scheduler activations [5 marks]

State any assumption you make about the functionality of the operating system.

(b) Discuss the problem of concurrent execution of the semaphore management module and how this concurrency might be controlled. [4 marks]