

Introduction

Using protection inadvertently presents some challenges, namely *when to use*, *how to use* and what might go run if used without care. These, rather abstract, notation are the topics for this lecture.

Content and reflection

Themes

- Deadlock
 - Definition[4][1]
 - Dining philosophers problem[5]
Read chandra/misra only as inspirational
- General
 - Thread Models[3, chap. 4]
Other kinds of thread models(!)
 - Thread Safety[3, chap. 5]
 - Rules for Multithreaded Programming[3, chap. 6]
- Priority Inversion[6]
Note: Read for understanding bounded and unbounded from a basic point of view. The article is quite extensive and the required knowledge is what is presented in the slides.
- Buffer case - Producer/Consumer[7][2]
Implemented using semaphores

Questions

- Pitfalls
 - Initialising semaphores - how and with what number
 - What to lock and when to lock
 - Locking / unlocking - missing one spells what?
- Deadlock
 - Which conditions need to be present for a deadlock to occur
 - What is the problem behind the *Dining philosophers problem*
 - Which rule can you do something about, and what could you do to solve this particular problem.
- Priority inversion
 - What actually makes this problem
 - What are the two different strategies to solve the problem
 - In what way do they solve the problem and what is the consequence of which when doing so.

Material

Slides

- [1] S. Hansen, *Thread synchronization ii*, Slides - see course repos.
- [2] —, *Thread synchronization i*, Slides - see course repos.

Local repository

- [3] P. C. Chapin, *Pthread tutorial*, Tutorial, See <https://redmine-server.ase.au.dk/courses/projects/i3isu/repository>, 2008.

Online

- [4] E. al. (). Deadlock, [Online]. Available: <https://en.wikipedia.org/wiki/Deadlock>.
- [5] —, (). Dining philosophers problem, [Online]. Available: https://en.wikipedia.org/wiki/Dining_philosophers_problem.
- [6] B. R. Kyle Renwick. (). How to use priority inheritance, [Online]. Available: <http://www.embedded.com/design/configurable-systems/4024970/How-to-use-priority-inheritance>.
- [7] E. al. (). Producer-consumer problem. Wikipedia Article, [Online]. Available: https://en.wikipedia.org/wiki/Producer%2dconsumer_problem.