

# Übung Echtzeitsysteme WS 2015 / 2016

## PThreads

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### Exercise 1 PThreads

Read the documentation for *pthread\_create* and *pthread\_join*. Write a program that starts two threads and waits for each thread. Each thread should be passed an id as an argument that is used for printing a message on the command line. The third parameter of *pthread\_create* is the name of a function that returns a void pointer and also has one void pointer as parameter.

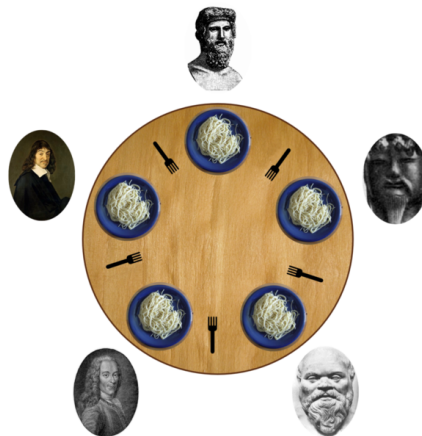
### Exercise 2 A bank account and pthread mutex

In the *pthreadmutex.c* file a simple multi-threaded program is given. The program creates two threads and each thread generates a random number that is added to a shared global variable.

- Why does this program not always work? What do you need to do to solve the problem?
- Read the documentation for *pthread\_mutex\_init*, *pthread\_mutex\_lock* and *pthread\_mutex\_unlock*.
- Fix the problem with one global pthread mutex.

### Exercise 3 Dining philosophers

In the lecture we already got to know the famous problem of the dining philosophers. You can download a code skeleton from our homepage. In the provided code the code to pickup the left and right fork is missing.



1. (*Semaphore functions*) Find out what the functions *sem\_init*, *sem\_destroy*, *sem\_post* and *sem\_wait* are for.
2. (*Solve the problem*) Use the semaphores to solve the problem. Explain the deadlock issue and find a way to avoid it.