1 Intro

empty by now

2 Quantitative analysis

A process is either (a) in its working phase (either working phase 1 or phase 2), (b) entering the barrier (by adding his id to the barrier variable), (c) exiting the barrier by noticing that the barrier is full.

Barrier properties

1. On the purely functional side we are mainly interested in the correctness of the barrier, meaning that there are no two processes $1 \leq i, j \leq n$, $i \neq j$ being in different working phases. Hence, the working periods are clearly separated by the barrier. On the liveness side, we intend to guarantee, that all processes run through both of their working periods infinitely often. There could be other purely functional properties which depend on the concrete barrier implementation.

   identify implementation-specific functional properties

2. On the quantitative side, we are interested in the *(average / min. / max.) time and energy spent within the barrier* for an *individual process* i, meaning in between the point in time where process i enters the barrier (indicated by the first read or write operation on the barrier variable) and the moment where process i leaves the barrier and enters the next working phase. As all the processes $1 \leq i \leq n$ are symmetric, we expect the overall (average / min. / max.) time and energy spent on the entire barrier to be n times the result for of individual process i.

   validate this expectation?

   From a *global perspective* the following points in time interesting

   A) the first process finished a working phase and entered the barrier

   B) the last process finished a working phase and entered the barrier

   C) the first process recognizes that the barrier is full and leaves the barrier

   D) the last process recognizes that the barrier is full and leaves the barrier

   does time (strictly) correlate with energy? why? why not?

   and we may ask for e.g., the *(average / min. / max.) time between B and D as well as C and D*.

   add timeline picture illustrating moments A–D

   Other indicators for the performance of the different barrier implementations in context of different memory models could be, e.g., the following. We may look at

   - the number and cost (i.e., energy and time) of (expensive) memory manager messages, e.g., pushes between processes with with large distance (measured in the number of hops in the network that would be needed to transfer the push message).
   - ...

   What about the other combinations of A,..,D?

References