בס"ד

תרגיל בית ג – מערכות הפעלה, תשפ"ג

בתרגיל זה עליכם לבצע תכנות מקבילי בשפת C בסביבת Linux.

לצורך סינכרון בין התהליכונים, עליכם להשתמש בסמפור בינארי.

יש להגיש את הפתרון עם התייחסות (בהערות) לכל הסעיפים של המשימה.

בהצלחה רבה!

Agents

This program simulates the use of agents for parallel operations.
It is very useful in distributing the job between parallel workers.

The main process initiates a global account file with a start sum and sends some agents to perform independent operations.
Every agent works independently, earning or spending resources, updates global account after each operation and lists each operation in personal log file.

There is also a controller who accidentally checks if the data in the log files is consistent with the amount written in the account file.

If it isn't, it will state "Not consistent!" and will end the program (kill all agents).

Syntax: agents N
  N is the number of parallel agents (actually: 0 < N <= 8).

The program generates the following files:
account - The common account.
A1,A2,A3... - Each file is the log that traces the operation of each agent.

The task

If there is only one agent, everything works great.
But if there are many, the data usually becomes inconsistent (if not, try a few more times).
1) What causes the problem? Fix it in the shortest way with maximum parallelism so the data will be always consistent.
Keep all agents working independently, use semaphores; you have an example. 60% mark?
2) When the controller really makes the check? Fix it to allow random checks. 40% mark?
3) Use ptread_join() to wait for the normal end of the program.
Is it a good idea to place it at the end of the main function to wait for the end of all agents? Give a proper solution.
4) Pay attention to the comment in the declaration section of the code and use it for counters that need to be synchronized. Simpler and cheaper than Mutexes and Semaphores. Very similar to Java.