452 Bake Off!

Project Two

Created by Denton Bobeldyk, inspired by two former students!

Figure 1 Image generated by Dall-E mini

For this project you will be using semaphores, threads and shared memory.

Each baker will run as its own thread. Access to each resource will require a counting/binary semaphore as appropriate.

The program should prompt the user for a number of bakers. Each baker will be competing for the resources to create each of the recipes.

Each baker is in a shared kitchen with the following resources:

Mixer - 2
Pantry – 1
Refrigerator - 2
Bowl – 3
Spoon – 5
Oven – 1

Only one baker may ‘access’ an ingredient at a time.

Ingredients available in the pantry:

1. Flour
2. Sugar
3. Yeast
4. Baking Soda
5. Salt
6. Cinnamon

Ingredients available in the refrigerator:

1. Egg(s)
2. Milk
3. Butter

Only one baker may be in the pantry at a time.
Two bakers may be in the refrigerator at a time.

To 'bake' a recipe, the baker must acquire each of the ingredients listed below:

Cookies: Flour, Sugar, Milk, Butter
Pancakes: Flour, Sugar, Baking soda, Salt, Egg, Milk, Butter
Homemade pizza dough: Yeast, Sugar, Salt
Soft Pretzels: Flour, Sugar, Salt, Yeast, Baking Soda, Egg
Cinnamon rolls: Flour, Sugar, Salt, Butter, Eggs, Cinnamon

Once all the ingredients have been acquired: a bowl, a spoon and a mixer must be acquired to mix the ingredients together. After they have been mixed together, it must be cooked in the oven.

Each baker must complete (and cook) each of the recipes once and then announce they have finished.

Each baker must attempt to complete each item as soon as possible (don't put them to sleep).

Output to the terminal what each of the bakers are doing in real time. The output from each baker should be a different color.

You may use System V semaphores or POSIX semaphores.

Assign one of the bakers to have a chance to be 'Ramsied', this means they must release all semaphores and start their current recipe from the beginning. This must be programmed to occur every time the program is run.

Hand-in:

1. A design document clearly describing your project as well as the implementation
2. The source code in c (no zip files please)
3. Screenshot(s) of the execution which clearly shows what each of the bakers are doing in real time (please limit your execution submission to 3 bakers to reduce the amount of output). The screenshots should be from a terminal where the output is easy to read (e.g., not a screenshot of visual studio code executing the program).

Grading:

Points will be deducted based on features that are missing in the project. The more prominent the feature, the larger number of points. The project should avoid any deadlock situations and use semaphores for any shared resources.

Extra Credit:

1. Turn the project in 2 weeks early (+10%)