

Gebze Technical University  
Computer Engineering  
CSE 344  
System Programming  
Homework 4 Report

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In this homework, we are responsible for manage the everything between chefs and wholesaler. The wholesaler will read the ingredients to deliver from a file which name is filePath containing two letters at each line like MF, MW, MS, FW, FS, WS.

## **My Solution:**

First of all all parameter test is done and setted some errno and printed screen then exited. Then all the semaphores are initialized. File: We can assume the file has valid content and at least 10 rows. So, I do not need to check the content of the file.

## **1 Semaphores and purposes:**

wholesaler\_ready: wholesaler gets 1 row ingredients from file and pusher decides which chef takes them and chef will takes. So this semaphore sets communication between wholesaler - pusher - chef. Chef post this semaphores when the g ulla  is prepared to deliver. mutex\_pusher: if wholesaler has 1 row

ingredient, wholesaler post this and pusher can see this, looks the ingredients which is read from the file by wholesaler and posts the relevant chef, chef will make a g ulla  and post wholesaler\_ready and pusher waits until the other post. milk\_flour, milk\_walnuts, milk\_sugar, flour\_walnuts, flour\_sugar, walnuts\_sugar: these are necessary to chefs and chefs get them when the pusher post.

## **2 Created Threads:**

### **2.1 Chefs:**

There are 6 chefs in a street, and each has an endless supply of two distinct ingredients and lacks the remaining two:

Chef1 has an endless supply of walnuts and sugar but lacks milk and flour.

Chef2 has an endless supply of flour and sugar but lacks milk and walnuts.

Chef3 has an endless supply of flour and walnuts but lacks milk and sugar.

Chef4 has an endless supply of milk and sugar but lacks flour and walnuts.

Chef5 has an endless supply of milk and walnuts but lacks flour and sugar.

Chef6 has an endless supply of milk and flour but lacks walnuts and sugar

### **2.2 Pusher:**

There is 1 pusher and responsible to decide which chef lacks of which ingredients. Post the semaphores of ingredients according to this knowledge.

## **3 Function Definitions:**

### **3.1 main:**

In the main function, created 6 threads for chefs and 1 thread for pusher. main is also thread which is wholesaler. I gave an ID for every chef and pusher. Wholesaler waits until wholesaler\_ready is quite (initialized with 1 already) and reads 1 line from the file and posts mutex\_pusher while the file contents is quite.

### 3.2 chef:

The parameter is the ID of chefs. Looks ID of chef and the ingredients. If the chef ID and ingredients are exist, then chef takes them and prepare g  lla  , sleeps random time 1 to 5 inclusive, and deliver to wholesaler and posts wholesaler\_ready. Now wholesaler can get the other ingredients.

### 3.3 pusher:

Pusher waits mutex\_pusher. Pusher knows which chef has which ingredients and which ingredients lack of. So, if the read line, by wholesaler, MF - posts milk\_flour, MW - posts milk\_walnuts, MS - posts milk\_sugar, FW - posts flour\_walnuts, FS - posts flour\_sugar, WS - posts walnuts\_sugar. For all these operations executes while all the file has read to onechar line by line, and there is no more thing to read, onechar is setted as -, and this onechar is kept in heap, so all the processes has what includes. If onechar has -, then all threads will exit. main, wholesaler waits then with pthread\_join, will also exit.

## Tests for parameters:

```
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$ make all
gcc -c program.c
gcc -Wall -Wextra -pedantic program.c -o program -pthread
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$ ./program
The file is not given
The command line should be: ./program -i filePath : No such file or directory
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$ ./program -i
The file is not given
The command line should be: ./program -i filePath : No such file or directory
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$ █
```

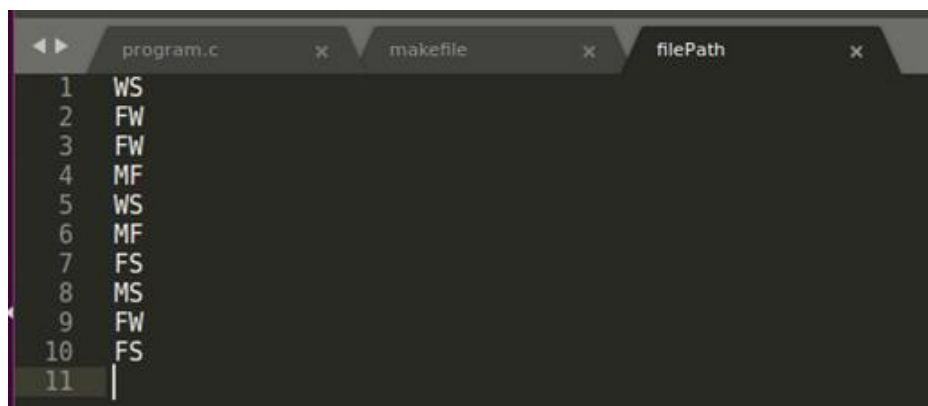
## Test for memory leak:

```
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$ valgrind --leak-check=yes ./program -i filePath
==2283== Memcheck, a memory error detector
==2283== Copyright (C) 2002-2015, and GNU GPL'd, by Julian Seward et al.
==2283== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==2283== Command: ./program -i filePath
==2283==
the wholesaler delivers walnuts and sugar
the wholesaler is waiting for the dessert
chef1 is waiting for milk and flour
chef4 is waiting for flour and walnuts
chef5 is waiting for flour and sugar
chef6 is waiting for walnuts and sugar
chef6 has taken the walnuts

==2283==
==2283== HEAP SUMMARY:
==2283==   in use at exit: 0 bytes in 0 blocks
==2283==   total heap usage: 10 allocs, 10 frees, 2,960 bytes allocated
==2283==
==2283== All heap blocks were freed -- no leaks are possible
==2283==
==2283== For counts of detected and suppressed errors, rerun with: -v
==2283== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIK$
```

Here is some sample input – output screens:

input file:



```
program.c x makefile x filePath x
1 WS
2 FW
3 FW
4 MF
5 WS
6 MF
7 FS
8 MS
9 FW
10 FS
11 |
```

output file:

```
gcc -Wall -Wextra -pedantic program.c -o program -pthread
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIKS ./program -i filePath
chef1 is waiting for milk and flour
chef2 is waiting for milk and walnuts
the wholesaler delivers walnuts and sugar
the wholesaler is waiting for the dessert
chef6 is waiting for walnuts and sugar
chef3 is waiting for milk and sugar
chef5 is waiting for flour and sugar
chef4 is waiting for flour and walnuts
chef6 has taken the walnuts
chef6 has taken the sugar
chef6 is preparing the dessert
chef6 has delivered the dessert to the wholesaler
chef6 is waiting for walnuts and sugar
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers flour and walnuts
the wholesaler is waiting for the dessert
chef4 has taken the flour
chef4 has taken the walnuts
chef4 is preparing the dessert
chef4 has delivered the dessert to the wholesaler
chef4 is waiting for flour and walnuts
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers flour and walnuts
the wholesaler is waiting for the dessert
chef4 has taken the flour
chef4 has taken the walnuts
chef4 is preparing the dessert
chef4 has delivered the dessert to the wholesaler
chef4 is waiting for flour and walnuts
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers milk and flour
the wholesaler is waiting for the dessert
chef1 has taken the milk
chef1 has taken the flour
chef1 is preparing the dessert
chef1 has delivered the dessert to the wholesaler
chef1 is waiting for milk and flour
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers walnuts and sugar
the wholesaler is waiting for the dessert
chef6 has taken the walnuts
chef6 has taken the sugar
chef6 is preparing the dessert
chef6 has delivered the dessert to the wholesaler
chef6 is waiting for walnuts and sugar
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers milk and flour
the wholesaler is waiting for the dessert
chef1 has taken the milk
chef1 has taken the flour
chef1 is preparing the dessert
chef1 has delivered the dessert to the wholesaler
chef1 is waiting for milk and flour
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers flour and sugar
the wholesaler is waiting for the dessert
chef5 has taken the flour
chef5 has taken the sugar
chef5 is preparing the dessert
chef5 has delivered the dessert to the wholesaler
chef5 is waiting for flour and sugar
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers milk and sugar
the wholesaler is waiting for the dessert
chef3 has taken the milk
chef3 has taken the sugar
chef3 is preparing the dessert
chef3 has delivered the dessert to the wholesaler
chef3 is waiting for milk and sugar
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers flour and walnuts
the wholesaler is waiting for the dessert
chef4 has taken the flour
chef4 has taken the walnuts
chef4 is preparing the dessert
chef4 has delivered the dessert to the wholesaler
chef4 is waiting for flour and walnuts
the wholesaler has obtained the dessert and left to sell it
the wholesaler delivers flour and sugar
the wholesaler is waiting for the dessert
chef5 has taken the flour
chef5 has taken the sugar
chef5 is preparing the dessert
chef5 has delivered the dessert to the wholesaler
chef5 is waiting for flour and sugar
the wholesaler has obtained the dessert and left to sell it
sed@sed:~/Desktop/hw4/151044068_SEDA_KANIKS
```

I showed for 10 row to add report. I also tried 450 row, there is not a problem while execution.