GIT Department of Computer Engineering
CSE 344 – Spring 2022

Hw4 #Report

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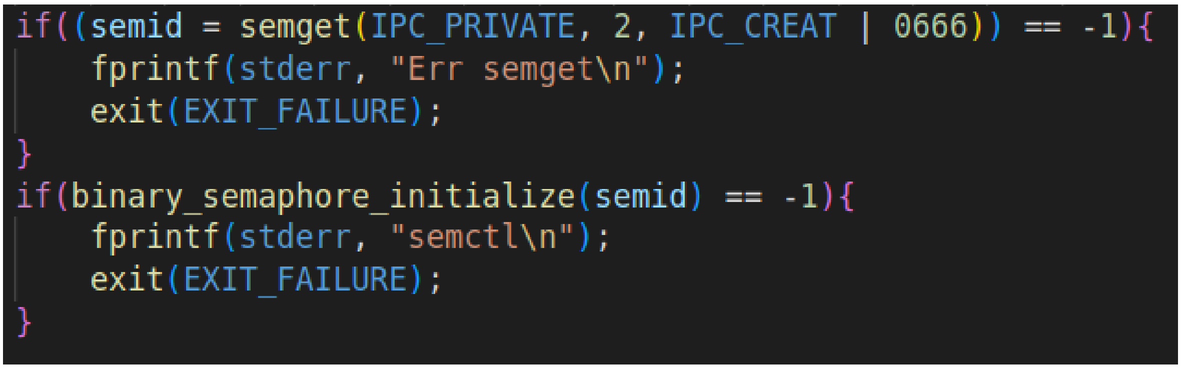
How Did I Handle the Problem?

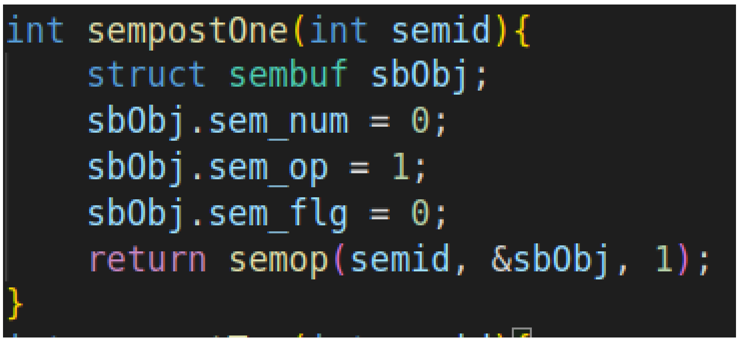
First, I checked that the NxC entered as a parameter is 'a' and 'b'. Then I created two semaphores with semaphore V specific patterns.
Then I created a thread for Supplier and ran it with pthread_detach. This thread is in SupplierFd function.
I read the file character by character and increased the required semaphore according to the value. I printed the states of the semaphores before and after increasing the semaphore. Later, I created a Consumer Thread with the for loop as much as the parameter value entered with pthread_join.
After creating, I started all of them with pthread_join. The function that these threads run is ConsumerFd. In this function, first of all, each theread tries to reduce the value of both semaphores by the N value entered with the loop. I specified the states of the semaphores by printing.
By defining some variables as global, I provided common access to threads and tried to implement the thread logic here.

How I Started Semaphores ?



```
if((semid = semget(IPC_PRIVATE, 2, IPC_CREAT | 0666)) == -1){
    fprintf(stderr, "Err semget\n");
    exit(EXIT_FAILURE);
}
if(binary_semaphore_initialize(semid) == -1){
    fprintf(stderr, "semctl\n");
    exit(EXIT_FAILURE);
}
```

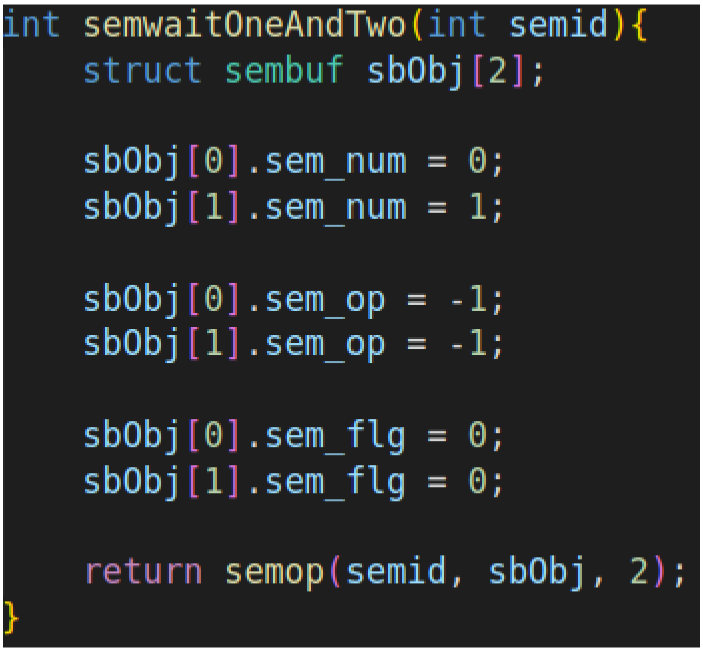
How Did I Increase Semaphores?



```
int sempostOne(int semid){
    struct sembuf sbObj;
    sbObj.sem_num = 0;
    sbObj.sem_op = 1;
    sbObj.sem_flg = 0;
    return semop(semid, &sbObj, 1);
}
```

Here I increase semaphore1. Sem_num indicates which semaphore it is and sem_post indicates how much I will increase its value.

How did I reduce the semaphore values?



```
int semwaitOneAndTwo(int semid){
    struct sembuf sbObj[2];

    sbObj[0].sem_num = 0;
    sbObj[1].sem_num = 1;

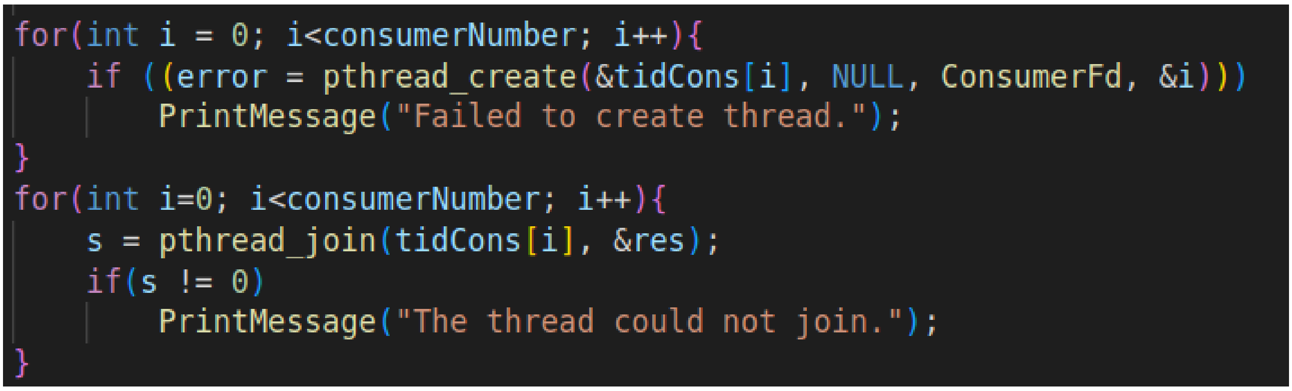
    sbObj[0].sem_op = -1;
    sbObj[1].sem_op = -1;

    sbObj[0].sem_flg = 0;
    sbObj[1].sem_flg = 0;

    return semop(semid, sbObj, 2);
}
```

I'm trying to decrease the value of the two semaphores I mentioned here, by 1. If any of the semaphores is 0, the consumer thread waits there, waiting for the semaphore to increase.

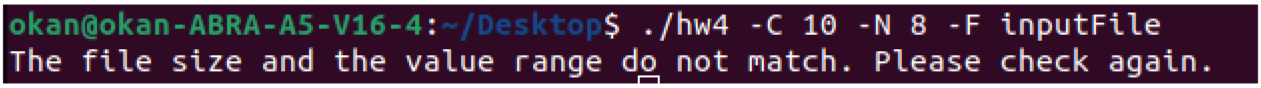
Creating and starting multiple Consumer threads



```
for(int i = 0; i<consumerNumber; i++){
    if ((error = pthread_create(&tidCons[i], NULL, ConsumerFd, &i)))
        PrintMessage("Failed to create thread.");
}
for(int i=0; i<consumerNumber; i++){
    s = pthread_join(tidCons[i], &res);
    if(s != 0)
        PrintMessage("The thread could not join.");
}
```

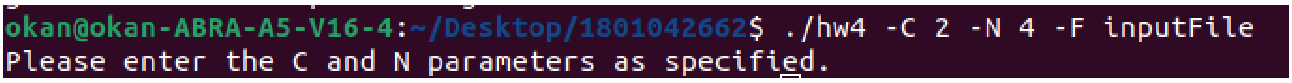
Test Cases

-Error Handling



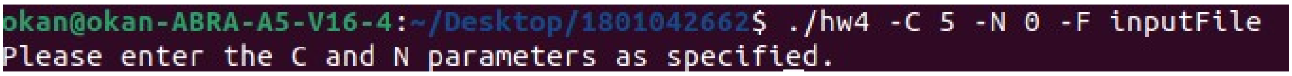
```
okan@okan-ABRA-A5-V16-4:~/Desktop$ ./hw4 -C 10 -N 8 -F inputFile
The file size and the value range do not match. Please check again.
```

I have a total of 80 'a' and 'b' in my file. However, the program terminates with a warning because the entered N and C values do not match the desired number.



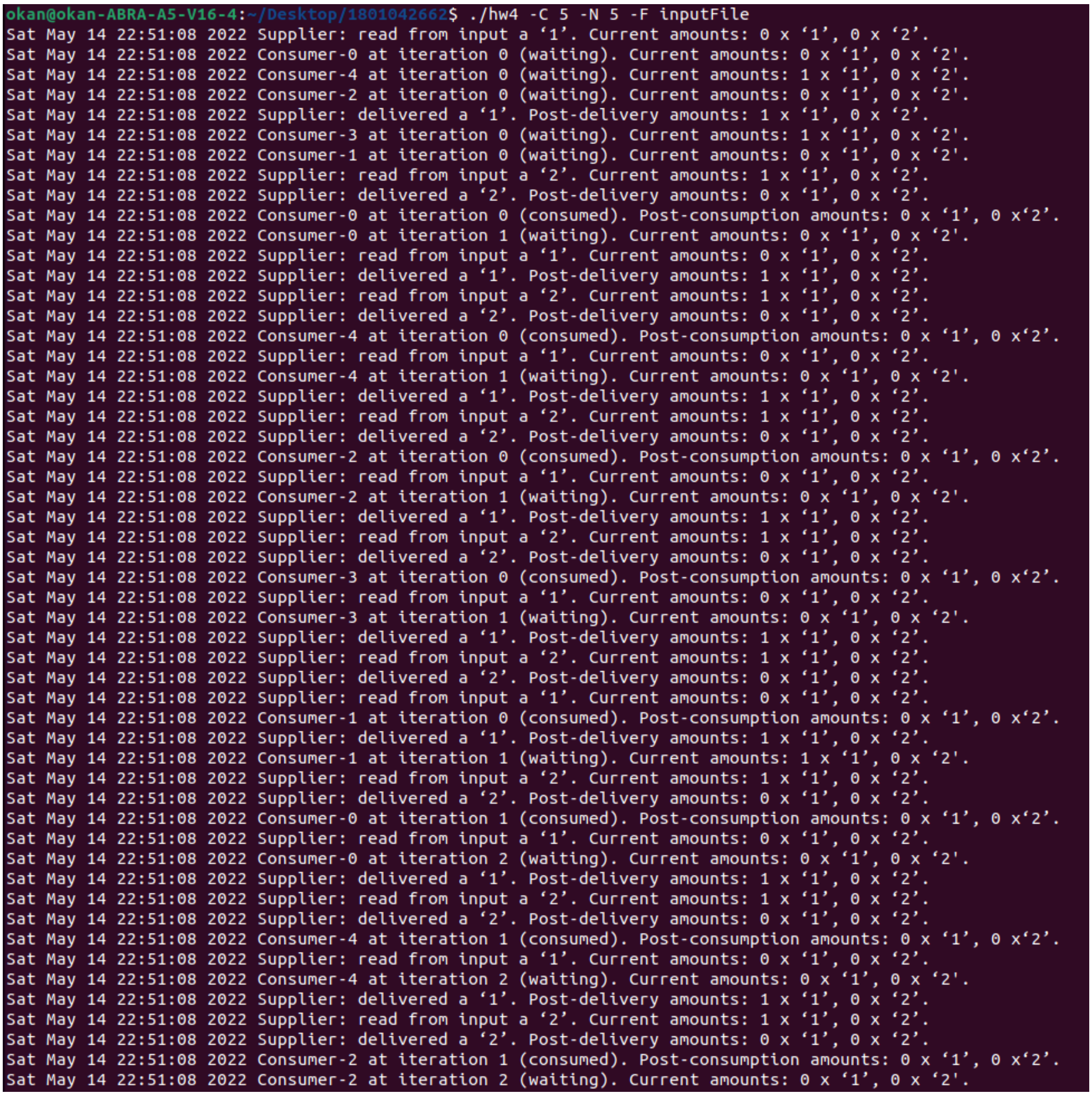
```
okan@okan-ABRA-A5-V16-4:~/Desktop/1801042662$ ./hw4 -C 2 -N 4 -F inputFile
Please enter the C and N parameters as specified.
```

The number of consumers must be more than 4.



```
okan@okan-ABRA-A5-V16-4:~/Desktop/1801042662$ ./hw4 -C 5 -N 0 -F inputFile
Please enter the C and N parameters as specified.
```

N parameter must be greater than 1.



```
okan@okan-ABRA-A5-V16-4:~/Desktop/1801042662$ ./hw4 -C 5 -N 5 -F inputFile
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-0 at iteration 0 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Consumer-4 at iteration 0 (waiting). Current amounts: 1 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Consumer-2 at iteration 0 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-3 at iteration 0 (waiting). Current amounts: 1 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Consumer-1 at iteration 0 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘2’. Current amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-0 at iteration 0 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Consumer-0 at iteration 1 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
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Sat May 14 22:51:08 2022 Consumer-1 at iteration 0 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
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Sat May 14 22:51:08 2022 Consumer-0 at iteration 1 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-0 at iteration 2 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘2’. Current amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-4 at iteration 1 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-4 at iteration 2 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
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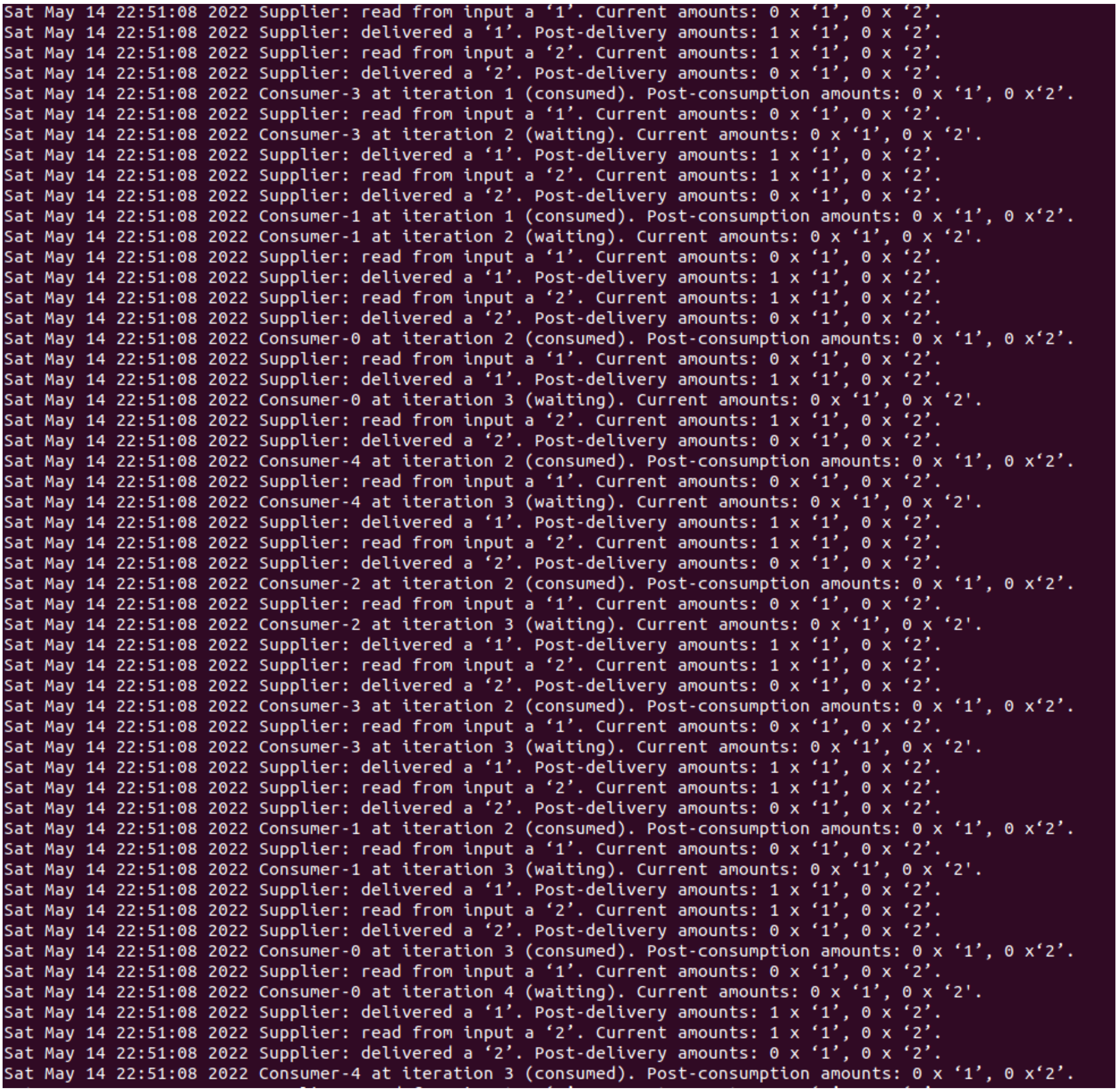
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-2 at iteration 1 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Consumer-2 at iteration 2 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
```



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Sat May 14 22:51:08 2022 Consumer-1 at iteration 2 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-1 at iteration 3 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
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Sat May 14 22:51:08 2022 Consumer-0 at iteration 3 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-0 at iteration 4 (waiting). Current amounts: 0 x ‘1’, 0 x ‘2'.
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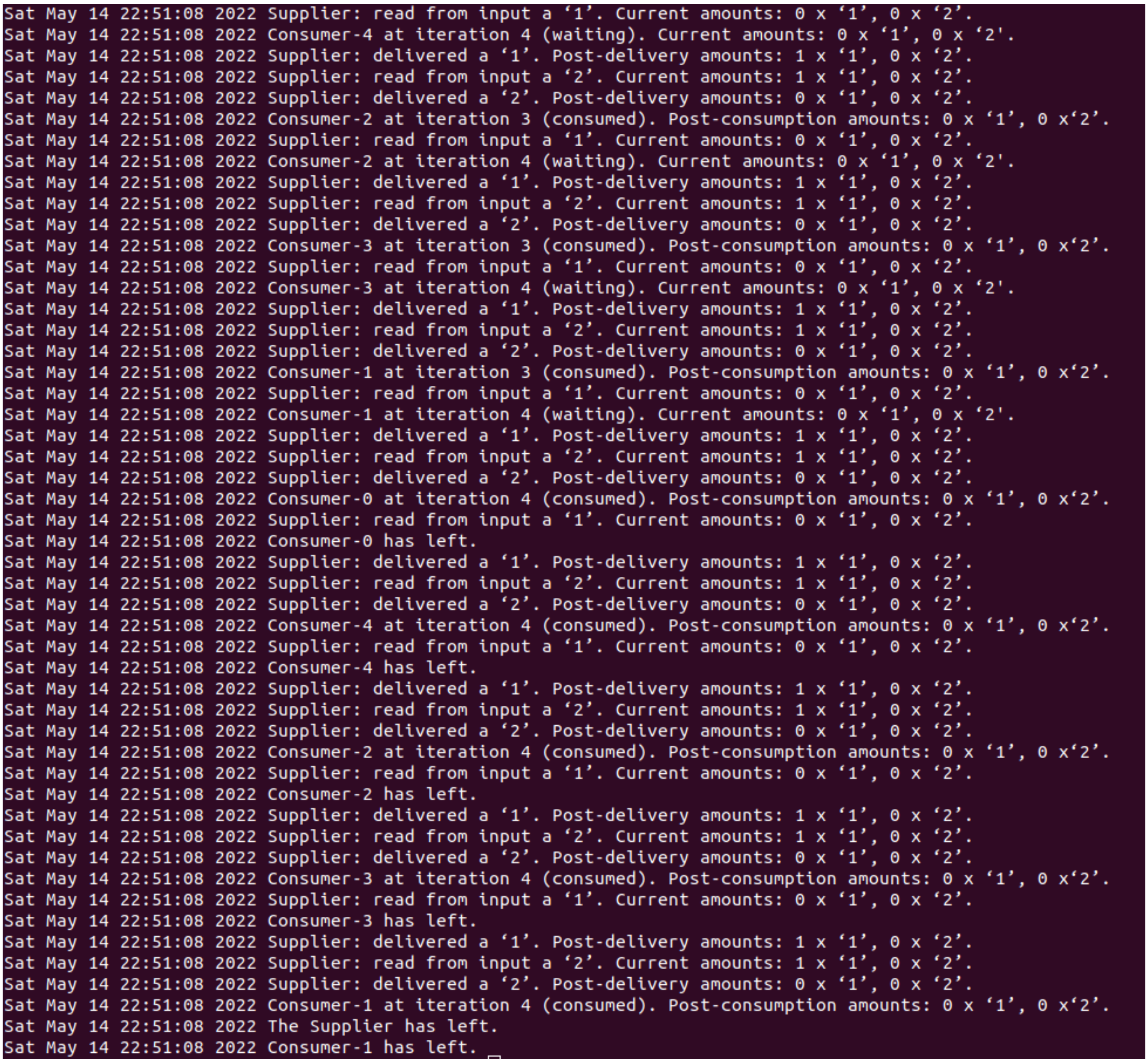
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-4 at iteration 3 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
```



```
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Sat May 14 22:51:08 2022 Consumer-1 at iteration 3 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
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Sat May 14 22:51:08 2022 Consumer-0 at iteration 4 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-0 has left.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘2’. Current amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-4 at iteration 4 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-4 has left.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘2’. Current amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-2 at iteration 4 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-2 has left.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘2’. Current amounts: 1 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-3 at iteration 4 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 Supplier: read from input a ‘1’. Current amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-3 has left.
Sat May 14 22:51:08 2022 Supplier: delivered a ‘1’. Post-delivery amounts: 1 x ‘1’, 0 x ‘2’.
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Sat May 14 22:51:08 2022 Supplier: delivered a ‘2’. Post-delivery amounts: 0 x ‘1’, 0 x ‘2’.
Sat May 14 22:51:08 2022 Consumer-1 at iteration 4 (consumed). Post-consumption amounts: 0 x ‘1’, 0 x‘2’.
Sat May 14 22:51:08 2022 The Supplier has left.
Sat May 14 22:51:08 2022 Consumer-1 has left.
```

Output for files with a total of 50 'a' and 'b'