Advanced Operating Systems
MPI Project – Banker's Algorithm

Project description

In this project you will implement a distributed version of the Bankers algorithm(describe in the class). The coordinator process(rank 0) will read a file containing the following information:

The total number of resources types

The total number of instances for each resource type.

The file format is as follows:

Format of the input file

```
total_number_of_resource_types
resource_type_1_total_number
resource_type_2_total_number
.
.
.
resource_type_n          total_number
```

Example: P_0

```
5
1 20
2 12
3 15
4 21
5 17
```

Each process will read a file named P_rank, where rank is the process rank. This file contain the process allocation and resource need. The file format is as follows:

Format of the input file

```
Resource_type  max_need   holding
```

Example: P_1

```
1  5   2
2  6   4

3  1   0
   . . .
   . . .
   . . .
```

After Reading the resource allocation file, each process will send that data to the coordinator. The coordinator will:

Construct the need vector, max matrix and the allocation matrix.

Run the safety algorithm to determine if the state is safe.

If the sate is safe, the coordinator will find a safe sequence to satisfy the requests for each process.

– The coordinator will send resources to the processes as determined in the safe requests.

– When the process receives the resources, if will use them(sleeps for a random number between 5 and 10 second).

– When the process wakes-up, it will release the resources; send a message to the coordinator.

Write a C/C++ program that uses MPI to simulate the distributed Banker algorithm describe above.
Program output
Sample Execution: mpirun -np 6 Cristian Cristian.txt

```
Process with rank 1 Reading the resource allocation
Process with rank 1 Sending the resources allocation information to coordinator.
Process with rank 2 Reading the resource allocation
Process with rank 2 Sending the resources allocation information to coordinator
.
.
.

The coordinator is checking if the state is safe :
< display the allocation matrix >
< display the need the allocation matrix >
<display the need the allocation matrix > The

current state is safe .

The coordinator is allocation resource A (2) ,... Y (8) to
    process 5
Process 5 has received the resources .
Process 5 is using the reso urces .
Process 5 is releasing resources .
...
The coordinator displays
< display the allocation matrix >
< display the need the allocation matrix >
< display the need the allocation matrix >

The coordinator is allocation resource A (3) ,... Y (7) to
    process 2
Process 2 has received the resources .
Process 2 is using the reso urces .
Process 2 is releasing resources .
```

Submission:
Submit a zip file containing:

1. Write your name on all files you submit.
2. Document your code.
3. Your C/C++ implementation of the Banker algorithm.
4. The jumpshots saved in pdf file.