Parallel and Distributed Computing: Homework 7

Objectives: The main goal of this assignment is to explore solutions to the resource allocation problem in a distributed system utilizing a general framework for spacial and temporal scheduling. The student is challenged to find solutions to multiple target functions within the constraints of a legal execution.

Consider a distributed computing system with 5 physical processors π_i, running a workload of 6 SPMD jobs J_i, each of them with a number of virtual processes (VP):

J_1: has 4 VPs
J_2: has 3 VPs
J_3: has 4 VPs
J_4: has 1 VP
J_5: has 7 VPs
J_6: has 2 VPs

Using the framework for spatial and temporal scheduling presented in class, a possible physical allocation (spatial schedule) is shown below:

				6
6				5
5	5			5
3	4	5	5	3
1	3	5	3	2
1	2	1	1	2
π_1	π_2	π_3	π_4	π_5

Assignment

Assuming there is no VP migration in the described system, discuss/answer the following items:

1. Derive a temporal schedule: From the above allocation derive a legal periodic temporal schedule, and:

- Clearly explain why your proposed temporal schedule is legal.
- Indicate the number of cycles in its period.
- Compute the idling ratio of the schedule.

2. New schedule: Try to find a new schedule (new or a modification of the given schedule) that has a better idling ratio, without making the schedule's period impractically large. Please explain clearly and show your work!

3. Best schedule: Is there a best periodic temporal schedule? That is a temporal schedule with a minimum idling ratio? If the answer is yes, do provide an example of such optimal schedule for this workload. *Hint*: There are many right answers, but there are only a few best answers - can you find one of them?

Report

You shall write a report of up to 2 pages addressing the mentioned points. Add diagrams as necessary to explain your answers.

Submission

Submit **one** file named `hw7.zip`, containing **exactly 2 files**. Make sure the zip file does **not** include sub-directories (as Mac's default compression tool does) or extra files:

1. `report.pdf`: The digitally produced report.
2. `team.txt`: Text file with UCINetID and name of each student in your team. Each line will have this format:
   `<UCINetID>, <firstName>, <lastName>`