

CSCI-GA.3033-009
Graphics Processing Units (GPUs): Architecture and Programming
Programming Assignment 3

In this lab, you are going to build a Sudoku solver in OpenMP or Pthreads and MPI. For those of you who are not familiar with this game, here is a quick description.

Sudoku is a logic-based, combinatorial number-placement puzzle. The objective is to fill a **9×9 grid** with digits so that each column, each row, and each of the nine 3×3 sub-grids that compose the grid contains all of the **digits from 1 to 9**. The input is a partially completed grid. The output is a fully filled 9x9 grid that satisfies the aforementioned constraints.

Here is an input grid:

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

And here is the solution (with solution numbers in red):

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

- Write your program such that it reads a text files and outputs a text file. The format of the text file is a row per line, with no spaces separating the digits. An empty spot is represented by 0. For example, the first grid above will be presented in a text file as:

530070000
600195000
098000060
800060003
400803001
700020006
060000280
000419005
000080079

- Write two versions of the program:
 - One in OpenMP or pthreads
 - One in MPI
- Your binary file must be called:
 - **ssolver** (for OpenMP or Pthreads)
 - **ssolvermpi** (the MPI version) **The MPI version must always run with 3 processes**
- The program will be called as: ***progname filename.in***
- Each version generates an output **filename.sol** (same filename as the input but different extension) that contains the solution.
- You can test your code with this online website that has easy and hard problems: http://www.puzl.be/en/puzl_list.html
- In a separate file explain the following:
 - Which implementation is faster?
 - By how much?
 - Why is that?
 - How did you measure the performance?
- Email, to the grader, your description file and your source code in a single zip file named: **yourlastname.yourfirstname.zip**

Important: There may be cases where there are several correct solutions. You just need to find one of them.

Have Fun!