# iMOPSE solution validator - User's Manual

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November 24, 2014

## 1 Introduction

This document describes what the iMOPSE solution validator is and how to use it.

iMOPSE solution validator is a open source tool released for students and researchers to provide a possibility of quickly checking whether final solution satisfies all constraints defined in Multi–Skill Resource–Constrained Project Scheduling Problem (MS–RCPSP). Types of constraints are as follows:

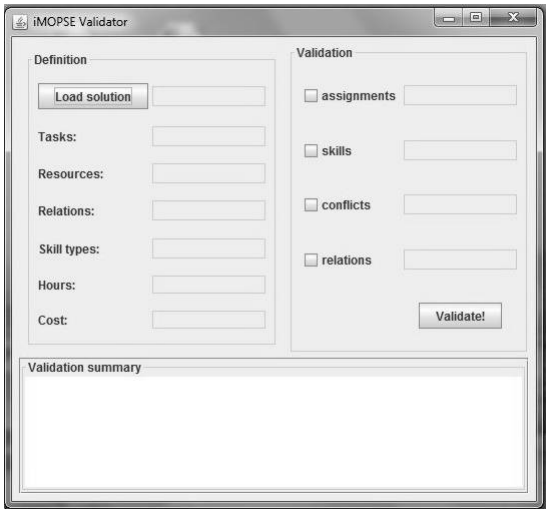
1. Assignments constraints - checks whether all tasks have any resource assigned.
2. Conflict constraints - checks whether any resource has more than one task assigned in given time.
3. Precedence relations constraints - checks whether any task having predecessors is set to be started after all of its predecessors would be finished.
4. Skills constraints - checks whether any task has resource assigned that is capable of performing it. Other words: if assigned resource disposes skill required by given task in no lower than required familiarity level.

All constraints have to be satisfied in final project schedule (solution file). If any constraint is violated, the final solution is invalid. It suggests that something is wrong with the rules responsible for building a schedule.

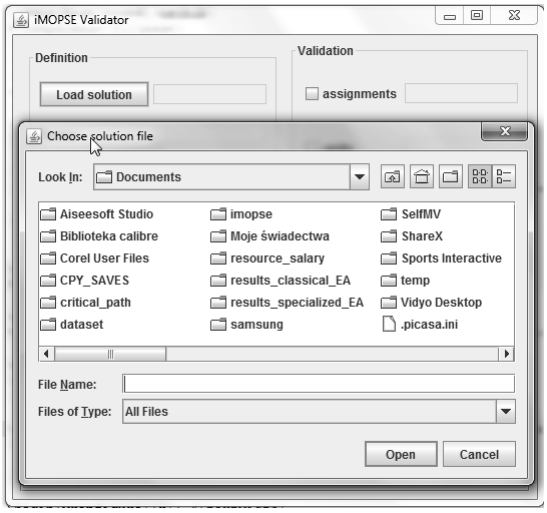
## 2 Technical requirements

To use the iMOPSE solution validator, Java Runtime Environment (version 1.5 or newer) has to be provided.

# 3 How to use the validator – step by step




1. Launch the validator.jar. Following starting screen should be displayed:
2. Click the button: Load solution. The file chooser dialog box will be displayed.
3. Localize the solution file on your hard disk. Choose a file with .sol file extension.

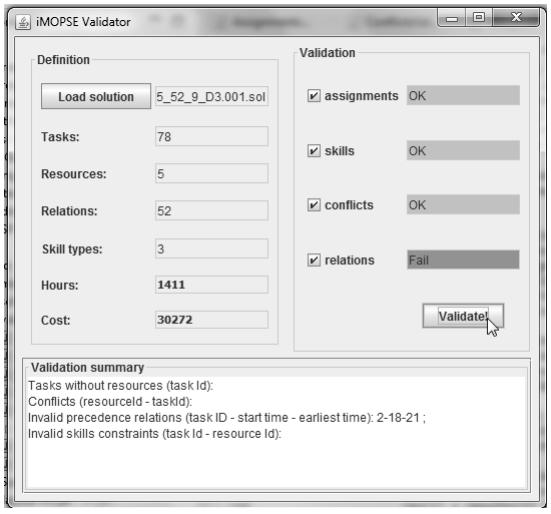



4. Validator will automatically search the file with project definition (file with .def extension) in the directory of selected solution.

   The solution file name should be the same as definition file name from the beginning to the first occurrence of dot in the file name. E.g. if definition file name is 78_5_52_9_D3.def, then the solution file should have name beginning with 78_5_52_9_D3. and the file extension .sol, e.g. 78_5_52_9_D3.001.sol.

   If the definition file is not found in the indicated directory, an error message is displayed.

5. After selecting the file, main project schedule info will be displayed: number of tasks, resources, relations and skill types. Furthermore, project schedule duration and cost is displayed in bold.




6. Choose which constraints you would like to validate in your loaded solution by ticking respective checkboxes.
7. Click the button: Validate, to run the validation. Regarding selected constraints, selected ones will be checked.
8. If given constraint is satisfied, the message 'OK' in the green background is displayed. Otherwise the message 'Fail' is displayed next to selected checkbox.
9. In the text area above, the validation summary is displayed. If some validation failed, the details are presented in given text area.

# 4 Used file formats

Validator uses two kinds of files: definition file and solution file.

Definition file contains some general info, information about tasks (ID, duration, skill required and list of predecessors) and information about resources (ID, salary and pool of skills covered). The file structure is as follows:

```
============================================================
File name: 78_5_52_9_D3.mpp
Creation date: Thu Sep 25 22:31:18 CEST 2014
Website: http://imopse.ii.pwr.edu.pl/
Reference:
Myszkowski P. B., Skowronski M. E., Olech L., Oslizlo K.,
Hybrid Ant Colony Optimization in solving Multi-Skill Resource-Constrained Project Scheduling Problem,
Soft Computing, DOI: DOI 10.1007/s00500-014-1455-x
============================================================
General characteristics:
Tasks: 78
Resources: 5
Precedence relations: 52
Number of skill types: 9
============================================================
ResourceID   Salary   Skills
1     16.4    Q2: 1    Q4: 1    Q3: 0    Q8: 1    Q1: 1    Q6: 1
2     15.7    Q2: 2    Q4: 2    Q8: 2    Q1: 0    Q3: 2    Q6: 2
..
============================================================
TaskID   Duration   Skill   Predecessor IDs
1     18  Q4: 1
2     35  Q0: 1   1
...
============================================================
```

Solution file contains information about resource–to–task assignments: which resource is assigned to given task and when given task is set to be started (hour number). The file structure is following:

```
Hour   Resource assignments (resource ID - task ID)
1 2-1 5-4
18 3-2
...
```