Resource Constrained Project Scheduling Problem (RCPSP)

- Given:
  - a set of cumulative resources,
  - a set of tasks with durations and resource requirements,
  - precedence constraints between some tasks,

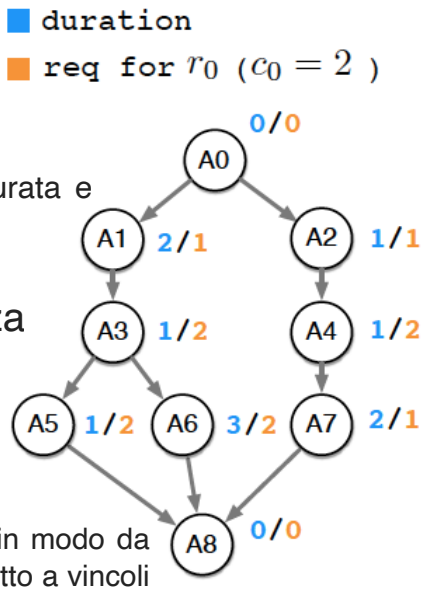
  RCPSP consists of deciding:
  - when to execute each task so as to minimize the makespan, subject to precedence and cumulative resource constraints.

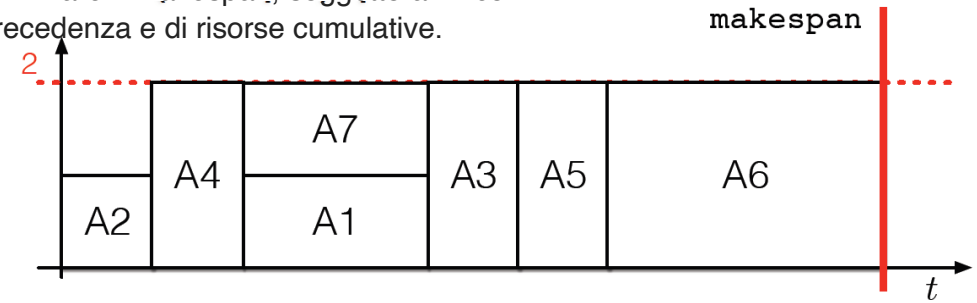
un insieme di risorse cumulative risorse,

un insieme di attività con durata e requisiti di risorse

vincoli di precedenza tra alcuni compiti

RCPSP consiste nel decidere quando eseguire ogni compito in modo da minimizzare il makespan, soggetto a vincoli di precedenza e di risorse cumulative.





RCPSP

- Variables and Domains
  - Start time S_i for each task with domain?
- Constraints
  - Precedence constraints for each $a_i \rightarrow a_j$
  - Cumulative constraints for each resource.
- Objective
  - Minimize the maximum $S_i + d_i$.

Job Shop Scheduling Problem (JSP)

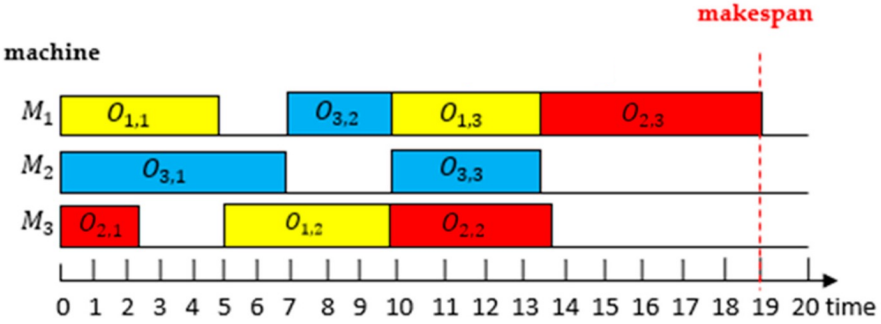
- un insieme di macchine e un insieme di lavori, ognuno dei quali è composto da una sequenza di compiti/ordini, ognuno dei quali richiede una macchina diversa,
- requisiti della macchina e durata dei compiti dipendenti dalla macchina,

- Given:
  - a set of machines and a set of jobs, each composed of a sequence of tasks/orders, each requiring a different machine,
  - machine requirements and machine-dependent durations of the job tasks,

JSP consists of deciding:

- when to execute the job tasks so to minimize the makespan, subject to task precedence and disjunctive resource constraints.

quando eseguire le attività lavorative in modo da minimizzare il makespan, soggetto alla precedenza delle attività e ai vincoli disgiuntivi delle risorse.



JSP

- Note # tasks = # machines (m)
- Variables and Domains
  - Start time S_{ji} for each job j and its task i with domain?
- Constraints
  - Precedence constraints on consecutive tasks of each job.
  - Disjunctive constraints for each machine on the job tasks requiring the machine.
- Objective function
  - Makespan as a dummy task with the lowest precedence in the schedule.
- Objective
  - minimize makespan.

To Do

- Implement both models.
- Search for the optimal solution to the given instances using Gecode, with a time limit of 5 mins (300 secs).
- Experiment with:
  - default search
  - search on the smallest (earliest) start times.
- Record the objective value and the time (msecs) in each experiment.
- What do you observe? Is searching on the smallest (earliest) start times is always a good idea? Justify your answer.