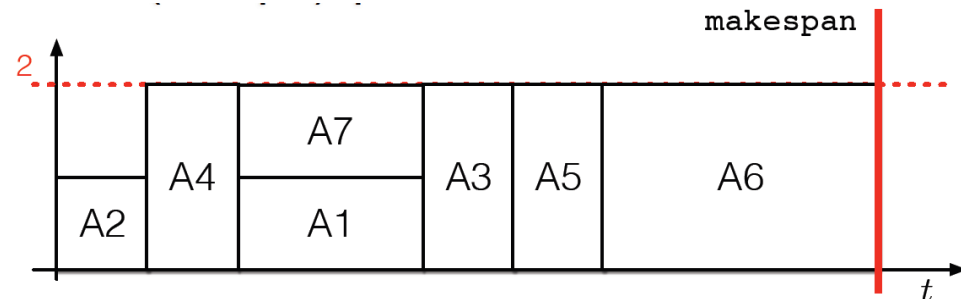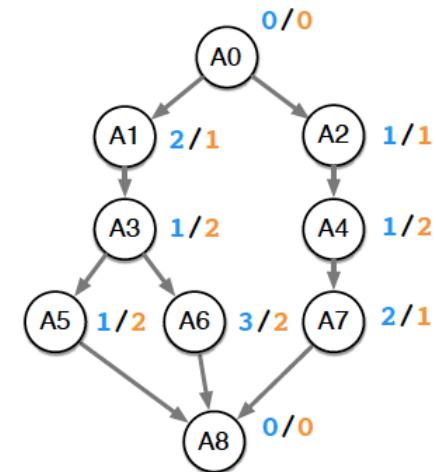# Resource Constrained Project Scheduling Problem (RCPSP)

- 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.

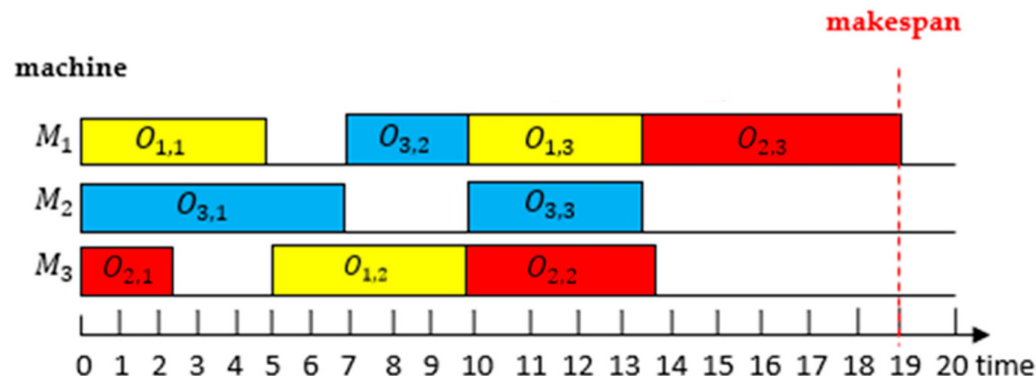# RCPSP

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

Job Shop Scheduling Problem (JSP)

- 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 durations of the job tasks,

  JSP consist of deciding:
  - when to execute the job tasks so to minimize the makespan, subject to task precedence and disjunctive resource constraints.

JSP

- # 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.
- 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?