Some Thoughts on Planning Problems

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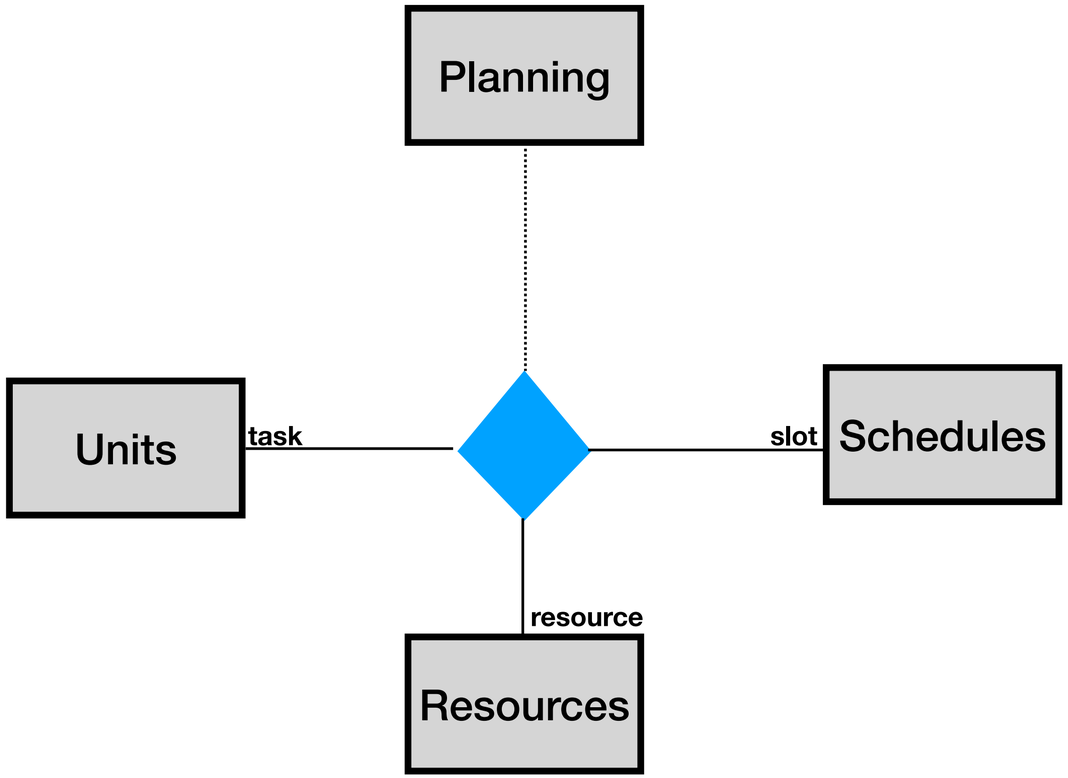
Planning in General

- A “Planning” consists of an assignment between:
  - Ressources R (Rooms, Processors, …)
  - Time-Slots T (“Schedules”)
  - Task-units (TU)
- … satisfying constraints:
  - Ressources must match to a Resource-Requirements
  - Task-units may have temporal constraints
    (tu_1 before tu_5, tu_7 + “3 days” before tu_8)
  - Task-units may have exclusivity constraints
    (the same processor/organizer can not be at the same time in different tasks …)

Planning in General

- UML - wise, this boils down to this:



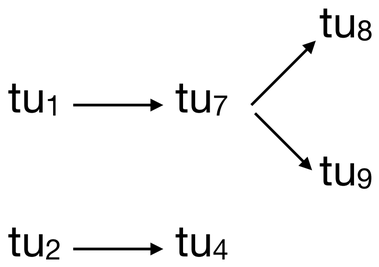
R	TIME	…	…	
E	tu_2			
S		tu_4		tu_9
S	tu_1		tu_7	tu_8
0				

p : Planning = { (tu_2, r_1, t_1),
(tu_1, r_3, t_1),
(tu_4, r_2, t_2),
(tu_7, r_3, t_3),
(tu_8, r_3, t_4),
(tu_9, r_2, t_4)
}

Planning in General

- Temporal Constraints on Tasks: e.g.

$$tu_1 < tu_7 \wedge tu_7 < tu_8 \wedge tu_7 < tu_9 \wedge tu_2 < tu_4$$



R	TIME	…	…	
E	tu_2			
S		tu_4		tu_9
S	tu_1		tu_7	tu_8
0				

or sth. like:

tu_1, tu_7 in different weeks, i.e.

tu_1 + “4 work-days” < tu_7

- Ressource requirement (“needs”):

tu_7 needs 50, r_3 offers 60;
tu_9 needs 25, r_2 offers 25,
tu_8 needs 25

p : Planning = { (tu_2, r_1, t_1),
(tu_1, r_3, t_1),
(tu_4, r_2, t_2),
(tu_7, r_3, t_3),
(tu_8, r_3, t_4),
(tu_9, r_2, t_4)
}

Planning in General

- A new demand

$tu_3 \longrightarrow tu_5$

can then be represented as the set of module placements (i.e. a set of sets):

"new_demand ≡ {S . ∃ p1. ∃ p2. S = {p1,p2} ∧ teaching_unit_of p1 = tu3
∧ teaching_unit_of p2 = tu5
∧ time_of p1 < time_of p2}"

- And a conflict-free solution for a new schedule looks like this:

R	TIME	…	…	
E	tu_2			
S		tu_4	tu_5	tu_9
S	tu_1	tu_3	tu_7	tu_8
0				