Vienna University of Technology

Modeling and Solving Constrained Optimization Problems

Energy-Cost Aware Scheduling

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4 Model

4.1 Formulation

We added an artificial root node v_0 to our graph and edges $(v0, i) : i \in V$ from the root node to every other node with weight 0:

- T Set of tasks. Artificial 0-Task added for which resource usage is 0.

- S Set of servers

- P Ordered set of time slots

4.2 Constants

- ct_i : CPU requirement for task $i \in T$

- mt_i : Memory requirement for task $i \in T$

- ot_i : I/O requirement for task $i \in T$

- st_i : Earliest start time of task $i \in T$

- et_i : Latest end time for task $i \in T$

- dt_i : Duration of task $i \in T$

- cs_j : CPU capacity of server $j \in S$

- ms_j : Memory capacity of server $j \in S$

- os_j : I/O capacity of server $j \in S$

4.3 Variables

- x_{sp} : Variable which indicates which tasks run on which server in which timeslot. An empty set indicates that no task is running on that server.

4.4 Domain Constraints

$$\forall s \in S : \forall p \in P : x_{sp} \in \mathcal{P}(T) \tag{1}$$

4.5 Constraints

$$\forall s \in S : \forall p \in P : \sum_{i \in x_{sp}} ct_i \leq cs_p \tag{2}$$

$$\forall s \in S : \forall p \in P : \sum_{i \in x_{sp}} mt_i \leq ms_p \tag{3}$$

$$\forall s \in S : \forall p \in P : \sum_{i \in x_{sp}} ot_i \leq os_p \tag{4}$$

4.6 Objective

$$min \sum_{e \in E} w_e x_e$$