

# Real-Time Systems

## Exercise 2: Scheduling

---

### Time-Driven Systems

Determine the appropriate frame sizes for a cyclic schedule for the following systems of periodic preemptible tasks described by  $(p; c)$  with  $p$ : period,  $c$ : execution time requirement.

- a)  $(6; 1), (10; 2), (18; 2)$
  - b)  $(4; 0,5), (5; 1), (10; 2), (24; 9)$
- 

### Event-Driven Systems

Given the following precedence graph of four jobs:

A 4 (0, 7]  $\longrightarrow$  B 2 (3, 10]

C 2 (1, 5]  $\longrightarrow$  D 1 (0, 6]

where in  $J e (r, d]$  means:  $J$ : job name,  $e$ : execution time,  $r$ : release time,  $d$ : deadline

- a) Explain and discuss the scheduling policies EDF, SPT, LPT, LST (MLF), LRT using the example. What follows with respect to EDF if job C has deadline 7 instead of 5?
  - b) What follows if an independent job E 1 (2,  $d]$  with  $d = 4 / d = 9$  is added to the job set?
- 

### Schedulability and Optimality

Given four sets of periodic tasks with utilization of 0.67, 0.77, 0.86, and 1.0, respectively. What do you know about the schedulability of these task sets? Explain the term "schedulable utilization."

Discuss the schedulability of the following periodic task sets according to RMS and EDF.

- a)  $T = \{(8,3), (9,2), (18,3)\}$
- b)  $T = \{(8,4), (12,4), (20,4)\}$
- c)  $T = \{(8,4), (10,2), (12,3)\}$
- d)  $T = \{(3,1), (6,2), (18,x)\}$

Explain why the policy SPT (shortest processing time) is not suited for scheduling fixed-priority real-time tasks, particularly for periodic task sets.