

# Exercise Multimedia Technology

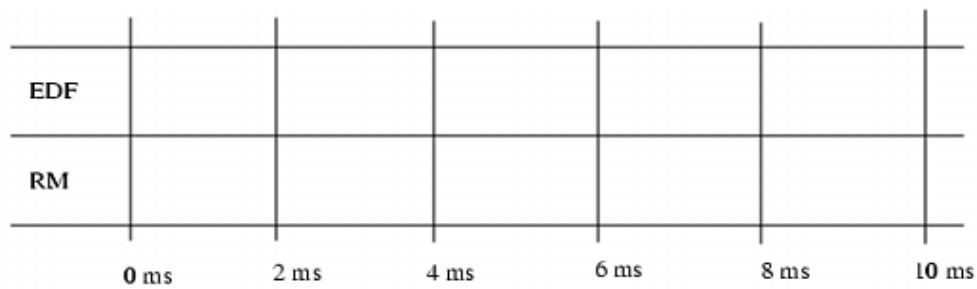
## WS 2004/2005

Sheet 13 (February 11th, 2005)

### Exercise 13.1: Scheduling

- (a) What kinds of tasks does a scheduler have to perform in an operating system?
- (b) Comment on the specific constraints a scheduler has to fulfill in the context of processing continuous data-streams.
- (c) Explain the technique of EDF-scheduling and rate-monotonic scheduling.
- (d) In the following table the arrival times and deadlines of two processes are given, each of which processes a data-stream. A packet from process 1 can be processed within 1 ms and a packet from process 2 can be processed within 2.5 ms. Insert the order of processing according to the RM (rate monotonic) scheme, resp. the EDF-scheme into the following figure. The scheduler is able to switch tasks every 0.5 ms.

| packet | Arrival process 1 | deadline P1 | Arrival process 2 | Deadline P2 |
|--------|-------------------|-------------|-------------------|-------------|
| 1      | 0 ms              | 2 ms        | 0 ms              | 5 ms        |
| 2      | 2 ms              | 4 ms        | 5 ms              | 10 ms       |
| 3      | 4 ms              | 6 ms        | -                 | -           |
| 4      | 6 ms              | 8 ms        | -                 | -           |
| 5      | 8 ms              | 10 ms       | -                 | -           |



In what periods do you encounter violations with regard to the response time using EDF?

- no problems
- violation of response time in period 1 (0 – 2ms)
- violation of response time in period 2 (2 – 4ms)
- violation of response time in period 3 (4 – 6ms)
- violation of response time in period 4 (6 – 8ms)
- violation of response time in period 5 (8 – 10ms)

In what periods do you encounter violations with regard to the response time using RM?

- no problems
- violation of response time in period 1 (0 – 2ms)
- violation of response time in period 2 (2 – 4ms)
- violation of response time in period 3 (4 – 6ms)
- violation of response time in period 4 (6 – 8ms)
- violation of response time in period 5 (8 – 10ms)

### Exercise 13.2: Videoserver

A video-on-demand server uses non-preemptive scheduling. Its purpose is to send video-data continuously to its receivers. Within 10ms the server is able to deliver a mean amount of data of about 100kByte. A video-stream has an average data-rate of about 2Mbit/s. Switching from one process to another takes 5 ms. What is the maximum number of streams the server can deliver in parallel?

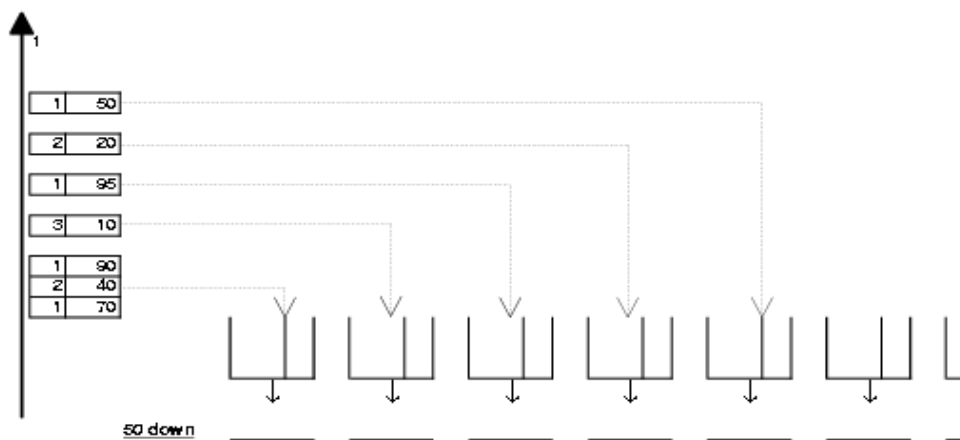
Note: 1kByte = 1000 bytes and 1 Mbit = 1000000 bits. A stream has to be fed with data at least once a second.

- The server can process 4 streams
- The server can process 22 streams

- The server can process 33 streams
- The server can process 46 streams
- The server can process 54 streams

### Exercise 13.3: Multimedia data storage

Consider the order of requested blocks of a harddrive in the next figure. Process the request order using the scan-EDF approach with modified deadlines. Write your results into the following diagram. In order to process the modified deadlines choose an appropriate function.



Choose the state of the read/write-head after processing the last query.

- 20 up
- 10 up
- 10 down

### Exercise 13.4: Threads and Processes

1. Discuss advantages and disadvantages of threads versus processes.
2. Find one application which is better suited to using threads and one to using processes.

### Exercise 13.5: Time-Warping

The following signal is given: 4, 8, 1, 5, 2

Match the signal to one of those examples provided below using time warping. Each signal has to be considered from the first to the last sample (don't omit any of them). Which signal fits best?

Signal 1: 4, 4, 8, 1, 1, 5, 5, 2

Signal 2: 9, 3, 7, 5, 2