# Exercise Multimedia Technology
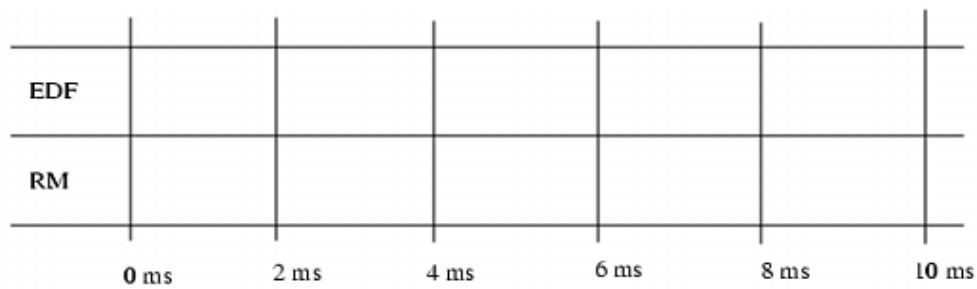# WS 2003/2004

Sheet 12 (January 30th, 2004)

## Aufgabe 12.1: 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       | -                 | -           |

| | 0 ms | 2 ms | 4 ms | 6 ms | 8 ms | 10 ms |
|-----|------|------|------|------|------|-------|
| EDF | | | | | | |
| RM | | | | | | |

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)

## Aufgabe 12.2: 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?
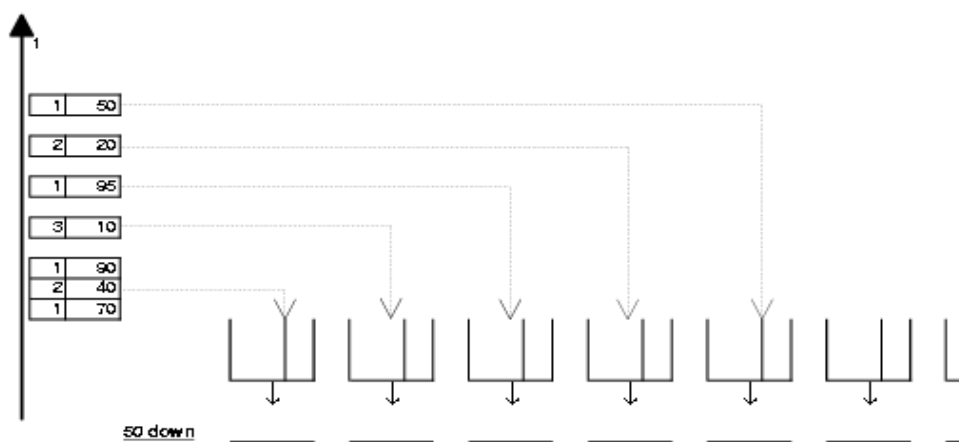
Note: 1kByte = 1000 bytes and 1 Mbit = 1000000 bits. A stream has to be fed with data at least once a second.

[ ] 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

## Aufgabe 12.3: 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

## Aufgabe 12.4: 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.

## Aufgabe 12.5: 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