

Exercise 6/6 (Tue 25.4.2006)

- 1) Using the RMFF (rate monotonic first fit) algorithm, find an assignment of the tasks in Table P9-2 to processors.
- 2) Using the RMST (rate monotonic small tasks) algorithm, find an assignment of the tasks in Table P9-2 to processors.

(Liu 9.3)

Table P9-2 Parameters of 10 periodic tasks

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
pi	7	21	29	49	64	66	160	235	260	450
ei	2	3	9	15	20	16	32	72	25	120

- 3) If the *timer_sleep()* function allows only the specification of a time interval for the calling thread to sleep, a periodic task can be implemented as follows:

```

timer_sleep(firstReleaseTime - clock);
nextReleaseTime = firstReleaseTime
do forever
    nextReleaseTime = nextReleaseTime+period;
    statements in the program of the thread
    timer_sleep(nextReleaseTime - clock);
enddo

```

where the value of *clock* is equal to the current time and *firstReleaseTime* is the delay to the first release time of the thread.

(a) Discuss the factor(s) that may introduce release-time jitters and how large the release-time jitter can be?

(b) If the thread overruns, *nextReleaseTime* may be earlier than the current time and the argument of the *timer_sleep* function is negative. What should be the semantic of the function?

(Liu 12.2.)

- 4) An operating system provides 256 fixed priorities to threads in the system, but only 32 priority levels for their messages exchanged through message queues. Suppose that each sending thread chooses the priority of its messages by mapping the 256 thread priority levels to 32 message priority levels. Compare the uniform mapping and constant ratio mapping schemes. Which one is better and why? Here we measure the performance of a mapping scheme by the average number of messages in each message queue found to have an identical priority; the fewer, the better.

(Liu 12.9.)

ESSAY: Write a one or two page essay or report. Return it on paper at the latest on the weekly meeting. If you cannot participate, you may send it (in pdf format) via email to the lecturer. It is also possible to submit on paper by giving it to the janitors in the first floor. Then you need to address it to Tiina Niklander.

Submitted essays will give you one additional point for the course. There will be one essay for each exercise session to write.

This week you can choose one of following two articles and write the essay based on the ideas that came to your mind when reading the article. It is more preferable to write more like a learning diary. However, this week you may write a summary of the article.

Choose one of the following articles:

- 1) The real-time operating system article mentioned at the course page
- 2) The real-time database article mentioned at the course page

or

- 3) David Andrews, Iain Bate, Thomas Nolte, Clara Otero-Perez and Stefan M. Petters. *Impact of embedded systems evolution on RTOS use and design*. Proceedings of the 2005 Workshop on Operating System Platforms for Embedded Real-Time applications, Palma, Mallorca, Spain, July, 2005 (http://feanor.sssup.it/~lipari/OSPERT_final/02.pdf)