

Exercise SOCR-09P. FreeRTOS – tasks priorities

REAL TIME OPERATING SYSTEMS

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Subject:

FreeRTOS real time operating system – tasks priorities

Tools:

Visual Studio Express, FreeRTOS sources

Required skills:

Basic knowledge of issues related to programming in C language and real-time systems

Introduction.

The task's severity can be defined by priority - it is a process parameter on the basis of which the scheduler decides which task in standby will be run next. The maximum number of priority levels is defined in the configuration file (FreeRTOSConfig.h) using the configMAX_PRIORITIES macro. Tasks with the highest priority value will be called first. Numbering starts from zero, so the maximum priority value can be (configMAX_PRIORITIES-1). Priorities in the FreeRTOS system do not have to be unique - many tasks can share the same priority. In this case, if several tasks of identical priority will be simultaneously in the READY state, they will be sorted according to the round robin algorithm, i.e. the tasks will be performed sequentially, one after the other, after the control has been explicitly given by the previous task (e.g. blocking) or after the execution time has expired.

Priorities can be set when creating tasks or co-functions, in addition to handling priorities you can use the function that retrieves the current process priority:

UBaseType_t uxTaskPriorityGet(TaskHandle_t xTask);

The argument of the function is:

- handle for the task whose priority is to be changed. If you change the priority of the calling task, you can specify NULL as the argument.

The function returns the priority of the task.

And a function that sets a new priority of the process:

void vTaskPrioritySet(TaskHandle_t xTask, UBaseType_t uxNewPriority);

The arguments of the function are:

- handle for the task whose priority is to be changed. If you change the priority of the calling task, you can specify NULL as the argument
- new priority.

Purpose of the exercise.

The purpose of the exercise is to become familiar with the scheduler mechanisms and task prioritization.

Exercise program.

1. Use project 008-Priorities_1 and test the operation in each of the following cases:
 - 1.1. Run two continuous tasks with the same priorities.
 - 1.2. Run two continuous tasks with the same priorities, and then change the priority of one task after some time.
 - 1.3. Run two continuous tasks with different priorities.
2. Use project 009-Priorities_2 and test the operation in each of the following cases:
 - 2.1. Run a continuous task and then run the next higher priority task from this task.
 - 2.2. Run a periodical task with a delay in the loop, and then from this task run another such periodical task with a higher priority with a delay in the loop.