

Exercise E – Real-time Architectures

Typically, a commercial-off-the-shelf (COTS) real-time operating system (RTOS) does *not* support the Priority Ceiling Protocol. Rather than “adapting” the code of the RTOS, it is conceivable to “extend” the RTOS by adding a dedicated layer on top of it providing the desired functionality. The aim of this exercise is the architecture/design of a dedicated layer for PCP that is residing on top of a COTS RTOS.

You may make the following assumptions:

- there only exist single-unit resources;
 - critical sections are not nested;
 - the set of tasks does not change, and the tasks do not change.
1. Discuss whether or not you need semaphores.
 2. Describe the so-called “provides interface(s)” of the layer, i.e. the (sets of) functionality provided by the layer to an application/set of tasks. Make at least a distinction between *initialization* and *processing*.
 3. Describe the so-called “required interface(s)” of the layer, i.e. the functionality required from the RTOS. Note that the required interface may include call-backs (or “user hooks”) to keep track of the states of processes as well as shared resources.
 4. Describe the different architectural views of the layer (i.e. logical view, execution view, module view and deployment view).
 5. Give a sketch of a design.
 6. Describe the functionality of the layer in terms of a set of relevant scenarios. Note that the layer may be triggered by both the RTOS as well as the tasks.

You may like, but do not need, to use UML as a means to describe the architecture/design of the layer.