

Carleton University
Department of Systems and Computer Engineering
SYSC 5701 Winter 2014
Operating System Methods for Real-Time Applications

Assignment 4

Assigned: Thursday, Mar. 13, 2014 (Version 1)

Due: Thursday, Apr. 3, 2014, at the start of class (6:05 pm)

Submit: Electronic (email) of your solution.
Please ensure your name(s) and student number(s) appear on your solution.

There is no programming involved in this assignment.

In your own words, describe how an application program written for FreeRTOS could demonstrate that a modified version of FreeRTOS implements the Priority Ceiling Protocol.

Assume that the modified version of FreeRTOS includes a "PCPgate" IPC object, which is a special type of binary semaphore that supports the Priority Ceiling Protocol. Assume that PCPgates are supported by the following operations:

`PCPgateID CreatePCPgate (priority_Ceiling)`

Creates a PCPgate.

Accepts `priority_Ceiling` = the priority ceiling for the PCPgate. This ceiling is a FreeRTOS task priority.

Returns the runtime ID of the created PCPgate.

`void PCPgateLock (thisPCPgate)`

Locks a PCPgate. Will block caller until PCPgate is locked by the caller.

Accepts `thisPCPgate` = the runtime ID of the PCPgate to be locked.

Returns nothing.

void **PCPgateUnlock** (thisPCPgate)

Unlocks a PCPgate.

Accepts thisPCPgate = the runtime ID of the PCPgate to be unlocked.

Returns nothing.

Your solution should indicate:

1. How the application is structured (i.e. what are the FreeRTOS objects created, and their general purpose in the context of the application).
2. How the application demonstrates the features of the Priority Ceiling Protocol (i.e. the cases tested, what should happen if the modified version of FreeRTOS is implemented correctly, and how the correct behavior is visible at the application-level).
3. Any FreeRTOS mechanisms other than PCPgates that are used to support application behavior, and how they are used.

In your solution, do not describe any FreeRTOS implementation details.

It is expected that the solution you submit for Assignment 4 (or a modified description) will describe your application program for the Course Project and will be included as part of the Course Project submission.