

**Assignment 4**Felix Friedrich, ETH Zürich

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**Introduction**

Minos supports preemptive scheduling under certain preconditions that were discussed in the lectures. Background tasks execute in a round robin fashion in the background. Periodic tasks can preempt background tasks. The command scheduler of Minos is an example of a background task. We can protect ourselves from commands executing an infinite loop with a watchdog.

## Lessons to Learn

- Learn to know the task scheduling mechanism of Minos.
- Understand and apply the mechanism of a watchdog.

**Preparation**

1. Update your repository
2. Open a console in directory [assignments/assignment4](#)
3. Make sure you have a proper kernel running on your RPI. If you need to recompile the kernel, you can do so by calling `oberon execute MakeMinos.txt`. You can then use module loading and are not required to link the kernel again for the rest of this exercise.

**1 Watchdog and Tasks**

Module [Minos/RPI.Kernel.Mos](#) contains procedures to setup the (largely undocumented) ARM watchdog registers `WDOG` (Watchdog) and `RSTC` (Reset Configuration). Bits 0 to 19 of the `WDOG` register provide a countdown register that, once it hits 0 will make the system reboot, provided register `RSTC` is set up accordingly. The frequency of the counter is  $2^{16}$  Hz, thus a maximum of 16 seconds can be set for the watchdog countdown. Please refer to the implementation of `Kernel.StartWatchdog` in order to understand the semantics.

Once the countdown is activated, software must periodically update the `WDOG` register in order to prevent a reboot. In the case of a failed program, the watchdog is no longer updated which should result in a reboot of the system.

1. Complement procedure `Tasks.InstallWatchdog` to enable the watchdog and to install a *background* task that (periodically) resets the watchdog.
2. Test the watchdog by executing an infinite loop as a command.
3. What happens when you install the watchdog resetter as a *periodic* task? What does it actually test?

The starting point for this exercise is provided as module [Tasks.Mos](#). It contains some example commands for installing tasks.

**Documents**

- System Construction Lecture 4 slides from the course-homepage <http://lec.inf.ethz.ch/syscon>