Basic Real-Time Operating System
targeting the ARMv7-M architecture

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Version history

Version	Date	Change(s)	Note
0.1	11-30-2019	Initial document	Created version history, introduction, acknowledgement and appendix.

Table 1: Overview of the different versions

1 Introduction

For the Real-time Operating Systems course (ROS01) taught at Rotterdam University of Applied Science, the authors had to implement a scheduler for a Real-time Operating System developed by one lecturers. Because these types of programming issues like implementing a scheduler require the programmer to be able to program at a low level and it cannot be assumed that every student following this course is familiar with low level progamming (both in the C programming language and assembler), this course contains multiple assingments to bridge this gap.

2　Acknowledgement

A Appendix

The appendix contains subsections that support this report or its where its content goes too much off-topic with the purpose of this report, but are interesting for the reader to possibly read.

A.1 Delay *exactly* one second counting instruction cycles

Many assignments require a delay of 1 second to spot blinky LEDs by eye. One can use the Systick timer or hardware timers, but where is the fun in that? For the sake of some assignments, it is acceptable to burn clock cycles by wasting the CPU. Listing 1 contains a function which will delay the return moment by 1 second. Now each line containing inline assembly will be explained.

```c
void delay_1sec(void)
{
    __asm("      PUSH {r4-r11,lr}");

    __asm("      LDR r4, [pc, #12]");

    __asm("      MOV r5, pc");
    __asm("      NOP");

    __asm("      SUBS r4, #1");      /* 1 instruction cycle */
    __asm("      ITE NEQ");          /* 1 instruction cycle */

    __asm("      MOV pc, r5");       /* 1 + P instructions (where P is between 1 and 3 depending on
     pipeline refill) */


    __asm("      POP {r4-r11,pc}");
    __asm("      .word    0x5000000");
}
```

Listing 1: C function containing inline assembly to perform a delay of *exactly* one second

Line 3