



Operating System Practice

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An Real-Time OS: μC/OS-II Quick Overview

Introduction of μC/OS-II (1 / 2)

- ▶ The name is from micro-controller operating system, version 2
- ▶ μC/OS-II is certified in an avionics product by FAA in July 2000 and is also used in the Mars Curiosity Rover
- ▶ It is a very small real-time kernel
 - Memory footprint is about 20KB for a fully functional kernel
 - Source code is about 5,500 lines, mostly in ANSI C
 - Its source is open but not free for commercial usages
- ▶ Preemptible priority-driven real-time scheduling
 - 64 priority levels (max 64 tasks)
 - 8 reserved for μC/OS-II
 - Each task is an infinite loop



Introduction of μC/OS-II (2/2)

- ▶ Deterministic execution times for most μC/OS-II functions and services
- ▶ Nested interrupts could go up to 256 levels
- ▶ Supports of various 8-bit to 64-bit platforms: x86, ARM, MIPS, 8051, etc.
- ▶ Easy for development: Borland C++ compiler and DOS (optional)
- ▶ However, uC/OS-II still lacks of the following features:
 - Resource synchronization protocol
 - Soft-real-time support

The µC/OS-II File Structure

Application Code (Your Code!)

Processor Independent Implementations

- Scheduling policy
- Event flags
- Semaphores
- Mailboxes
- Event queues
- Task management
- Time management
- Memory management

Application Specific Configurations

- OS_CFG.H
- Max # of tasks
- Max Queue length
- ...

uC/OS-II Port for Processor Specific Codes

Software
Hardware

CPU

Timer

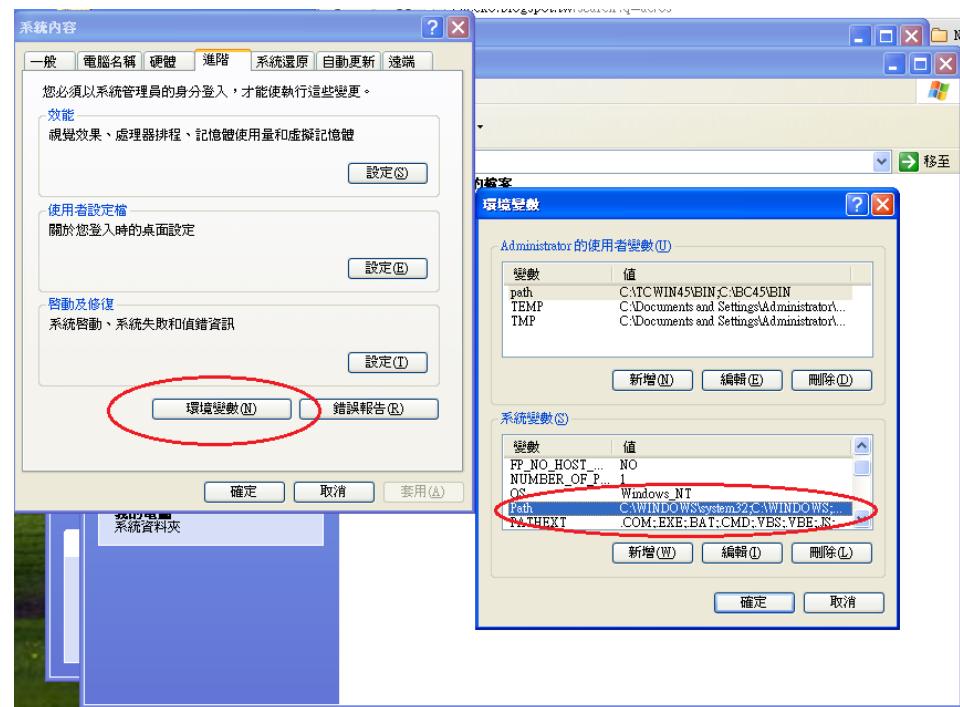
Requirements of μC/OS-II Emulator

- ▶ Operating System
 - Windows XP 32bits
 - Use virtual machine to install the OS
 - Install “Guest Additions” for Virtualbox
- ▶ Tools
 - Borland C++ compiler (V4.5)
 - BC45 is the compiler
 - Turbo Assembler
 - The assembler is in tasm
 - The source code and the emulation environment of μC/OS-II
 - SOFTWARE is the package
- ▶ Full Package
 - Download it from the course website with password: csie2018



Borland C++ Compiler

- ▶ Download Borland C++ and install it on your windows XP environment
 - Double click the “INSTALL.EXE”
- ▶ Add “;C:\BC45\BIN” to your system Path



Turbo Assembler

- ▶ Download Turbo assembler and unzip the file
- ▶ Copy “\tasm\BIN\TASM.EXE” to your “C:\BC45\BIN”
 - Include the missing assembler which is going to be used during we compile the source code of µC/OS-II

Compile µC/OS-II Example Code

- ▶ Download the source code and emulator µC/OS-II
 - It is recommended to put the source code package “SOFTWARE” directly in C:\
- ▶ Test the first example
 - Execute C:\SOFTWARE\uCOS-II\EX1_x86L\BC45\TEST\TEST.EXE
 - Press ECS to leave
- ▶ Rename or remove the executable file
 - Rename TEST.EXE
- ▶ Compile the µC/OS-II and the source code of the first example
 - Run C:\SOFTWARE\uCOS-II\EX1_x86L\BC45\TEST\MAKETEST.BAT
 - A new “TEST.EXE” will be created if we compile it successfully

Common Mistakes

- ▶ Did you directly put the package “SOFTWARE” in C:\ ?
- ▶ Have you copied the correct file “TASM.EXE” to your “C:\BC45\BIN” directory?
- ▶ Did you set the Path correctly?
 - See the picture in Page 7
 - There is no space

Extra Exercise

- ▶ Read the e-book of μC/OS-II
 - Try to read and understand the first chapter
- ▶ Read the source code to understand the application
 - The application source code is in C:\SOFTWARE\uCOS-II\EX1_x86L\BC45\SOURCE
- ▶ Browse the source code of μC/OS-II
 - The source code of μC/OS-II is in C:\SOFTWARE\uCOS-II\SOURCE
- ▶ 準時繳交且實作完成第九頁的內容，提供截圖或相關說明 → 標準分數為80正負10分
- ▶ 有做Extra Exercise，並寫入報告心得且說明精確者最多加20分

Report

- ▶ Each student should write a report
- ▶ Only two A4 pages
- ▶ 內文12 pt font
- ▶ Deadline is **23:59 2018/05/01**
 - 請保留寄件備份佐證
- ▶ File name: **OSP-Homework-StudentID**
- ▶ File type: PDF or Word
- ▶ Send it to TA's email: kf200660306@gmail.com
- ▶ Email title: **OSP Homework StudentID**
- ▶ **任何一項格式錯誤，各扣十分**