FreeRTOS Start Up - Preliminaries

(slides are based on Prof. Dr. Jian-Jia Chen)

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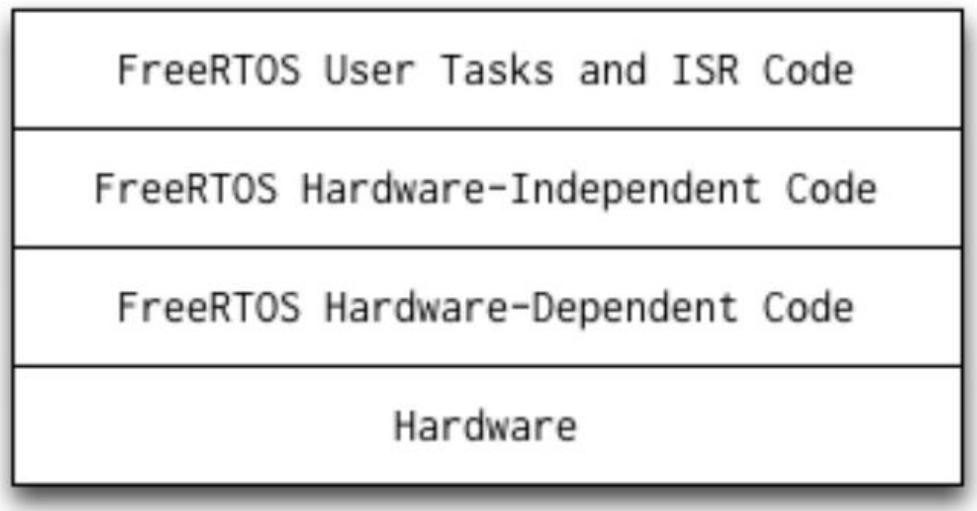
Hardware Considerations

- Hardware-dependent layer
  - Talk to the chip architecture you choose
- FreeRTOS chips with all the hardware-independent
  - ARM7, ARM Cortex-M3, various PICs, Silicon Labs 8051, etc.



Project Structure

- Official website: http://www.freertos.org
  - News, documents, downloads, demos, etc.
- 3 core source files
  - tasks.c: subroutines for maintaining the tasks
  - queue.c: subroutines for maintaining the message passing queues
  - list.c: utilities for maintaining data structures for "lists"

Name	Size	Type
Demo	107 items	folder
License	1 item	folder
Source	8 items	folder
include	11 items	folder
portable	18 items	folder
croutine.c	14.5 KB	C source code
list.c	8.1 KB	C source code
queue.c	50.3 KB	C source code
readme.txt	822 bytes	plain text document
tasks.c	79.1 KB	C source code
timers.c	25.1 KB	C source code
TraceCon	3 items	folder
readme.txt	873 bytes	plain text document

Create A FreeRTOS Project

- Eclipse
  - C/C++ IDE
  - import a demo project for starting
- makefile + scripts or cmake
  - configure the makefile for compilations and executions
- Choose a correct port for the hardware/platform

Data Types in FreeRTOS

macro or typedef	actual type
TickType_t	to store the tick count value and to specify block times usually 16-bit or 32-bit unsigned integer
BaseType_t	represent the most efficient data type for the architecture usually align with the bits of the architecture

- Signed or unsigned **char** types should be always specified
- Plain **int** types should never be used

Variables and Functions Naming

- Variables: prefixes
  - 'c': for char
  - 's': for short
  - 'l': for long
  - 'x': for portBASE_TYPE and any others
  - 'u': for unsigned
  - 'p': pointer
  - combinations are possible
- Functions: prefixes
  - by the returning data type
  - 'v': for void
- Common macros:
  - pdTRUE is 1, pdFALSE is 0
  - pdPASS is 1, pdFAIL is 0

Configurations: FreeRTOSConfig.h

Some important fields/features:

- configUSE_PREEMPTION: This is set to 1 if the preemptive kernel is desired.
- configUSE_IDLE_HOOK: An idle task hook will execute a function during each cycle of the idle task.
- configUSE_TICK_HOOK: A tick hook function will execute on each RTOS tick interrupt if this value is set to 1.
- configTICK_RATE_HZ: This is the frequency at which the RTOS tick will operate.
- configMAX_PRIORITIES: The total number of priority levels that can be assigned when prioritizing a task.
- configUSE_COUNTING_SEMAPHORES: This is set to 1 if counting semaphores are required.
- configUSE_MUTEXES: This is set to 1 if mutexes are needed. Priority inheritance will then be enforced.
- etc...