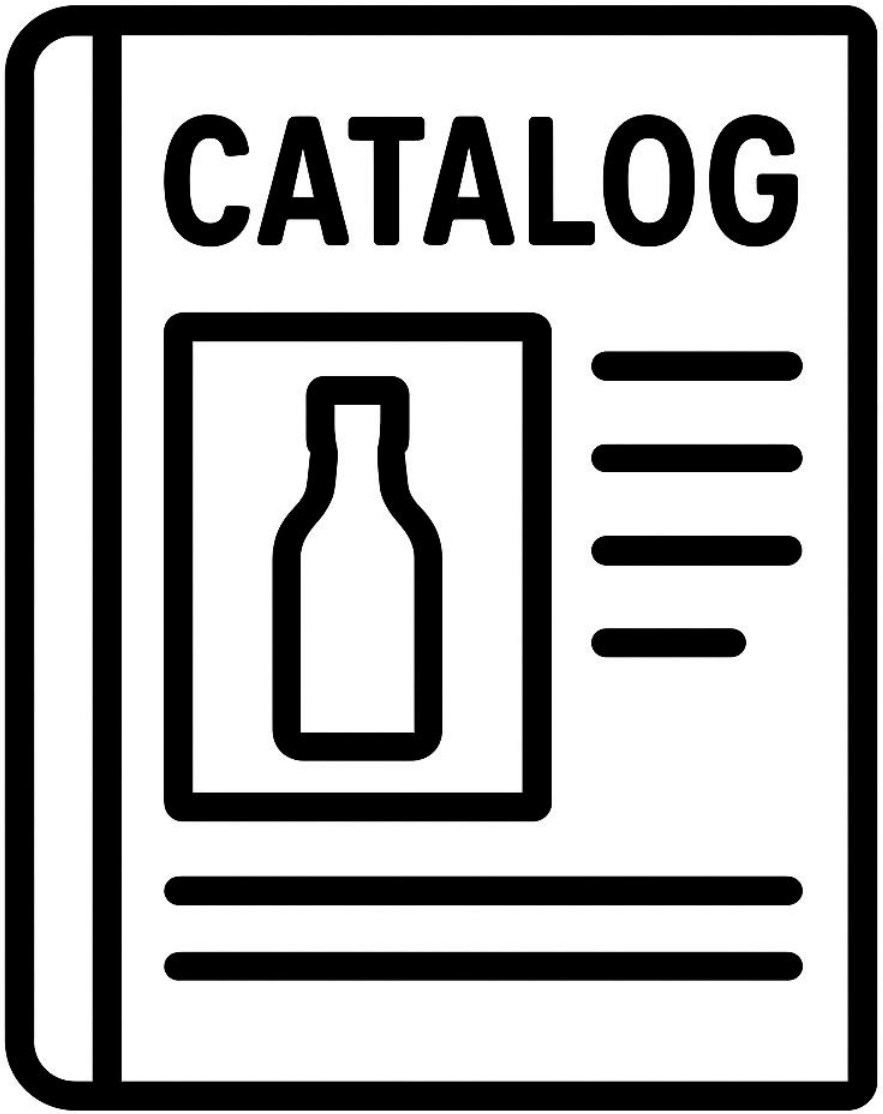
資訊專案開發與實作

Hypervisor開發與Linux、即時系統整合

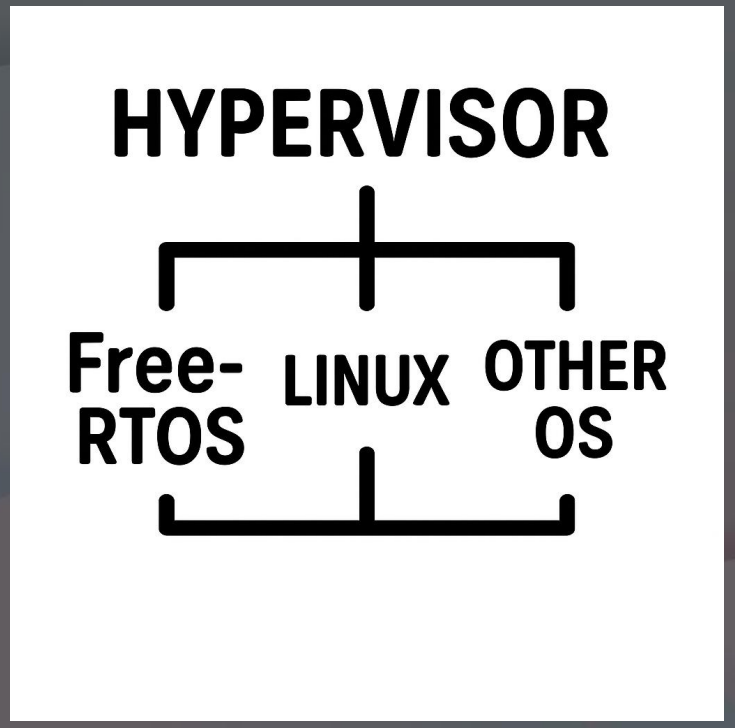
指導老師 : 涂嘉恒 老師
業師 : 高逸明 、賴奇星 老師
學生 : 陳靖勳、官子恩

目錄:

- 專案簡介
- 遭遇困難
- 成果展現
- 未來展望

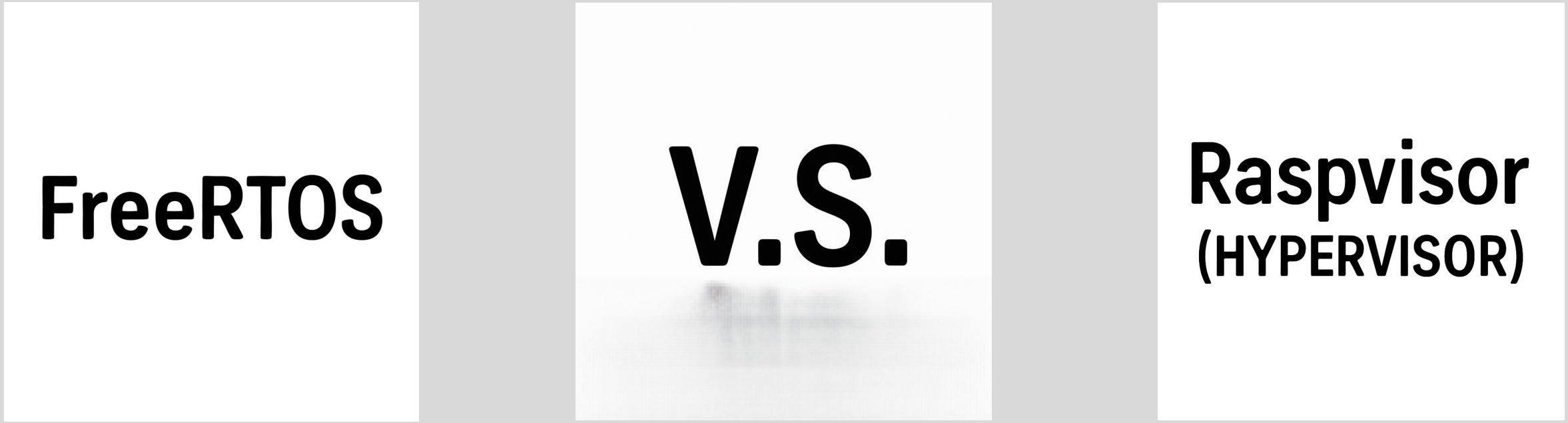


專案簡介



遭遇困難

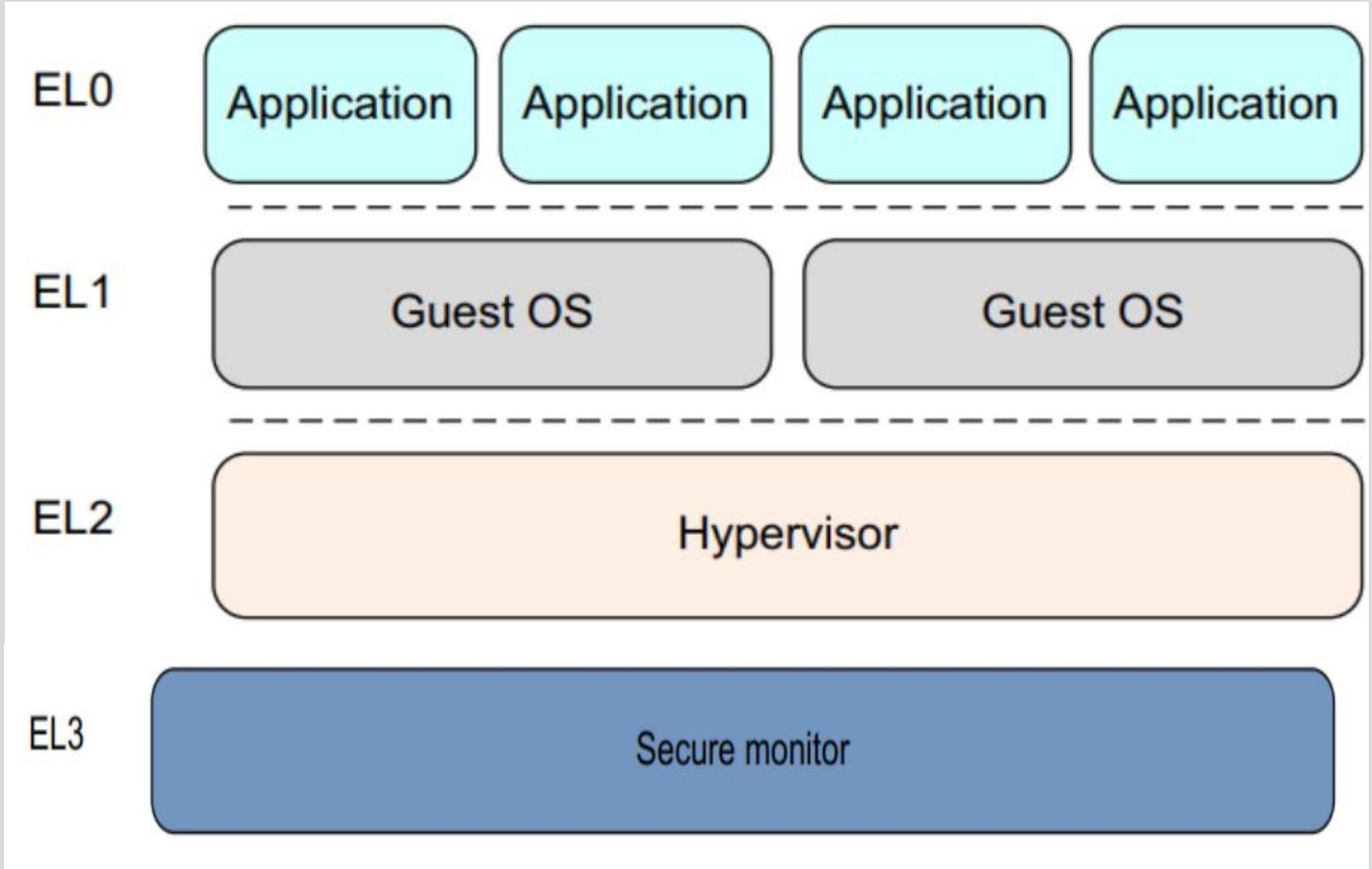
解決專案相容的問題



差異點:

- **Initial point**
- **Entry point**
- **Bss 初始化**
- **Exception level**

Exception level



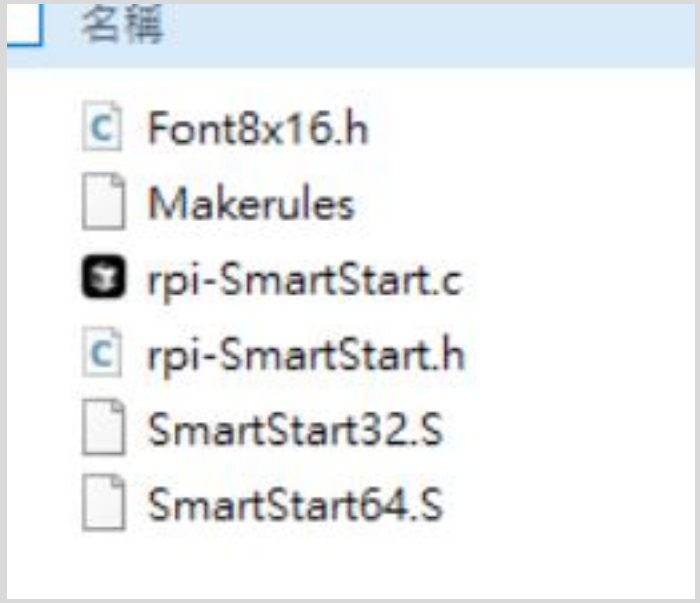
```
sctlr_el2: 30C50811
hcr_el2: 8027603B
sctlr_el2: 30c50811
hcr_el2: 8027603b
INFO[1]: loading...
INFO[1]: loaded
Kernel process started. EL 1

User process

12INFO[2]: loading...
INFO[2]: loaded
INFO[3]: loading...
INFO[3]: loaded
!!! PANIC[3]: uncaught synchronous exception:
Instruction Abort from a lower Exception level.
esr: 82000007, address: 200
```

解決問題:

Loader的改寫



新舊語法特點

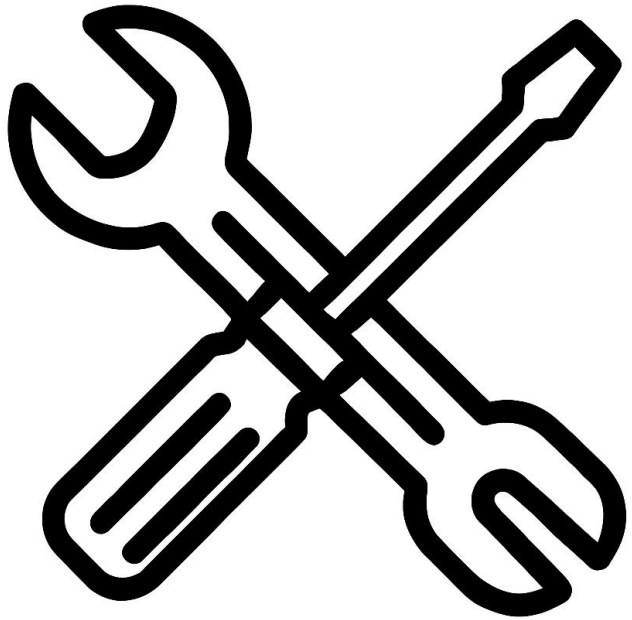
```c
// 簡潔明確的函式宣告
void uart_send(char c)
{
    while(1) {
        if(get32(AUX_MU_LSR_REG) & 0x20)
            break;
    }
    put32(AUX_MU_IO_REG, c);
}

// 分組相關功能
void uart_init(void)
{
    unsigned int selector;
    // 配置GPIO和UART設置
    // ...
}
```

```c
// 複雜的聯合結構與詳細註解
typedef union
{
    struct
    {
        unsigned unused : 1;
        unsigned Counter32Bit : 1;
false)
        TIMER_PRESCALE Prescale : 2;
        // ...
    };
    uint32_t Raw32;
bits as a uint32_t
} time_ctrl_reg_t;

// 大量的硬體寄存器結構定義
struct __attribute__((__packed__, aligned(4))) GPIORegisters {
    uint32_t GPFSEL[6];
    uint32_t reserved1;
    // ...
};
```

經過一番努力



```
Kernel process started. EL 1

User process

12INFO[2]: loading...
INFO[2]: loaded
INFO[3]: loading...
INFO[3]: loaded
345123451abcdeabcdeab23451234512cdeabcdeabc345123451234deabcdeabcd45123451234eabc
deabcde51234512345abcdeabcdea12345123451bcdeabcdeab23451234512cdeabcdeabc3451234
51234deabcdeabcd51234512345eabcdeabcde12345123451abcdeabcdeab23451234512cdeabcde
abc345123451234deabcdeabcd45123451234eabcdeabcde51234512345abcdeabcdea12345123451
bcdeabcdeab23451234512cdeabcdeabc345123451234deabcdeabcd51234512345eabcdeabcde12
345123451abcdeabcdea23451234512bcdeabcdeabc345123451234deabcdeabcd45123451234eabc
deabcde51234512345abcdeabcdea12345123451bcdeabcdeab23451234512cdeabcdeabc3451234
5123deabcdeabcd45123451234eabcdeabcde12345123451abcdeabcdea23451234512bcdeabcde
ab345123451234cdeabcdeabcd45123451234eabcdeabcde51234512345abcdeabcdea12345123451
bcdeabcdeab23451234512cdeabcdeabc345123451234deabcdeabcd451
```

```
sctlr_el2: 30C50811
hcr_el2: 8027603B
sctlr_el2: 30c50811
hcr_el2: 8027603b
INFO[1]: loading...
INFO[1]: loaded
Kernel process started. EL 1

User process

12INFO[2]: loading...
INFO[2]: loaded
INFO[3]: loading...
INFO[3]: loaded
345123451abcdeabcdeab2345l2345l2cdeabcdeabc345l2345l23deabcdeabcd45123451234eabcdeabcde5123451234512cdeabcdeabc345l2345l23deab
switched to 2
Exception level: 1

this is raspvisor switch system test!
```

```
hcr_el2: 8027603b
INFO[1]: loading...
INFO[1]: loaded
Kernel process started. EL 1

User process

12INFO[2]: loading...
INFO[2]: loaded
INFO[3]: loading...
INFO[3]: loaded
3451
switched to 3


======== FreeRTOS ========
```

```
按下 Enter 鍵繼續...
```

把引導跟UART的部分重構後可以順利的在RaspVisor上開機並切換系統

未來展望:

- 多核心效能調度
- 在Raspvisor上執行Linux並進行資料交換
- 移植到其他主控版上進行工作

謝謝大家