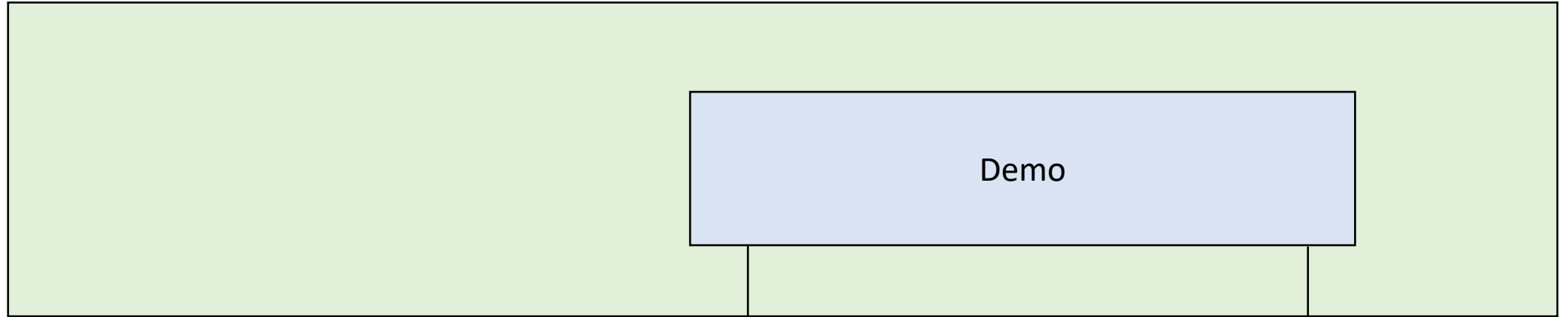


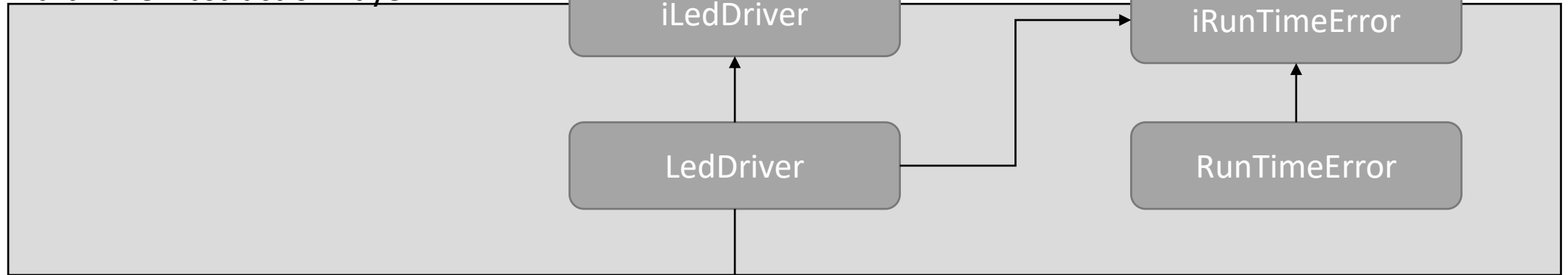
LEDPrj

→ Compile time dependency

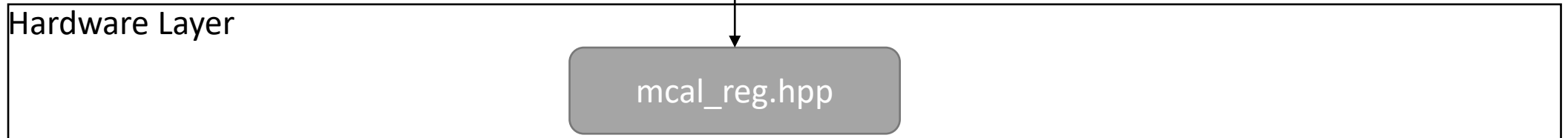
## Application Layer



## Hardware Abstraction Layer



## Hardware Layer



Demo

```
RuntimeError::gErrorLogger
```

```
extern RuntimeError gErrorLogger
```

LedDriver

```
extern RuntimeError gErrorLogger
```

Component 2

```
extern RuntimeError gErrorLogger
```

Component 3

```
extern RuntimeError gErrorLogger
```

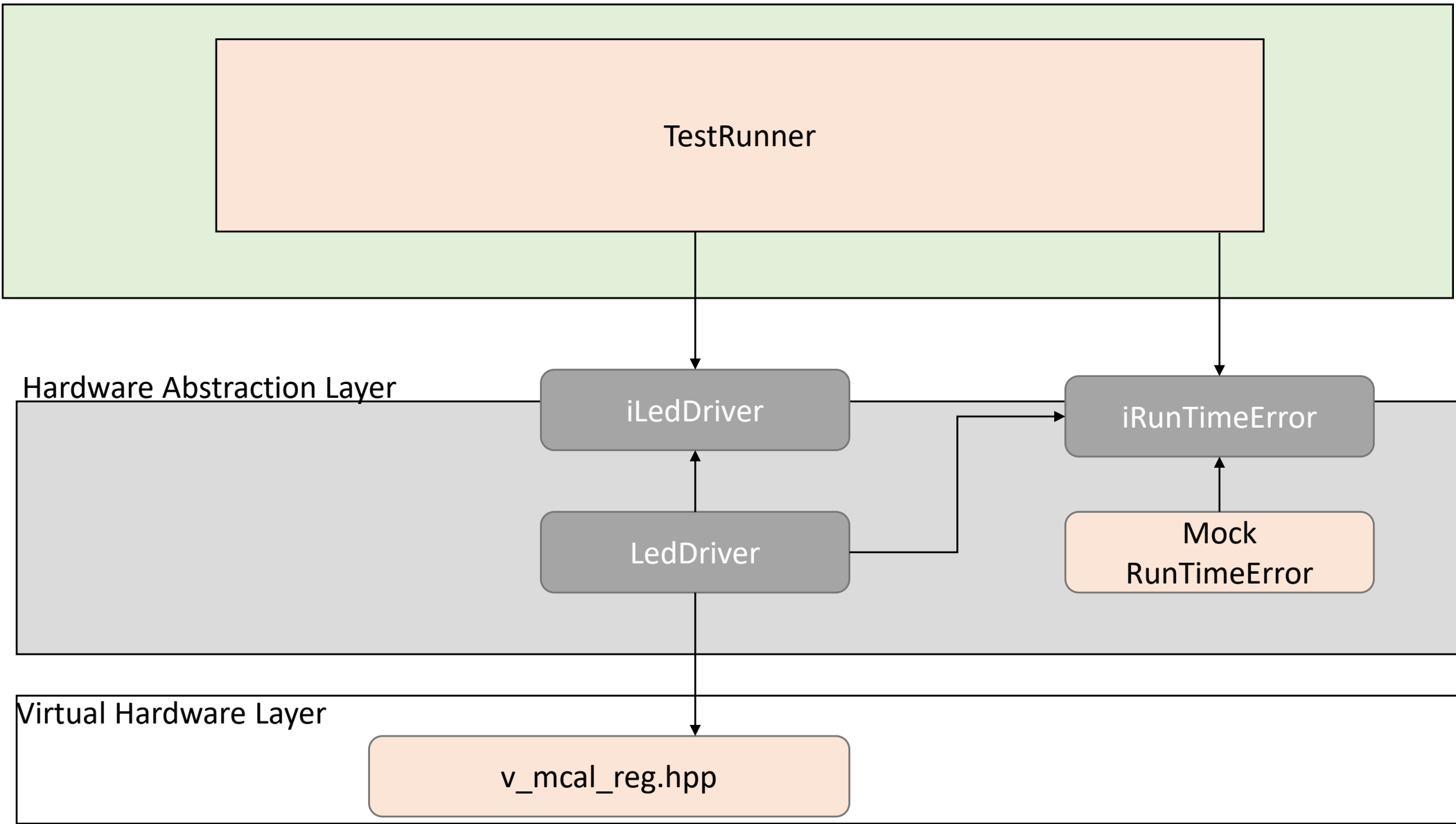
Component 4

# Architectural Features

- Dependency Inversion
- Dependency Injection
- Layers Abstractions

→ Compile time dependency

Tests



- Virtual Hardware Layer
  - Simulates Real Hardware
  - Addresses are equal the target MCU
  - v\_pGpioSpace simulating memory space for GPIO

```
#pragma once
#include <stdint.h>

uint32_t v_pRccAhb1enr = 0;
#define addr_pRccAhb1enr &v_pRccAhb1enr

uint32_t v_pGpioSpace[11263];
uint32_t * addr_pGpioBaseReg=v_pGpioSpace;
#define GPIO_LEN (0x0400UL)

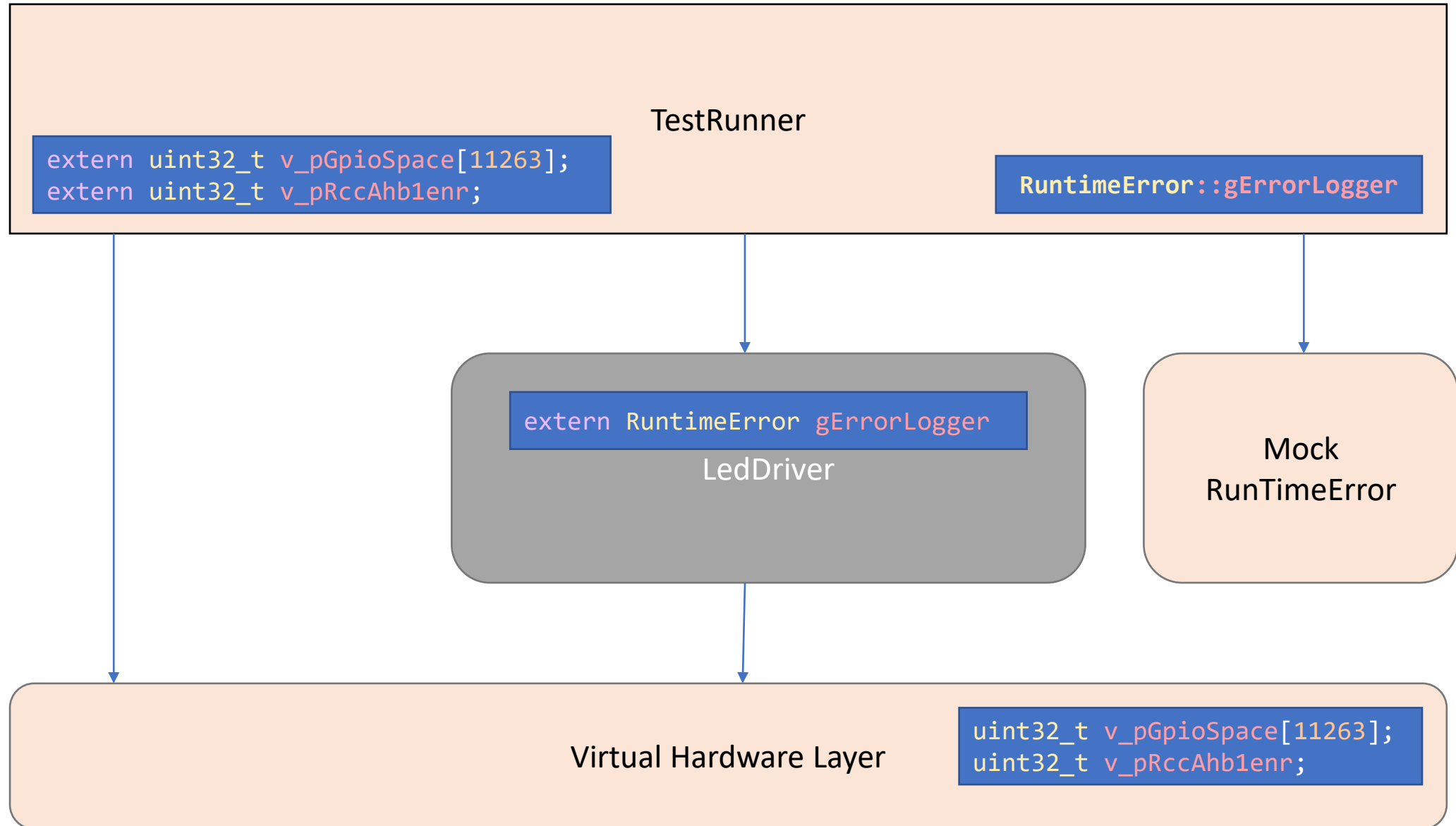
#define MODER_OFFSET      (0)
#define OTYPER_OFFSET     (1)
#define OSPEEDR_OFFSET    (2)
#define PUPDR_OFFSET      (3)
#define IDR_OFFSET        (4)
#define ODR_OFFSET        (5)
#define BSRR_OFFSET       (6)
#define LCKR_OFFSET       (7)
#define AFR1_OFFSET       (8)
#define AFR2_OFFSET       (9)
```

- Hardware Layer
  - Real Memory Map for a STM32F4
  - From 0x4002 0000 to 0x4002 2BFF memory space for GPIO

0x4002 3800 - 0x4002 3BFF	RCC	AHB1
0x4002 3000 - 0x4002 33FF	CRC	
0x4002 2800 - 0x4002 2BFF	GPIOK	
0x4002 2400 - 0x4002 27FF	GPIOJ	
0x4002 2000 - 0x4002 23FF	GPIOI	
0x4002 1C00 - 0x4002 1FFF	GPIOH	
0x4002 1800 - 0x4002 1BFF	GPIOG	
0x4002 1400 - 0x4002 17FF	GPIOF	
0x4002 1000 - 0x4002 13FF	GPIOE	
0x4002 0C00 - 0x4002 0FFF	GPIOD	
0x4002 0800 - 0x4002 0BFF	GPIOC	APB2
0x4002 0400 - 0x4002 07FF	GPIOB	
0x4002 0000 - 0x4002 03FF	GPIOA	
0x4001 6800 - 0x4001 6BFF	LCD-TFT	
0x4001 5800 - 0x4001 5BFF	SAI1	

0x2BFF = 11263\_dec

→ Run time dependency



# Test Features

- 100% branch coverage
- 100% coverage of the desired side effects
- Easy to adapt to other MCUs