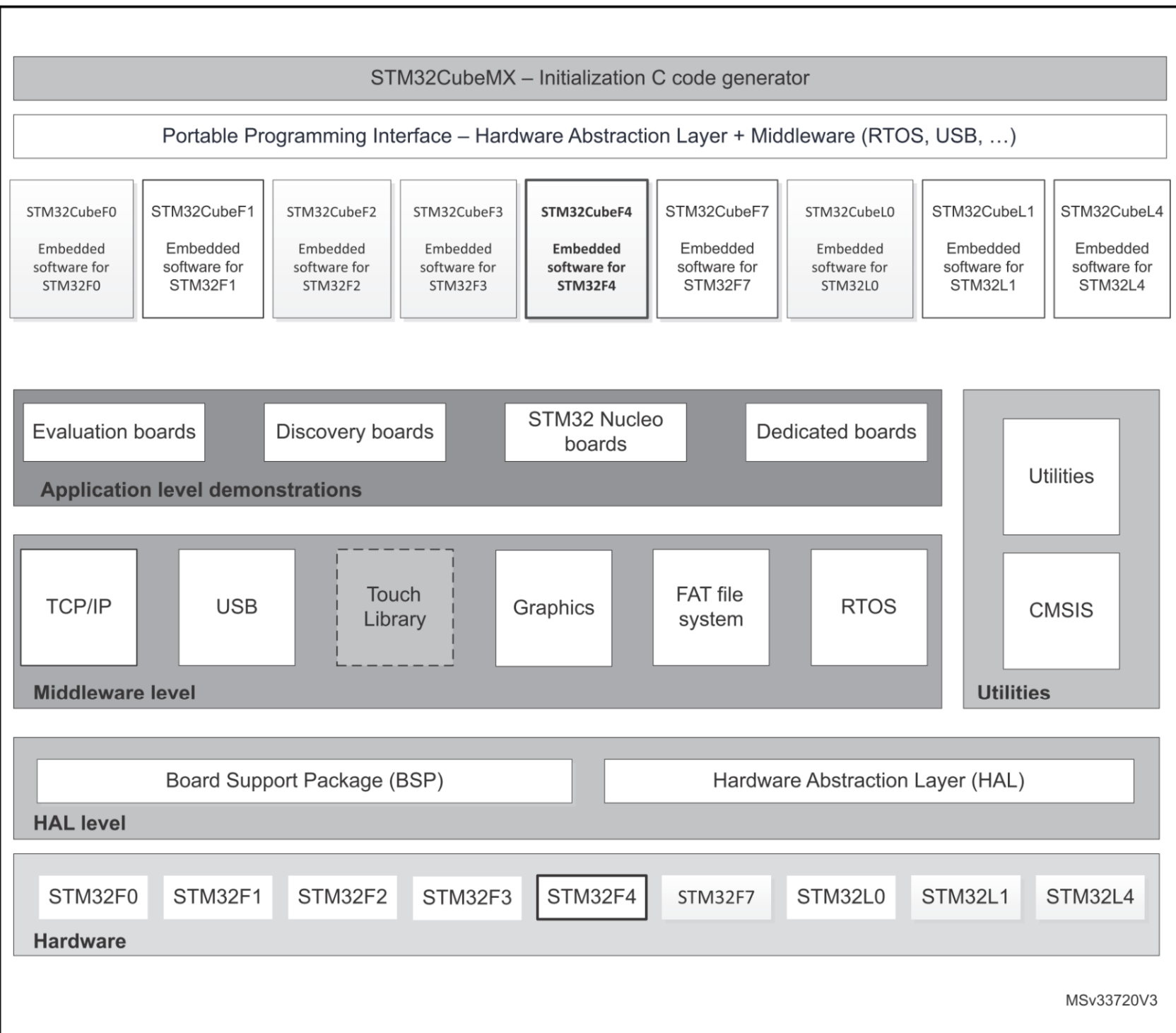


Lesson 5

STM32Cube

Lecturer: Harvard Tseng



What does STM32Cube contain?

- Hundreds of examples.
- Middleware level driver.
- HAL driver.
- Low layer driver.
- CMSIS

Middleware level

- TCP/IP
- USB
- Graphics
- ...

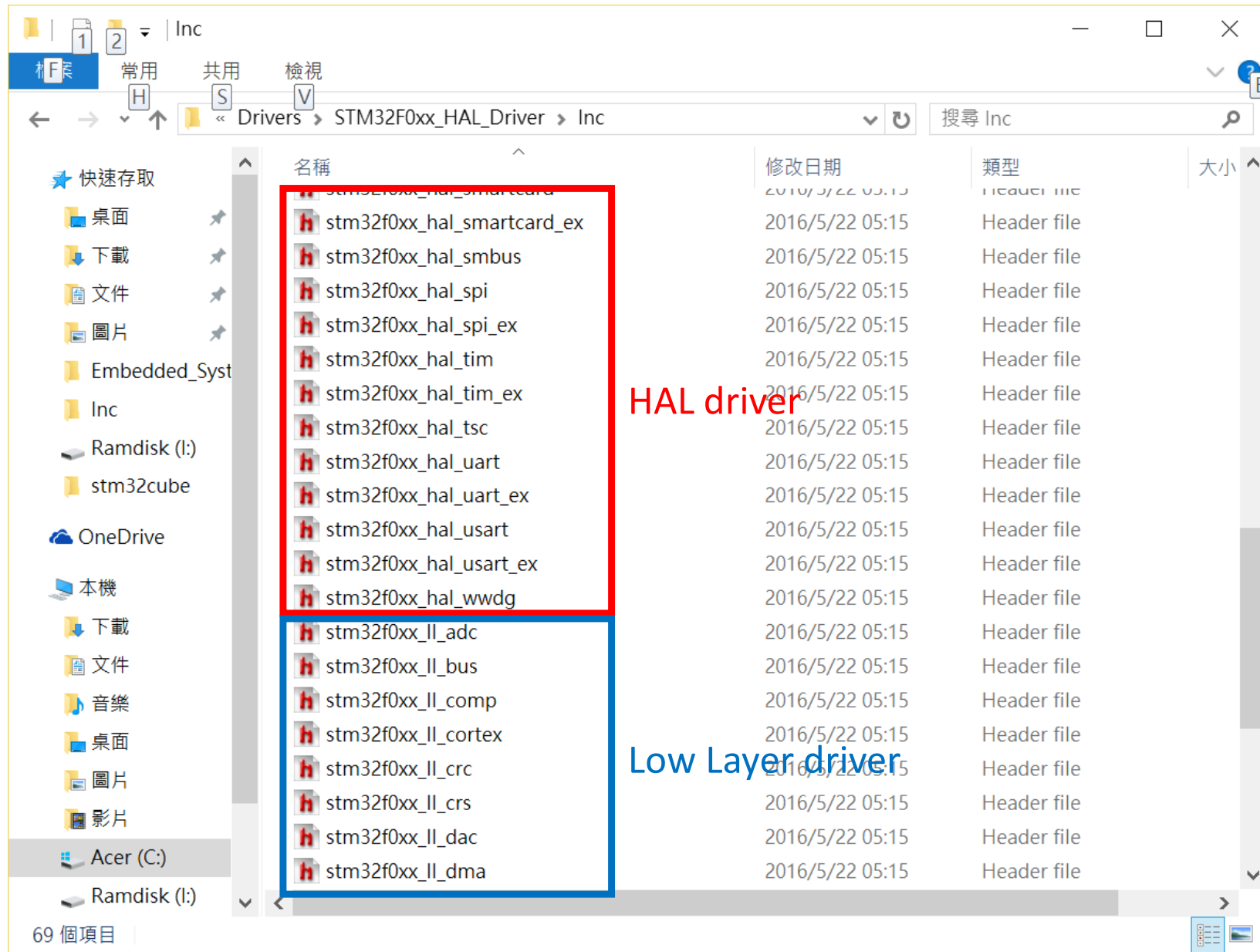
Hardware Abstraction Layer(HAL)

- Easy to use.
- Separate hardware and software.
- Enabling portability between different STM32 devices.

Low layer APIs

- Light-weight
- Optimized
- Expert oriented
- Closer to the hardware than the HAL.

Files



HAL Driver Setup

Step1. Download STM32CubeF4

- Download from [ST](#).

GET SOFTWARE

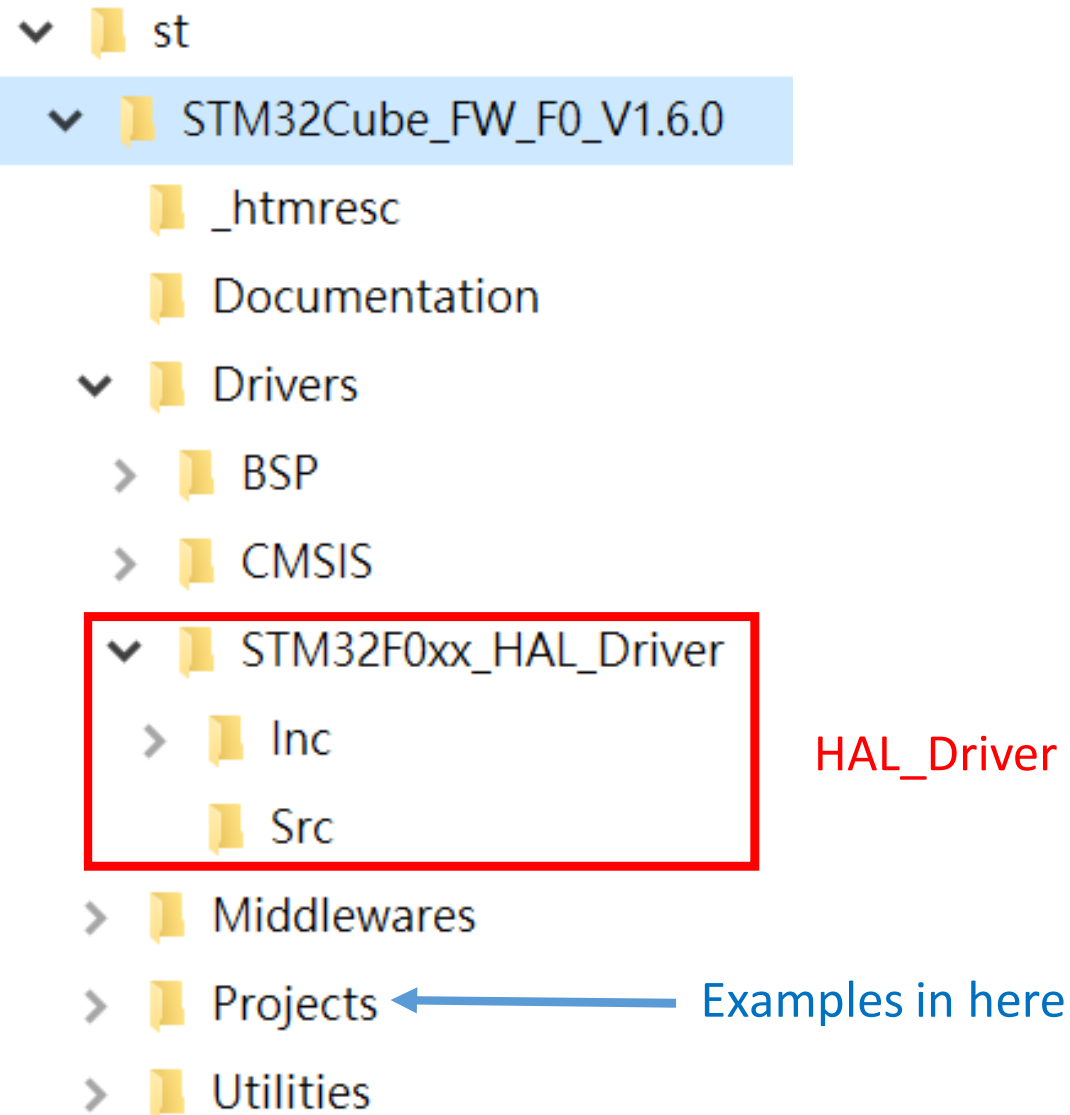
Part Number ▲	Software Version ◆	Marketing Status ◆	Supplier ◆	Order from ST ◆
STM32CubeF4	1.13.0	Active	ST	Get Software

Step2. Extract

- Extract to folder C:\st\

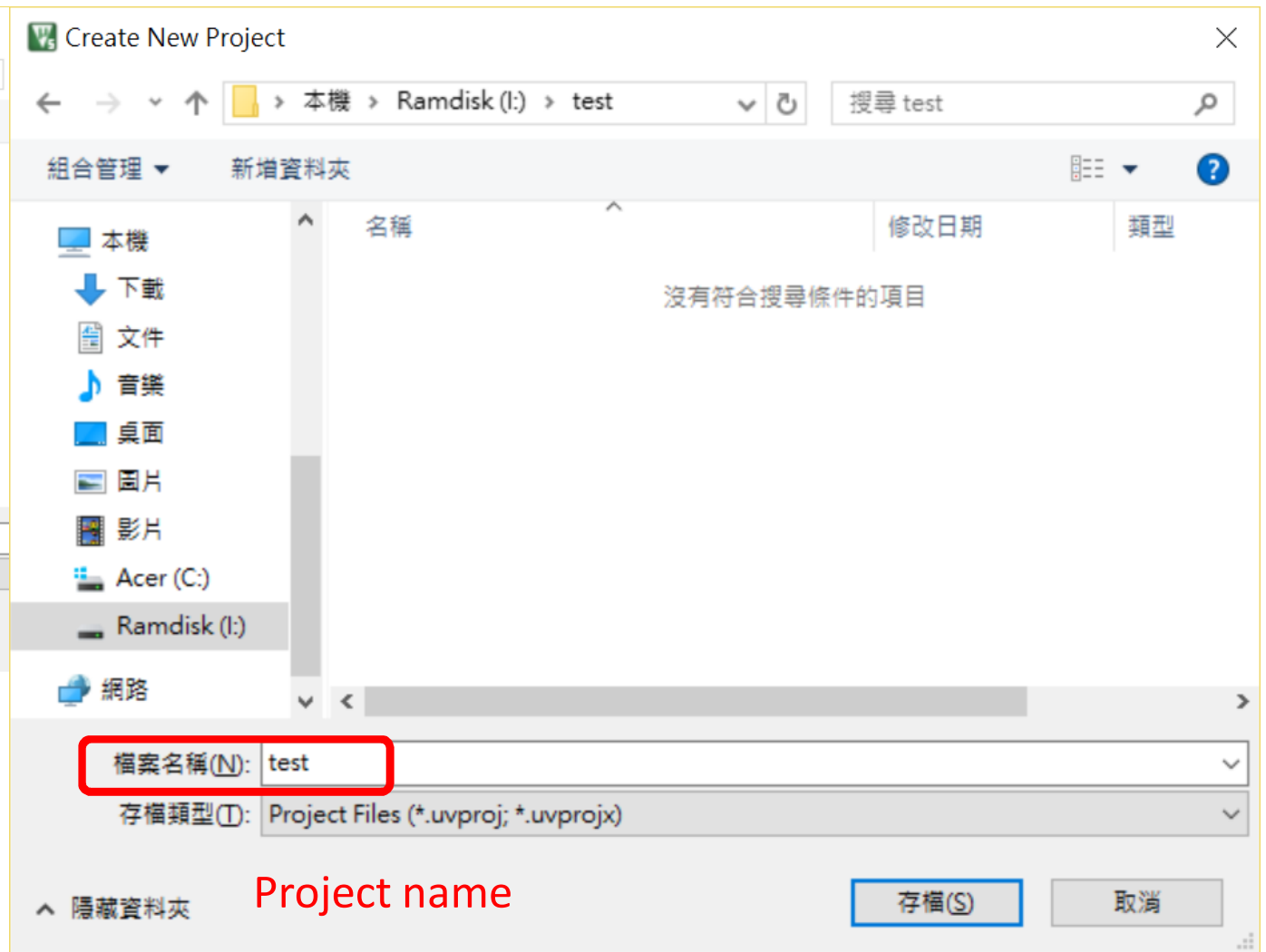
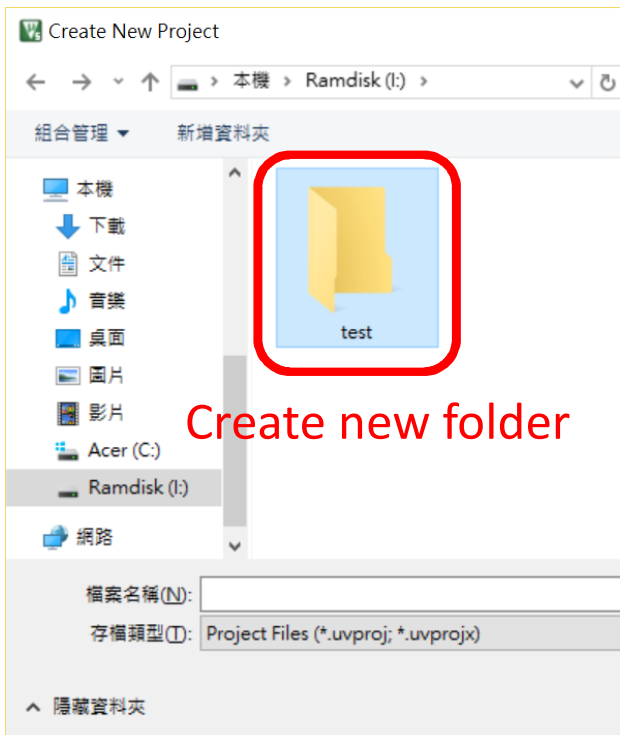


File tree



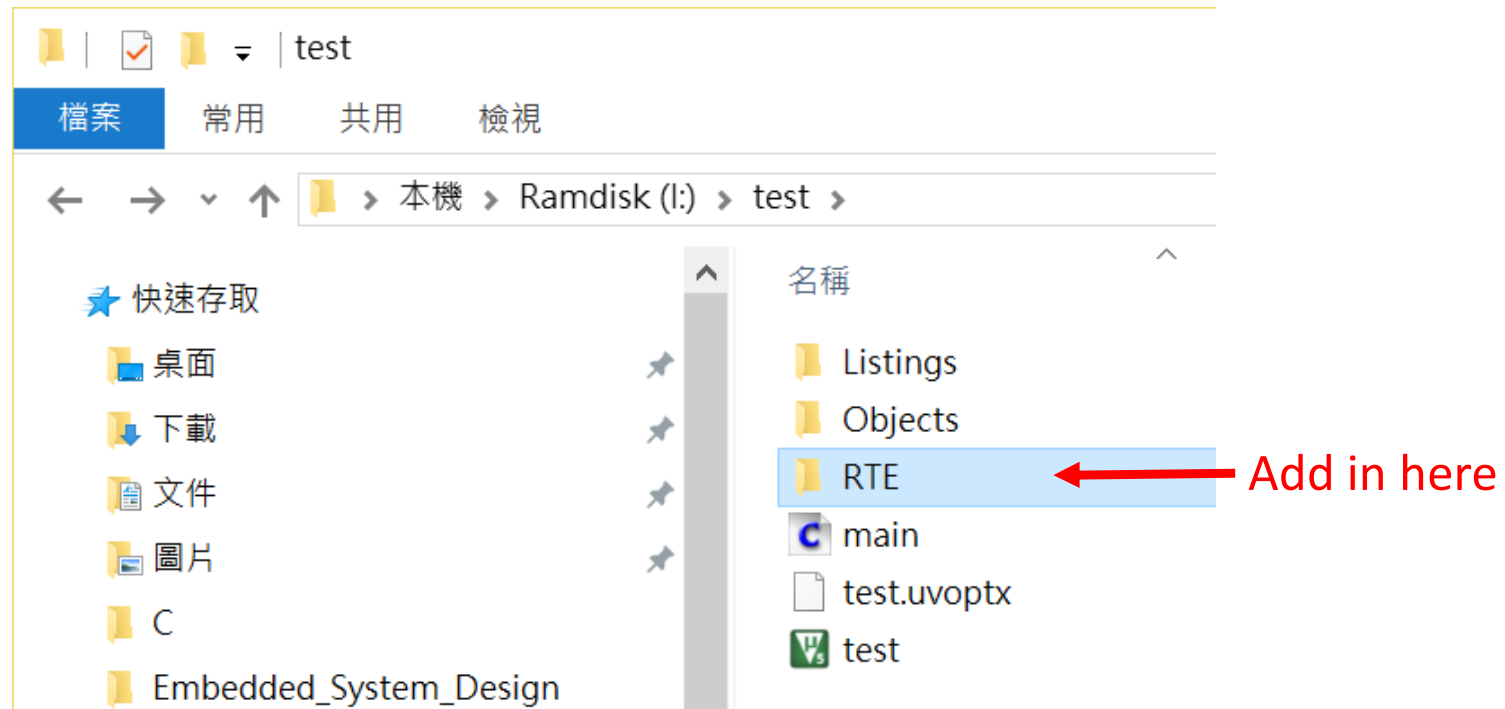
Step3. Create new project

- Setup as usual.

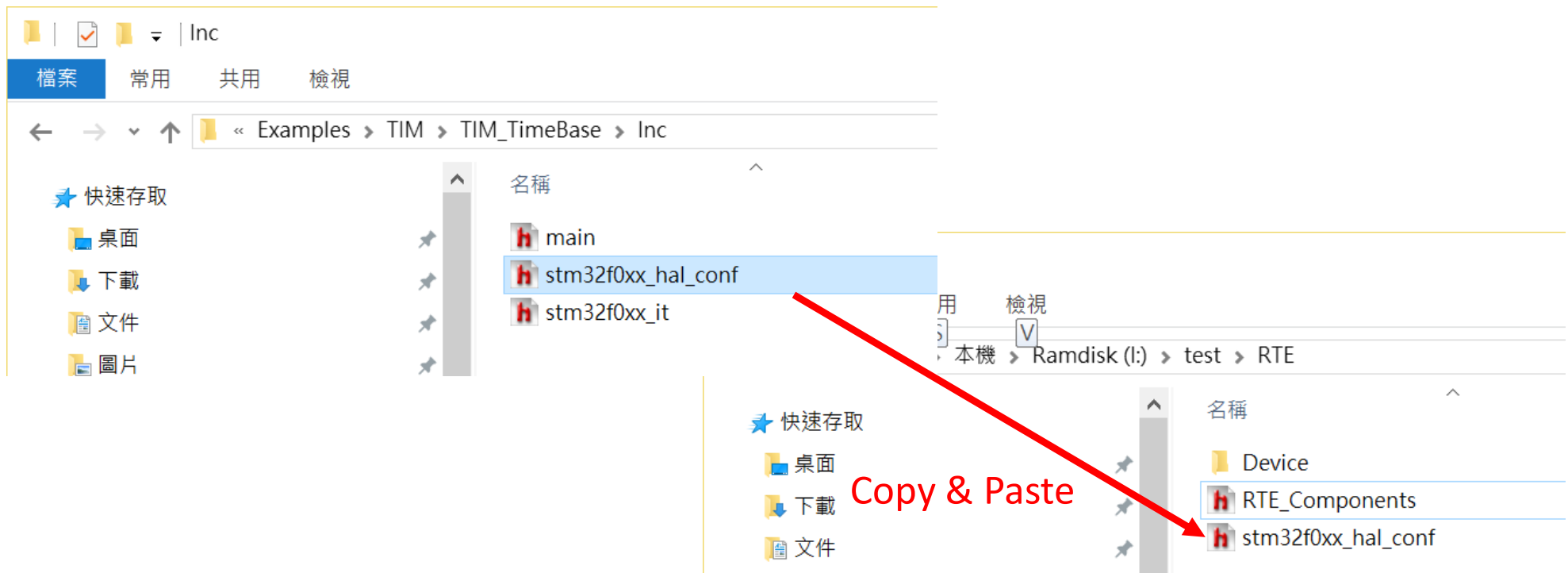


Step4. Add stm32f4xx_hal_conf.h

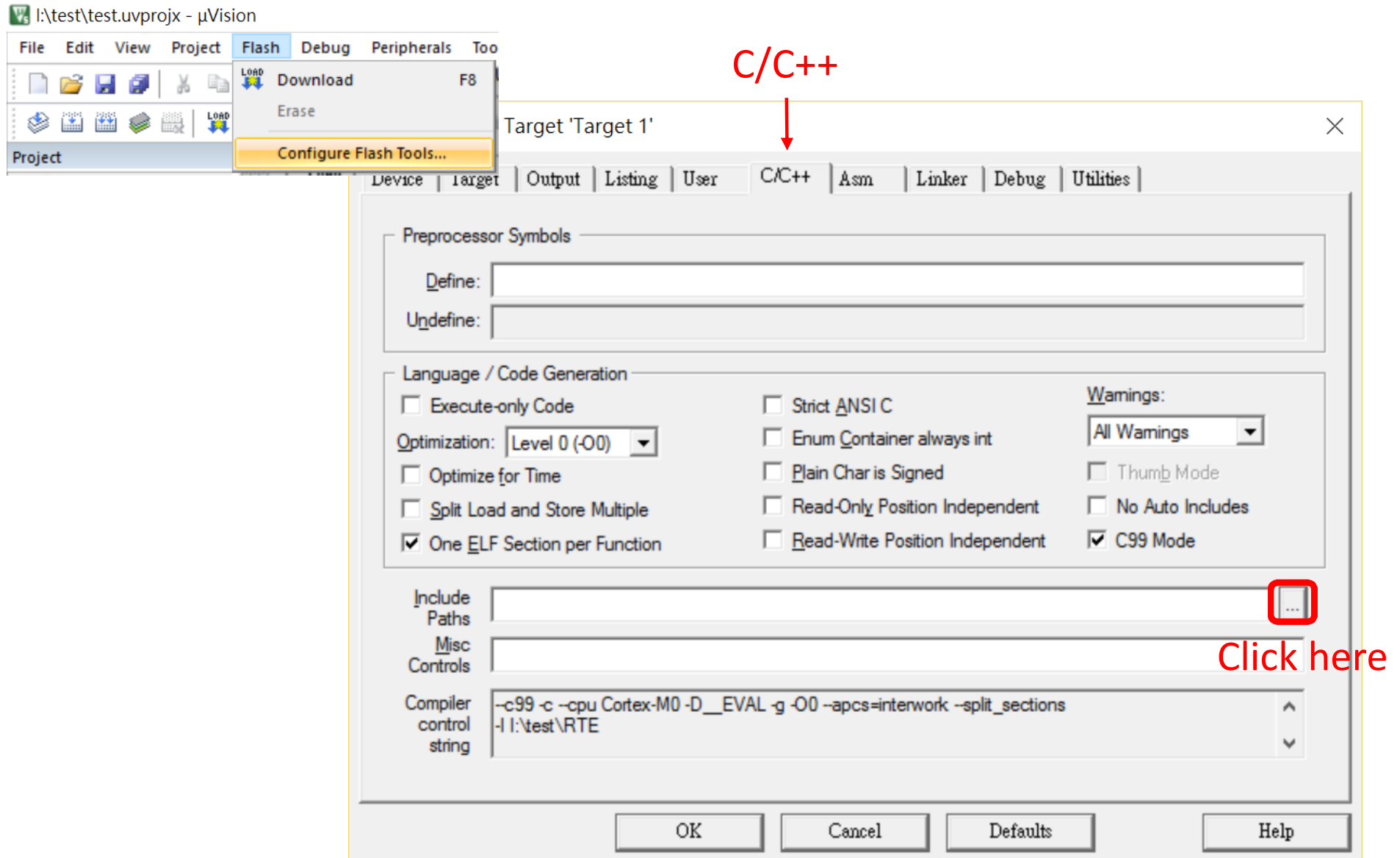
- This header can be found in any example.
- Copy and paste to our project folder/RTE.



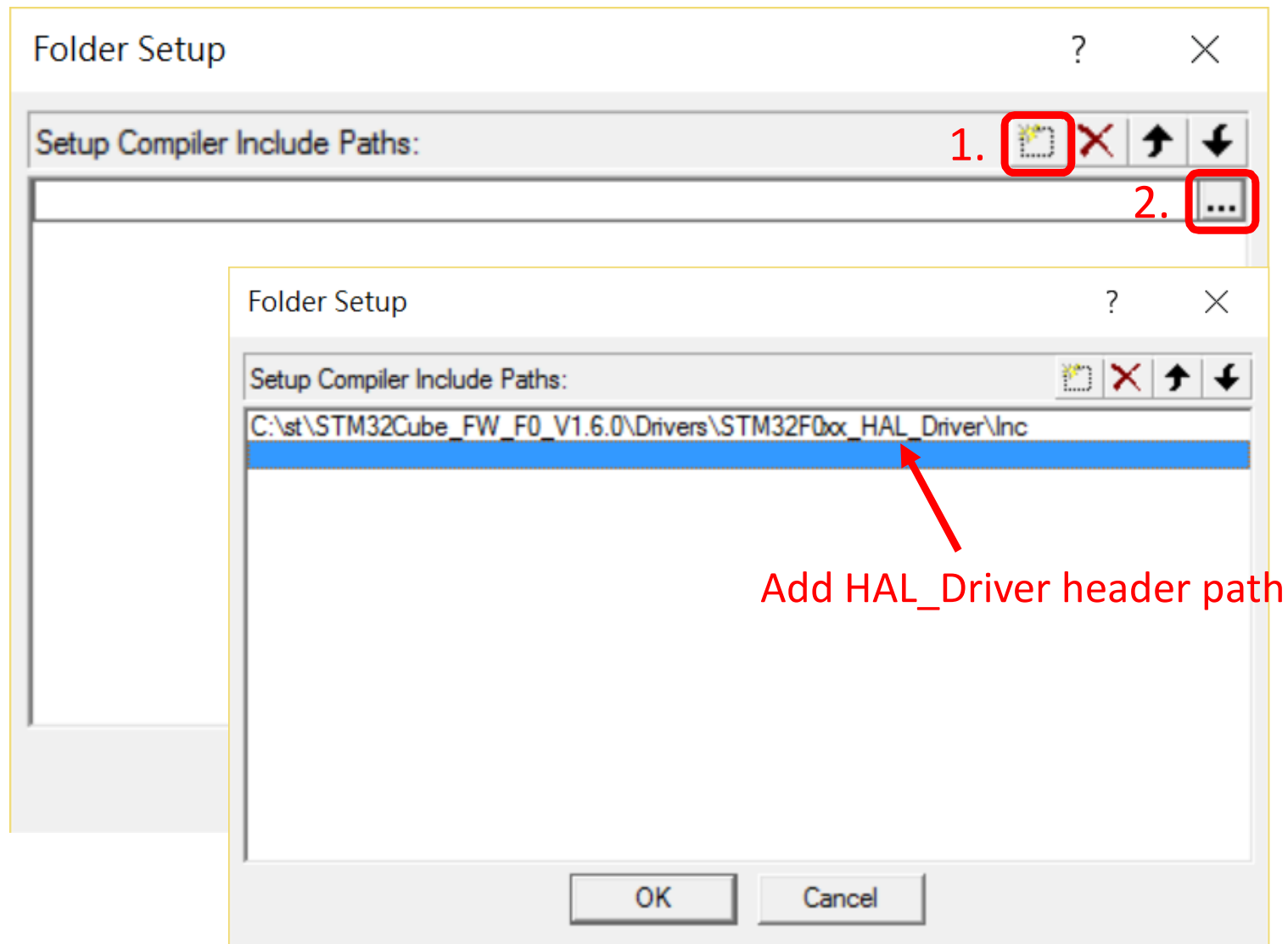
Step4. Add stm32f4xx_hal_conf.h



Step5. Add include path

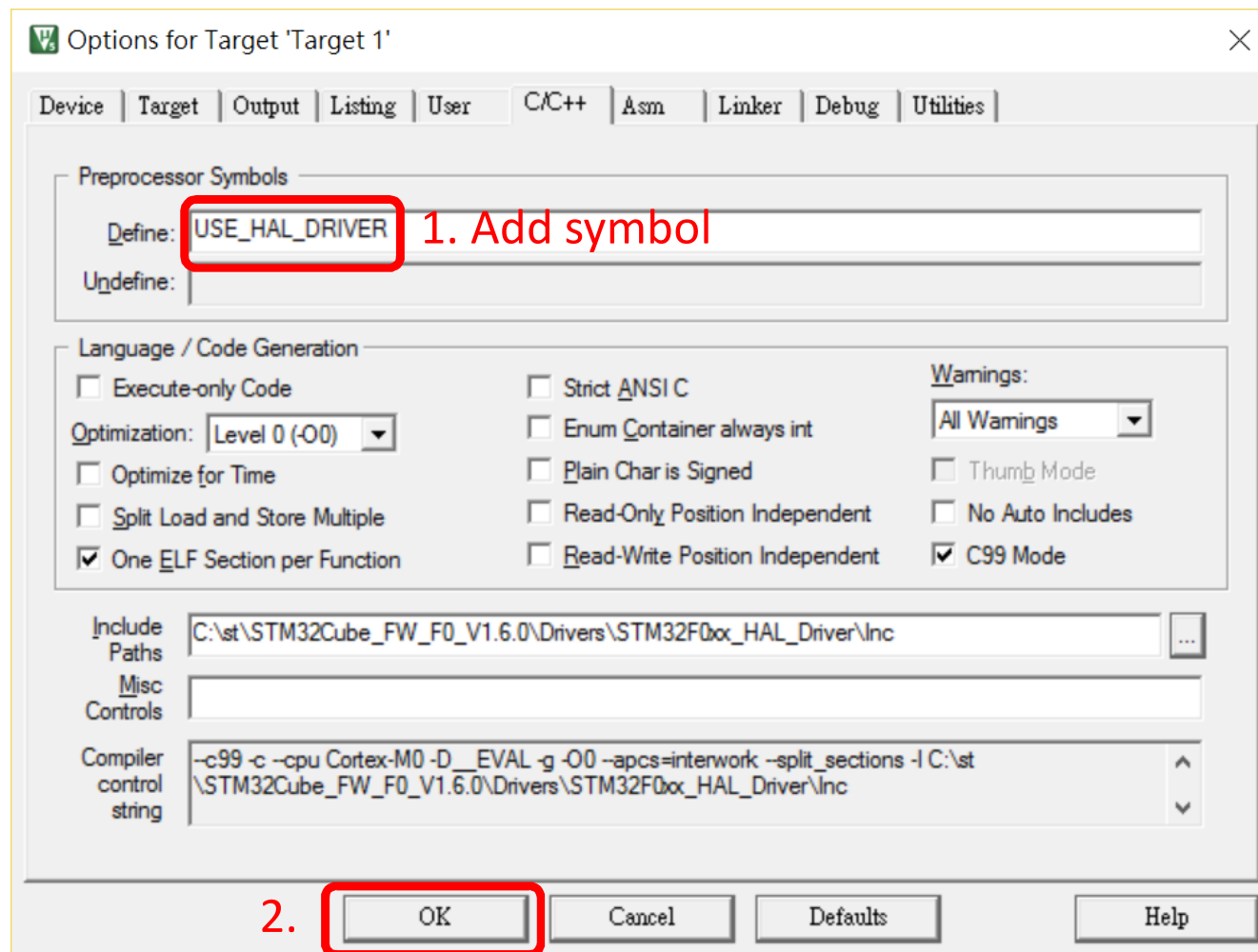


Step5. Add include path

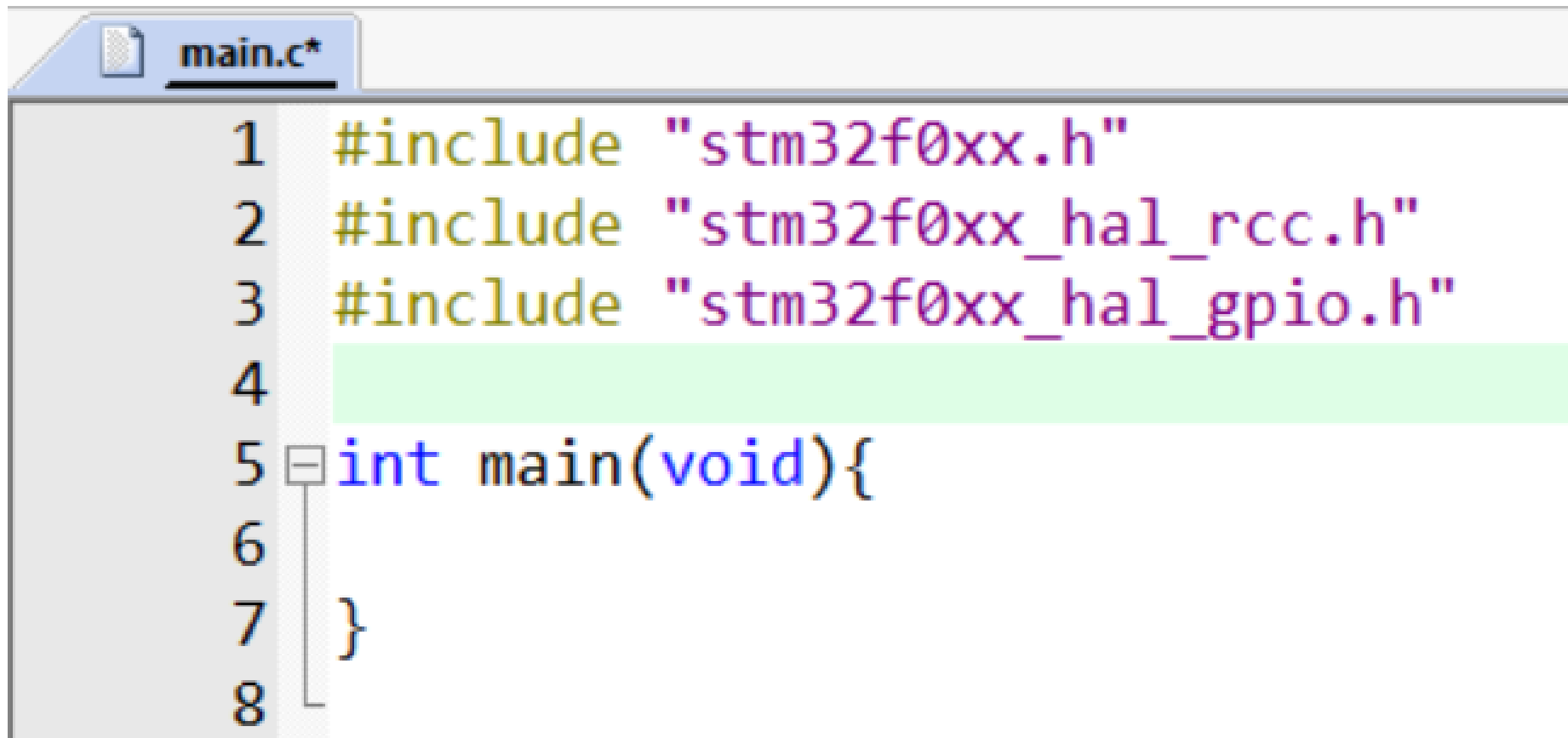


Step6. Add Preprocessor Symbol

- Type USE_HAL_DRIVER.



Step7. Include HAL header



The screenshot shows a code editor window with a tab labeled "main.c*". The code is as follows:

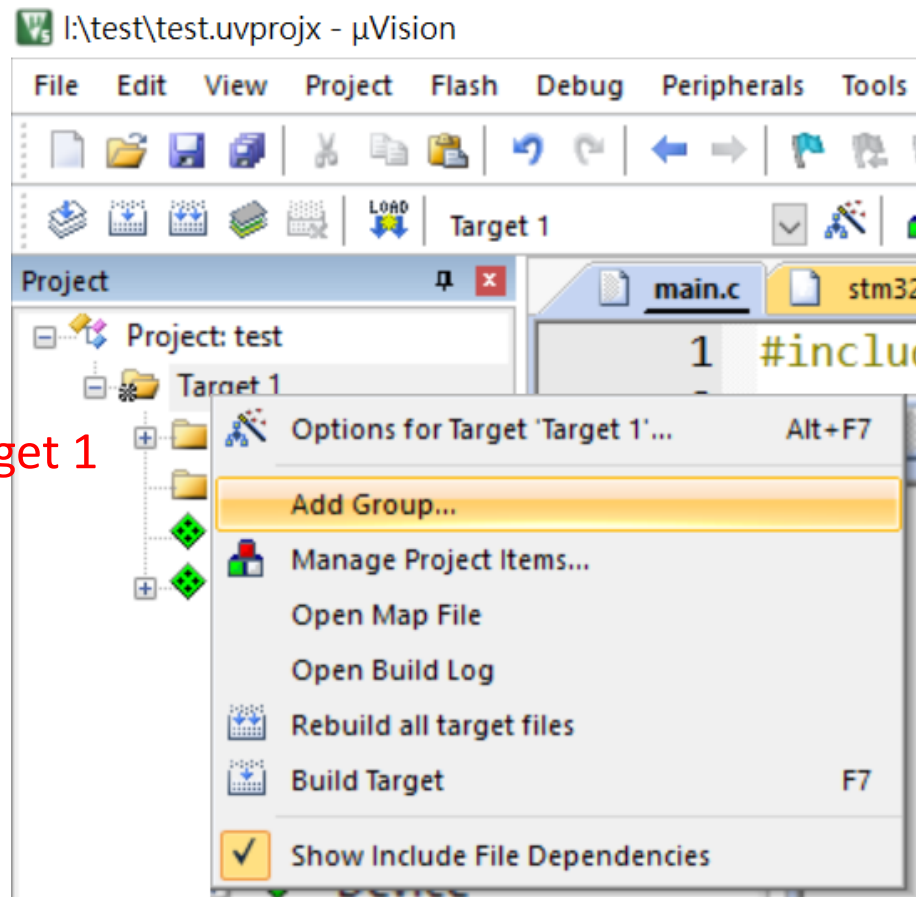
```
1  #include "stm32f0xx.h"
2  #include "stm32f0xx_hal_rcc.h"
3  #include "stm32f0xx_hal_gpio.h"
4
5  int main(void){
6
7  }
8
```

Line 4 is highlighted in green. A vertical line with a small square at the top is positioned between lines 5 and 8, indicating a scope or block structure.

Step8. Add source file

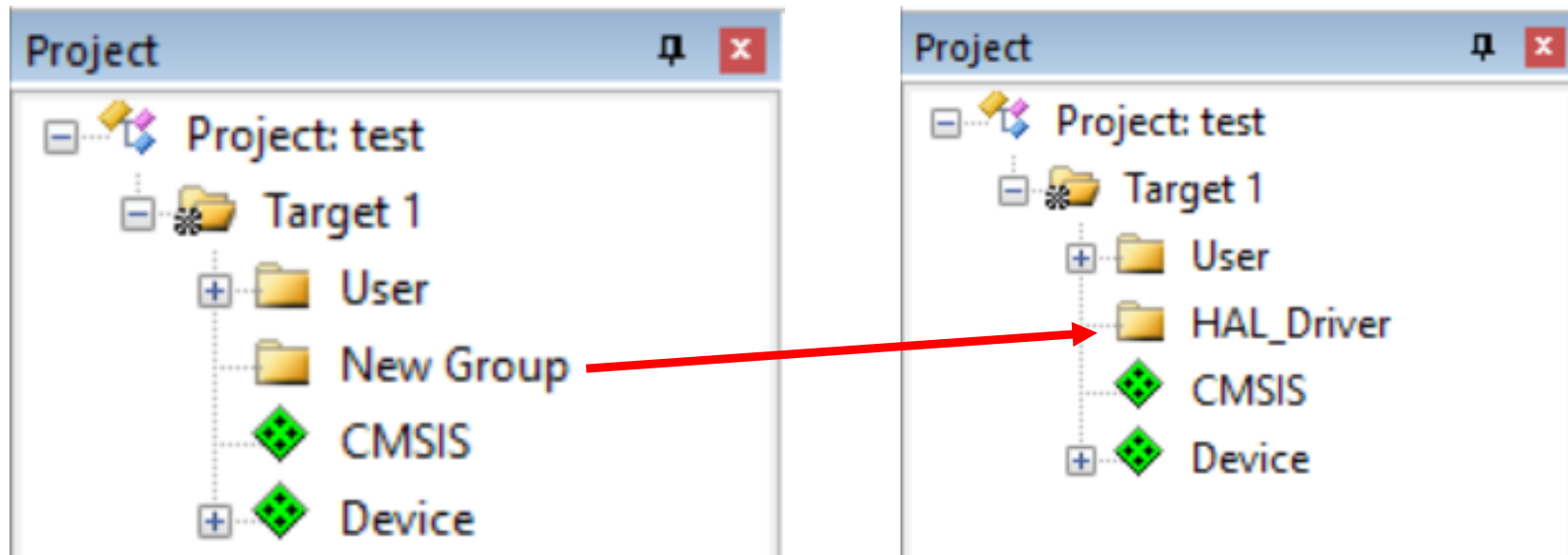
- Add group.

Right click on Target 1

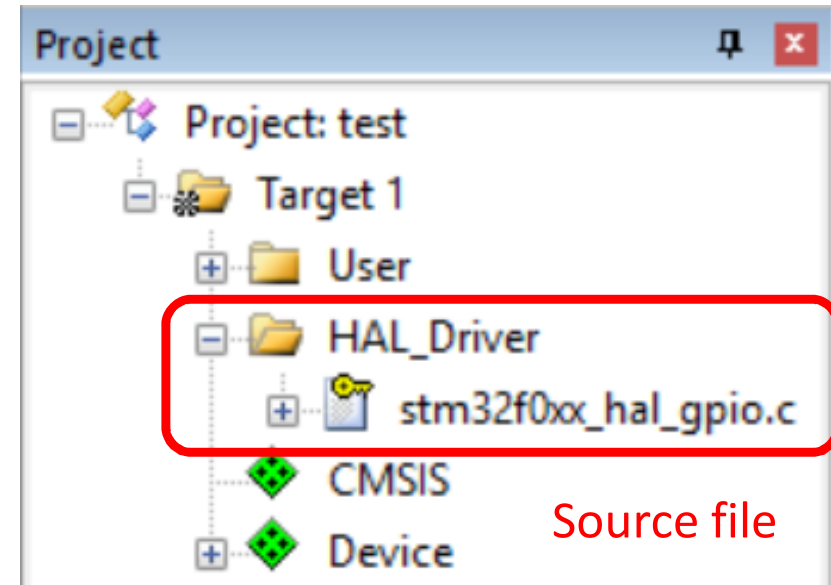
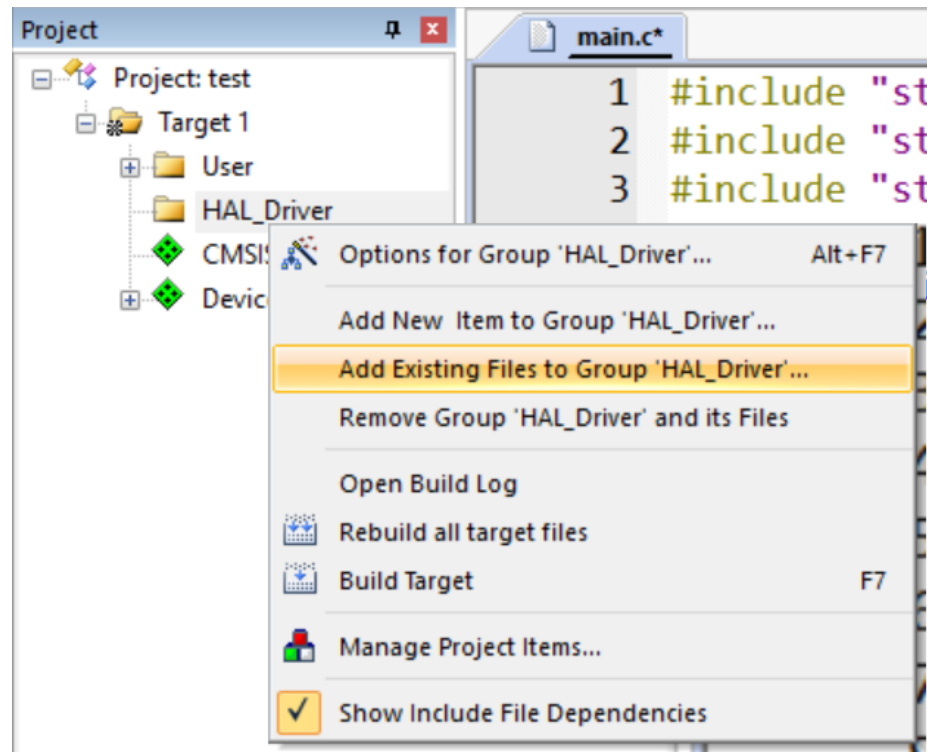


Step8. Add source file

- Rename New Group to HAL_Driver.

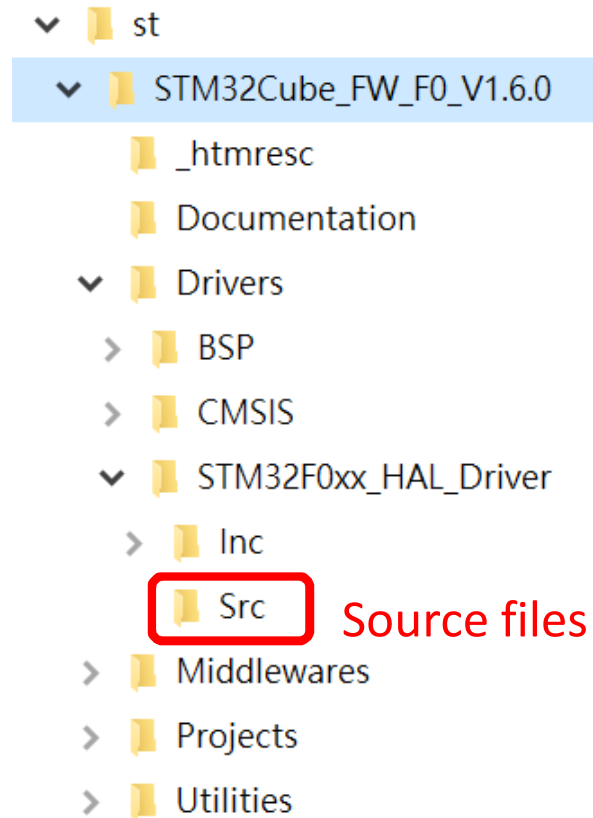


Step8. Add source file



Step8. Add source file

- Source files will be in here.



Step9. Test

- Blinky LED.

```
main.c
1  #include "stm32f0xx.h"           // Device header
2  #include "stm32f0xx_hal_rcc.h"
3  #include "stm32f0xx_hal_gpio.h"
4
5  int main(void){
6      __HAL_RCC_GPIOC_CLK_ENABLE();
7      GPIO_InitTypeDef GPIO_Init;
8      GPIO_Init.Pin = GPIO_PIN_8 | GPIO_PIN_9;
9      GPIO_Init.Mode = GPIO_MODE_OUTPUT_PP;
10     HAL_GPIO_Init(GPIOC, &GPIO_Init);
11
12     while(1){
13         HAL_GPIO_TogglePin(GPIOC, GPIO_PIN_9);
14         for(int i=0; i<800000; i++);
15     }
16 }
17
```

Exercise

Transfer previous code into HAL API

```
main.c  stm32f0xx.h  stm32f051x8.h
1  #include "stm32f0xx.h"           // Device header
2
3  int main(void){
4      RCC->AHBENR |= RCC_AHBENR_GPIOCEN;
5
6      GPIOC->MODER |= (0x1 << 2*8) | (0x1 << 2*9);
7      while(1){
8          GPIOC->BSRR = (0x1 << 9);
9          for(int i=0; i<800000; i++);
10         GPIOC->BSRR = (0x1 << (9+16));
11         for(int i=0; i<800000; i++);
12     }
13 }
14
```

```
main.c
1  #include "stm32f0xx.h"           // Device header
2  #include "stm32f0xx_hal_rcc.h"
3  #include "stm32f0xx_hal_gpio.h"
4
5  int main(void){
6      __HAL_RCC_GPIOC_CLK_ENABLE();
7      GPIO_InitTypeDef GPIO_Init;
8      GPIO_Init.Pin = GPIO_PIN_8 | GPIO_PIN_9;
9      GPIO_Init.Mode = GPIO_MODE_OUTPUT_PP;
10     HAL_GPIO_Init(GPIOC, &GPIO_Init);
11
12     while(1){
13         HAL_GPIO_TogglePin(GPIOC, GPIO_PIN_9);
14         for(int i=0; i<800000; i++);
15     }
16 }
17
```