

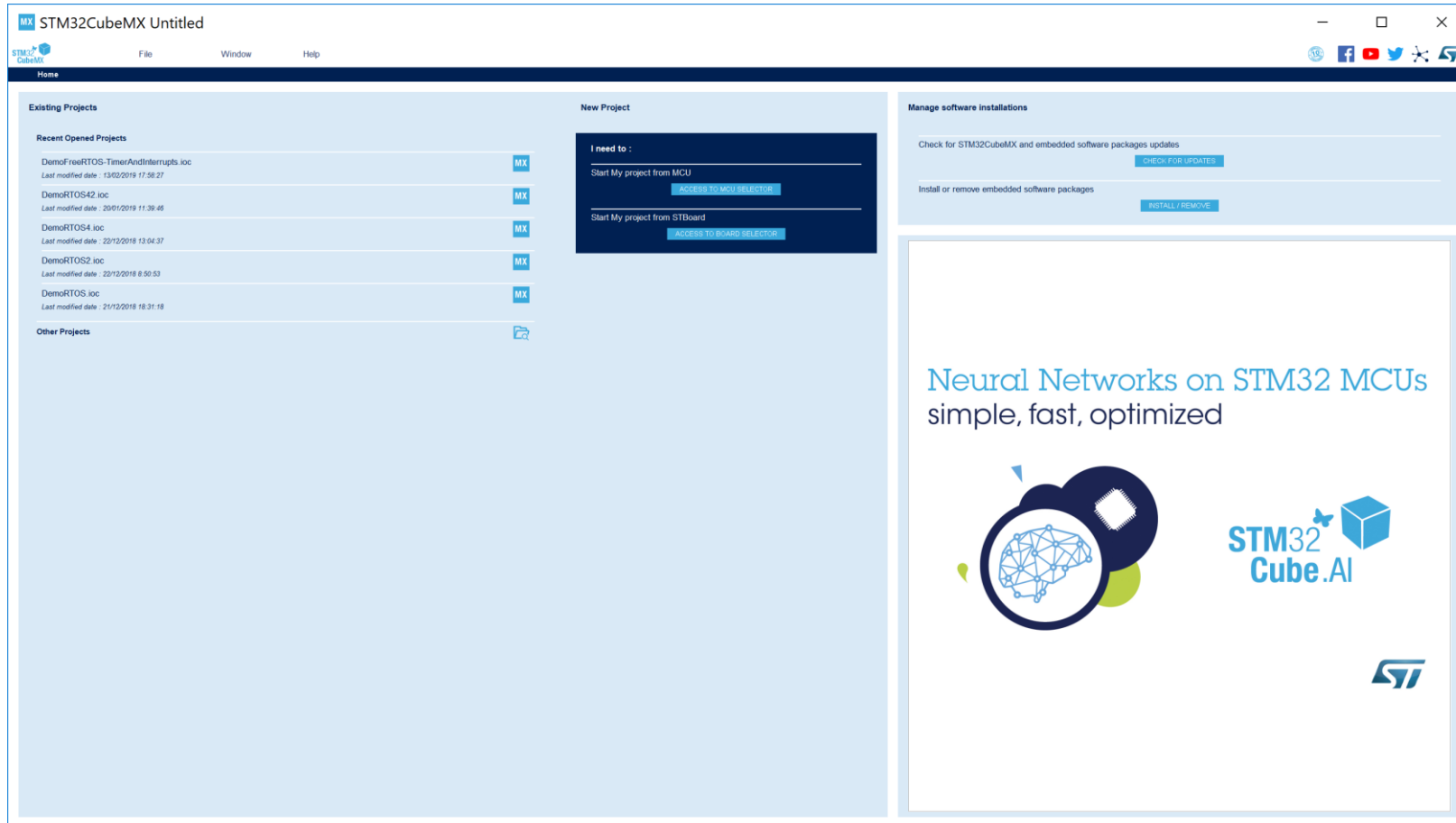
USCD Embedded C Assignment 3

By

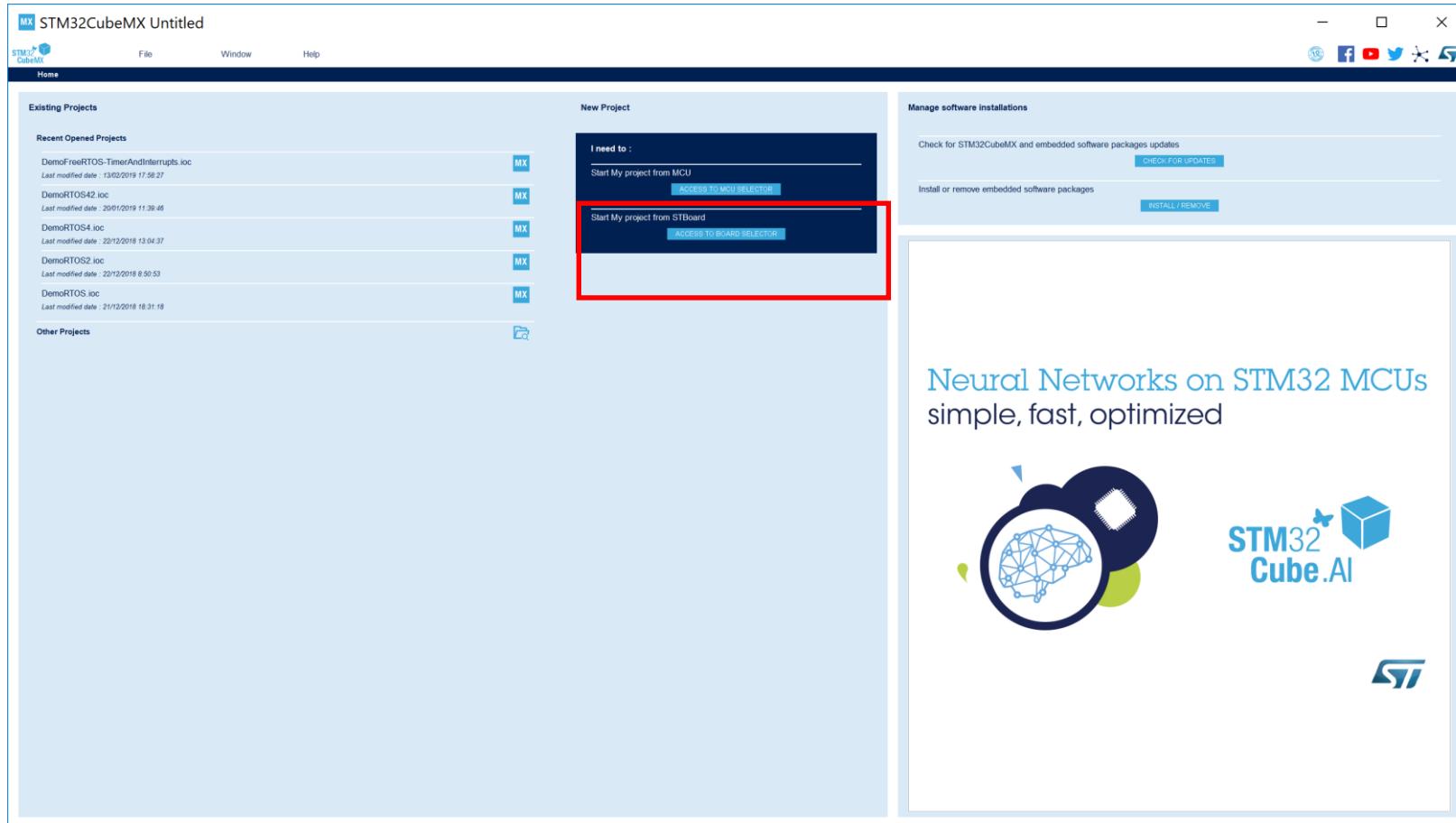
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Step 1. Startup STM32CubeMX



Step 2. Access Board Selector



Step 3. Enter “B-L475E-IOT01A” Board

New Project from a Board

Board Filter

Product Search:

Vendor:

Type:

MCU Series:

Other:

Peripheral:

- ☒ Accelerometer
- ☐ Analog I/O
- ☐ Analog Front End
- ☐ Audio Line In
- ☐ Audio Line Out
- ☐ Button
- ☐ Camera
- ☐ Display
- ☐ External Flash
- ☐ External I2C
- ☐ External SPI
- ☐ External UART
- ☐ External USB
- ☐ GPS
- ☐ Gyroscope
- ☐ I2C
- ☐ I2C Device (Slave)
- ☐ I2C Device (Master)
- ☐ LED
- ☐ Magnetometer
- ☐ Memory Card
- ☐ Microphone
- ☐ On-board Debug
- ☐ Other
- ☐ Power Source
- ☐ Pressure Sensor
- ☐ ROM
- ☐ RS-232
- ☐ RS-485
- ☐ RS-485/RS-422
- ☐ RS-485/RS-422
- ☐ Temperature Sensor
- ☐ Touch Screen
- ☐ USB

B-L475E-IOT01A

STMicroelectronics B-L475E-IOT01A IOT Discovery Board Support and Examples

ACTIVE Active
Product is in mass production

Unit Price (USD): \$3.8
Mounted device: [STM32L475G5](#)

The B-L475E-IOT01A Discovery kit for IoT node allows users to develop applications with direct connection to cloud servers.
The Discovery kit enables a wide diversity of applications by exploiting the power communication, multi-sensing and ARM Cortex-M4 core-based STM32L4 Series features.
The support for Arduino Uno V3 and PMOD connectivity provides unlimited expansion capabilities with a large choice of specialized add-on boards.

Features

- On-board ST-LINKV2-1
- Supply through ST-Link USB
- USB OTG (Full speed) with micro-AB Connector
- Blue Tooth module
- WiFi module
- 8 MByte QuadSPI Flash
- ST MEMS 3-axis accelerometer (LSM2DS1)
- ST MEMS gyroscope (LSM2DS1)
- ST MEMS magnetometer (LSM2DS1)
- ST MEMS barometer (LPS22DH)
- ST MEMS humidity and temperature (HTS221)
- Digital microphone (MP34DT01)
- RS-232 serial interface
- Two Push-buttons: User and Reset
- Seven LEDs: ST-LINKV2-1 communication, 3.3 V Power, Over current, USB COM (Red/Green), User (2*Green/Yellow/Blue)

Boards List: 1 item


Image	Chipset	Type	Manufacturer	Unit Price (USD)	Mounted device
	B-L475E-IOT01A	Discovery	Active	\$3.8	STM32L475G5

Step 4. Select Board Photo

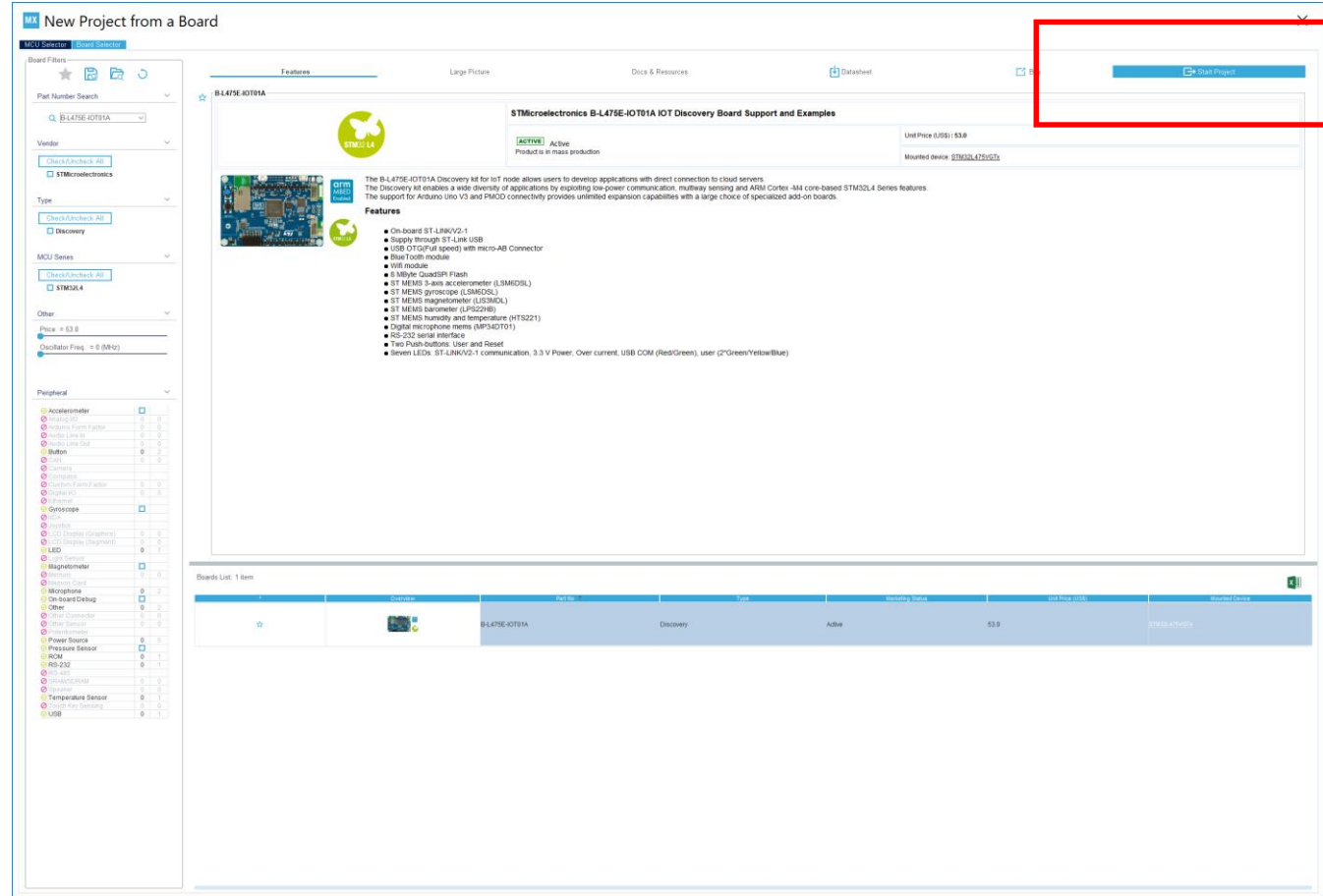
The screenshot shows the 'New Project from a Board' dialog with the 'Board Selection' tab active. On the left, filters are set for Part Number Search (B-L475E-IOT01A), Vendor (STMicroelectronics), Type (Discovery), MCU Series (STM32L4), and Other (Price >= \$3.8, Oscillator Flag <= 0 (BHz)). The Peripheral list on the left includes Accelerometer, Audio, Button, Gyroscope, LED, Magnetometer, Microphone, On-board Debug, Other, Power Source, Pressure Sensor, ROM, RS-232, Serial, Temperature Sensor, and USB.

The main panel displays the 'B-L475E-IOT01A' board details. The 'Features' tab is selected, showing a list of features: On-board ST-LINK/V2-1, Supply through ST-Link USB, USB OTG (Full speed) with micro-AB Connector, Blue Tooth module, 1MB module, 8 MByte QuadSPI Flash, ST MEMS 3-axis accelerometer (LSM2DS1), ST MEMS gyroscope (LSM2DS1), ST MEMS magnetometer (LSM2DS1), ST MEMS barometer (LPS22DH), ST MEMS humidity and temperature (HTS221), Digital microphone (MP34DT01), RS-232 serial interface, Two Push-buttons: User and Reset, and Seven LEDs: ST-LINK/V2-1 communication, 3.3 V Power, Over current, USB COM (Red/Green), User (2*Green/Yellow/Blue).

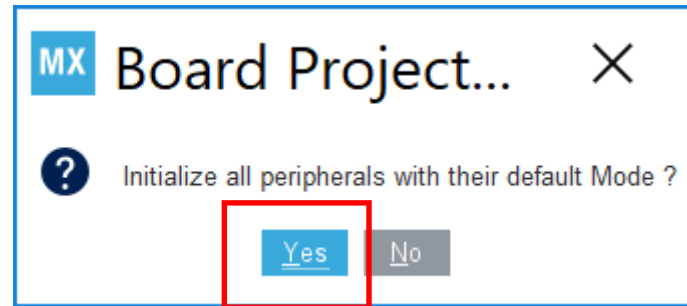
At the bottom, the 'Boards List: 1 item' table shows the selected board, with its photo highlighted by a red box:

Icon	Board Name	Type	Status	Price (USD)	Mounted device
	B-L475E-IOT01A	Discovery	Active	\$3.8	STMicroelectronics

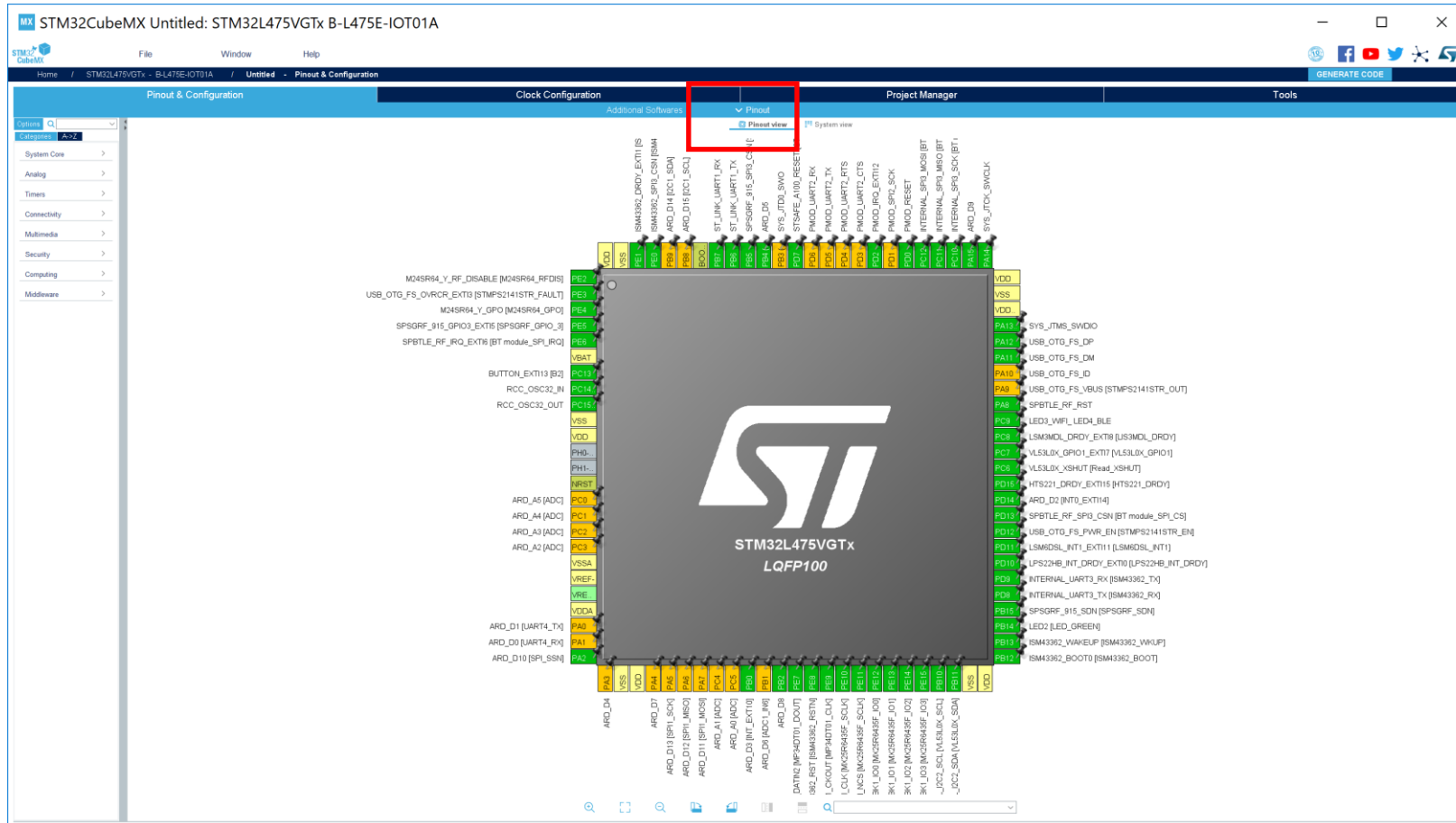
Step 5. Select “Start Project”



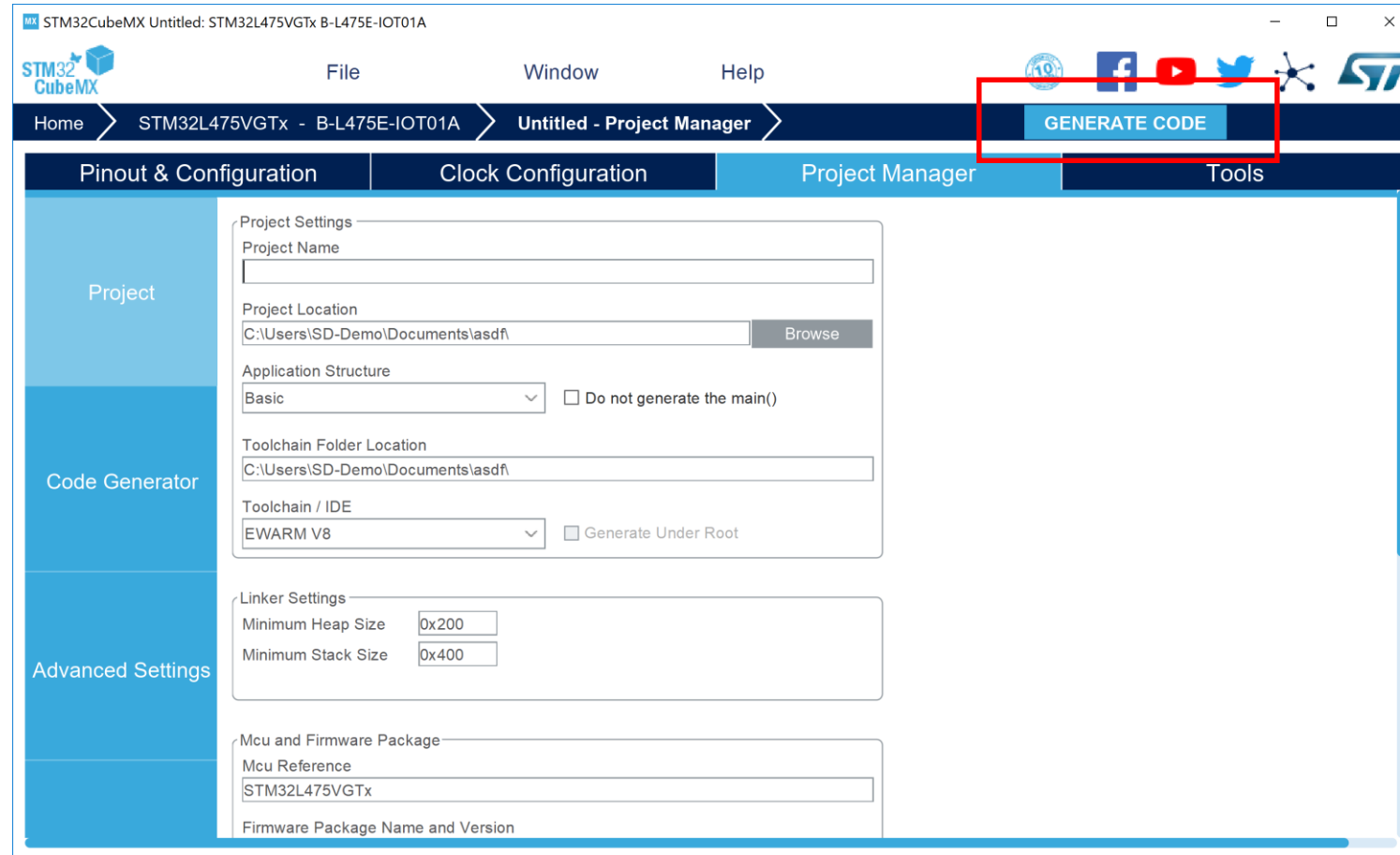
Step 6. Select **YES** (initialize all peripherals with the default mode)



Step 7. Observe Results (Pinout View)



Step 8. Select Project Manager Tab



Step 9. Select Advanced Settings

The screenshot shows the STM32CubeMX software interface. The title bar indicates the project is 'STM32CubeMX Untitled: STM32L475VGTx B-L475E-IOT01A'. The menu bar includes 'File', 'Window', and 'Help'. The breadcrumb navigation shows 'Home > STM32L475VGTx - B-L475E-IOT01A > Untitled - Project Manager'. A 'GENERATE CODE' button is visible in the top right.

The main interface has four tabs: 'Pinout & Configuration', 'Clock Configuration', 'Project Manager' (selected), and 'Tools'. The 'Project Manager' tab is active, showing a 'Driver Selector' search bar and a list of drivers with their HAL components:

- > USART HAL
- > RCC HAL
- > DFSDM HAL
- > USB_OTG_FS HAL
- > I2C HAL
- > QUADSPI HAL
- > SPI HAL
- > GPIO HAL

Below the driver list is a 'Generated Function Calls' table:

Rank	Function Name	IP Instance Name	<input type="checkbox"/> Not Generate Function C...	<input type="checkbox"/> Visibility (Static)
1	MX_GPIO_Init	GPIO	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	SystemClock_Config	RCC	<input type="checkbox"/>	<input type="checkbox"/>
3	MX_DFSDM1_Init	DFSDM1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	MX_I2C2_Init	I2C2	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	MX_QUADSPI_Init	QUADSPI	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	MX_SPI3_Init	SPI3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	MX_USART1_UART_Init	USART1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	MX_USART3_UART_Init	USART3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	MX_USB_OTG_FS_PCD_Init	USB_OTG_FS	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The 'Advanced Settings' option in the left sidebar is highlighted with a red box.

Step 10. Observe the HAL is the default option for Driver Selector

The screenshot shows the STM32CubeMX software interface. The top menu bar includes File, Window, and Help. The main toolbar has buttons for Home, STM32L475VGTX - B-L475E-IOT01A, Untitled - Project Manager, and GENERATE CODE. The left sidebar contains Project, Code Generator, and Advanced Settings. The main area is divided into four tabs: Pinout & Configuration, Clock Configuration, Project Manager, and Tools. The Project Manager tab is active, showing the Driver Selector. A red box highlights the HAL option in the list. Below the Driver Selector is a table of Generated Function Calls.

Driver Selector

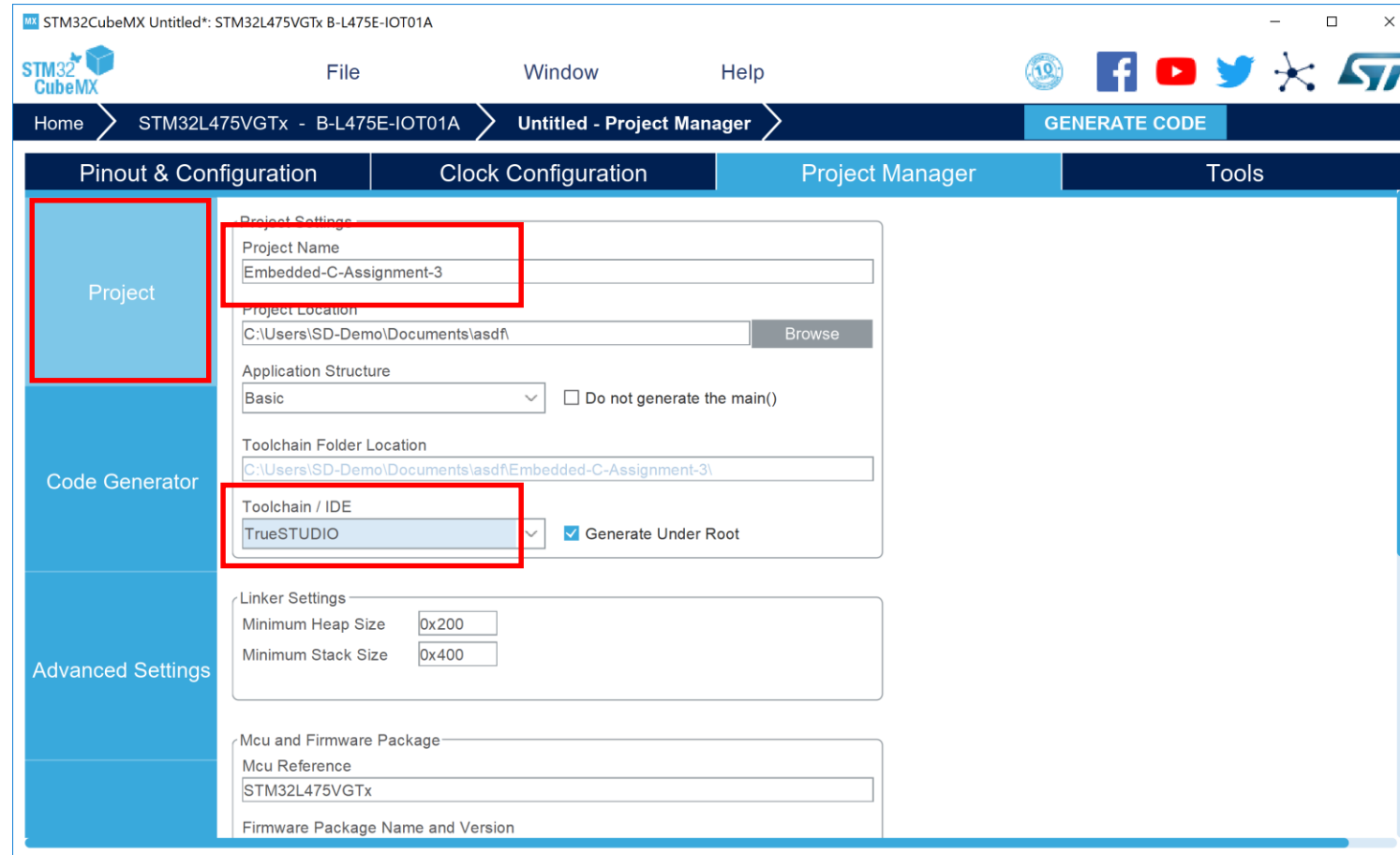
- > USART
- > RCC
- > DFSDM
- > USB_OTG_FS
- > I2C
- > QUADSPI
- > SPI
- > GPIO

HAL
HAL
HAL
HAL
HAL
HAL
HAL
HAL
HAL

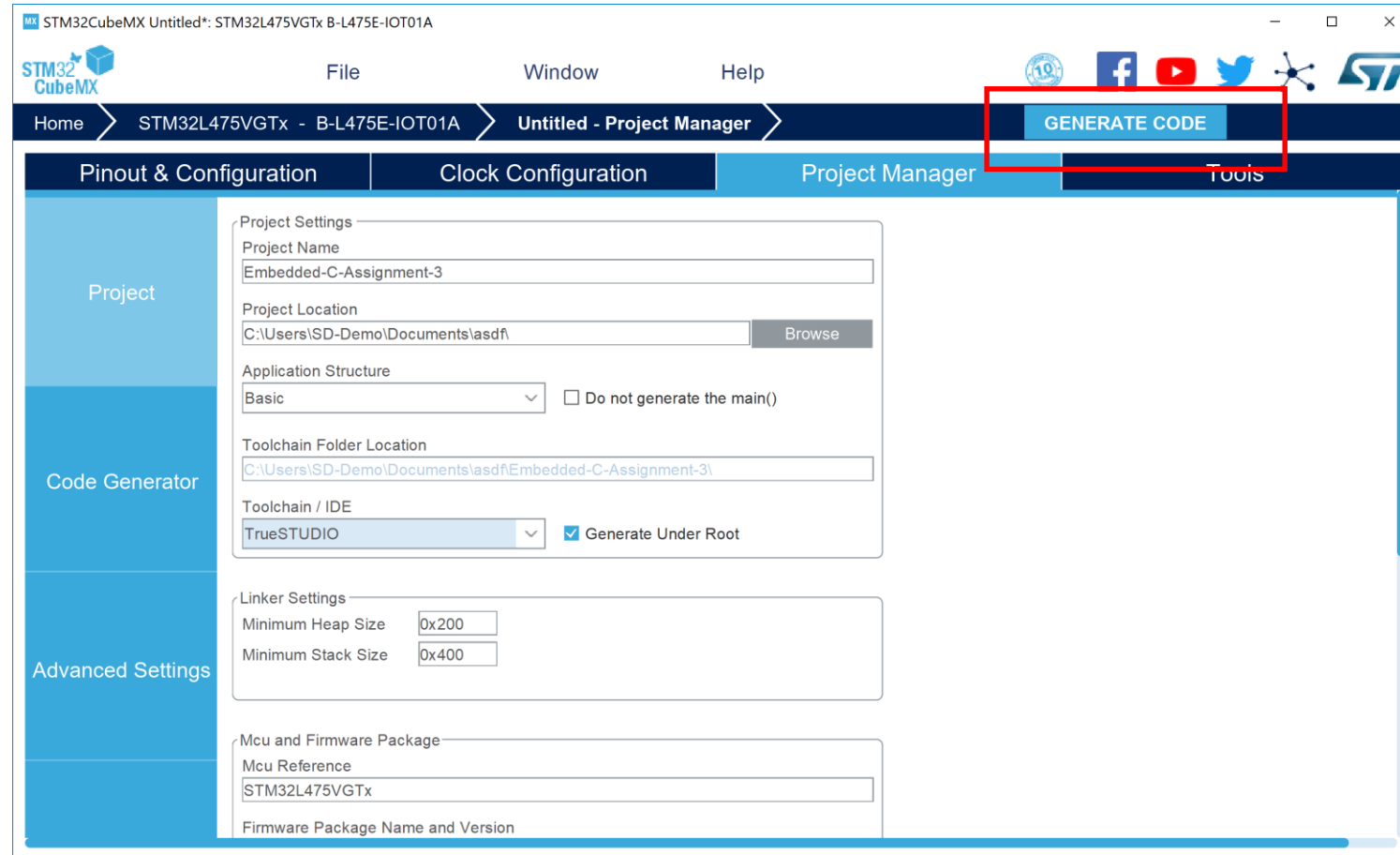
Generated Function Calls

Rank	Function Name	IP Instance Name	<input type="checkbox"/> Not Generate Function C...	<input type="checkbox"/> Visibility (Static)
1	MX_GPIO_Init	GPIO	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	SystemClock_Config	RCC	<input type="checkbox"/>	<input type="checkbox"/>
3	MX_DFSDM1_Init	DFSDM1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	MX_I2C2_Init	I2C2	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	MX_QUADSPI_Init	QUADSPI	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	MX_SPI3_Init	SPI3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	MX_USART1_UART_Init	USART1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	MX_USART3_UART_Init	USART3	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	MX_USB_OTG_FS_PCD_Init	USB_OTG_FS	<input type="checkbox"/>	<input checked="" type="checkbox"/>

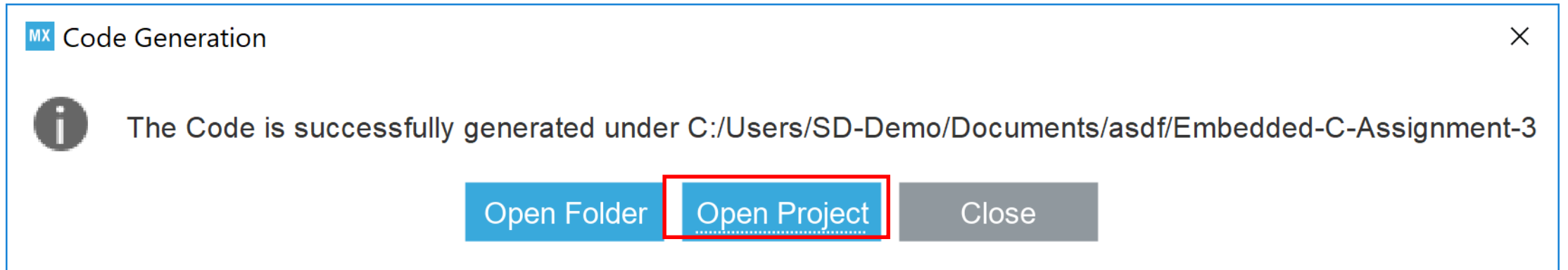
Step 11. Enter “Embedded-C-Assignment-3” and select TrueStudio as IDE

















Step 12. Select “Generate Code”



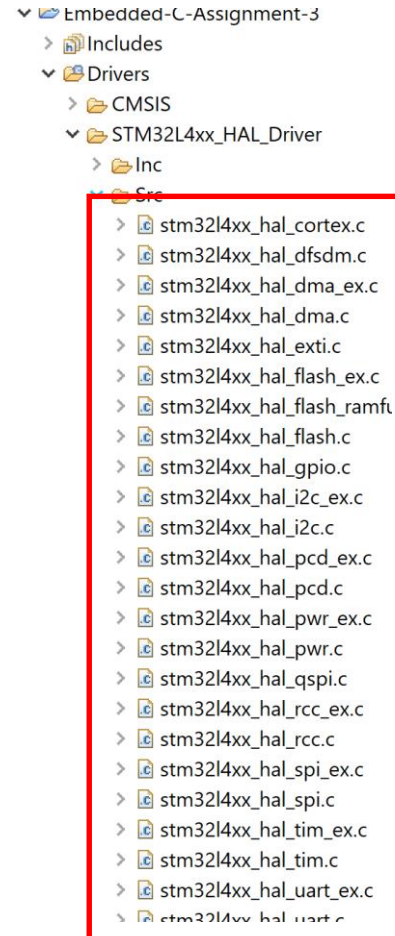
Step 13. Select “Open Project”



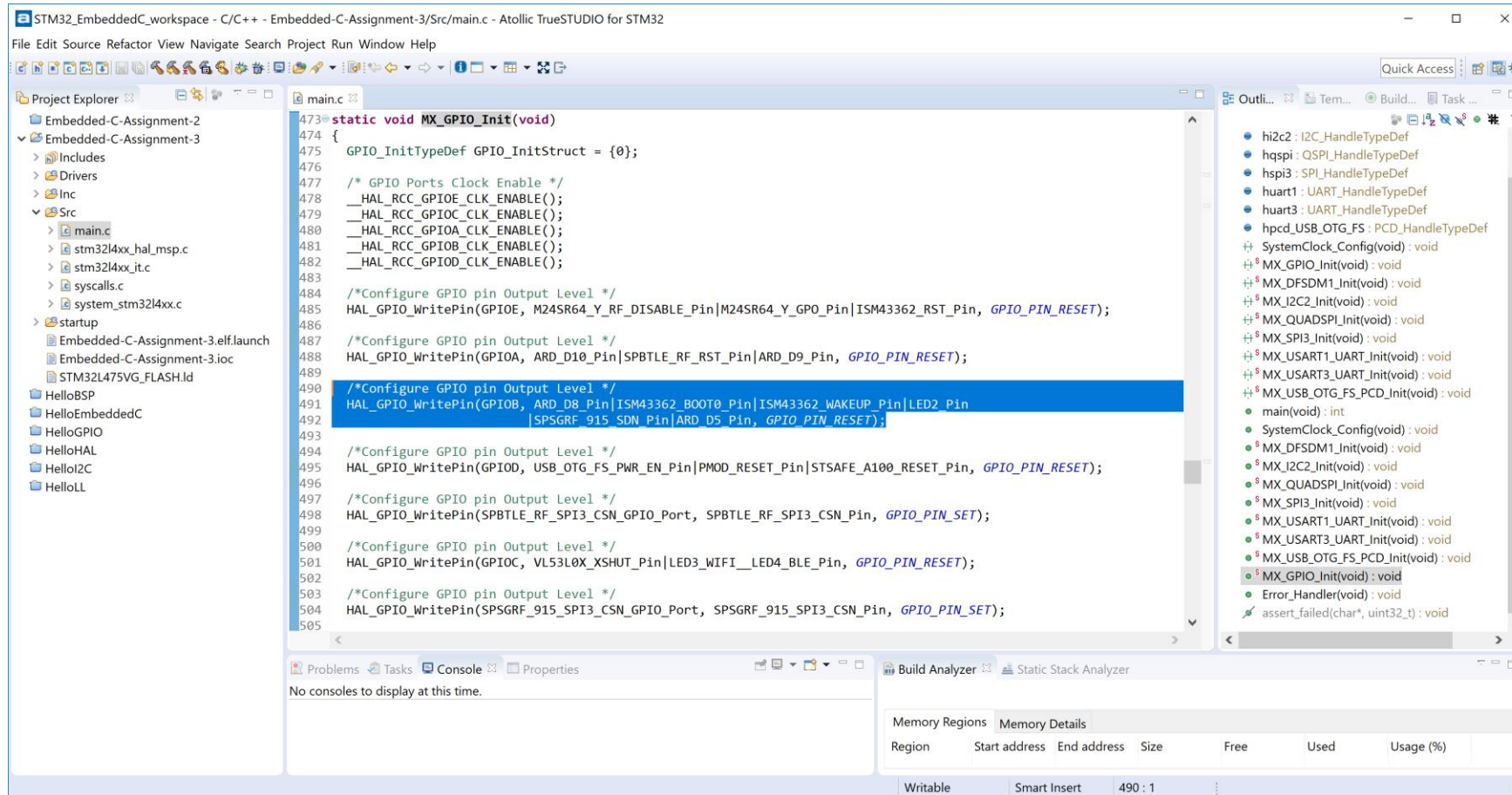
Step 14. Resulting Project

- ▼  Embedded-C-Assignment-3
 - >  Includes
 - >  Drivers
 - >  Inc
 - ▼  Src
 - >  main.c
 - >  stm32l4xx_hal_msp.c
 - >  stm32l4xx_it.c
 - >  syscalls.c
 - >  system_stm32l4xx.c
 - >  startup
 -  Embedded-C-Assignment-3.elf.launch
 -  Embedded-C-Assignment-3.ioc
 -  STM32L475VG_FLASH.ld

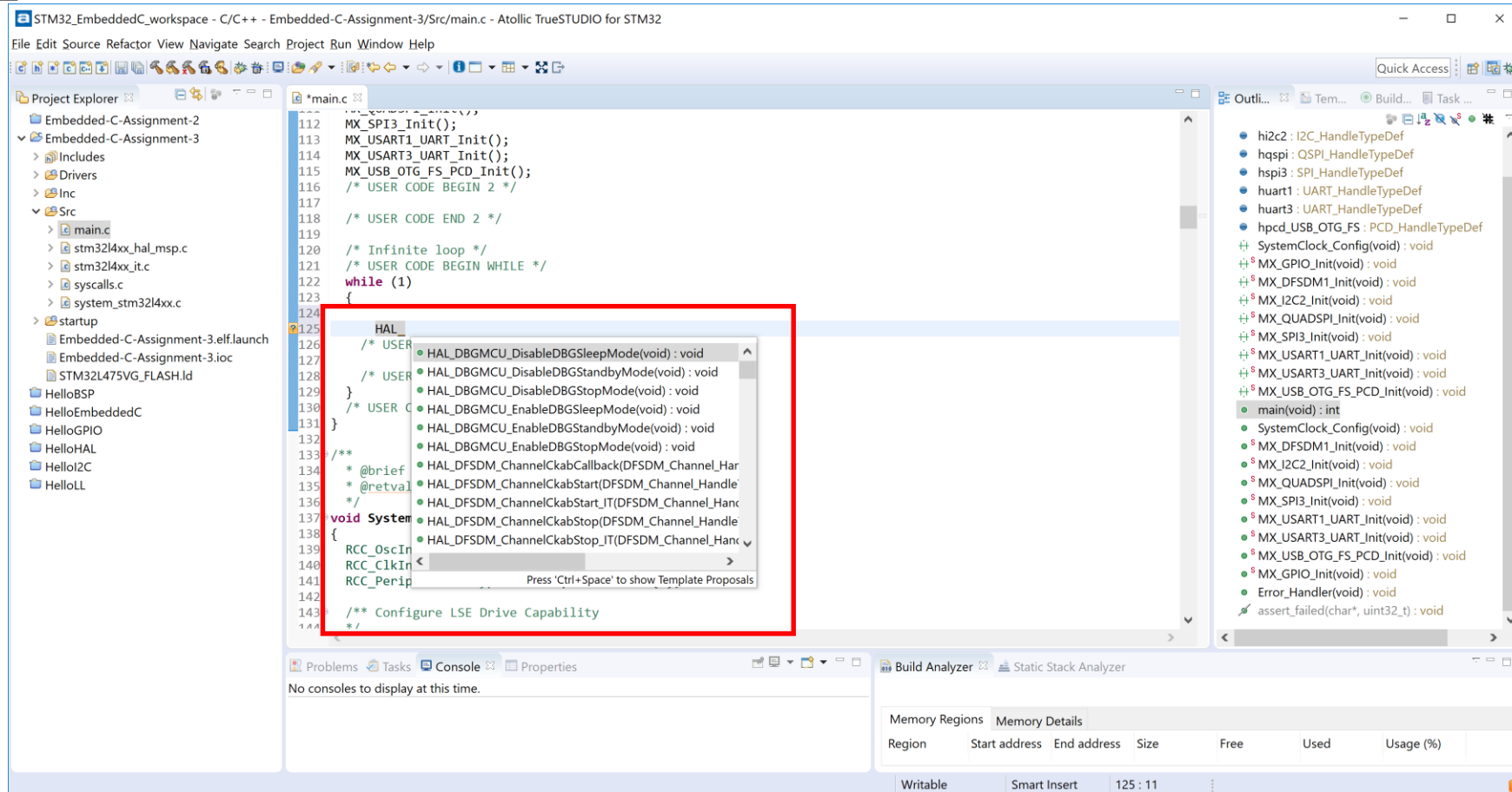
Step 15. Confirm that HAL drivers added to project



Step 16. Find GPIO Init code that initializes the LED2 using HAL (highlighted in blue below)



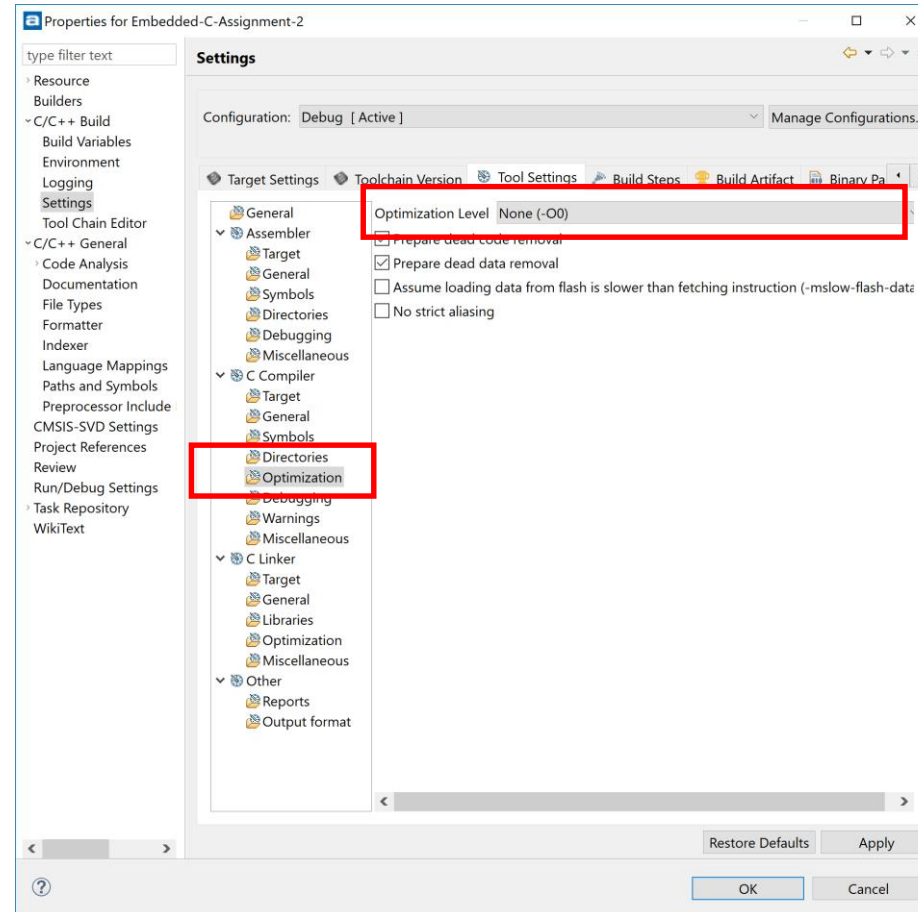
Step 17. In main.c, inside the “while(1)” loop, enter “HAL_” then press Ctrl+SpaceBar to observe HAL_ APIs



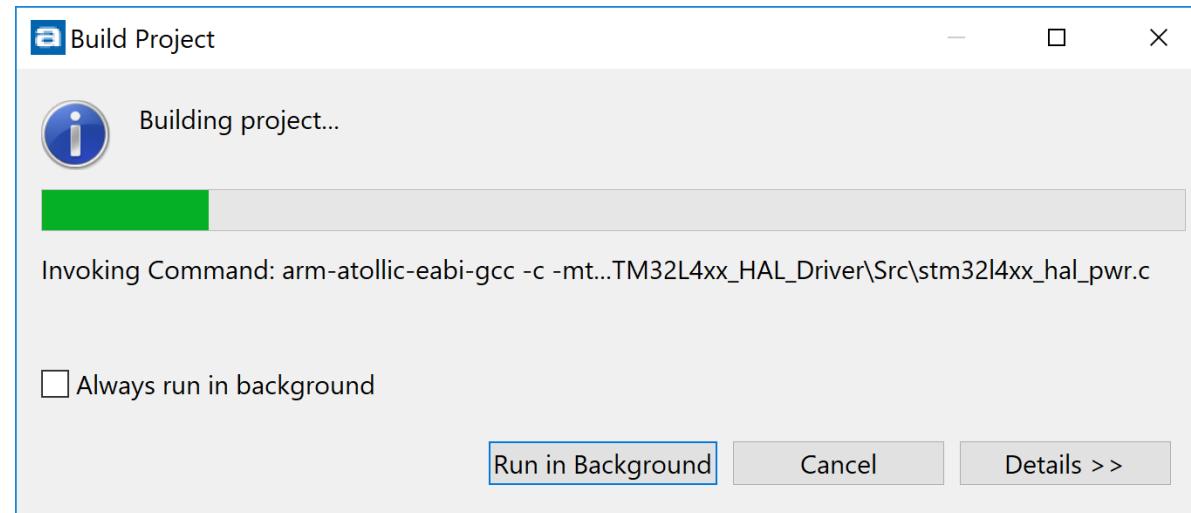
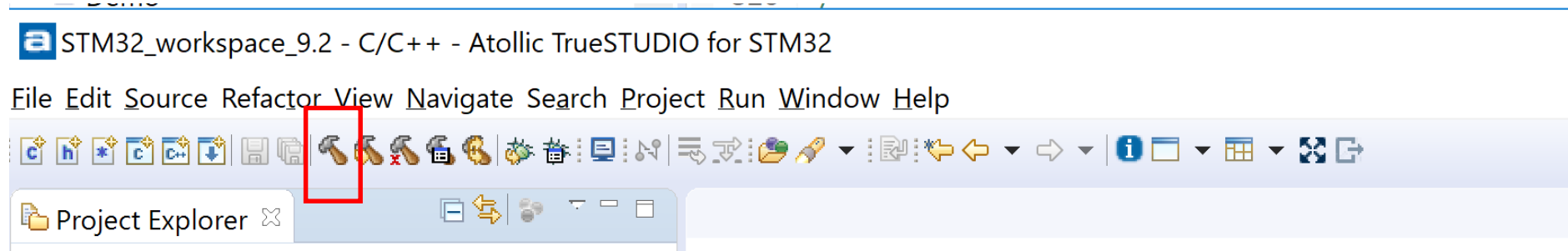
Step 18. In main.c, enter HAL related code shown below

```
117
118  /* USER CODE BEGIN 2 */
119
120  uint32_t devid = HAL_GetDEVID();
121  printf("devid: 0x%x\n", devid);
122
123  uint32_t uid[3];
124  uid[0] = HAL_GetUIDw0();
125  uid[1] = HAL_GetUIDw1();
126  uid[2] = HAL_GetUIDw2();
127  printf("uid: 0x%x 0x%x 0x%x\n", uid[0], uid[1], uid[2]);
128
129  /* USER CODE END 2 */
130
131  /* Infinite loop */
132  /* USER CODE BEGIN WHILE */
133
134  while (1)
135  {
136
137      HAL_GPIO_TogglePin(GPIOB, LED2_Pin);
138      HAL_Delay(1000);
139
140      /* USER CODE END WHILE */
141
142      /* USER CODE BEGIN 3 */
143  }
```

Step 19. Properties, C/C++ Build, Settings, Tool Settings, C Compiler, Optimization, None



Step 20. Build Project






Step 21. Results of Build – Part 1

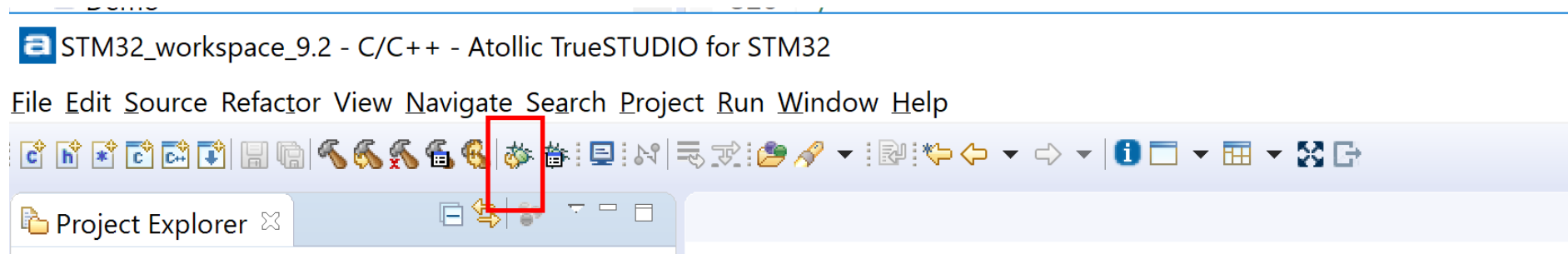
```
Problems Tasks Console Properties
CDT Build Console [Embedded-C-Assignment-3]
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -c -mthumb -mcpu=cortex-m4 -mfloat-abi=hard -mfpu=fpv4-sp-d16 -std=gnu11 -D__weak=__attribute__((weak)) Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
arm-atollic-eabi-gcc -o Embedded-C-Assignment-3.elf Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o Drivers\STM32L4xx_HAL_Driver\Src\stm32l4xx_hal.o
C:\Program Files (x86)\Atollic\TrueSTUDIO for STM32 9.2.0\ide\jre\bin\java -jar C:\Program Files (x86)\Atollic\T
Generate build reports...
Print size information
  text    data    bss    dec    hex filename
 22652    112    3196  25960  6568 Embedded-C-Assignment-3.elf
Print size information done
Generate listing file
Output sent to: Embedded-C-Assignment-3.list
Generate listing file done
Generate build reports done
arm-atollic-eabi-objcopy.exe -O ihex Embedded-C-Assignment-3.elf Embedded-C-Assignment-3.hex

09:21:10 Build Finished (took 11s.495ms)
```

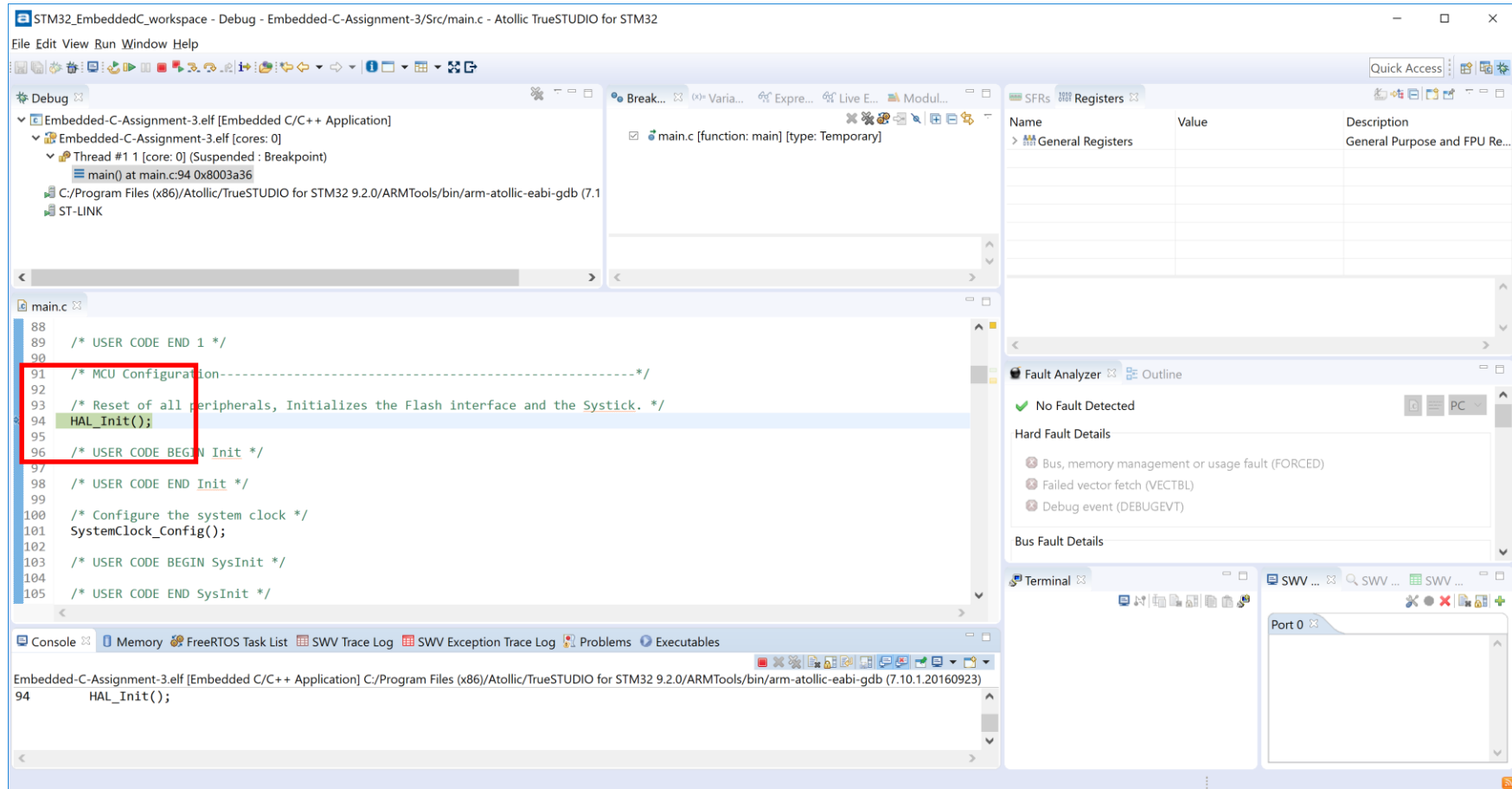
Step 22. Results of Build – Part 2

Memory Regions		Memory Details				
Region	Start address	End address	Size	Free	Used	Usage (%)
 RAM	0x20000000	0x20018000	96 KB	92.78 KB	3.22 KB	<div><div></div></div> 3.36%
 RAM2	0x10000000	0x10008000	32 KB	32 KB	0 B	0.00%
 FLASH	0x08000000	0x08100000	1024 KB	1001.77 KB	22.23 KB	<div><div></div></div> 2.17%

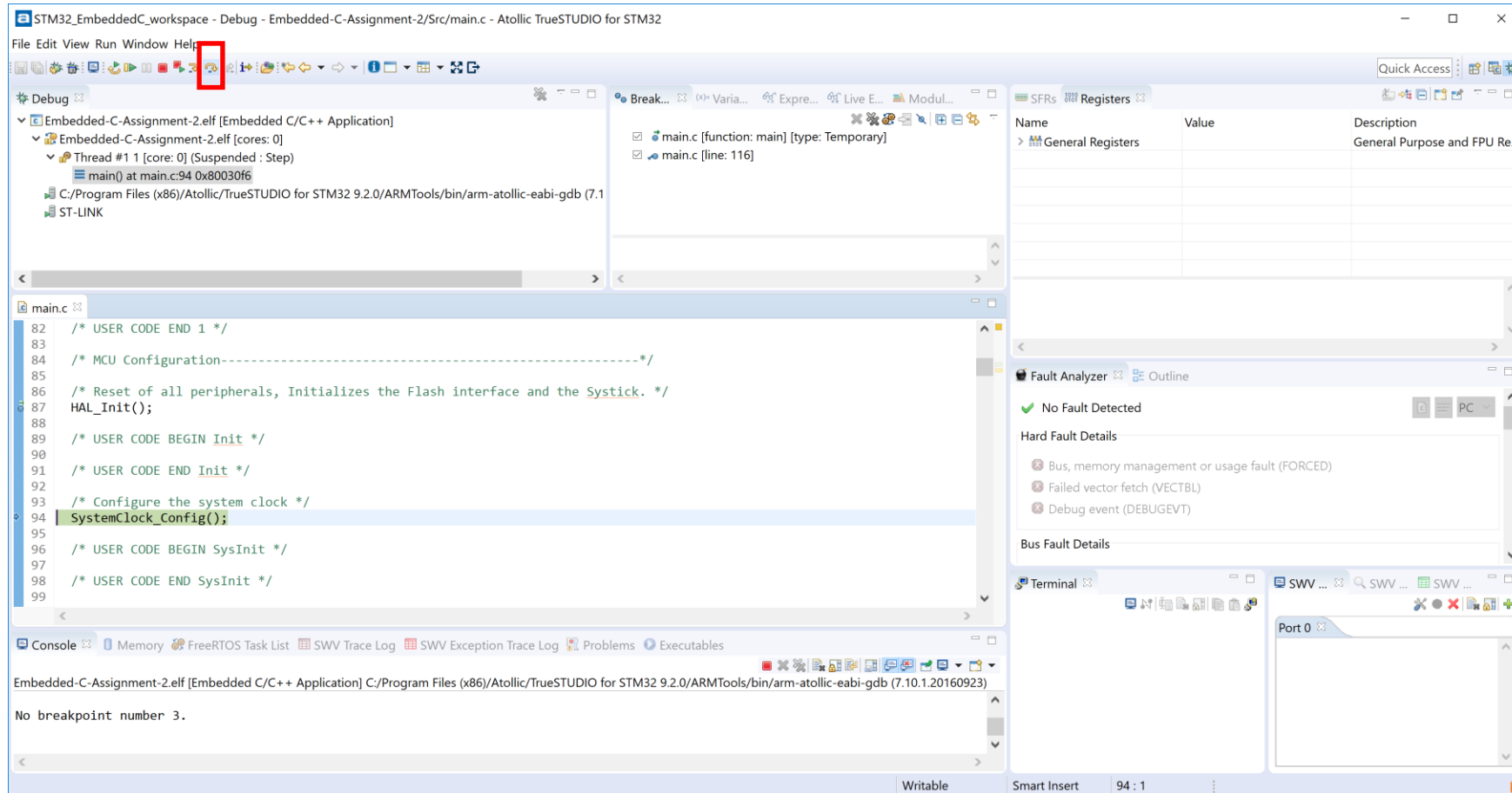
Step 23. Run in Debug



Step 24. Hit Breakpoint



Step 25. Click “Step Over”.



Step 26. Click “Step Over”. Repeat as needed.
Confirming that the LED toggles on/off using HAL

