

Micromouse2019

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# Chapter 1

## Module Index

### 1.1 Modules

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## Chapter 3

# Module Documentation

### 3.1 Template\_Project

#### Functions

- void [NMI\\_Handler](#) (void)  
*This function handles NMI exception.*
- void [HardFault\\_Handler](#) (void)  
*This function handles Hard Fault exception.*
- void [MemManage\\_Handler](#) (void)  
*This function handles Memory Manage exception.*
- void [BusFault\\_Handler](#) (void)  
*This function handles Bus Fault exception.*
- void [UsageFault\\_Handler](#) (void)  
*This function handles Usage Fault exception.*
- void [SVC\\_Handler](#) (void)  
*This function handles SVCcall exception.*
- void [DebugMon\\_Handler](#) (void)  
*This function handles Debug Monitor exception.*
- void [PendSV\\_Handler](#) (void)  
*This function handles PendSVC exception.*
- void [SysTick\\_Handler](#) (void)  
*This function handles SysTick Handler.*

#### 3.1.1 Detailed Description

#### 3.1.2 Function Documentation

##### 3.1.2.1 BusFault\_Handler()

```
void BusFault_Handler (  
    void )
```

This function handles Bus Fault exception.

**Parameters**

<i>None</i>	
-------------	--

**Return values**

<i>None</i>	
-------------	--

**3.1.2.2 DebugMon\_Handler()**

```
void DebugMon_Handler (
    void )
```

This function handles Debug Monitor exception.

**Parameters**

<i>None</i>	
-------------	--

**Return values**

<i>None</i>	
-------------	--

**3.1.2.3 HardFault\_Handler()**

```
void HardFault_Handler (
    void )
```

This function handles Hard Fault exception.

**Parameters**

<i>None</i>	
-------------	--

**Return values**

<i>None</i>	
-------------	--

**3.1.2.4 MemManage\_Handler()**

```
void MemManage_Handler (
```

```
void )
```

This function handles Memory Manage exception.

**Parameters**

None	
------	--

**Return values**

None	
------	--

**3.1.2.5 NMI\_Handler()**

```
void NMI_Handler (  
    void )
```

This function handles NMI exception.

**Parameters**

None	
------	--

**Return values**

None	
------	--

**3.1.2.6 PendSV\_Handler()**

```
void PendSV_Handler (  
    void )
```

This function handles PendSVC exception.

**Parameters**

None	
------	--

**Return values**

None	
------	--

### 3.1.2.7 SVC\_Handler()

```
void SVC_Handler (
    void )
```

This function handles SVCcall exception.

#### Parameters

None	
------	--

#### Return values

None	
------	--

### 3.1.2.8 SysTick\_Handler()

```
void SysTick_Handler (
    void )
```

This function handles SysTick Handler.

#### Parameters

None	
------	--

#### Return values

None	
------	--

### 3.1.2.9 UsageFault\_Handler()

```
void UsageFault_Handler (
    void )
```

This function handles Usage Fault exception.

#### Parameters

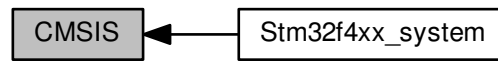
None	
------	--

#### Return values

None	
------	--

## 3.2 CMSIS

Collaboration diagram for CMSIS:



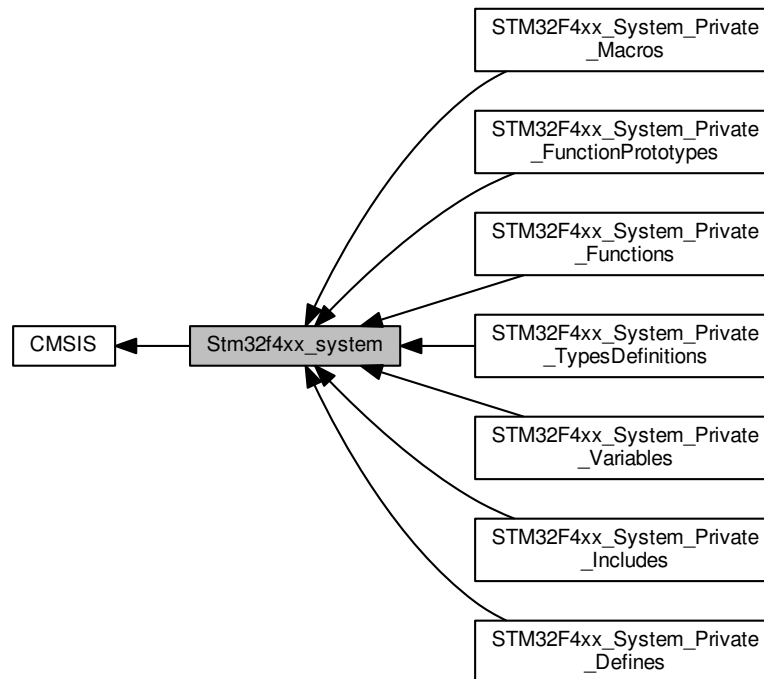
### Modules

- [Stm32f4xx\\_system](#)

### 3.2.1 Detailed Description

### 3.3 Stm32f4xx\_system

Collaboration diagram for Stm32f4xx\_system:



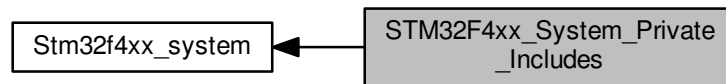
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#### 3.3.1 Detailed Description

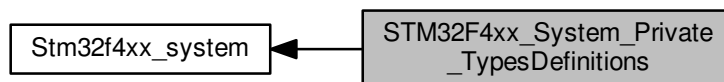
### 3.4 STM32F4xx\_System\_Private\_Includes

Collaboration diagram for STM32F4xx\_System\_Private\_Includes:



### 3.5 STM32F4xx\_System\_Private\_TypesDefinitions

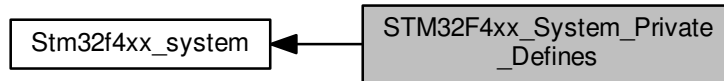
Collaboration diagram for STM32F4xx\_System\_Private\_TypesDefinitions:





## 3.6 STM32F4xx\_System\_Private\_Defines

Collaboration diagram for STM32F4xx\_System\_Private\_Defines:



### Macros

- #define **VECT\_TAB\_OFFSET** 0x00
- #define **PLL\_M** 16 /\* 25 \*/
- #define **PLL\_N** 336
- #define **PLL\_P** 2
- #define **PLL\_Q** 7

### 3.6.1 Detailed Description

### 3.6.2 Macro Definition Documentation

#### 3.6.2.1 VECT\_TAB\_OFFSET

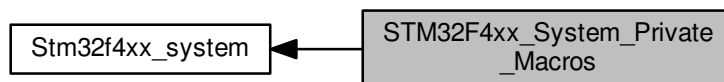
```
#define VECT_TAB_OFFSET 0x00
```

< Uncomment the following line if you need to use external SRAM mounted on STM324xG\_EVAL/STM324x7I\_EVAL boards as data memory

< Uncomment the following line if you need to relocate your vector Table in Internal SRAM. Vector Table base offset field. This value must be a multiple of 0x200.

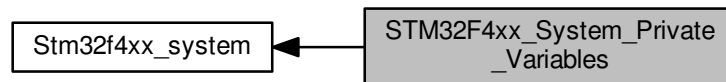
### 3.7 STM32F4xx\_System\_Private\_Macros

Collaboration diagram for STM32F4xx\_System\_Private\_Macros:



## 3.8 STM32F4xx\_System\_Private\_Variables

Collaboration diagram for STM32F4xx\_System\_Private\_Variables:



### Variables

- `uint32_t SystemCoreClock` = 168000000
- `__I uint8_t AHBPrescTable` [16]

### 3.8.1 Detailed Description

### 3.8.2 Variable Documentation

#### 3.8.2.1 AHBPrescTable

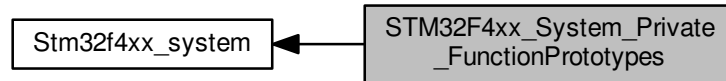
```
__I uint8_t AHBPrescTable[16]
```

**Initial value:**

```
=  
{ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 2, 3, 4, 6, 7, 8, 9 }
```

### 3.9 STM32F4xx\_System\_Private\_FunctionPrototypes

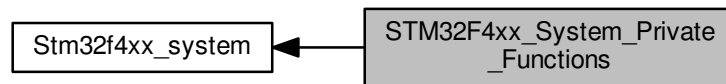
Collaboration diagram for STM32F4xx\_System\_Private\_FunctionPrototypes:



#### 3.9.1 Detailed Description

## 3.10 STM32F4xx\_System\_Private\_Functions

Collaboration diagram for STM32F4xx\_System\_Private\_Functions:



### Functions

- void [SystemInit](#) (void)  
*Setup the microcontroller system Initialize the Embedded Flash Interface, the PLL and update the SystemFrequency variable.*
- void [SystemCoreClockUpdate](#) (void)  
*Update SystemCoreClock variable according to Clock Register Values. The SystemCoreClock variable contains the core clock (HCLK), it can be used by the user application to setup the SysTick timer or configure other parameters.*

#### 3.10.1 Detailed Description

#### 3.10.2 Function Documentation

##### 3.10.2.1 SystemCoreClockUpdate()

```
void SystemCoreClockUpdate (
    void )
```

Update SystemCoreClock variable according to Clock Register Values. The SystemCoreClock variable contains the core clock (HCLK), it can be used by the user application to setup the SysTick timer or configure other parameters.

#### Note

Each time the core clock (HCLK) changes, this function must be called to update SystemCoreClock variable value. Otherwise, any configuration based on this variable will be incorrect.

- The system frequency computed by this function is not the real frequency in the chip. It is calculated based on the predefined constant and the selected clock source:

- If SYSCLK source is HSI, SystemCoreClock will contain the HSI\_VALUE(\*)
- If SYSCLK source is HSE, SystemCoreClock will contain the HSE\_VALUE(\*\*)
- If SYSCLK source is PLL, SystemCoreClock will contain the HSE\_VALUE(\*\*) or HSI\_VALUE(\*) multiplied/divided by the PLL factors.

(\*) HSI\_VALUE is a constant defined in stm32f4xx.h file (default value 16 MHz) but the real value may vary depending on the variations in voltage and temperature.

(\*\*) HSE\_VALUE is a constant defined in stm32f4xx.h file (default value 25 MHz), user has to ensure that HSE\_VALUE is same as the real frequency of the crystal used. Otherwise, this function may have wrong result.

- The result of this function could be not correct when using fractional value for HSE crystal.

**Parameters**

<i>None</i>	
-------------	--

**Return values**

<i>None</i>	
-------------	--

**3.10.2.2 SystemInit()**

```
void SystemInit (
    void )
```

Setup the microcontroller system Initialize the Embedded Flash Interface, the PLL and update the SystemFrequency variable.

**Parameters**

<i>None</i>	
-------------	--

**Return values**

<i>None</i>	
-------------	--

## Chapter 4

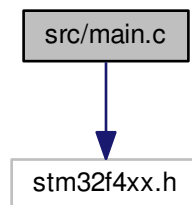
# File Documentation

### 4.1 src/main.c File Reference

main program

```
#include "stm32f4xx.h"
```

Include dependency graph for main.c:



#### Functions

- int `function` (int a, int b)
- int `main` (void)

#### 4.1.1 Detailed Description

main program

#### Author

Daniel Tar, Zoltar Resi, Andras Lauko

**Version**

V0.1

**Date**

04-03-2019

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## 4.1.2 Function Documentation

### 4.1.2.1 function()

```
int function (  
    int a,  
    int b )
```

**Parameters**

<i>a</i>	- interger 1
<i>b</i>	- interger 2

**Returns**

the sum of intergers



## 4.1.2.2 main()

```
int main (
    void )
```

```
=====
```

Abstract: main program

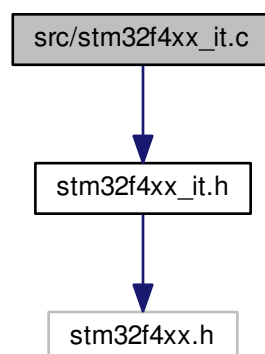
IMPORTANT NOTE! The symbol VECT\_TAB\_SRAM needs to be defined when building the project if code has been located to RAM and interrupts are used. Otherwise the interrupt table located in flash will be used. See also the <system\_\*.c> file and how the [SystemInit\(\)](#) function updates SCB->VTOR register. E.g. SCB->VTOR = 0x20000000;

## 4.2 src/stm32f4xx\_it.c File Reference

Main Interrupt Service Routines. This file provides template for all exceptions handler and peripherals interrupt service routine.

```
#include "stm32f4xx_it.h"
```

Include dependency graph for stm32f4xx\_it.c:



### Functions

- void [NMI\\_Handler](#) (void)  
*This function handles NMI exception.*
- void [HardFault\\_Handler](#) (void)  
*This function handles Hard Fault exception.*
- void [MemManage\\_Handler](#) (void)  
*This function handles Memory Manage exception.*
- void [BusFault\\_Handler](#) (void)  
*This function handles Bus Fault exception.*
- void [UsageFault\\_Handler](#) (void)

*This function handles Usage Fault exception.*

- void [SVC\\_Handler](#) (void)

*This function handles SVCcall exception.*

- void [DebugMon\\_Handler](#) (void)

*This function handles Debug Monitor exception.*

- void [PendSV\\_Handler](#) (void)

*This function handles PendSVC exception.*

- void [SysTick\\_Handler](#) (void)

*This function handles SysTick Handler.*

### 4.2.1 Detailed Description

Main Interrupt Service Routines. This file provides template for all exceptions handler and peripherals interrupt service routine.

#### Author

MCD Application Team

#### Version

V1.1.0

#### Date

18-January-2013

#### Attention

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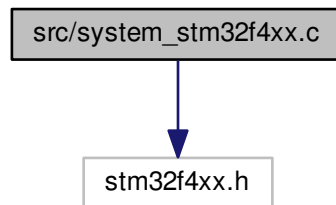
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## 4.3 src/system\_stm32f4xx.c File Reference

CMSIS Cortex-M4 Device Peripheral Access Layer System Source File. This file contains the system clock configuration for STM32F4xx devices, and is generated by the clock configuration tool stm32f4xx\_Clock\_Configuration\_V1.1.0.xls.

```
#include "stm32f4xx.h"
```

Include dependency graph for system\_stm32f4xx.c:



### Macros

- #define `VECT_TAB_OFFSET` 0x00
- #define `PLL_M` 16 /\* 25 \*/
- #define `PLL_N` 336
- #define `PLL_P` 2
- #define `PLL_Q` 7

### Functions

- void `SystemInit` (void)  
*Setup the microcontroller system Initialize the Embedded Flash Interface, the PLL and update the SystemFrequency variable.*
- void `SystemCoreClockUpdate` (void)  
*Update SystemCoreClock variable according to Clock Register Values. The SystemCoreClock variable contains the core clock (HCLK), it can be used by the user application to setup the SysTick timer or configure other parameters.*

### Variables

- uint32\_t `SystemCoreClock` = 168000000
- \_\_I uint8\_t `AHBPrescTable` [16]

### 4.3.1 Detailed Description

CMSIS Cortex-M4 Device Peripheral Access Layer System Source File. This file contains the system clock configuration for STM32F4xx devices, and is generated by the clock configuration tool stm32f4xx\_Clock\_Configuration\_V1.1.0.xls.

#### Author

MCD Application Team

#### Version

V1.1.0

#### Date

18-January-2013

1. This file provides two functions and one global variable to be called from user application:
  - [SystemInit\(\)](#): Setups the system clock (System clock source, PLL Multiplier and Divider factors, AHB/APBx prescalers and Flash settings), depending on the configuration made in the clock xls tool. This function is called at startup just after reset and before branch to main program. This call is made inside the "startup\_stm32f4xx.s" file.
  - SystemCoreClock variable: Contains the core clock (HCLK), it can be used by the user application to setup the SysTick timer or configure other parameters.
  - [SystemCoreClockUpdate\(\)](#): Updates the variable SystemCoreClock and must be called whenever the core clock is changed during program execution.
2. After each device reset the HSI (16 MHz) is used as system clock source. Then [SystemInit\(\)](#) function is called, in "startup\_stm32f4xx.s" file, to configure the system clock before to branch to main program.
3. If the system clock source selected by user fails to startup, the [SystemInit\(\)](#) function will do nothing and HSI still used as system clock source. User can add some code to deal with this issue inside the SetSysClock() function.
4. The default value of HSE crystal is set to 25MHz, refer to "HSE\_VALUE" define in "stm32f4xx.h" file. When HSE is used as system clock source, directly or through PLL, and you are using different crystal you have to adapt the HSE value to your own configuration.

### 5. This file configures the system clock as follows:

=====

Supported STM32F40xx/41xx/427x/437x devices

System Clock source | PLL (HSI) // (HSE)

SYSCLK(Hz) | 168000000

HCLK(Hz) | 168000000

AHB Prescaler | 1

APB1 Prescaler | 4

APB2 Prescaler | 2

HSI Frequency (Hz) // HSE Frequency(Hz) | 16000000 // 25000000

PLL\_M | 16 // 25

PLL\_N | 336

PLL\_P | 2

PLL\_Q | 7

PLLI2S\_N | NA

PLLI2S\_R | NA

I2S input clock | NA

VDD(V) | 3.3

Main regulator output voltage | Scale1 mode

Flash Latency(WS) | 5

Prefetch Buffer | ON

Instruction cache | ON

Data cache | ON

Require 48MHz for USB OTG FS, | Disabled

SDIO and RNG clock |

=====

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