



STM32Cube F7 firmware package

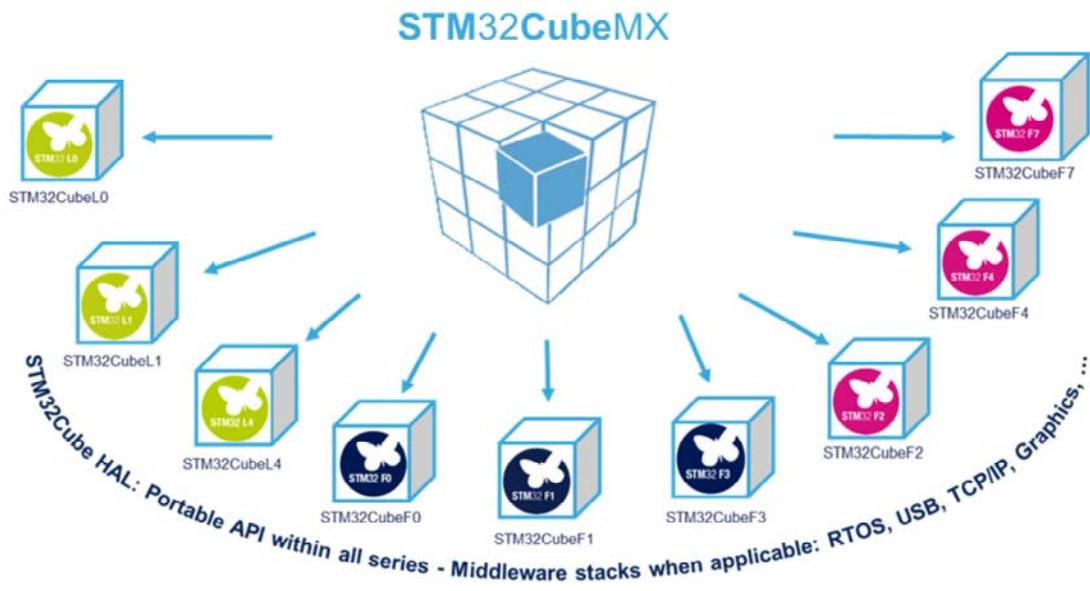
Revision 1.0



Hello, and welcome to this presentation of the STM32Cube firmware drivers including the hardware abstraction layer drivers.

STM32CubeF7 FW- introduction

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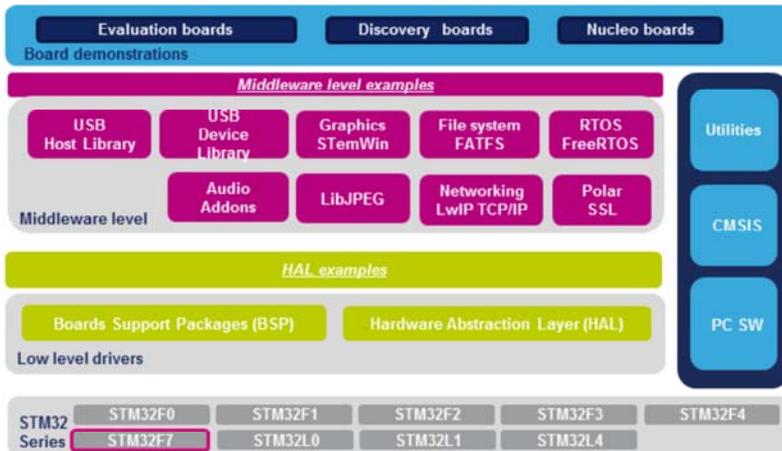


While this presentation is specifically about the STM32F7, the STM32Cube comprehensive software tool offers:

- STM32CubeMX graphical software configuration tool used to generate initialization code based on user choices
- A complete embedded software package for each STM32 series (such as our STM32CubeF7) with:
 - Hardware Abstraction Layer (HAL) and low-layer (LL) APIs
 - A consistent set of middleware components: RTOS, USB, TCP/IP, graphics...

STM32CubeF7 FW- overview

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Application benefits

- Single package
- Compatible with all STM32 series
- Source code with open-source BSD license



The embedded software package is a layered approach:

- Low level: Hardware Abstraction Layer (HAL), with libraries and examples
- Middleware level: Set of libraries with examples including RTOS, USB, TCP/IP ...
- Application level: Demonstrations for use on ST boards

Embedded software is delivered by series (STM32F7, STM32F4, ...) and common modules are covered with fully portable APIs.

Embedded software initialization code can be generated

through STM32CubeMX allowing the customer to remain focused on the core application code.

STM32CubeF7 FW- key features

Layer	Category	Provided embedded software	Provided examples
HAL	Analog	Analog/Digital conversion, ...	~345 examples on ST evaluation boards* !
	Timers	Timers, RTC, Watchdogs, ...	
	Graphic	LTDC, DMA2D, DSI, JPEG...	
	Cryptography	CRC, AES, 3DES, Hash and Random Number generator, ...	
	Connectivity	I2C, USART, SPI, I2S, SDMMC, CAN, CEC, USB, MDIO, Ethernet, ...	
	Interface	External memory, display, camera, audio,...	
Middleware	RTOS	FreeRTOS open source RTOS, with CMSIS-RTOS wrapper	~162 applications on ST evaluation boards* !
	USB	USB Host and Device cores Host classes: HID, MSC, CDC, Audio, and MTP Device classes: HID, MSC, CDC, Audio, MTP, DFU, and CCID	
	TCP/IP	LwIP open-source stack with DHCP, DNS, ICMP, TCP, UDP, TFTP, HTTP, SSL/TLS (PolarSSL)...	
	File System	FatFS open-source file system with enhanced mechanisms including NAND handling	
	Graphics	STemWin professional stack from SEGGER and available in binary form	
Application	Demonstration	Full demonstrations for ST boards	~6 demonstration projects for ST boards!



*: STM32 F7 Series

The STM32Cube package is a complete embedded software offer that ensures maximum portability between all STM32 series through 3 software layers: HAL, Middleware and Applications.

The HAL Layer is providing an API for the STM32 embedded peripherals from analog to connectivity, and cryptography to graphical categories.

A rich set of examples is available to help developers start using the HAL and the product.

The middleware layer contains a full USB Host and Device stack supporting many classes as shown.

STemWin, a professional graphical stack solution, is available in binary format and based on the emWin solution from ST's partner SEGGER, as well as LibJPEG, an open-source implementation on STM32 for JPEG images encoding and decoding.

There is also a CMSIS-RTOS implementation with FreeRTOS, an open-source solution, and a FAT ["FAT"] file system based on an open-source FatFS solution. The TCP/IP stack is based on an open-source LwIP solution and the SSL/TLS secure layer is based on open-source PolarSSL ["Polar" "S" "S" "L"].

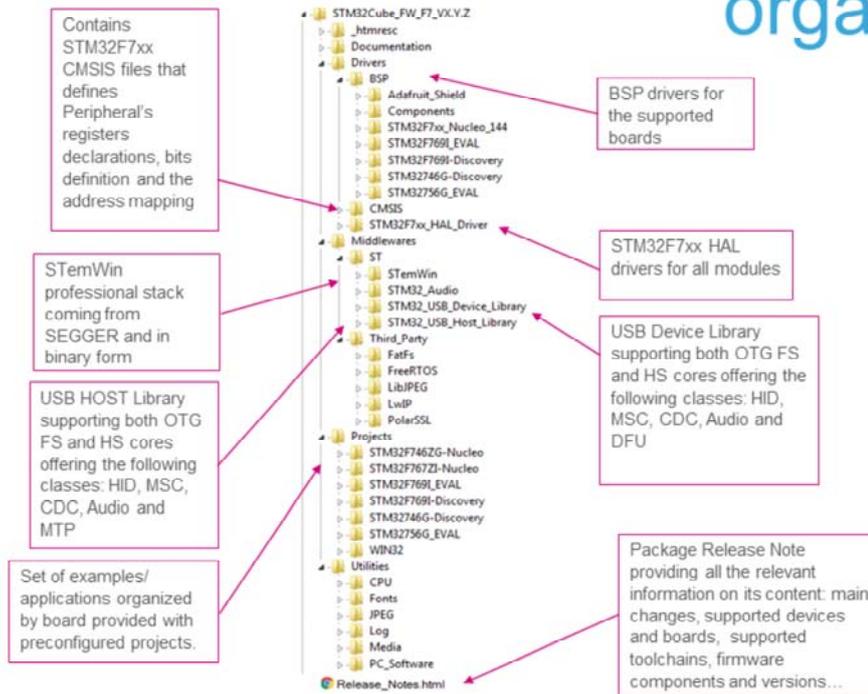
Advanced demos putting together all the embedded software components are also provided in the STM32CubeF7 package.

There is a complete set of documents including release notes, readme files or associated user manual.

The packages come with free and user-friendly license terms.

STM32CubeF7 FW- package organization

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Like all STM32Cube firmware packages, the STM32CubeF7 firmware solution comes in a single ZIP file having the structure shown in this slide.

It's organized in several main folders:

- The Documentation folder contains the STM32Cube F7 getting starting document, helping developers to quickly become familiar with the firmware package and its contents.
- The Drivers folder contains all the ST-developed drivers.
 - CMSIS contains the files defining STM32F7xx supported devices, peripheral registers declarations, their associated bit definitions and address mapping.
 - STM32F7xx_HAL_Driver folder contains the drivers for all the peripherals.

- The drivers for all supported boards are found in the BSP folder.
- Middleware contains the supported middleware libraries and stacks provided either by ST or third parties.
- The Projects folder contains templates, examples, applications and demonstrations for supported boards and with preconfigured projects and specific readme files that provides all necessary information for a quick and easy execution.
- The Utilities folder contains miscellaneous utility drivers that are used by the provided projects.

The Release Note lists the contents of all the packages, tracks the main changes and provides information on the supported devices and boards and any known limitations.

STM32CubeF7 FW- supported devices & boards

Macro defined in stm32f7xx.h	STM32F7 Series devices
STM32F756xx	STM32F756VG, STM32F756ZG, STM32F756IG, STM32F756BG, STM32F756NG
STM32F746xx	STM32F746VE, STM32F746VG, STM32F746ZE, STM32F746ZG, STM32F746IE, STM32F746IG, STM32F746BE, STM32F746BG, STM32F746NE, STM32F746NG
STM32F745xx	STM32F745VE, STM32F745VG, STM32F745ZG, STM32F745ZE, STM32F745IE, STM32F745IG
STM32F765xx	STM32F765BI, STM32F765BG, STM32F765NI, STM32F765NG, STM32F765II, STM32F765IG, STM32F765ZI, STM32F765ZG, STM32F765VI, STM32F765VG
STM32F767xx	STM32F767BG, STM32F767BI, STM32F767IG, STM32F767II, STM32F767NG, STM32F767NI, STM32F767VG, STM32F767VI, STM32F767ZG, STM32F767ZI, STM32F768AI
STM32F769xx	STM32F769AG, STM32F769AI, STM32F769BG, STM32F769BI, STM32F769IG, STM32F769II, STM32F769NG, STM32F769NI
STM32F777xx	STM32F777BI, STM32F777II, STM32F777NI, STM32F777VI, STM32F777ZI, STM32F778AI
STM32F779xx	STM32F779AI, STM32F779BI, STM32F779II, STM32F779NI

Board	STM32F7 devices supported
STM327x6G_EVAL ⁽¹⁾	STM32F746xx and STM32F756xx
STM32F746G-Discovery	STM32F746NG
STM32F746ZG-Nucleo	STM32F746ZG
STM32F7x9I_EVAL ⁽²⁾	STM32F779xx and STM32F769xx
STM32F769I-Discovery	STM32F769NI
STM32F767ZI-Nucleo	STM32F767ZI

1. STM327x6G_EVAL refers to STM32746G_EVAL and STM32756G_EVAL evaluation boards.

2. STM32F7x9I_EVAL refers to STM32F769I_EVAL and STM32F779I_EVAL evaluation boards



Through its generic architecture, STM32Cube offers a highly portable hardware abstraction layer (HAL). It allows developers to implement application functions by building on layers, such as the middleware layer, without requiring any in-depth knowledge of the MCU. This improves the re-usability of the library code and guarantees an easy portability to other devices. In addition, thanks to its layered architecture, STM32CubeF7 offers full support of all STM32F7 microcontrollers and the development boards designed by ST. The user has only to define the correct macro in the stm32f7xx.h file and get in touch with BSP drivers and example/application projects specific to each board provided within the firmware package.

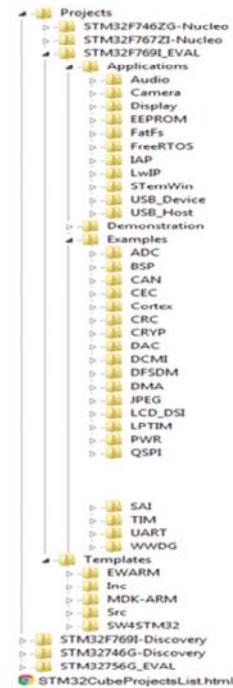
STM32CubeF7 FW- examples overview

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- For each board, a set of examples is provided with preconfigured projects for EWARM, MDK-ARM and SW4STM32 toolchains.
- This figure shows the projects structure for the STM32F769I-EVAL board, which is identical for other boards.

The examples are classified depending on the STM32Cube level they apply to, and are named as follows:

- Examples in Level 0 are called **Examples**, and use HAL drivers without any middleware component
- Examples in Level 1 are called **Applications**, and provide typical use cases of each middleware component
- Examples in Level 2 are called **Demonstration**, and implement all the HAL, BSP and middleware components
- The **Template** project is provided to build quickly any firmware application for all supported boards
- The **STM32CubeProjectList** file allows quick access and search for a given example within the firmware package
- All examples have the same structure,
 - **\Inc** folder contains all header files
 - **\Src** folder for the source code
 - **EWARM**, **MDK-ARM** and **SW4STM32** contain the preconfigured project for each toolchain.
 - **readme.txt** describes example behavior and the environment needed to make it work.



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The right side figure shows the projects structure for STM32F769I-EVAL board, which is identical for all the other boards.

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- **\Src** folder contains the sources code.
- **\EWARM**, **\MDK-ARM** and **\SW4STM32** folders contain the preconfigured project for each toolchain.

A readme text file describes the example behavior and environment needed to make it work.

STM32CubeF7 FW- documentation

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Product Specifications	
Description	
 DB2601 : STM32Cube embedded software for STM32F7 series including HAL drivers, USB, Ethernet, File System, RTOS and Graphics	STM32 F7 Series specific doc
Application Notes	
Description	
 AN4731 : STM32Cube firmware examples for STM32F7 Series	STM32 F7 Series specific doc its content is similar to the STM32CubeProjectList file available within the STM32CubeF7 firmware Package
User Manuals	
Description	
 UM1905 : Description of STM32F7xx HAL drivers	STM32 F7 Series specific doc
 UM1721 : Developing Applications on STM32Cube with FatFs	STM32 Generic doc
 UM1722 : Developing Applications on STM32Cube with RTOS	STM32 Generic doc
 UM1713 : Developing applications on STM32Cube with LwIP TCP/IP stack	STM32 Generic doc
 UM1891 : Getting started with STM32CubeF7 firmware package for STM32F7 Series	STM32 F7 Series specific doc Also available within the STM32CubeF7 firmware Package → Its main entry point
 UM1709 : STM32Cube Ethernet IAP example	STM32 Generic doc
 UM1723 : STM32Cube PolarSSL example	STM32 Generic doc
 UM1734 : STM32Cube USB device library	STM32 Generic doc
 UM1720 : STM32Cube USB host library	STM32 Generic doc
 UM1906 : STM32CubeF7 demonstration platform	STM32 F7 Series specific doc



Rich documentation is associated to the STM32Cube F7 FW package. Some documents are generic to all STM32 series and others are specific to the STM32F7 series. The Getting started with the STM32CubeF7 Firmware Package user manual is the document that you need to read first when you start using the STM32Cube Firmware Package.

STM32CubeF7 FW- reference

Exhaustive documentation list and STM32CubeF7 Firmware package can be accessed from ST's web site at www.st.com/stm32cubefw

Home > Embedded Software > MCU Embedded Software > STM32 Embedded Software > STM32Cube Embedded Software

STM32Cube Embedded Software

With STM32Cube, STMicroelectronics provides a comprehensive software tool, significantly reducing development efforts, time and cost.

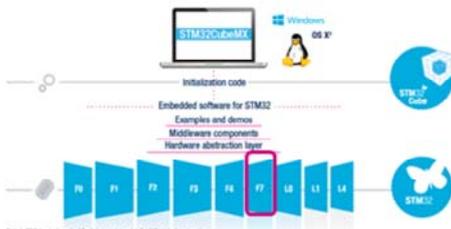
STM32Cube consists of (usable together or independently):

The STM32CubeMX, featuring

- Configuration C code generation for pin multiplexing, clock tree, peripherals and middleware setup with graphical wizards
- Generation of IDE ready projects for an integrated development environment tool chains
- Power consumption calculation for a user-defined application sequence
- Direct import of STM32Cube embedded software libraries from st.com
- Integrated updater to keep STM32CubeMX up-to-date

STM32Cube embedded software libraries, including

- The HAL hardware abstraction layer, enabling portability between different STM32 devices via standardized API calls
- The Low-Layer (LL) APIs, a light-weight, optimized, expert oriented set of APIs designed for both performance and runtime efficiency
- A collection of Middleware components, like RTOS, USB library, file system, TCP/IP stack, Touch sensing library or Graphic Library (depending on the MCU series)



Note 1: STM32 is a trademark of STMicroelectronics, registered in the U.S. and other countries.

STM32Cube Embedded Software					
Total Parts: (14) for STM32Cube Embedded Software Matching Parts: (14)					
Part Number	Marketing Status	Supplier	Supported Devices	Software Type	Software
STM32CubeF4	Active	ST	STM32F4	Firmware	1.12.0
STM32CubeF2	Active	ST	STM32F2	Firmware	1.3.0
Patch_CubeFW_F2	Active	ST	STM32F2	Firmware	1.3.1
Patch_CubeFW_F4	Active	ST	STM32F4	Firmware	1.10.0
STM32CubeL0	Active	ST	STM32L0	Firmware	1.7.0
Patch_CubeFW_F0	Active	ST	STM32F0	Firmware	1.2.1
STM32CubeF3	Active	ST	STM32F3	Firmware	1.5.0
Patch_CubeFW_L4	Active	ST	STM32L4	Firmware	1.5.1
STM32CubeL4	Active	ST	STM32L4	Firmware	1.5.0
STM32CubeF1	Active	ST	STM32F1	Firmware	1.4.0
STM32CubeF7	Active	ST	STM32F7	Firmware	1.4.0
Patch_CubeFW_L0	Active	ST	STM32L0	Firmware	1.1.2

The STM32Cube F7 firmware can be downloaded from ST website at www.st.com/stm32cubefw
Thank you.