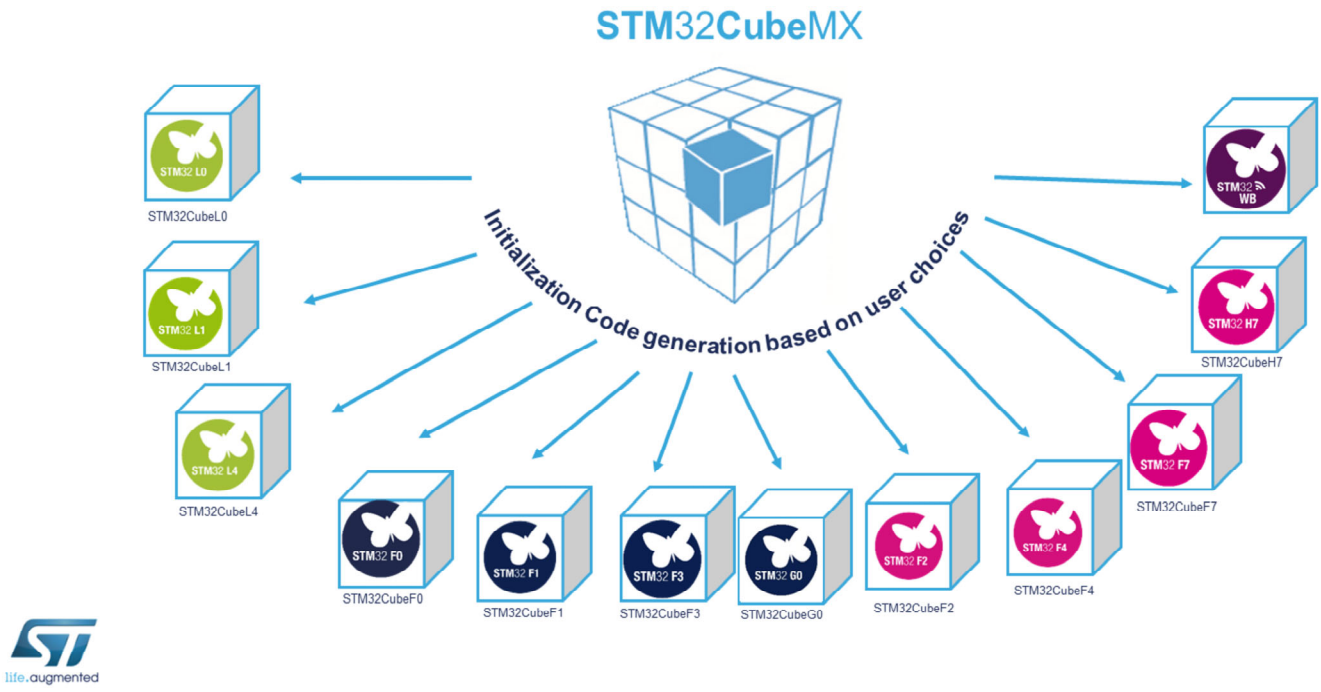
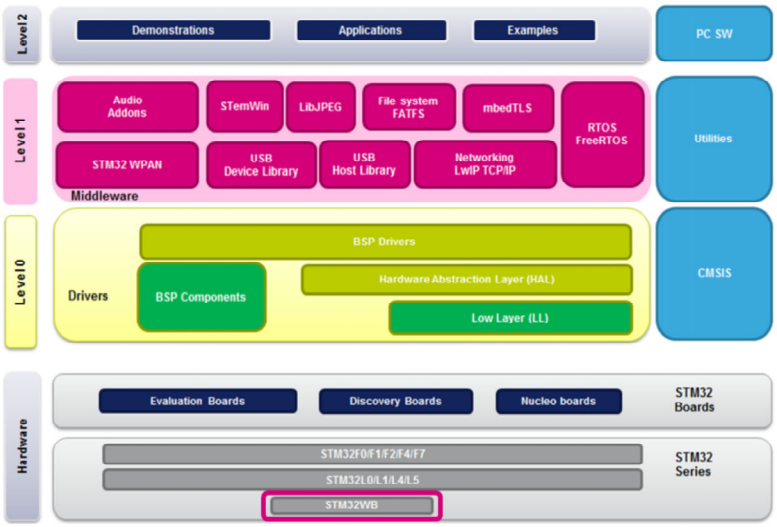
Hello, and welcome to this presentation of the STM32Cube firmware drivers including the hardware abstraction layer drivers.



While this presentation is specifically about the STM32WB, 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 STM32CubeWB) with:
  - Hardware Abstraction Layer (HAL) and low-layer (LL) APIs
  - A consistent set of middleware components: RTOS, USB, TCP/IP, graphics…

Overview



Application benefits

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

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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 (STM32WB, STM32G0, STM32H7, …) 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.

Key features

Layer	Category	Provided embedded software	Provided examples
HAL	Analog	Analog/Digital conversion, …	~88 examples on STM32WB boards !
	Timers	Timers, RTC, Watchdogs, …	
	Cryptography	CRC, AES, PKA and Random Number generator, …	
	Connectivity	I2C, USART, SPI, USB, BTH	
	Interface	External memory, LCD, TSC, Serial audio	
Middleware	RTOS	FreeRTOS open source RTOS, with CMSIS-RTOS wrapper	~39 applications on STM32WB boards !
	USB	USB Host and Device cores Device classes: HID, MSC, CDC, Audio, MTP, DFU, and CCID	
	TSC	Touch Sensing controller	
	WPAN	BLE stack, OpenThread stack, BLE & Thread static concurrent mode	
	File System	FatFS open-source file system with enhanced mechanisms including NAND handling	
Application	Demonstration	Full demonstrations for ST boards: BT SIG GATT-based application using ST BlueMS application on IOS/Android smartphone	~22 demonstration projects for ST boards!

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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 Device stack supporting many classes as shown.

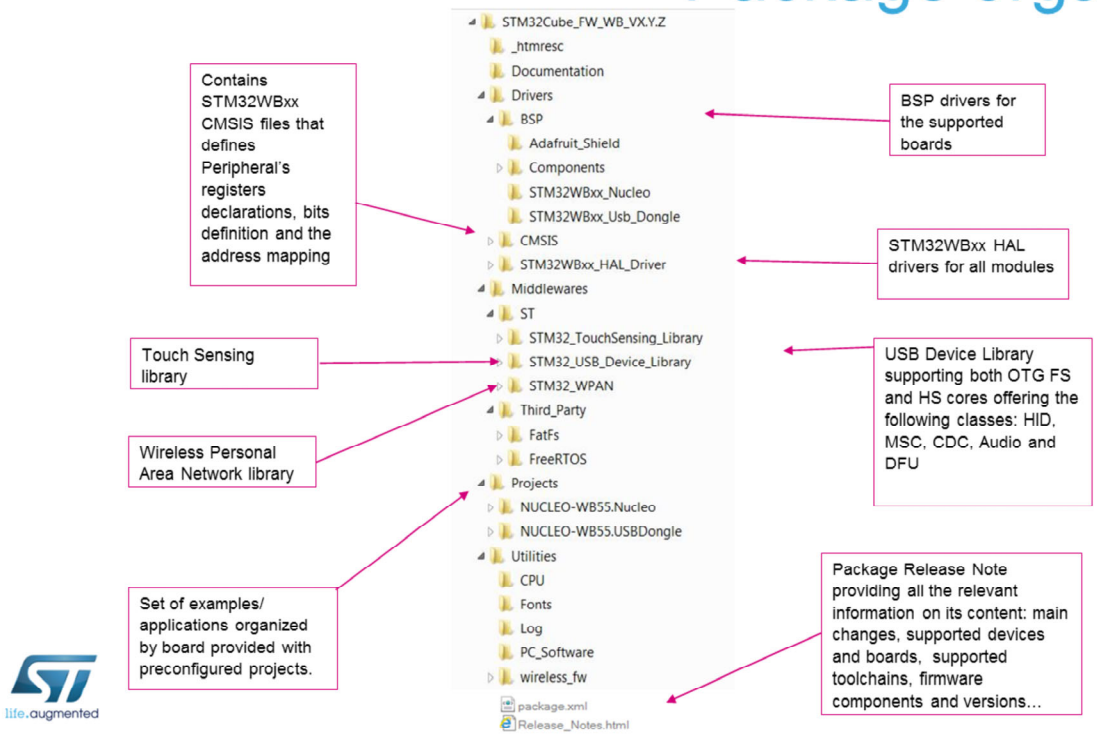
STemWin, a professional graphical stack solution, is available in binary format and based on the emWin solution from ST's partner SEGGER, as well as LibJPEG, an open-source implementation on STM32 for JPEG images encoding and decoding.
There is also a CMSIS-RTOS implementation with

FreeRTOS, an open-source solution, and a FAT 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.
The Wireless stack is a ST solution for Bluetooth or Thread connectivity. STM32_WPAN middleware contains the wrapper used to control the BLE and the Thread stacks. It also supports the BLE & Thread static concurrent mode.

Advanced demos putting together all the embedded software components are also provided in the STM32CubeWB 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.

Package organization



Like all STM32Cube firmware packages, the STM32CubeWB 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 WB 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 STM32WBxx supported devices, peripheral registers declarations, their associated bit definitions and address mapping.
    - STM32WBxx_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.

Supported devices & boards

Macro defined in stm32wbxx.h	STM32WB Series devices
STM32WB55xx	STM32WB55VG, STM32WB55CG, STM32WB55RG

Board	Example	Application	Demonstration
STM32WB55 Nucleo pack	88	39	22

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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, STM32CubeWB offers full support of all STM32WB microcontrollers and the development boards designed by ST. The user has only to define the correct macro in the stm32wbxx.h file and get in touch with BSP drivers and example/application projects specific to each board provided within the firmware package.

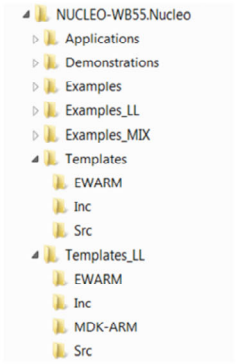
Examples overview

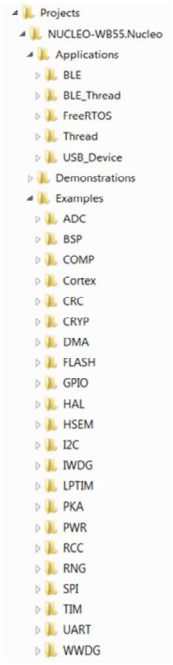
- For each board, a set of examples is provided with preconfigured projects for EWARM, MDK-ARM and SW4STM32 toolchains.
- This figure shows the projects structure for the STM32WB55 NUCLEO board, (order code: P-NUCLEO-WB55) which is identical for other boards.

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.





For each board, a set of examples is provided with preconfigured projects for EWARM, MDK-ARM and SW4STM32 toolchains.

The right side figure shows the projects structure for the STM32WB55 Nucleo board, which is identical for all the other boards.

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The Template project is provided to quickly build any firmware application for all supported boards.

The STM32CubeProjectList file allows a 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 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.

Reference

Exhaustive documentation list and STM32CubeWB Firmware package can be accessed from ST's web site at www.st.com/stm32cubefw

Total Parts: (10) for STM32Cube MCU Packages | Matching Parts : (10)

Part Number	Supplier	Supported Devices	Software Type	Software Version
STM32CubeF0 STM32Cube MCU Package for ST M32F0 series (HAL, Low-Layer Al...	ST	STM32F0	Firmware	1.9.0
STM32CubeF1 STM32Cube MCU Package for ST M32 F1 series (HAL, Low-Layer A...	ST	STM32F1	Firmware	1.4.0
STM32CubeF2 STM32Cube MCU Package for ST M32 F2 series (HAL, Low-Layer A...	ST	STM32F2	Firmware	1.7.0
STM32CubeF3 STM32Cube MCU Package for ST M32 F3 series (HAL, Low-Layer A...	ST	STM32F3	Firmware	1.8.0
STM32CubeF4 STM32Cube MCU Package for ST M32F4 series (HAL, Low-Layer Al...	ST	STM32F4	Firmware	1.18.0
STM32CubeF7 STM32Cube MCU Package for ST M32F7 series (HAL, Low-Layer Al...	ST	STM32F7	Firmware	1.7.0
STM32CubeH7 STM32Cube MCU Package for ST M32H7 series (HAL low level driv...	ST	STM32H7	Firmware	1.1.0
STM32CubeL0 STM32Cube MCU Package for ST M32L0 series (HAL, Low-Layer Al...	ST	STM32L0	Firmware	1.10.0
STM32CubeL1 STM32Cube MCU Package for ST M32 L1 series (HAL, Low-Layer A...	ST	STM32L1	Firmware	1.7.0
STM32CubeL4 STM32Cube MCU Package for ST M32L4 series and STM32L4 Plus ...	ST	STM32L4, STM32L4+	Firmware	1.10.0

The STM32CubeWB firmware can be downloaded from ST website at www.st.com/stm32cubefw
Thank you.