UM2312
User manual

Development checklist for STM32Cube Expansion Packages

Introduction

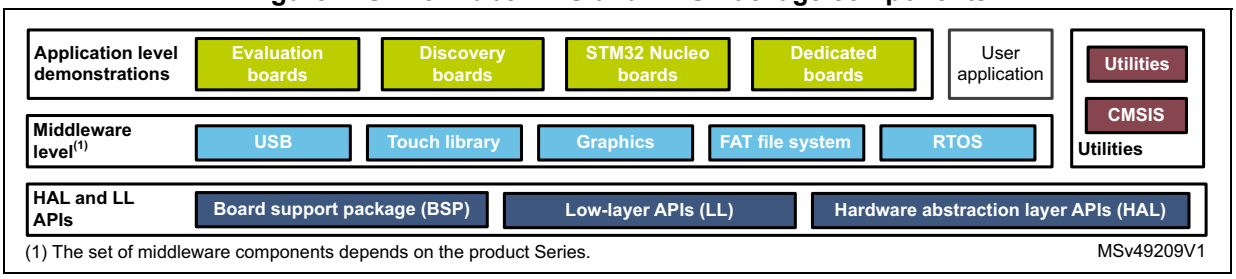
STM32Cube is an STMicroelectronics original initiative to significantly improve designer's productivity by reducing development effort, time and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from the conception to the realization, among which STM32CubeMX, a graphical software configuration tool, STM32CubeIDE, an all-in-one development tool, and STM32CubeProgrammer (STM32CubeProg), a programming tool.
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeL4 for the STM32L4 Series), which include STM32Cube hardware abstraction layer (HAL), STM32Cube low-layer APIs, a consistent set of middleware components, and all embedded software utilities.
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with middleware extensions and applicative layers, and examples.

For a complete description of STM32Cube, refer to *Chapter 3*.

Figure 1. STM32Cube MCU and MPU Package components



(1) The set of middleware components depends on the product Series.

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The proper development of the STM32Cube Expansion Package depends on criteria related to quality, packaging, middleware support, documentation and others.

This document is a checklist describing all criteria together with their level of importance. These must be met to ensure the compliance of the STM32Cube Expansion Package with each STM32Cube MCU and MPU Package and, further, overall coherence with the global STM32Cube offering.

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1 General information

The STM32Cube MCU and MPU Packages and STM32Cube Expansion Packages run on STM32 32-bit microcontrollers, based on the Arm®(a) Cortex®-M processor.

2 References and acronyms

The following document available on *www.st.com* is a reference for the development of STM32Cube Expansion Packages:

1. *Development guidelines for STM32Cube Expansion Packages* (UM2285)

Table 1 presents the definition of acronyms that are relevant for a better understanding of this document.

Table 1. List of acronyms

Term	Definition
API	Application programming interface
BSP	Board support package
CMSIS	Cortex® microcontroller system interface standard
DHCP	Dynamic host configuration protocol
FTP	File transfer protocol
HAL	Hardware abstraction layer
HTTP	Hypertext transfer protocol
HW	Hardware
LL	Low layer
SW	Software
TCP/IP	Transmission control protocol / Internet protocol
TLS/SSL	Transport layer security / secure sockets layer

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3 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to significantly improve designer's productivity by reducing development effort, time and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from the conception to the realization, among which:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an all-in-one development tool with IP configuration, code generation, code compilation, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command line versions
  - STM32CubeMonitor-Power (STM32CubeMonPwr), a monitoring tool to measure and help in the optimization of the power consumption of the MCU
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeL4 for the STM32L4 Series), which include:
  - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
  - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over the HW
  - A consistent set of middleware components such as FAT file system, RTOS, USB Host and Device, TCP/IP, Touch library, and Graphics
  - All embedded software utilities with full sets of peripheral and applicative examples
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards

4 STM32Cube Expansion quality criteria

Table 2. Quality criteria

ID	Item description	Importance	Comment
C.Q1	BSP drivers, Middleware and Projects developed within the STM32Cube Expansion Package (add-on to the STM32Cube MCU Package) shall meet the minimum requirements below: – Ensure compilation with all supported toolchains (EWARM, MDK-ARM and SW4STM32) on Windows® and Linux® platforms, without errors neither warnings. *Note: warnings are accepted only in SW components not owned by the developer of the Expansion Package.* – Perform functional tests with evidence reports with no known bugs left. *Note: minor bugs are accepted provided they are documented in the component release notes.*	Recommended	-
C.Q2	BSP drivers and middleware developed within the STM32Cube Expansion Package (add-ons with respect to the STM32Cube MCU Package) shall be compliant with MISRA C® coding standard and checked with static code analysis, with evidence reports. *Note: any deviation shall be precisely justified.*	Recommended	MISRA C® 2004
		Recommended	MISRA C® 2012

5 STM32Cube Expansion packaging criteria

Table 3. Packaging criteria

ID	Item description	Importance	Comment
C.P1	The Expansion Package shall have the same repository hierarchy as the STM32Cube MCU Package.	Mandatory	Refer to chapter 4 *Packaging requirements* of user manual *STM32Cube Expansion Package development guidelines* (UM2285).
C.P2	Native software components provided within STM32Cube MCU Package shall not be modified. For instance, no release note shall be deleted, no unused file shall be deleted, and no source code shall be modified.	Mandatory	-
C.P3	A global release notes shall be provided for the Expansion Package containing these sections: – Main changes: List the main changes with respect to the previous release. – Content: Lists all the software components developed for the STM32Cube Expansion Package and those reused from STM32Cube MCU Package. – Development toolchains and compilers: Lists the supported toolchains and their versions. – Supported Devices and hardware boards: Lists the supported STM32 devices and the boards (together with their versions) used to run the examples. – Known limitations: Lists the main known limitations.	Mandatory	-
C.P4	A release note shall be provided for each software component.	Mandatory	-
C.P5	Application specific files and added software components shall be versionned and dated in the file header, the release note or both.	Mandatory	-
C.P6	Application specific files and added software components shall have a license information clearly written in the source file header and release note.	Mandatory	-
C.P7	New BSP drivers shall be added under **\Drivers\<Board-Name>**, if a new hardware component driver is needed, it shall be added under **\Drivers\BSP\Components**.	Mandatory	-

Table 3. Packaging criteria (continued)

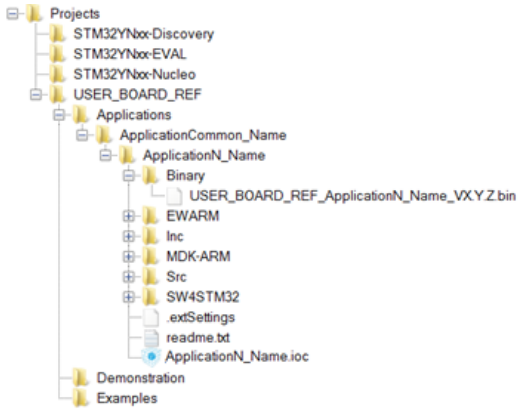
ID	Item description	Importance	Comment
C.P8	Any new middleware component (not part of the STM32Cube MCU Package) shall be located under **\Middlewares\Third_Party**.	Mandatory	-
C.P9	User examples shall be added under **\Projects\<Board-Name>** and classified as follows: – Examples: using only HAL and BSP – Applications: using middleware – Demonstration: using HAL, BSP and middleware	Mandatory	-
C.P10	User examples shall be organized as indicated: – **\Inc** for header files – **\Src** for source files – **\<Toolchain-Name>** toolchain pre-configured project, all temporary files have to be deleted – **ApplicationN_Name.ioc**: STM32CubeMX project file – **.extSettings**: STM32CubeMX project additional settings file (optional, if needed) – **\Binary** containing binary file, using this naming format "USER_BOARD_REF_ApplicationN_Name_VX.Y.Z.bin"  - **readme.txt** provided at the root containing at least: the example description, hardware and Software environment, how to use instructions	Mandatory	-
C.P11	User examples shall be generated by means of STM32CubeMX.	Mandatory	-
C.P12	*.ioc, .mxproject and .extSettings (optional, if available) files shall be provided at the same location as the readme.txt in the example folder	Mandatory	-
C.P13	ioc file shall apply this naming convention: ApplicationN_Name.ioc	Mandatory	-
C.P14	All media files (i.e. images, audio, videos…) shall be located under \Utilities\Media.	Mandatory	If not used, the \Media folder can be deleted.
C.P15	A readme file explaining the copyright/license of each used media file, shall be added	Mandatory	-

Table 3. Packaging criteria (continued)

ID	Item description	Importance	Comment
C.P16	All PC software tools (i.e. any application running on a PC compatible platform) shall be located under **\Utilities\PC_Software**	Mandatory	If not used, the \PC_Software folder can be deleted.
C.P17	A readme file explaining the tool(s) license and how to use it, shall be added	Mandatory	-
C.P18	For each example, a pre-configured project shall be provided for EWARM, MDK-ARM and SW4STM32 toolchains.	Mandatory	-
C.P19	The top folder of the uncompressed archive shall contain STM32CubeExpansion_<Feature>_<STM32Series>_VX.Y.Z, where: – <Feature> is the Application Domain – <STM32Series> is OPTIONAL and could be the STM32 Series where the Expansion is known to run, otherwise this field is not used – V<X.Y.Z> is the release version: - X: major changes with APIs compatibility break - Y: minor changes - Z: patch	Recommended	Example: STM32CubeExpansion_LRWAN_V1.0.0
C.P20	Each library delivered in binary or object format shall be packaged as follows: – A header file to be provided to export the library interface API to end application – A release notes to be added – The Library to be provided in object format for all supported compilers (IAR, Keil and GCC). In case the library object is compiler dependent, the supported compiler must clearly be indicated in the object final name. As an example for illustration only, LibraryNameV_CMx_C_O.a is the name of a library object file with: – V: module version (ex. V=01 for V0.1…) – x: the CMx core class (CM0, CM3, CM4, CM7, CM23, CM33) – C: compiler (IAR, Keil, GCC) – O: specify the compiler optimization - <empty>: high size optimization - Ot: high speed optimization - Otnsc: high speed optimization with No Size constraints - Ob: high balanced optimization	Mandatory	Example: STemWin526_CM4_IAR.a or STemWin526_CM4_IAR_ot.a

6 STM32Cube Expansion middleware criteria

Table 4. Middleware criteria

ID	Item description	Importance	Comment
C.M1	CMSIS-RTOS API shall be used for application making use of an RTOS.	Mandatory	V1.02
		Mandatory	V2.0
C.M2	A new middleware shall be hardware and platform independent and the link with the low layers shall be provided by means of an interface file.	Mandatory	-
C.M3	The middleware interface file shall be provided as a template within the middleware folder to be customized or updated by the user.	Mandatory	-

7 STM32Cube Expansion documentation criteria

Table 5. Documentation criteria

ID	Item description	Importance	Comment
C.D1	Each newly added software component (such as BSP or middleware) shall have its API documented in a user manual. This user manual can be in .pdf format or in a format for on-line documentation such as .html or .chm.	Mandatory	-
C.D2	Each user example shall come with detailed explanation, functional description and hardware set-up.	Mandatory	-

8 STM32Cube Expansion Package commercial offering criteria

Table 6. Commercial offering criteria

ID	Item description	Importance	Comment
C.C1	For a commercial software Expansion of STM32Cube, a free version of this software Expansion shall be provided for evaluation. ST partner can choose its strategy for the free evaluation version, for instance: – Middleware delivered as a binary, and time limited (time bombed, reset after a timeout or others) – Middleware delivered as a binary, with limited features	Mandatory	-
C.C2	An example, running on a STM32 board (Discovery, Nucleo or Evaluation) or a board widely available at STM32 distributors shall be provided	Mandatory	-

9 Revision history

Table 7. Document revision history

Date	Revision	Changes
14-Nov-2017	1	Initial release.
6-Sep-2019	2	Updated *Importance* of *C.Q2* in *Table 2: Quality criteria* and *C.M1* in *Table 4: Middleware criteria*. Updated the description of STM32Cube on the cover page and in *Chapter 3*.