

# STM32H5 Amazon Web Services® IoT software expansion for STM32Cube

Application with Arm® TrustZone® Application without Arm® TrustZone®						
Common application files of Boards Sys	Common application files of the FreeRTOS™ IoT reference integrands  Sys  Cli  KvStore  Cryp				PC software	
Applications						
FreeRTOS™	AWS		Arm <sup>®</sup>			
Kernel	IoTDeviceDefender		mbedTLS			
coreMQTT	IoTDeviceShadow IoTJobs		littlefs			
coreMQTT-Agent  coreHTTP	OTA		ota-pal-psa		Utilities	
coreJSON	LwIP		Secure manager			
corePKCS11	tinycbor					
Middleware	http_p	parser				
Board support package (BSP)  Hardware abstraction layer (HAL)  Drivers						
STM32H5 NOR flash memory LCD Wi-Fi® module Hardware components						
STM32H573I-DK Wi-Fi® daughterboard  Development boards						
Development boards  (1) Files common to the FreeRTOS™ IoT reference integration for B-U585I-IOT02A in the X-CUBE-AWS Expansion Package with STM32U5.						
Product status link						
X-CUBE-AWS-H5						





#### **Features**

- Ready-to-run firmware example using Ethernet or Wi-Fi<sup>®</sup> connectivity to support the quick evaluation and development of Amazon Web Services<sup>®</sup> cloud-connected applications based on STM32H5 series microcontrollers
- Amazon FreeRTOS<sup>™</sup> IoT reference integration for the STM32H573I-DK Discovery kit
- Ethernet
- Wi-Fi<sup>®</sup> MXCHIP EMW3080B module over SPI through the STMod+connector of the Discovery kit
- Configurable TCP/IP stack
- TLS encryption
- Firmware update
- AWS IoT Core<sup>™</sup> multi-account registration
- AWS IoT Core<sup>™</sup> just-in-time registration
- AWS IoT Core<sup>™</sup> connection, device shadow, jobs, defender
- AWS IoT Core<sup>™</sup> OTA firmware update
- Telemetry
- Command-line interface:
  - Device provisioning
  - Configuration saving to NVM
  - Monitoring of the FreeRTOS<sup>™</sup> kernel tasks and their memory usage
- Easy step-in project, without Arm<sup>®</sup> TrustZone<sup>®</sup>
- STMicroelectronics secure manager enabled project:
  - Arm<sup>®</sup> TrustZone<sup>®</sup>
  - Secure boot
  - Unique device authentication initially provisioned by STMicroelectronics at manufacturing time: device key pair and X.509 certificate
  - Secure storage of private key and user secrets
  - Sensitive operations executed in an isolated environment

#### **Description**

The X-CUBE-AWS-H5 Expansion Package consists of an adaptation of the Amazon FreeRTOS<sup>™</sup> STM32U5 IoT reference integration ported to an STM32H573I-DK Discovery kit as an end device.

X-CUBE-AWS-H5 proposes four projects that expose the same functionalities to the user: telemetry, shadows, device defender, jobs, and over-the-air firmware update. The telemetry data consists in the count of the IP packets going in and out of the network interface.

The easy step-in projects, *aws\_eth* and *aws\_ri* (no-TrustZone<sup>®</sup>), save the device credentials and settings in the external NOR flash memory of the STM32H573I-DK Discovery kit. They provide Ethernet and Wi-Fi<sup>®</sup> connectivity, respectively.

The reference projects,  $aws\_eth\_tz$   $aws\_ri\_tz$  (Arm<sup>®</sup> TrustZone<sup>®</sup> and STMicroelectronics secure manager), keep the device credentials and settings encrypted in the MCU secure storage. The security-sensitive data and operations remain in a secure partition, where they are not exposed to the user application. The secure boot process acts as a root of trust for the application before launching it. It takes care of the secure firmware update once a new image has been downloaded by the user application. In addition, at MCU manufacturing time, STMicroelectronics provisions a unique identity in the chip. It consists of an ECDSA key pair and an X.509 certificate signed by STMicroelectronics. This project uses this certificate for connecting to AWS loT Core<sup>TM</sup>.

Before running <code>aws\_eth\_tz</code> or <code>aws\_ri\_tz</code>, the user must install the secure manager on the STM32H573I-DK target. The secure manager access kit is available as X-CUBE-SEC-M-H5 from the STM32TRUSTEE-SM STMicroelectronics secure manager web page.

The STM32H573I-DK Discovery kit, which natively supports Ethernet connectivity, targets both the AWS IoT Core<sup>™</sup> and the FreeRTOS<sup>™</sup> qualification.

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### 1 General information

The X-CUBE-AWS-H5 Expansion Package is demonstrated on an STM32H5 32-bit microcontroller based on the Arm® Cortex®-M33 processor with Arm® TrustZone®.

Note: Arm and TrustZone are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

arm

### 1.1 Ordering information

X-CUBE-AWS-H5 is available for free download from the www.st.com website.

#### 1.2 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to improve designer productivity significantly 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 conception to realization, among which are:
  - 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 peripheral configuration, code generation, code compilation, and debug features
  - STM32CubeCLT, an all-in-one command-line development toolset with code compilation, board programming, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command-line versions
  - STM32CubeMonitor (STM32CubeMonitor, STM32CubeMonPwr, STM32CubeMonRF, STM32CubeMonUCPD), powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real time
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeH5 for the STM32H5 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 hardware
  - A consistent set of middleware components such as ThreadX, FileX / LevelX, NetX Duo, USBX, USB-PD, mbed-crypto, secure manager API, MCUboot, and OpenBL
  - 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

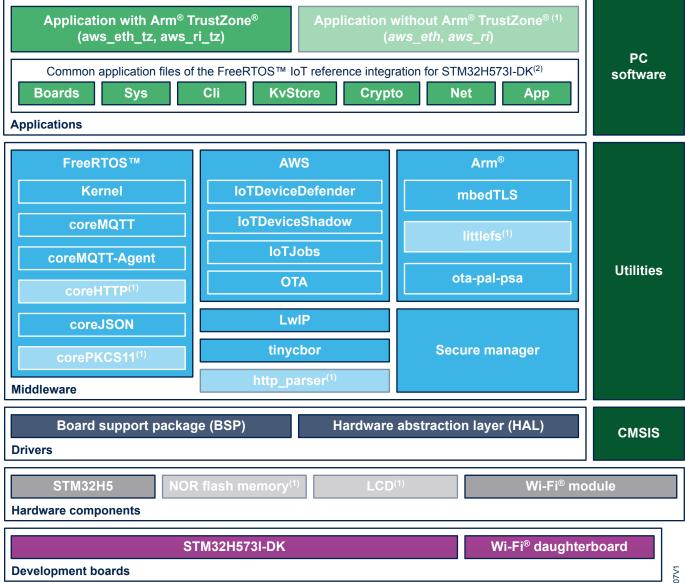
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## Software architecture examples

Figure 1 presents the active software blocks for the application examples that are using Arm® TrustZone®. The other blocks are grayed out.

Figure 1. Application examples using Arm® TrustZone®



<sup>(1)</sup> Not used in the examples with Arm® TrustZone®.

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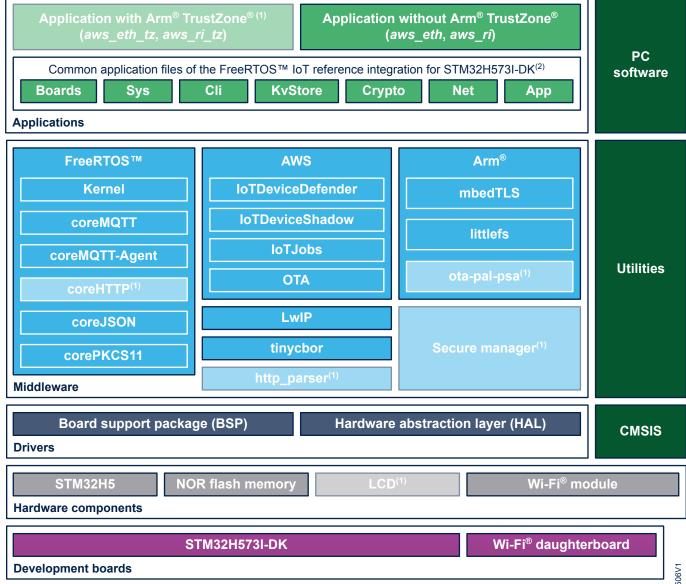
DT73507V1

<sup>(2)</sup> Files common to the FreeRTOS™ IoT reference integration for B-U585I-IOT02A in the X-CUBE-AWS Expansion Package with STM32U5.



Figure 2 presents the active software blocks for the application examples that are not using Arm<sup>®</sup> TrustZone<sup>®</sup>. The other blocks are grayed out.

Figure 2. Application examples not using Arm® TrustZone®



(1) Not used in the examples without Arm® TrustZone®.

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<sup>(2)</sup> Files common to the FreeRTOS™ IoT reference integration for B-U585I-IOT02A in the X-CUBE-AWS Expansion Package with STM32U5.





# 3 License

X-CUBE-AWS-H5 is delivered under the SLA0048 software license agreement and its Additional License Terms.

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# **Revision history**

Table 1. Document revision history

Date	Revision	Changes
4-Sep-2023	1	Initial release.

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