

AIROC[™] Wi-Fi/Bluetooth[®] STM32 Expansion pack user guide

About this document

Version

1.5.1

Scope and purpose

AIROC[™] Wi-Fi/Bluetooth[®] ^[1] STM32 Expansion Pack from Infineon is an extension of the CMSIS-Pack standard established by Arm. The pack is compliant with the full CMSIS-Pack standard, with additional requirements/restrictions on the final pack to meet the STM standard. This pack uses libraries from the ModusToolbox[™] environment. For more details, refer to <u>https://www.infineon.com/cms/en/design-support/tools/sdk/modustoolbox-software</u>. You can select and configure the pack in the STM32CubeMX tool, make choices appropriate for your design, such as which CYW43xxx device to use, and then generate a project from your selection.

Document conventions

Convention	Explanation
Bold	Emphasizes heading levels, column headings, menus and sub-menus
Italics	Denotes file names and paths.
Courier New	Denotes APIs, functions, interrupt handlers, events, data types, error handlers, file/folder names, directories, command line inputs, code snippets
File > New	Indicates that a cascading sub-menu opens when you select a menu item

Abbreviations and definitions

The following define the abbreviations and terms used in this document:

- BSP Board Support Package
- PAL Platform Adaptation Layer
- WCM Wi-Fi Connection Manager
- WHD Wi-Fi Host Driver

¹ Bluetooth[®] is a registered trademark owned by Bluetooth SIG Inc.



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1 Expansion pack contents

The following table shows the components and their versions included with the expansion pack:

Component name	Version	Details
abstraction-rtos	1.5.0	The RTOS abstraction layer provides simple RTOS services like threads, semaphores, mutexes, queues, and timers. It is not intended to be a full features RTOS interface, but they provide just enough support to allow for RTOS independent drivers and middleware.
<u>btstack-integration</u>	4.3.1	AIROC [™] Bluetooth [®] host stack solution includes Bluetooth [®] stack library, Bluetooth [®] controller firmware and platform/OS porting layer. This component is compatible with Theadx as well.
<u>btstack</u>	3.7.0	BTSTACK is Infineon's Bluetooth [®] Host Protocol Stack implementation. The stack is optimized to work with Infineon Bluetooth [®] controllers. The BTSTACK supports Bluetooth [®] BR/EDR and Bluetooth [®] LE core protocols.
command-console	4.0.0	This library provides a framework to add command console to your application and support Wi-Fi, iPerf, Bluetooth [®] Low Energy commands.
connectivity-utilities	4.1.1	The connectivity utilities library is a collection of general-purpose middleware utilities such as: JSON parser, Linked list, String utilities, Network helpers, Logging functions, and Middleware Error codes. Several connectivity middleware libraries will depend on this library.
<u>core-lib</u>	1.3.1	The Core Library provides basic types and utilities that can be used between different devices. This allows different libraries to share common items between themselves to avoid reimplementation and promote consistency.
device	1.5.1	Selects appropriate CYW43xxx firmware and drivers for selected connectivity device.
<u>lwip</u>	2.1.2	lwIP is a small independent implementation of the TCP/IP protocol suite. The focus of the lwIP TCP/IP implementation is to reduce the RAM usage while still having a full-scale TCP. This making lwIP suitable for use in embedded systems with tens of kilobytes of free RAM and room for around 40 kilobytes of code ROM.
pal	1.5.1	Infineon-STM32 Platform Adaptation Layer (PAL).
<u>wifi-host-driver</u>	3.1.0	The Wi-Fi host driver (WHD) is an independent, embedded driver that provides a set of APIs to interact with Infineon WLAN chips. The WHD is an independent firmware product that is easily portable to any embedded software environment. Therefore, the WHD includes hooks for RTOS and TCP/IP network abstraction layers.
<u>wcm</u>	3.1.1	The Wi-Fi Connection Manager (WCM) is a library which helps application developers to manage Wi-Fi Connectivity. The library provides a set of APIs that can be used to establish and monitor Wi-Fi connections on Infineon platforms that support Wi-Fi connectivity.
<u>whd-bsp-</u> integration	2.3.0	The WHD library provides some convenience functions for connecting to a Board Support Package (BSP) that includes a WLAN chip. This library initializes the hardware and passes a reference to the communication interface on the board into WHD. It also sets up the LwIP based network buffers to be used for sending packets back and forth.
netxduo-network- interface- integration	1.0.0	This library is an integration layer that links the NetXDuo network stack with the underlying WHD. This library interacts with ThreadX, NetXDuo TCP/IP stack, and WHD. It contains the associated code to bind these components together.
<u>lwip-network-</u> interface- integration	1.0.0	This library is an integration layer that links the lwIP network stack with the underlying WHD and Ethernet driver. This library interacts with FreeRTOS, lwIP TCP/IP stack, WHD, and Ethernet driver. It contains the associated code to bind these components together.



Component name	Version	Details
<u>lwip-freertos-</u> integration	1.0.0	This library contains the FreeRTOS dependencies needed by the Lightweight open- source TCP/IP stack, version: 2.1.2 to execute. See the https://savannah.nongnu.org/projects/lwip/ web site for details.
<u>wifi-mfg-test</u>	3.3.0	The WLAN Manufacturing Test Middleware application is used to validate the WLAN firmware and radio performance of the Wi-Fi device. The mfg-test middleware repo can accept the serial input byte stream from the Mfg Test application and transform the contained commands into IOVAR/IOCTL messages to the WLAN firmware. It can get the response from the WLAN firmware (if expected) and transport it back to the 'wl tool' running on the host.
<u>secure-sockets</u>	3.0.0	The secure sockets library provides APIs to create software that can send and/or receive data over the network using sockets. This library supports both secure and non-secure sockets, and abstracts the complexity involved in directly using network stack and security stack APIs. This library supports both IPv4 and IPv6 addressing modes for UDP and TCP sockets.
stm32_mw_freertos	10.4.6	The stm32_mw_freertos MCU component repository is common to all STM32Cube MCU embedded software packages, providing the FreeRTOS Middleware part.
<u>wpa3-external-</u> supplicant	1.1.0	The WPA3 External Supplicant supports WPA3 SAE authentication using HnP (Hunting and Pecking Method) using RFC <u>https://datatracker.ietf.org/doc/html/rfc7664</u> and H2E (Hash to Element Method) using RFC <u>https://datatracker.ietf.org/doc/html/draft-irtf-cfrg-hash-to- curve-10</u> and following 802.11 spec 2016.

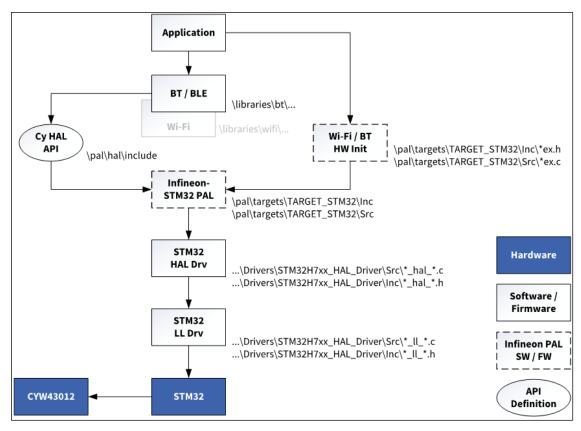
1.1 Infineon-STM32 Platform Adaptation Layer (PAL)

The Infineon-STM32 PAL is based on the STM32 Driver MCU Component HAL, and it offers the minimum set of (required) APIs for Infineon-STM32 PAL. The supported HAL versions are:

STM32Cube HAL package	STM32Cube MCU verified package version
STM32H7 Series	1.11.0
STM32L5 Series	1.5.0
STM32U5 Series	1.2.0
STM32H5 Series	1.0.0



The PAL integrates the STM32 HAL APIs underneath the Infineon HAL APIs expected by the Infineon Connectivity Libraries. The following figure shows the architectural intent of the Infineon-STM32 PAL:



We created the Infineon-STM32-PAL to meet the following guidelines:

- Developers will continue to use STM32CubeMX and/or STM32 HAL APIs to configure STM32 MCU hardware.
- Developers will communicate to the PAL what STM32 hardware that they have selected and configured for communicating with a CYW43xxx via an initialization API.
- Infineon-STM32 PAL adapts only the minimum set of Infineon HAL APIs to STM32 HAL in order to communicate and control Infineon's CYW43xxx connectivity device(s).
- The Infineon PAL layer behaves like the Infineon HAL as much as possible to minimize impact to the Infineon libraries. The Infineon PAL adapts the following STM32 HAL Drivers:
 - GPIO
 - LPTimer
 - SDIO
 - SPI
 - TRNG
 - UART

1.2 Supported STM32 MCUs

- STM32H7xx
- STM32L5xx
- STM32U5xx
- STM32H5xx



1.3 Supported STM32 boards

- STM32H747I-DISCO Discovery kit
- STM32L562E-DK
- STM32U575I-EV
- NUCLEO-H563ZI

1.4 Supported connectivity modules

Infineon's AIROC[™] CYW43xxx Wi-Fi-Bluetooth[®] combo chip family:

- CYW43012
- CYW43022
- CYW43439 / CYW43438 / CYW4343W
- CYW4373 / CYW4373/E
- CYW55500
- CYW55572

1.5 Compatible software

- STM32 CubeMX 6.8.0
- STM32 CubeIDE 1.12.0
- IAR EWARM 9.30.1



2 Download/install/import expansion pack

2.1 Downloading the pack

Download the expansion pack from GitHub:

https://github.com/Infineon/AIROC-Wi-Fi-Bluetooth-STM32/releases/tag/release-v1.5.1

2.2 Installing/importing the pack

2.2.1 Add from local file

Perform these steps to add the expansion pack to the STM32 development environment:

- 1. Run the STM32CubeMX tool.
- 2. Navigate to Home > Manage software installations and select Install/Remove.

STM32CubeMX Untitled				– 🗆 X
STM32 CubeMX	File	Window	Help	🐵 F 🖻 🄰 🔆 ATT
Home 🔪				
Existing Projects		New Project		Manage software installations
Open Existing Projects	ित	Start My proje	ct from MCU MCU SELECTOR ct from ST Board BOARD SELECTOR	Check for STM32CubeMX and e CHECK FOR UPDATES Install or remove embedded softw INSTALL / REMOVE
			ct from Example	Contraction of the second



3. Select **From Local...**, navigate to the downloaded pack file, and select **Open**.

MX E	Embedded Software Pa	ckages Manag	er					×
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	Releases Informatio	Select a STM	32Cube Package File			×		
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•	STM32F0	Infineon.Alf	ROC-Wi-Fi-Bluetooth-S	GTM32.1.5.1.pack	J			
Þ	STM32F1							
Þ	STM32F2							
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Deta	ils	Files of <u>Types</u>	STM32Cube Packag	es File (*.zip, *.pa	ck)	~		
					Open	Cancel		
Fro	om Local From U	ht		Refresh	Install N	low Ren	nove Now	Close

4. Accept the license agreement and select **Finish**.

Licensing Agreement	×
Infineon AIROC-Wi-Fi-Bluetooth-STM32 1.5.1 License Agreement	
Please read and accept the following agreement carefully to finish the installation:	
CYPRESS (AN INFINEON COMPANY) END USER LICENSE AGREEMENT	•
PLEASE READ THIS END USER LICENSE AGREEMENT ("Agreement") CAREFULLY BEFORE DOWNLOADING, INSTALLING, COPYING, OR USING THIS SOFTWARE AND ACCOMPANYING DOCUMENTATION. BY DOWNLOADING, INSTALLING, COPYING OR USING THE SOFTWARE, YOU ARE AGREEING TO BE BOUND BY THIS AGREEMENT. IF YOU DO NOT AGREE TO ALL OF THE TERMS OF THIS AGREEMENT, PROMPTLY RETURN AND DO NOT USE THE SOFTWARE. IF YOU HAVE PURCHASED THIS LICENSE TO THE SOFTWARE, YOUR RIGHT TO RETURN THE SOFTWARE EXPIRES 30 DAYS AFTER YOUR PURCHASE AND APPLIES ONLY TO THE ORIGINAL PURCHASEN 1. Definitions.	
I have read, and I agree to the terms of this license agreement I do not accept the terms of this license agreement	
Finish Canc	el



5. The tool shows an **Infineon** tab with the installed Expansion Pack displayed. Click **Close**.

Embedded Software Packages Manager							
STM32Cube MCU							
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RoweBots	SEGGER	WES	emotas	portGml	bH	wolfSSL	
STM32Cub	e MCU Packages		STM	icroelectronics		Infineon	
Status	Description				Avai	lable Version	
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	The Infineon AIR	OC-Wi-Fi-Bluet	ooth-STM32 Expansio	on Pack is an ex	ktension (1.5.1	
• • • • •	The Infineon AIR(OC-Wi-Fi-Bluet	ooth-STM32 Expansio	on Pack is an ex	ktension	1.5.0	
Details							
Release version : 1.5.1							
Release date : 2023-06-21							
Release information :							
Patch Release (maintenance I	Bluetooth FW)						
What's New?							
From Local From	Url		Refresh	🔺 Install	Remove	Close	

2.2.2 Add the Pack from URL

- 1. Run the STM32CubeMX tool.
- 2. Navigate to Home > Manage software installations and select Install/Remove.

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	·	
	New Project	Manage software installations
ojects 🔂	I need to : Start My project from MCU ACCESS TO MCU SELECTOR Start My project from ST Board	Check for STM32CubeMX and e CHECK FOR UPDATES Install or remove embedded softw INSTALL / REMOVE
	ACCESS TO BOARD SELECTOR Start My project from Example ACCESS TO EXAMPLE SELECTOR	MX fore to stol Considering on the stol
		ojects I need to : Start My project from MCU ACCESS TO MOU SELECTOR Start My project from ST Board ACCESS TO BOARD SELECTOR Start My project from Example

3. Select From URL...



- 4. Select New (URL).
- 5. Input the GitHub URL to PDSC-file:

https://github.com/Infineon/AIROC-Wi-Fi-Bluetooth-STM32/releases/download/packs/Infineon.AIROC-Wi-Fi-Bluetooth-STM32.pdsc

6. Click **Check** and **OK** if check is successful.

Embedded Soft	tware Packages Manager	×
STM32Cu	Ibe MCU Packages and embedded software packs releases	• •
	User Defined Packs Manager	
STM32Cube MC	Manage Urls for user defined embedded software packs	able Version
► STM32F0	Ve Add new Url X	
► STM32F1	To add packs, please enter url to either one of the following: - A valid pdsc (Ex: http://www.vendor.com/pack/Vendor.PackName.pdsc) - A valid pack index (Ex: http://www.vendor.com/pack/Vendor.pidx)	
► STM32F2	https://github.com/Infineon/AIROC-Wi-Fi-Bluetooth-STM32/releases	
	Check OK Cancel	
Details		
	New Remove OK Cancel	
From Local	From Url Refresh Install Now Remove Now	Close

7. Select the just added URL and confirm with **OK** button.

W User Defined Packs	Manager		×		
Manage I	Urls for user defined embe	edded software packs			
Vendor	Name	URL			
✓ Infineon	AIROC-Wi-Fi-Bluet http	s://github.com/Infineon/AIROC-	Wi-Fi-Bluetooth-STM3		
			•		
				Check Firmware & Software	×
				Check Pack Releases for X-CUBE-GNSS1	
				Check index file cubemx.pidx	
		New Remove	OK Cancel	OK	Cancel



8. In the Software Package Manager select the pack and click **Install Now** to start online installation.

Embedded	Software Packa	ges Manager					×			
S	TM32Cube M	CU Packages and er	nbedded softw	vare packs releases						
Releases Information was last refreshed less than one hour ago.										
RoweB		SEGGER	WES	emotas	portGmbH	wolfSSL				
	STM32C	ube MCU Packages		M STM	croelectronics	Infineon				
	Status	Description				Available Version	n			
• • • •		AIROC-Wi-Fi-BI	uetooth-STM32							
		The Infineon AIR	OC-Wi-Fi-Blueto	oth-STM32 Expansio	n Pack is an extensior	n 1.5.1				
		The Infineon AIR	DC-Wi-Fi-Blueto	oth-STM32 Expansio	n Pack is an extensior	n 1.5.0				
Details										
Release vers	ion : 1.5.1									
Release date	: 2023-06-21									
Release infor	mation :									
Patch Releas	Patch Release (maintenance Bluetooth FW)									
What's New?										
From Loca	L Fro	m Url		Refresh	Install F	Remove Close				



Hardware setup 3

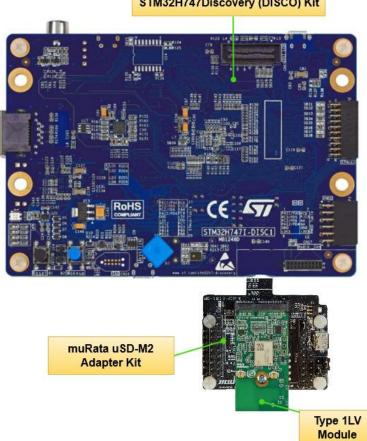
3.1 Using STM32H747 DISCO kit

STM32H747 Disco Kit setup requires three discrete boards to create a setup where an STM32H747 hosts Infineon's CYW43xxx connectivity device. The three boards and links are:

- STM32H747 Discovery (DISCO) Kit: The STM32H747I-DISCO Discovery kit is a complete demonstration and • development platform for STMicroelectronics STM32H747XIH6 microcontroller, designed to simplify user application development.
- muRata uSD-M2 Adapter Kit (rev B1): muRata's uSD-M.2 Adapter Kit with Embedded Artists' Wi-• Fi/Bluetooth® M.2 Modules enable users with a simple plug-in solution. The Embedded Artists' Wi-Fi/Bluetooth[®] M.2 Modules are based on Murata modules using Infineon's Wi-Fi/Bluetooth[®] chipsets.

Current Wi-Fi/Bluetooth® EVB support include

- Murata Type 1DX M.2 (CYW4343W)
- Type 1MW (CYW43455) •
- Type 1LV M.2 (CYW43012)
- Embedded Artists 1LV M.2 Module: Embedded Artists Type 1LV M.2 EVB is designed to work with the Murata uSD-M.2 Adapter.







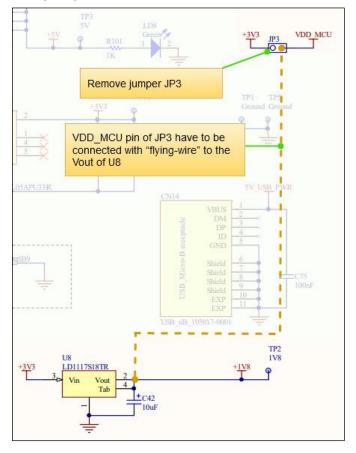
3.1.1	Set up type 1LV M.2 module	
Model	Embedded Artists 1LV M.2 Module	63 63
	 802.11 a/b/g/n/ac-friendly[™] and Bluetooth/LE 5.0 	
Features	• SDIO 3.0 interface, SDR40@80MHz	
	Chipset: Infineon CYW43012	
Datasheet	<u>1LV M.2</u>	
		3.6 € 3.7 € 1906 E 100 € COO © Embasded Artists HO-0918 - 1052 At 2019

3.1.1.1 Board preparations

The 1LV module operates at 1.8 V VIO only (chipset limitation). The following preparation on STM32H747 DISCO Kit and muRata uSD-M2 Adapter are required:

1. Modify STM32H747 Disco Kit to operate on 1.8 V.

Remove the jumper JP3 and connect the VDD_MCU pin of JP3 with "flying-wire" to the Vout of U8 linear voltage regulator (which is effectively a 1.8 V source).



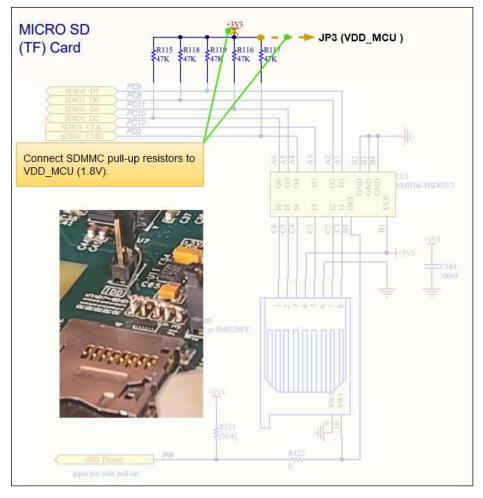
Note:

Switching STM32H747 Disco Kit to operate on 1.8 V affects the functionality of external flash (MT25QL512ABB8ESF).



2. Connect SDMMC pull-up resistors to VDD_MCU (1.8V) on STM32H747 DISCO Kit.

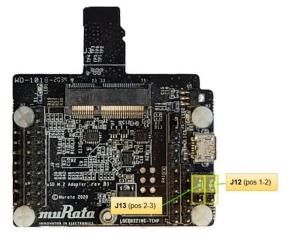
SDMMC pull-up resistors R115-R119 must be unsoldered from the 3.3 V point and soldered vertically. The tops of these resistors have to be soldered to "flying-wire" and connected to JP3 at the side of VDD_MCU.



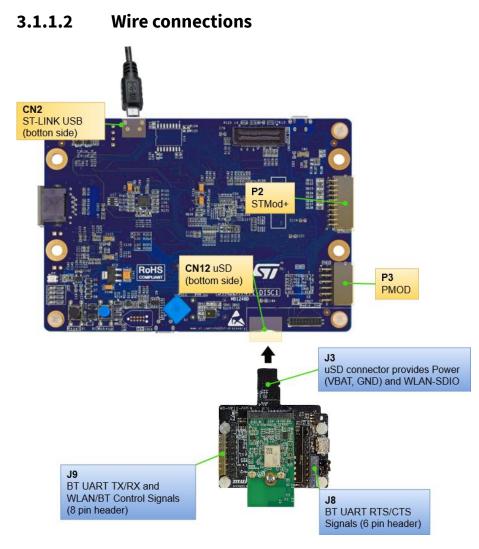
3. Modify muRata uSD-M2 Adapter to operate on 1.8V.

To switch muRata uSD-M2 Adapter to 1.8V the following jumpers have to be configured:

- J1 to pos 2-3 to powered USD_3V3 from uSD VCC
- J12 to pos 1-2 (M2 IO Voltage for 1.8V VDDIO)
- J13 to pos 2-3 (Host IO Voltage for 1.8V)







		STM32H747 Disc	o Kit	muRata		
Connection	Operation	Connector	STM32 GPIO	uSD-M2 Adapter	Note	
VBAT (3.3V)	VCC	CN12		12	VRAT CND	
GND	GND	CN12		J3	VBAT, GND connected via microSD connector	
WL_REG_ON_HOST	Wi-Fi	P3.7 (PMOD#11)	PC6	J9.3	Enables/Disables WLAN core: Active High	
WL_HOST_WAKE_HOST	Wi-Fi	P3.8 (PMOD#12)	PJ13	J9.5	WLAN Host Wake: Active Low (OOB IRQ)	
SDIO	Wi-Fi	CN12	PC8, PC9, PC10, PC11, PC12, PD2	J3	uSD connector pin provides Power (VBAT, GND) and WLAN-SDIO (DATA1, DATA2, DATA3, Clock and Command)	
UART RX	Bluetooth	P3.1 (PMOD#1)	PA11	J9.1		
UART TX	Bluetooth	P3.4 (PMOD#4)	PA12	J9.2		
UART CTS	Bluetooth	P2.8 (STmod+)	PB15	J8.3	UART	
UART RTS	Bluetooth	P2.9 (STmod+)	PB14	J8.4		
BT_REG_ON	Bluetooth P2.10 (STmod+) PD13		PD13	J9.4	Enables/Disables Bluetooth® core: Active High	



3.1.2	Set up type 1DX M.2 module	
Model	Embedded Artists 1DX M.2 Module	
Features	 802.11 b/g/n and Bluetooth/LE 4.2 SDIO 2.0 interface, SDR25@50MHz Chipset: Infineon CYW4343W 	10x M.2 bord rave PA13 bord rave PA1
Datasheet	<u>1DX M.2</u>	

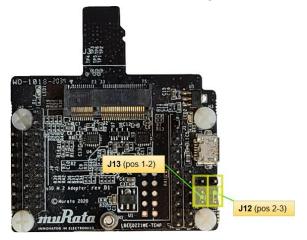
3.1.2.1 Board preparations

This module does not require the host to provide 1.8 V on the SDIO/UART GPIO. It can operate on 3.3V/1.8V. This makes board preparation simpler. Please see the following sections

1. Modify muRata uSD-M2 Adapter to operate on 3.3V.

To switch muRata uSD-M2 Adapter to 3.3V the following jumpers have to be configured:

- J1 to pos 2-3 to powered USD_3V3 from uSD VCC
- J12 to pos 2-3 (M2 IO Voltage for 3.3V VDDIO)
- J13 to pos 1-2 (Host IO Voltage for 3.3V VDDIO)



3.1.2.2 Wire connections

The Type 1DXM module uses the same wire connections as Type 1LV modules. Refer to the <u>Wire connections</u> section for Type 1LV Modules.

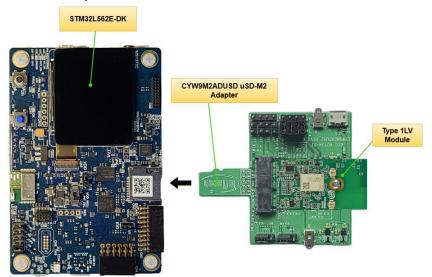


3.2 Using STM32L562E-DK

3.2.1 Set Up M.2 Module + CYW9M2ADUSD Adapter Kit for Wi-Fi and Bluetooth[®] Connectivity

STM32L562E DK Kit setup for Bluetooth[®] connectivity requires three discrete boards to create a setup where an STM32L562E hosts Infineon's CYW43xxx connectivity device. The three boards and links are:

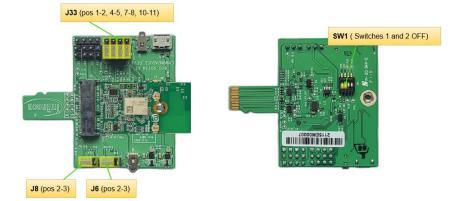
- <u>STM32L562E-DK</u> Discovery kit is a complete demonstration and development platform for Arm[®] Cortex[®]-M33 with Arm[®] TrustZone[®] and ARMv8-M mainline security extension core-based STM32L562QEI6QU microcontroller, with 512 Kbytes of Flash memory and 256 Kbytes of SRAM.
- CYW9M2ADUSD Adapter Kit_: adapter which allows you to connect M.2-based CYW43x connectivity modules into SD-card slot of a various DVKs and EVKs. Please contact sales for order questions.
- <u>Embedded Artists 1LV M.2 Module</u>: Embedded Artists Type 1LV M.2 EVB is designed to work with the Murata uSD-M.2 Adapter.



3.2.1.1 Board preparation

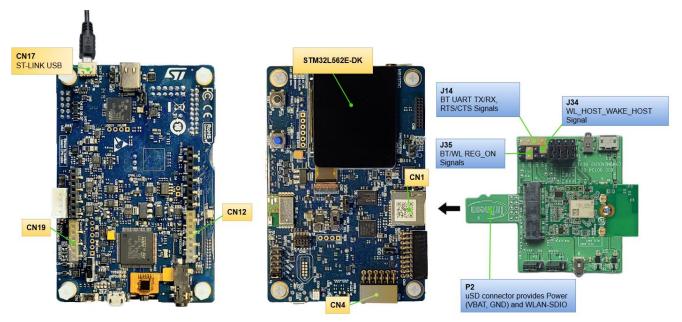
CYW9M2ADUSD Adapter requires to configure the following jumpers:

- J6 and J8 to pos 2-3 (use 3.3V from VDD_SDIO)
- J33 to use 1.8V level shifters for UART
- SW1 switches 1 and 2 in OFF position





3.2.1.2 Wire connections



Connection	Operation STM32L562E-DK		E-DK	CYW9M2ADUSD	Note	
		Connector	STM32 GPIO	Adapter		
VBAT (3.3V)	VCC	CNI		D2 (uCD Commention)	VBAT, GND connected via microSD	
GND	GND	CN1		P2 (uSD Connection)	connector	
WL_REG_ON_HOST	Wi-Fi	CN4.7	PF5	J35.1	Enables/Disables WLAN core: Active High	
WL_HOST_WAKE_HOST	Wi-Fi	CN4.1	PB13	J34.1	WLAN Host Wake: Active Low (OOB IRQ)	
SDIO	Wi-Fi	CN1	PC8, PC9, PC10, PC11, PC12, PD2	P2 (uSD Connection)	uSD connector pins: provides Power (VBAT, GND) and WLAN-SDIO (DATA0, DATA1, DATA2, DATA3, Clock and Command)	
BT_REG_ON	Bluetooth	CN12.5	PF4	J35.2	Enables/Disables Bluetooth® core: Active High	
UART RX	Bluetooth	CN19.6	PC5	J14.2 (TX)		
UART TX	Bluetooth	CN12.1	PB10	J14.1 (RX)		
UART CTS	Bluetooth	CN12.3	PD11	J14.4 (RTS)	UART (USART3)	
UART RTS	Bluetooth	CN12.4	PD12	J14.3 (CTS)	1	



3.3 Using STM32U575I-EV Evaluation board

The STM32U575I-EV Evaluation board setup requires three discrete boards to enable the STM32U575 board to host Infineon's CYW43xxx connectivity device. The three boards and links are:

- <u>STM32U575I-EV Evaluation board</u>: This board is a complete demonstration and development platform for STMicroelectronics STM32U575AII6Q microcontroller, designed to simplify user application development.
- <u>muRata uSD-M2 Adapter Kit (rev B1)</u>: muRata's uSD-M.2 Adapter Kit with Embedded Artists' Wi-Fi/Bluetooth[®] M.2 Modules enable users with a simple plug-in solution. The Embedded Artists' Wi-Fi/Bluetooth[®] M.2 Modules are based on Murata modules using Infineon's Wi-Fi/Bluetooth[®] chipsets.

Current Wi-Fi/Bluetooth® EVB support include:

- Murata Type 1DX M.2 (CYW4343W)
- Type 1MW (CYW43455)
- Type 1LV M.2 (CYW43012)
- <u>Embedded Artists 1LV M.2 Module</u>: Embedded Artists Type 1LV M.2 EVB is designed to work with the Murata uSD-M.2 Adapter.

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3.3.1 Set up type 1LV M.2 module

3.3.1.1 Board preparations

The 1LV module operates at 1.8 V VIO only (chipset limitation). The following preparation on STM32U575I-EV Evaluation board and muRata uSD-M2 Adapter are required:

1. Modify the STM32U575I-EV Evaluation board to operate on 1.8 V.

By default, the STM32U575I-EV Evaluation board is configured with VDD_MCU at 3.3 V. To switch the board to 1.8V:

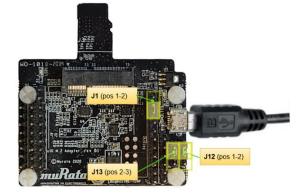
- Use a potentiometer RV3 to adjust VDD_ADJ to 1.8V. You can use TP29 as test point for the Voltmeter connection.
- Configure JP23 to pos 2-3. It switches VDD/VDD_MCU to VDD_ADJ instead of 3.3V

Note: Switching the STM32U575I-EV Evaluation board to operate on 1.8 V affects the functionality of external flash (MT25QL512ABB8ESF) and external SRAM (IS61WV102416BLL-10MLI).

2. Modify the muRata uSD-M2 Adapter to operate on 1.8 V.

To switch the muRata uSD-M2 Adapter to 1.8 V, configure the following jumpers:

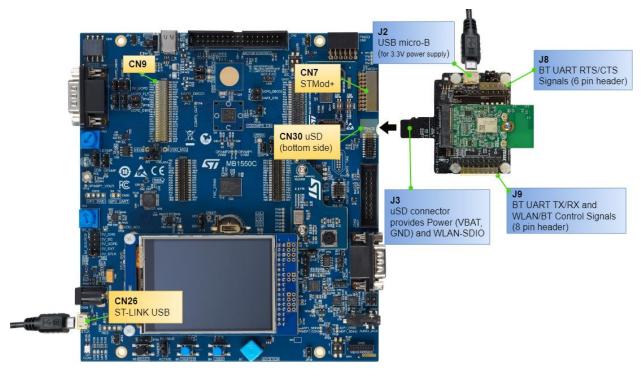
- J1 to pos 1-2 to powered USD_3V3 from micro USB (J2)
- J12 to pos 1-2 (M2 IO Voltage for 1.8V VDDIO)
- J13 to pos 2-3 (Host IO Voltage for 1.8 V)
- Micro USB (J2) should be plugged in.



- 3. Configure jumpers on the STM32U575I-EV Evaluation board:
 - Remove JP10
 - Remove JP11
 - Remove JP12
 - Remove SB38 is shorted (default)



3.3.1.2 Wire connections



6	0	STM32U	575I-EV	muRata uSD-M2	Note	
Connection	Operation	Connector	STM32 GPIO	Adapter		
VBAT (3.3V)	VCC	CN20		12	VBAT, GND connected via	
GND	GND	- CN30		J3	microSD connector	
WL_REG_ON_HOST	Wi-Fi	CN7.9 (STmod+)	PB4	J9.3	Enables/Disables WLAN core: Active High	
WL_HOST_WAKE_HOST	_WAKE_HOST Wi-Fi CN7.8 (S		PB5	J9.5	WLAN Host Wake: Active Low (OOB IRQ)	
SDIO	Wi-Fi	CN30	PC8, PC9, PC10, PC11, PC12, PD2	J3	uSD connector pin provides Power (VBAT, GND) and WLAN- SDIO (DATA1, DATA2, DATA3, Clock and Command)	
UART RX	Bluetooth	CN9.13	PG8	J9.1		
UART TX	Bluetooth	CN9.12	PG7	J9.2		
UART CTS	Bluetooth	CN9.24	PB13	J8.3	UART (LPUART1)	
UART RTS	Bluetooth	CN9.11	PG6 J8.4			
BT_REG_ON	Bluetooth	CN7.10 (STmod+)	PB11	J9.4	Enables/Disables Bluetooth® core: Active High	



3.3.2 Set up type 1DX M.2 module

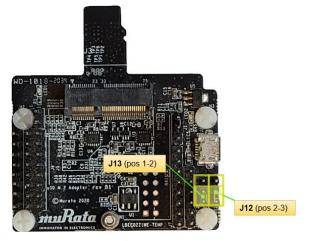
3.3.2.1 Board preparations

This module does not require the host to provide 1.8 V on the SDIO/UART GPIO. It can operate on 3.3 V/1.8 V. This makes board preparation simpler.

1. Modify the muRata uSD-M2 Adapter to operate on 3.3 V.

To switch the muRata uSD-M2 Adapter to 3.3V, configure the following jumpers:

- J12 to pos 2-3 (M2 IO Voltage for 3.3V VDDIO)
- J13 to pos 1-2 (Host IO Voltage for 3.3V VDDIO)



3.3.2.2 Wire connections

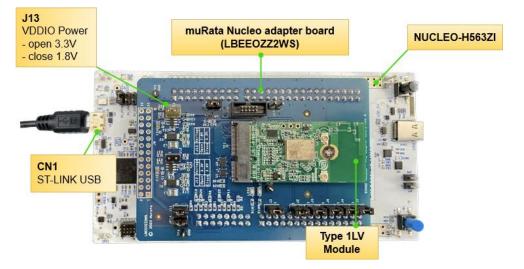
The Type 1DXM module uses the same wire connections as the Type 1LV modules. Refer to the <u>Wire</u> <u>connections</u> section (<u>3.3.1.2</u>) for Type 1LV Modules.



3.4 Using NUCLEO-H563ZI board

The NUCLEO-H563ZI board setup requires three discrete boards to enable the STM32H5xx board to host Infineon's CYW43xxx connectivity device. The three boards and links are:

- <u>NUCLEO-H563ZI board</u>: This board is a complete demonstration and development platform for STMicroelectronics STM32U575AII6Q microcontroller, designed to simplify user application development.Murata STM32 NUCLEO M.2 Adapter Board (LBEEOZZ2WS): This Board enables users to connect M.2 Module to NUCLEO-H563ZI Board. The LBEEOZZ2WS board is early ES sample and will be coming soon to be ordered.
- <u>Embedded Artists 1LV M.2 Module</u>: Embedded Artists Type 1LV M.2 EVB is designed to work with the Murata uSD-M.2 Adapter.



This setup does not require any wires to be connected. The default pin mapping is described in the following section.

Note: Ensure you set 1.8V for VDDIO (J13 must be shorted) when using only 1.8V compatible radio.

3.4.1 Pin mapping

.	Nucleo-H563ZI			muRata Nucleo		
Connection	Operation	Connector STM32 GPIO		Adapter	Note	
WL_REG_ON_HOST	Wi-Fi	CN9.25	PD0	CN3.25	Enables/Disables WLAN core: Active High	
WL_HOST_WAKE_HOST	Wi-Fi	CN9.27	PD1	CN3.27	WLAN Host Wake: Active Low (OOB IRQ)	
SDIO	Wi-Fi	CN8	PC8, PC9, PC10, PC11, PC12, PD2	CN1	WLAN-SDIO (DATA1, DATA2, DATA3, Clock and Command)	
UART RX	Bluetooth	CN9.4	PD6	CN3.4		
UART TX	Bluetooth	CN9.6	PD5	CN3.6		
UART CTS	Bluetooth	CN9.10	PD3	CN3.10	UART (USART)	
UART RTS	Bluetooth	CN9.8	PD4	CN3.8		
BT_REG_ON	Bluetooth	CN8.16	PG3	CN1.16	Enables/Disables Bluetooth® core: Active High	



4 Using example projects

We provide the following example projects to get started using the pack:

- <u>Wi-Fi Scan</u>
- <u>Wi-Fi onboarding with Bluetooth® LE</u>
- <u>Azure RTOS NetXDuo Wi-Fi UDP echo server</u>
- Bluetooth[®] LE Hello Sensor
- Wi-Fi TCP keepalive offload

4.1 Wi-Fi Scan

This example demonstrates how to configure different scan filters provided in the Wi-Fi Connection Manager (WCM) middleware and scan for the available Wi-Fi networks.

The example initializes the Wi-Fi device and starts a Wi-Fi scan without any filter and prints the results on the serial terminal. The example starts a scan every three seconds after the previous scan completes.

This example demonstrates how an STM32H7 can be used to host CYW43xxx connectivity devices.

4.1.1 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate:

Using STM32H747 DISCO Kit

4.1.2 Other software

Install a terminal emulator if you do not have one. Instructions in this document use Tera Term.

4.1.3 **Project components**

The following are the only components used in this project:

- Wifi/network-interface (configured as LWIP)
- Wifi/wifi-host-driver (WHD)
- Wifi/wcm
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities
- Wifi/LwIP
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device (configured as CYW43012)



4.1.4 Example project start/import

You can open the Wi-Fi Scan example by copying the example from the Pack to an appropriate location. Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the following steps:

1. Copy the code example from the pack directory to your local directory.

The default path for installed packs is:

C:\Users\<USER>\STM32Cube\Repository\Packs\

Copy the wifi_scan example from the appropriate directory. For instance, for STM32H747I-DISCO:

C:*Users**STM32Cube**Repository**Packs**Infineon**Connectivity*-*STM32**1.3.0**Projects*\ *STM32H747I-DISCO**Applications**wifi_scan*

Paste into your working folder. For example:

C:\Users\<USER>\STM32Cube\Example

2. Open *wifi_scan.ioc* file in the root folder of project.

C:\Users\<USER>\STM32Cube\Example\wifi_scan\wifi_scan.ioc

3. Click **OK** to accept.



4.1.5 Generate code

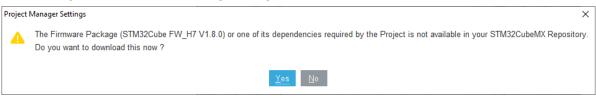
Follow these steps to generate code:

- 1. Select the Project Manager tab.
- 2. Select Project.
- 3. Select the appropriate option under **Toolchain / IDE** and select the **Generate Under Root** check box.

4. Click GENERATE CODE.

STM32	File	Window	Help	<u>(</u>] 🖸 🎽 🔆 .
Home > STM32H	747XIHx - STM32H747I-DI	sco 🔰 wifi_scan.ioo	c - Project Manager >	GENERAT	
Pinout & Conf	iguration Clock	< Configuration	Project Manag	er	Tools
Project Code Generator Advanced Settings	Project Settings Project Name Wifi_scan Project Location C: Dual Core Boot Mode Both CPUs booting at once Application Structure Advanced Toolchain Folder Location C: Wifi_scan\ Toolchain /IDE STM32CubeIDE Linker Settings Minimum Heap Size 0x80 Minimum Stack Size 0x40		erate the main()		
	Mcu and Firmware Package — Mcu Reference STM32H747XIHx Firmware Package Name and 1 STM32Cube FW_H7 V1.8.0				

If a message displays about missing packages, select Yes:



5. After the code is generated, you will see this dialog. Select **Open Project**.

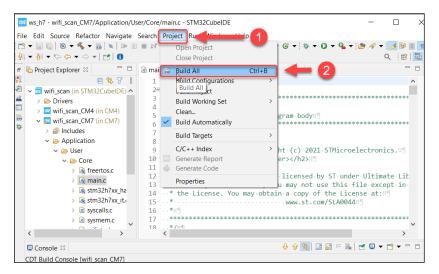




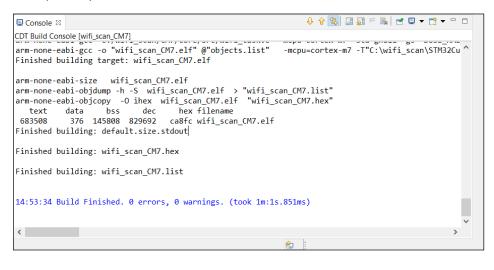
4.1.6 Build the project

The build step and expected output are illustrated here for each IDE.

4.1.6.1 STM32CubeIDE:

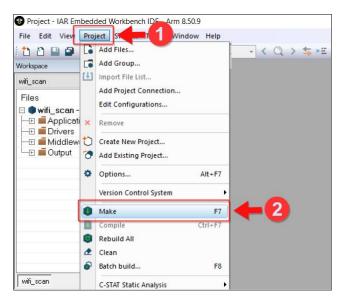


Example output from a successful build:

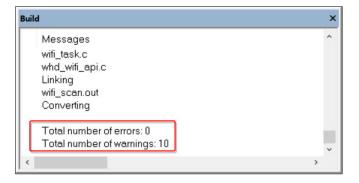




4.1.6.2 IAR EWARM:



The project should build without errors. There are 10 warnings in the lwIP library.



4.1.7 Project hardware setup

Refer to section <u>Hardware Setup</u>.

4.1.8 Terminal display

The terminal display is used by the application to provide status and network information.

You will need a terminal emulator such as Tera Term (<u>https://ttssh2.osdn.jp/index.html.en</u>) to display the output.

4.1.8.1 Serial terminal setup

The terminal interface is a virtual COM port which is part of the ST-LINK (CN2) USB connection. Terminal emulator configuration:

- Baud Rate: 115200
- Data Length: 8 Bits
- Stop Bit(s): 1
- Parity: None
- Flow control: None



Using example projects

4.1.8.2 **Example output**

* * * *	****** Wil	Fi-Scan app ******	* * * * * * * *	* * * *						
:	Insert CYW43xxx in	to microSD card slo	t							
Push blue button to continue										
(CYW43xxx detected									
(c4c) 1.34	4c7c CY) FWID 01-7	9301becWLAN CLM		: API: 18	pp 9 2020 01:22:10 vers: .2 Data: 9.10.0 Compile: . v1.93.0 : IAR 805000	r: 1.36.1 ClmImport				
#	S	SID	RSSI	Channel	MAC Address	Security				
1	Private		-72	11	1C:AF:F7:26:8D:A8	WPA2_MIXED_PSF				
2	Private		-73	11	74:DA:88:29:F2:27	WPA2_MIXED_PSK				

#	SSID	RSSI	Channel	MAC Address	Security
1 2	Private Private	-68 -73	11 11	74:DA:88:29:F2:27 1C:AF:F7:26:8D:A8	WPA2_MIXED_PSK WPA2_MIXED_PSK

4.2 Wi-Fi onboarding with Bluetooth[®] LE

This example uses the STM32H7 MCU to communicate with the CYW43xxx combo devices and control the Wi-Fi and Bluetooth[®] LE functionality. It uses Bluetooth[®] LE on the combo device to help connect the Wi-Fi to the AP.

In this example, Bluetooth[®] LE provides a mechanism for the device to connect to a Wi-Fi AP by providing the Wi-Fi SSID and password in a secure manner. The Wi-Fi credentials are stored in EEPROM so that the device can use this data upon reset to connect to an AP without requiring Bluetooth® LE intervention. Note that the data stored in the EEPROM is unencrypted.

The Wi-Fi SSID and password are exchanged using custom GATT service and characteristics. There is a third custom characteristic, which gives the command to connect and disconnect. The Wi-Fi password is write-only; the device needs to be paired before this characteristic can be written.

Bluetooth® LE GATT Custom Service This example uses custom GATT service and characteristics to communicate with the Bluetooth[®] LE GATT client. The files cycfg_gatt_db.c and cycfg_gatt_db.h contain the GATT DB.

The following custom characteristics are used in this example:

- Wi-Fi SSID: Provides the Wi-Fi SSID from Bluetooth® LE GATT client to the server. The maximum size is 32 as • Wi-Fi limits the SSID name to 32 characters.
- Wi-Fi Password: Provides the Wi-Fi password from the Bluetooth® LE GATT client to the server. The • minimum size is 8 because Wi-Fi encryption requires a minimum of 8 characters for password.
- Wi-Fi Connect: A Boolean characteristic that is used to connect and disconnect from the Wi-Fi AP. This has . a Client Characteristic Configuration Descriptor (CCCD) attached with it. Whenever there is a successful connection, it will send a notification value of 1 otherwise it will send a notification value of 0 if notifications are enabled.

4.2.1 Hardware

Refer to section the STM32 hardware configuration descriptions as appropriate:

Using STM32H747 DISCO Kit



4.2.2 Other software

This code example requires two devices: Host (Mobile Phone or PC) and a Target (STM32H747 DISCO Kit).

1. For the Host, download and install the AIROC[™] Bluetooth[®] Connect App for iOS or Android. Scan the following QR codes from your mobile phone to download the AIROC[™] Bluetooth[®] Connect App:



2. Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

4.2.3 **Project components**

The following are the components used in this project:

- Wifi/network-interface (configured as LWIP)
- Wifi/wifi-host-driver (WHD)
- Wifi/wcm
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities
- Wifi/LwIP
- Bluetooth/btstack
- Bluetooth/btstack-integration
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device (configured as CYW43012)

4.2.4 Example project start/import

You can open the Wi-Fi Onboarding with Bluetooth[®] LE example by copying the example from the Pack to an appropriate location:

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.3.0\Projects\ STM32H747I-DISCO\Applications\Bluetooth[®] LE_wifi_onboarding

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import</u>, <u>Generate code</u>, <u>Build the project</u>.

4.2.5 Project hardware setup

Refer to section <u>Hardware Setup</u>.



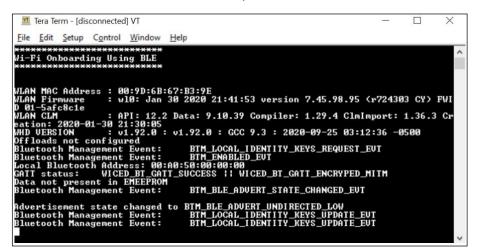
4.2.6 Operation

- 1. Connect the STM32H747 DISCO Kit to your PC.
- 2. Use your favorite serial terminal application and connect to the ST-LINK (CN2) COM port. Configure the terminal application to access the serial port using the following settings.

Baud rate: 115200 bps; Data: 8 bits; Parity: None; Stop: 1 bit; Flow control: None; New line for receive data: Line Feed (LF) or Auto setting.

3. Program the board.

After programming, the application starts automatically. Observe the messages on the UART terminal, and wait for the device to make all the required connections.

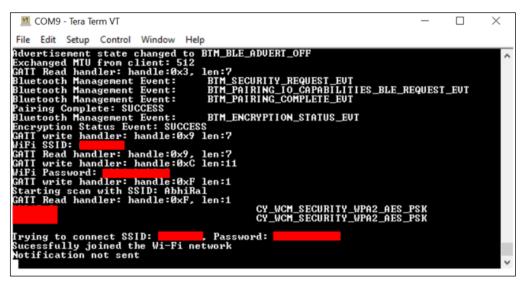


- 4. To test using the AIROC[™] Bluetooth[®] Connect App mobile app, do the following:
 - a. Turn ON Bluetooth[®] on your Android or iOS device.
 - b. Launch the app.
 - c. Press the reset switch on the kit to start sending advertisements.
 - d. Swipe down on the app home screen to start scanning for Bluetooth[®] LE Peripherals. Your device ("bleProv") appears in the app home screen. Select your device to establish a Bluetooth[®] LE connection.
 - e. Select the GATT DB Profile from the carousel view then select Unknown Service.
 - f. Select the attribute with the UUID ending in 63. In the ASCII field, type your Wi-Fi SSID in string format. Do the same for password UUID ending in 64) as described above.



	6:10 🗈		.al 😤 🐨		6:10 🖪	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		6:10 🗈	
	■ BLE Devices	<	Ξ		≡ Services	< 🗉 🕯		≡ GATT DB	< 🛛
	Pull down to	o refresh	\$				-	Services	
								Unknown Service	
	3D:F3:01:60:02:23		Not Paired					t	
	Android TV	RSSI:	Not Paired			GATT DB		Select Unknown Service	
	8C:5A:F8:E3:B0:EC	-71 (dBm						
Select your	bleProv 43:43:A1:12:1F:AC		Not Paired			GATT DB			
					,	†	1		
					S	elect GATT DB			
						pe across to see more profiles			
						house			
					6:10	al \$ ⊕ < ■		6:10	
					<	Details		< Characteristics	6
					Service Characteristic	Unknown Service	Select Characteristic	Properties : Read & Write	
				Write your SSID		· /0043-0031-4830-0916-	with UUID ending in 63	043-6b31-4a3d-b91e-025f	92ca976
				in the ASCII field	ASCII		ending in 05	Properties : Write	
					HEX		<u> </u>	043-6b31-4a3d-b91e-025f	92ca976
					Date			Properties : Read & Write & No	tify
					Time			043-6b31-4a3d-b91e-025f	92ca976
						Descriptors			
					Read	Write			

5. Select the attribute with the UUID ending in 65. Select **Notify**. Write hex value 1 to this characteristic to connect to the Wi-Fi network. If the connection is successful, then the server will send a notification with the value 1 or with the value 0.



Once the Wi-Fi SSID and password are provided by the client it is stored in the EEPROM. To delete this data the user needs to press the User Button.



4.3 Azure RTOS NetXDuo Wi-Fi UDP echo server

This application provides an example of Azure RTOS NetX/NetXDuo stack usage. It shows you how to develop a NetX UDP server to communicate with a remote client using the NetX UDP socket API.

This example demonstrates how an STM32H7 can be used to host CYW43xxx connectivity devices.

4.3.1 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate:

Using STM32H747 DISCO Kit

4.3.2 Other software

Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

Download <u>echotool</u> utility.

4.3.3 **Project components**

The following are the only components used in this project:

- Wifi/network-interface (configured as NetXDuo)
- Wifi/wifi-host-driver (WHD)
- Wifi/wcm
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities
- Bluetooth/btstack
- Bluetooth/btstack-integration
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the ThreadX kernel)
- Platform/device (configured as CYW43012)

4.3.4 Example project start/import

You can open this example by copying the example from the Pack to an appropriate location:

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.3.0\Projects\ STM32H747I-DISCO\Applications\wifi_netxduo

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import</u>, <u>Generate code</u>, <u>Build the project</u>.

4.3.5 Project hardware setup

• Refer to section <u>Hardware Setup</u>.



4.3.6 Operation

- 1. Connect the board to your PC using the provided USB cable through the ST-Link USB connector.
- 2. Modify the WIFI_SSID and WIFI_PASSWORD macros in *Application/User/NetXDuo/console_task.c* to match with those of the Wi-Fi network that you want to connect to.
- 3. Update the DEFAULT_PORT macro in Application/User/NetXDuo/console_task.c.
- 4. Open a terminal program and select the **ST-Link COM** port. Set the serial port parameters to 8N1 and 115200 baud.
- 5. Program the board using STM32CubeIDE or EWARM.

After programming, the application starts automatically. Observe the messages on the UART terminal, and wait for the device to make the required connections.

6. Run the <u>echotool</u> utility on a windows console as following:

```
# echotool.exe <board IP address> /p udp /r <DEFAULT_PORT> /n 10 /d "Hello
World"
```

Example usage:

echotool.exe 192.168.1.2 /p udp /r 6000 /n 10 /d "Hello World"

4.4 Bluetooth[®] LE Hello Sensor

This code example demonstrates the implementation of a simple Bluetooth[®] Stack functionality in GAP Peripheral role. During initialization the app registers with LE stack to receive various notifications including bonding complete, connection status change and peer write. Peer device can also write to the client configuration descriptor of the notification characteristic.

4.4.1 Features demonstrated

- GATT database and Device configuration initialization
- Registration with LE stack for various events
- Sending data to the client
- Processing write requests from the client

4.4.2 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate:

Using STM32H747 DISCO Kit



4.4.3 Other Software

This code example requires two devices: Host (Mobile Phone or PC) and a Target (STM32H747 DISCO Kit).

1. For the Host, download and install the AIROC[™] Bluetooth[®] Connect App for iOS or Android. Scan the following QR codes from your mobile phone to download the AIROC[™] Bluetooth[®] Connect App:



2. Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

4.4.4 **Project Components**

The following are the only components used in this project:

- Bluetooth/btstack
- Bluetooth/bluetooth-freertos
- Platform/pal
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device
- connectivity-utilities
- pal (minimum interface to ST HAL to enable connectivity)

4.4.5 Example Project Start/Import

You can open the Bluetooth[®] Hello Sensor example by copying the example from the Pack to an appropriate location:

```
C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.1.0\Projects\
STM32H747I-DISCO\Applications\BLE_hello_sensor
```

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import</u>, <u>Generate code</u>, <u>Build the project</u>.

4.4.6 Project Hardware Setup

Refer to section <u>Hardware Setup</u>.

4.4.7 Operation

- 1. Connect the STM32H747 DISCO Kit to your PC.
- 2. Use your favorite serial terminal application and connect to the ST-LINK (CN2) COM port. Configure the terminal application to access the serial port using the following settings.



Baud rate: 115200 bps; Data: 8 bits; Parity : None; Stop : 1 bit; Flow control : None; New line for receive data : Line Feed(LF) or Auto setting

- 3. Program the board.
- 4. After programming, the application starts automatically. Observe the messages on the UART terminal. Use the ST-LINK (CN2) COM port to view the Bluetooth[®] stack and application trace messages in the terminal window as shown below:

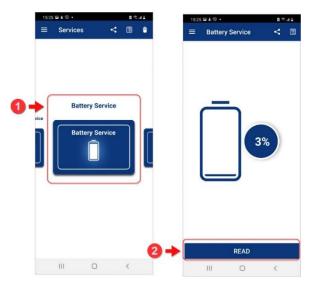
```
[0] Hello Sensor Start
[0] wiced_bt_stack_init()
[515] bt_post_reset_cback()
[515] bt_post_reset_cback(): Change baudrate (300000) for FW downloading
[516] bt_update_controller_baudrate(): 300000
[521] bt_baudrate_updated_cback(): Baudrate is updated for FW downloading
[522] bt_update_platform_baudrate(): 3000000
[722] bt_start_fw_download(): FW ver = [1428] bt_patch_download_complete_cback():
status=1
[1428] bt_fw_download_complete_cback(): Reset baudrate to 115200
[1429] bt_update_platform_baudrate(): 115200
[1630] bt_fw_download_complete_cback(): Changing baudrate to 3000000
[1630] bt_update_controller_baudrate(): 3000000
[2065] bt_baudrate_updated_cback(): Baudrate is updated for feature
```

- 5. To test using the mobile app, do the following:
 - a. Turn ON Bluetooth[®] on your Android or iOS device.
 - b. Launch the app on your Phone.
 - c. Swipe down on the app home screen to start scanning for Bluetooth[®] LE Peripherals; your device ("hello") appears in the app home screen. Select your device to establish a Bluetooth[®] LE connection.

SCANNER	_	PAIRED
hello	RSSI:	NOT PAIRED
E8:E8:B7:9F:CC:05	-36	dBm
Unknown device		NOT PAIRED
[TV] Samsung 080 Series		NOT PAIRED
[TV] Samsung 070 Series		NOT PAIRED
Habaaum		NATIONNED
111	0	<

- d. Read Battery.
 - Select the 'Battery' Profile from the carousel view.
 - Press Read button.





e. Enable Sensor notification/indication as shown in the following images.

		≣m≓•	8 NI 18-14 B		12:51 🖬 🗏 m 🔸	白州市。		12:52 🖼 📑 m 🔸	2 N 75 # 1		12:53 🖬 🖬 m 🔸		8 N N A L
	=	Services K	: •		≡ GATT DB	*		≡ GATT DB	< 🗉	a	≡ GATT	DB	< 🗉
					Se	rvices		< Characte	ristics		<	Details	
				2→	Unknown Ser	vice	_ 3→	Properties : Read & I			Service Characteristic	Unknown	2d3f-5cb9-4
					Device Inform	ation Service		8ac32d3f-5cb9-4d	144-bec2-ee68		ASCII	Hello 1	
0-		GATT DB			Battery Servic	e		Properties : Read & V			HEX	48656c6c6f2	031
		GATT DB						5e9bf2a8-f93f-448	81-a67e-3b2f4a		Date	31 6ep. 202	21
											Time	12:53 11 18	19
		★)											DESCRIPTORS
	L												Stop
											Read	Notify	Indicate
		III O	<		III	0 <		III O	<		111	0	<

The notification "Hello **N**" appears every 10 seconds.

f. Read / Write the Sensor characteristic.

12:51 ■ m ♥ • 2 ×1 *	12:51 22 mm ▲ NI TO ALB ■ GATT DB < 33	12:52 ■ ■ m • ● N % # 8 ■ GATT DB < 18	12:53 ₩ 2 m • 2 N % 4 8
ATT DB GATT DB GATT DB SATT DB Satt DB Satt DB Satt DB	Services Unknown Service Device Information Service Battery Service	Characteristics Properties : Read & Indicate Bac32d3f-5cb9-4d44-bec2-ee685 Properties : Read & Write Se9bf2a8-f93f-4481-a67e-3b2f4;	Characteristic : Unknown Service Characteristic : (4481-a67e-3b2f4a0) ASCII
III O <	III O <	III O <	III O <

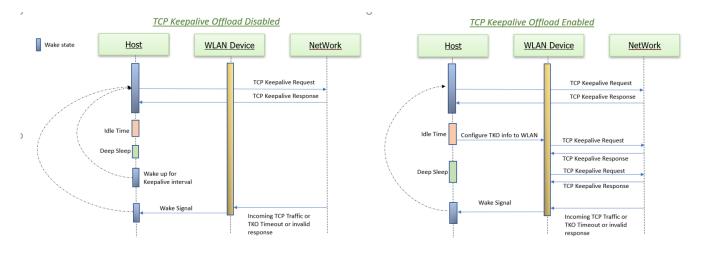


4.5 Wi-Fi TCP keepalive offload

The TCP keepalive offload part of the Low Power Assistant (LPA) improves the power consumption of your connected system by reducing the time the Host needs to stay awake to support the TCP keepalive request. This example describes how to enable TCP keepalive offload and configure four different sockets for TCP keepalive that can be incorporated into your project from LPA middleware.

TCP keepalive maintains idle TCP connections by periodically passing packets between the client and server. If either the client or server does not respond to a packet, the connection is considered inactive and is terminated. This helps in pruning dead connections. Typically, TCP keepalives are sent every 45 or 60 seconds on an idle TCP connection, and the connection is dropped after 3 sequential ACKs are missed. This means the Host MCU has to wake up periodically to send a TCP keepalive packet to maintain the TCP connection during idle state.

TCP keepalive offload helps in moving this functionality to WLAN firmware so that the Host MCU does not need to wake up periodically to send/receive TCP keepalive packets. This functionality is offloaded only when the Host MCU goes to sleep and the network stack is suspended.



4.5.1 Hardware

Refer to section the STM32 hardware configuration descriptions as appropriate:

• Using STM32H747 DISCO Kit

4.5.2 Other software

Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

4.5.3 **Project components**

The following are the components used in this project:

- Wifi/network-interface (configured as LWIP)
- Wifi/wifi-host-driver (WHD)
- Wifi/wcm
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities



- Wifi/secure-sockets
- Wifi/LwIP
- Wifi/mbedtls
- Wifi/lpa
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device (configured as CYW43012)
- Platform/module(configured as MURATA-1V)

4.5.4 Example project start/import

You can open the Wi-Fi TCP keepalive offload example by copying the example from the Pack to an appropriate location:

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.4.0\Projects\ STM32H747I-DISCO\Applications\wifi_tko

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps described in the <u>Wi-Fi Scan</u> section (sections 4.1.4 - 4.1.6).

4.5.5 Project hardware setup

Refer to section <u>Hardware Setup</u>.

4.5.6 Operation

- 1. Connect the STM32H747 DISCO Kit to your PC.
- 2. Open **app_config.h** and modify the **WIFI_SSID**, **WIFI_PASSWORD**, and **WIFI_SECURITY_TYPE** macros to match the Wi-Fi network credentials that you want to connect to. All possible security types are defined in the cy_wcm_security_t structure in cy_wcm.h file.
- 3. Ensure that your computer is connected to the same Wi-Fi access point (AP) that you configured in Step 2 and Setup a TCP server and the server starts listening for incoming TCP connections.
- 4. Open a **cycfg_connectivity_wifi.c** and modify cy_tko_ol_cfg_0, ports, remote_port and remote_ip to match the TCP server that be set up on your computer;
- 5. Use your favorite serial terminal application and connect to the ST-LINK (CN2) COM port. Configure the terminal application to access the serial port using the following settings.

Baud rate: 115200 bps; Data: 8 bits; Parity: None; Stop: 1 bit; Flow control: None; New line for receive data: Line Feed (LF) or Auto setting

6. Program the board.

Note: For dual cores MCU (e.g STM32H7) the both cores must be programmed.

7. After programming, the application starts automatically. Observe the messages on the UART terminal, and wait for the device to make all the required connections. application trace messages in the terminal window as shown:

WLAN MAC Address : 00:A0:50:45:13:81



```
WLAN Firmware : wl0: Apr 12 2022 20:39:36 version 13.10.271.287 (760d561 CY) FWID 01-b438e2a0
WLAN CLM
              : API: 18.2 Data: 9.10.0 Compiler: 1.36.1 ClmImport: 1.34.1 Creation: 2021-04-26
04:01:15
WHD VERSION
               : v2.4.0 : v2.4.0 : GCC 10.3 : 2022-08-04 17:12:02 +0800
Info: Wi-Fi initialization is successful
Info: Join to AP: SM9500
Info: Successfully joined wifi network SM9500
Info: Assigned IP address: 192.168.43.124
Info: Taking TCP Keepalive configuration from the Generated sources.
Info: Socket[0]: Created connection to IP 192.168.43.228, local port 3353, remote port 3360
Info: Skipped TCP socket connection for socket id[1]. Check the TCP Keepalive configuration.
Info: Skipped TCP socket connection for socket id[2]. Check the TCP Keepalive configuration.
Info: Skipped TCP socket connection for socket id[3]. Check the TCP Keepalive configuration.
whd tko toggle: Successfully enabled
Network Stack Suspended, MCU will enter DeepSleep power mode
Resuming Network Stack, Network stack was suspended for 31867ms
------
WHD Stats..
tx total:73, rx total:74, tx no mem:0, rx no mem:0
tx fail:0, no credit:0, flow control:0
Bus Stats..
cmd52:2430, cmd53_read:393, cmd53_write:596
cmd52 fail:7, cmd53 read fail:0, cmd53 write fail:0
oob intrs:0, sdio intrs:484, error intrs:0, read aborts:0
Network is active. Resuming network stack
```

whd_tko_toggle: Successfully disabled
whd_tko_toggle: Successfully enabled

Network Stack Suspended, MCU will enter DeepSleep power mode Resuming Network Stack, Network stack was suspended for 4142ms



5 Manufacture tools

The following manufacture tool projects are included in the pack:

- <u>Tester Wi-Fi Bluetooth® Console</u>
- WLAN manufacturing test application (Wifi-Mfg-Tester) for FreeRTOS
- Bluetooth[®] Manufacturing Test Application for FreeRTOS

5.1 Tester - Wi-Fi Bluetooth[®] Console

This application integrates the command console library including Wi-Fi iPerf and Bluetooth[®] Low Energy functionality. You can use this application to characterize the Wi-Fi/Bluetooth[®] LE functionality and performance.

This example demonstrates how an STM32H7 can be used to host CYW43xxx connectivity devices.

5.1.1 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate:

Using STM32H747 DISCO Kit

5.1.2 Other software

Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

Setting up iPerf on the host:

- iPerf 2.0.13 (supported on Ubuntu, macOS, and Windows)
- Go to the iPerf installation directory and launch the terminal (command prompt for Windows, terminal shell for macOS or Ubuntu).

5.1.3 Project components

The following are the only components used in this project:

- Wifi/network-interface (configured as LWIP)
- Wifi/wifi-host-driver (WHD)
- Wifi/wcm
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities
- Wifi/secure-sockets
- Wifi/LwIP
- Bluetooth/btstack
- Bluetooth/btstack-integration
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device (configured as CYW43012)
- MfgTools/command-console



5.1.4 Example project start/import

You can open this example by copying the example from the Pack to an appropriate location:

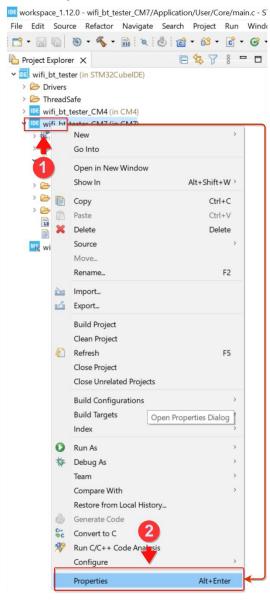
C:*Users**STM32Cube**Repository**Packs**Infineon**Connectivity*-*STM32**1.3.0**Projects*\ *STM32H747I-DISCO**Applications**wifi_bt_tester*

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import, Generate code</u>, <u>Build the project</u>.

Also check in your project workspace that **MCU Settings** and **Preprocessor** are configured correctly.

Open Properties

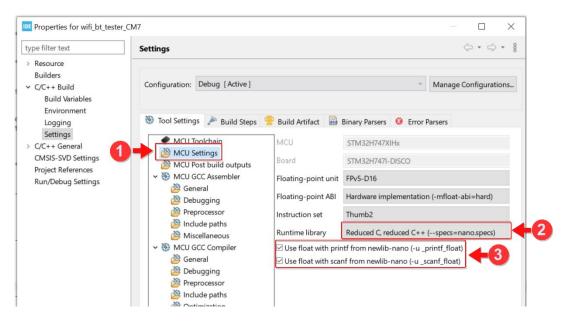
- 1. Right-click on a project.
- 2. Select Properties





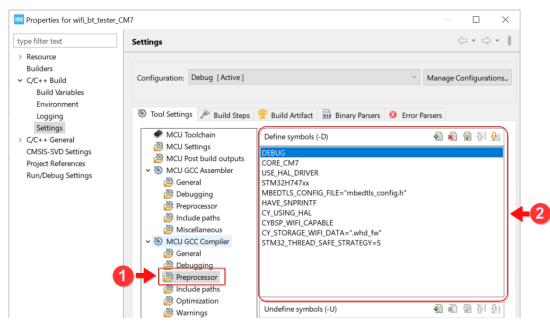
MCU Settings

- 1. In project Properties select C/C++ Build > Settings > MCU Settings.
- 2. Check Runtime library should be Reduced C, reduced C++ (--specs=nano.specs)
- 3. Set tick for Use float with printf and Use float with scanf



Preprocessor

- 1. In project Properties, select C/C++ Build > Settings > MCU GCC Compiler > Preprocessor .
- 2. Check if these defines exist:
 - HAVE_SNPRINTF
 - CY_USING_HAL
 - CYBSP_WIFI_CAPABLE
 - CY_STORAGE_WIFI_DATA=".whd_fw"





5.1.5 Project hardware setup

Refer to section <u>Hardware Setup</u>.

5.1.6 Operation

- 1. Connect the board to your PC using the provided USB cable through the ST-Link USB connector.
- 2. Modify the **WIFI_SSID** and **WIFI_KEY** macros in *Application/User/Core/console_task.c* to match with those of the Wi-Fi network that you want to connect to.
- 3. To join a Wi-Fi network of a specific band, update the **WIFI_BAND** macro in *Application/User/Core/console_task.c* as follows:

CY_WCM_WIFI_BAND_2_4GHZ: 2.4-GHz band CY_WCM_WIFI_BAND_5GHZ: 5-GHz band

- 4. Configure the TCP window size in iPerf before building the application. See the command console library's <u>README.md</u> for instructions on how to configure the TCP window size.
- 5. Open a terminal program and select the ST-Link COM port. Set the serial port parameters to 8N1 and 115200 baud.
- 6. Program the board using STM32CubeIDE or EWARM. After programming, the application starts automatically. Observe the messages on the UART terminal, and wait for the device to make the required connections.
- 7. The application connects to the configured Wi-Fi access point (AP) and obtains the IP address. When the device is ready, the > prompt appears.
- 8. Run iPerf commands (client and server) against a remote peer device.
 - See <u>Running iPerf client and server against a remote peer device</u>.
- 9. Run Bluetooth[®] LE commands against a remote peer device.

5.1.7 Serial terminal setup

The terminal interface is a virtual COM port which is part of the ST-LINK (CN2) USB connection.

Terminal emulator configuration:

- Baud Rate: 115200
- Data Length: 8 Bits
- Stop Bit(s): 1
- Parity: None
- Flow control: None



5.1.8 Example output

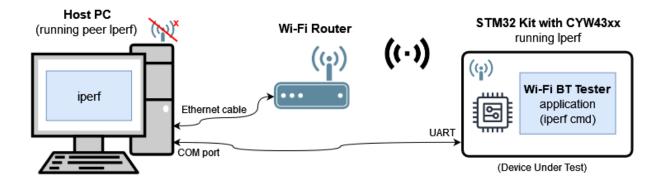
💆 COM3 - Tera Term VT					_	\times
File Edit Setup Control	Window Help					
Command console appl	ication					
WLAN MAC Address : J MLAN Firmware : u WLAN CLM : f WHD VERSION : u WCM Initialized Successfully joined IP Address executing command_co	10: Apr 12 2022 PI: 18.2 Data: 9 2.4.0 : v2.4.0 wifi network ' assigned	20:39:36 v 2.10.0 Comp : GCC 10.3 , res	ersion 1 iler: 1. : 2022-0 ult = 0'	3.10.271.287 (760d561 CY) FWID 01-b438e2a0 36.1 ClmImport: 1.34.1 Creation: 2021-04-26 04:01:15 7-01 13:23:51 +0300		
> Wi-Fi module init:	alized					
> scan #### Scan Results ##	##					
SSID > ##### Scan Results EF	Security Type wpa2 wpa2_aes wpa2_aes wpa2_aes wpa2 D #####	RSSI(dBm) -42 -82 -66 -84 -54	Channe 1 11 4 4 5 36	BSSID 8C:DE:F9:C2:98:CC B0:BE:76:A6:AF:95 6C:3B:6B:F4:BC:B3 84:D8:1B:27:EB:8A 8C:DE:F9:C2:98:CD		
> []						

5.1.9 iPerf measurement

iPerf commands are used for measuring the Wi-Fi performance/throughput. The iperf tool sends TCP/UDP data between two peer devices to compute the Wi-Fi performance/throughput.

5.1.9.1 iPerf setup

The following diagram shows the exact setup that should be used for measuring the Wi-Fi performance/throughput of a STM32 device using iperf.



5.1.9.2 iPerf commands for Wi-Fi throughput measurement

Enter the following commands on the STM32 device (DUT) after the device boots up and connects to the Wi-Fi network. This section provides only the commands to be run on the DUT. When the 'client *iperf* command' runs on the DUT, the 'server *iperf* command' should run on the host PC (as shown in the iPerf Setup diagram), and vice versa.

1. Start iPerf as a TCP server:

```
iperf -s
```

Note: On the peer iPerf device (host PC), start iPerf as a TCP client to send the TCP data.

2. Start iPerf as a TCP client:

User guide

AIROC[™] Wi-Fi/Bluetooth[®] STM32 Expansion pack user guide



Manufacture tools

iperf -c <server_ip_addr> -t <time in sec>
Sample command:
iperf -c 192.168.0.100 -t 60

Note: On the peer iPerf device (host PC), start iPerf as a TCP server.

3. Start iPerf as a UDP server:

```
iperf -s -u
```

Note: On the peer iPerf device (host PC), start iPerf as a UDP client to send the UDP data.

4. Start iPerf as a UDP client:

iperf -c <server_ip_addr> -t <time in sec> -u -b <band width>
Sample command:
iperf -c 192.168.0.100 -t 60 -u -b 50M

Note: On the peer iPerf device (host PC), start iPerf as a UDP server.



5.1.9.3 Results

STM32H747 DISCO + CYW43012

	Through	put, Mbit/s	Command		
TCP/ UDP	2.4G	5G	Command		
ΤСΡ ΤΧ	TX 35.3 42.7		iperf -c <ip> -t 60</ip>		
TCP RX	35.7	39.2	iperf -s		
UDP TX	52.4	52.4	iperf -c <ip> -t 60 -u -b 50M</ip>		
UDP RX	50.0	50.0	iperf -s -u		

Test configuration: Iperf app run on STM32H747 CM7/400Mhz, GCC, Wi-Fi router: Asus RT-AX56U.

STM32L5-DK + CYW43012

TCP/ UPD	Through	put, Mbit/s	Command
	2.4G	5G	Command
TCP TX	20.2 20.5		iperf -c <ip> -t 60</ip>
TCP RX	20.6	20.8	iperf -s
UDP TX	31.0	31.1	iperf -c <ip> -t 60 -u -b 50M</ip>
UDP RX	25.7	24.7	iperf -s -u

Test configuration: Iperf app run on STM32L5 CM33/110Mhz, GCC, Wi-Fi router: Asus RT-AX56U.

STM32U575I-EV + CYW43012

	Through	put, Mbit/s	Command
TCP/ UPD	2.4G	5G	Command
TCP TX	26.5	27.4	iperf -c <ip> -t 60</ip>
TCP RX	25.3	26.1	iperf -s
UDP TX	36.5	36.6	iperf -c <ip> -t 60 -u -b 50M</ip>
UDP RX	33.8	33.9	iperf -s -u

Test configuration: Iperf app run on STM32U5 CM33/160Mhz, GCC, Wi-Fi router: Asus RT-AX56U.

STM32H747 DISCO + CYW43022

	Through	put, Mbit/s	Command
TCP/ UDP	2.4G	5G	Command
ΤСΡ ΤΧ	32,6 36,9		iperf -c <ip> -t 60 -i 10</ip>
TCP RX	33,4	37,1	iperf -s
UDP TX	52,1	52,2	iperf -c <ip> -t 60 -u -b 80M</ip>
UDP RX	57,3	64,9	iperf -s -u

Test configuration: Iperf app run on STM32H747 CM7/400Mhz, GCC, Wi-Fi router: NEC Aterm WX7800 (11ax).

STM32H747 DISCO + CYW55500

	Through	put, Mbit/s	Command
TCP/ UDP	2.4G	5G	Command
ТСР ТХ	44,7	48,7	iperf -c <ip> -t 60 -i 10</ip>



TCP/ UDP	Through	put, Mbit/s	Command
	2.4G	5G	Command
TCP RX	30,1	39,3	iperf -s
UDP TX	78,8	80	iperf -c <ip> -t 60 -u -b 80M</ip>
UDP RX 62,3		63,7	iperf -s -u

Test configuration: Iperf app run on STM32H747 CM7/400Mhz, GCC, Wi-Fi router: NEC Aterm WX7800 (11ax).

STM32H747 DISCO + CYW555572

TCP/ UDP	Through	put, Mbit/s	Commond
	2.4G	5G	Command
ΤСΡ ΤΧ	53,4 57,1		iperf -c <ip> -t 60 -i 10</ip>
TCP RX	37,5	40,3	iperf -s
UDP TX	82,9	83,1	iperf -c <ip> -t 60 -u -b 80M</ip>
UDP RX	64,8	64,8	iperf -s -u

Test configuration: Iperf app run on STM32H747 CM7/400Mhz, GCC, Wi-Fi router: NEC Aterm WX7800 (11ax).

5.2 WLAN manufacturing test application (Wifi-Mfg-Tester) for FreeRTOS

The Wifi-Mfg-Tester is used to validate the WLAN firmware and radio performance of Wi-Fi chips.

The Wifi-Mfg-Tester acts as a transport layer between the host "wl tool" and the WLAN firmware. It receives the commands from the wl tool and forwards them to the WLAN firmware using IOVAR/IOCTL commands. The Tester also relays the response received back from the WLAN firmware.

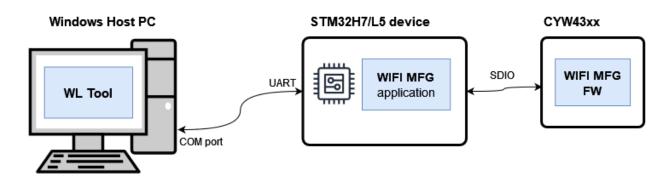
The wl tool binaries for testing the WLAN firmware are also included in this application repository.

This example demonstrates how an STM32H7 can be used to host CYW43xxx connectivity devices.

5.2.1 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate: <u>Using STM32H747</u> <u>DISCO Kit</u>

Test setup is shown below:





5.2.2 Other software

Install a terminal emulator if you don't have one. Instructions in this document use <u>Tera Term</u>.

This application requires the WL tool running on a Windows PC. The pre-built executables for the WL tool are available in the *wl-tool-bin*.

5.2.3 Project components

The following list shows the only components used in this project:

- Wifi/wcm
- Wifi/wifi-mw-core
- Wifi/wifi-host-driver (WHD)
- Wifi/whd-bsp-integration
- Wifi/connectivity-utilities
- Wifi/LwIP
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device
- MfgTools/wifi-mfg-test

5.2.4 Example project start/import

You can open the example by copying this example from the Pack to an appropriate location:

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.1.0\Projects\ STM32H747I-DISCO\Applications\wifi_mfg_tester

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import</u>, <u>Generate code</u>, <u>Build the project</u>.

5.2.5 Project hardware setup

Refer to section <u>Hardware Setup</u>.

5.2.6 Operation

- 1. Go to the WL tool directory:
 - # cd wl-tool-bin
- 2. Reset the board by pressing the Reset button.
- 3. Run the command on Windows host for the WLAN chip on the target board:

wl43012C0.exe --serial <port> ver

```
For example:
#w143012C0.exe --serial 5 ver
cmd resp: 7/19/2017 build 0
w10: Jan 11 2022 21:32:24 version 13.10.271.280 (c32ff79 CY WLTEST) FWID 01-
3566e923
```



4. Observe the output of the command.

The list of WL commands which can be retrieved by typing --help. Partial output of the command and display is as follows:

wl43012C0.exe --serial 5 -help Usage: wl43012C0.exe [-a|i <adapter>] [-h] [-d|u|x] <command> [arguments] this message and command descriptions -h -h [cmd] command description for cmd -a, -i adapter name or number -d output format signed integer output format unsigned integer -u output format hexadecimal -x get version information ver generate a short list of available commands cmds ioctl echo check ioctl functionality reinitialize and mark adapter up (operational) up reset and mark adapter down (disabled) down mark adapter down but do not reset hardware(disabled) out On dual-band cards, cards must be band-locked before use.



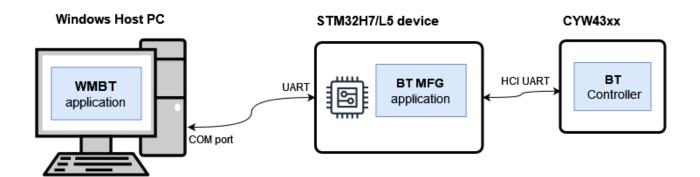
5.3 Bluetooth[®] Manufacturing Test Application for FreeRTOS

The Bluetooth[®] Manufacturing Test Application is used to validate the Bluetooth[®] Firmware and RF performance of Cypress SoC Bluetooth[®] BR/EDR/LE devices.

The Bluetooth[®] MFG Application acts as a transport layer between the host "WMBT tool" and Bluetooth[®] Firmware. Mfg Test Application receive commands from the WMBT tool and forwards them to the Bluetooth[®] firmware. The Bluetooth[®] MFG Application also relays the response received back from Bluetooth[®] firmware.

This example demonstrates how an STM32H7 can be used to host CYW43xxx connectivity devices.

Test setup is shown below:



5.3.1 Hardware

Refer to the section on the STM32 hardware configuration descriptions as appropriate:

<u>Using STM32H747 DISCO Kit</u>

5.3.2 Other software

- This application requires the WMBT Tool running on a windows PC and uses a UART port for communication with the target. The pre-built executables for the WMBT Tool are available in *bt_mfg_tester/wmbt-tool-bin* directory, which sync from <u>btsdk-utils</u>. The user guide is in <u>Bluetooth®</u> <u>Manufacturing Test Tool</u>.
- Use the IQxel tool as a transmitter to send a fixed count test packet to ensure whatever is sent from the transmitter is received without any error.
- Use a Sniffer to ensure that whatever is included in the test packet is in same transmit channel, packet length and data patterns from the transmitter. Better to test it in the shield room to avoid air interference.

5.3.3 Project components

The following are the only components used in this project:

- Bluetooth/btstack
- Bluetooth/btstack-integration
- Platform/pal (PAL, HAL, core-lib)
- Platform/abstraction-rtos (configured for the FreeRTOS kernel)
- Platform/device (configured as CYW43012)



5.3.4 Example project start/import

You can open the example by copying this example from the Pack to an appropriate location:

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.3.0\Projects\ STM32H747I-DISCO\Applications\bt_mfg_tester

Once you have copied the example, you can then open it in STM32CubeMX and export to your IDE using the steps from the Wi-Fi Scan example: <u>Example project start/import</u>, <u>Generate code</u>, <u>Build the project</u>.

5.3.5 Project hardware setup

Refer to section <u>Hardware Setup</u>.

5.3.6 Operation

- 1. Go to WMBT tool directory
- 2. Reset the Board by pressing Reset button
- 3. Run the command on Windows Host for the proper BT Chip on target board.
- 4. Observe the output of the command

List of wmbt commands with Bluetooth[®] LE function which can be retrieved by typing --help Partial output of the command and display is below.

wmbt reset COMx

5.3.6.1 Example output

wmbt.exe reset COM5 cmd resp: MBT_BAUD_RATE: 115200 TRANSPORT_MODE: 0 (HCI) Opened COM5 at speed: 115200 Close Serial Bus Opened COM5 at speed: 115200 Sending HCI Command: 0000 < 01 03 0C 00 > Received HCI Event: 0000 < 04 0E 04 01 03 0C 00 > Success Close Serial Bus



6 Special options and setup

6.1 STM32H7xx – using serial flash

There may be a need for extra internal Flash space when running applications on STM32H7xx. A significant amount of internal Flash can be saved if the Wi-Fi stack is placed on an external Serial Flash memory module. The STM32H747I-DISCO board has MT25QL512ABB8ESF-0SIT memory IC present for this purpose.

- STM32H747I-DISCO has serial Flash in dual-bank Quad-SPI mode
- STM32H7 has QSPI HW block

Additional settings are needed to enable placing the Wi-Fi stack firmware on external memory:

1. Linker script (*.ld) has external memory address defined:

QSPI (rx) : ORIGIN = 0x90000000, LENGTH = 131072K

2. Linker script has section name defined where Wi-Fi stack will be located during linkage:

```
.whd_fw :
{
    whd_fw_start = .;
    KEEP(*(.whd_fw))
    _whd_fw_end = .;
} > OSPI
```

3. Preprocessor macro name added:

CY_STORAGE_WIFI_DATA=".whd_fw"

```
BSP-files have to be added:
BSP\stm32h747i_discovery_qspi.c
BSP\stm32h747i_discovery_qspi.h
BSP\Components\mt25tl01g\mt25tl01g.c(*.h)
BSP\Components\mt25tl01g\mt25tl01g.c(*.h)
BSP\Components\mt25tl01g\mt25tl01g conf.h
```

4. BSP Initialization routine call have to be added:

```
/* Configure External Memory to Memory Mapped Mode*/
/* QSPI info structure */
BSP QSPI Info t pQSPI Info;
uint8 t status;
/* QSPI device configuration */
BSP QSPI Init t init ;
init.InterfaceMode=MT25TL01G QPI MODE;
init.TransferRate= MT25TL01G DTR TRANSFER ;
init.DualFlashMode= MT25TL01G DUALFLASH ENABLE;
status = BSP QSPI Init(0,&init);
if (status != BSP ERROR NONE)
{
    printf("\r\n
                 ERROR: BSP QSPI Init() failed \r\n");
    Error Handler();
}
/* Initialize the structure */
pQSPI Info.FlashSize
                       = (uint32 t)0x00;
pQSPI Info.EraseSectorSize = (uint32 t) 0x00;
pQSPI Info.EraseSectorsNumber = (uint32 t)0x00;
                   = (uint32 t)0x00;
pQSPI Info.ProgPageSize
```



5. Programming of the Serial Flash should be performed with appropriate Flash Loader selection:

Debug Configurations				- 0 ×
Create, manage, and run configurations				- (
🗅 🖻 🕫 🗰 🗶 🖻 🏹 •	Name: wifi_scan_CM7]
Image: Section 1 Type filter ted Sock + Application CC++ Application CC++ Reprivation CC++ Reprivation CC++ Reprivation CC++ Reprivation CC++ Reprivation Image: Section 2 Image: Section 2	Name wiff, scan, CM7 Main \$P Debugger Processing Source Common Processing Debug in low power modes: Inable Suspend watchdog counters while haited No configuration Cores flagger interface (C1) Cores flagger interface (C1) Cores flagger interface (C1) Core Clock OH1 in core Sarial Wire Viewer (SWV) Enable Core Clock OH1 in core Signal hait events to other cores Main Pot number 61235 Enable Looder Joader Looder	Enabled Initialize	RDS Kernel Awareness Content RDS Process Driver Streads Driver Streads Port context,m0 Port context,m0 Port number 20000	Add Edil Remove
Filter matched 9 of 11 items				Revert Apply
0				Debug Close
External Loader Add External Loader Select the external loader to add to th External Loader: M1251L01G_STM32H7 Enabled Initialize		X File system		

Note: External flash (MT25QL512ABB8ESF) requires 3.3 V for normal operation.

OK

6.2 STM32H7xx – using internal flash (BANK2) to store Wi-Fi FW

The internal flash space on STM32H7xx is divided into two banks: BANK1 (1M) is used for CM7, BANK2 (1M) is used for CM4. The steps to reuse part of BANK2 to store Wi-Fi firmware images:

Cancel

1. Update the linker script (*.ld):

a. Add WIFI_FLASH memory definition to the MEMORY section of the linker script:

```
WIFI_FLASH (rx) : ORIGIN = 0x08140000, LENGTH = 768K /* ORIGIN address of
BANK2 (0x08100000) with 768K offset */
```

?



b. Define the whd_fw section where the Wi-Fi FW will be located during linkage:

```
.whd_fw :
{
    whd_fw_start = .;
    KEEP(*(.whd_fw))
    whd_fw_end = .;
    >WIFI_FLASH
```

2. Add the reprocessor macro name:

```
CY_STORAGE_WIFI_DATA=".whd_fw"
```

6.3 STM32L562 – using serial flash

The Wi-Fi application can't fit STM32L5x internal flash due to size constraints. MCU has 512kB of area when connectivity firmware reaches over 1MB.

To resolve this external memory module is used, present on STM32L562E-DK board.

The project has the following additional settings made to enable placing WiFi stack firmware on external memory:

1. Linker script (*.ld) has external memory address defined:

```
OSPI(rx) : ORIGIN = 0x90000000, LENGTH = 65536K
```

2. Linker script has section name defined where WiFi stack will be located during linkage:

```
.whd_fw :
{
    whd_fw_start = .;
    KEEP(*(.whd_fw))
    _whd_fw_end = .;
} > OSPI
```

3. Preprocessor macro name added:

CY_STORAGE_WIFI_DATA=".whd_fw"

With given setup, the compiler and linker will split a resulting image into two pieces, which will reside in both – internal and external memory of an STM32L562E-DK.

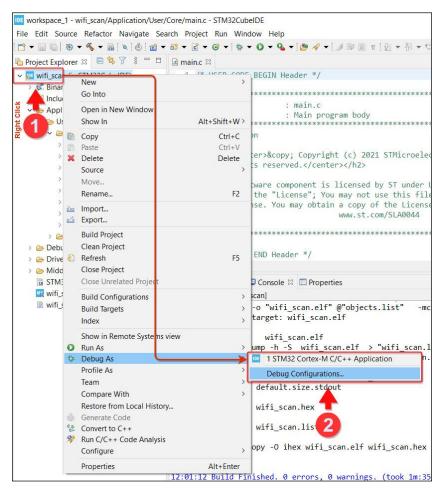


6.4 STM32L562 – serial flash programming

6.4.1 Using STM32CubeMX IDE

To program resulting image into the target device an appropriate Flash loader has to be selected:

Right-click on a project, select **Debug As > Debug Configurations...**





Select the external loader (see steps illustrated in the following image).

- Select "wifi_scan Debug" and select the **Debugger** tab.
- Scroll down and find the External Loader.
- Click Add button to add external loader.

10 🕅 🗶 🖻 🍸 👻	Name: wifi_scan Debug		
e filter text	Main Debugger Startup Source Common		
C/C++ Application	Access por 0 - Cortex-M33	~	
C/C++ Postmortem Debugger	Reset behavour		
C/C++ Remote Application	Type: C 2 under reset ~		
Launch Group	Device settings		
STM32 C/C++ Application	Debug in low power modes: No configuration		
uifi_scan Debug	Suspend watchdog counters while halted: No configuration		
≜	Serial Wire Viewer (SWV)	RTOS Kernel Awareness	
<u>Ā</u>	Enable	Enable RTOS Proxy	
	Core Clock (MHz): 110.0	Driver settings	
	Limit SWO clock	Driver: ThreadX	
	Maximum SWO dock (kHz): auto detect Port number: 61235	Port: cortex_m0	
	Port number: 01235	Port number: 60000	
	External loaders		
	Loader Enabled Initialize		4 - Adi
			Edi
			Rem
	Misc		
	Verify flash download		
	Enable live expressions		
	Log to file: C\L5\adding_wifi_mfg_L5\wifi_mfg_tester\STM32 Shared ST-LINK	ubeIDE\Debug\st-link_gdbserver_log.bt	Br (
	Max halt timeout(s): 2		

• Enter the appropriate loader in the External loader dialog: MX25LM51245G_STM32L562E-DK.stldr

External Loa				×
Add External Select the external	Loader mal loader to add to the launch configuration			
External Loader:	MX25LM51245G_STM32L562E-DK.stldr	~	Workspace	File system
Enabled				
Initialize	I			
	5			

Program your target with "Run" or "Debug" command.



7

Create a new project from scratch

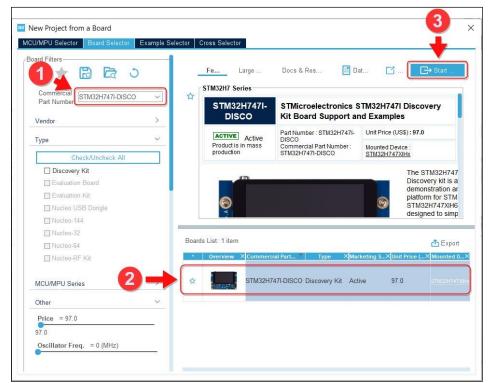
This section takes you step-by-step through the process of creating a project file from scratch.

7.1 Create a project for specific board

1. Start creating a project via the **ACCESS TO BOARD SELECTOR** option.

STM32CubeMX Untitled								×
STM32	File	Window	Help	(US	f	3 🏏	\star	57
Home >								
Existing Projects		New Project			Manage sof	ware inst	allation	s
Recent Opened Projects		I need to :			Check for	STM32Cu		,
Other Projects		Start My projec	t from MCU		Install or r			
	0 -		t from ST Board		INST	ALL / REMC	VE	
		Start My projec	t from Example		Crie click a to all STM3 and other S	2 tools	<u> </u>	•
		ACCESS TO EXA	MPLE SELECTOR		application		-	
					About STM	32 % (O O External Te	pols

- 2. Select a board.
 - Enter/select the board number.
 - Click on your selected board.
 - Select Start Project.





7.2 Enable software components from AIROC[™] Wi-Fi/Bluetooth[®] STM32 expansion pack

- 1. Select the **Pinout & Configuration** tab.
- 2. Select Software Packs.

3. Select Select Components

This will open the Software Packs Component Selector dialog with a list of the installed packs and their contents.

TM32	File	Window Help		(19) 🗗 🕨	1		
CubeMX		2 Window Help	. \				10	
Home > S	TM32H747XIHx - STM32H747I-DISC	Untitled - Pinout & Configur	ation /		GENERATE COD)E		
Pinout 8	Configuration Cloc	k Configuration Pro	ject Manag	jer		Tools		
	▲ Software F	Packs V Pinout						
Q	Select Compon	ients Alt-0 Photos 3	System vi	D14/			-	
•	->Z Manage Softwa	ire Packs Att-U	Cystem					
10	Software Packs Component Selector							
System Co	ilters	Packs						
Analog	* @ 14		nponents for cor	text: Cort	ex-M7 V			
- unareg								
Timers	Search V	Pack / Bundle / Component	Status ©	Version 1.5.0	n Selection		120	
Connectivit	Q	 Wireless Connectivity 	0	1.5.0				
Cominection		~ Bluetooth						
Multimedia	Pack Vendor	btstack			Not selected ~			
	☑ Infineon	btstack-integration		1.5.0				
Security		✓ Wifi	\odot					
Computing	STMicroelectronics	network-interface	\odot	1.5.0	LWIP ~			
	U WES	wcm	\odot	1.5.0	WCM ~			
Middleware	emotas	wifi-host-driver	\odot	1.5.0				
Trace and	portGmbH	wpa3-external-supplicant		1.5.0				
	wolfSSL	whd-bsp-integration	0	1.5.0				
Power and		connectivity-utilities	\odot	1.5.0				
Utilities	Software Component Class	secure-sockets LwIP	\odot	1.5.0				
Otintios		mbedtls	U	1.5.0				
	Application	Ipa		1.5.0				
	Artificial Intelligence	✓ Platform	0	1.0.0				
	Audio	pal	0	1.5.0				
	BLE_Features	abstraction-rtos	0	1.5.0	FreeRTOS ~			
	BLE_Manager	device	0	1.5.0	CYW43012 ~			
	Bluetooth	module	\odot	1.5.0	MURATA V			
	Board Extension	✓ MfgTools						
	Board Part	command-console		1.5.0				
	Board Support	wifi-mfg-test		1.5.0				
	CANopen	> RTOS Middleware		10.3.1				

- 4. Select Infineon under **Pack Vendor**.
- 5. Select the components you need for your project.

All projects will use three 'Platform' components. If you are using Wi-Fi, select all the 'Wifi' components. If you are using Bluetooth[®] LE, select all 'Bluetooth' components.

- *Note:* Platform components are required for each type of application either Wi-Fi-only, Bluetooth-only or combined.
 - a. For the 'Platform / device' component, select the appropriate connectivity device for your system (CYW43012, CYW4343W or CYW43438, etc.).
 - b. For the 'Wifi / network-interface' component, select the appropriate network interface for your system (LwIP or NetxDuo).

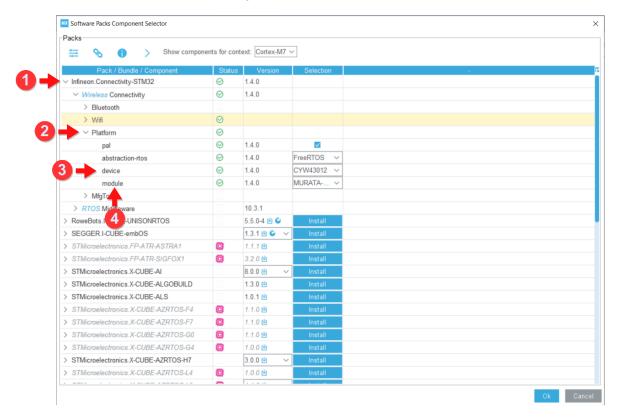


- c. For the 'Wifi / wcm' component, select the appropriate variant (WCM or WCM /WPS/MBEDTLS).
 - WCM Variant compiles only Wi-Fi connection manager files, which provide a set of APIs that can be used to establish and monitor Wi-Fi connections on Infineon platforms that support Wi-Fi connectivity.
 - WCM /WPS/MBEDTLS Variant also includes APIs to connect to a Wi-Fi network using Wi-Fi Protected Setup (WPS) methods which uses MBED TLS security stack.

6. Click **OK**.

7.2.1 Module selection

The AIROC[™] Wi-Fi/Bluetooth[®] STM32 expansion pack has a software component named module configuration (in the "Platform" section), which is used to select different modules for the Connectivity device. Also, you can select the USER_MODULE variant for custom configuration. To do this, provide own your NVRAM header, Firmware, CLM somewhere in your project (for example, in the "Core/Inc" folder).



Module	Device	Description
MURATA-1LV	CYW43012	Type 1LV is a small and high-performance module based on Infineon CYW43012 combo chipset which supports Wi-Fi® 802.11a/b/g/n + Bluetooth® 5.0 BR/EDR/LE up to 72.2Mbps PHY data rate on Wi-fi® and 3Mbps PHY data rate on Bluetooth®. 2Mbps LE PHY is also supported. The WLAN section supports SDIO v2.0 SDR25 interface and the Bluetooth® section supports high-speed 4-wire UART interface and PCM for audio data.
MURATA-1YN	CYW43439	Type 1YN is a small and high-performance module based on Infineon CYW43439 combo chipset which supports Wi-Fi® 802.11b/g/n + Bluetooth® 5.2 BR/EDR/LE up to 65Mbps PHY data rate on Wi-fi® and 3Mbps PHY data rate on Bluetooth®. The WLAN section supports SDIO v2.0 interface and the Bluetooth® section supports high-speed 4-wire UART interface and PCM for audio data.



Create a new project from scratch

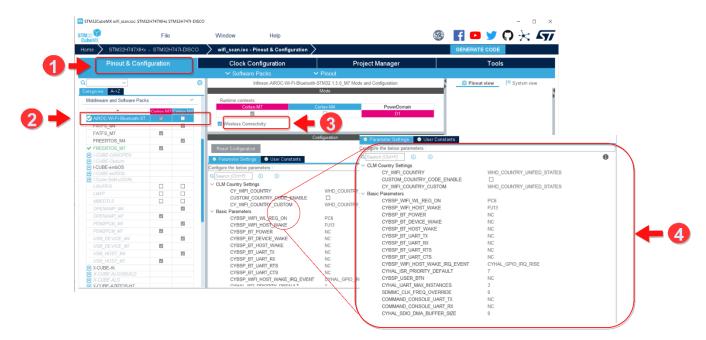
Т

Module	Device	Description
MURATA-1DX	CYW4343W	Type 1DX is a small and high-performance module based on Infineon CYW4343W combo chipset which supports Wi-Fi® 802.11b/g/n + Bluetooth® 5.1 BR/EDR/LE up to 65Mbps PHY data rate on Wi-fi® and 3Mbps PHY data rate on Bluetooth®. The WLAN section supports SDIO v2.0 interface and the Bluetooth® section supports high-speed 4-wire UART interface and PCM for audio data.
<u>CYW9P62S2-M2BASE-</u> <u>4373</u>	CYW4373	Infineon's AIROC [™] CYW4373/CYW4373E/CYW43732 single-chip combo device features 1x1 dual-band 2.4 GHz and 5 GHz Wi-Fi 5 (802.11ac) and Bluetooth [®] 5.2.
STERLING-LWB5plus	CYW4373	Sterling LWB5+ development board.
MURATA-2AE	CYW4373	Type 2AE is a small and very high-performance module based on the Infineon CYW4373E combo chipset which supports Wi-Fi 802.11a/b/g/n/ac + Bluetooth [®] 5.2 BR/EDR/LE up to 433Mbps PHY data rate on Wi-Fi and 3Mbps PHY data rate on Bluetooth [®] .
MURATA-2BC	CYW4373	Type 2BC is a small and very high-performance module based on the Infineon CYW4373 combo chipset which supports Wi-Fi® 802.11a/b/g/n/ac + Bluetooth® 5.2 BR/EDR/LE up to 433Mbps PHY data rate on Wi-Fi® and 3Mbps PHY data rate on Bluetooth®. The WLAN section supports SDIO v3.0 DDR50 interface and the Bluetooth® section supports high-speed 4-wire UART interface and PCM for audio data. Both WLAN and Bluetooth® section support USB2.0 interface too.
<u>CYW43022</u>	CYW43022	Infineon's AIROC [™] CYW43022 an ultra-low power single-chip, combo device features 1x1 dual-band 2.4 GHz and 5 GHz Wi-Fi 5 (802.11ac) and Bluetooth [®] 5.4. With a low-power architecture, the CYW43012 is ideal for battery powered applications where best-in-class power consumption is critical. An embedded Bluetooth stack and Wi-Fi networking offloads allow the CYW43022 to maintain connectivity activity even while a host processor is in low-power sleep mode.
<u>CYW955513WLPA</u>	CYW55500	The CYW55500 is a low-power, single-chip device that supports single-stream, tri-band, Wi-Fi 6/6E, IEEE 802.11ax-compliant Wi-Fi MAC/baseband/radio and Blueto oth®/Bluetooth® Low Energy 5.3. In 802.11ax mode, the device supports rates up to 1024 QAM MCS11 in 20 MHz channels. All legacy rates in the 802.11a/b/g/n/ac are also supported. Included on-chip are 2.4 GHz, 5-7 GHz transmit power amplifiers (PA) and low-noise amplifiers (LNA). The device is also capable of operating with external power amplifiers and low-noise amplifiers, and antenna diversity, if improved range is required. An SDIO v3.0 interface or GSPI are available for interfacing with the host.
<u>CYW955572FCIPA-SM</u>	CYW55572	The AIROC [™] CYW55572 is part of the Wi-Fi 6 and Bluetooth [®] 5.3 SoC family. The highly integrated solution supports Wi-Fi 6 features, is Dual-band capable (2.4G, 5G). It offers an exceptional video/audio streaming and seamless gaming experience in congested network environments and significantly reduces latency, while also decreasing total Bill of Materials cost and board space.
<u>CYW955573M2IPA1-SM</u>	CYW55573	The AIROC [™] CYW55573 is part of Infineon's Wi-Fi 6/6E and Bluetooth [®] 5.3 SoC family. The solution supports Wi-Fi 6/6E features, is tri-band capable (2.4G, 5G, 6G). Its features improve range, power efficiency, network robustness, and security, while reducing the total Bill of Materials cost and board space. The solution delivers an exceptional high-quality video/audio streaming and seamless connectivity experience in congested network environments and significantly reduces latency by operating in the 6G spectrum.
USER-MODULE	ALL	Custom USER-MODULE configuration, in this case User should provide own NVRAM header somewhere in project (e.g. in Core/Inc folder).

7.3 Enable Software pack



- 1. Select the **Pinout & Configuration** tab.
- 2. Expand Middleware and Software Packs and select AIROC-Wi-Fi-Bluetooth-STM32
- 3. Click the checkbox next to Wireless Connectivity.
- 4. Configure different Settings including these (this will generate cybsp.h):
 - Wi-Fi Country Code
 - WL_REG_On Pin
 - BT_REG_On Pin
 - SDMMC Clock Override
 - BT UART TX, RX, RTS, CTS



7.4 Country Code Configuration

WLAN Devices have support for different Country Code based on the CLM file, which is specific to Module vendors.

Some CLM files do not have support for all countries. So, you need to configure Country Code based on the WLAN TX/RX regulations and CLM blob, which is loaded.



7.5 FreeRTOS configuration

Select FreeRTOS version and configure Stack Size and Heap size as required for the application.

🐹 STM32	CubeMX wifi_scan.ioc: ST	M32H747XIHx STM	32H747I-DISCO			-	
STM32		File	Window	Help	🐵 f	D y	* 57
Home	STM32H747XIHx - ST	M32H747I-DISCO	> wifi_scan.io	c - Pinout & Configu	ration GENE	RATE CODE	
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USE	B_HOST_M4		D_STACK_HIGH_ADD	RESS Disa	ibled		
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Under Tasks and Queues, configure Default task and its stack size.

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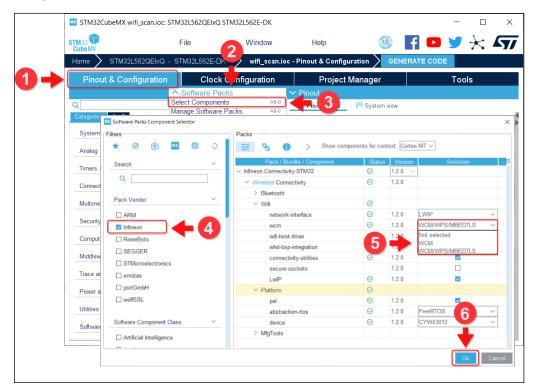


7.6 MbedTLS configuration

The mbedTLS is required by LwIP (Lightweight IP) WCM (Wi-Fi Connection Manager) Pack's components. To enable mbedTLS. The STM32L5 MCU is used as an example to demonstrate Crypto features (AES, HASH, etc.) HW acceleration configuration:

Open the project's *.IOC file w/ STM32CubeMx.

Navigate to Infineon Pack's components and switch WCM to WCM/WPS/mbedTLS.



Navigate to **Select Components**, select **Middleware** and then select **MBEDTLS** for target device and select the **Enabled** check box.

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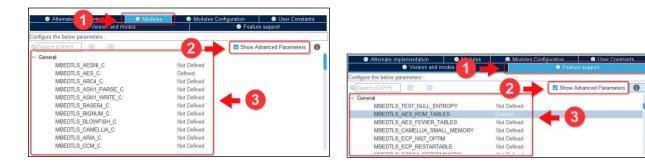
Ensure that the following features and modes are enabled by performing appropriate steps:

- mbedTLS sources are added to application
- mbedTLS config is applied to support Infineon's connectivity middleware

```
MBEDTLS_ENTROPY_HARDWARE_ALT
MBEDTLS_AES_ROM_TABLES
MBEDTLS_CIPHER_MODE_CBC
MBEDTLS_NO_PLATFORM_ENTROPY
MBEDTLS_ENTROPY_FORCE_SHA256
MBEDTLS_AES_C
MBEDTLS_SHA256_C
```

Note:

Set "Not defined" for unneeded modes to reduce memory consumption and eliminate unused code.



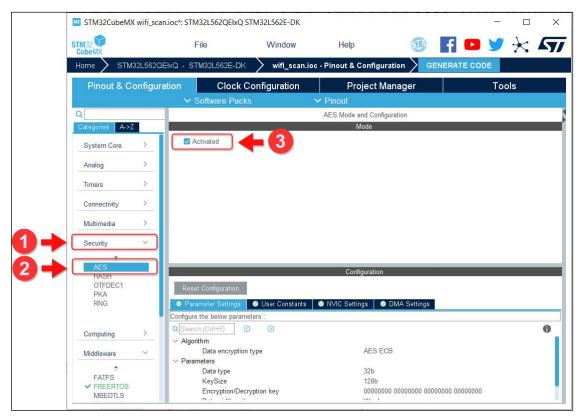


7.6.1 Crypto HW acceleration

	STM32H7	STM32L5	Notes
RNG	+	+	
AES		+	AES-128/256 (ECB, CBC, CTR, GCM GMAC, CCM)
HASH		+	SHA1, SHA224, SHA256, MD5 HMAC SHA1, HMAC SHA224, HMAC SHA256, HMAC MD5
PKA		+	Public Key Cryptography
OTFDEC1		+	On-the-fly decryption of Octo-SPI external memories (AES-128)

STM32 offers HW acceleration for the following crypto-related functions:

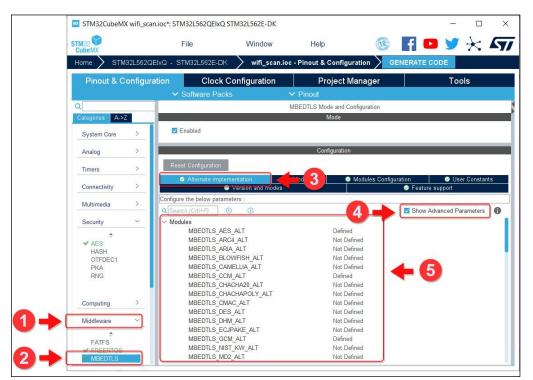
The IP modules listed above must be enabled (Activated) from the "Security" section of STM32CubeMX configurator.



To enable HW acceleration the following literals have to be defined for mbedTLS (should be done in STM32CUbeMX configurator):

```
MBEDTLS_AES_ALT
MBEDTLS_CCM_ALT
MBEDTLS_GCM_ALT
MBEDTLS_MD5_ALT
MBEDTLS_SHA1_ALT
MBEDTLS_SHA256_ALT
MBEDTLS_ENTROPY_HARDWARE_ALT
```



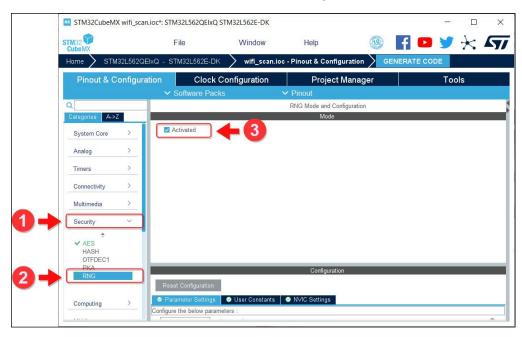


After these steps, source files marked with *_alt suffixes (meaning "alternative", not the original mbedTLS version) will be added into the user's project. They will provide an interface between the mbedTLS crypto functions and its HAL HW counterpart.

7.6.2 HW source of entropy example

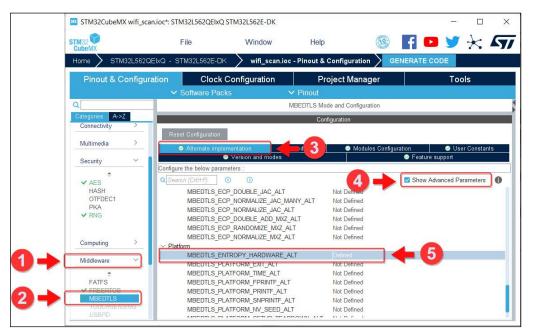
To obtain a good source of entropy used for a public/private key generation and other cryptographic functions:

Enable the RNG module in the STM32CubeMX configurator.





Set MBEDTLS_ENTROPY_HARDWARE_ALT to "Defined" in the STM32CubeMX configurator:



The tool will add hardware_rng.c source file to the user's project.

This will provide the mbedtls_hardware_poll() implementation, which relies on the devices' HW RNG IP block.

A call to the standard STM32 HAL RNG API (HAL_RNG_GenerateRandomNumber()) will be used by the system to fulfill the mbedTLS entropy pool.

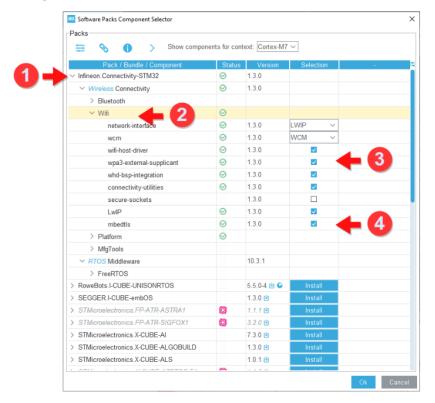


7.7 Wpa3-external-suplicant

Library wpa3-external-suplicant supports WPA3 SAE authentication using HnP (Hunting and Pecking Method) using RFC https://datatracker.ietf.org/doc/html/rfc7664 and H2E (Hash to Element Method) using RFC https://datatracker.ietf.org/doc/html/draft-irtf-cfrg-hash-to-curve-10 and following 802.11 spec 2016.

This library required mbedTLS version 2.25.0. To enable wpa3-external-suplicant supports:

Navigate to Infineon Pack's components, then Wifi and enable wpa3-external-supplicant and mbedTLS.



Navigate to **Select Components**, select **Security** and then select **RNG** for target device and select the **Enabled** check box, and enable **Activated** check box.

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Caregones	RAL			Runtime contexts:		Mode	
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Multimedia							
Security							
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Computing			,		Co	nfiguration	
Middleware			>	Reset Configuration			
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Utilities			>	Clock Error Dete	tion	Enable	
Software Pa	icks		~				
	•	Cortex-M7 Co	ortex-M4				
 Infineon 	Connectivity-STM32.1.3.0_M7						



After generating your code copy **mbedtls_user_config.h** folder from Infineon pack to your project directory (e.g. CORE/Inc folder):

C:\Users\<USER>\STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.3.0\Middlewares\Third_Party\configs\ mbedtls_user_config.h

Add Preprocessor macro name: *MBEDTLS_USER_CONFIG_FILE="mbedtls_user_config.h"*

type filter text	Settings	⇔ ▼
 > Resource Builders C/C++ Build Build Variables Environment 	Configuration: Debug [Active]	 ✓ Manage Configu
Logging Settingsi CCE General CMSIS-SVD Settings Project References Run/Debug Settings	Tool Settings Puild Steps Build Artifact Binary Parsers Error Parsers MCU Toolchain MCU Settings Define symbols (-D) MCU Dool build output: Define symbols (-D) MCU Dock chain MEDITS USER CONFIG FILE="mbedtls_user_config.h" Opencessor MacDits USER (-CAPALE Proprocessor Include paths Macellaneous STM32.THREAD_SAFE_STRATEGY=5 Proprocessor Include paths Proprocessor Include paths	ର ଜୁନ
	MCU GCC Linker Miscellaneous	 € 4) ⊕ 5

Add implementation for Mbedtls entropy, as shown in the following example for STM32H7 RNG: #include "mbedtls user config.h"

```
#ifdef MBEDTLS_ENTROPY_HARDWARE_ALT
#include "main.h"
#include "string.h"
#include "stm32h7xx hal.h"
#include "mbedtls/entropy_poll.h"
extern RNG HandleTypeDef hrng;
int mbedtls_hardware_poll( void *Data, unsigned char *Output, size_t Len, size_t *oLen )
  uint32 t index;
  uint32 t randomValue;
  for (index = 0; index < Len/4; index++)
  {
    if (HAL RNG GenerateRandomNumber(&hrng, &randomValue) == HAL OK)
    {
      *oLen += 4;
      memset(&(Output[index * 4]), (int)randomValue, 4);
    }
    else
    {
      Error Handler();
    }
```



```
}
return 0;
}
#endif /*MBEDTLS_ENTROPY_HARDWARE_ALT*/
```

For more information, refer to the code example wifi_join_wpa3.

7.8 Configure resources for Wi-Fi connectivity

The following Peripherals and I/O lines are required for the host MCU to communicate to Infineon connectivity device(s) for Wi-Fi:

7.8.1 SDIO

SDIO is used as an interface with Infineon Connectivity devices.

The SDMMC HAL component is required for STM32 host MCU to access/control Infineon connectivity device(s).

1. Add the API call at initialization with appropriate handle passed in:

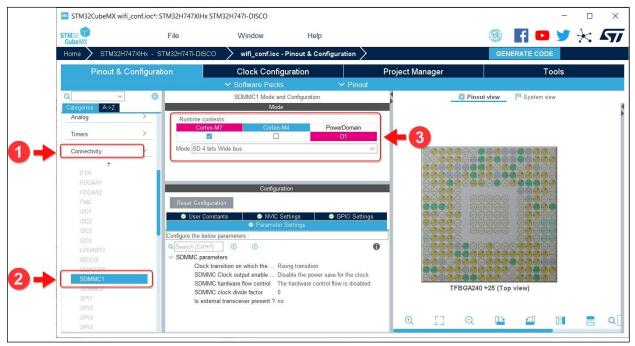
```
SD_HandleTypeDef SDHandle = { .Instance = SDMMC1 };
cy_rslt_t result = stm32_cypal_wifi_sdio_init(&SDHandle);
```

2. SDMMC Interrupt handler must be overwriting in application and call stm32_cyhal_sdio_irq_handler function:

```
void SDMMC1_IRQHandler(void)
{
    stm32_cyhal_sdio_irq_handler();
}
```

Make sure the SDMMC instance selected has its pins routed to the Infineon Connectivity device. Follow the steps listed to enable/configure SDIO in STM32CubeMX:

Enable SDMMC block in STM32CubeMX > Pinout & Configuration > Connectivity.





Disable generation function call of SDMMC initialization (MX_SDMMC_SD_Init).

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										LTDC	DISABI
										MDIOS	DISABI
										MMC	DISABL
										OPAMP	DISABL
										OSPI	DISABI
										OTFDEC	DISABI
										PCD	DISABL
										QSPI	DISABL

7.8.2 Control pins

Infineon Connectivity devices require control lines to be connected to host MCU:

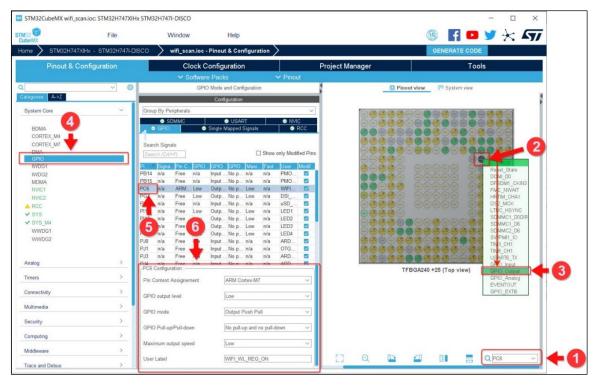
Line Name	FW Name	Description
WL_REG_ON	WIFI_WL_REG_ON	This is a power pin that shuts down the device WLAN section.
WL_HOST_WAKE	CYBSP_WIFI_HOST_WAKE	WLAN Host Wake: Active Low (OOB IRQ)
		WLAN Device Wake
WL_DEV_WAKE		<i>Note: WL_DEV_WAKE</i> is not used in current version of PAL.

7.8.2.1 WL_REG_ON

A power pin that shuts down the device WLAN section. WL_REG_ON must be configured as output with following parameters:



GPIO Parameter	Value	Note
Direction	GPIO_Output	
Pin Context Assignment	ARM Cortex-M7	Assign to core, where Connectivity run
GPIO output level	Low	
GPIO mode	Output Push Pull (PP)	
GPIO Pull-up/Pull-down	No pull-up and no pull-down	
Maximum output speed	Low	
User label	WIFI_WL_REG_ON	



7.8.2.2 WL_HOST_WAKE

Host MCU Wake signal from WLAN section. WL_HOST_WAKE must be configured in External Interrupt mode / EXTI with following parameters:

GPIO Parameter	Value	Note
Direction	GPIO_EXTIxx	
Pin Context Assignment	ARM Cortex-M7	Assign to core, where Connectivity runs.
GPIO mode	External Interrupt mode with Rising edge trigger detection	
GPIO Pull-up/Pull-down	No pull-up and no pull-down	
User label	CYBSP_WIFI_HOST_WAKE	
NVIC for EXTI	Enable	



1. Configure in STM32CubeMX:

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MDMA		9J4 n/a Free n/a	Input No p n/a n/a			999	90			_B4 Input		
NVIC1		PJ5 n/a Free n/a	Input No p n/a n/a			99 0	କ୍ର କ			Output	9 00	
NVIC2		PJ12 n/a Free Low	Outp No p Low n/a			999	e e -			Analog		
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✓ SYS M4	F		InputNopn/a n/a InputNopn/a n/a			999	00					
WWDG1	F	PK n/a Free	Input No p n/a n/a			000			666	999		
WWDG2	E	n/a Free d/a	Input No p n/a n/a				000	000	000	00		
		5 h/a Free	Input No p n/a n/a				000			000		
	р Х. Д	n/a Free	Input No p n/a n/a			NO.			NAX X			
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		r in context Assignment	P NAM CONTRA MIT									
Multimedia	`	GPIO mode	External Interrupt Mode with	Rising edge trigger det								
Security	>	GPIO Pull-up/Pull-down	No pull-up and no pull-down									
Computing	>	User Label	CYBSP_WIFI_HOST_WAKE									
Middleware	>					0	05	CD				
Trace and Debug	>				53	Q		4		-	Q PJ13	<u> </u>

2. Enable NVIC interrupt for EXTI line:

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		 Software Packs 	✓ Pinout					
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3. EXTI Callback handler must be overwriting in application and call stm32_cyhal_gpio_irq_handler function:

```
void HAL_GPIO_EXTI_Callback(uint16_t GPIO_Pin)
{
    stm32_cyhal_gpio_irq_handler(GPIO_Pin);
}
```



7.9 Configure resources for Bluetooth[®] connectivity

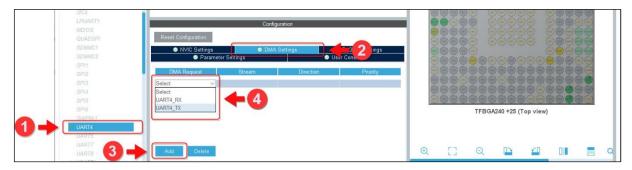
The following Peripherals and I/O lines required for the host MCU to communicate to Infineon connectivity device(s) for Bluetooth:

7.9.1 UART

- 1. Enable UART block in **STM32CubeMX > Pinout & Configuration > Connectivity.**
- 2. Configure Mode as **Asynchronous**.
- 3. Configure Hardware Flow Control (RS232) as CTS/RTS.
- 4. Enable UART interrupt in **NVIC Settings**.



5. Add DMA for RX and TX in **DMA Settings**. Use default settings for RX/TX.





6. Enable UART Callback.

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	Home > STM32H	747XIHx - STM32H74	7I-DISCO	> ble_hello_	_sensor.ioc - Project	Manager >		GE	NERATE C	ODE	
		Configuration		Clock	< Configure		Project Manager			Tools	
	Code Generator									NAND	DISABLE
		Generated Function Ca	lls CortexM7—							NOR	DISABLE
		-						11 II	ĝ↓	SDRAM SRAM	DISABL
		Generate Code					Do Not Generate Function Call	Visibility	(Static)	HASH	DISABLE
			1	M	IX_GPIO_Init	GPIO		Z		HCD	DISABLE
			2		ystemClock_Config	RCC				GFXMMU	DISABLE
			3		IX_FREERTOS_Init	FREERTOS_M7				HRTIM	DISABLE
-			4		IX_LPTIM1_Init	LPTIM1				I2C	DISABLE
			5		IX_UART4_Init	UART4				125	DISABLE
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										JPEG	DISABLE
										LPTIM	ENABLE
										LTDC	DISABLE
										MDIOS	DISABLE
										MMC	DISABLE
										OPAMP OSPI	DISABLE
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										SAL	DISABLE
										SD	DISABLE
										SMARTCARD	DISABLE
										SPDIFRX	DISABLE
										SMBUS	DISABLE
										SPI	DISABLE
										SWPMI	DISABLE
								-		TIM	DISABL
								(4)		UART	ENABLE
									-	USART	ENABLE
										WWDG	DISABLE

7.9.2 LPTIMER

- 1. Enable LPTIMER block in **STM32CubeMX > Pinout & Configuration > Timers**.
- 2. Configure Mode as **Counts internal clock events**.
- 3. Enable LPTIMER interrupt in **NVIC Settings**.

5											X
	STM32 CubeMX		File	Window	Help			(19)	f 🗖	¥ ×	57
		132H747XIHx - S	TM32H747I-DISCO	> ble_hello	_sensor.ioc - Pinout &	Configuration >		GEI	NERATE COD	-	
	Pinou	ut & Configura	ition	Clock	Configuration	Pr	oject Manager		То	ols	
				✓ Software	are Packs	✓ Pinout					
	Q	~ @		LPT	1M1 Mode and Configuration	n		Pinout view	w System	n view	
	Categories A->	<u>z</u>			Mode						
			Runtime contexts: Cortex-Mi		Cortex-M4	PowerDomain					
	Analog	>				D2					_
	Timers	~	Mode Counts internal	clock events			3				29
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97	LPTIM1										
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	TIMB	· · · · ·	Parameter Settings	User Cons	tants Settings						
			NVIC1 Inter LPTIM1 global interrupt	rupt Table	Enabled Pri	Priority Sub	Priority	TERCARA	0 +25 (Top vie		
	TIM13 TIM14	L	Le nivi i giocal interrupt					TPBGA24	u +20 (Top Vie	wj	
	✓ TIM16										
							Q] Q			-



4. Enable LPTIM Callback.

	SIM32CUDEMX D	le_hello_sensor.ioc: STM	VI32H/4/XIH)	STM32H/4/I-DISC	.0						-	
5	STM32	File		Window	Help				(10)	f	• 🥑 🖯	×
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- 1	Pinout	& Configuration		Clock C	onfigura		Project Manager				Tools	
	T Inouc	r Driver Selector		CICCR C			Trojost managor					ck
		Q Search (CrtI+F)	0 0						Â.	0		0 0
			0 0						Z.			
		GPIO				HAL					ADC	DIS
		DMA				HAL					CEC	DIS
		RCC				HAL					COMP	DIS
		> FREERTOS				HAL					CORDIC	DISA
		> LPTIM				HAL					CRYP	DIS
		> UART > USART				HAL					DAC	DIS
						HAL					DCMI DFSDM	DIS
		CORTEX_M7				HAL						DIS
	Code Generator	CORTEX_M4				HAL					DMA2D	DISA
											DSI	DIS
		Generated Function Ca	IIIs CortexM7-								ETH	DISA
								1.7	11	21	FDCAN	DIS
- 11		Generate Code		Rank	Function Name	Peripheral Instance Name	Do Not Generate Function	o Call	Visibility (Static)	FMAC	DIS
			1	2011/09	SPIO Init	GPIO				static)	NAND	DIS
. 1			2		DMA Init	DMA					NOR	DIS
			3		emClock Config	RCC					SDRAM	DIS
			4		REERTOS Init	FREERTOS M7					SRAM	DIS
			5		PTIM1 Init	LPTIM1					HASH	DIS
			6		JART4_Init	UART4					HCD	DIS
			7		JSART1 UART Init						GEXMMU	DISA
			1	MA_0	JOART_UART_INK	USANTI			124		HRTIM	DISA
											I2C	DISA
												DIS
											12S	
											I2S IRDA	DISA
									3		I2S IRDA JPEG	DIS/
		- Generated Function Ca	ills CortexM4						3	-	I2S IRDA JPEG LPTIM	DIS/ DIS/ EN/
		- Generated Function Ca	Ils CortexM4-						-		I2S IRDA JPEG	DIS/ DIS/ ENA
								87	11	2J	I2S IRDA JPEG LPTIM LTDC	DISA DISA ENA DISA DISA
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7.9.3 Control pins

Infineon Connectivity devices require control lines to be connected to host MCU:



Line Name	FW Name	Description
BT_REG_ON	CYBSP_BT_POWER	Used by the PMU to power-up or power-down the internal regulators used by the Bluetooth [®] section.
BT_HOST_WAKE	CYBSP_BT_HOST_WAKE	 Bluetooth[®] device wake-up: Signal from the host to the CYW43xx indicating that the host requires attention. Asserted: The Bluetooth[®] device must wake-up or remain awake. De-asserted: The Bluetooth[®] device may sleep when sleep criteria are met. The polarity of this signal is software configurable and can be asserted HIGH or LOW. Note: BT_HOST_WAKE is not used in current version of PAL.
BT_DEV_WAKE	CYBSP_BT_DEVICE_WAKE	 Host wake-up. Signal from the CYW43xx to the host indicating that the CYW43xx requires attention. Asserted: host device must wake-up or remain awake. De-asserted: host device may sleep when sleep criteria are met. The polarity of this signal is software configurable and can be asserted HIGH or LOW Note: BT_DEV_WAKE is not used in current version of PAL.

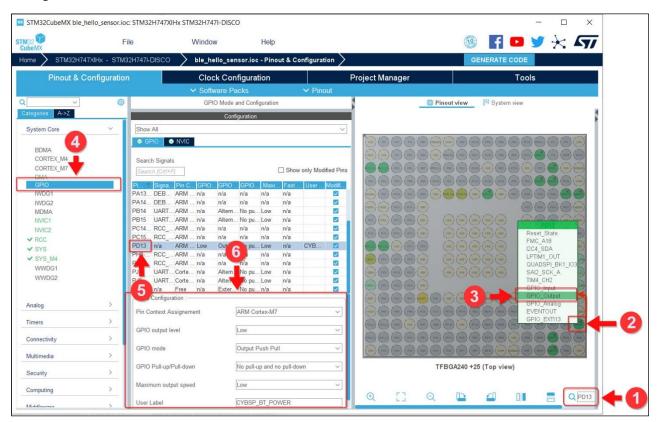
7.9.3.1 **BT_REG_ON**

A power pin that shuts down the device Bluetooth[®] section. BT_REG_ON must be configured as output with the following parameters:



GPIO Parameter	Value	Note
Direction	GPIO_Output	
Pin Context Assignment	ARM Cortex-M7	Assign to core, where Connectivity run
GPIO output level	Low	
GPIO mode	Output Push Pull (PP)	
GPIO Pull-up/Pull-down	No pull-up and no pull-down	
Maximum output speed	Low	
User label	CYBSP_BT_POWER	

Configuration in STM32CubeMX:





7.10 Heap and stack configuration

Configure Heap and Stack size required for the example app.

STM32CubeMX wif	i_scan.ioc: STM32H747)	(IHx STM32H747I-DISC	0			-	
STM32	File	Window	w He	lp	🐵 f		* 57
Home 🔰 STM32H	747XIHx - STM32H7471	-DISCO 🔪 wifi_so	an.ioc - Project M	lanager >	GENERAT	E CODE	242
Pinout & Cor	nfiguration	Clock Confi	0	Project Manager		Tools	
Project	Project Settings Project Name wifi_scan post 2 C:stm32_projects Dual Core Boot Mode						
Code Generator	Both CPUs booting at of Application Structure Advanced Toolchain Folder Locati C:\stm32_projects\wifi_	on	 ✓ ✓ Do not gen 	erate the main()			
Advanced Settings	Toolchain / IDE STM32CubeIDE / Linker Settings Minimum Heap Size Minimum Stack Size	0x8000 0x400	+ 3	Generate Under Roo	yt		
	Mcu and Firmware Pack Mcu Reference STM32H747XIHx Firmware Package Nam STM32Cube FW_H7 V	e and Version	<u>,</u>				

7.11 Generating code

- 1. After clicking **Generate Code**, copy the following files from existing examples provided along with the pack:
 - cybsp.h
 - lwipopts.h

Location of these files in the pack:

STM32Cube\Repository\Packs\Infineon\Connectivity-STM32\1.3.0\Projects\STM32H747I-DISCO\Applications\wifi_scan\Core\Inc

2. Add the following to the *FreeRTOSConfig.h* file:

```
/* Enable using CY_HAL for rtos-abstraction */
#define CY USING HAL
```

3. Update the following fields in the *cybsp.h* file to match the configurations done in the <u>Configuring Control</u> <u>pins</u> section



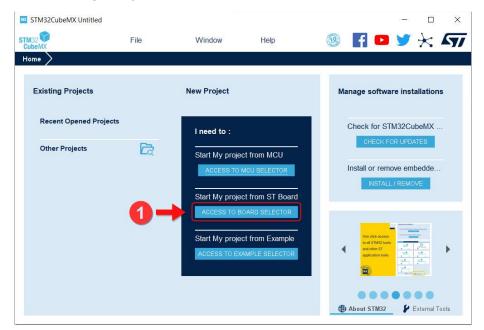
Create a new project for non-H7 MCU boards

8 Create a new project for non-H7 MCU boards

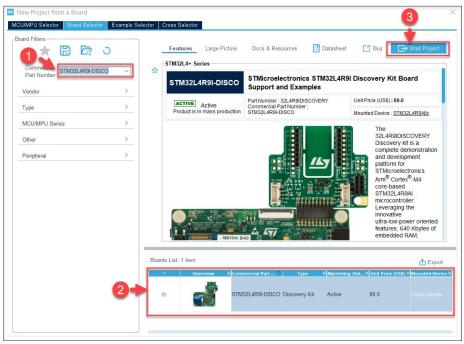
This section explains how to create new example project for any non-H7 MCU boards using the expansion pack.

8.1 Creating a project

1. Start creating a project via the Access to Board Selector option.



- 2. Select a board like STM32L4R9I-DISCO
 - Enter/select the board number (STM32L4R9I-DISCO) and click on your selected board.
 - Select Start Project.





Create a new project for non-H7 MCU boards

- 3. Select Software Components from the AIROC[™] Wi-Fi/Bluetooth[®] STM32 Expansion Pack
 - Select the Pinout & Configuration tab.
 - Select **Software Packs > Select Components**. This will show a list of the installed packs and their contents.
 - Platform/device is selected as CYW43438 for reference along with other components required for the Wi-Fi Example.
 - Enable Software components as required for the Wi-Fi Example.
 - Refer to Enable Software components from the AIROC[™] Wi-Fi/Bluetooth[®] STM32 Expansion Pack.

8.2 FreeRTOS configuration

Follow same steps as mentioned in FreeRTOS Configuration.

8.3 Other configurations

- 1. Configure SDMMC (refer to <u>SDIO</u>).
- 2. Configure Control Pins (refer to Control Pins).
- 3. Configure Heap and Stack size (refer to Heap and Stack Configuration).

8.4 Changes required in PAL library

By default, Expansion pack supports only H7 MCU variant. The following changes are required to support other MCU variants.

1. stm32_cyhal_common.h

(Middlewares\Third_Party\Infineon_Wireless_Infineon\pal\targets\TARGET_STM32\Inc) folder

```
#elif defined (STM32L4R9xx)
    #define TARGET_STM32L4xx
#elif defined (TARGET_STM32L4xx)
    #include "stm32l4xx.h"
    #include "stm32l4xx_hal.h"
    #include "stm32l4xx hal def.h"
```

- 2. stm32_cyhal_sdio_ex.h
 - Define STM32_RCC_PERIPHCLK_SDMMC based in the SDMMC* type supported by MCU variant.
 - For L4, it is RCC_PERIPHCLK_SDMMC1:

```
#elif defined (TARGET_STM32L4xx)
    /* RCC clock for SDMMC */
    #define STM32_RCC_PERIPHCLK_SDMMC RCC_PERIPHCLK_SDMMC1
```

3. stm32_cyhal_gpio.c

Define "exti_table" based on the IRQn_Type defined in the stm32l4r9xx.h.

8.5 Changes required in main.c

To enable SDMMC to work with Wi-Fi connectivity device:

1. The API call has to be added at initialization with appropriate handle passed in:

```
SD_HandleTypeDef SDHandle = { .Instance = SDMMC1 };
cy_rslt_t result = stm32_cypal_wifi_sdio_init(&SDHandle);
```



Create a new project for non-H7 MCU boards

2. SDMMC Interrupt handler must be overwriting in application and call stm32_cyhal_sdio_irq_handler function:

```
void SDMMC1_IRQHandler (void)
{
    stm32_cyhal_sdio_irq_handler();
}
```

3. GPIO Interrupt handler must be overwriting in application and call stm32_cyhal_gpio_irq_handler function:

```
void HAL_GPIO_EXTI_Callback (uint16_t GPIO_Pin)
{
    stm32_cyhal_gpio_irq_handler (GPIO_Pin);
}
```

8.6 DMA configuration

PAL Library is currently supporting SDIO CMD53 transfer using Internal DMA Registers in SDMMC. If the MCU variant does not support IDMABASE, Use DMA Channels and Modify below functions to handle SDIO Command 53.

- cyhal_sdio_bulk_transfer
- stm32_cyhal_sdio_irq_handler

8.7 OctoSPI configuration

STM32L4R9I-DISCO has external flash memory available and can be used for placing the Wi-Fi Firmware.

1. Linker script (*.ld) change to address external memory:

```
OSPI(rx) : ORIGIN = 0x90000000, LENGTH = 131072K
```

2. Add Linker script with section name defining where WiFi Firmware needs to be placed:

```
.whd_fw :
{
    whd_fw_start = .;
    KEEP(*(.whd_fw))
    whd_fw_end = .;
} > OSPI
```

3. Add Preprocessor macro name:

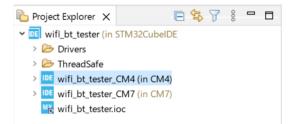
```
CY_STORAGE_WIFI_DATA=".whd_fw"
```



9 Miscellaneous Information

9.1 Muli-Core MCU: STM32H747I-DISCO

Some MCUs (e.g. STM32H7) have multiples cores: Cortex-M7(CM7) and Cortex-M4(CM4). Although a Wi-Fi/Bluetooth® application uses only the CM7, please make sure to build and flash the CM4 application at the very beginning. ST Micro pre-installs demo applications on both CM7 and CM4. So, if you flash only the CM7 application, your CM7 Wi-Fi application and pre-installed CM4 demo application access to SDIO bus and Wi-Fi application will not work correctly.



9.2 Workaround when changing device/module

When you build a sample application for a different device/module, you should change the device/module on the STM32CubeMX as follows before pushing the "Generate Code" button.

Pinout & Configuration > Software Packs > Infineon.Connectivity-STM32 > Wireless Connectivity > Platform > device/module

Packs		-		
📅 💊 🎁 > Show compon	ents for con	text: Cortex-M7	\sim	
Pack / Bundle / Component	Status	Version	Selection	
 Infineon.Connectivity-STM32 	\odot	1.5.0 ~		
✓ Wireless Connectivity	\odot	1.5.0		
> Bluetooth	\odot			
> Wifi	\odot			
✓ Platform	\odot			
pal	\odot	1.5.0		
abstraction-rtos	\odot	1.5.0	FreeRTOS	~
device	\odot	1.5.0	CYW4373	7
module	\odot	1.5.0	MURATA-2AE	\sim
> MfgTools	\odot			
✓ RTOS Middleware		10.3.1		
> FreeRTOS				
> RoweBots.I-CUBE-UNISONRTOS		5.5.0-4 ڬ 😂	Install	
> SEGGER.I-CUBE-embOS		1.3.1 👜 😜	Install	
> STMicroelectronics.FP-ATR-ASTRA1	0	2.0.0 ڬ 🗸 🗸	Install	
> STMicroelectronics.FP-ATR-SIGFOX1	0	3.2.0 🗉	Install	
> STMicroelectronics.FP-SNS-FLIGHT1	0	5.0.1 🖶 🗸 🗸	Install	
> STMicroelectronics.FP-SNS-MOTENV1	0	4.3.2 😐	Install	
> STMicroelectronics.X-CUBE-AI		8.0.1 😐 🗸 🗸	Install	
> STMicroelectronics.X-CUBE-ALGOBUILD		1.3.0 😐	Install	
> STMicroelectronics.X-CUBE-ALS		1.0.1 👜	Install	
> STMicroelectronics.X-CUBE-AZRTOS-F4	O	1.1.0 🗎	Install	
> STMicroelectronics.X-CUBE-AZRTOS-F7	Ö	1.1.0 🗎	Install	
> STMicroelectronics.X-CUBE-AZRTOS-G0	Ö	1.1.0	Install	

However, in some cases, code is not generated appropriately. Please apply the following workaround for such cases.



Case 1

After generating a STM32CubeIDE project on STM32CubeMX, please check the include paths as follows. You might see include paths of firmware/nvram/clm of **default** device in addition to selected device as follows.

Select Project > Properties > path and Symbols.

You should remove include paths of default device (43012) and keep them for selected device (43439).

type filter text	Paths and Symbols			⇔ •⇒•
 Resource Builders C/C++ Build C/C++ General 	Configuration: Debug [Active]		~ Manage C	Configurations_
 > Code Analysis > Code Analysis > Documentation File Types > Formatter Indexer Indexer Paths and Symbols > Preprocessor Include Path CMSIS-SVD Settings > Project References Run/Debug Settings 	Languages GNU C Assembly	burrary Paths Source Location Pathodewares/Third, Party/Infineon, RTOS, Middleware/FreeRTOS/Source/CMSIS, RTOS, V/ Middlewares/Third, Party/Infineon, RTOS, Middleware/FreeRTOS/Source/CMSIA, MIDE NEW Party, MIDE NEW Party, Middleware/FreeRTOS/Source/CMPONENT, 43012/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/dm/COMPONENT, 43012/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 4302/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 4303/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 4303/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 43439/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 43439/ Middlewares/Third, Party/Infineon, Wretes, Connectivity/Wiff-host-driver/resource/Introvar/COMPONENT, 43439/ Middlewares/Third, Party/Infineon, Wretes, Connectivi		
	Show built-in values			
¢ >>			Restore Defaults	Apply
(?)			-	



Case 2

After generating a STM32CubeIDE project on STM32CubeMX, you might see include paths of firmware/nvram/clm of only default device. (default =43012, selected device=4373 in the following case).

Iter text ×	Paths and Symbols		Q	• 🗘 •
++ General	Configuration: Debug [Active]		 Manage Config 	.guratio
 C/C++ Build C/C++ General Code Analysis Documentation File Types Formatter Indexer Language Mappings Paths and Symbols Preprocessor Include Patt CMS-SVD Settings Project References Run/Debug Settings 		Current Party Current Party Party Current Party Current Party/Infineon, Wireless, Connectivity/LWP/src/indude/wip/prot Current Party Current Party/Infineon, Wireless, Connectivity/LWP/src/indude/wip/prot Current Party Current Party/Infineon, Wireless, Connectivity/LWP/src/indude/wip/prot Current Party Current Party/Infineon, Wireless, Connectivity/Wirel-Connection Current Party Current Party/Infineon, Wireless, Connectivity/Wirel-Connection Current Party Current Party/Infineon, Wireless, Connectivity/Wirel-Constellow Current Party Current Party/Infineon, Wireless, Connectivity/Wirel-Constellow Current Party Current Party/Infineon, Wireless, Connectivity/Wirel-Constellow Current Party Current Party/Infineon, Wireless, Connectivity/Wirel/Corecle/Infindude/ Current Party Current Party/Infineon, Wireless, Connectivity/Party/Infineon, Wirel		
		8	lestore Defaults	Apply

In this case, delete the entire project folder, copy the project folder again, and modify it as follows:

- 1. Rename <application>\STM32CubeIDE folder to <application>\STM32CubeIDE.org.
- 2. Select Device/Modules on STM32CubeMX.
- 3. Push "Generate Code" button on STM32CubeMX.
- 4. STM32CubeMX newly creates <application>\STM32CubeIDE folder for selected device/module.
- 5. Restore Linker script; Copy <application>\STM32CubeIDE.org\CM7\STM32XXXX_FLASH.ld to <application>\STM32CubeIDE\CM7\STM32XXXX_FLASH.ld (in the case of multi-core),

or

Copy <application>\STM32CubeIDE.org\STM32XXXX _FLASH.ld to <application>\STM32CubeIDE\STM32XXXX _FLASH.ld (in the case of single core).

6. If application uses floating point variables with printf/scanf (e.g. wifi_bt_tester), enable floating point with printf/scanf library as follows:

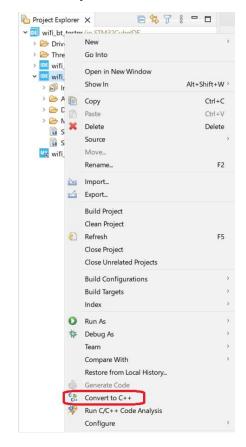


Select Project > Properties > Settings > MCU Settings > Use float with printf/scanf.

Properties for wifi_bt_tester	_CM7				
type filter text	Settings			¢	• 🖒 • 🖇
type filter text > Resource Builders < C/C++ Build Build Variables Environment Logging Settings > C/C++ General CMSIS-SVD Settings Project References Run/Debug Settings	Settings Configuration: Debug [Active] Tool Settings Build Steps MCU Toolchain MCU Toolchain MCU GCC Assembler MCU GCC Assembler MCU GCC Compiler MCU GCC Compiler General Debugging Preprocessor MCU GCC Compiler General Debugging Preprocessor MCU GCC Compiler MCU GCC Linker MCU GCC Linker MCU GCC Linker MCU GCC Linker	MCU Board Floating-point unit Floating-point ABI Instruction set Runtime library Suge float with print	Binary Parsers S Error Parsers STM32H747XIHx STM32H747P.DISCO FPv5-D16 Hardware implementation (-mfloat-abi= Thumb2 Reduced C (specs=nano.specs) ntf from newlib-nano (-u_scanf_float) nf from newlib-nano (-u_scanf_float)	Manage Configu	^
	ibraries				v
?			Appl	y and Close	Cancel

7. If application includes C++ source code, convert project from C to C++.

8. Select Project -> "Convert to C++".





9.3 Additional Macro for CYW43022/CYW55500/CYW55572

When you select CYW43022/CYW55500/CYW55572 as the device, you need to add the following macro(s) when building application.

For CYW43022 device:

- BLHS_SUPPORT
- ULP_SUPPORT
- DM_43022C1

For CYW55500 device:

• BLHS_SUPPORT

For CYW55572 device:

BLHS_SUPPORT

Select Project > Properties > C/C++ Build > Settings > MCU/GCC Compiler > Preprocessor.

Properties for wifi_scan	_CM7					\times
type filter text	Settings				⇔ ◄ ➪	₩ 8
 Resource Builders C/C++ Build Build Variables Environment Logging Settings 	Configuration: Debug [Active]	😤 Build Artifact 🗟 Binary Parsers 🥺 Error Parser	5	Manage C	Configurati	
 C/C++ General CMSIS-SVD Settings Project References Run/Debug Settings 	 MCU Softialit MCU Settings MCU Post build outputs MCU GCC Assembler General Debugging Preprocessor Include paths Miscellaneous MCU GCC Compiler General Debugging Preprocessor Include paths 	Define symbols (-D) DEBUG BLHS_SUPPORT ULP_SUPPORT DM_43022C1 CORE_CM7 USE_HAL_DRIVER STM32H747xx CYBSP_WIFI_CAPABLE CY_USING_HAL CY_STORAGE_WIFI_DATA=".whd_fw" STM32_THREAD_SAFE_STRATEGY=5		•		
	 Protect parts Poptimization Warnings Miscellaneous MCU GCC Linker General Libraries Miscellaneous 	Undefine symbols (-U)		Ð	<u>昭</u> 留 (5)	ÐI
		Do not search system directories (-nostdinc) Preprocess only (-E)				
?			Restore	Defaults	<u>A</u> pply Cancel	
0			inppry and		cancer	



Known issues, limitations, and workarounds

10 Known issues, limitations, and workarounds

This section lists the known issues/limitations of this release:

Problem	Component	Workaround
BLE is not supported on CYW43022, CYW55500, CYW55572 devices.	btstack-integration (CYW43022, CYW55500, CYW55572)	None. BT FW for CYW43022, CYW55500, CYW55572 devices will be added in a future release.
STM32U5 + CYW43012 is not able to join to WPA3 network.	wifi-host-driver, wpa3- external-supplicant	None. This will be addressed in a future release.
STM32L5 is not functional with CYW55500 device.	wifi-host-driver (CYW55500)	None. This will be addressed in a future release.
communication (with CYW43012), Dtstack-integration (CYW42012 BT FW) HAL_UART_RegisterCallback funct		Register a User UART Error Callback (by using HAL_UART_RegisterCallback function) with implementing the Bluetooth® LE or System reset.
STM32CubeIDE returns the linkage error "undefined reference to _nx_nd_cache***" when IPv6 is enabled in the NetxDuo configuration.	STM32CubeMx/ STM32CubeIDE	Manually add nx_nd_cache_***.c files from the MCU pack (e.g STM32Cube_FW_U5_V1.1.1\Middlewares\ ST\netxduo\common\src) to the project workspace.
component from the project workspace (STM32Cubelde/EWARM), when another variant of this component is disabled or changed. It causes a build error when two versions of one component are added to the project (e.g., device CYW/43012 andSTM32CubeMx/ STM32CubeIDEOption 2: Remove the project workspace fol generate a project from STM32Cul careful with the custom linker scri		Manually remove files/includes of the previous component variant from the project workspace.
STM32CubeIDE does not include source files of modified device component for wifi_bt_tester project (i.e. if CYW4343W is selected instead of CYW43012 in device dropdown during Code Generate in STM32CubeMX)	STM32CubeMx/ STM32CubeIDE	This can be fixed by modifying the project to "C" instead of C++ in STM32CubeIDE before Generating the project.



Revision history

Revision history

Date	Version	Description
2021-03-25	**	Initial release.
2022-11-14	*A	Updated from version 1.1.0 to version 1.2.0.
2022-12-22	*В	Updated from version 1.2.0 to version 1.3.0.
2023-07-14	*C	Updated to version 1.5.0.
2023-08-29	*D	Updated to version 1.5.1.

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Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.