UM11443

NXP Wi-Fi and Bluetooth Debug Feature Configuration Guide for i.MX Platforms Running FreeRTOS

Rev. 12.0 — 16 September 2025 **User manual**

Document information

Information	Content
Keywords	Debug configurations, NXP-based wireless modules, i.MX RT1060 EVKC board
Abstract	Describes the debug configurations available to generate various Wi-Fi driver/feature logs, and covers some Bluetooth protocol debugging methods.

1 About this document

The document describes the use of debug configurations to generate Wi-Fi driver/feature logs. Another section addresses the Bluetooth protocol debugging methods. For the debugging, the Wi-Fi/Bluetooth sample application is used with i.MX RT1060 EVKC board and an NXP-based wireless module. This document aims at providing a quick understanding of the debugging techniques.

1.1 Considerations

This document does not include wireless module information, i.MX RT product information, hardware interconnection, board settings, bring-up, IDE setup, SDK download, as these are covered in ref.[1] and ref.[2].

2 Wi-Fi debug features and configurations

This section shows the list of user-configurable Wi-Fi debug macros available in i.MX RT MCUXpresso SDK and how to get different Wi-Fi debug logs based on the features by enabling/defining these macros at the time of application execution.

2.1 Wi-Fi debug configurations

To enable the debug logs, use the macros listed in Table 1 along with the source file name. Some of the debug macros are already defined and others can be defined in the header file.

For example, to define `CONFIG_ENABLE_ERROR_LOGS` macro, add the following line in *wifi_config.h* file. The path to *wifi_config.h* file is:

evk<i.MX RT platform>wifi_<example>\source\wifi_config.h.

```
#define CONFIG_ENABLE_ERROR_LOGS   1
```

Note: *The default values for all debug macros are included in wifi_config_default.h file located at evk<RT-Platform>\wifi\incl\wifi_config_default.h. To change the values for your configuration, edit the file wifi_config.h file.*

Table 1. Wi-Fi debug log configurations

Debug macros	Default macro value	File name	Details
CONFIG_ENABLE_ERROR_LOGS	1	*wifi_config.h*	Enable error logs for Wi-Fi (Includes DHCPD, lwIP, os [port], WLCM, Wi-Fi driver modules)
CONFIG_ENABLE_WARNING_LOGS	1	*wifi_config.h*	Enable warning logs for Wi-Fi (Includes DHCPD, WLCM, Wi-Fi driver modules)
CONFIG_WLCMGR_DEBUG	0	*wifi_config.h*	Enable wireless connection manager debug logs
CONFIG_WIFI_EXTRA_DEBUG	0	*wifi_config.h*	Additional debugging information for the Wi-Fi driver
CONFIG_WIFI_EVENTS_DEBUG	0	*wifi_config.h*	Dump event codes received from the Wi-Fi firmware
CONFIG_WIFI_CMD_RESP_DEBUG	0	*wifi_config.h*	Enable host command and response debug logs (no hex dump)
CONFIG_WIFI_SCAN_DEBUG	0	*wifi_config.h*	Enable scan debug logs
CONFIG_WIFI_IO_INFO_DUMP	0	*wifi_config.h*	Enable information dump about input/output data packets
CONFIG_WIFI_IO_DEBUG	0	*wifi_config.h*	Enable IO debug logs
CONFIG_WIFI_IO_DUMP	0	*wifi_config.h*	Enable SDIO send/receive dump
CONFIG_WIFI_MEM_DEBUG	0	*wifi_config.h*	Enable Wi-Fi module memory related debug logs like allocation and free
CONFIG_WIFI_AMPDU_DEBUG	0	*wifi_config.h*	Enable AMPDU debug level logs
CONFIG_WIFI_TIMER_DEBUG	0	*wifi_config.h*	Enable timer debug level logs
CONFIG_WIFI_SDIO_DEBUG	0	*wifi_config.h*	Enable SDIO debug level logs
CONFIG_WIFI_FW_DEBUG	0	*wifi_config.h*	Enable Wi-Fi Firmware debug logs
CONFIG_WIFI_PKT_DEBUG	0	*wifi_config.h*	Enable RX TX packets debug logs

Table 1. Wi-Fi debug log configurations*...continued*

Debug macros	Default macro value	File name	Details
CONFIG_WIFI_UAP_DEBUG	0	*wifi_config.h*	Enable uAP mode specific debug logs
CONFIG_WPS_DEBUG	0	*wifi_config.h*	Enable WPS security specific debug logs
CONFIG_FW_VDLL_DEBUG	0	*wifi_config.h*	Enable Wi-Fi FW VDLL debug logs
CONFIG_DHCP_SERVER_DEBUG	0	*wifi_config.h*	Enable DHCP server specific debug logs
CONFIG_FWDNLD_IO_DEBUG	0	*wifi_config.h*	Enable Wi-Fi FW download process specific logs
CONFIG_WIFI_SG_DEBUG	0	*wifi_config.h*	Enable Wi-Fi scatter gather debug logs
CONFIG_WIFI_PS_DEBUG	0	*wifi_config.h*	Enable Wi-Fi power save specific debug logs

3 Bluetooth debug features and configurations

This section shows the steps to capture HCI and console debug logs for Bluetooth using *a2dp_sink* application. The HCI logs are used to analyze the Bluetooth Host and Controller communication. It also provides the steps to extract the link key for the Bluetooth Classic used to decrypt the Bluetooth sniffer logs.

3.1 Bluetooth/Bluetooth LE debug configuration headers

Table 2 lists of configuration header files available in the Edgefast Bluetooth sample application. The files are used to configure the application.

Table 2. Debug configuration header files

Configuration header file	Purpose
edgefast_bluetooth_app.h	Defines the macro of the connected wireless module, and the macros which cannot be configured by kconfig from GitHub.
edgefast_bluetooth_audio_config.h	Includes the macro definitions related to the audio configuration.
edgefast_bluetooth_config.h	Provides the macro definitions to enable the common Bluetooth/ Bluetooth LE features, and the debug logs across various application sections.

3.2 Bluetooth Classic/Bluetooth LE debug configurations

To enable the debug logs, use the macros listed in the table below along with the source file name.

For example, to define `CONFIG_BT_DEBUG` macro, add the following line in *edgefast_bluetooth_config.h* file. The path to *edgefast_bluetooth_config.h* file is *evk<i.MX RT platform>edgefast_bluetooth<example>\source\edgefast_bluetooth_config.h*.

```
#define CONFIG_BT_DEBUG 1
```

Table 3. Bluetooth debug log configurations

Debug macros	Default macro value	File name	Details
CONFIG_BT_DEBUG	Undefined	*edgefast_bluetooth_config.h*	Enable the debug print feature.
CONFIG_BT_DEBUG_HCI_CORE	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for HCI interface.
CONFIG_BT_DEBUG_CONN	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for connection.
CONFIG_BT_DEBUG_GATT	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for GATT module.
CONFIG_BT_DEBUG_ATT	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for ATT module.
CONFIG_BT_DEBUG_L2CAP	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for L2CAP module.
CONFIG_BT_DEBUG_A2DP	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for A2DP module.
CONFIG_BT_DEBUG_HFP_AG	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for HFP Audio gateway.
CONFIG_BT_DEBUG_HFP_HF	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for HFP device.
CONFIG_BT_DEBUG_SPP	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for SPP
CONFIG_BT_DEBUG_RFCOMM	Undefined	*edgefast_bluetooth_config.h*	Enable the debug prints for RFCOMM

3.3 Capture and analyze HCI logs using *a2dp_sink*

This section describes the use of *a2dp_sink* application for which support is enabled on i.MX RT1060 EVKC board with an NXP-based wireless module and it helps to capture Bluetooth HCI logs. For more details on *a2dp_sink* application usage and configuration, refer to ref.[2].

3.3.1 Software download and i.MX RT image setup

For the SDK download and image setup, refer to ref.[1].

3.3.2 Pre-requisites before running the application

- Define `CONFIG_BT_SNOOP` macro in *edgefast_bluetooth_config.h* file. The file is located at *evk<i.MX RT platform>edgefast_bluetooth<example>\source\edgefast_bluetooth_config.h*.
- Rebuild and flash *a2dp_sink* application.
- Connect the USB Drive.
  Plug the USB Drive into the i.MX RT1060 EVKC board.
- Setup *Wireshark* tool.
  The Wireshark tool is required to open and analyze the HCI logs. Download and install *Wireshark* tool for Windows and Mac OS. Refer to ref.[3].
  Steps to install *Wireshark* tool on a computer running Linux Ubuntu:

```
sudo add-apt-repository ppa:wireshark-dev/stable
sudo apt update
sudo apt install wireshark
```

3.3.3 Run the Bluetooth demo application

This section describes how to capture the Bluetooth HCI logs saved in the USB drive plugged into i.MX RT1060 EVKC board.

Once the image is flashed on the board, power reset the i.MX RT1060 EVKC board.

The demo application first loads the Wi-Fi and Bluetooth module firmware through the SDIO interface.

Next, the application automatically turns on the discoverable and connectable mode for Bluetooth Classic.

Look for the logs once the i.MX RT1060 EVKC board and NXP-based wireless module are up and running.

```
Bluetooth initialized
BR/EDR set connectable and discoverable done
```

Pair a phone with *a2dp_sink*

At this point, the stack is ready to accept incoming connections from any peer device.

Take the mobile phone and use the **Pair new device** option in Bluetooth settings to scan, connect and pair with the i.MX RT1060 EVKC and NXP-based wireless module named as *a2dp_sink*.

The following log shows on the console upon the successful Bluetooth connection.

```
Connected
Security changed: 7A:5A:2B:2E:9E:C3 level 2
a2dp connected success
```

Disconnect *a2dp_sink* from the phone

The following log shows on the console.

```
Disconnected (reason 0x13)
```

Unplug the USB drive and connect it to the laptop

The file named "*btsnoop*" is available in the USB drive. The *Wireshark* tool can be used to open the file and analyze the logs.

Extract the Link Key for Bluetooth Classic

Open the captured HCI Logs in *Wireshark* tool and search for `Link Key Notification` event. Copy the `Link Key` to use for the sniffer logs decryption.

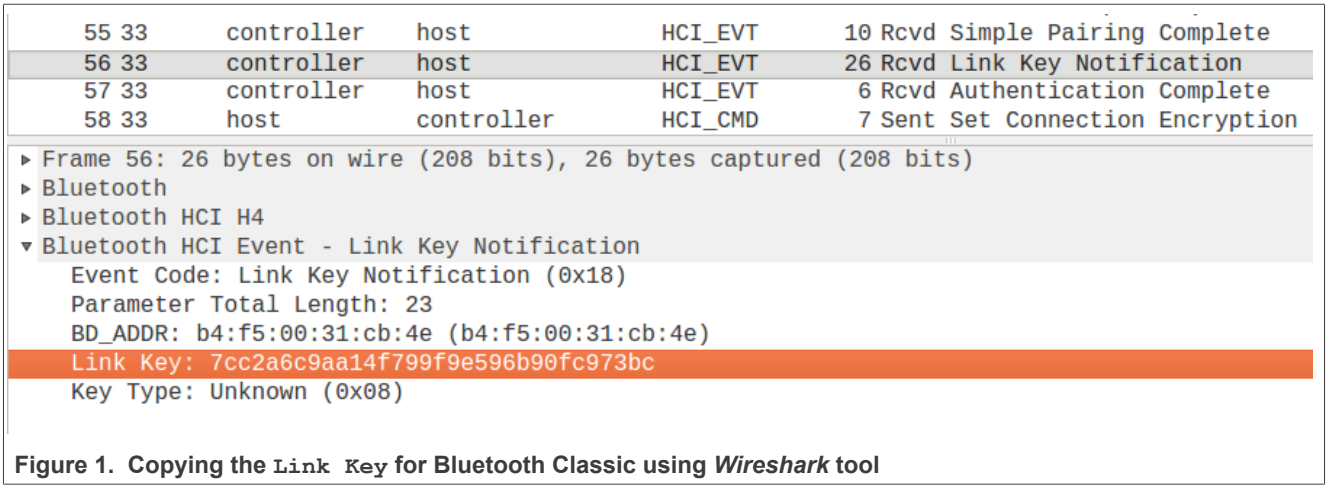

Figure 1. Copying the `Link Key` for Bluetooth Classic using *Wireshark* tool

4 Abbreviations

Table 4. Abbreviations

Abbreviation	Definition
A2DP	Advanced audio distribution profile
AMPDU	Aggregate – MAC protocol data unit
AMSDU	Aggregate – MAC service data unit
AP	Access point
APPL	Application
DHCP	Dynamic host configuration protocol
EVK	Evaluation kit
FW	Firmware
HCI	Host controller interface
IDE	Integrated development environment
IE	Information element
IP	Internet protocol
lwIP	Lightweight IP
OTG	On the go
SD	Secure digital
SDK	Software development kit
STA	Station/client
SW	Software
USB	Universal serial bus
WLAN	Wireless local area network
WLCM	Wireless connection manager
WMM	Wi-Fi multimedia

5 References

[1] User manual – NXP – UM11441: Getting Started with NXP-based Wireless Modules and i.MX RT Platform Running RTOS (link)

[2] User manual – NXP – UM11442: Wi-Fi and Bluetooth Demo Applications for i.MX RT Platforms User Guide (link)

[3] Webpage – WIRESHARK – The world's most popular network protocol analyzer (link)

6 Note about the source code in the document

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8 Revision history

Revision history

Document ID	Date	Description
UM11443 v.12.0	16 September 2025	• Section 3.1 "Bluetooth/Bluetooth LE debug configuration headers": updated the table. • Section 3.2 "Bluetooth Classic/Bluetooth LE debug configurations": update the filename of the configuration file. • Section 3.3.2 "Pre-requisites before running the application": updated the filename of the configuration file.
UM11443 v.11.0	9 June 2025	• Section 2.1 "Wi-Fi debug configurations": added some content to the table *Wi-Fi debug configurations*.
UM11443 v.10.0	23 March 2025	• Replaced occurrences of i.MX RT1060 EVK with i.MX RT 1060 EVKC. • Section 3.1 "Bluetooth/Bluetooth LE debug configuration headers": added. • Section 3.2 "Bluetooth Classic/Bluetooth LE debug configurations": updated. • Section 3.3.2 "Pre-requisites before running the application": updated. • Section 3.3.3 "Run the Bluetooth demo application": updated *Pair a phone with a2dp_sink*. • Section 5 "References": updated.
UM11443 v.9.0	6 January 2025	• Section 2 "Wi-Fi debug features and configurations": removed the sentence about *wifi_cli_dump* application and firmware dump collection in the introduction. • Section *Collect Wi-Fi firmware dump logs using wifi_cli_fw_dump*: removed.
UM11443 v.8.0	26 June 2024	• Debug macro configurations restructured • Section 2.1 "Wi-Fi debug configurations": – Added a note about the default values for the debug macros. – Updated the entries for the default macro value in the table. • Section 3.2 "Bluetooth Classic/Bluetooth LE debug configurations": updated the file name of the configuration file. • Section *Pre-requisites before running the application*: updated the file name of the configuration file. • Section 5 "References": updated.
UM11443 v.7.0	9 January 2024	• Section 6 "Note about the source code in the document": added the section
UM11443 v.6.0	14 March 2022	• Section 5 "References": updated. • Table 3 "Bluetooth debug log configurations": – Added *CONFIG_BT_DEBUG_SPP* macro – Added *CONFIG_BT_DEBUG_RFCOMM* macro – Removed *CONFIG_WMM* • Section 3.3.3 "Run the Bluetooth demo application": removed the content on demo start-up logs
UM11443 v.5.0	7 September 2021	• Section 2.1 "Wi-Fi debug configurations": added *CONFIG_WMM* debug log in the table. • Section 4 "Abbreviations": added *WMM* acronym
UM11443 v.4.0	8 June 2021	• Section 5 "References": updated. • Section *Run the Wi-Fi demo application*: updated the command output example • Section 3.2 "Bluetooth Classic/Bluetooth LE debug configurations": added • Linktext-Section_'number-title: updated

Revision history...*continued*

Document ID	Date	Description
UM11443 v.3.0	24 March 2021	• Section 2.1 "Wi-Fi debug configurations": updated • Section *Pre-requisites before running the application*: added details about the USB stick format • Section 3 "Bluetooth debug features and configurations": updated
UM11443 v.2.0	13 January 2021	• Section 1 "About this document": updated • Section 2.1 "Wi-Fi debug configurations": updated • Section *Collect Wi-Fi firmware firmware dump logs using wifi_cli_fw*: added • Section 3 "Bluetooth debug features and configurations": added • Section 4 "Abbreviations": added
UM11443 v.1.0	17 July 2020	Initial version

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