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ROHM Co., Ltd.
April 1, 2024

Bluetooth® low energy Module (MK71511/MK71521)

Application Note

How to use Sniffer for MK71521

Issue: Nov. 19, 2020

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Introduction

This application note describes the method of using "nRF Sniffer for Bluetooth LE" of the development tool offered by Nordic on the evaluation-kit implemented with LAPIS's **Bluetooth®** low energy modules: MK71521 that support Bluetooth 5.

As well as this document, read the following provided documents as needed.

- MK71511 Data Sheet
- MK715x1EK1 Hardware Manual
- MK715x1EK1A/MK715x1EK1AP Hardware Manual
- MK715x1 Software Development Start-up Guide

Note: In this document, MK715x1 is used to indicate both MK71511 and MK71521.

- Bluetooth® is a registered trademark of Bluetooth SIG, Inc.
- Other names are generally trademarks or registered trademarks of their respective development companies.

Notation

Category	Notation	Description
• Value	0xnn 0bnnnn	Represents a hexadecimal number. Represents a binary number.
• Address	0xnnnn_nnnn	Represents a hexadecimal number. (indicates 0xnnnnnnnn)
• Unit	Word, WORD Byte, BYTE Mega, M Kilo, K Kilo, k Milli, m Micro, μ Nano, n Second, s (lowercase)	1 word = 32 bits 1 byte = 8 bits 10^6 $2^{10} = 1024$ $10^3 = 1000$ 10^{-3} 10^{-6} 10^{-9} Second
• Term	"H" level "L" level	Indicates high voltage signal levels V_{IH} and V_{OH} as specified by the electrical characteristics. Indicates low voltage signal levels V_{IL} and V_{OL} as specified by the electrical characteristics.
• Register Description	Read/write attribute: R indicates read-enabled; W indicates write-enabled. MSB: Most significant bit in an 8-bit register (memory) LSB: Least significant bit in an 8-bit register (memory)	

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1. Overview

nRF Sniffer for Bluetooth LE can display the wireless protocol packet for Bluetooth low energy in real time and check the wireless communication state.

The below describes Operation Environment, Setup and Operation for "nRF Sniffer for Bluetooth" using the evaluation kit implemented with MK71521.

Because the firmware corresponding to "nRF Sniffer for Bluetooth LE" is not prepared, MK71511 cannot be used.

1.1. System Requirements

The operation environment using "nRF Sniffer for Bluetooth LE" is shown as follows.

"nRF Sniffer for Bluetooth LE" captures the wireless communication packets between two Bluetooth low energy devices, and displays captured data to Wireshark of the network protocol analyzer on PC.

Refer to "MK715x1EK1 Hardware Manual" or "MK715x1EK1A/MK715x1EK1AP Hardware Manual" for details of the evaluation kit implemented of MK71521.

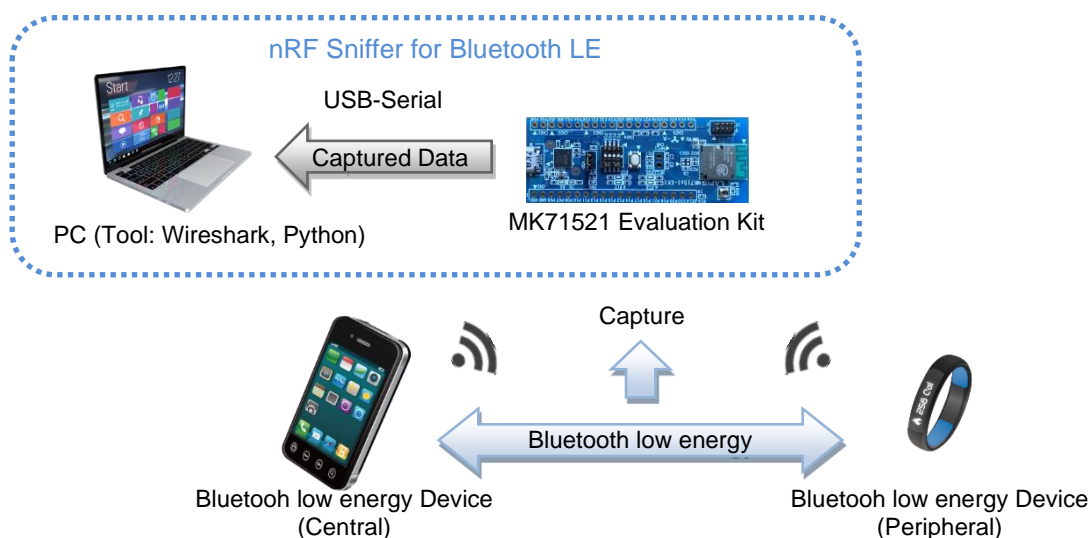


Figure 1-1 nRF Sniffer for Bluetooth LE Operation Environment

This document is described for Windows 10. Moreover, the operation of other software is described in the following table.

Table 1-1 Software Version

Software	Version
nRF Sniffer (Nordic)	Version 3.0.0
Wireshark	Version 3.2.1
Python	Version 3.8.1

Refer to the following support site for details of these software.

nRF Sniffer (Nordic) : https://infocenter.nordicsemi.com/index.jsp?topic=%2Fug_sniffer_ble%2FUG%2Fsniffer_ble%2Fintro.html
 Wireshark : <https://www.wireshark.org/>
 Python : <https://www.python.org/>

2. Setup

The setup procedure of the software relates to "nRF Sniffer for Bluetooth LE" is described.
PC needs to connect to internet for the following setup procedure.

2.1. Installing USB-Serial Driver

When PC and the evaluation kit implemented of MK71521 are connected, the FT232RQ driver is needed.
The FT232RQ driver corresponding to PC is installed from the following site if necessary.

URL: <http://www.ftdichip.com/Drivers/D2XX.htm>

2.2. Writing Sniffer Firmware for MK71521

The ZIP file of "nRF Sniffer for Bluetooth LE" is downloaded from the following site, and unzip it to one folder of PC.

URL: <https://www.nordicsemi.com/Software-and-tools/Development-Tools/nRF-Sniffer-for-Bluetooth-LE/Download#infotabs>

ZIP file: nrf_sniffer_for_bluetooth_le_3.0.0_129d2b3.zip *Version 3.0.0

Next, the Hex file of the following folder is written in Flash ROM with built-in MK71521.

Refer to "2.6. Installing nRF Connect for Desktop" of "MK715x1 Software Development Start-up Guide" and "3.4. Writing Built Program" for method of writing the firmware. The writing procedure only of the application program is done without doing the writing procedure of SoftDevice.

Folder : ".\<nRF Sniffer Folder Name>\hex\"

Hex File : "sniffer_pca10040_129d2b3.hex"

The other files in ZIP file is used at Wireshark installing.

2.3. Installing Wireshark

The installation file of Wireshark is downloaded and executed from the following site.
Complete the installation according to the procedure of the executed installer.

URL: <https://www.wireshark.org/>

2.4. Python Setup

The following procedure is executed, and Python is set up.

(1) Python Downloading & Installing

The installation file of Python is downloaded and executed from the following site.
Complete the installation according to the procedure of the executed installer.

URL: <https://www.python.org/downloads/>

(2) Environment Variable Addition

A new path is added to the system environment variable according to the following operating procedure.

Operation 1: The control panel is opened by the figure below operation of the Explorer of Windows.

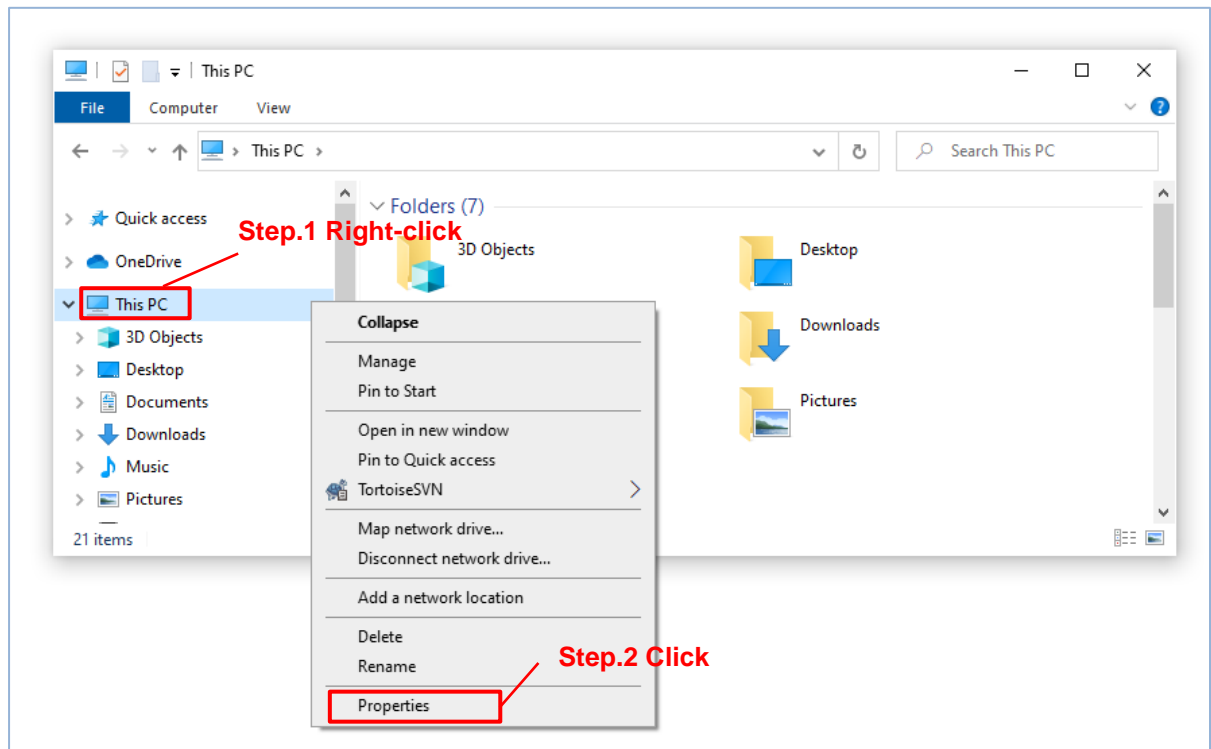


Figure 2-1 Python Environment Variable Addition (1)

Operation 2: "System Properties" window is opened by the operation in the figure below.

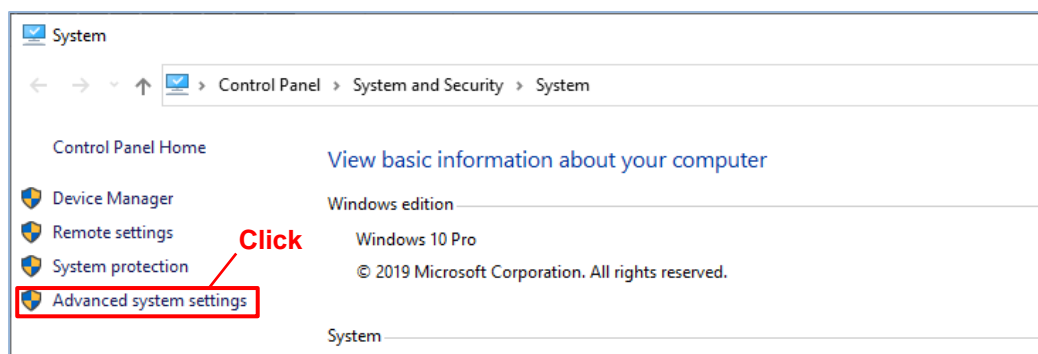


Figure 2-2 Python Environment Variable Addition (2)

Operation 3: "Environment Variables" window is opened by the operation in the figure below.

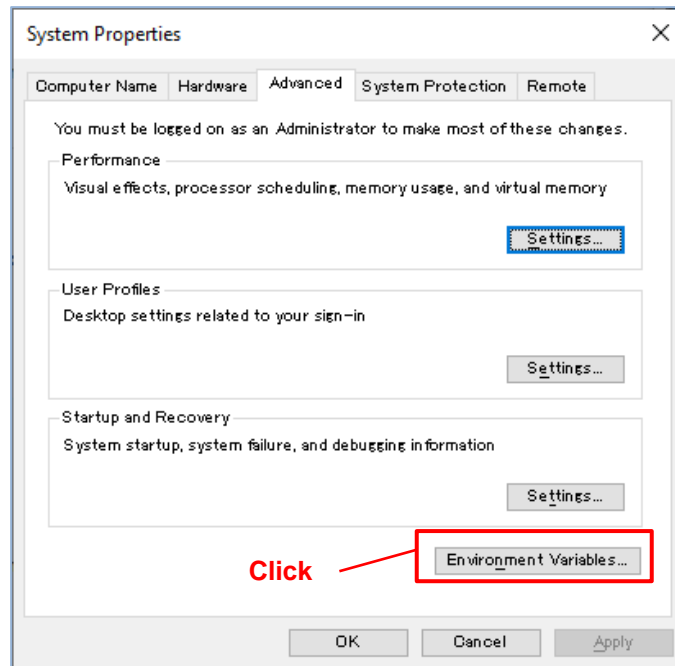


Figure 2-3 Python Environment Variable Addition (3)

Operation 4: "Edit environment variable" window is opened by the operation in the figure below.

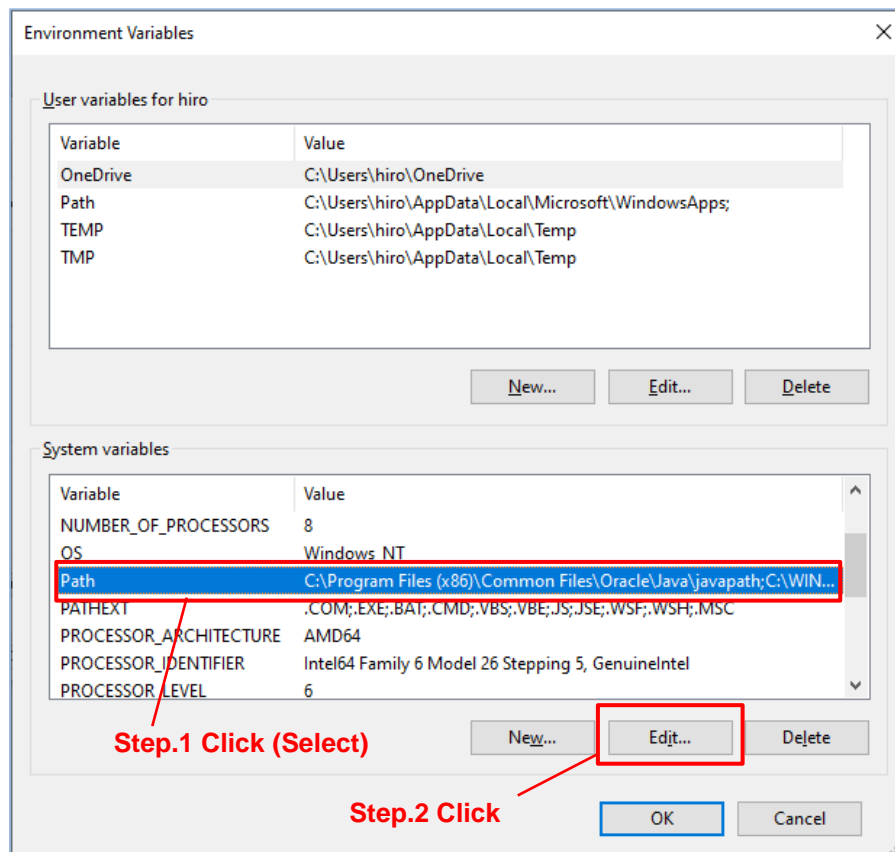


Figure 2-4 Python Environment Variable Addition (4)

Operation 5: A new path is added to system variable by the operation in the figure below.
The command prompt needs to restart after adding a new path.

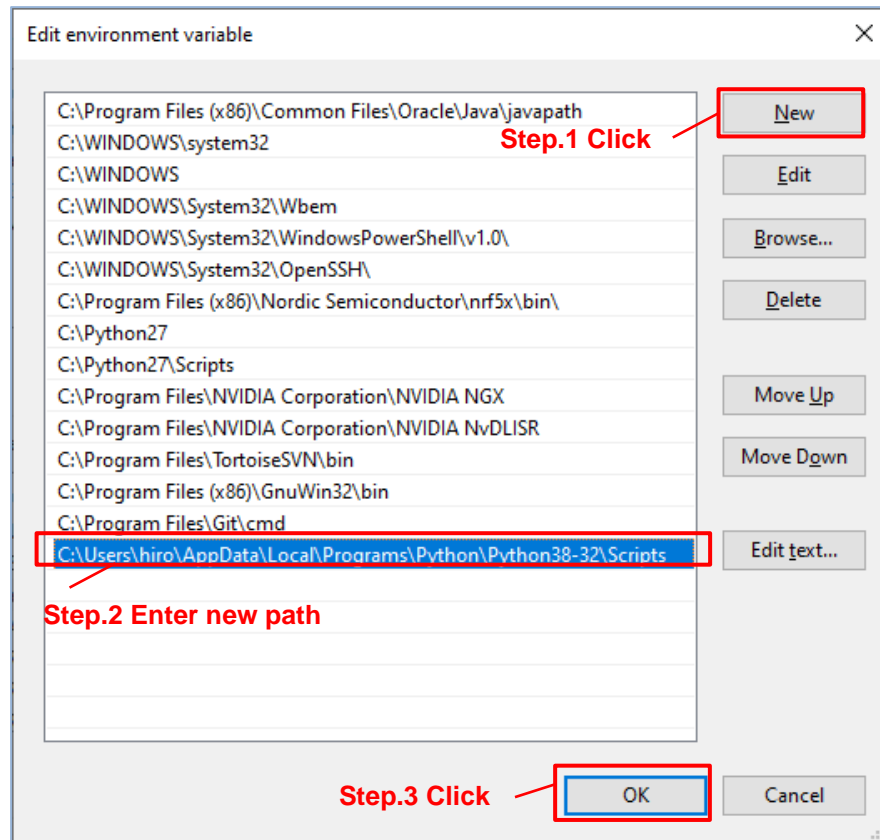


図 2-5 Python Environment Variable Addition (5)

New Path : "C:\Users\<User Folder Name>\AppData\Local\Programs\Python\Python38-32\Scripts" (Reference)
*A new path is different according to the version of Python. Referring to the above new path, the folder path of "Pip3.exe" is confirmed after installing Python.

(3) Serial Library Addition

The serial library is added by the following command entering.
It is necessary to connect PC with the Internet when command is executed

```
C:\>pip install pyserial
```

Figure 2-6 Python Serial library addition

2.5. Wireshark Setup

Wireshark is set up by the following procedures.

(1) Installing Wireshark Plug-in

The plug-in is installed to Wireshark by the following command entering.
It is necessary to connect PC with the Internet when command is executed

```
C:\>cd <nRF Sniffer Folder Name>\extcap

C:\Work\nRF Sniffer\extcap>pip3 install -r requirements.txt
```

Figure 2-7 Installing Wireshark Plug-in

(2) Wireshark setting

Wireshark is started and set by the following operating procedure.

Operation 1: Windows Start - "Wireshark"

Operation 2: Wireshark Menu "Help" - "About Wireshark" and the procedure of the following figure is done.

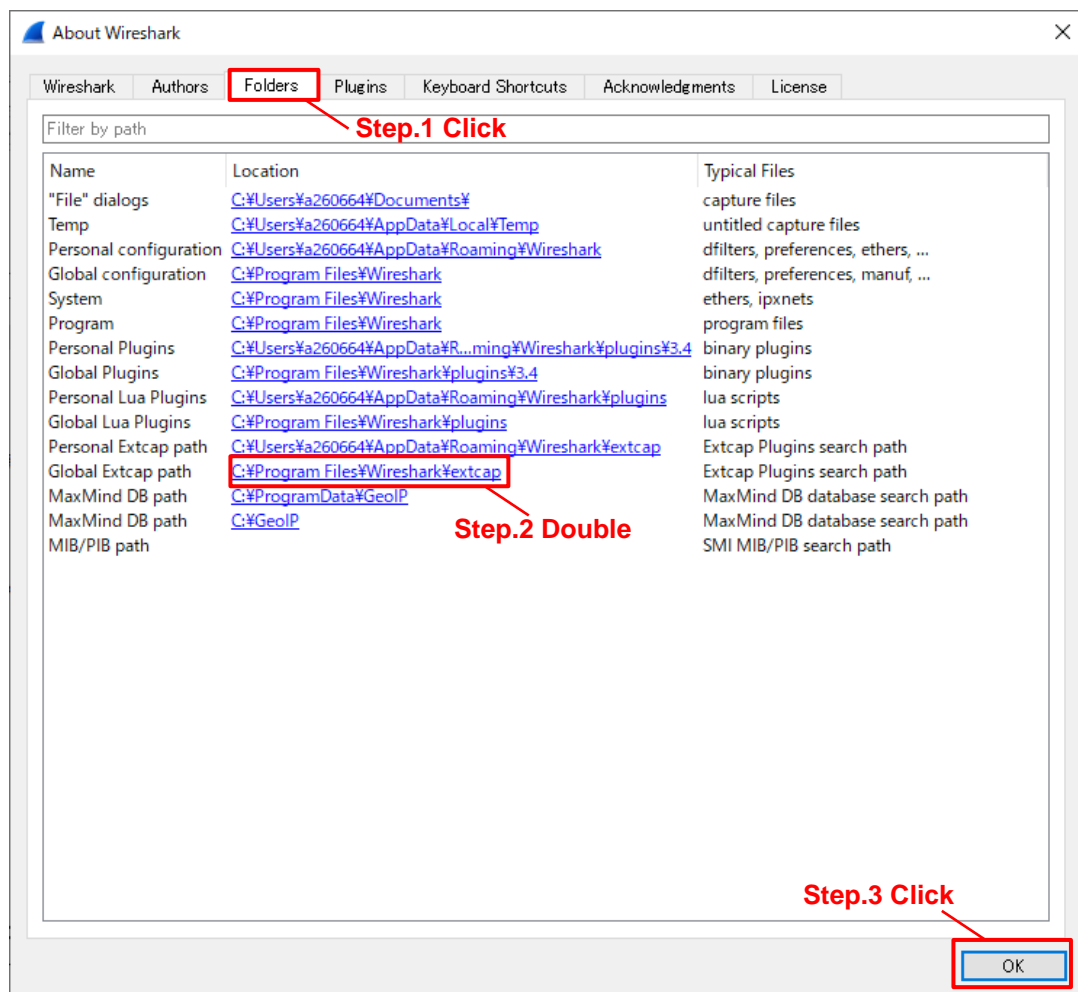


Figure 2-8 Wireshark Setting (open Extcap folder)

Operation 3: The files in the following folder are copied (overwrite) to the related folder of Operation 2.

Copy source: files in ".\<nRF Sniffer Folder Name>\extcap"
Copy destination: Related folder of Operation 2.

Operation 4: Change to related folder of Operation 2, the following command is executed in the command prompt.

```
C:\>cd < Related folder path of Operation 2>

C:\Program Files\Wireshark\extcap>nrf_sniffer_ble.bat --extcap-interfaces
```

Figure 2-9 Wireshark Setting (Batch execution)

Operation 5: Wireshark Menu "Help" - "About Wireshark" and the procedure of the following figure is done.

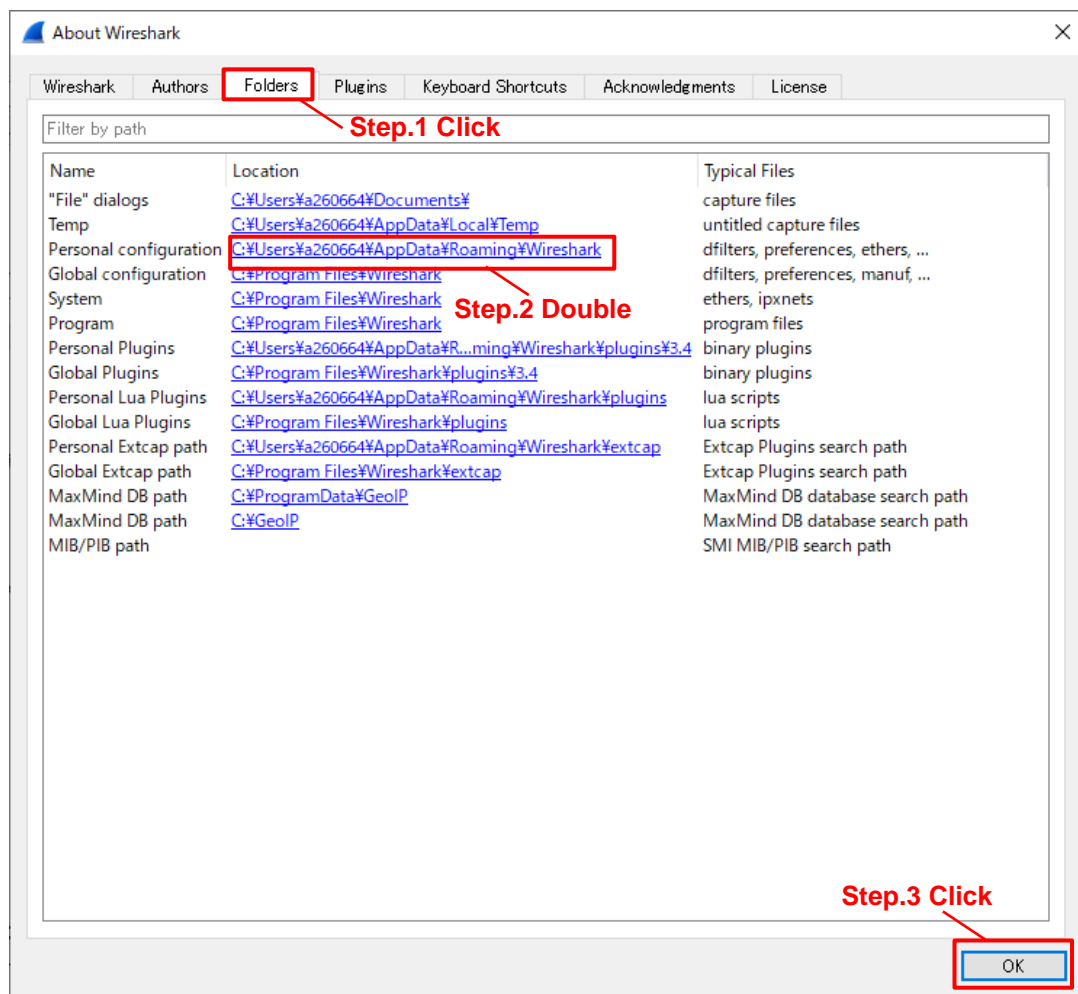


Figure 2-10 Wireshark Setting (Open Configuration Folder)

Operation 6: The files in the following folder are copied into the related folder " profiles" of Operation 5.

Copy source: ".\<nRF Sniffer Folder Name>\ Profile_nRF_Sniffer_Bluetooth_LE"
Copy destination: Into related folder " profiles" of Operation 5.

Operation 7: Wireshark Menu "Edit" - "Configuration Profiles..." and the procedure of the following figure is done.

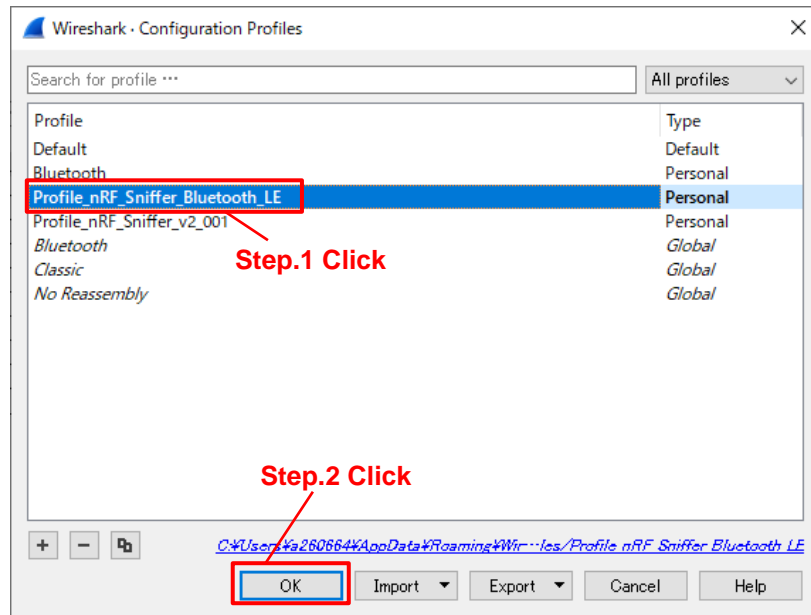


Figure 2-11 WiresharkSetting (Profile Setting)

3. Operation

The operation method to capture the wireless communication packets for "nRF Sniffer for Bluetooth LE" is described as follows.

- (1) Connect MK71251 Evaluation-kit to PC

Prepared MK71521 evaluation kit for "nRF Sniffer for Bluetooth LE" is connected to PC.

- (2) Wireshark Start-up

Wireshark is started by the following operation.

Operation: Windows Menu - "Wireshark"

- (3) Selecting the Network Device

After Wireshark is started, the network device is selected by operation of the figure below (red). "COM" port number is different by PC used.

The packet list screen is displayed after the network device is selected, and the output of the capture data is started..

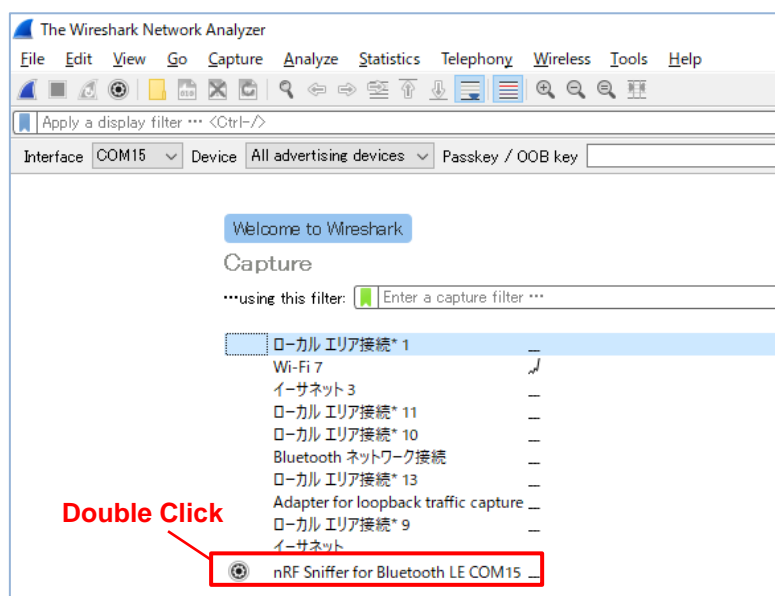


Figure 3-1 Select Network Device

- (4) Selecting the Bluetooth low energy Device for Capturing

The Bluetooth low energy device is selected to display captured data at connecting by operating the figure below (red).

When Bluetooth low energy device (device name or device address) is not displayed in the pull-down list, the advertising packet of the Bluetooth low energy device is captured at first.

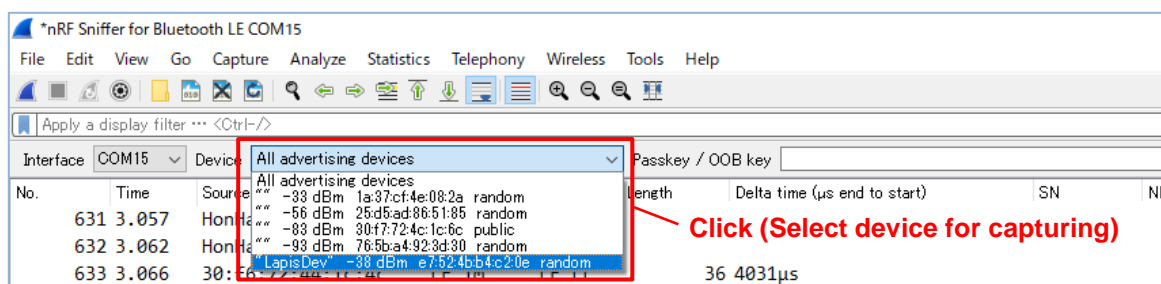


Figure 3-2 Selecting the Bluetooth low energy Device for Capturing

(5) Starting the Capturing

Capture is started by operating in the following figure (red).

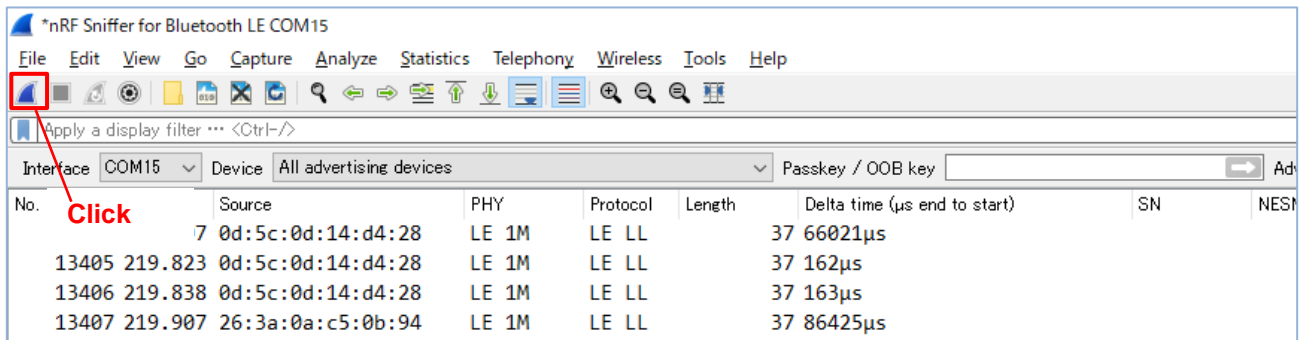


Figure 3-3 Starting the Capturing

(6) Stop the Capturing

Capture is stopped by operating in the following figure (red).

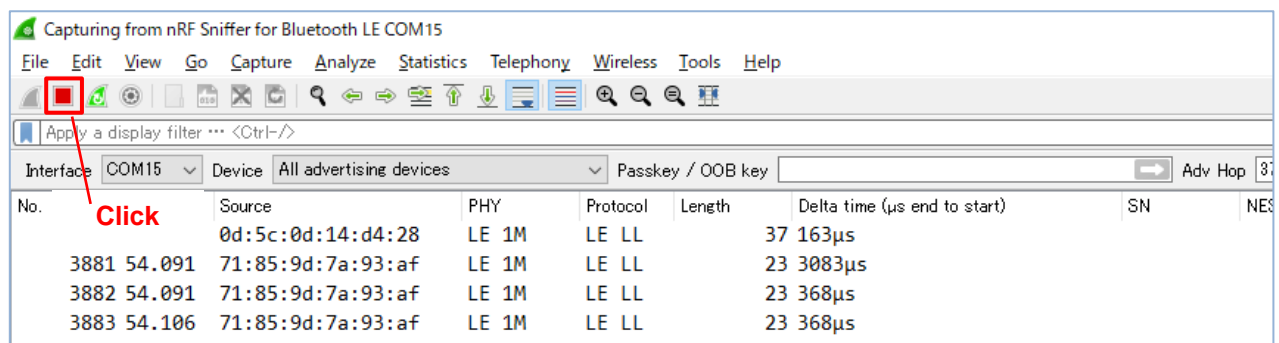


Figure 3-4 Stop the Capturing

(7) Saving the Captured Data

The following operation saves the captured data when the capturing is the stopped condition

Operation: Wireshark Menu "File" - "Save"

Revision History

[illegible]