WCH-BLE Analyzer User Manual

http://wch.cn

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1. Overview

WCH-BLE Analyzer and WCH-BLE Analyzer Pro is multi-purpose Bluetooth Low Energy development and testing tool. It is used to listen to BLE broadcast channel packets or communication between connected devices, and analyze the packets through PC software (BleAnalyzer.exe) and finally display them to the user in a concise way.

WCH-BLE analyzer can accurately and quickly parse each protocol layer of BLE and display the results of parsing various types of packets in a unique display in the user interface, making it very easy to see the data transmitted by BLE. The analyzer also provides many auxiliary function modules, such as a powerful filtering function to quickly isolate unwanted packets, a selective display function to directly select packets of interest, and a multi-type statistics function to display the number of various packets in real time.

WCH-BLE analyzer can help developers to quickly locate problems, analyze them and solve them in BLE development, thus greatly improving development efficiency, and is one of the indispensable tools for some BLE protocol learners.

2. Features

- Powerful parsing function: Parse each protocol layer of BLE; can restore encrypted data packets in case of packet loss.
- Accurate statistics function: Real-time statistics on the number of connection communication packets lost, empty packets, connection packets, broadcast packets and other types of packets.
- Clear interface display: unique control to display the results of different kinds of packet parsing; there is also a clear interface indication of packet loss for connection communication.
- Rich filtering function: filtering according to broadcast type, broadcast address, RSSI range and other conditions.
- Flexible configuration: Can be configured to listen to the connection communication for specified address or set to broadcast channel polling; can also be configured to listen to packets of any communication channel, access address, CRC initial value, and choose whether to disable the Whitening function.

3. Parameters

Product Size:	WCH-BLE Analyzer:	67 x 24 x 10 mm

	WCH-BLE Analyzer Pro: 91 x 64 x 50 mm
Operating Temperature Range:	-40°C~85°C
Interface Configuration:	USB2.0
Working Voltage:	5V
Bluetooth Protocols:	BLE4.2/BLE5.0

4. Appearance

WCH-BLE Analyzer

WCH-BLE Analyzer pro

5. Computer configuration requirement

5.1. Minimum configuration

CPU Clock Speed:	1 GHz
Memory:	512MB
Hard drive space remaining:	1GB

USB Interface:	USB 2.0
OS:	Windows XP

5.2. Recommended configuration

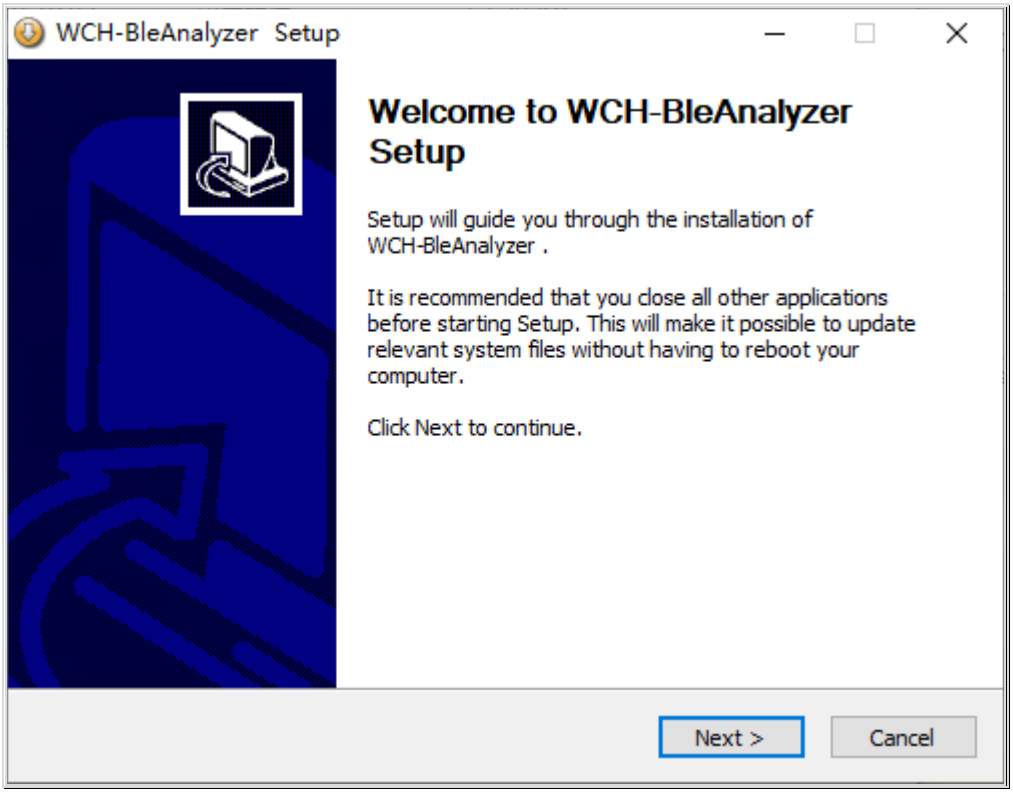
CPU Clock Speed:	2GHz or higher
Memory:	2GB or more
Hard drive space remaining:	2GB or more
USB Interface:	USB 2.0
OS:	Windows 7 or higher

6. Software installation / uninstallation

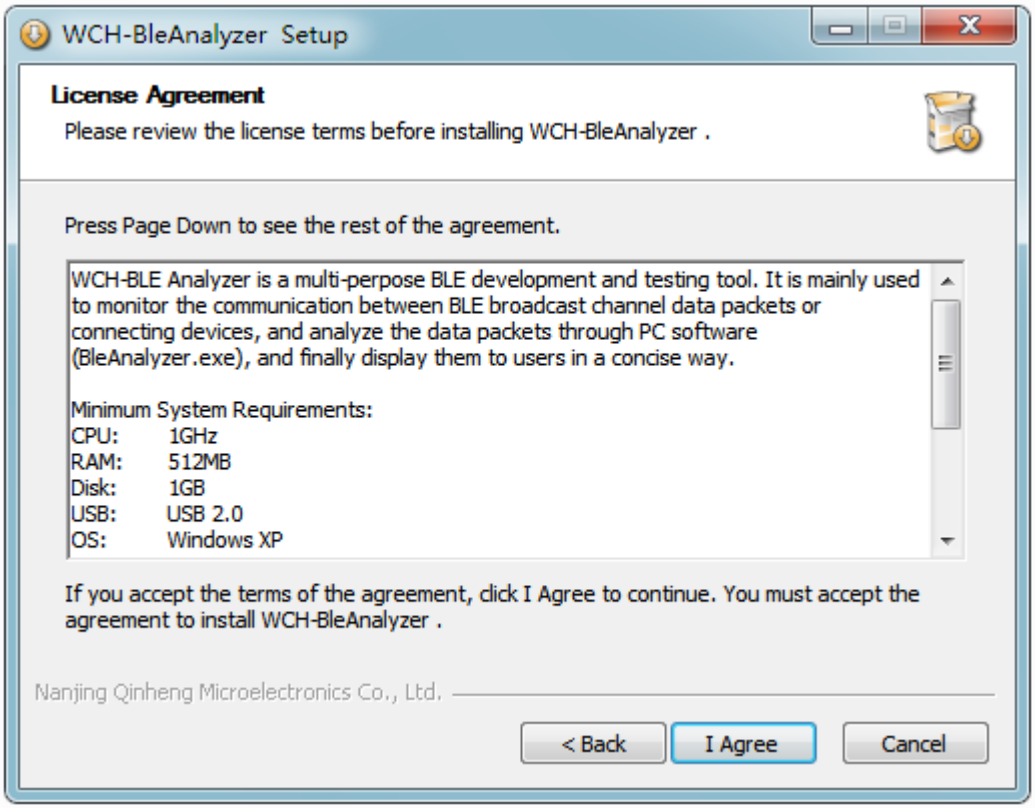
6.1. Software installation

Download the software in this link: https:// wch.cn/downloads/WCH_BLEAnalyzer_zip.html
Connecting the WCH-BLE analyzer to the PC and the system will indicate that new hardware has been found;

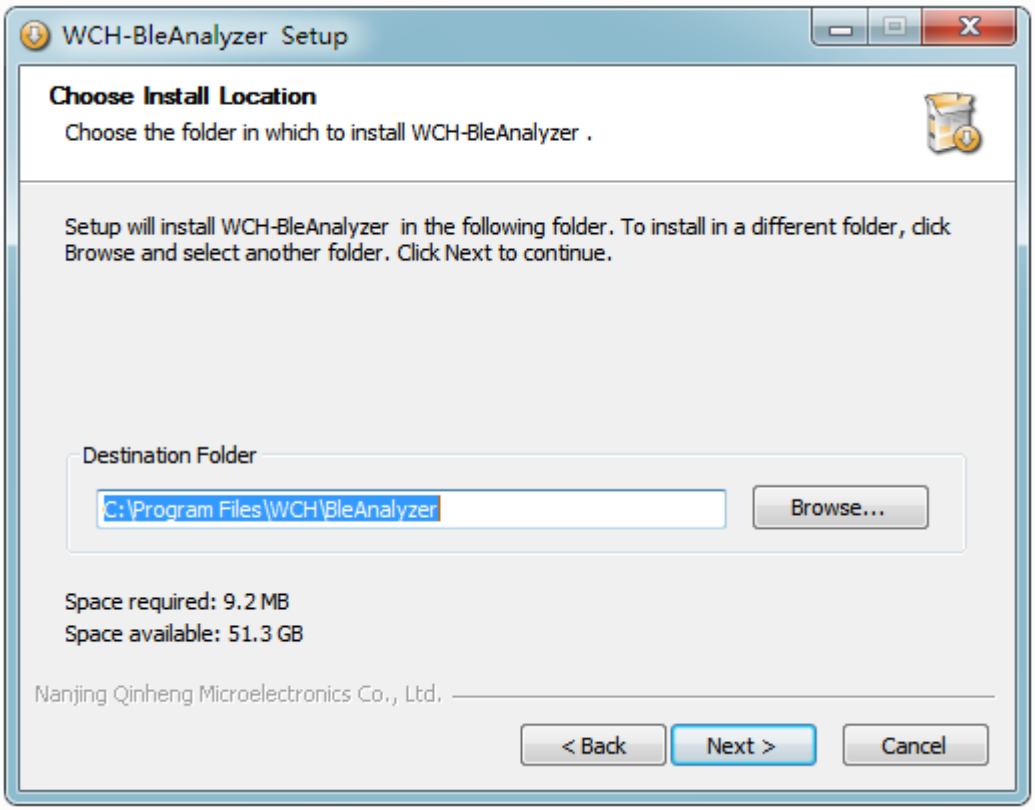
Double-click the BleAnalyzer Setup.exe installation file, as shown in the following image;



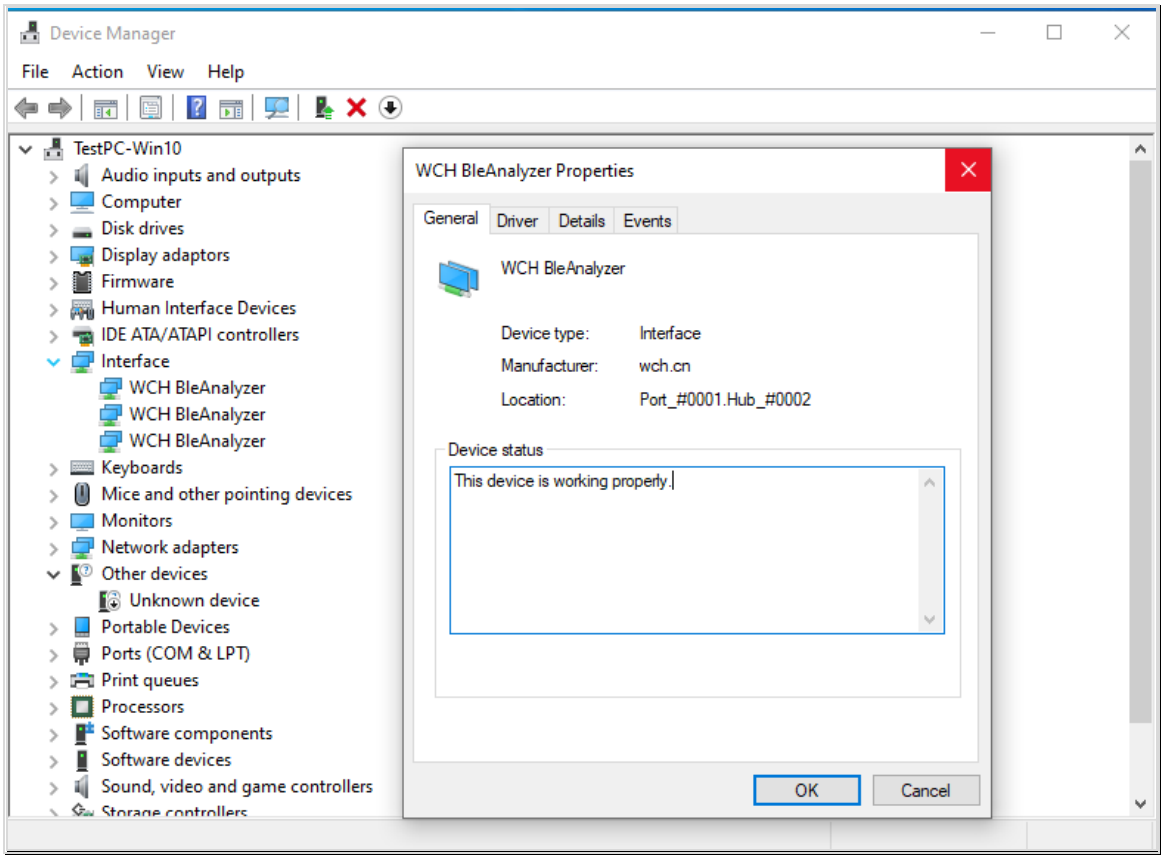
Follow the prompts and click "Next" to install, as shown in the following image:



After confirming the license terms, click "I Agree" to proceed to the next step, as shown in the following image:

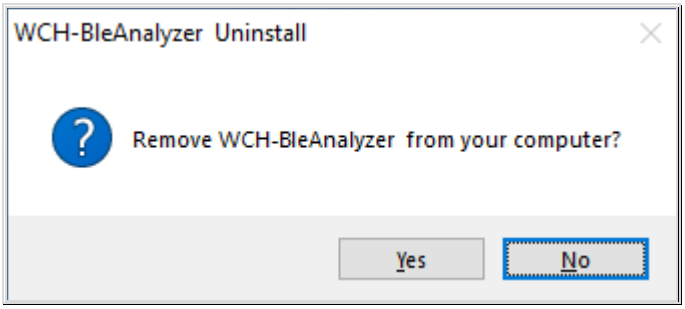


After confirming the installation path, click Next to complete the installation. After successful installation, the driver can be seen in the device manager, as shown in the following image:

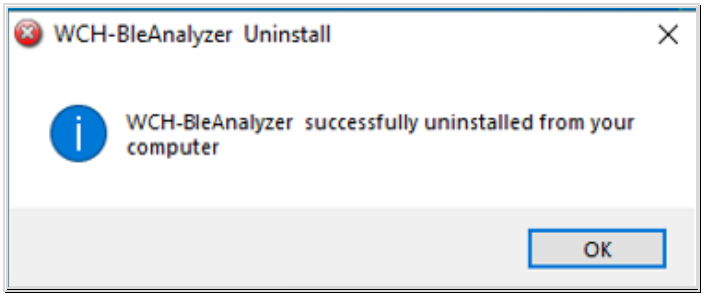


6.2. Software uninstallation

Click "Start" menu, find "BleAnalyzer" in "All Programs", run "Uninstall ", as shown in the following image:

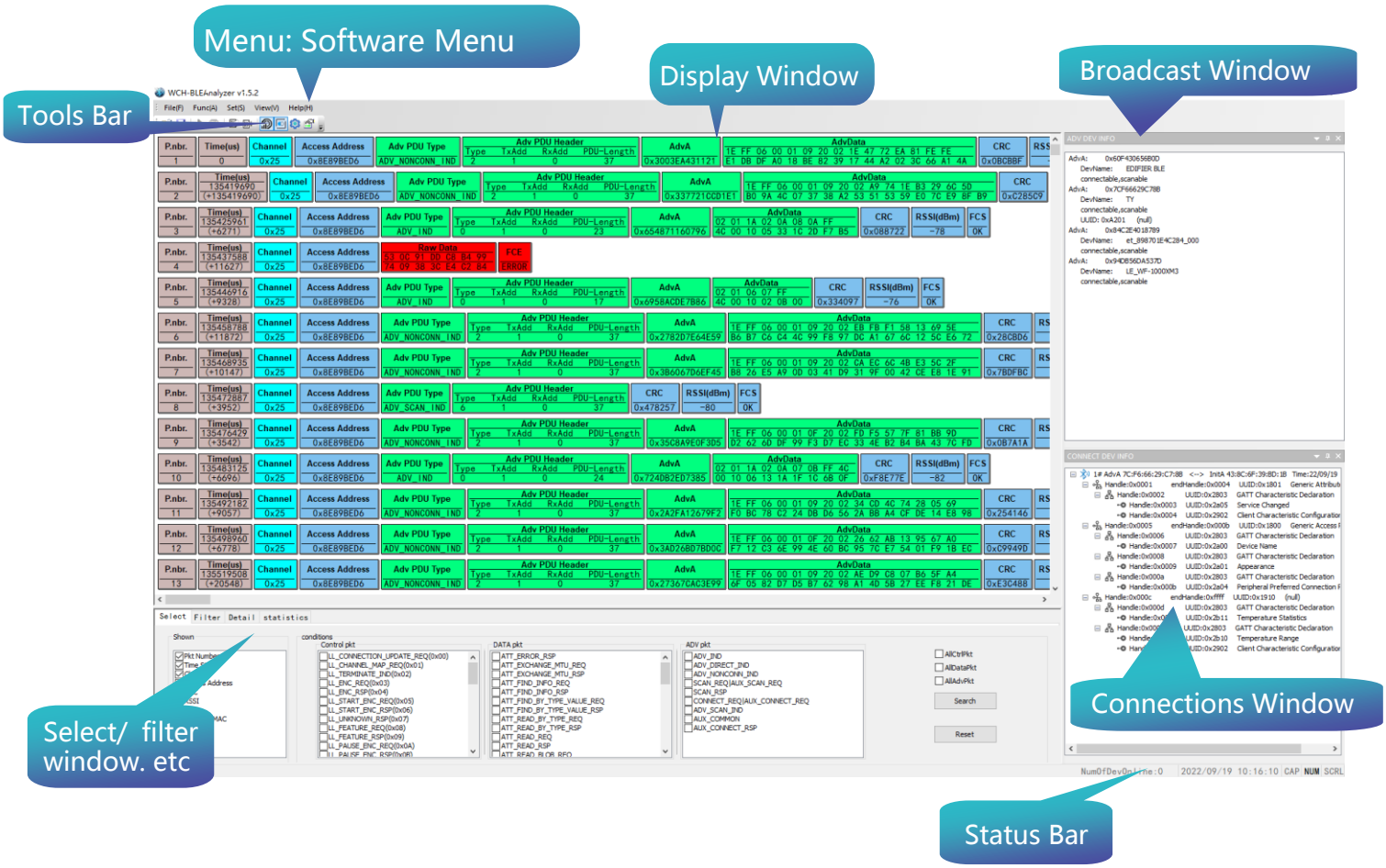


Click "Yes" to complete the uninstallation, and the dialog box shown in figure below will pop up after the successful uninstallation.



7. Software introduction

7.1. Interface introduction



The software can be broadly divided into the following functional modules:

- Menu: Software menu list, including file operations, function menu, parameter settings and other modules.
- Tools bar: Iconic software toolbar for easy operation.
- Display window: Display all packet contents and filtering results.
- Function window: Contains filtering, finding, statistics and other operation function modules.
- Status bar: Displays the time and information about the operation.
- Connections window: Displays the property service and handle information of all currently grabbed connections.
- Broadcast window: Shows nearby broadcast devices.

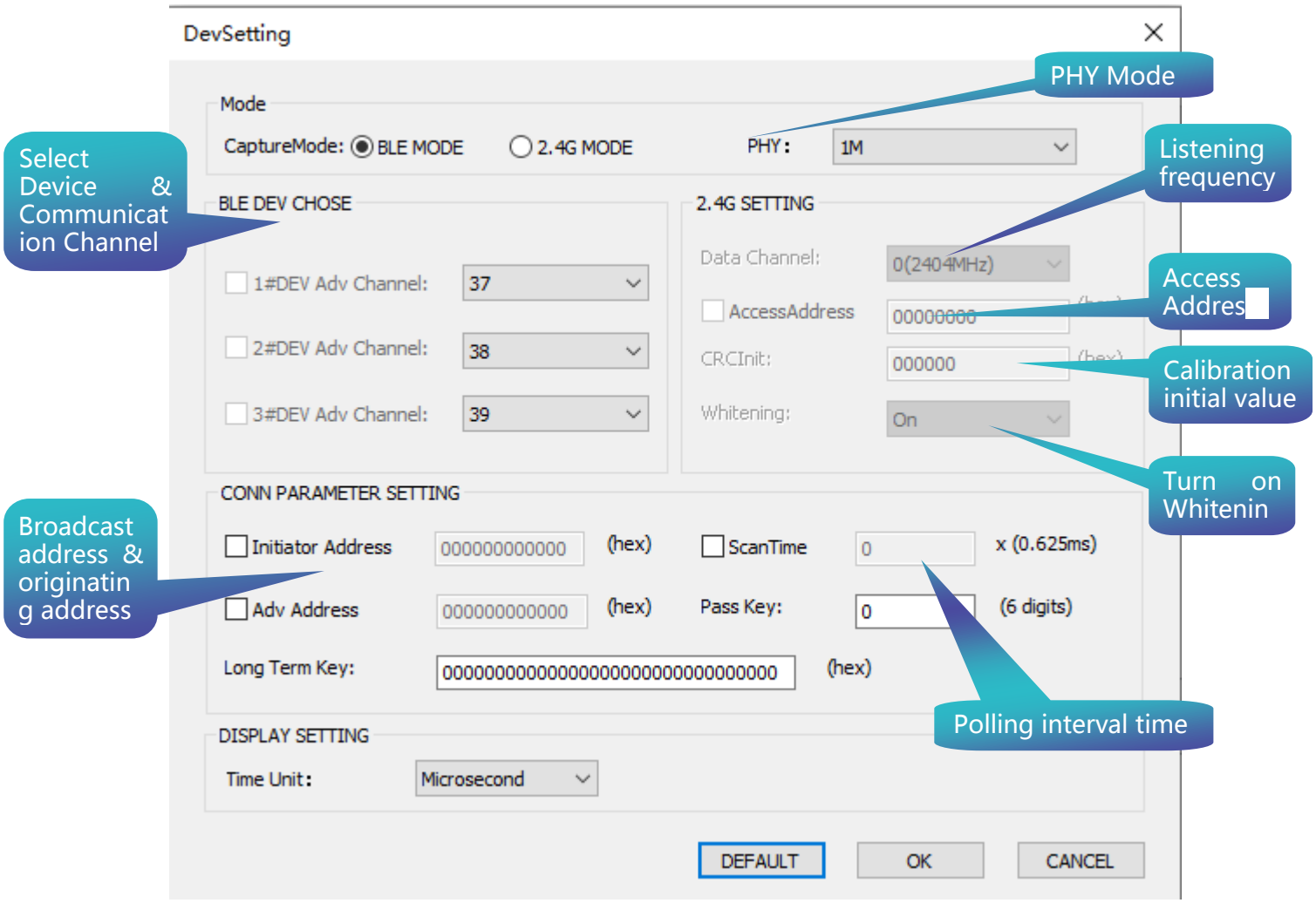
7.2. Software function list

Logo	Name	Description
	Clean	Clear screen, clear all data in the current area
	Open	Open the existing *.ble file and analyze the data again
	Save	Save the display data as a *.ble file with the specified name
	Start	Start the packet capture and display the analysis results in the screen
	Stop	Stop packet capture
	Auto Scroll	Set automatic scrolling to the latest data or stop automatic scrolling
	About	Display program information, version number and copyright information
	Broadcast Window	Show or hide the broadcast window
	Connections Window	Show or hide the connections window
	Set	Set time units, broadcast channels, LTK and other parameter values
——	Status bar	displays the time and information about the operation of the software
——	Select Display	Display matching data based on different combinations of conditions
——	Packet Filter	Filter the current data based on different combinations of conditions
——	Packet Detail	Double-click on any packet in the display area to display its detailed information
——	Packet Statistics	Real-time statistics on the number of packets of each type

Logo	Name	Description
——	Help	View this WCH-BLE Analyzer product manual

8. Software functional description

8.1. Set



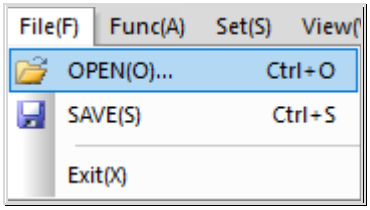
Users can configure the BLE listen settings to listen for connection traffic at a specified address, or to broadcast channel polling, when multiple devices are plugged in, cascade mode will be used, at which time the open status of multiple devices and listening channels can be set. With the custom 2.4G module, you can listen to packets of any communication channel, access address, packets with initial CRC values, and choose whether to disable the whitening function; users can also configure LTK and PassKey for decryption settings.

After setting, the software will automatically save this configuration; it supports users to restore the default configuration by clicking the "Default" button.

8.2. Open

Function: Open the existing *.ble file and analyze the data again.

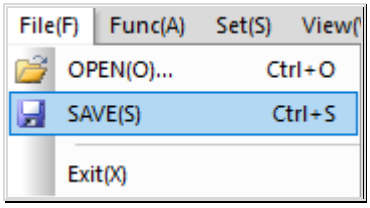
Location: As shown in the figure below, Menu—File—OPEN，or click button.



8.3. Save

Function: Save the display data as a *.ble file with the specified name.

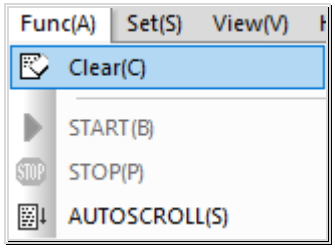
Location: As shown in the figure below, Menu—File—SAVE, or click button.



8.4. Clear

Function: Clear screen, clear all data in the current area (need to pause and then perform this operation).

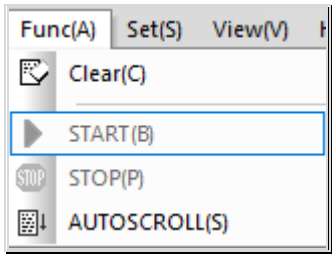
Location: As shown in the figure below, Menu—Func—Clear, or click button.



8.5. Start

Function: Start the packet capture and display the analysis results in the screen

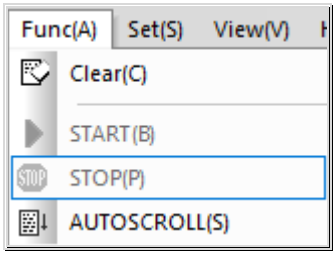
Location: As shown in the figure below, Menu—Func—START, or click button.



8.6. Stop

Function: Stop packet capture, filtering, searching, and other operations can be performed in the stopped state.

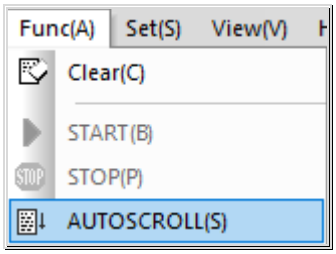
Location: As shown in the figure below, Menu—Func—STOP, or click button.



8.7. Auto scroll

Function: Set automatic scrolling to the latest data or stop automatic scrolling.

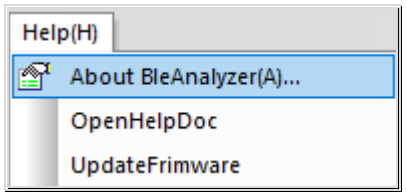
Location: As shown in the figure below, Menu—Func—AUTOSCROLL, or click button.



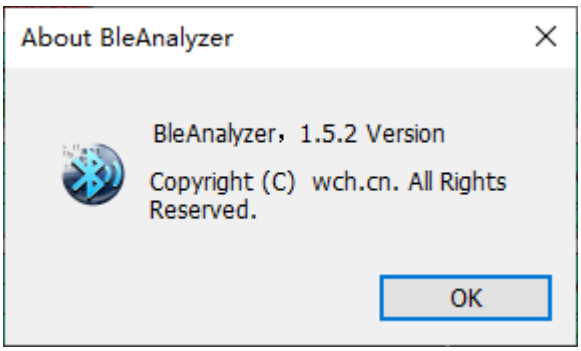
8.8. About

Function: Display program information, version number and copyright information.

Location: As shown in the figure below, Menu—Help—About BleAnalyzer, or click button.



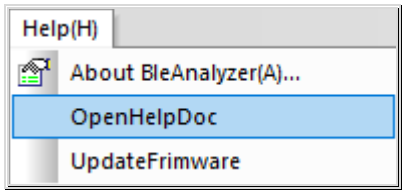
Functional description: show the software version and Copyright message.



8.9. Description document

Function: Open this document.

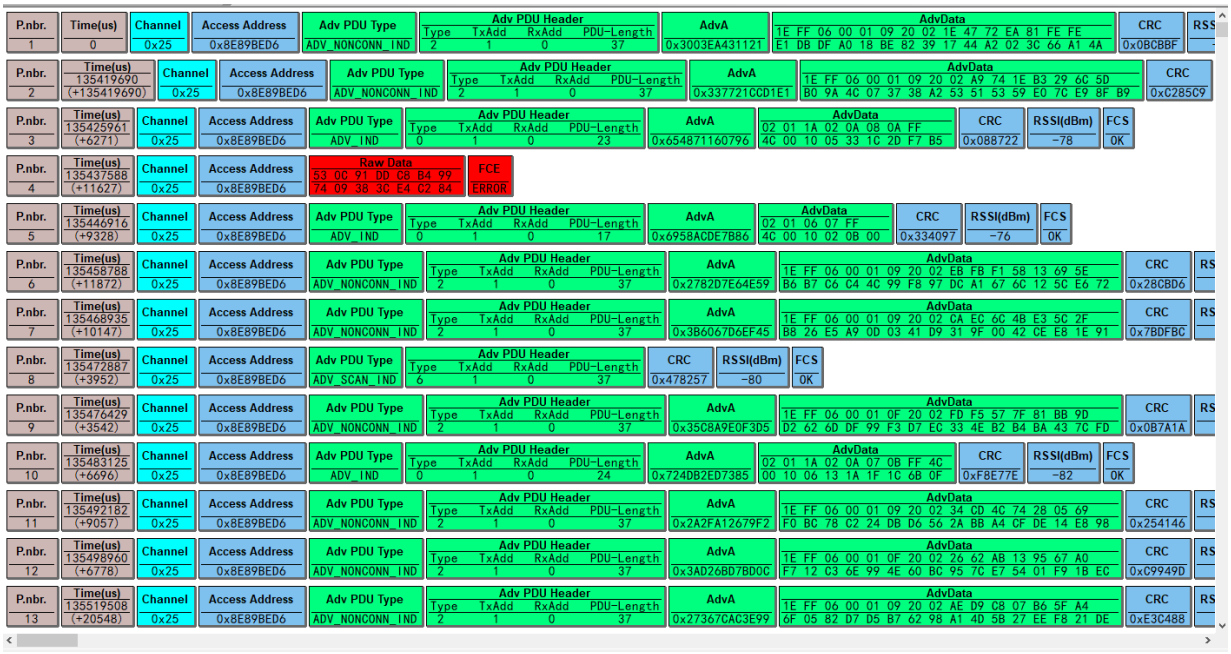
Location: As shown in the figure below, Menu—Help—OpenHelpDoc.



8.10. Display area

Function: Display the captured packets and their analysis results, as shown in the figure below.

Location: Located in the center of the software, below the toolbar.

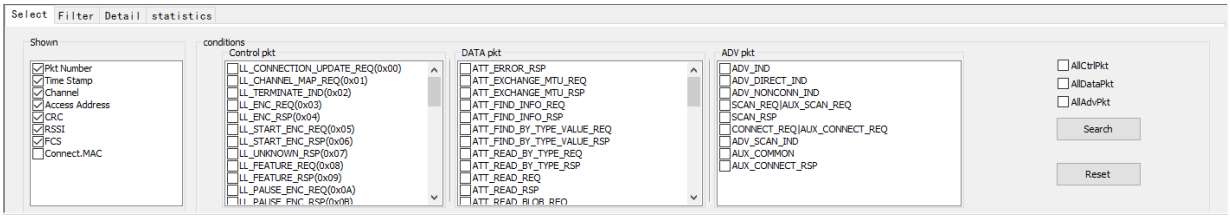


Functional Description: As shown in the figure below, this display screen shows all the captured packets and their parsing results; this screen can show the data results after filtering, finding or selecting to display, etc.

8.11. Select display

Function: Display matching data based on different combinations of conditions.

Location: The first tab of the functional area.



Functional Description: As shown in the figure below, there are 2 functional modules in this tab.

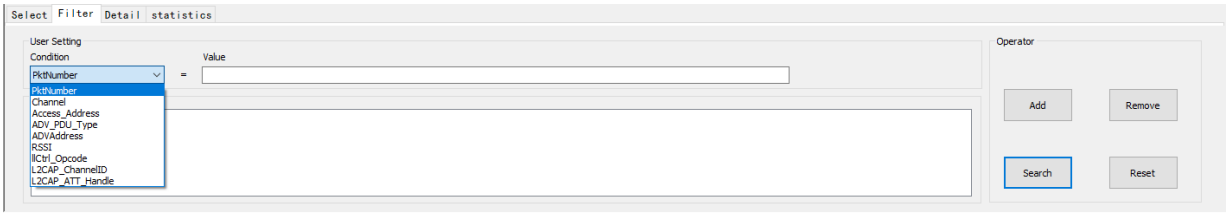
① When the display area packet length is large, the display of some unimportant information, such as index number (Pkt Number), RSSI, etc., can be removed by unchecking. This function can be used during packet capture or after it is stopped.

② Users can filter out the packets they need among all the current packets according to their needs. When pausing the packet capture, they can check on the packets they want to see in Module 2 and then click Match to filter out all the eligible packets. When multiple checkboxes are checked, all packets that meet the conditions are displayed, and the relationship between the conditions is or; after configuring the options, click [Run] to dynamically display the matched packets; users can click the "Reset" button to restore the operation.

8.12. Packet filter

Function: Filter the current data based on different combinations of conditions.

Location: The second tab of the functional area.



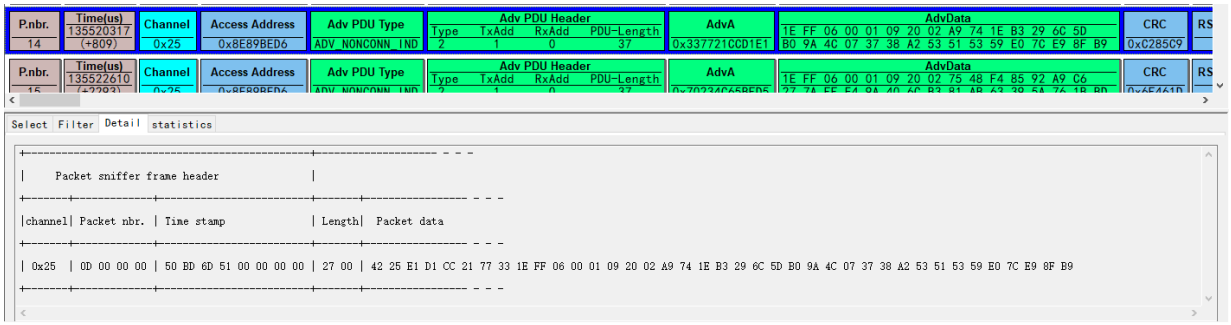
Functional Description: As shown in the figure above, users can filter packets based on: index number, Channel, Access Address, broadcast packet type, broadcast packet address, RSSI range, control packet type and packet channelID value. The format of the conditional value input will be prompted by the mouse hover in the right edit box, users must follow the prompts to enter the condition values in the standard format, and then click the Add button. Multiple conditions can be added to the comparison list in turn, as shown in the following figure, the relationship between the conditions is "AND" when comparing, that is, the filtered package should meet all the conditions in the comparison list at the same time.

When you need to remove a condition, first select the condition item in the comparison list, and then click the "Remove" button; you can also directly click the "Reset" button to restore the situation before the comparison.

8.13. Packet details

Function: Displays the channel value (hex), index value (hex), time value (hex), length (hex) and the original data of a packet.

Location: The third tab of the functional area.

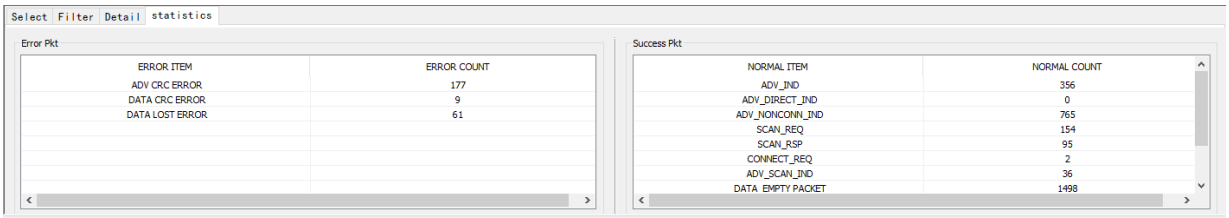


Functional Description: As shown in the figure above, the user can double-click on any packet in the display area to view the original data for that packet in that function module.

8.14. Packet statistics

Function: During packet capture, the module can count the number of each type of packet in real time; when opening ble data file, the module can re-analyze the number of each type of packet in the file.

Location: The fourth tab of the functional area.



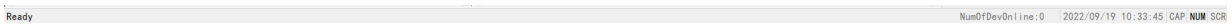
Functional Description: As shown in the picture above, this is a display interface for the packet statistics during the packet capture process. The interface is divided into two statistics modules.

① Error statistics: Statistics for data packets, packet loss and CRC errors for broadcast packets

② Success statistics: The number of different types of broadcast packets, the number of control packets, data packets and empty packets can be counted.

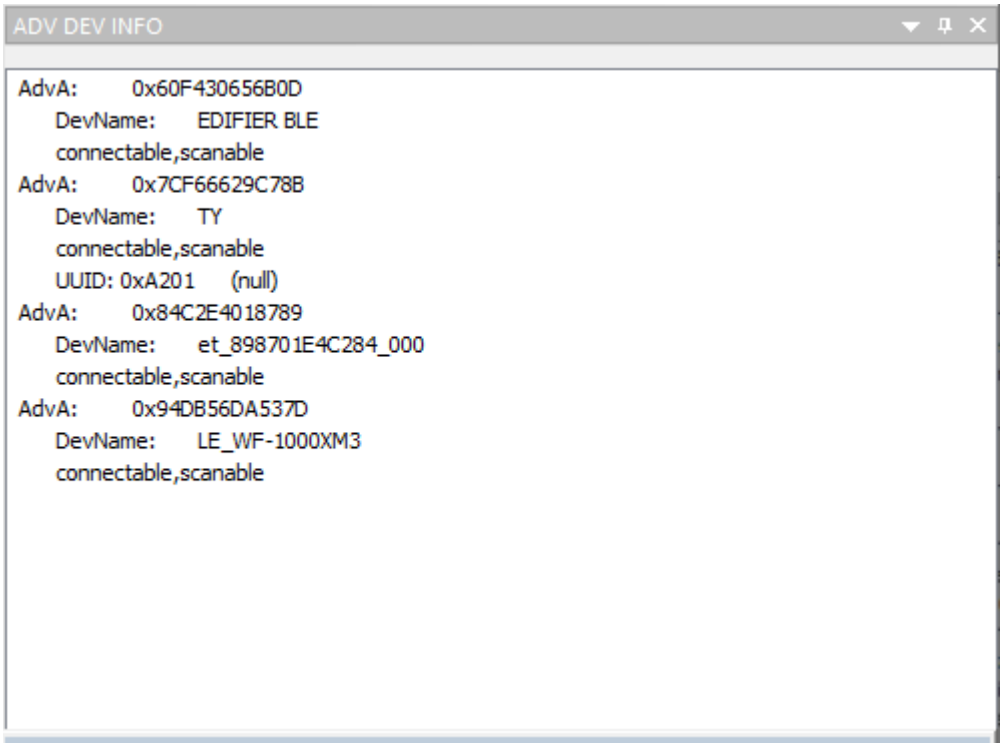
8.15. Status bar

Function: Displays the current actions of the menu bar and toolbar, as well as the current time.
Location: located at the bottom of the software. As shown in the figure below.



8.16. Broadcast information

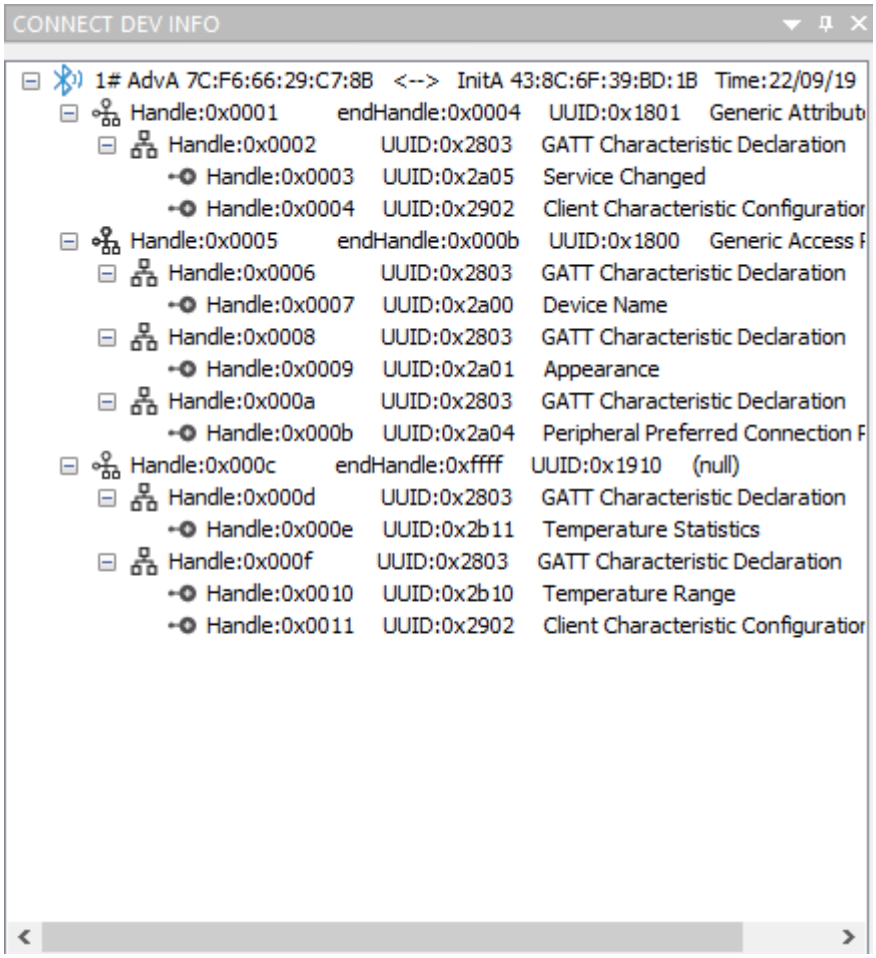
Function: Displays the devices that are broadcasting nearby. As shown in the figure below.



8.17. Connection information

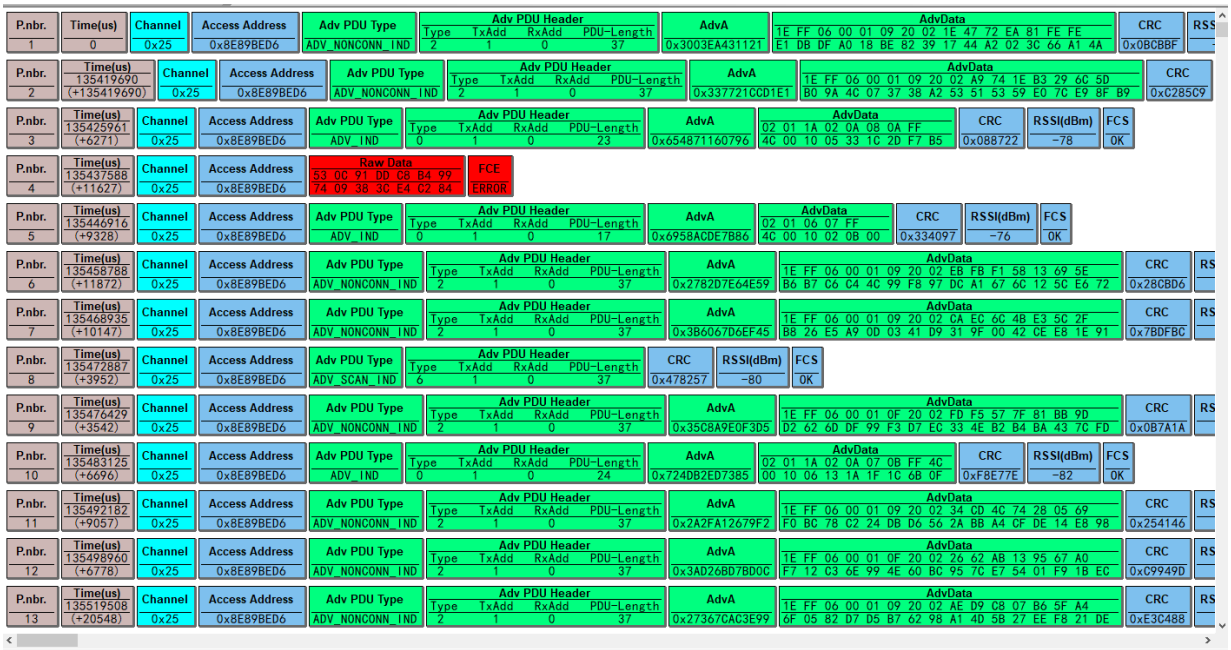
Function: Displays connection information captured by the analyzer, including device address, time, attribute handle, service, etc.

Operation: Left-click to jump to the corresponding location of the packet serial number. Also in the packet filtering function, you can filter the data according to the handle. As shown in the figure below.

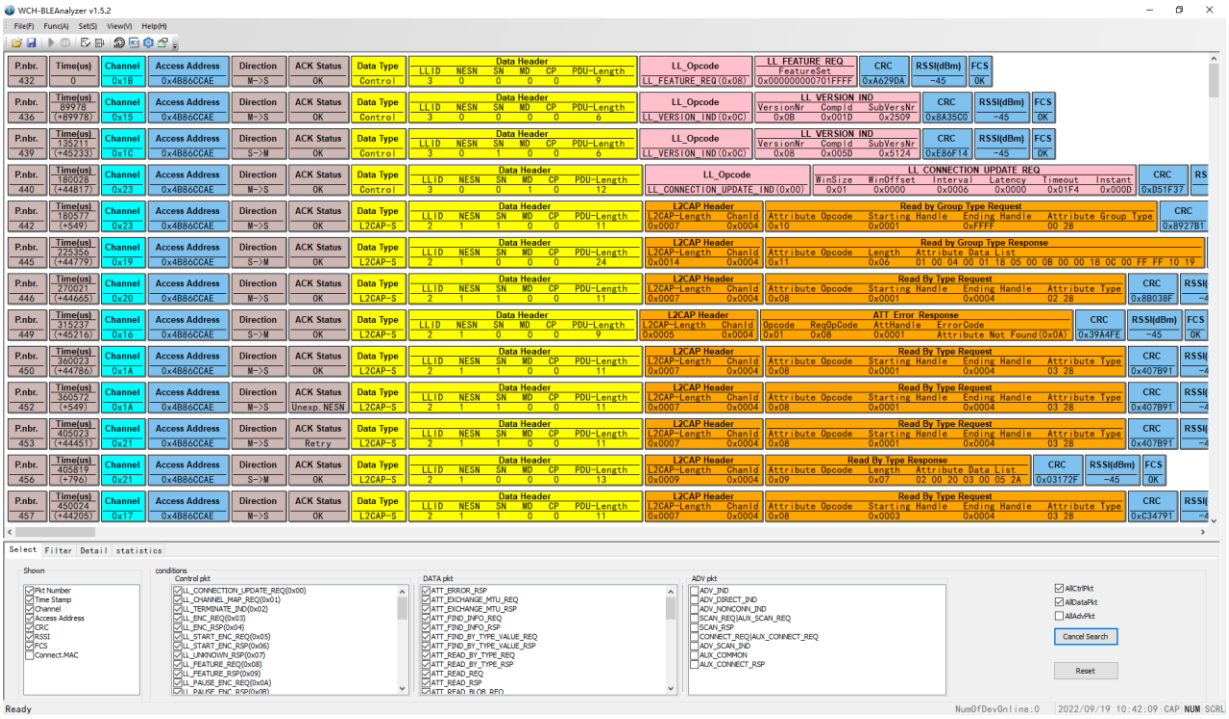


9. General operation

1. Start the analyzer tool, click the [START] button, the default configuration to listen to 37 channels of broadcast packets. At this point, the broadcast packets can be captured as shown in the following figure.



2. Connecting a slave device with a master device, if the analyzer listens for a "connection request packet" in the broadcast channel, it will start tracking the connection communication and can capture the data of the connection communication, as shown in the following figure.



3. Note that if the host device and slave device are connected, but the analyzer does not show a connection status. In this case, you need to cancel the pairing, disconnect, and then repeat step 2 until the analyzer is connected.

10. Q&A

Q1: Why the "start" button of the software is grayed out?

A1: (a) Open the Device Manager and check if the WCH-BLE Analyzer device is running properly. If the device is not recognized, please reinstall the program.

(b) Re-plug the device and check if the device is not recognized properly due to hardware connection failure.

11. Cautions

- Avoid bumping, knocking, dropping or vibrating the BLE Analyzer.
- Do not use or store BLE Analyzer near strong magnetic fields.
- Please keep away from high temperature, high humidity, and dusty environment to avoid damage.
- Please keep away from corrosive and oxidizing gases to avoid damage.
- Do not disassemble the WCH-BLE Analyzer device components.

- Unplug the BLE Analyzer when it is not used for a long time.

12. Contact us

- Address: No.18, Ningshuang Road, Nanjing, China
- Postal Code: 210012
- Switchboard: 025-84730668
- Technical Email: tech@wch.cn
- Sales Email: sales@wch.cn