



802.15.4 SITE ANALYZER USER GUIDE

Version 1.0

Document Revisions

Date	Version Number	Document Changes
04/18/2017	1.0	Initial Version

Table of Contents

1	Introduction.....	4
1.1	....Scope and Purpose	4
1.2	....Prerequisites.....	4
1.3	....Disclaimer.....	4
1.4	....Evaluation Board	5
2	Using the product.....	6
2.1	....What is the 802.15.4 Site Analyzer?	6
2.2	....Installing the 802.15.4 Site Analyzer.....	6
2.3	....Using the 802.15.4 Site Analyzer in Windows.....	6
2.3.1	Starting the 802.15.4 Site Analyzer Adaptor	6
2.3.2	Configuring Wireshark	8
2.3.3	Starting the 16-channel Sniffer application	8
2.3.4	Starting the 16-channel Energy Detect flow	9
2.3.5	Firmware Update	10
2.4	....Using the 802.15.4 Site Analyzer in Linux.....	10
2.5	....Troubleshooting.....	11

1 Introduction

1.1 Scope and Purpose

This guide describes how to install and use the BeamLogic 802.15.4 Site Analyzer in Windows and Linux operating systems.

1.2 Prerequisites

In order to use the 802.15.4 Site Analyzer, you will need the following:

- A PC that can run either Windows 7 or later, or Linux (Ubuntu 12.04 or later)
- A USB port that you can plug the device into
- Wireshark to display and process the raw 802.15.4 packets
- For Windows 7 or later:
 - o The Microsoft .NET Framework 4.0 or later
 - o The FTDI D2XX drivers (downloadable from <http://www.ftdichip.com/Drivers/D2XX.htm>)
- For Linux operating systems
 - o The FTDI D2XX drivers (downloadable from <http://www.ftdichip.com/Drivers/D2XX.htm>)
 - o You will need to compile the “Adaptor” application on your local version of Linux

1.3 Disclaimer

THE SOFTWARE, DOCUMENTATION AND ANY RELATED MATERIAL IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

1.4 Evaluation Board

BeamLogic provides the enclosed product under the following conditions: This evaluation board/kit is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by **BeamLogic** to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-,marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies **BeamLogic** from all claims arising from the handling or use of the goods.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

BeamLogic assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

No license is granted under any patent right or other intellectual property right of **BeamLogic** covering or relating to any machine, process, or combination in which such **BeamLogic** products or services might be or are used.

FCC Warning. This evaluation board/kit is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY and is not considered by **BeamLogic** to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

2 Using the product

2.1 What is the 802.15.4 Site Analyzer?

The 802.15.4 Site Analyzer is a 16-channel 802.15.4-compatible sniffer. It can help you sniff 802.15.4-compatible traffic on all 2.4GHz channels at the same time. The device will listen on all channels simultaneously, and when a packet is detected on any channel, it is received and sent to the PC for logging or processing. The packet capture can also be done simultaneously on all channels. The device can also do Energy Detect to report RSSI on each 802.15.4 channel at predefined time intervals.

The package contains the 802.15.4 Site Analyzer device as well as a Micro-USB to USB cable needed to connect the device to a PC.

In order to run the 802.15.4 Site Analyzer, we provide an “Adapter” software that communicates with the device, configures it, receives all packets and forwards them to Wireshark or directly into a file.

2.2 Installing the 802.15.4 Site Analyzer

To install the 802.15.4 Site Analyzer, you need to plug the device into an available USB port on your PC or laptop.

For Windows, the device should install automatically with the correct FTDI driver. If it doesn't, please try to install the FTDI driver for your version of Windows from <http://www.ftdichip.com/Drivers/D2XX.htm>

For Linux operating systems, the FTDI driver should be already included in your distribution of Linux, so once you plug the device in, it should show up.

2.3 Using the 802.15.4 Site Analyzer in Windows

2.3.1 Starting the 802.15.4 Site Analyzer Adaptor

In order to use and configure the 802.15.4 Site Analyzer device, you need to start the 802.15.4 Site Analyzer Adaptor for Windows. The application is provided in zip-file form.

You will need to unzip the contents of the file we provided into a folder of your choice. After unzipping the archive, you should have the following files:

```
SiteAnalyzerAdapter.exe.config
FTD2XX_NET.DLL
Security.Cryptography.dll
SiteAnalyzerAdapter.exe
SiteAnalyzer.lua
SiteAnalyzer+WHart.lua (optional)
```

To start the application, run the SiteAnalyzerAdapter.exe file.

The main screen looks as shown in Figure 1.

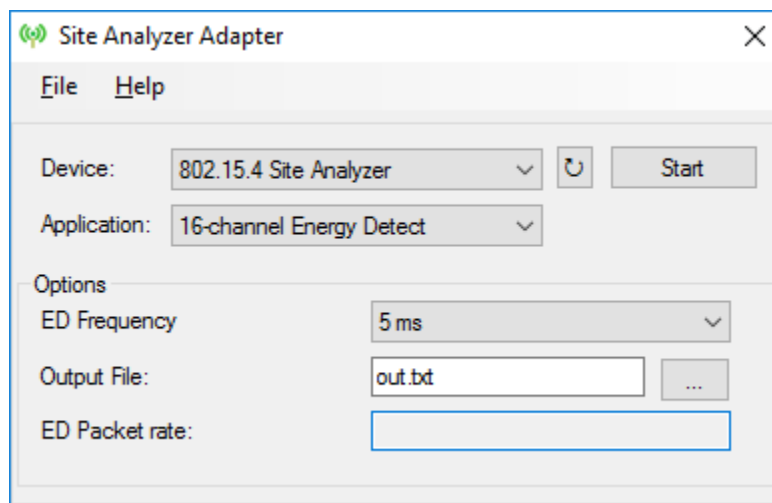


Figure 1 The 802.15.4 Site Analyzer Adapter

Device: If you have a device connected when you start the Adapter application, it will show up in the Device drop-down list. Otherwise, the Device drop-down will be empty, and you can do a re-scan by pressing the Refresh button on the right of the drop-down list.

Application: Currently there are two supported applications: 16-channel sniffer and 16-channel Energy Detect. The 16-channel sniffer will listen for packets on all channels and only report when a packet is successfully received. The 16-channel Energy Detect will listen on all channels simultaneously at a predefined frequency (selectable from a drop-down list) and report the resulting RSSI on each channel.

ED Frequency: This setting represents the frequency at which the Energy Detect flow will start performing the measurements. The following options are available: Continuous, 5ms, 50ms, 100ms, 500ms, 1s, 2s, 5s, 10s.

Output File: This field will set the output file for the Energy Detect flow. Once the flow is started, measurements will be appended to the designated file.

ED Packet Rate: This read-only field reports how many Energy Detect measurements are performed per second.

Start: This button is used to start the application with the configured parameters. For the 16-channel sniffer flow, Wireshark will also be started and received packets will be sent to it. For the Energy Detect flow, the measurements can only be saved to a file.

2.3.2 Configuring Wireshark

In order to visualize the packets captured by the 802.15.4 Site Analyzer, you need to have Wireshark installed.

The 802.15.4 Site Analyzer uses a proprietary packet format that also includes the actual sniffed packet. For Wireshark to be able to parse this packet format, you will need to add a filter that is provided with the 802.15.4 Site Analyzer Adaptor software (called SiteAnalyzer.lua). Once Wireshark is installed, you will need to copy this file in the plugins folder of Wireshark.

The folder in which the LUA filter needs to be copied (the Wireshark plugins folder) can be obtained by starting Wireshark, then going in the following menus:

Home > About > Folders

and select either the “Personal Plugins” or “Global Plugins”

2.3.3 Starting the 16-channel Sniffer application

To start the 16-channel Sniffer application, select the “16-channel Sniffer” option from the “Application” drop-down, then press the “Start” button.

Wireshark will be automatically started. When packets are sniffed, they are automatically fed to Wireshark, as can be seen in Figure 2.

The packets are fed to Wireshark as 802.15.4 packets, with the following added information: Channel, RSSI and Timestamp.

To display these fields as columns, you must expand the BeamLogic 802.15.4 Site Analyzer section in the packet breakdown and right-click on the Channel, RSSI or Timestamp field and select “Apply as Column”.

Channel: represents the channel on which the packet was received.

RSSI: represents the Received Signal Strength Indicator value (between 0 and 32)

Timestamp: an integer value representing the timestamp at which the packet started to be received (expressed in units of 1/3 microseconds). The timestamp represents the value of an internal 48-bit free-running timer with a frequency of 3 MHz.

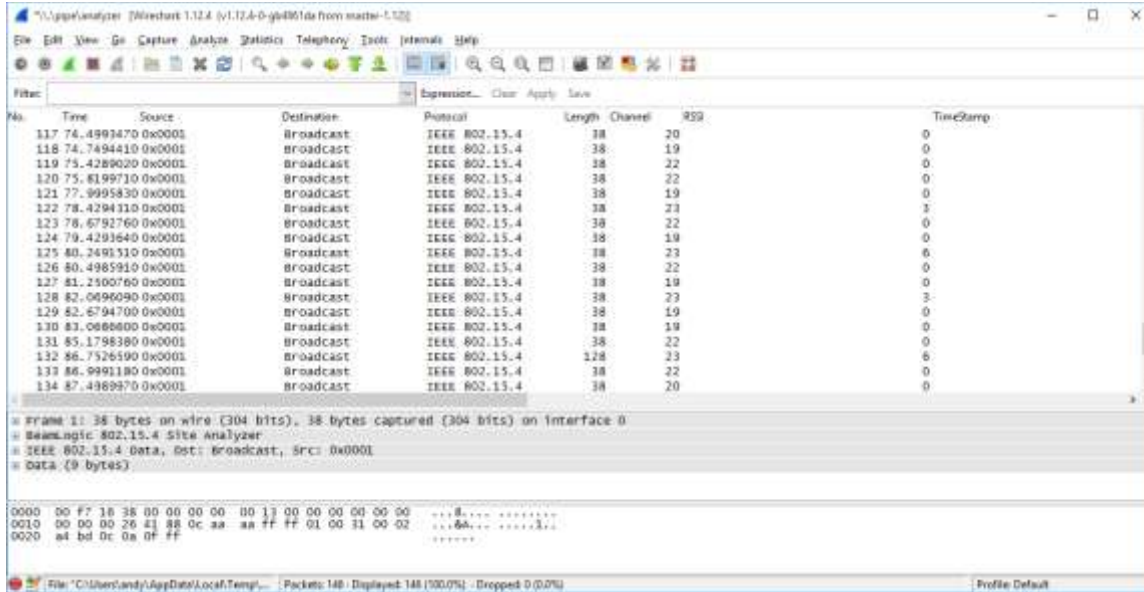


Figure 2 Wireshark sniffing packets

2.3.4 Starting the 16-channel Energy Detect flow

To start the 16-channel Energy Detect flow, select the “16-channel Energy Detect” option from the “Application” drop-down. You also have the option to choose the period at which the Energy Detect flow is performed (starting from Continuous - 0ms delay - to 10 seconds delay between measurements), as well as the file in which the output will be saved / appended to.

The data that will be gathered will not be sent to Wireshark, so it will not be started. The format of the saved data is:

<Timestamp>, <Channel>, <RSSI>

Once you start the Energy Detect flow, an indicator of how many measurements are done is updated in the “ED Packet Rate”. A measurement is represented by an RSSI for a channel, therefore if you choose a delay of one second you should see a rate of 16 packets / second (one packet for each channel).

2.3.5 Firmware Update

The 802.15.4 Site Analyzer Adaptor can upgrade the firmware of the 802.15.4 Site Analyzer device.

CAUTION! Only use approved firmware that you received from BeamLogic to update the firmware on the 802.15.4 Site Analyzer. Any other type of firmware that will be uploaded to the device will void the warranty and possibly render the device unusable.

If you have an official firmware file, you may upgrade the firmware on the 802.15.4 Site Analyzer by accessing the menus:

File > Firmware Upgrade

This option will be enabled only when an 802.15.4 Site Analyzer device is connected to the PC. You will be asked to select your file, and the firmware update process will begin.

When the process is over, you may close the window, and you will also need to unplug the 802.15.4 Site Analyzer from the USB on your PC and plug it back in before using it again.

2.4 Using the 802.15.4 Site Analyzer in Linux

The 802.15.4 Site Analyzer will be installed on Ubuntu by default using the VCP drivers built into the Linux kernel. The VCP driver is too slow for the purposes of the 802.15.4 Site Analyzer, so the first step is to remove this driver:

```
sudo rmmod ftdi_sio
```

```
sudo rmmod usbserial
```

When the 802.15.4 Site Analyzer device is power cycled or reset the VCP driver will be reloaded. The `rmmod` process must be repeated each time this occurs. It is possible to write a simple script that unloads the VCP driver before running the D2XX application.

The D2XX driver that the 802.15.4 Site Analyzer adaptor software uses is statically linked in the adaptor so no further driver installation is required.

The following options are available for the adaptor software:

802.15.4 Site Analyzer Adaptor for Linux version 1.0.1

(C)2016 BeamLogic. All rights reserved.

Usage: ./adaptor [-option]

Options:

- i Select input device index. Default is 0.
- o Select output file name. Default is stdout.
- p Select pipe on which to send data. Default is null.
- w Prepend Wireshark header to data. Default is off.
- help Displays this help page.

To run the 802.15.4 Site Analyzer Adaptor software and send the output to stdout, the following command needs to be run:

```
./adaptor
```

To run the 802.15.4 Site Analyzer Adaptor software and write the output to a file named out.txt, the following command needs to be run:

```
./adaptor -o out.txt
```

To run the 802.15.4 Site Analyzer Adaptor software in conjunction with Wireshark, a named pipe needs to be created. The following commands need to be run:

```
mkfifo wspipe
```

```
wireshark -k -i wspipe &
```

```
./adaptor -w -p wspipe &
```

2.5 Troubleshooting

If you run into any trouble, please contact us at office@beamlogic.com.