



# **Wireless Sensor Network Sniffer/Analyser (IEEE 802.15.4 / ZigBee® version)**

## **User Manual Version 2.0**



**PLEASE READ THE NO WARRANTY, NO LIABILITY  
STATEMENTS AND TRADEMARK INFORMATION  
DESCRIBED ON THE LAST FEW PAGES OF THIS USER  
MANUAL BEFORE USING THE PRODUCT OR THE  
DOCUMENT FURTHER.**

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## 1 WiSens® Classic – Introduction

The words WiSens® Classic and WiSens® mean the same in the scope of this document, and they are used interchangeably in this document.

WiSens® is a wireless sensor network sniffer/analyser tool, which meets the needs of engineers in the IEEE 802.15.4/ZigBee® development and deployment domain. It detects and captures wireless radio signal packets in the ambience during a testing/ commissioning session and presents them in convenient graphic displays.

WiSens® presents users with a wide variety of choices in displays to help them evaluate, diagnose and fix wireless communication related issues/bugs. Further, each session can be saved, printed or attached as electronic documents, which can be archived for future analysis or for attachment as test records.

WiSens® captures all conversations between devices/nodes in a network, communicating in a specified channel, just as you would capture a chat session with a friend. The sentences give way to packets, graphically displayed – and you see the conversation! The packets are captured, displayed and stored sequentially, and can be traced to which device communicated to which other device and at what time. If there is a glitch, you see it in vivid detail on the screen, making it is easy to diagnose and fix a problem.



**Meet Dr. Bee**, our friendly diagnostic specialist and consultant mascot for BzWorks' products, gives valuable tips and suggestions that allow the user to enjoy maximum performance from usage of BzWorks' products.

### 1.1 WiSens® – The ZigBee® technology development tool

WiSens® is a tool for professionals who work on IEEE 802.15.4 and ZigBee® technology hardware, communication stack software development and application developments. It is used to sniff (detect) IEEE 802.15.4 PHY/MAC radio signal packets with encapsulated ZigBee 2004, 2006 or 2007 frames transmitted in a specified channel. The packets sniffed are filtered as per the user defined settings, decoded and displayed.

### 1.2 Pre-requisites for using WiSens®

As the packets are displayed according to IEEE 802.15.4 and ZigBee® specifications, users are expected to possess some knowledge of these formats in order to work effectively with this tool.

### 1.3 Hardware and software of WiSens®

WiSens® Classic is a product consisting of hardware and software components:

Sniffer hardware (USB stick)

Sniffer software loaded on to the PC

For the sniffer hardware used, the corresponding USB driver software needs to be installed separately by the user.

### 1.3.1 Hardware Required

The hardware required to setup a complete sniffer system is tabulated below:

Sl. No.	Description	Qty	Remarks
1	PC – Pentium 4 or above/equivalent with USB port and a <u>minimum</u> of 512 MB RAM	1	User to arrange
2	WiSens® sniffer – (USB stick)	1	Deliverable by BzWorks



I strongly recommend usage of Pentium 4 or better versions of the hardware for best results. A minimum of 512 MB RAM is needed to run the application well. The higher the RAM capacity, the better the sniffing and packet capture performance.

### 1.3.2 Software Required

Sl. No.	Description	Remarks
1	WiSens® Classic sniffer software (version as sold or as updated latest at the website)	Deliverable by BzWorks
2	Windows XP Professional, Vista, 7	User's responsibility
3	.NET Framework 2.0	User's responsibility



WiSens® Classic needs .NET framework version 2.0. User is required to download the free distribution of .NET framework version 2.0 (available at <http://www.microsoft.com/downloads/en/details.aspx?FamilyID=0856eacb-4362-4b0d-8edd-aab15c5e04f5&displaylang=en>) before installing WiSens® Classic.



### 1.3.3 WiSens® Hardware

The WiSens® hardware is supplied as a compactly packed and sleek USB stick housing (see picture below).



**WiSens® USB stick**

Data sheets for the supported hardware are available at [www.bzworks.com/downloads](http://www.bzworks.com/downloads).

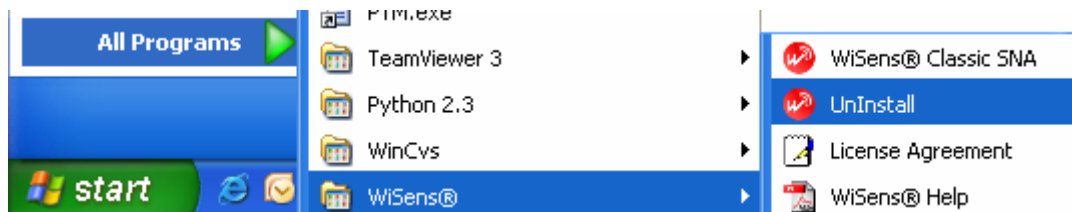
## 2 Installing WiSens® Classic



Before starting installation of a newer version of WiSens®, uninstall the older version if any, first.

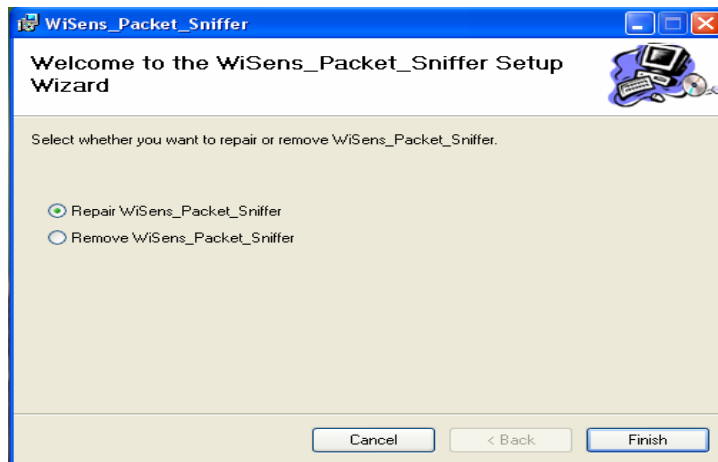
### 2.1.1 Uninstalling WiSens®

To uninstall WiSens®, Click **Start > Programs > WiSens® Packet Sniffer > Uninstall**



### Uninstalling WiSens®

Dialog box as below appears:



### Uninstalling WiSens®

Select Remove WiSens\_Packet\_Sniffer. Click Finish to uninstall.

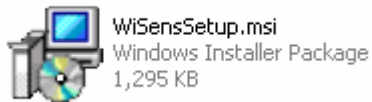
WiSens® Classic is uninstalled now. You are ready to install now.

### 2.1.2 Installing WiSens®

WiSens® software can be easily installed following onscreen guided steps. To install WiSens®:

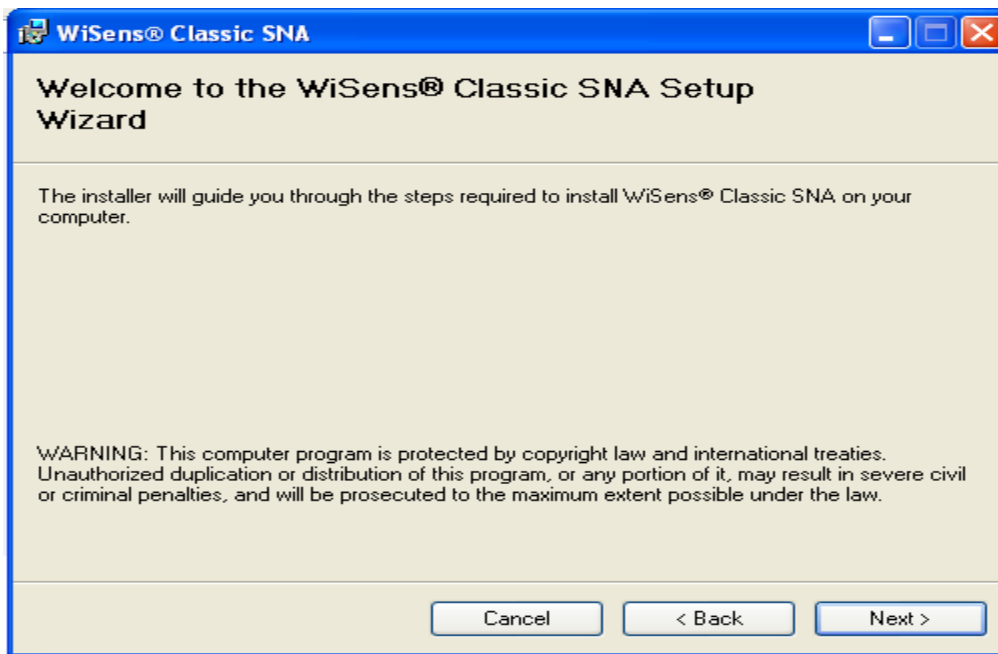
Insert CD supplied along with the hardware

Select Your CD drive and open



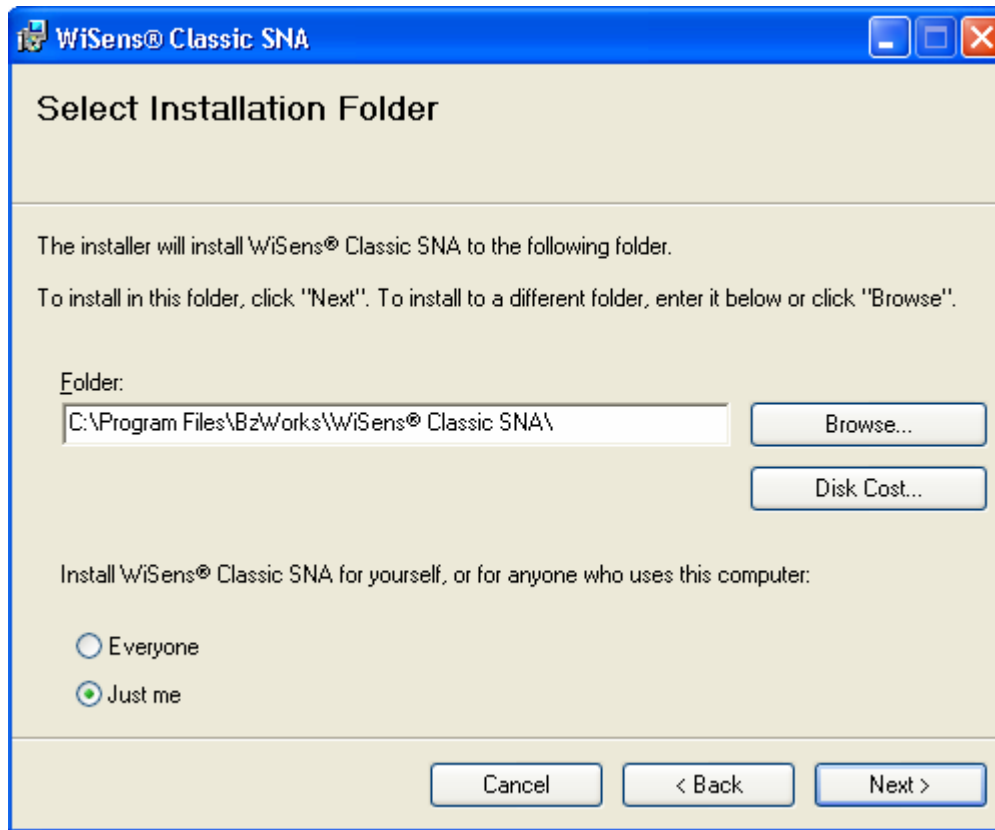
Double click

. Opens dialog box as below:



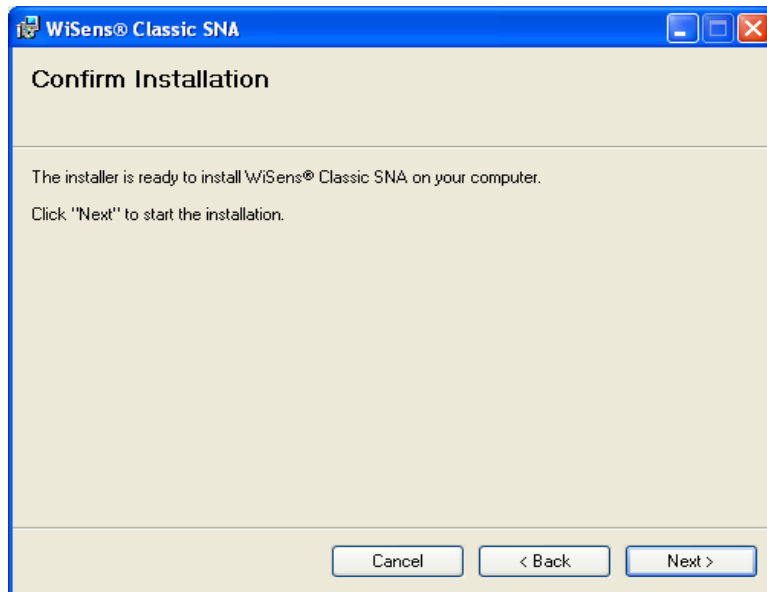
#### WiSens® Setup wizard

Click **Next**. Opens



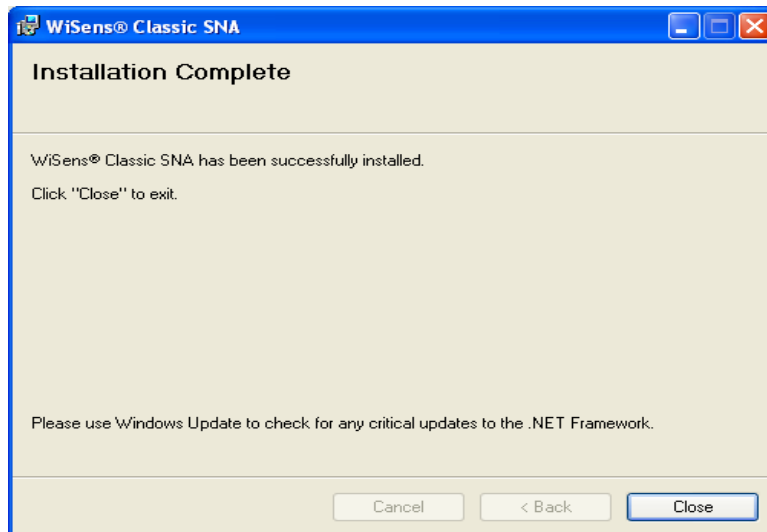
**Selecting installation folder**

Click **Next**




**Confirm Installation**

Click Next. The program installs and displays completion message.



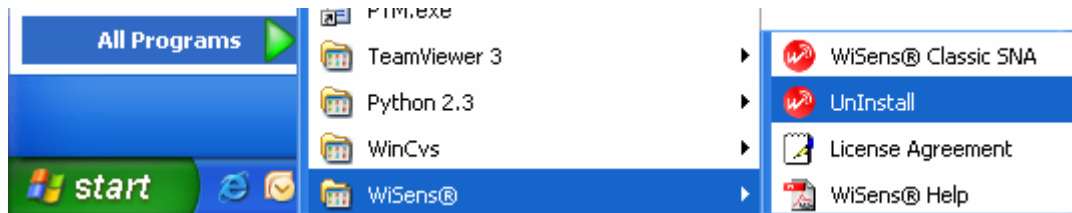
**Completion of installation message**

The icon  is placed on your desk top after the installation is completed. Also the Start menu lists WiSens® Packet Sniffer as a short cut to access the software.

### 2.1.3 Uninstalling WiSens®

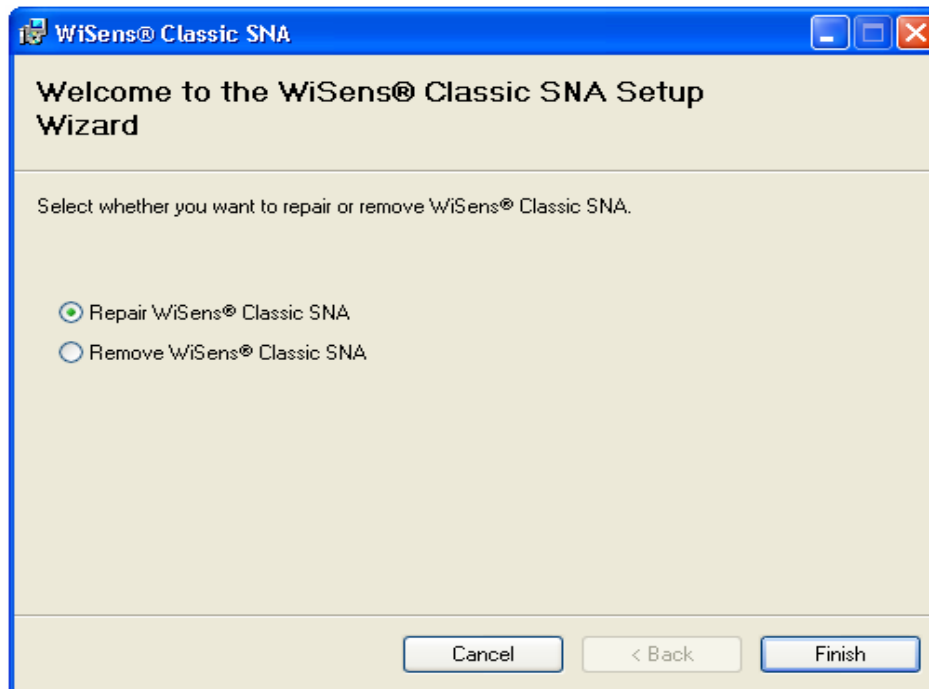
To uninstall WiSens®:

Click Start > Programs > WiSens® Packet Sniffer > Uninstall



#### Uninstalling WiSens®

Dialog box as below appears:



#### Uninstalling WiSens®


Click **Finish** to uninstall


### 3 Understanding WiSens® GUI

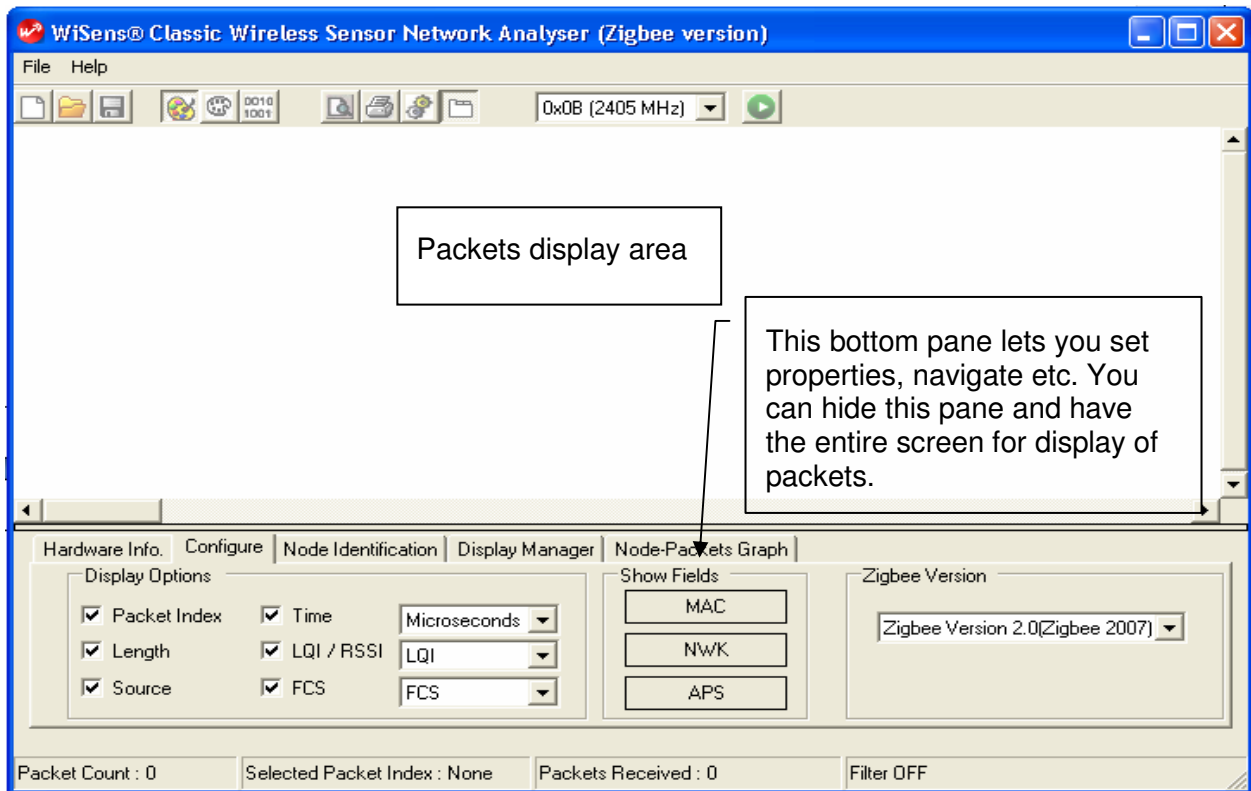
To get started, check if:

- WiSens® Classic is installed on your PC
- The WiSens® hardware is connected to the PC's USB or serial ports.

#### 3.1 Starting WiSens® Classic

The installation, when completed places an icon  on the desktop.

To start WiSens®, double-click the  icon on the desk top. The application opens as shown below:



WiSens® Screen

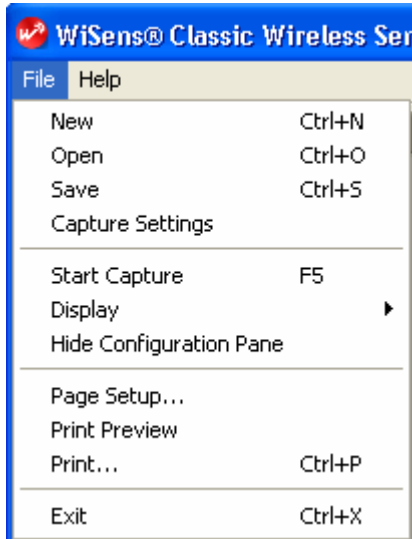
The user can control the display content using the fields for user inputs on the pane at the bottom of the window.

## 3.2 Menu and Tool Bar

The menu bar comprises simple **File** and **Help** menus.

### 3.2.1 File menu

The file menu with all its sub-menus is pictured below. The file menu facilitates opening a new file or a saved file. It also helps in saving and printing the sessions.



### File menu

The sub-menus are explained elsewhere in detail.

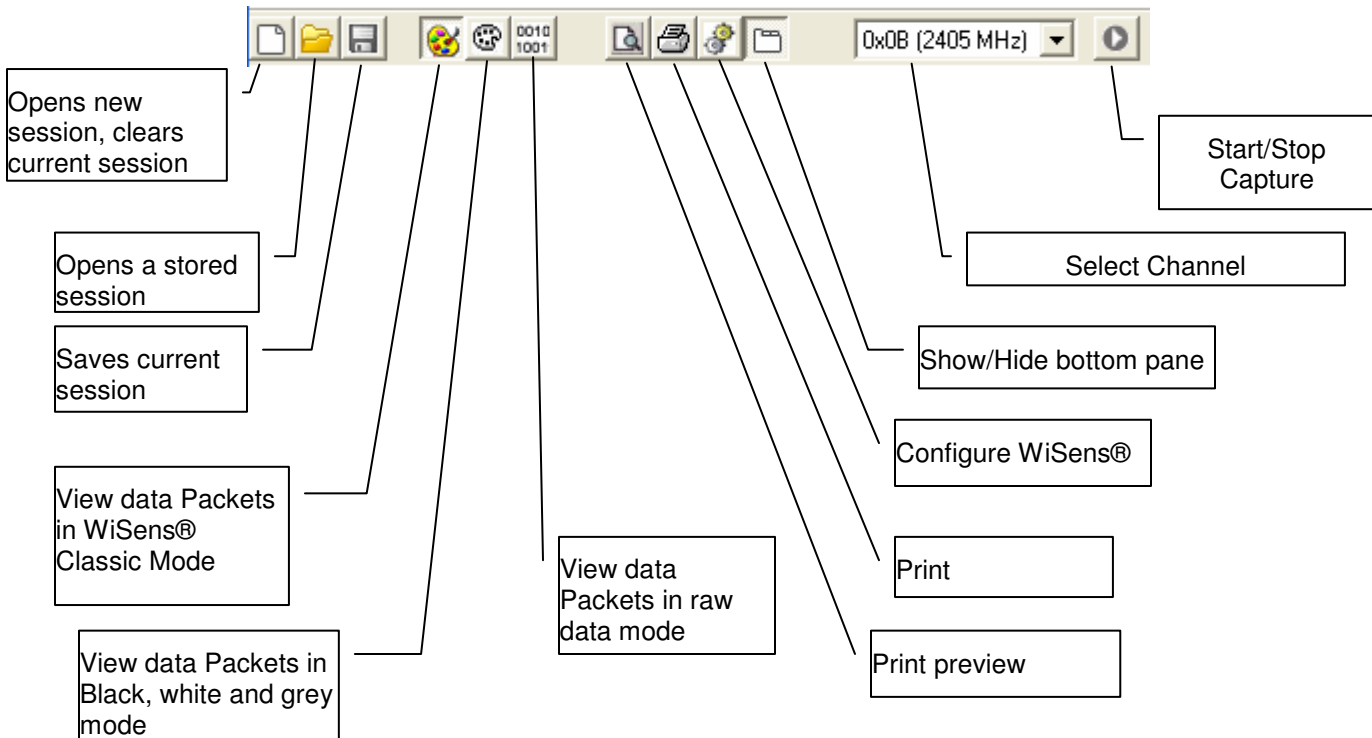
### 3.2.2 Help menu

The contents of the help menu and how to use it will be captured here.

### 3.2.3 Tool Bar

The WiSens® application presents a set of tools at the tool bar to help users easily and quickly perform required tasks.

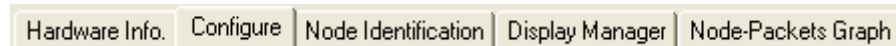




**Tool bar**

### 3.3 Bottom Pane

The pane at the bottom of the window has six tabs as below:



**Tabs at bottom pane**

This pane can be hidden when you desire to have the full screen for viewing the packets. This pane is very important as here you control the properties of the display.

Following table presents the basic objectives of each of the tabs in the bottom pane.

Tab	Description
<b>Hardware Info</b>	The hardware details are displayed
<b>Configure</b>	This tab allows user to set the properties of the session to be captured such as the channel, the time with its unit, the display characters etc.
<b>Node Identification</b>	All the nodes participating in a session are registered and listed in this pane along with its PAN ID, short address and IEEE address
<b>Display Manager</b>	The user sets the display properties in this tab

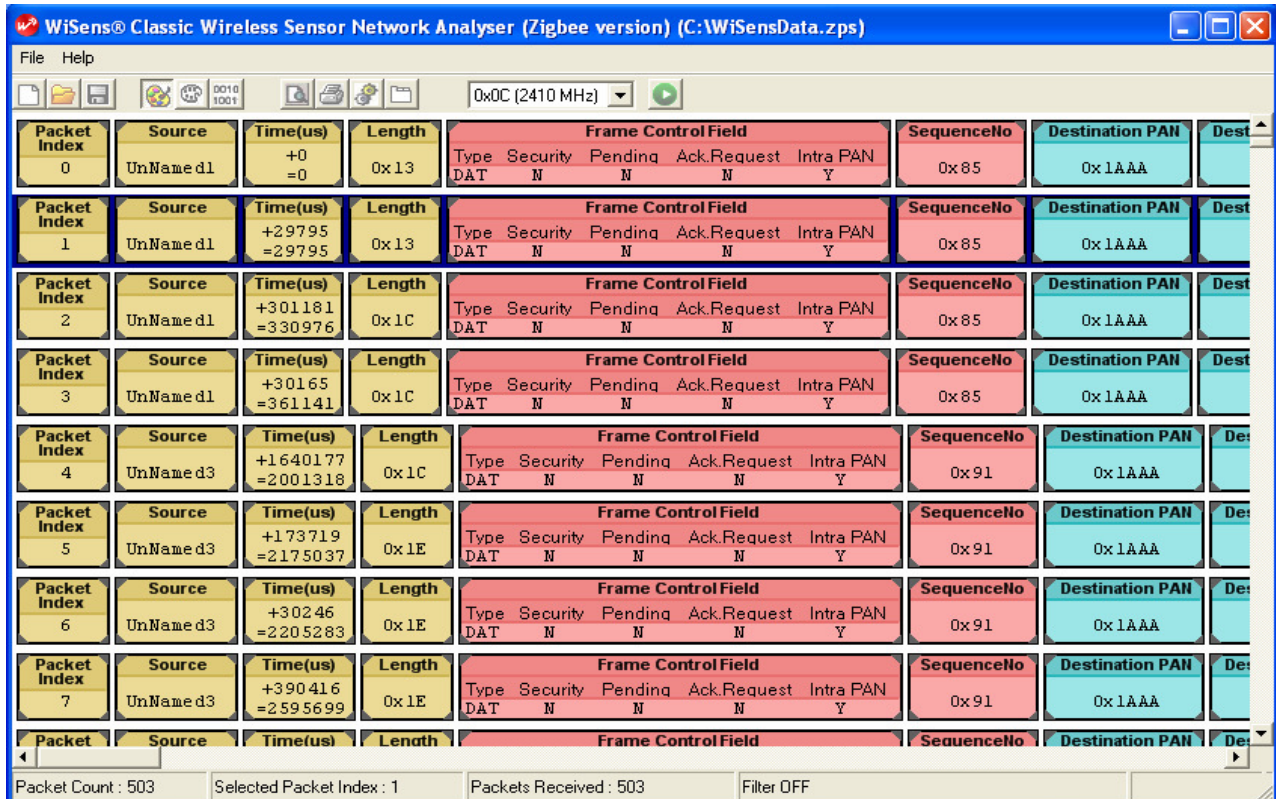
**Node-Packets Graph**

This tab complements packets view. The time line helps user analyse and navigate to the correct frame for viewing in the display pane.

**3.3.1 Hiding the bottom pane**

To hide the bottom pane:

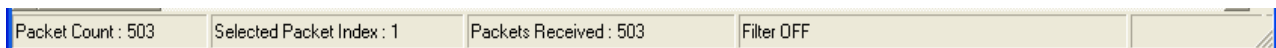
Click **File > Show/Hide** or Click 



**View with the bottom pane hidden**

**3.3.2 Status Bar**

The status bar at the bottom of the window dynamically displays vital information such as packet counts, packet buffer size, filter status and selected packet index.



**Status bar**

**Packet counts** - Displays the total number of packets captured during a session.

**The packet buffer size** - The packet buffer size is set by the user as part of setting the properties using **Configure** tab. The packet buffer size display at the status bar captures the extent of usage of the buffer in percentage.

**Selected packet index** - Displays the sequential number of the packet, which is selected at any given moment

**Filter** - Indicates whether the filter is ON or OFF.

The packet selected has a distinctly marked blue background (cursor) as below:

Packet Index	Source	Time(us)	Length	Frame Control Field					SequenceNo	Destination PAN	Destination Address
0	UnNamed1	+0 =0	0x17	Type	Security	Pending	Ack.Request	Intra PAN	0x74	0x2255	0xFFFF
1	UnNamed1	+29959 =29959	0x17	DAT	N	N	N	Y	0x74	0x2255	0xFFFF

A selected packet

### 3.4 Hardware Information

The tab 'Hardware Info' at the bottom pane displays the sniffer hardware data:

Hardware Info.	Configure	Node Identification	Display Manager	Node-Packets Graph
Version Number : v01.29 Model Number: BZW_Z_1612_2420_1 Device Identification : BZ_1234 Serial Number : BZ06_03_0001				

Hardware Handshake Data

## 4 Working with WiSens®

This session details how to capture / open a session and work around to derive optimum benefit.

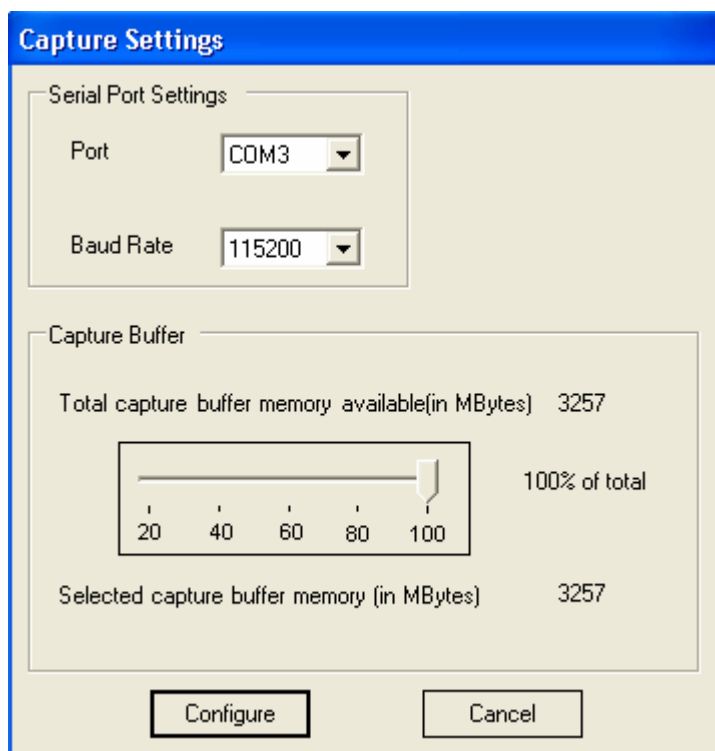
### 4.1 Capturing a session

The first and foremost requirement to start work with WiSens® is to set the communication settings, set the channel number and other parameters in which the sniffing to be carried out etc.

#### 4.1.1 Configuring the COM port

To configure the communication port:

Click **File > Configuration** or Click . Opens following dialog box.

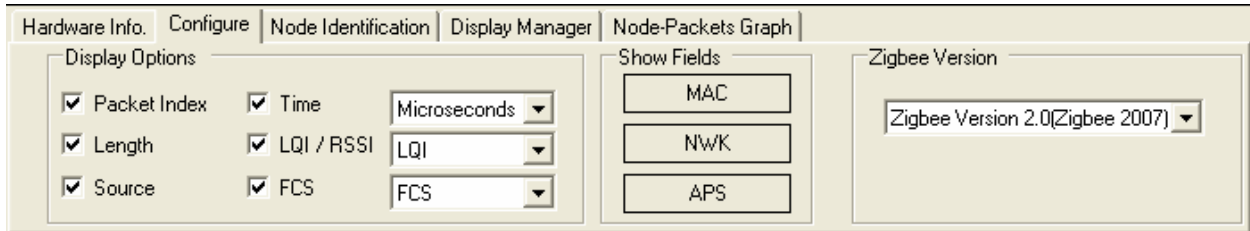


#### Configuring COM port

Set the port, baud rate and buffer sizes as shown in the figure above and click **Configure**.

### 4.1.2 Configuring data packet properties

The **Configure** tab allows you to set some of the properties of parameters you need for the display.



#### Configuring the sniffer

Select the channel at which you need the sniffer active from the Channel drop down menu. The channel selected should be the one at which the target PAN is operating. For 2.4 GHz, transceivers channel numbers 11 to 26 are valid selections. The channel numbers field accepts hexadecimal values equivalent to values 11 to 26. Enter the value and click Set Channel.

Select the unit of time for display in the packet at the Time field drop down menu

Select the parameter for display along with the sniffed packets at Show field drop down menu

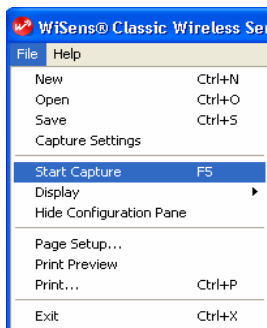
If you require packet Index displayed at the status bar at the bottom of the window, check mark the check box for Packet Index

The sniffer is now ready to capture the packets in the ambience.

To start capture:

Click  or Click **File > Start Capture**

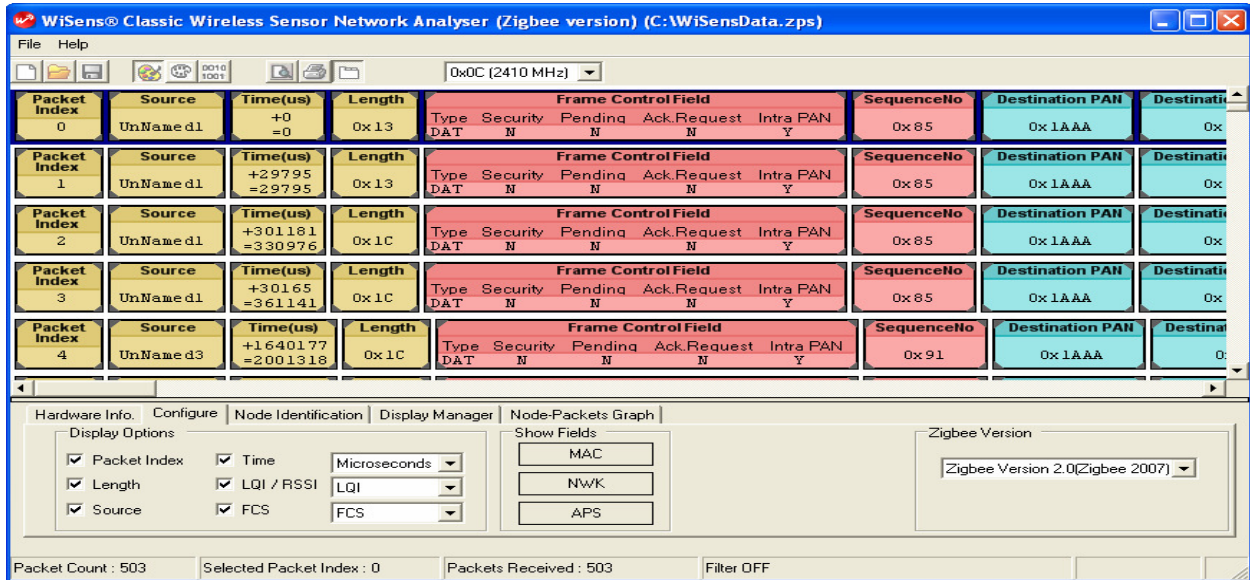
The system automatically clears the display on the screen prior to start of any capture session.



#### Capturing data packets

While viewing display of packets of a session, the focus can be easily shifted from one layer to

another i.e. even as the capture is APSDU, for the same packet you can chose to view up to only the MSDU in order to have a closer study and switch to APSDU view or to NSDU views. This kind of switching views only affects the display and not the captured packets during a session.



### Session on display

Click **MAC Fields** to view IEEE 802.15.4, protocol packets

Click **NWK Fields** to view ZigBee® Network protocol packets

Click **APS Fields** to view ZigBee® Application Support Sub-layer protocol packets

For each of the packet received, the user can select/deselect any of the following parameters for display on screen

- (i) Packet Index
- (ii) Length
- (iii) Source
- (iv) Time
- (v) LQI/RSSI
- (vi) FCS



For the same packet all the three different modes of viewing are available. viz., WiSens® Classic Mode, Black, White, Gray Mode and Raw Data Mode. While WiSens® Classic mode offers the best choice of colors, the Black, White, Gray mode is good for printing to a non-color printer while the raw data mode shows the raw over-the-air packet in hexadecimal bytes.

## 4.2 Opening a session

To open an archived session:

Click **File > Open** or Click 

Browse to the folder in which the stored file is available and select the desired file

Click **Open**

### 4.2.1 Saving a session

To save a captured session:

Click **File > Save As**. The Save As dialog box opens or Click 

Browse to the folder in which to save the session

Enter a name for the file

Click **Save**


### 4.2.2 Setting up display characteristics

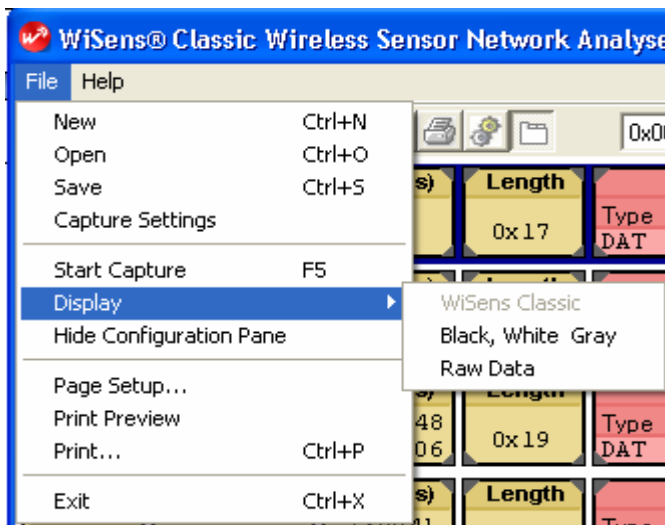
The display can be set for the colourful WiSens® classic or grey scale.

To set display properties:

Click File > **Display > WiSens® Classic** or Click 

Or

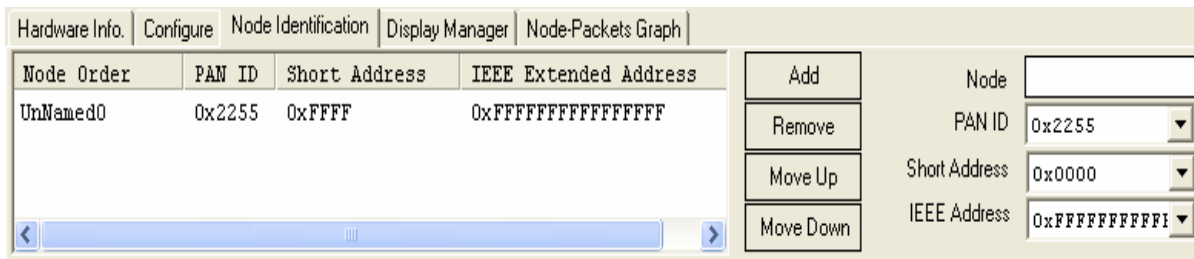
Click File > Display > Black, White Gray or Click 



Display options

### 4.3 Node Identification

Every device that joins the network is automatically registered and listed under this tab. **Node Identification** tab helps you manage the housekeeping tasks. The nodes listed here appear in **TimeLine** view. Often times the list gets unwieldy with a number of inactive nodes cluttering the view. This tab helps you remove the inactive nodes and maintain an uncluttered view in Timeline tab.



Node Identification tab

Each device is identified in the list with its node name, the PAN ID to which the node is joined, the short address and the IEEE extended address.

**Move Up** and **Move Down** buttons help you navigate the list. Any selected list item can be removed from the list using the **Remove** button. The fields at the right help you to quickly accomplish the task of removing a node from the list by selecting the node using the drop down menus.

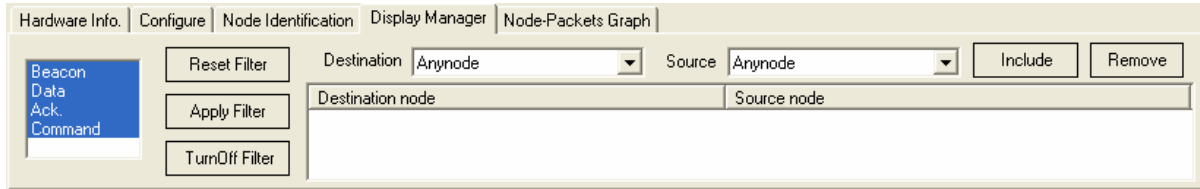
You can also manually add to the list by entering a node name, PAN ID, short address and



IEEE address and clicking the **Add** button.

#### 4.4 Display Manager

**Display Manager** allows you to select/focus the display to present the details you wish to see/analyze. This powerful feature adds to the flexibility and versatility of WiSens®.



#### Display Manager

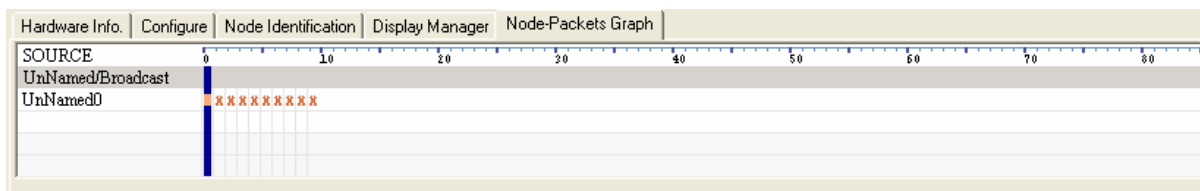
At the list box at left you can choose any one or a combination or all packet types in a ZigBee® network (Beacon, Data, Acknowledgement, and Command) for viewing. After selecting the desired combination of data packets for viewing click **Apply Filter** to get the display reflect your choice. The **Reset Filter** button reverts the display to default display i.e. all the packets in view. The **TurnOff Filter** renders all filtering ineffective.

Further filtering options to the users presented is selection of **Destination** and **Source** addresses. The display renders only the transmission packets between the selected addresses. Alternatively the desired nodes can be selected from the list at the list box for **Destination Node** and **Source Node** and clicking the **Include** button. The **Remove** button takes the selected node off the display.

#### 4.5 Node-Packets graph

**Node-Packets Graph** tab offers a convenient navigation and valuable visual depiction of important information like missing packets, the node whose packet is missing and the ability to quickly view the group of packets in question.

The blue vertical bar in can be moved across in the horizontal plane to focus the view on to the packets of interest in the display pane at the top. The green vertical line seen on either sides of the blue line demarcate the group of packets on display.

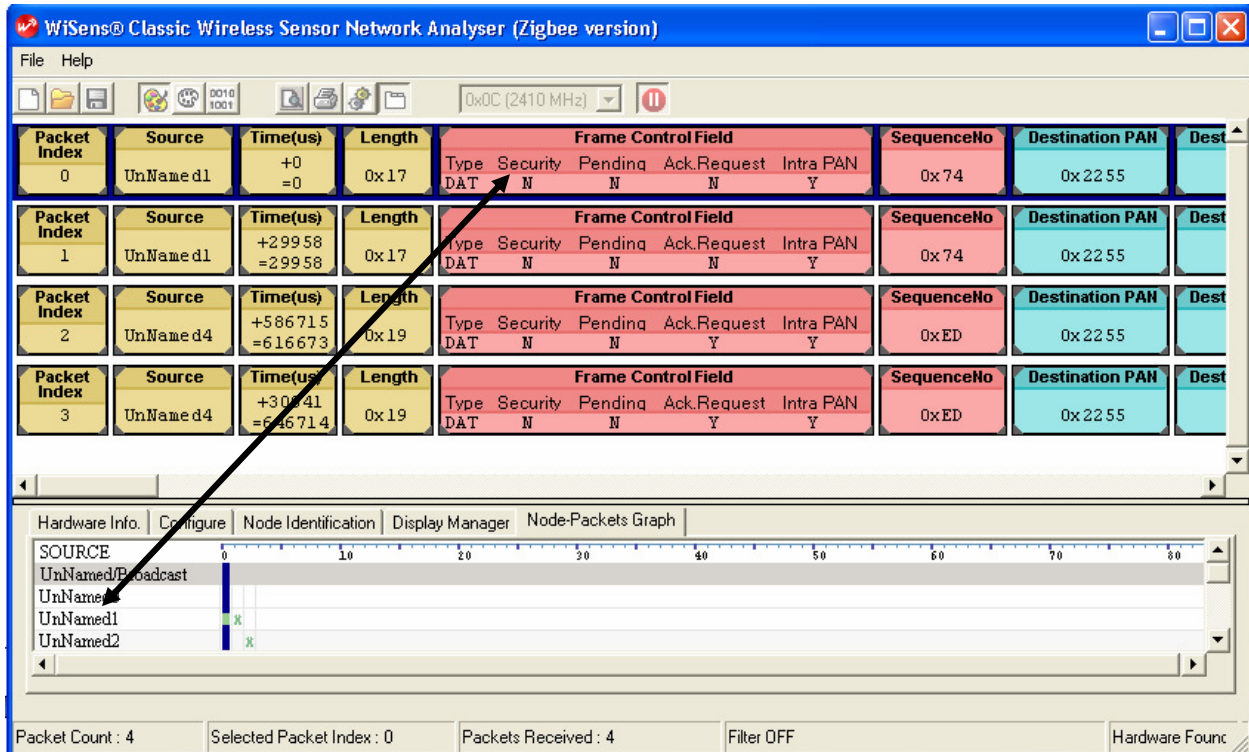


#### Node-Packets graph

The horizontal time line bar at the top of the tab view time correlation for each packet captured during a session by the sniffer.

The orange cross mark **x** appears at the coordinate to correlate the device which transmitted and the time at the top horizontal scale.

Following figure illustrates how to select a packet at the Node-Packets Graph tab.



**Navigating through Node-Packets Graph**

**Note that the selected packet is high-lighted with a blue background**

#### 4.6 Printing

To print:

Click **File > Print**. Print dialog box opens

Set all the print settings including the number of copies and paper orientation

Click **OK**

**WiSens® fits the packet length in more than one line in case it is too long. It breaks the packet and shifts the excess length to the next line, thus completing the entire display of the packet for convenient viewing.**

<b>Packet Index</b> 0	<b>Source</b> UnNamed1	<b>Time(us)</b> +0 =0	<b>Length</b> 0x17	<b>Frame Control Field</b>				
				Type	Security	Pending	Ack.Request	Intra PAN
				DAT	N	N	N	Y
<b>SequenceNo</b> 0x74		<b>Destination PAN</b> 0x2255	<b>Destination Address</b> 0xFFFF	<b>Source Address</b> 0x0000	<b>NWK Frame</b>			
					Type	Version	DisRoute	MultiFlag
					CMD	0x2	01	0
<b>Control Field</b>				<b>NWK Destination</b>	<b>NWK Source</b>			
Sec Src.route DestIEEE SrcIEEE				0xFFFF	0x0000			
N 0 0 0								
<b>NWK Radius</b> 0x0A		<b>NWK SequenceNo</b> 0x34						
<b>NWK Route Request(01)</b>				<b>LQI</b>	<b>FCS</b>			
CommandOptions RouteRequest DestAddress PathCost				176	OK			
0x00 0x01 0x0002 0x00								
<b>Packet Index</b> 1	<b>Source</b> UnNamed1	<b>Time(us)</b> +29958 =29958	<b>Length</b> 0x17	<b>Frame Control Field</b>				
				Type	Security	Pending	Ack.Request	Intra PAN
				DAT	N	N	N	Y
<b>SequenceNo</b> 0x74		<b>Destination PAN</b> 0x2255	<b>Destination Address</b> 0xFFFF	<b>Source Address</b> 0x0000	<b>NWK Frame</b>			
					Type	Version	DisRoute	MultiFlag
					CMD	0x2	01	0
<b>Control Field</b>				<b>NWK Destination</b>	<b>NWK Source</b>			
Sec Src.route DestIEEE SrcIEEE				0xFFFF	0x0000			
N 0 0 0								
<b>NWK Radius</b> 0x0A		<b>NWK SequenceNo</b> 0x34						
<b>NWK Route Request(01)</b>				<b>LQI</b>	<b>FCS</b>			
CommandOptions RouteRequest DestAddress PathCost				176	OK			
0x00 0x01 0x0002 0x00								

[Print Preview](#)

## 5 Error Messages

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In the event of a suspected malfunction – minor or major, WiSens® generates several intuitive error messages to caution the user to take remedial action. As the nature of the error messages are self-explanatory, we do not list them here.

In the event of any serious errors that the user encounters or would like to find out more about particular error messages, please contact BzWorks support personnel by emailing them at [support@bzworks.com](mailto:support@bzworks.com) or by reporting the error at [www.bzworks.com/support](http://www.bzworks.com/support).

## 6 IMPORTANT INFORMATION, DECLARATIONS

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