*Bringing to you the most affordable, advanced and compact WSN research platform developed by Industry Experts. This platform will be useful for academic, research and industrial applications to benefit students, faculties and scientists across various domains. Supported by user friendly GUI, seamlessly integrated with sensor node to monitor as well as program for various applications.*
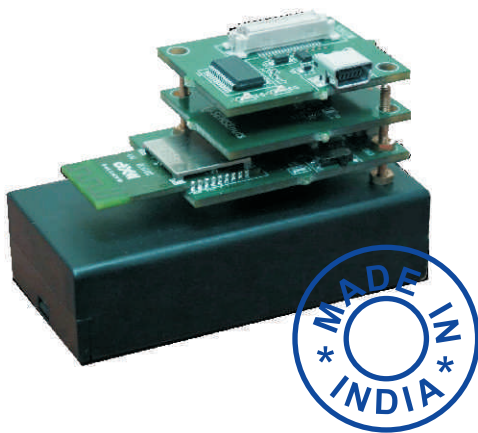
Product in brief:

- Microcontroller with integrated 802.15.4 transceiver
- Variety of sensors : Environment, Meteorological, Air & water quality etc.
- Modular design having Gateways, Radios & sensors devices
- Self-healing multi-hop network
- Easy to install and faster deployment
- Affordable solution for WSN concept testing and learning
- An ideal platform for research projects

What makes us apart:

- ⊙ *C based programming*
- ⊙ *Exhaustive set of "easy to use" APIs*
- ⊙ *Comprehensive Long term support*
- ⊙ *Flexible MAC protocol implementation*
- ⊙ *Live data Interface with MATLAB*
- ⊙ *Access to online technical resources*
- ⊙ *Source code of Protocols open for modification*
- ⊙ *Android APP with sample code (Optional)*
- ⊙ *Interface to Cloud access (Optional)*

The playgrounds:

- Environment monitoring
- Security implementation
- Home automation
- Industrial control
- Precision Agriculture
- Predictive maintenance
- *IoT* applications
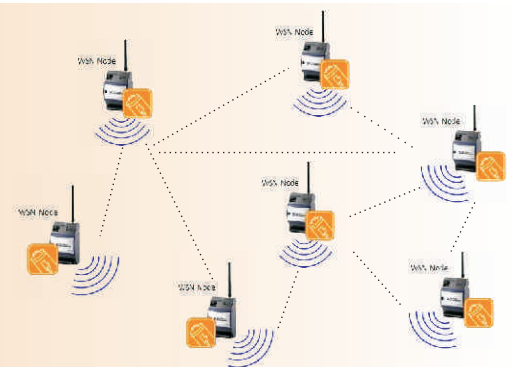
SENSEnuts™ IoT Research Lab

- • **Special discounted prices**
- • **Course Material**
- • **Lab curriculum**
- • **Training and online support**

- • **Free compatible software updates**
- • **Internship opportunities**
- • **Exclusive Forum Access**
- • **Collaborative Research Project**

Radio Module: It comprises of microcontroller and an integrated transceiver for processing, sending and receiving the data.

- 32-bit RISC JN 5168 Microcontroller
- 1-32MHz clock speed
- 256KB flash, 32KB RAM, 4KB EEPROM
- 2.4 GHz IEEE 802.15.4 compliant transceiver
- 128-bit AES security processor
- Time of Flight engine for ranging
- Integrated PCB antenna
- Rx current 17mA, Tx current 15mA
- 2V to 3.6V battery operation
- Controllable transmission power (-32 to +2.5 dBm)
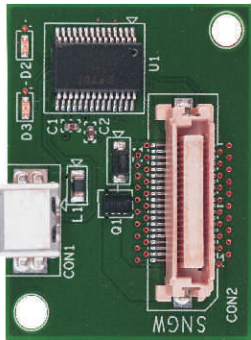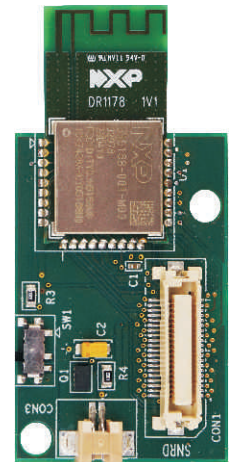
USB Gateway Module : It programs the microcontroller and acts as an interface between the network and PC.

- USB to Asynchronous serial data transfer interface
- USB protocol handled by the device (No USB specific programming required)
- Data Transfer rate 115200 baud
- 128 byte receive buffer and 256 byte transmit buffer

Ethernet Gateway Module : IEEE 802.3™ Compatible Ethernet Controller

- 8-Kbyte Transmit/Receive Packet Dual Port SRAM
- Configurable Transmit/Receive Buffer Size
- Fully Compatible with 10/100/1000Base-T Networks
- Integrated with SENSEnuts Radio module with SPI interface
- Temperature Range: -40°C to +85°C

Wifi Gateway Module : ·

- Low-power Wi-Fi networking module
- Integrated SPI-serial flash for software
- Broadcom BCM43362 single band 2.4GHz IEEE 802.11b/g/n 1x1 Wi-Fi transceiver
- Includes support for all Wi-Fi security modes including Open, WEP, WPA,WPA2-PSK
- Integrated 1MB Flash memory and 128kB SRAM
- Operational Temperature Range: -30°C to +85°C
- Wi-Fi Powersave : 0.77mA
- Active receive : 6.9mA @ 1Mbit/s
- Active transmit : 12.5mA @ 1Mbit/s

2G/3G Gateway Module : It is a SIM based solution which helps in receiving and sending data from various sensors communicating using 802.15.4 to internet

TL Sensor Module: This module measures the temperature and light intensity for environment monitoring.
- Temperature Range -25^0 C to 80^0 C with12 bit resolution,
- Light Range 3 to 64k lux with16 bit resolution, Excellent IR/UV rejection
- 1.5uA shutdown current
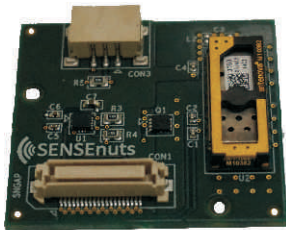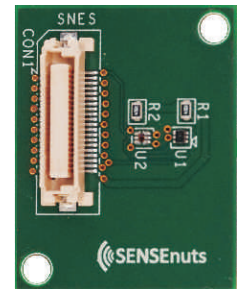
GAP Sensor Module: It provides the complete solution for motion and positioning applications. It houses a GPS transceiver with an integrated antenna, an accelerometer and an interface for a PIR sensor
- NMEA 0183 (2.3, compatible to 3.0) protocol output for GPS
- ±2g/±4g/±8g dynamically selectable full-scale
- 14-bit and 8-bit digital output
- PIR with extremely low current consumption

HTP Sensor Module: It enables an application designer to implement a weather or environment specific application with minimal efforts. Sensor HTP is capable of gathering the information of Relative Humidity, Barometric Pressure and ambient temperature.
- The humidity sensor provides digital output with a 14-bit resolution (0.04%   RH)
- Pressure sensor outputs the barometric pressure in 24-bit resolution
- Hardware interrupts in order to update the microcontroller about any critical events
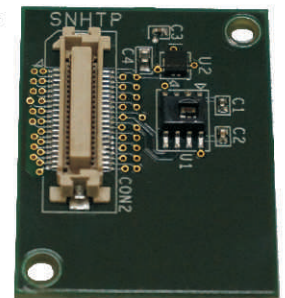
Camera Module: it supports QVGA/160*120 resolution output in JPEG
- It Supports standard baud rates from 9600 to 115200 baud
- Current consumption of 80 mA (approximate)

CO /CO$_2$ Sensor Module
- Concentration detection 350 to 10000 ppm for CO$_2$ and 20 to 2000 ppm for CO
- Input voltage requirements : 6 volts
- Current requirement 200mA
- operating temperature -20 to 70 degrees celcius
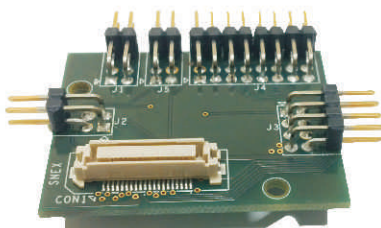
Extender Module: It extends all the pins of the micro controller on a board and provides access to users, if needed. This makes it easier to,
- Connect external sensors and devices.
- Debug hardware/checking output on DIOs and other ports
- Access ADC, SPI, UART, I2C, and PWM generators

SENSEnuts™ ToolChain: SENSEnuts™ Toolchain provides the user with all the software support required for developing applications on/for SENSEnuts™ WSN Platform viewing live data and analysis. It is accompanied by an intuitive GUI which is used for programming the motes and displaying data from the sensor network. Loaded with immense features, it enables the user to focus on their research in WSN domain and realize their algorithms by real time implementation. Users may easily develop proof of concept designs for IoT applications.
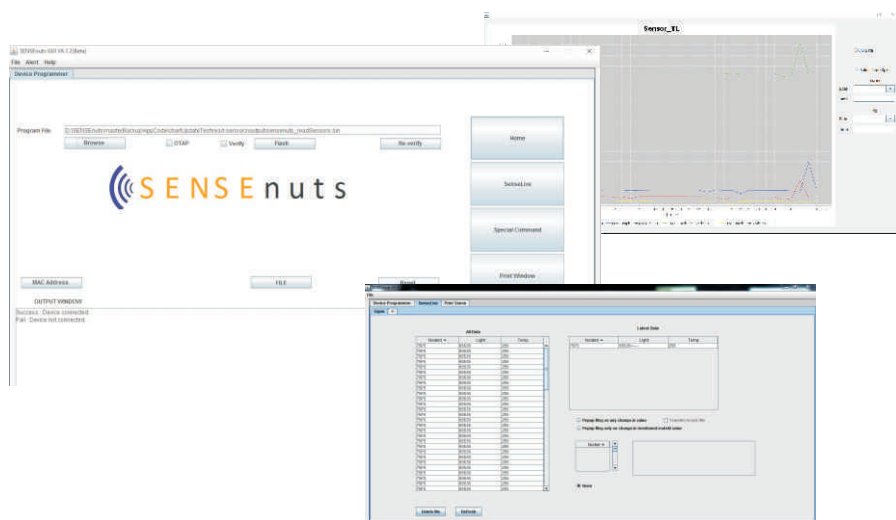
Highlights:

● Programing interface for the device
● Displays live data from the network and create SQL (sqlite3) database
● All data available in graphical charts
● Command panel for IoT applications
● Network topology graph generator for selected protocols
● Special Command window for generating commands for the nodes in the network
● Flexible mac and phy layer with controllable PIB attributes through predefined APIs.
● Complete implementation of protocol stack in C
● AODV, Level Based Routing and Mac Based Routing available.
● Modifiable source codes of complete protocol stack available with users.
●GUI also provides communication with TCP/IP to make a soft gateway
● Easy to install and supported on Windows Operating System
●*Optional Features: Android APP with sample code and cloud interface*

Sales Packages

Centre of Excellence for IoT

Radio Module	-	100
TL Sensor Module	-	50
USB Gateway Module	-	25
HTP Sensor Module	-	15
GAP Sensor Module	-	10
WiFi Gateway Module	-	02
Ethernet Gateway Module	-	02
2G/3G Gateway Module	-	01
Extender	-	10
Associated Software Toolchain		

ProLAB

USB Gateway	-	10
Radio Module	-	30
TL Sensor Module	-	20
Extender	-	02
Associated Software Toolchain		

TeachLAB

USB Gateway	-	05
Radio Module	-	15
TL Sensor Module	-	10
Extender	-	01
Associated Software Toolchain		

Upcoming add-ons

Solar Powered Devices

Alternative Routing protocols

Precision Agriculture

• **Water-** pH, Temperature, electrical conductivity, dissolved oxygen, ORP

• **Soil -** pH, Temperature, Moisture, electrical conductivity

Gas- CO_2, LPG, CO, CH_4, Alcohol, H_2, O_3