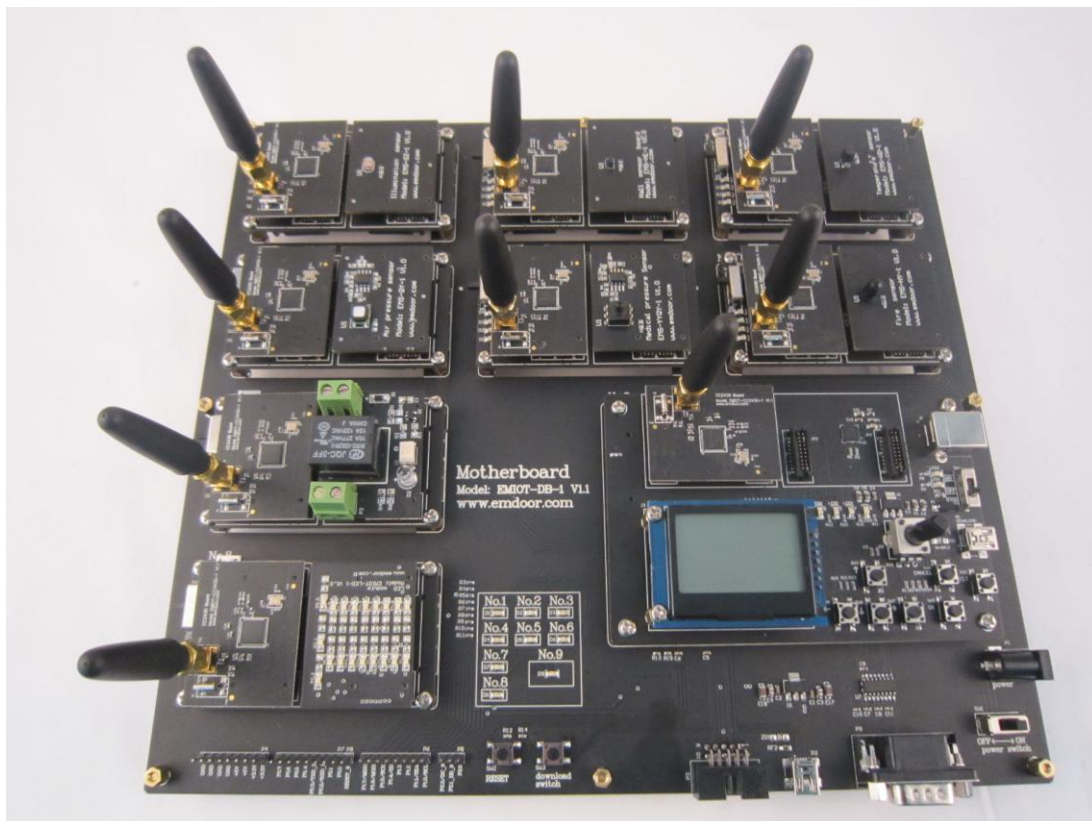


# Opterna- Education Platform

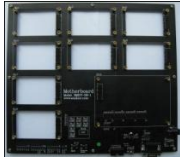

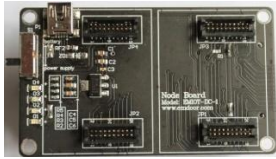















## I. Introduction


According to the current construction, absorbing domestic and foreign similar products, fully considering the advantages of the characteristics of university teaching of IOT contrive EMIOT-JX-1 teaching platform of IOT. The plate integrates a variety of sensor models and a variety of wireless networking mode, it can run a variety of network architecture, provide a large number of test routines and typical application to make the students familiar with and master the principles and practical application of IOT.

Embedded teaching and research platform of IOT, including hardware, software resources, laboratory resources. Experimental resources which include experiments on the basis of CC2430/XSBase-270-S, sensor information collection, the wireless signal transceiver test, and PC software, interactive control, can fully satisfy the networking and embedded objects relating to teaching and research.



## II. Product List

Name and NO.	Image	Name and NO.	Image
BaseboardX1		Gateway boardX1	
Battery boardX8		CC2430 node moduleX9	
2.4G antenna X9		Illuminate sensorX1	
Pressure sensorX1		Medical pressure sensorX1	
Flame sensorX1		Temperature sensorX1	
Hall sensorX1		Relay sensoX1	
LED test moduleX1		CC Debugger emulatorX1	
USB interfaceX1		JTAG interfaceX1	
Mini USB interfaceX1		Serial interfaceX1	

Resource CDX1		5V cable lineX1	
------------------	--	--------------------	---

### III. The hardware resources

#### Network nodes

Using current Zigbee mainstream solution built-in hardware CC2430/2530 processor of recommended by TI, located the engine and the enhanced 8-bit microcontroller 51; \* rich in I / O ports, built-in temperature sensor, A / D and a variety of common peripherals interface (timers, UART, DMA, interrupt);

Meet IEEE802.15.4/ZigBee standards, frequency range 2045M-2483.5M, be free to switch between the 16 bands.

Wireless data transfer rate of about 20 ~ 250 kb / s;

Has a programmable chip 128K Flash, and 8K of RAM;

Operate Voltage 2.0V-3.6V, low power consumption, supporting sleep and wake-up function;

Support specifically designed wireless sensor networks, TinyOS operating system

Compatible XMesh network protocols, standard ZigBee protocols and support the Z-MAC (integrated CSMA, TDMA system), X-MAC etc, can facilitate the rapid secondary development;

Integrated development environment based on IAR 51 engineering emulating debugging environment;

Support routing interrupt request, auto repairing of network nodes;

Connect with a variety of modules like Sensor nodes, temperature and humidity, pressure, acceleration, light sensors, sound detection data acquisition;

#### System Board

System board adopts the system motherboard, power supply node and the gateway board one design, the system motherboard mainly achieve power supply and programming to power supply node and gateway node board. Group 3 also leads to the node board of all GPIO ports. The main hardware interface resource of the System board:

8 completely symmetrical plate interface cards;

3 set of nodes GPIO port interface board

1 standard of 2 \* 5 2 emulator interface and 2 emulator interface switch of DIP switch;

1 standard mini-USB interface to download and simulation;

1 a standard DB9 serial interface;

9 modules selected indicators.

#### Battery node board

**The main hardware interface resources of battery node board are:**

2 completely symmetrical CC2430 module plug-in interface;

3 GPIO LED lights and a power indicator;

**Sweden**

**Phone: +46-8-58020800**

**Fax: +46-8-58020801**



- 
- 2 2 \* 11 2.54 2-pin interfaces, all connected to the CC2430 module pins.
  - 2 5-battery-powered boxes, enabling the battery-powered;
  - 1 standard mini-USB interface to download and simulation;

#### **Gateway board**

Gateway processor use CC2430 module as the microprocessor, responsible for data collection, distribution, and program testing. The gateway adopted high-performance CP2102 USB RS232 chip, is convenient to communicate with different operating systems for RS232, and uses 128x16 graphic LCD display, visual data display. The main gateway board hardware resources:

- USB switch RS232 interface;
- 4 different directional buttons;
- 2 GPIO Interface buttons;
- 128 \* 64 graphic LCD display
- 2 symmetrical the CC2430interface plug-in modules
- 1 standard mini-USB interface to download and simulation
- 4 LED GPIO interfaces
- 1 precision adjustable potentiometer, can be converted ADC

#### **Sensor nodes**

Sensor nodes adopt the same interface design of CC2430 module; main 8 standard sensor interface module:

- Illumination sensor module
- pressure sensor module
- medical pressure sensor module
- Hall sensor module
- flame sensor module
- temperature sensor module
- relay sensor module
- LED test module

#### **Emulator**

CC Debugger as Zigbee multifunctional simulation / debugging tools, mainly for debugging and emulation the RF system on chip (CC1010 excluded) has introduced by TI, it can use TI's SmartRF Flash Programmer software on TI's RF PSoC programming, meanwhile with the IAR Embedded Workbench for 8051 development environment, seamlessly build and realize TI's RF PSoC chip debugging.

### **IV software resources**

#### **IOT teaching platform software**

- TinyOS bottom development software package-ZigbemDS
- PC part upper monitor software-ZigbemPC
- WinCE upper monitor software -ZigbemCE

#### **IAR basic experiment**

1. an automatic flash
2. button control switch

**Sweden**

**Phone: +46-8-58020800**

**Fax: +46-8-58020801**

3. buttons control flash
4. use of T1
5. use of T2
6. use of T3
7. use of T4
8. relay
9. external interrupt
10. temperature inside sensor test
11. GPIO light
12. sending and receiving the interface data
13. system sleep and wake-up
14. work of sleep state
15. use of sleep timer
16. Watchdog and the dogs feeding
17. CC2430 inside flash read and write

**Experiment based on comprehensive demonstration:**

1. wireless communication
2. Stopwatch
3. Send and receive serial data
4. analog-digital conversion
5. Random number
6. Data encryption and decryption
7. DAM
8. Power mode set
9. Flash programming

**Point to point and multipoint wireless communication experiment:**

1. a point to point communication
2. Two-to-multipoint communication

**ZStack-1.4.3 experiment:**

1. SampleApp
2. light - switch
3. Sensor data collection
4. key demonstration
5. demonstration of AD samples
6. Demonstration of DA samples
7. GenericApp
8. SerialApp
9. TransmitApp
10. Home Automation

**TinyOS basic experiment:**

1. build TinyOS development environment
2. LED lights

3. Timer test
4. serial debugging
5. serial communication
6. Watchdog
7. Flash read and write test
8. consumption mode
9. random sequence generator
10. AES-128 security coprocessor

**TinyOS communication experiment**

1. point to point communication
2. RSSI Measurement
3. Set emit consumption
4. Set wireless communication
5. Wireless sensor network -- illuminate sensor