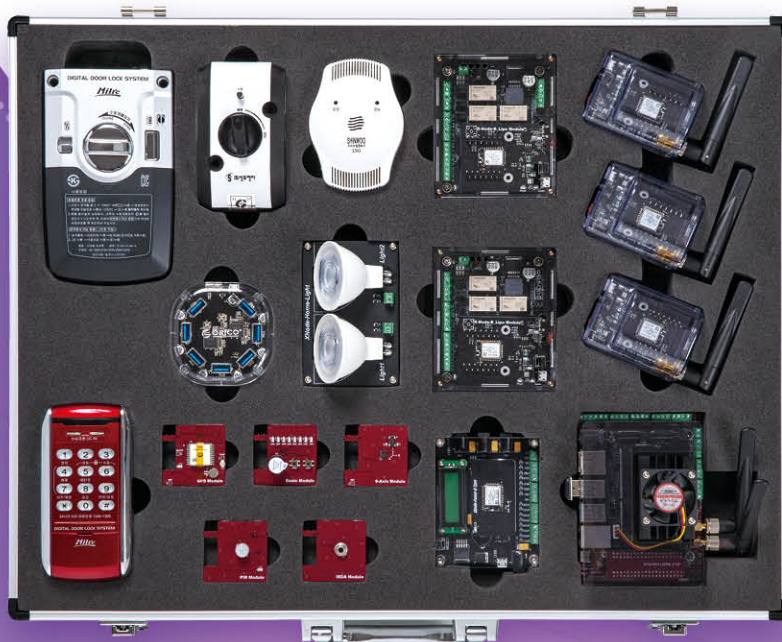




Based on Wireless Personal  
Area Network (WPAN)

# IoT Connectivity Application Practical Training Equipment

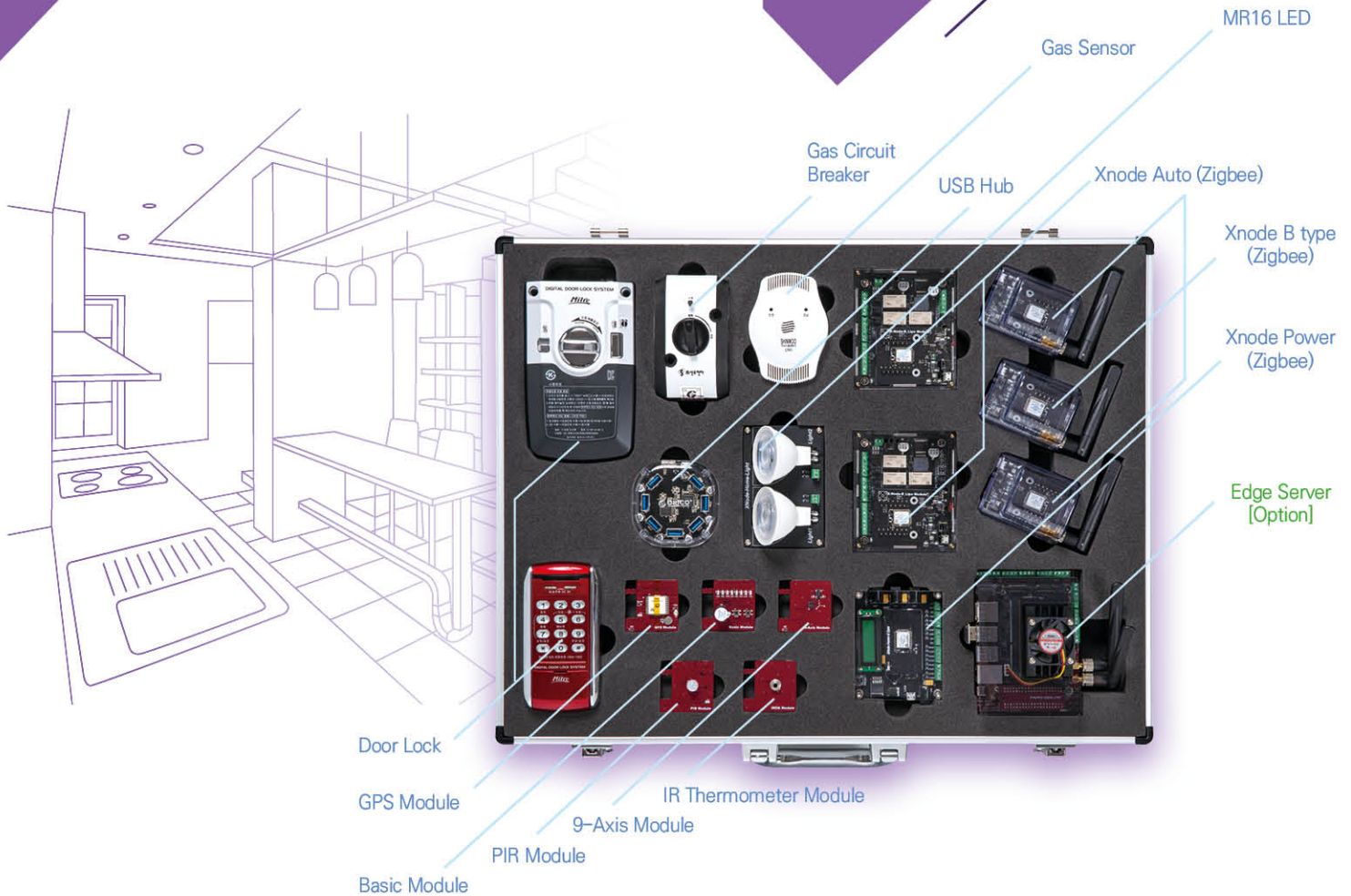


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Homepage



## Training Contents

- ① Components and Concepts of Sensor Network
- ② Sensor Network Platform
- ③ Sensor Network Protocol
- ④ Sensor Network Development Environment
- ⑤ Basic Sensor Control
- ⑥ Extension Module Control
- ⑦ Zigbee Basic Communication
- ⑧ Zigbee Communication Extension
- ⑨ Zigbee and BLE
- ⑩ Sensor Network Application Project

## Appendix

1. Visual Studio Code Add-on
2. Edge Server Initialization
3. Python

- // IoT connectivity application training equipment based on wireless personal network (WPAN)
- // By using the mesh network method, it can be used in large quantities in a wide range of areas such as wireless control and monitoring, and a wide range of communication is possible
- // Provides an environment for building a smart home with devices used in real home appliances such as door locks, gas circuit breakers, gas detectors, fans, and LED lights
- // DC power is supplied and measured by the XNode Power board, and the measured usage can be monitored remotely
- // Provides sensors such as GPS, IrThermo, IMU, and PIR in addition to the Basic Module
- // The sensor node provides a 2100mA battery so that it can be operated independently, and also provides an LED for an indicator, and a light sensor and temperature/humidity sensor based on lux units
- // Provided sensor node supports interpreter-style Python 3 to write control programs easily and concisely
- // Visual Studio Code-based integrated development environment for professional application development
- // Provides training contents for Python-based sensor nodes



# Software Specifications

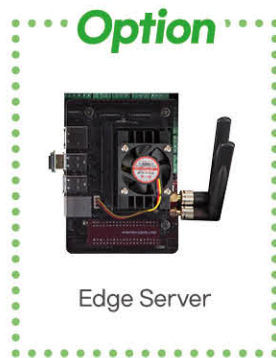
List	Specifications
Node B	MicroPython 3 (built in node)
	VSCoDe4Soda
	Configuration Software (compatible with Linux, OS X and Windows)
	Remote Terminal & Remote Desktop support
	Pop Library

# Hardware Specifications

List	Specifications	
XNode Power	RAM: 128KB	
	Flash Memory: 1MB	
	Interface: UART, SPI, I <sup>2</sup> C, ADC, PWM, GPIO	
	Indicator: LED	
	ZigBee 3.0	Frequency: 2.4GHz Range: Max 3200m (Outdoor), Max 90m(Indoor) Data Rate: 250kbps Sensitivity: 103dBm Output Power: 19dBm Receiver Sensitivity: 100dBm Bluetooth Support
	Measure: DC Current	
	Power Output: DC 12V x 3EA	
	Size: 93.5 x 76(mm)	
XNode Auto	RAM: 128KB	
	Flash Memory: 1MB	
	Interface: UART, SPI, I <sup>2</sup> C, ADC, PWM, GPIO	
	Indicator: LED	
	ZigBee 3.0	Frequency: 2.4GHz Range: Max 3200m (Outdoor), Max 90m(Indoor) Data Rate: 250kbps Sensitivity: 103dBm Output Power: 19dBm Receiver Sensitivity: 100dBm Bluetooth Support
Relay: 3ch	DC: 5A/30VDC AC: 5A/250VAC	
	Motor Driver: Dual FullBridge Driver(4A/46V)	
	Size: 103 x 89(mm)	
Node B (3a)	RAM: 128KB	
	Flash Memory: 1MB	
	Interface: UART, SPI, I <sup>2</sup> C, ADC, PWM, GPIO	
	Indicator: LED	
	ZigBee 3.0	Frequency: 2.4GHz Range: Max 3200m (Outdoor), Max 90m(Indoor) Data rate: 250kbps Sensitivity: 103dBm Output Power: 19dBm Receiver Sensitivity: 100 dBm Bluetooth Support
	Light Sensor	Illuminance: 1 ~ 65535(lx) Interface: I <sup>2</sup> C
	Humidity & Temperature Sensor	Humidity Resolution: 12bit(0.04%RH), 8bit(0.7%RH) Humidity Accuracy: +3%RH Temperature Resolution: 14bit(0.01C), 12bit(0.04C) Temperature Accuracy: +4°C Interface: I <sup>2</sup> C
Power	Micro USB B Type(+5V) Expansion Connector (+5V) LiPo Type 3.7V/2100mAh (1EA)	

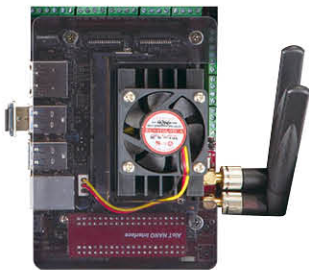
List	Specifications	
Basic	Input Device: Tact Switch x 2EA(GPIO)	
	Output Device: LED 8EA(I <sup>2</sup> C)	
	Actuator: Passive Buzzer(GPIO) Size: 46x44(mm)	
9axis Sensor	Acceleration ranges: ±2g/±4g/±8g/±16g Gyroscope ranges: ±125°/s to ±2000°/s Magnetic Field Range: ±1300uT(x,y axis), ±2500uT(z axis) Interface: I <sup>2</sup> C Size: 46x44(mm)	
PIR Sensor	Sensing Range: 110° Spectral Response: 5 ~ 14 um I/O Interface: Digital Out Size: 46x44(mm)	
Infrared Thermometer	Measurement Resolution: 0.02°C Measure Range: 40°C ~ +125°C Interface: I <sup>2</sup> C Size: 46x44(mm)	
Expansion Module	GPS Module	Sensitivity: 165dBm Update Rate: up to 10Hz AGPS Support for Fast TTFF Consumption Current(@3.3V) Acquisition: 25mA Typ Tracking: 20mA Typ Size: 46x44(mm)
	Door Lock	Method: One Way Solution (Secret Code) Operating Voltage: 8V
Gas Sensor	Gas Sensor	Operating Voltage: 12V Type: Stand Alone, Immediate, Diffusion Applicable Gas: LNG, Town Gas Alarm Indication: Flashing Yellow, Buzzer
	Gas Circuit Breaker	Shutoff Method: Geared Motor Opening/Closing Speed: >10s Current Rating: Max 500mA
	MR16 LED	12V/3W
FAN	12V/140mA FAN Speed: 1300rpm Size: 60x60x15(mm)	

# Composition



## Option

### EdgeServer (Option)



Edge server supports sensor node control and artificial intelligence convergence programming in a web browser environment through Soda OS, an AIoT-only operating system, and Pop Library

Edge server supports mDNS/DNS-SD, SSH, SFTP, SMB/CIFS, MQTT, NXX Window protocol

Soda OS and Pop Library, an AIoT-only operating system are provided

### Software Specifications

List	Specifications
Linux Kernel	aarch32 4.x 또는 aarch64 4.x
Lightweight Desktop	X-Server, Openbox, lxdm, Tint2, blueman, network-manager, conky pcanf, lxterminal
CLI	Zsh with Oh-My-Zsh, Tmux, Peco, powerlevel9k thema, Powerline fonts
Tool Chain	GCC (c, c++), JDK, Node JS, Python3, Cling
Soda OS IDE	Visual Studio Code, NeoVim, Geany
Multimedia	PulseAudio, sox (lame, oggenc), snowboy, Google Assistant OpenGL ES, OpenCV 4
Data Science & AI	Numpy, Matplotlib, Pandas, Scipy, Seaborn Scikit-learn, TensorFlow, Keras, PyTorch, TorchVision, OpenAI Gym
Jupyter Lab	Python3 and Cling support IPython Widgets Terminal support
Multimedia Object	AudioPlay, AudioPlayList, AudioRecord, Tone, SoundMeter
Pop Library Voice Assistant Object	GAssistant, create_conversation_stream
AI Object	Linear Regression, Logistic Regression, Perceptron, ANN, DNN, CNN, DQN Pilot with AutoCar & SerBot

Edge Server (Gateway)

### Hardware Specifications

List	Specifications
CPU	6-core NVIDIA Carmel ARM v8.2 64-bit
CPU Max Freq	6MB L2 + 4MB L3 2-core@1900MHz, 4/6-core@1400Mhz
GPU	384-core NVIDIA VoltaTM GPU with 48 Tensor Cores GPU Max Freq: 1100MHz
Memory	8GB 128-bit LPDDR4x@ 1600MHz
Storage	16GB eMMC 5.1
Video Encoder	2x464MP/sec(HEVC), 2x4k@30(HEVC) 6x 1080p@ 60(HEVC), 14x 1080p@ 30(HEVC)
Video Decoder	2x690MP/sec(HEVC), 2x4k@60(HEVC), 4x4k@30(HEVC) 12x1080p@ 60(HEVC), 32x 1080p@ 30(HEVC), 16x 1080p@30(H.264)
CSI Camera	Up to 6 Cameras(36 Via Virtual Channels) 12 Lanes MIPI CSI-2, D-PHY 1.2(up to 30 Gbps)
Connectivity	Dual Band Wireless Wi-Fi 2GHz/5GHz Band, 867Mbps, 802.11ac Bluetooth 4.2 10/100/1000 Base-T Ethernet
Display	2 multi-mode DP 1.4/eDP 1.4/HDMI 2.0
USB	4x USB 3.0, USB 2.0 Micro-B

Edge Server (Gateway)