

AIoT Server Plus

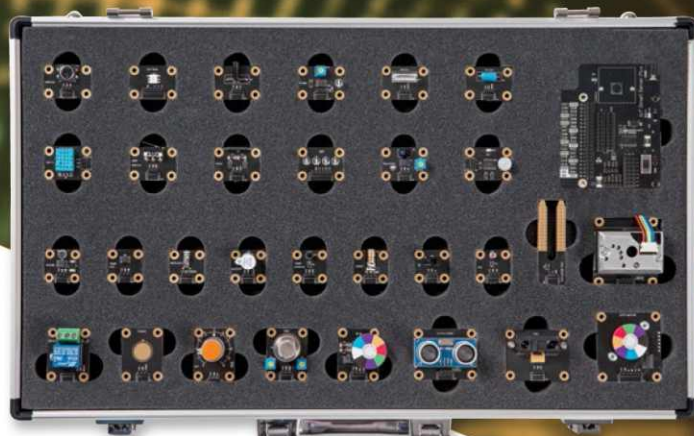
AI and IoT application lab equipment which gives more freedom to use by module-to-module cabling

AIoT Server Plus provides a variety of exercises ranging from development environments, sensor control, databases, multimedia, and artificial intelligence on high performance edge devices based on Soda OS. This enables you to acquire the foundational knowledge and application projects required for developing on-device AI applications



AIoT Server Plus

AI and IoT application lab equipment which gives more freedom to use by module-to-module cabling



Product Features

- Module-to-module cabling makes AI and IoT application practice equipment easier to use
- Consists of ARM Cortex-A72 quad-core processor module, dedicated shield and IoT sensor module
- 2.54mm jumper cables and 30 IoT sensor modules enable a variety of real-world ideas
- Provides 8M pixel high resolution camera for image processing applications
- Provides Gigabit Ethernet, dual band Wi-Fi (2.4GHz, 5GHz) and Bluetooth 5.0
- Headsets support cloud-based speech recognition and audio playback
- Tensor processor unit module can be added as an option
- Soda OS and Pop library, the exclusive AIoT operating system
- Interpreter-based C/C++ development environment optimized for beginners in programming, including Python 3
- Dedicated web browser-based learning environment for learning Python 3 and C/C++ simultaneously on PCs and tablets
- mDNS/DNS-SD based distributed name resolution and network service publishing and discovery
- Integrated development environment based on Visual Studio Code for professional application development
- IoT sensor control and multimedia, AI learning contents

Software Specifications

| Module | Item | Specifications |
|------------------|--|---|
| Soda OS | Linux Kernel | 4.19 |
| | Desktop | X-Server, Openbox, LightDM, Tint2, blueman, network-manager, conky |
| | CLI | Zsh, Tmux, Peco, powerlevel9k thema, Powerline fonts |
| | Tool Chain | GCC 9, JDK, Node JS, Python3, Clang |
| | IDE | Visual Studio Code, NeoVim, Geany |
| | Connectivity | Mosquitto(MQTT), Bluez, mtr, nmap, iptraf, Samba, Blynk Server, Remove Desktop Server |
| | Multimedia | portaudio, sox, OpenCV 4, snowboy, Google Assistant |
| Pop library V1.0 | Data Science & AI | Python3, Numpy, Matplotlib, sympy, Pandas, Seaborn, Scipy, Gym Scikit-learn, Tensorflow, Keras |
| | Output Object (C/C++, Python3) | Led, Laser, Buzzer, Relay, RGBLed, DCMotor, StepMotor, Oled PiezoBuzzer, PixelDisplay, TextLCD, FND, Led Bar |
| | Input Object (C/C++, Python3) | Switch, Touch, Reed, LimitSwitch, Mercury, Knock, Tilt, Opto, Pir, Flame LineTrace, TempHumi, UltraSonic, Shock, Sound, Potentiometer, Cds SoilMoisture, Thermistor, Temperature, Gas, Dust, Psd, Gesture |
| | Multimedia (Python3) | AudioPlay, AudioPlayList, AudioRecord, Tone, SoundMeter |
| | Voice Assistant (Python3) | GAssistant, create_conversation_stream |
| AI (Python3) | Linear Regression, Logistic Regression, Perceptron, ANN, DNN, CNN, DQN | |

Hardware Specifications

| Module | Item | Specifications | |
|------------------|--|--|-------------------------------------|
| On Device Server | CPU | 1.5GHz quad-core 64-bit ARM Cortex-A72 CPU | |
| | GPU | VideoCore VI graphics, supporting OpenGL ES 3.x | |
| | Video | 4Kp60 hardware decode of HEVC, Dual monitor support, at resolutions up to 4K1 | |
| | Memory | 4GB of LPDDR4 SDRAM | |
| | Storage | 32GB | |
| | USB | Two USB 3.0 and two USB 2.0 ports | |
| | Ethernet | Full-throughput Gigabit Ethernet | |
| | Wireless | Dual-band 802.11ac wireless networking and Bluetooth 5.0 | |
| | Expansion I/O | 40ea GPIO(2x20 2.54mm Pitch Header) | |
| | Size | 88x58mm | |
| Shield Board | Camera | Still resolution | 8 Megapixels |
| | | Video modes | 1080p30, 720p60 and 640 × 480p60/90 |
| | | Linux integration | V4L2 driver available |
| | | Sensor | Sony IMX219 |
| | | Sensor resolution | 3280 × 2464 pixels |
| | | Optical size | 1/4" |
| | | Focal length | 3.04 mm |
| | ADC | 8ch 12bit Analog to Digital Converter | |
| Expansion I/O | 40ea GPIO(2x20 2.54mm Pitch Header) | | |
| size | 85x66mm | | |
| Sensor Modules | Pir Sensor | Sensor : RE200B Sensing Range : 110 Degree Operating Voltage : 3.3V I/O Interface : 1 pin Digital Out | |
| | Sound Sensor | Sensor : Microphone Operating Voltage : 5V I/O Interface : 1 pin Analog Output | |
| | Humidity Temperature Sensor | Sensor : DHT11 Operating Voltage : 5V I/O Interface : 1 pin Digital Output | |
| | Ultrasonic | Sensor : HC-SR04 Feature : 2~200cm distance measuring range, 40KHz Frequency Operating Voltage : 5V I/O Interface : 1 pin Digital Output, 1 pin Digital Input | |
| | Cds Sensor | Operating Voltage : 5V I/O Interface : 1 pin Analog Output | |
| | Potentiometer | Sensor : 1k(ohm) Variable Resistor Feature : 0~5V DC Variable Voltage out I/O Interface : 1 pin Analog Output | |
| | Tilt Sensor | Contact Resistance : 50m(ohm) Max Operating Voltage : 3.3v~5V I/O Interface : 1 pin Digital Output | |
| | Mercury Sensor | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output | |
| | Reed Sensor | Operating Voltage : 3.3V~5V Switching Current : 0.5A I/O Interface : 1 pin Digital Output | |
| Psd Sensor | Operating Voltage : 3.3V~5V Sensing Range : 2~40cm I/O Interface : 1 pin Analog Output | | |

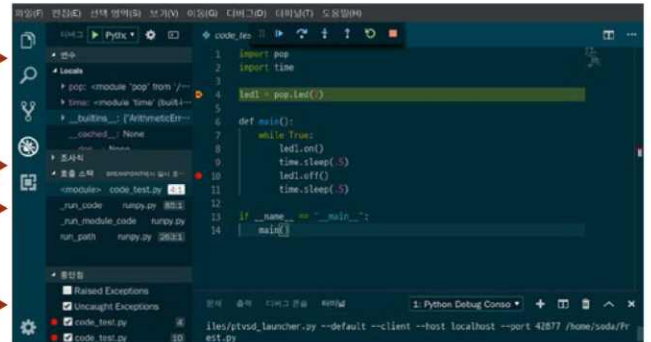
| Module | Item | Specifications |
|------------------|--|---|
| Sensor Modules | Flame Sensor | Operating Voltage : 3.3V~5V Sensing Range : 60 Degree I/O Interface : 1 pin Digital Output |
| | Touch Sensor | Sensor: TTP223 Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| | Opto Sensor | Sensor : FC33 Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| | Shock Sensor | Sensor : SW-420 Operating Voltage : 5V I/O Interface : 1 pin Analog Output |
| | Dust Sensor | Sensor : GP2Y1014AUOF Operating Voltage : 5V I/O Interface : 1 pin Analog Output, 1 pin Digital Input |
| | Gas Sensor | Sensor : MQ-1 Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output, 1 pin Analog Output |
| | Soil Moisture | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Analog Output |
| | Line Trace Sensor | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| | Thermistor | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Analog Output |
| | Temperature | Sensor : LM35 Operating Voltage : 3.3V~5V I/O Interface : 1 pin Analog Output |
| | Limit Switch | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| | knock Sensor | Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| | Relay | Feature : NC/NO Relay, 250VAC 10A/30VDC 10A Operating Voltage : 3.3V~5V I/O Interface : 1 pin Digital Output |
| Actuator Modules | LED Module | Operating Voltage : 3.3V~5V Current : 20mA I/O Interface : 1 pin Digital input |
| | DC Motor | Motor : Micro Type DC Motor Motor Driver : TB6552 Operating Voltage : 5V I/O Interface : 2 pin Digital input |
| | Step Motor | Feature : 32 Step, 1/16Gear Motor Motor driver : ULN2003 Operating Voltage : 5V I/O Interface : 4 pin Digital input |
| | Switch Module | Feature : Tact Button I/O Interface : 1 pin Digital input |
| | Buzzer Module | Sound Output at 10cm : 60dB(Min) Operating Voltage : 3.3V~5V Current Consumption : 2mA I/O Interface : 1 pin Digital input |
| | Laser Module | Wavelength : 650nm Operating Voltage : 5V I/O Interface : 1 pin Digital input |
| | RGB LED | Operating Voltage : 3.3V~5V I/O Interface : 3 pin Digital input |
| Network Adaptor | USB 3.0 Gigabit Ethernet Card IEEE 802.3/ 802.3u/ 802.3au 10/100/1000Mbps RJ-45 62x23x16mm(LxWxH) | |
| Sound Card | Virtual 7.1ch USB2.0 to Audio Converter Realtek ALC DAC/ADC 48KHz 16bit output, I2S/PCM/TDM support 47x28x12mm(LxWxH) | |

Advantages of AIoT Server Plus

Part I Edge Device Development Environment

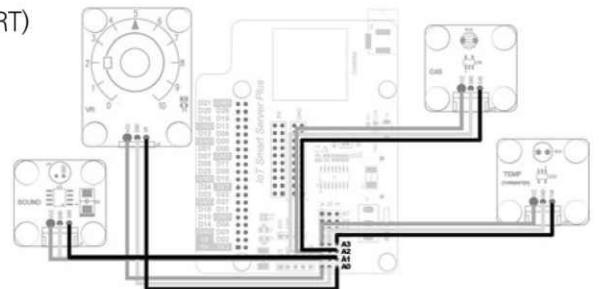
- AIoT Server Plus & Soda OS
- Host & Edge Device Connection
- Edge Device Support Software
- Python 101
- Desktop Environment
- CLI Environment
- Linux 101

- Variable Value
- Result
- Function Call Flow
- Breakpoint



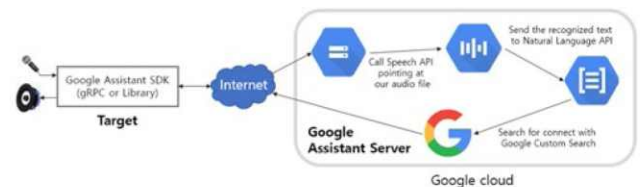
Part II Sensor Programming

- Circuit basics (charge, voltage, current, resistance, capacitors, inductors, diodes, transistors, computer amplifiers, comparators, integrated circuits, electrical supply devices)
- Hardware Interface (Signal Type, GPIO, PWM, ADC, I 2 C, SPI, UART)
- WiringPi and Pop Library
- GPIO output device control (Led, Buzzer, DC Motor)
- GPIO input device control (Switch, Pir, Ultrasonic)
- ADC Input device control (Potentiometer, Sound, Cds, Thermistor)
- Reading multiple analog sensor values



Part III IoT Application Technology

- Saving sensor value as text file and drawing chart with Excel
- Collecting sensor values and running multiple SQL statements
- WAV file playback and waveform output
- Using the microphone as an ambient noise level sensor
- Google text-to-speech converter
- Using Google Assistant API
- Creating stop motion with GAssistant-based user device action cameras and switch modules
- Recording whenever a human movement is detected by camera and Pir module
- Creating a vehicle video recording device with camera and shock module
- Gesture detection system
- OpenCV and Matplotlib Visualization
- Video capture with OpenCV and PiCamera



Part IV AI Application Technology

- Numpy for fast multidimensional matrix operations
- Pandas for time series and tabular data analysis
- Matplotlib for data visualization
- Understanding supervised and unsupervised learning
- Theory & practical exercise for Pop.AI-based linear regression algorithm
- Theory & practical exercise for Pop.AI-based logistic regression algorithm
- Theory & practical exercise for Pop.AI-based perceptron
- Theory & practical exercise for Pop.AI-based ANN
- Theory & practical exercise for Pop.AI-based DNN
- Theory & practical exercise for Pop.AI-based CNN
- Theory & practical exercise for Pop.AI & OpenAI DQN-based reinforcement learning
- Theory & practical exercise for Pop.AI-based On-device AI
- Understanding Tensorflow
- High level AI library design

Training Contents

Introduction to AIoT Server Plus

- Configuration and Lab Environment of AIoT Server Plus
- Python & Linux 101

IoT Application Technology

- Saving sensor value as text file and drawing chart with Excel
- Collecting sensor values and running multiple SQL statements
- WAV file playback and waveform output
- Using the microphone as an ambient noise level sensor
- Google text-to-speech converter
- GAssistant-based user device action
- Application of camera & sensors

Sensor Programming

- GPIO output device control
- GPIO input device control
- ADC input device control

AI Technology

- Numpy for fast multidimensional matrix operations
- Pandas for time series and tabular data analysis
- Matplotlib for data visualization
- Supervised and unsupervised learning
- Theory & practical exercise for Pop.AI-based linear regression & logistic regression algorithm
- Theory & practical exercise for Pop.AI-based perceptron
- Theory & practical exercise for Pop.AI-based ANN, DNN and CNN
- Theory & practical exercise for Pop.AI & OpenAI DQN-based reinforcement learning
- Understanding Tensorflow

Product Composition



AIoT Server Plus



5V 4A Power Adapter
1EA



Micro SD Adapter
1EA



USB to Ethernet
Adapter
1EA



Ethernet Cable
1EA



Earphone Mic
1EA



User Guide book
1EA