

IoT Hardware Guide – 1 Page Notes

◆ What is IoT Hardware?

IoT hardware includes all physical components (devices, sensors, processors, and connectivity modules) that enable data collection, communication, and processing in an IoT system.

◆ Key Hardware Components

1. Microcontrollers (MCUs)

- Act as the brain of IoT devices.
- Control sensors, communication, and data processing.
- Examples:
 - Arduino Uno / Nano
 - ESP8266 / ESP32
 - STM32, ATmega328

2. Microprocessors (MPUs)

- Used in more powerful IoT systems (e.g., gateways, edge devices).
- Run complex OS like Linux.
- Examples: Raspberry Pi, BeagleBone, NVIDIA Jetson

3. Sensors

- Collect data from the environment (input).
- Types:
 - Temperature – DHT11, LM35
 - Motion – PIR Sensor
 - Light – LDR
 - Gas – MQ2, MQ135
 - Humidity, Pressure, Proximity sensors

4. Actuators

- Perform physical actions (output).

- Examples: Motors, Relays, LEDs, Buzzers, Servo motors

5. Connectivity Modules

- Enable data transfer between devices and cloud.
- Common Interfaces:
 - Wi-Fi → ESP8266, ESP32
 - Bluetooth → HC-05, BLE modules
 - GSM/4G → SIM800L, SIM900
 - Zigbee, LoRa, NRF24L01 for long-range/low-power IoT

6. Power Sources

- Supply power to IoT devices.
- Types: Battery (Li-ion, Li-Po), USB power, Solar panels, Power banks

7. Storage Devices

- Store sensor data and configuration.
- Examples: SD cards, Flash memory, EEPROM

8. Interface Components

- Help connect sensors and modules.
- Examples: Breadboards, jumper wires, resistors, voltage regulators, ADC/DAC converters

◆ IoT Hardware Categories

Type	Description	Example
Prototyping Boards	Used for experimentation and small projects	Arduino, NodeMCU
Development Boards	Full-featured boards for smart products	Raspberry Pi, Jetson Nano
Sensors/Actuators	Sense environment and perform actions	DHT11, Servo Motor
Communication Modules	Enable data transfer	ESP8266, GSM module

- ◆ **Hardware Selection Tips**

- ✓ Choose low-power devices for battery-operated IoT.
 - ✓ Ensure compatibility with your communication protocol.
 - ✓ Prefer modular hardware for scalability.
 - ✓ Consider environmental factors (temperature, humidity, etc.).
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Example IoT Hardware Setup

Smart Garden System:

-  DHT11 (Temp & Humidity Sensor) →
-  ESP32 (Microcontroller) →
-  Wi-Fi Module →
-  Relay + Water Pump →
-  Cloud Dashboard