



VIRTUAL COURSE
**BUILD YOUR OWN
DATA LOGGER**



WILDLABS.NET

[The conservation technology network]

FREAKLABS

A photograph of an electronic module, possibly a power supply or control unit, with a black cylindrical component and various wires. The image is overlaid with text.

MODULE 1-2A

**UNDERSTAND THE FULL
DESIGN STACK - HARDWARE**

Device Design Stack



Device
(data logger)



Data into database

Data to SD card
internet via wireless,
cellular

Application

Libraries & Drivers

Physical Hardware



Device Design Stack



Device
(data logger)



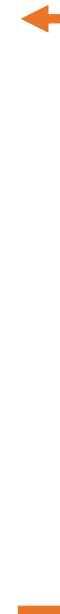
Data into database

Data to SD card
internet via wireless,
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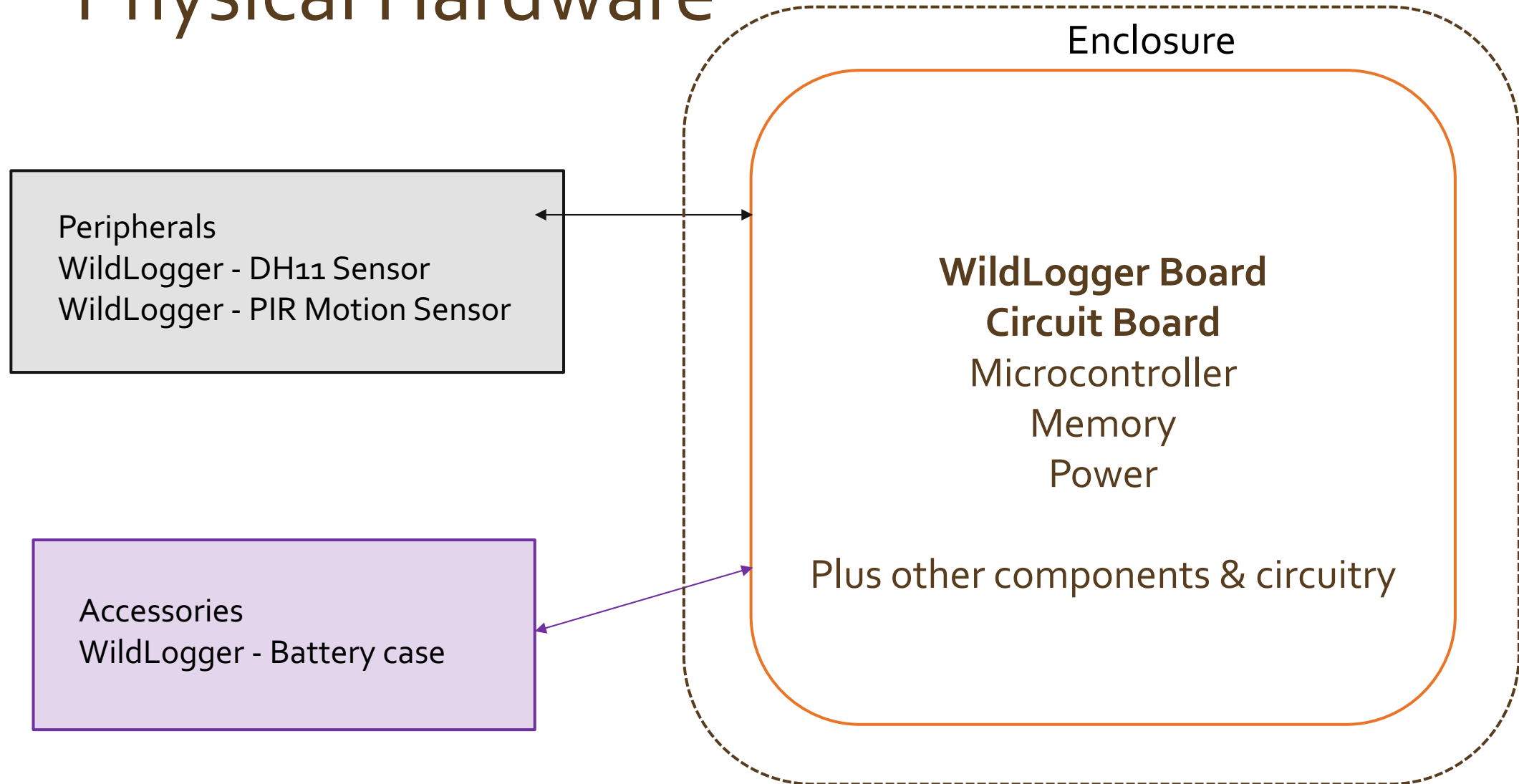
Application

Libraries & Drivers

Physical Hardware



Physical Hardware

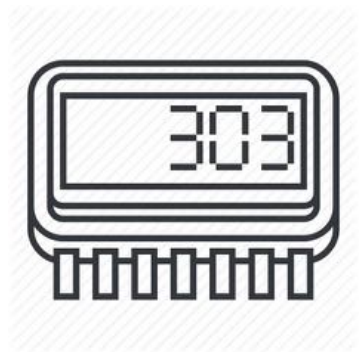
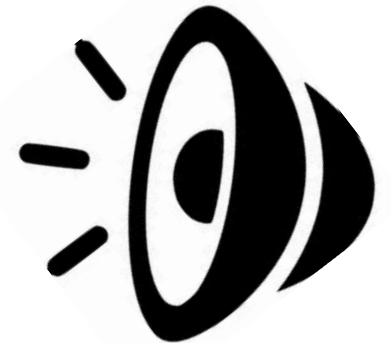


Peripherals

- Interface with the real world

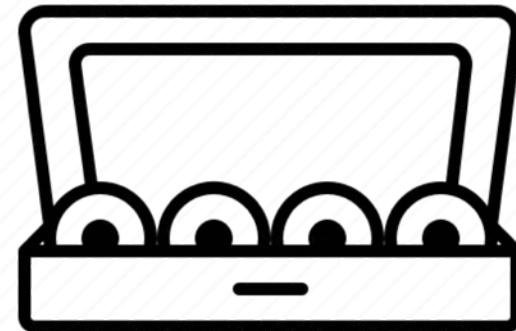
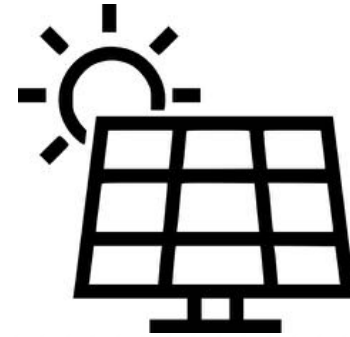
Send information (data) as

- an input (sends data to circuit board) eg. sensors, microphone
 - an output (receives data from circuit board) eg. speakers
 - both eg. LCD
-
- Data is sent or received in analogue or digital format



Accessories

- connect to the circuit board
- passive, no 'active parts
- battery cases, antennas, solar panels

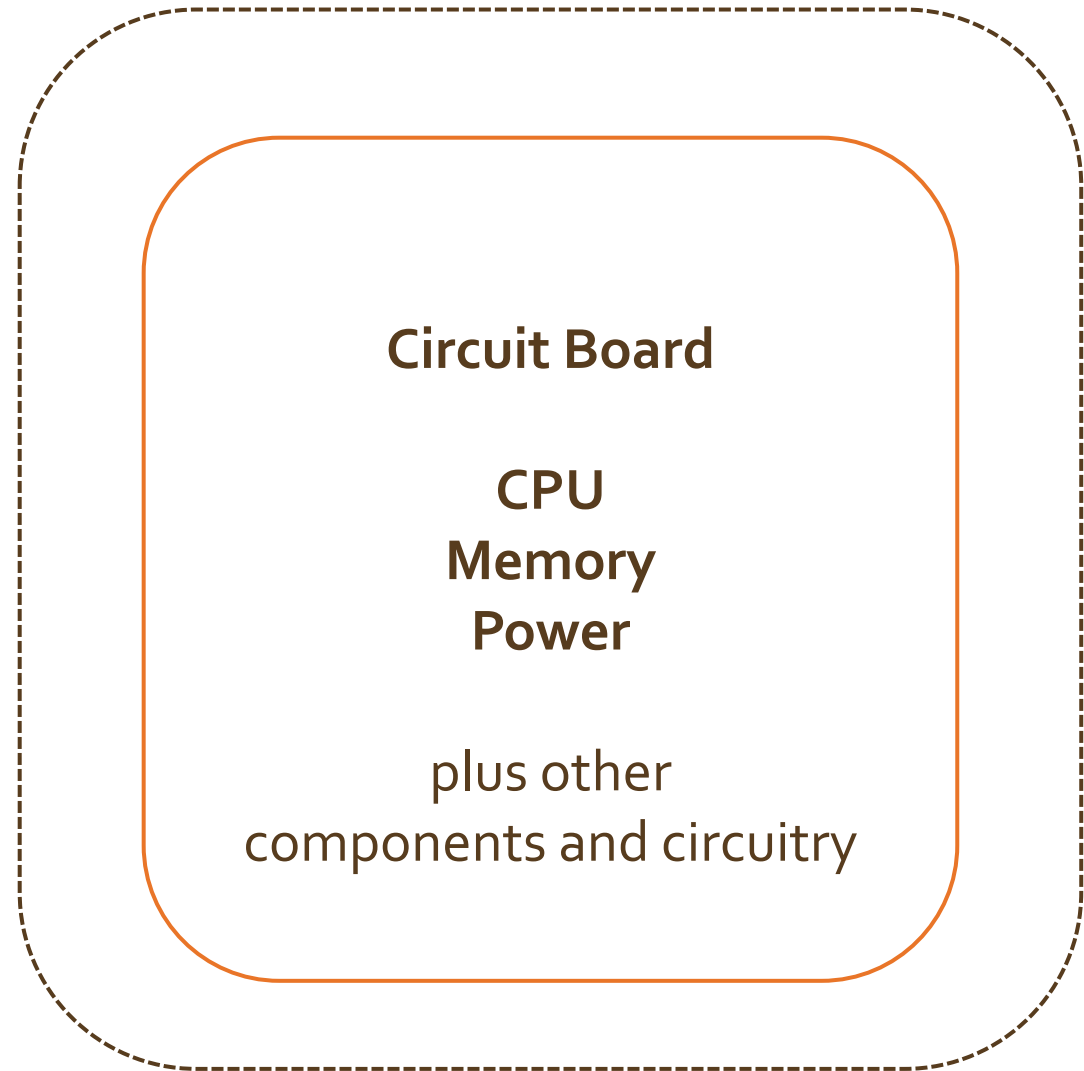


Circuit Board

Controls the device

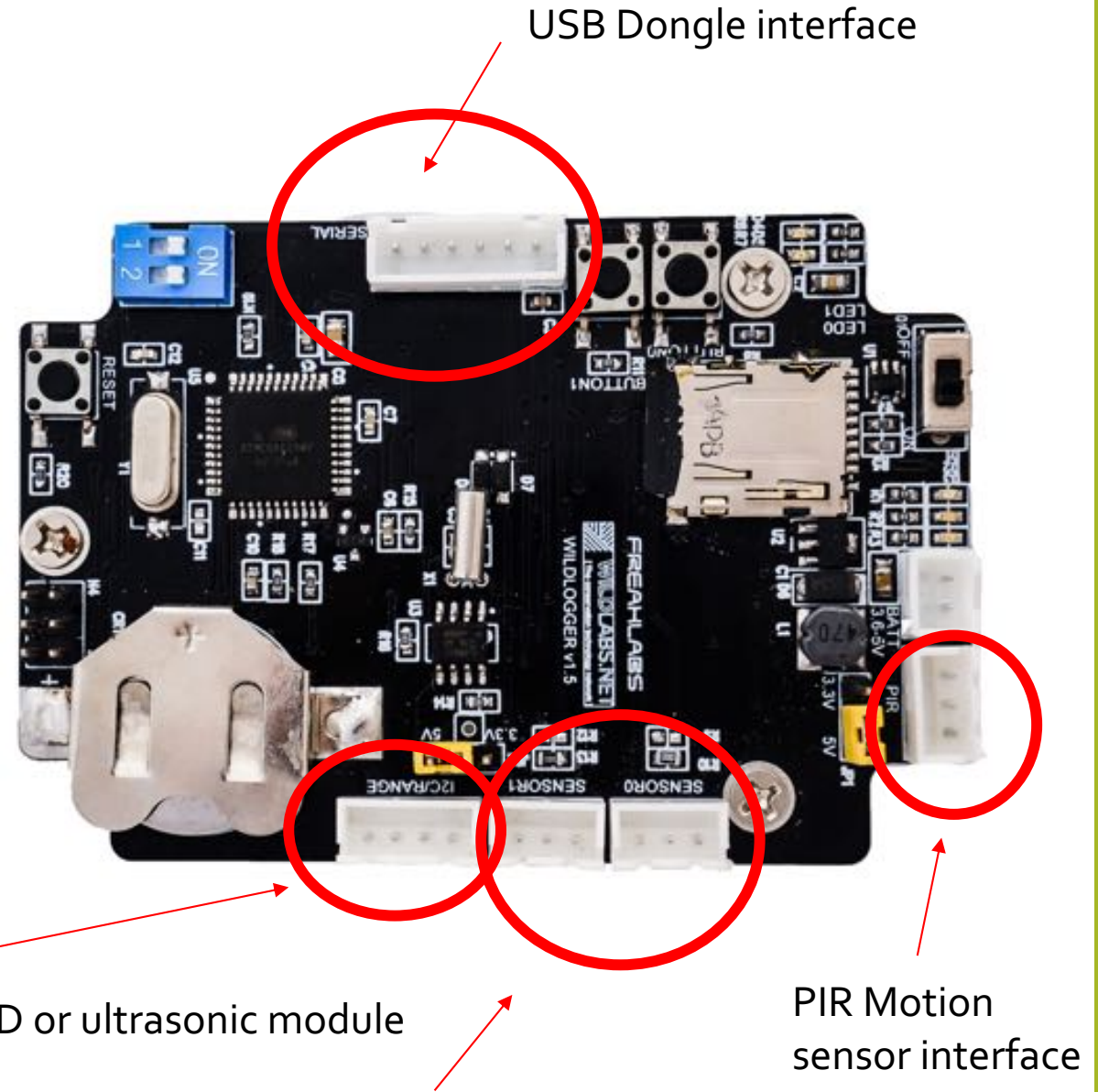
1) How peripherals connect and interact with the circuit board, (ports and interfaces, input / output pins)

2) Circuit Board
Central Processing Unit (CPU)
MCU versus MPU
Memory
Power



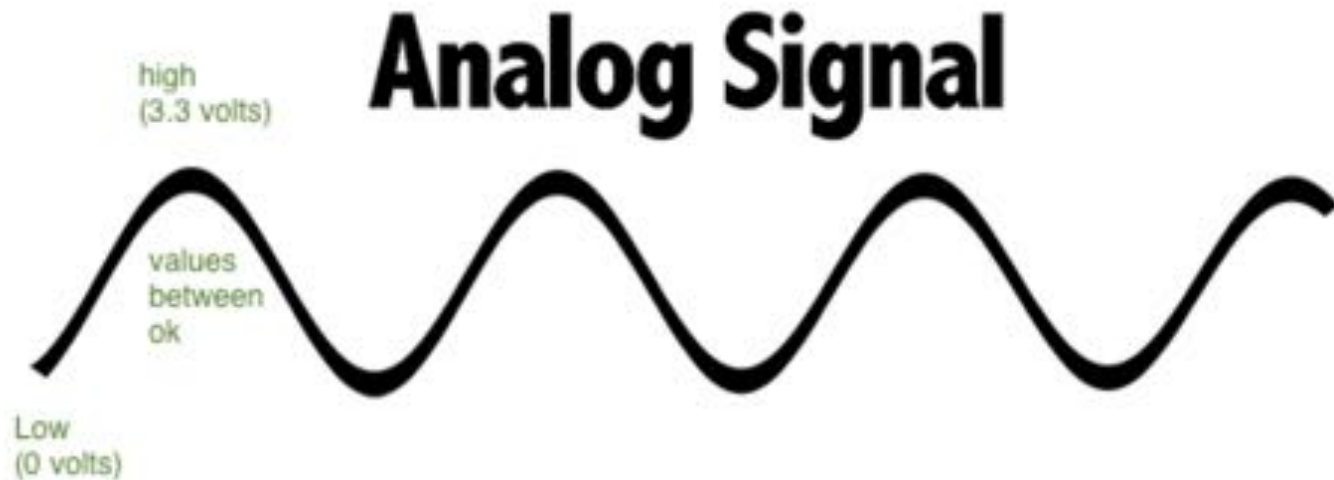
Ports / Interfaces

- physically connects peripheral, accessory or other hardware to circuit board
- used interchangeably eg. serial interface, serial port
- USB Dongle connects to serial interface and downloads code
- I2C is a common interface used to connect LCD and other sensors



Sensor interfaces eg. for temp/ humidity , infrared proximity, photoresistor for light sensing, microphone module

Input /Output (I/O) Pins



Input /Output (I/O) Pins

- In our code, we use pin number to access and control the hardware

Example Code

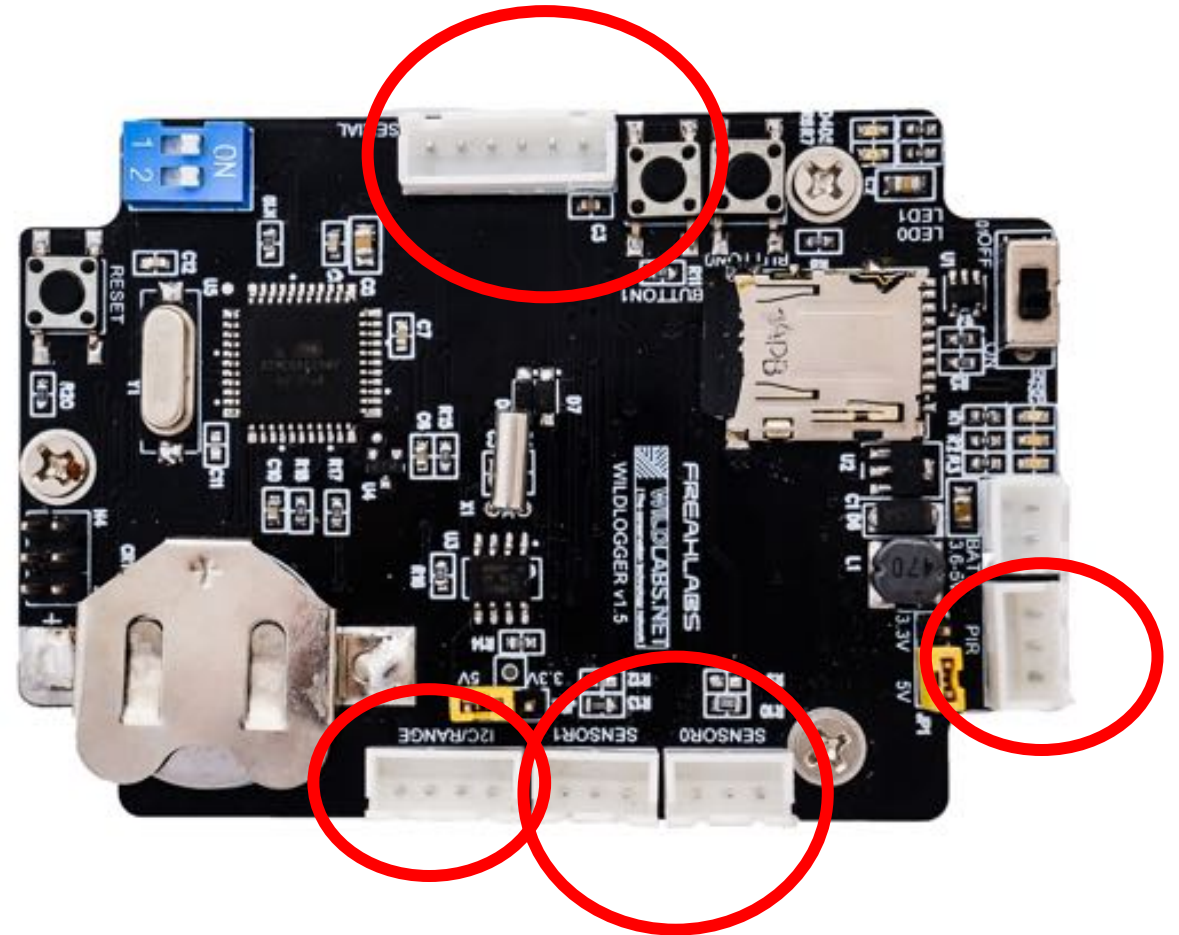
The code makes the digital pin 13 **OUTPUT** and Toggles it **HIGH** and **LOW**

```
void setup() {  
  pinMode(13, OUTPUT);    // sets the digital pin 13 as output  
}  
  
void loop() {  
  digitalWrite(13, HIGH); // sets the digital pin 13 on  
  delay(1000);           // waits for a second  
  digitalWrite(13, LOW);  // sets the digital pin 13 off  
  delay(1000);           // waits for a second  
}
```


Input /Output (I/O) Pins

On WildLogger

- using digital sensors and pins
- allocated the pin number for you



Circuit Board

Microcontroller

- central processing unit (CPU)
- memory
- power

PLUS other components and circuitry

- power distribution, voltage management
- controls peripherals
- storage
- communications
- realtime clock / calendar

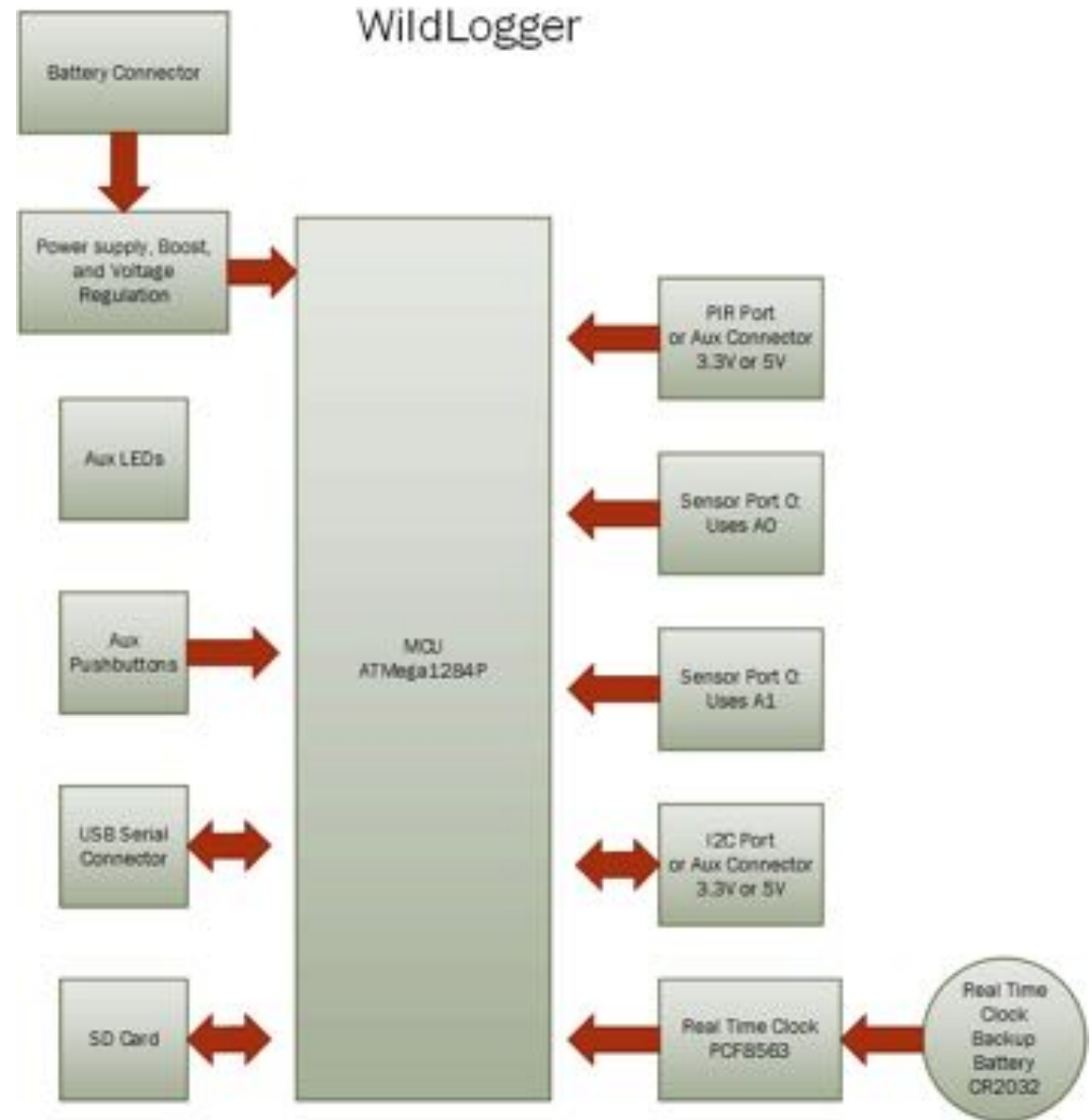
Microcontroller

- CPU**
- Memory**
- Power**

plus other
components and circuitry that's
application dependent

Block Diagram

- diagram of the system showing the key parts and functions, and how they're connected to each other



Microcontroller versus Microprocessor

MCU = Microcontroller

CPU

Memory

Peripherals

VS

MPU = Microprocessor

CPU

- Simpler applications / devices such as data logging
- Has defined, specific i/o interactions
- Executes code quickly, quick start up time
- Lower cost
- **Lower power consumption**

- For computers such as laptops and desktops
- Multiple, complex applications
- Less structured i/o interactions
- External memory, power
- Higher cost
- **higher power consumption**

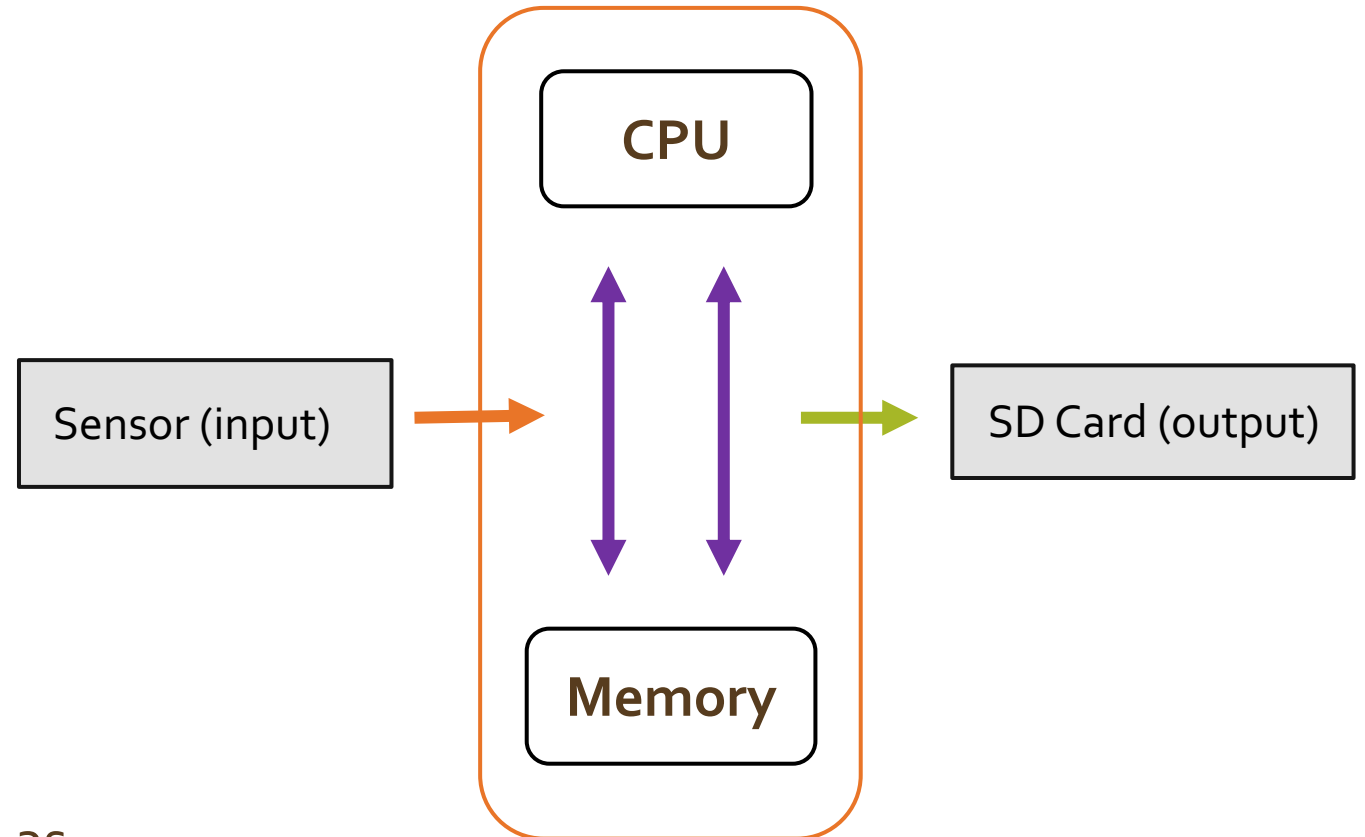
Central Processing Unit (CPU)

Central Processing Unit (CPU)

- brains of the system
- within the microcontroller

Function

- takes input (eg. data from sensor)
- stores input in memory
- requests instructions from memory on how to process the data
- processes the data & saves results in memory
- when finished processing, sends data as output as per instructions





COMING UP - 1-2B

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DESIGN STACK - HARDWARE**

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CONSERVATION
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