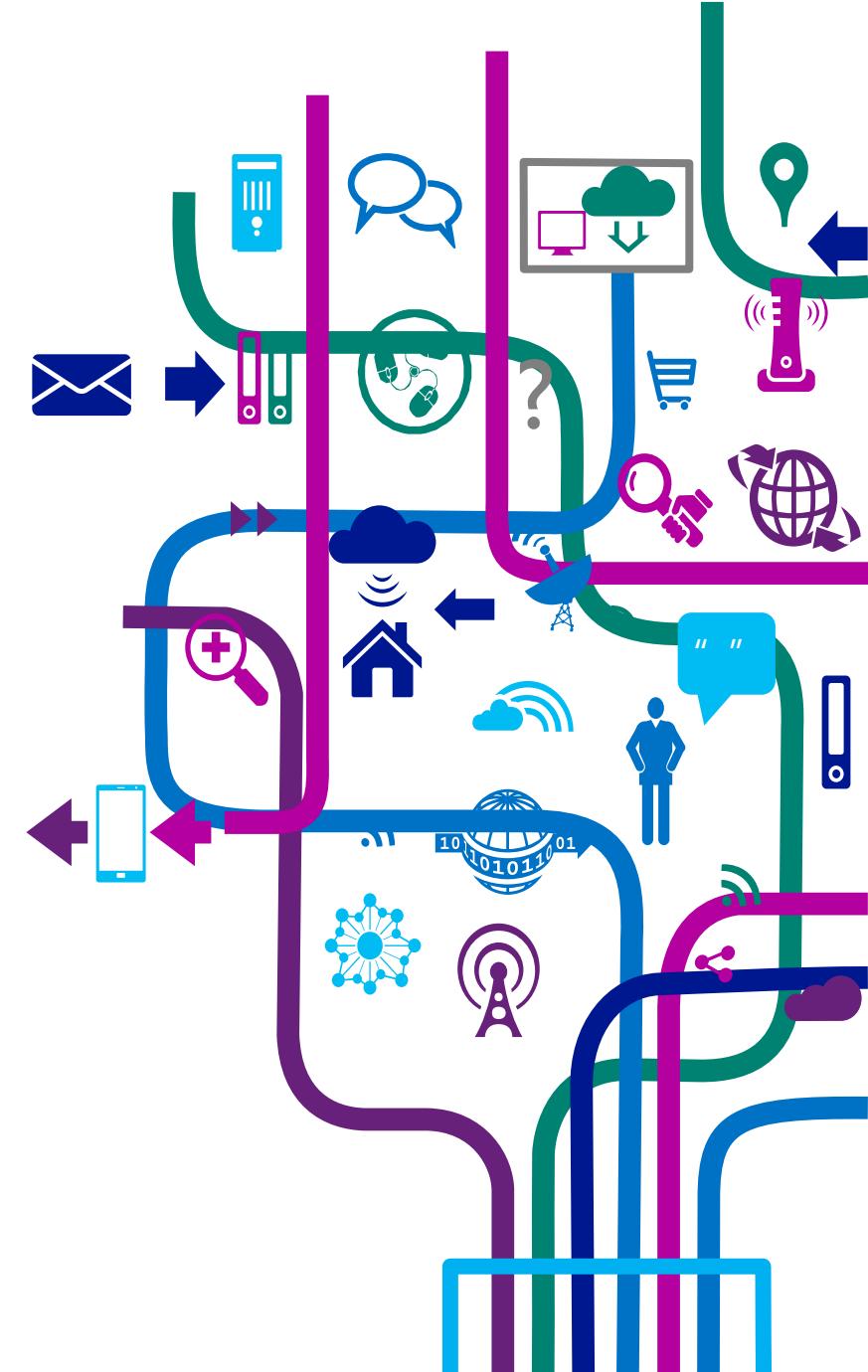


Microsoft IoT Camp

# Windows 10 IoT Core 실습

김영욱 Technical Evangelist  
부장/ DX / Microsoft

[youngwook@outlook.com](mailto:youngwook@outlook.com)  
Blog: [Youngwook.com](http://Youngwook.com)



Phone



Phablet



Small Tablet



Large Tablet



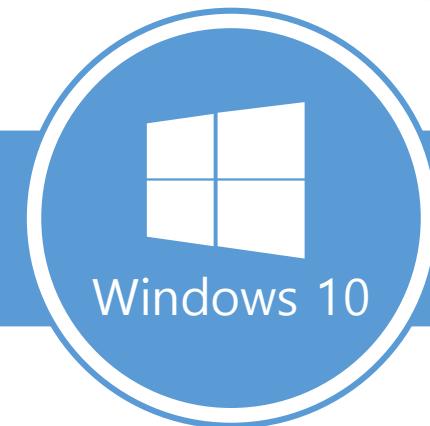
2-in-1s  
(Tablet or Laptop)



Classic  
Laptop



Desktops  
& All-in-Ones



Surface Hub



Xbox



Holographic



IoT

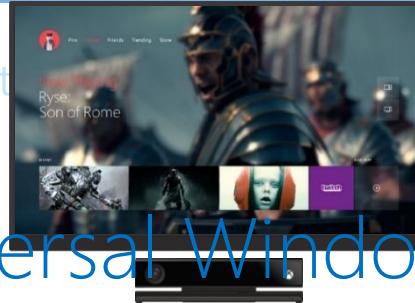




Adaptive  
User Interface



Natural  
User Input



Open

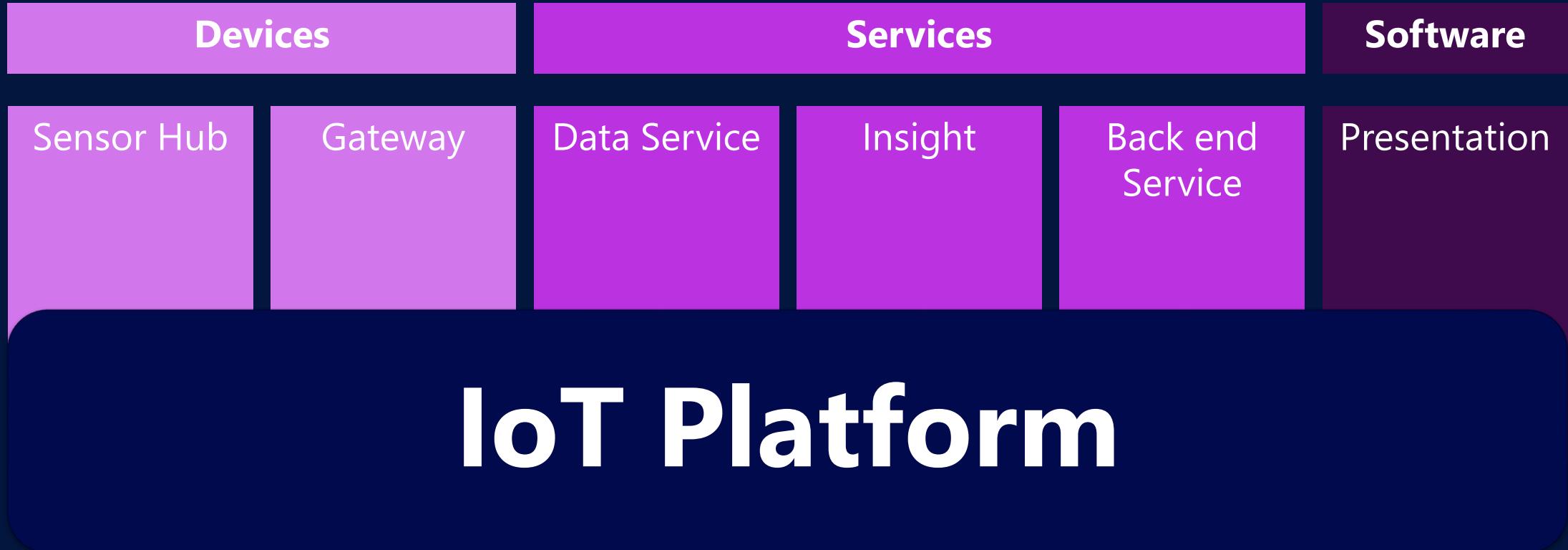


Reuse Existing  
Code

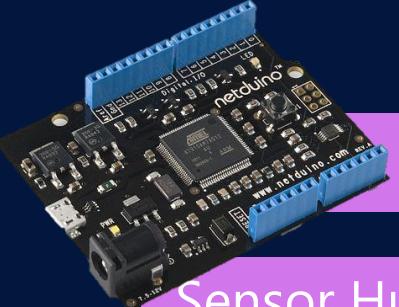


One Universal Windows Platform

# IoT Platform Layer



# Devices



## Devices

Sensor Hub

Arduino  
Netduino  
Galileo  
Raspberry Pi

....

Gateway

IoT Gateway  
Raspberry Pi  
Galileo  
....

## Services

Data Service

Insight

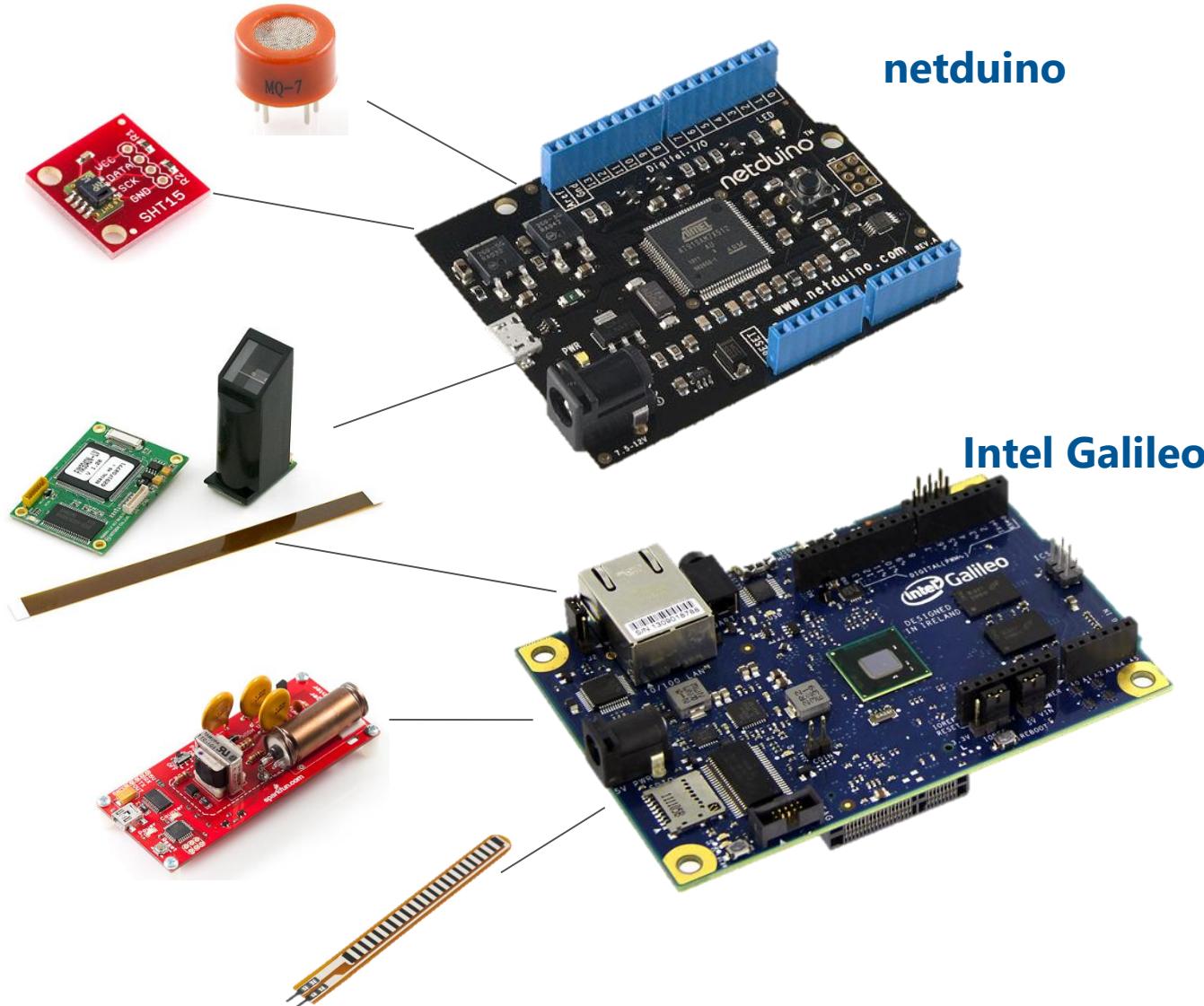
Back end  
Service

## Software

Presentation

IoT Platform

# Devices Sensor Hub



netduino

Visual Studio  
(C++, C#)

A screenshot of Microsoft Visual Studio 2010 Express showing the code for an RFID reader application. The code uses the SecretLabs.NETMF.Hardware library to control an output port on the Intel Galileo board, turning an onboard LED on and off at 250ms intervals.

```
using System;
using System.Threading;
using Microsoft.SPOT;
using Microsoft.SPOT.Hardware;
using SecretLabs.NETMF.Hardware;
using SecretLabs.NETMF.Hardware.Netduino;
using System.IO.Ports;

namespace RFIDReader
{
    public class Program
    {
        public static void Main()
        {
            // write your code here
            OutputPort led = new OutputPort(Pins.ONBOARD_LED, false);
            while (true)
            {
                led.Write(true); // turn on the LED
                Thread.Sleep(250); // sleep for 250ms
                led.Write(false); // turn off the LED
                Thread.Sleep(250); // sleep for 250ms
            }
        }
    }
}
```

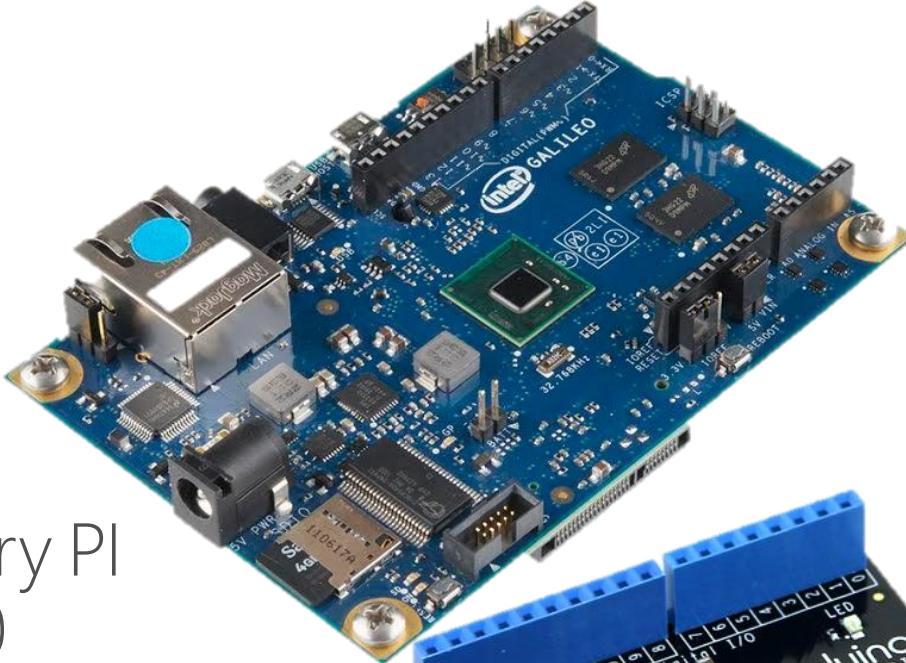
IoT Devices

Arduino, Raspberry Pi,  
Galileo, Netduino....





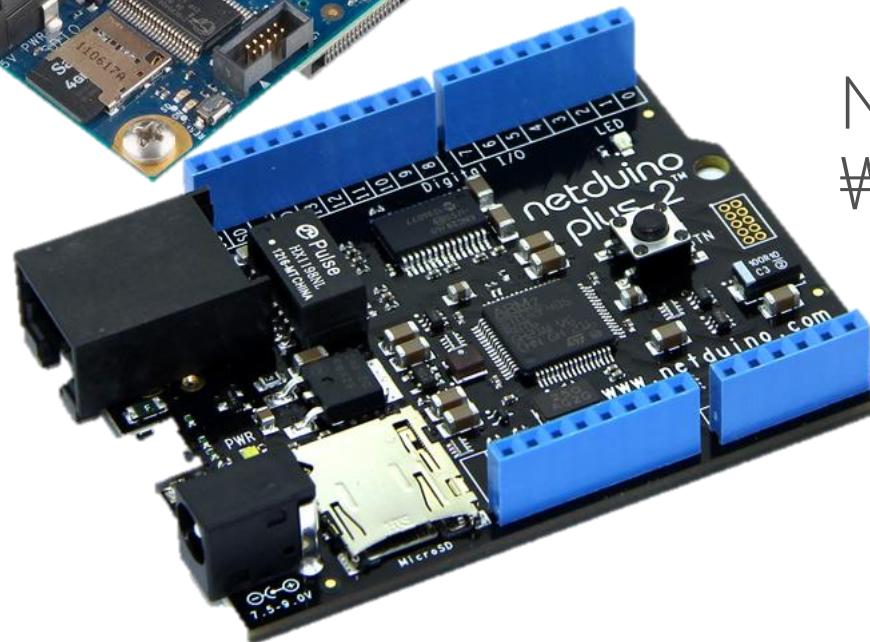
Arduino  
₩12,000  
C



Galileo GEN 2  
₩121,000  
Visual C++, C



Raspberry PI  
₩46,000  
Python, C

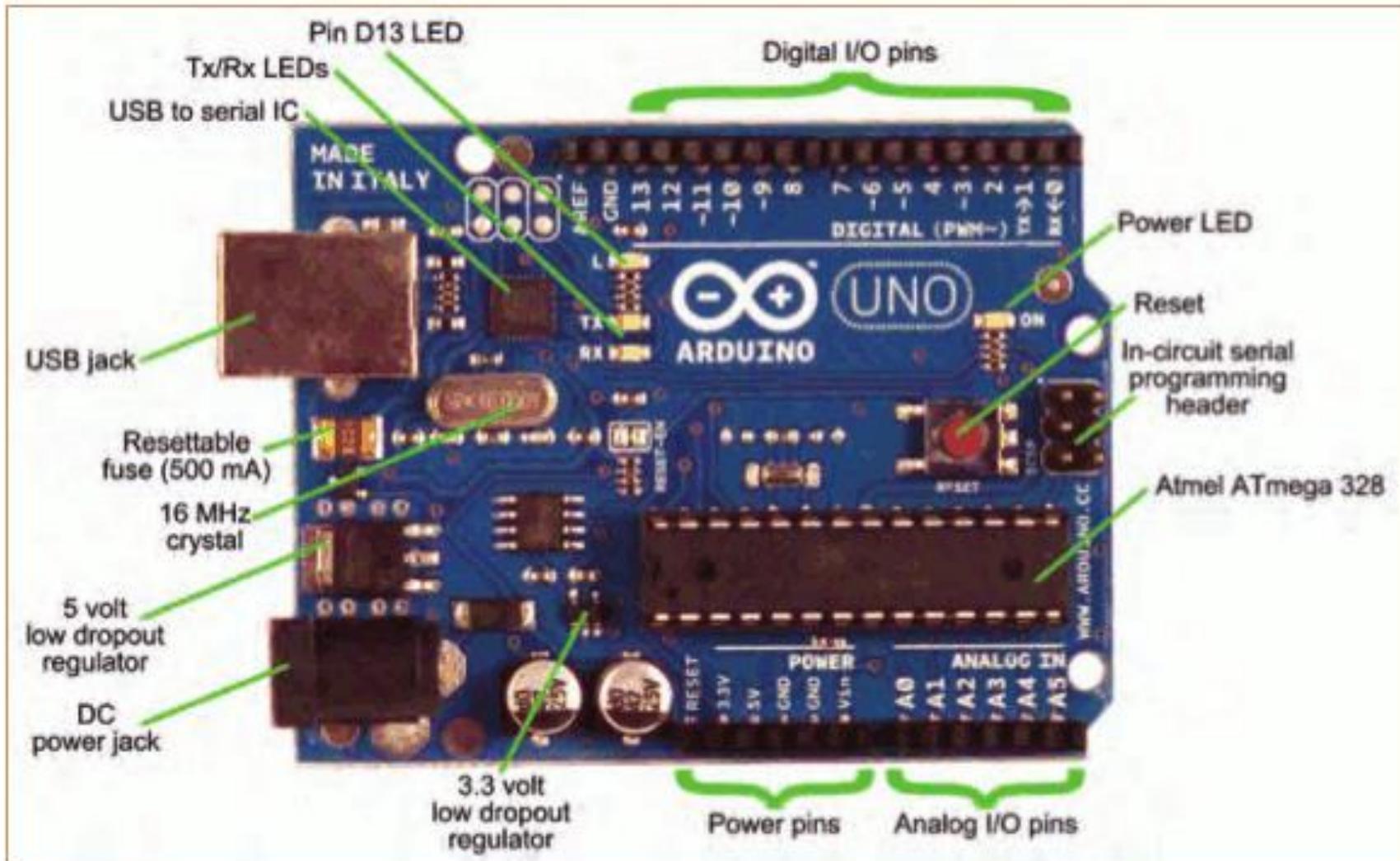


Netduino  
₩80,000  
C#

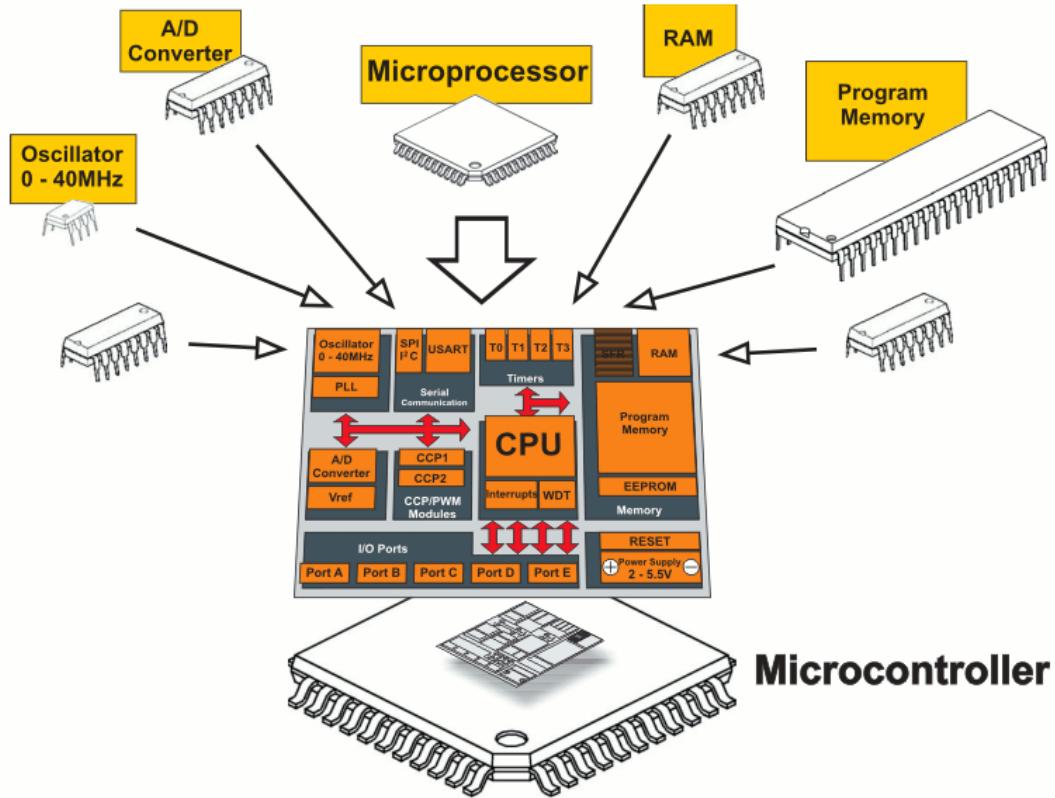
# 1. Arduino



# Arduino UNO R3

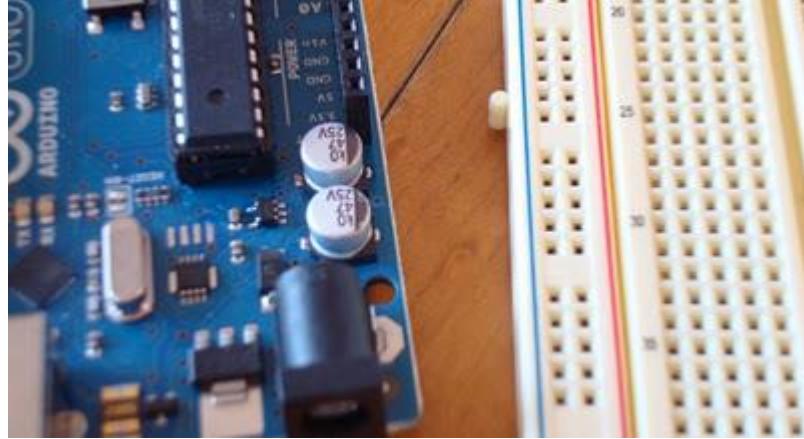


# Microcontroller



- 하나의 칩으로 구성된 작은 컴퓨터
  - processor, memory, input/output
- 주로 Embedded 영역에서도 최저 성능/비용
- Arduino, Raspberry Pi.....

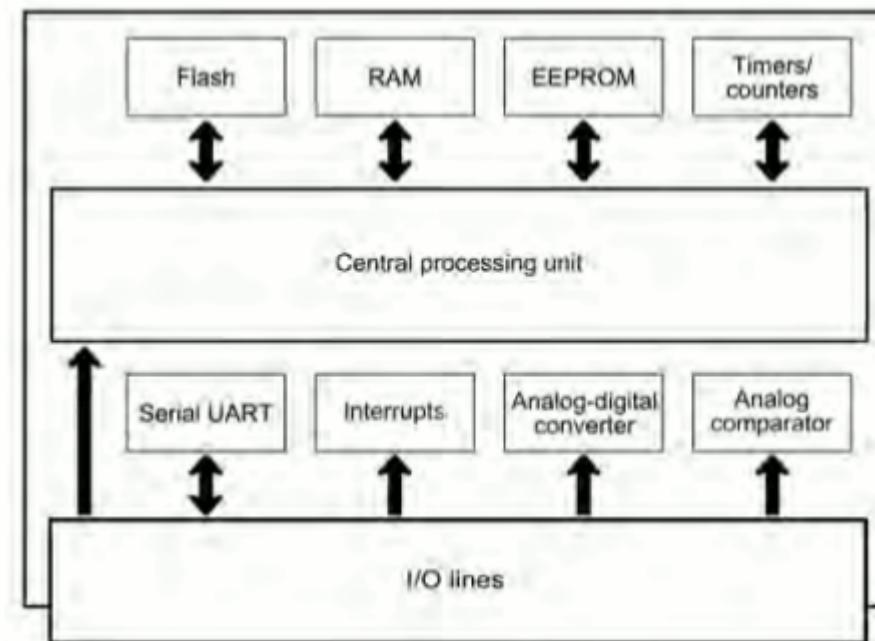
# Open Hardware



- Typical components include:
  - power circuit
  - programming interface
  - basic input; usually buttons and LEDs
  - I/O pins

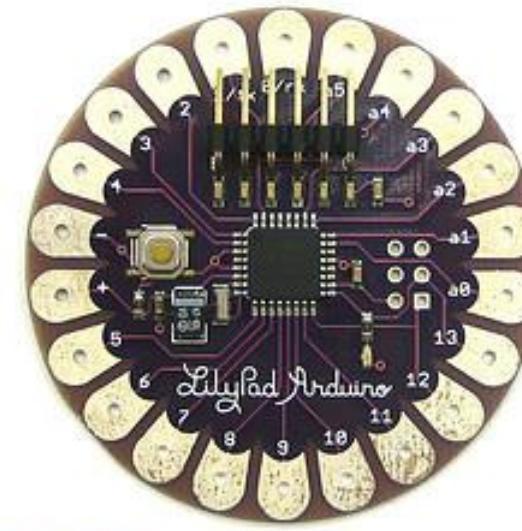
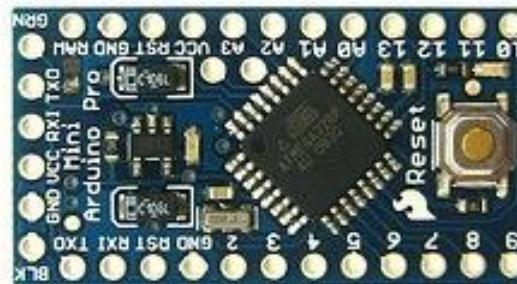
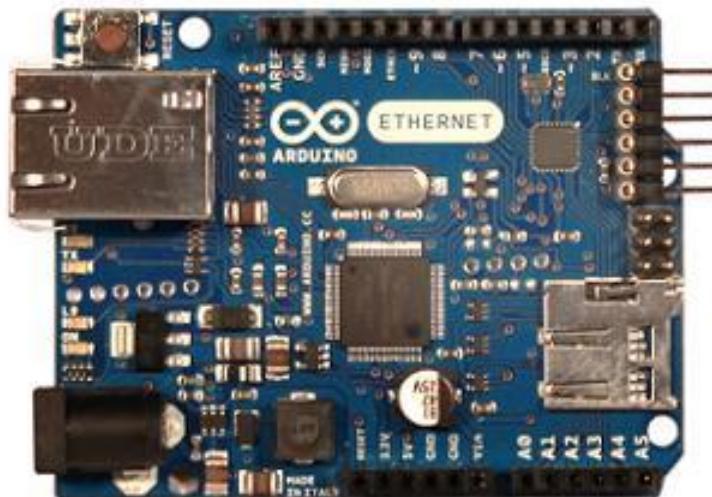
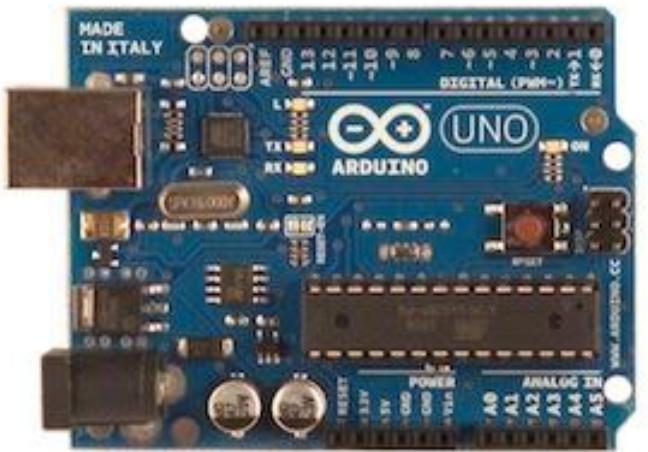
# Atmega 328 microprocessor

Atmel AVR ATmega 328		
(PCINT14/RESET) Reset	1 PC6	PC5 28 (PCINT13/ADC5/SCL) Analog input A5
(PCINT16/RXD) Digital pin D0 (Rx)	2 PDD	PC4 27 (PCINT12/ADC4/SDA) Analog input A4
(PCINT17/TXD) Digital pin D1 (Tx)	3 PD1	PC3 26 (PCINT11/ADC3) Analog input A3
(PCINT18/INT0) Digital pin D2	4 PD2	PC2 25 (PCINT10/ADC2) Analog input A2
(PCINT19/OC2B/INT1) Digital pin D3*	5 PD4	PC1 24 (PCINT9/ADC1) Analog input A1
(PCINT20/XCK/T0) Digital pin D4	6 PD4	PC0 23 (PCINT8/ADC0) Analog input A0
5V	7 VCC	GND 22 Gnd
Gnd	8 GND	AREF 21 AREF
(PCINT6/XTAL1/TOSC1) (crystal)	9 PB6	AVCC 20 5V
(PCINT7/XTAL2/TOSC2) (crystal)	10 PB7	PB5 19 (PCINT5/SCK) Digital pin D13
(PCINT21/OC0B/T1) Digital pin D5*	11 PD5	PB4 18 (PCINT4/MISO) Digital pin D12
(PCINT22/OC0A/AIN0) Digital pin D6*	12 PD6	PB3 17 (PCINT3/MOSI/OC2A) Digital pin D11*
(PCINT23/AIN1) Digital pin D7	13 PD7	PB2 16 (PCINT2/SS/OC1B) Digital pin D10*
(PCINT10/CLKO/ICP1) Digital pin D8	14 PB0	PB1 15 (PCINT1/OC1A) Digital pin D9*
Arduino pin mapping in blue		
* denotes capable of PWM output		



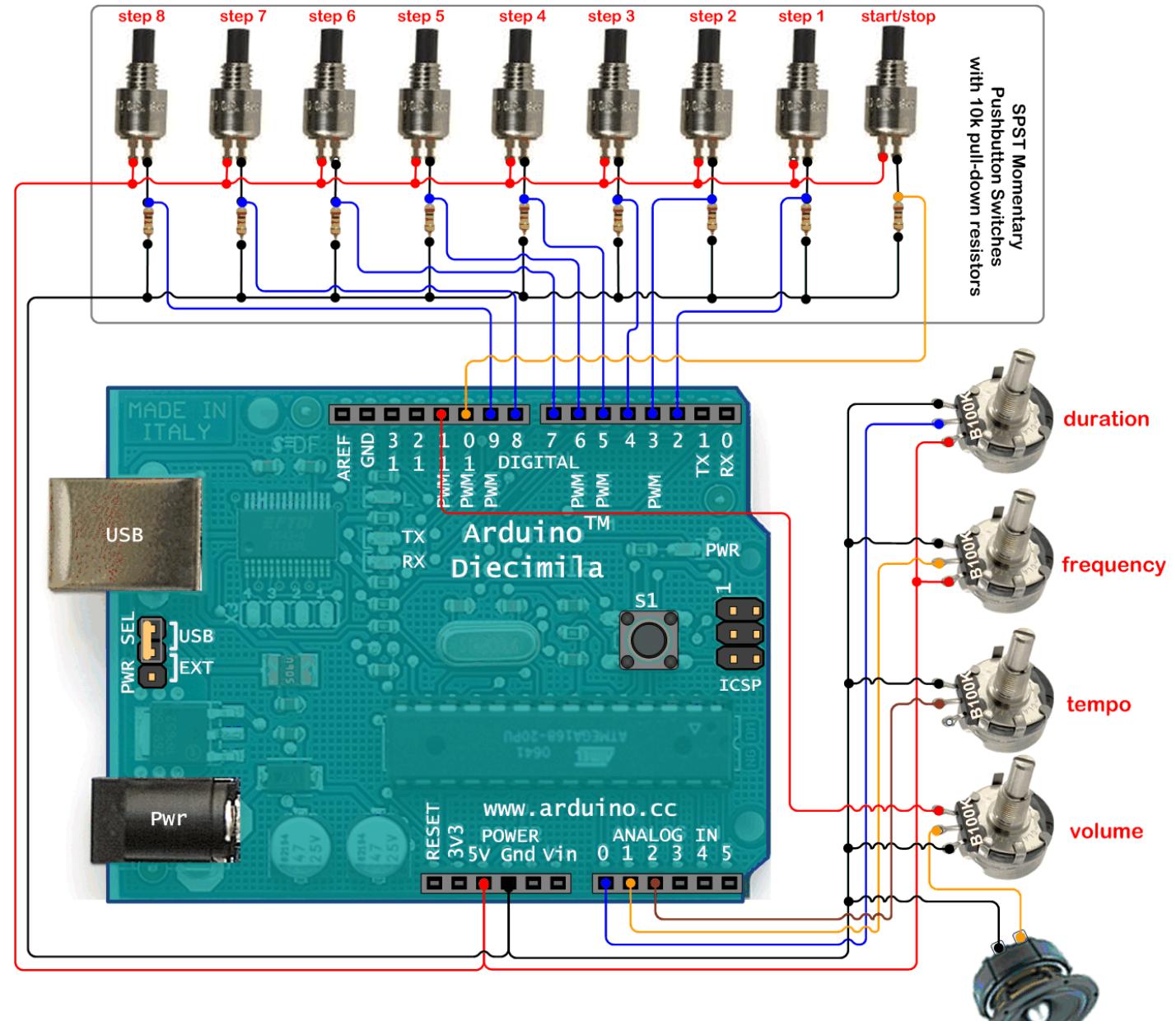
## Specification

# Arduino I/O Boards



14 current boards

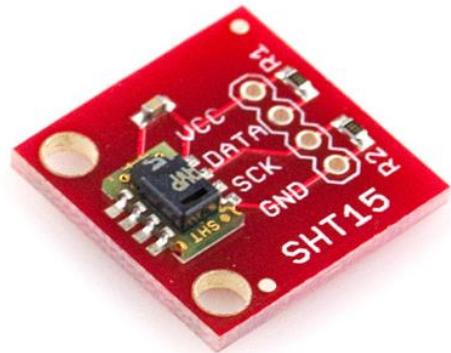
# Arduino + Sensor



# Sensors



Gas Sensor

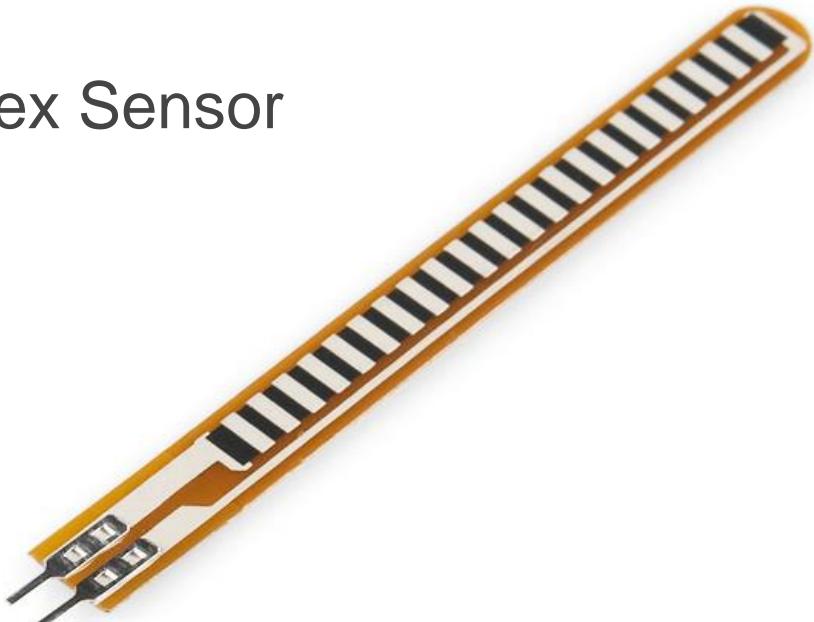


Temp & Humidity



Fingerprint Scanner

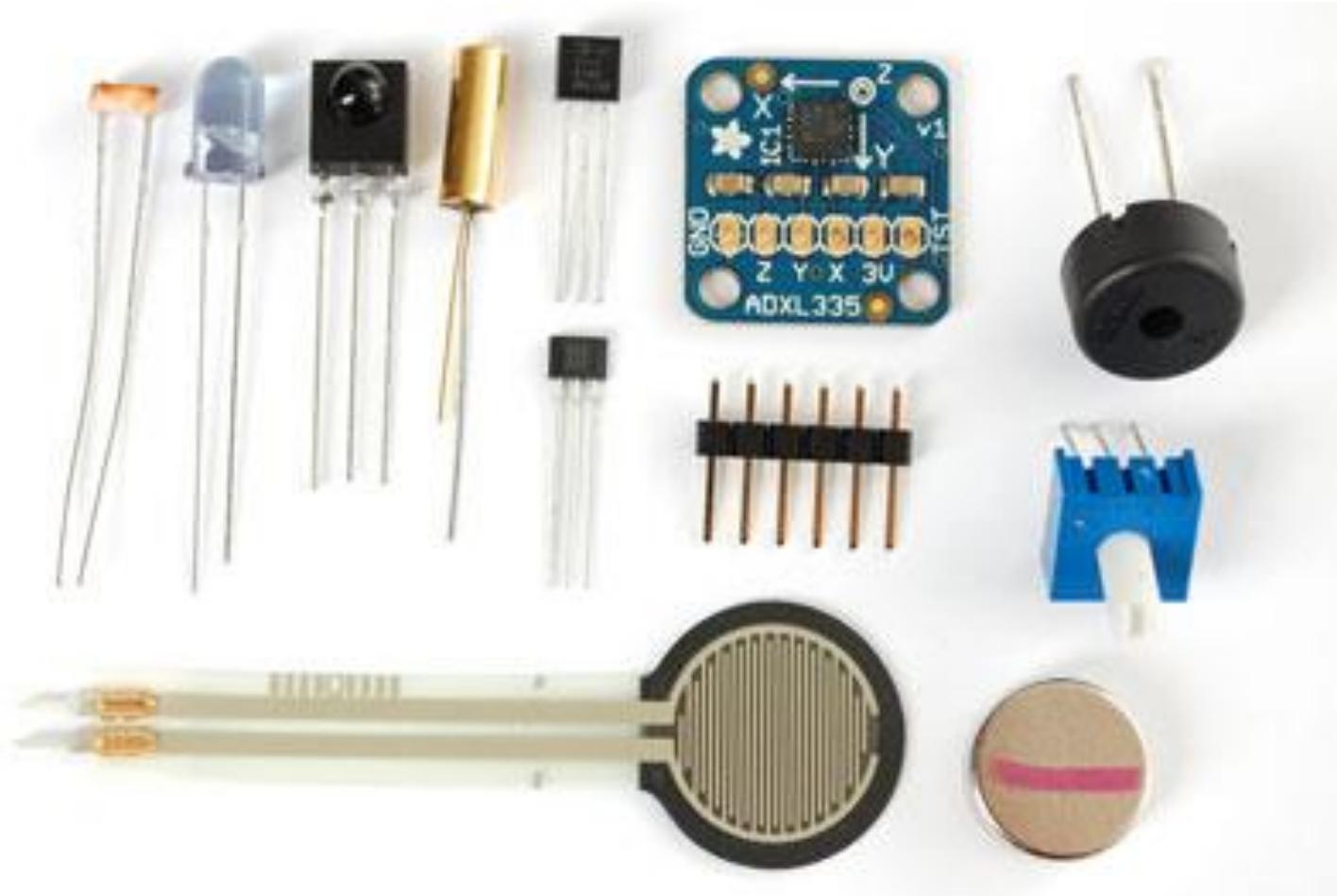
Flex Sensor



Geiger Counter

# Sensors

Photo/thermistor, infrared, force sensitive resistor, Hall effect,  
Piezo, tilt sensor..

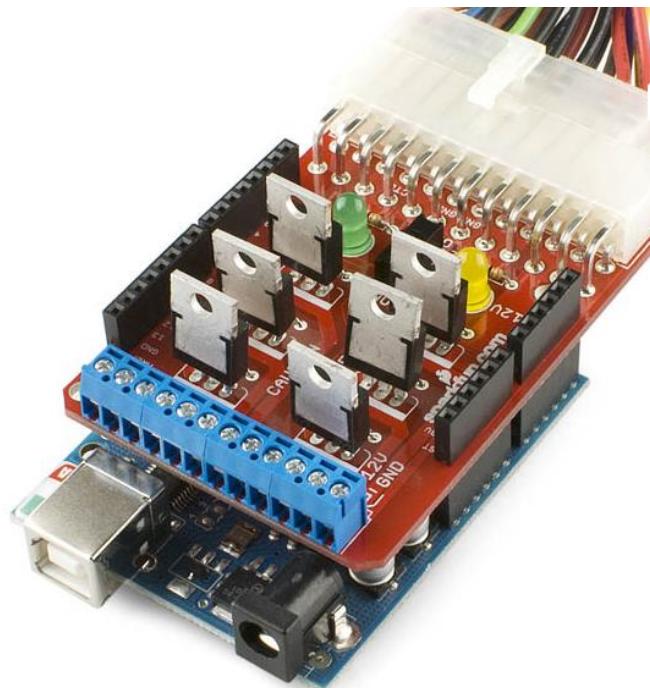
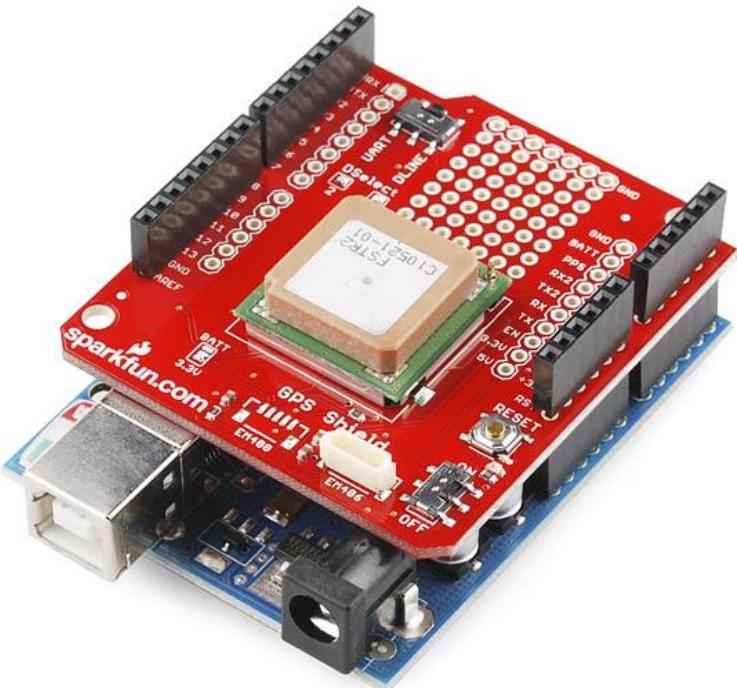


# Arduino 난관

1. 성능
2. 네트워킹



# Shields



# Shields

## Datalogging Shield



Touchscreen Shield

## Wave Shield



# More Shields...



XBee Shield

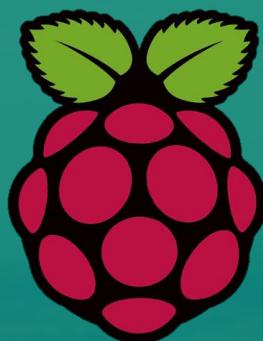


Ethernet Shield

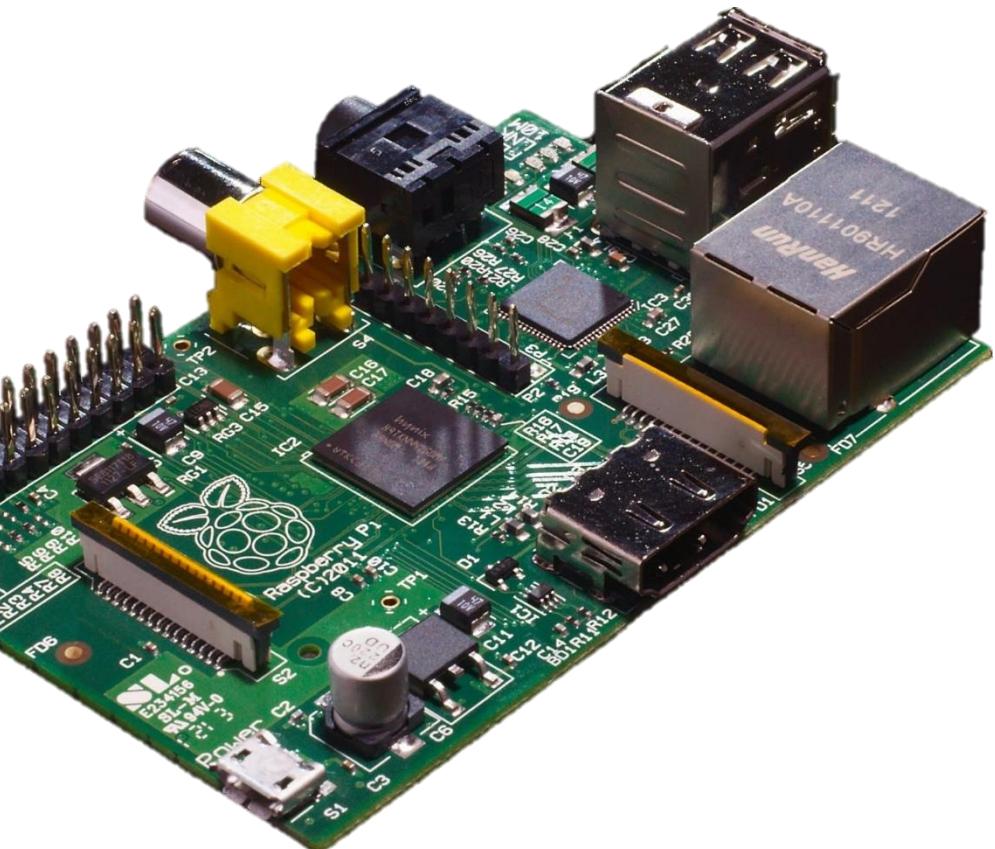


Wifi Shield

## 2. Raspberry PI



# Raspberry Pi



- 2006년 초기 컨셉이 시작됨 (Eben Upton)
- 2012년 2월 29일 판매 시작
- 2012년 4월 16일 최초 구매자가 받기 시작
- 2013년 1월초 1,000,000 대 판매
- 2013년 2월 라즈베리 파이 MODEL A 판매 시작

# Raspberry Pi

MODEL B



Memory 512 MB  
2 USB  
Ethernet

**BCM 2835**

**ARM 11 - 700 Mhz**

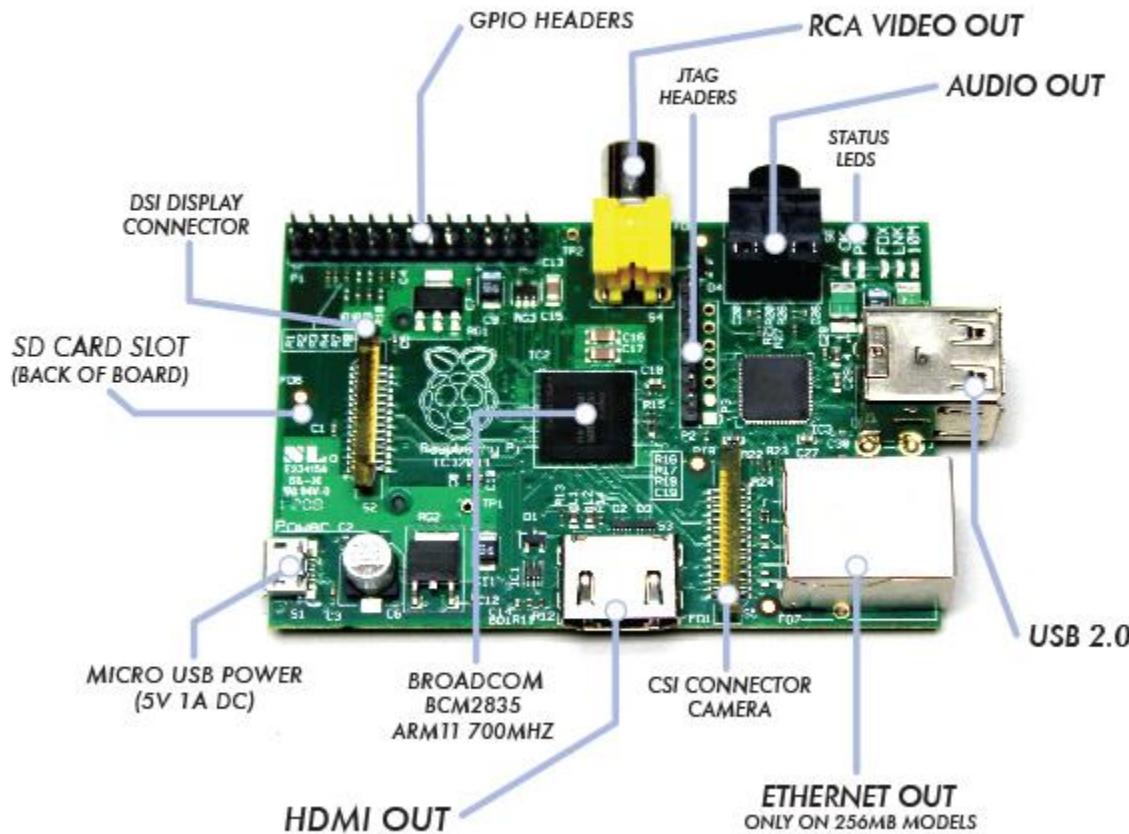
MODEL A



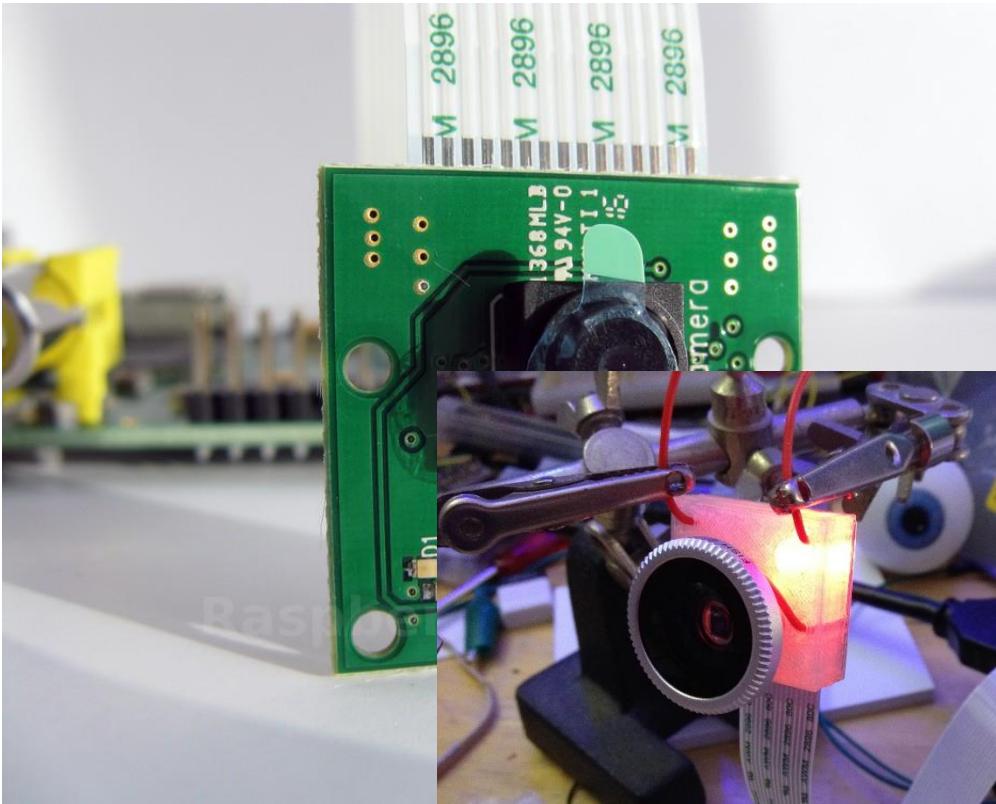
Memory 256 MB  
1 USB  
No Ethernet

- 운영체제 – 리눅스 (RASPBIAN)
- 저렴한 가격 : Model B – USD 35,  
Model A – USD 25
- 저렴하고 쉬운 저장장치
- 라즈베리 파이 재단
- GPIO (General Purpose Input Output)

# Raspberry PI B Type



# PI Camera

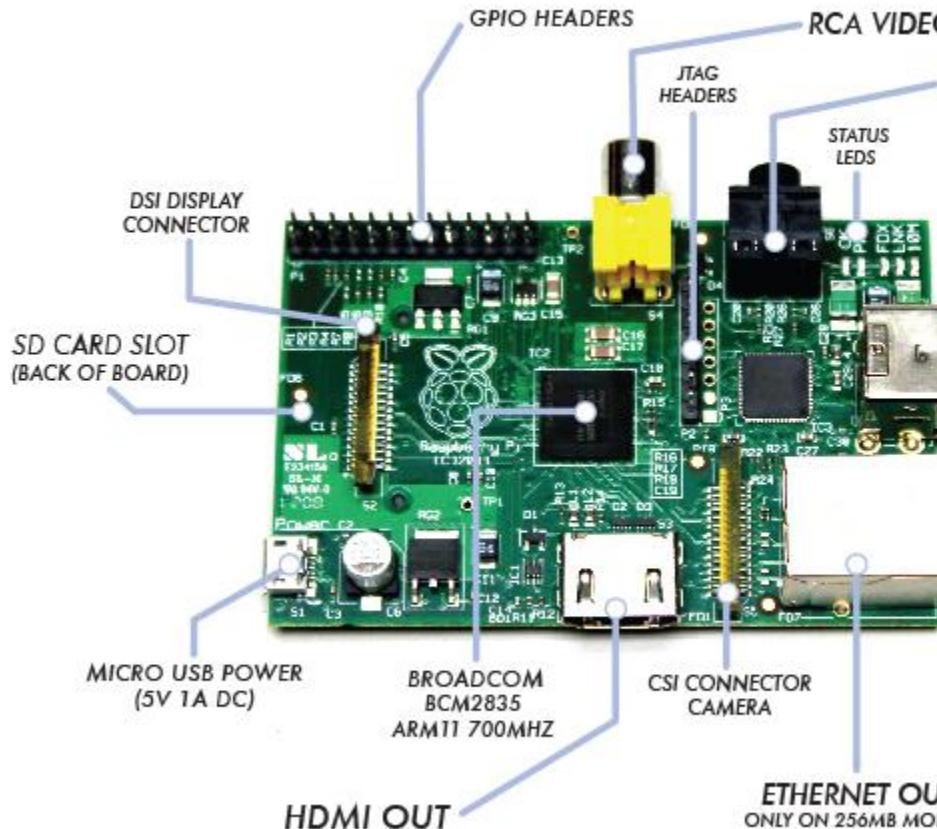


# Raspberry Pi 난관

1. 개발환경
2. 리눅스 학습



# Raspberry PI B Type



1. Linux  
2. Python

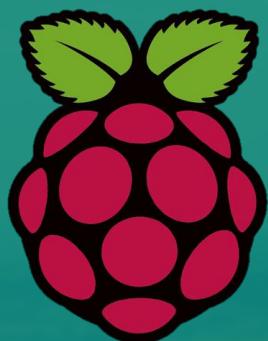
```
iPad WiFi 25.7 - 13:21 - 160MB - 192.168.0.7 - pridopia-u27a
+ 1 2 Ctrl Alt Esc Tab F# Paste
[ 7.486756] smsc95xx 1-1.1:1.0: eth0: register 'smsc95xx' at usb-banana2708_usb-1.1,0
[ 11.662428] EXT4-fs (mmcblk0p2): re-mounted. Opts: (null)
[ 12.101693] ### snd_bcm2835_alsa_probe c05ce768 ####### PROBING FOR bcm2835
[ 12.123580] Creating card...
[ 12.129485] Creating device/chip ..
[ 12.136203] Adding controls ..
[ 12.141805] Registering card ....
[ 12.154147] bcm2835 ALSA CARD CREATED!
[ 12.169784] ### BCM2835 ALSA driver init OK #####
[ 12.909986] Adding 131068k swap on /var/swapfile. Priority:-1 extents:4 across:1S
[ 14.590169] fuse init (API version 7.17)

Debian GNU/Linux 6.0 raspberrypi ttyAMA0
raspberrypi login: pi
Password:
Last login: Thu Jan 1 01:00:23 BST 1970 on ttyAMA0
Linux raspberrypi 3.1.9+ #138 PREEMPT Tue Jun 26 16:27:52 BST 2012 armv6l

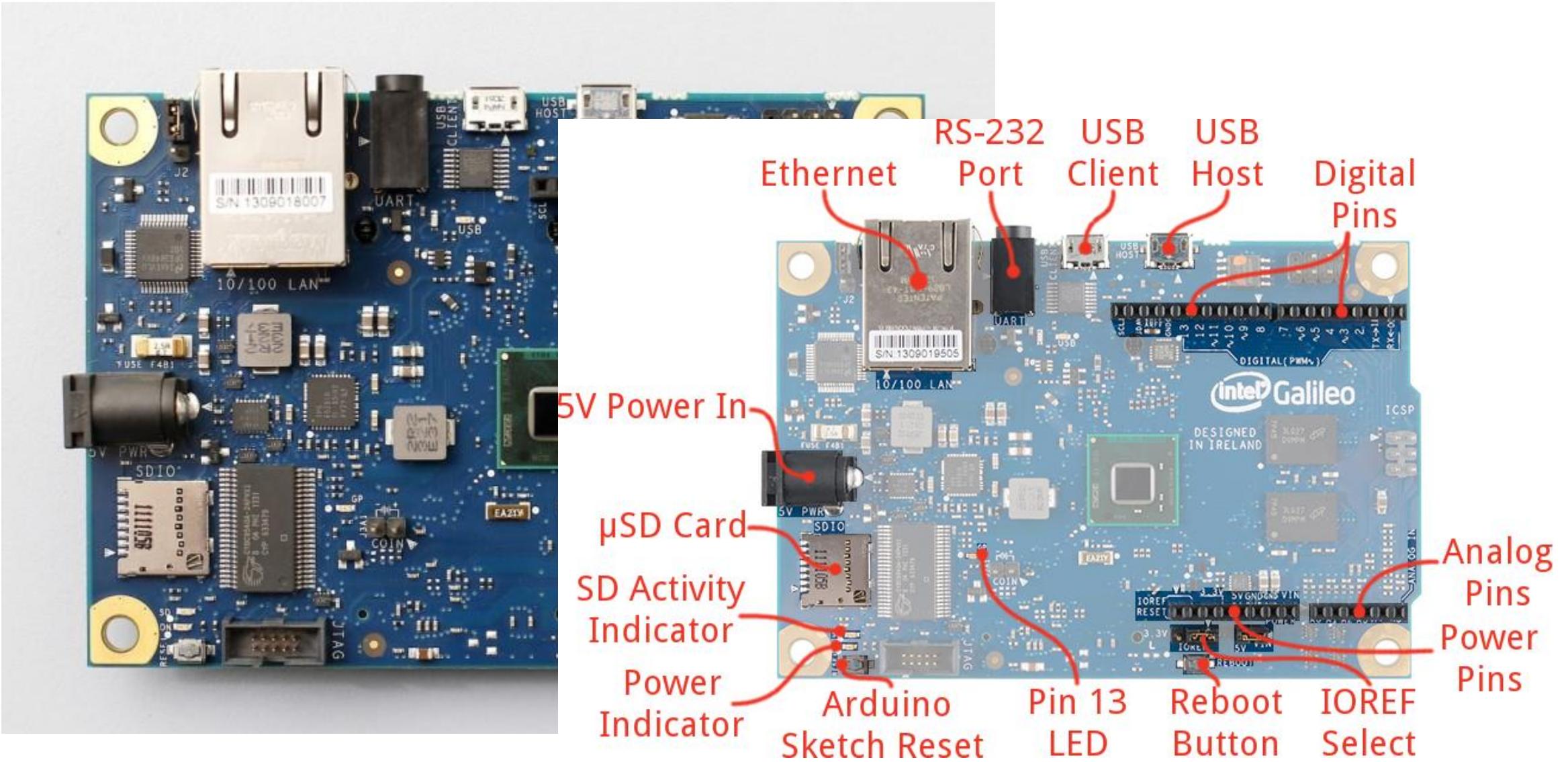
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Date and Time are unknown - using 2012-07-16 11:36 as an approximation
Correct the date and time using e.g: sudo date --set="2012-07-16 11:36"
pi@raspberrypi:~$ CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.2 | VT102 | Offline
```

### 3. Intel Galileo

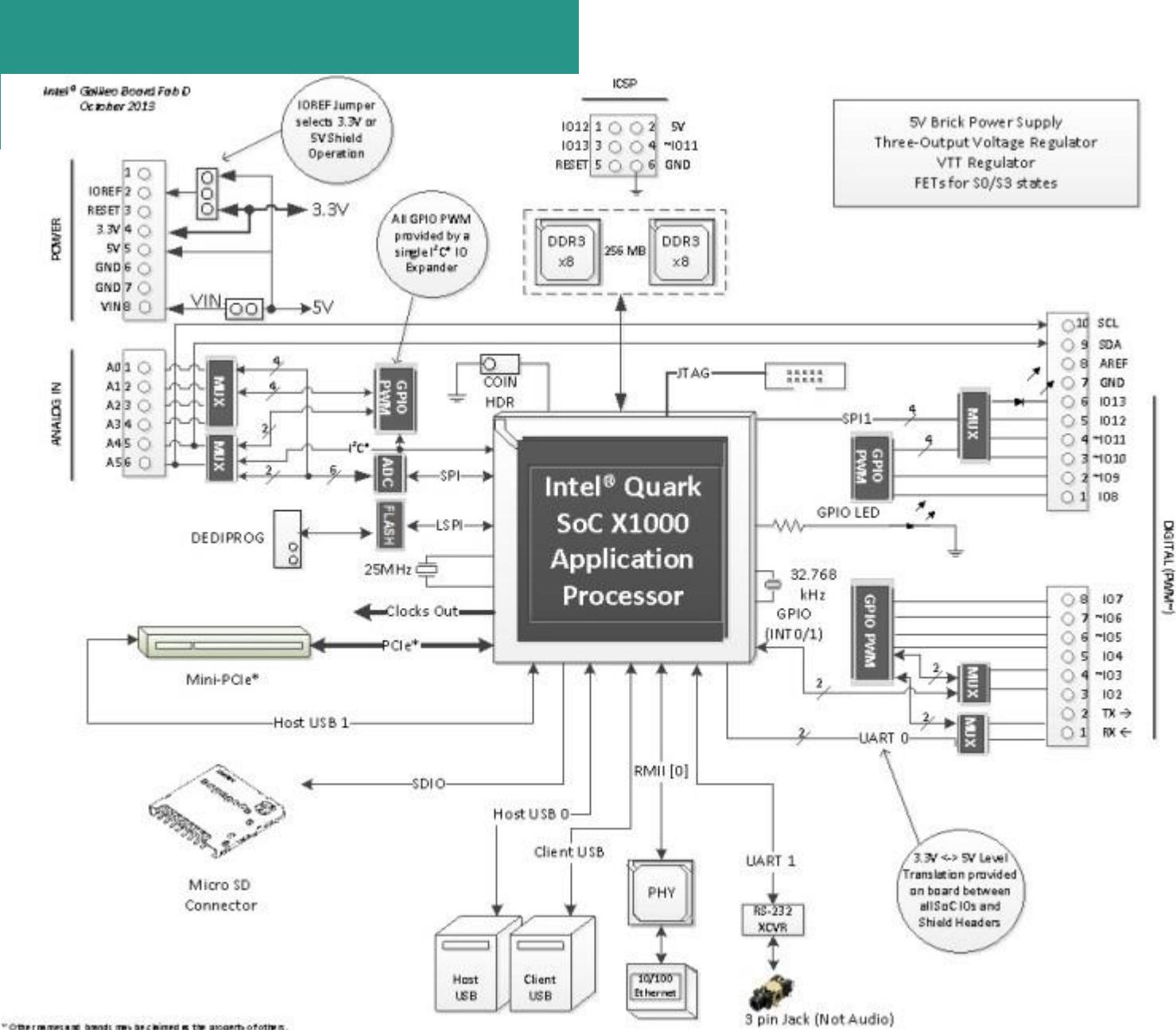


# Galileo



# Galileo

- Intel Quark
- SoC(System on Chip)
- Arduino와 호환됨
- 추가적인 방법으로 성능 확장 가능



# 4. Arduino 개발환경 구성



# Arduino 의 개발환경

The word “Arduino” can mean 3 things

A physical piece  
of hardware



A programming  
environment

```
Arduino - 0010 Alpha

// This sketch blinks an LED. Turn on an LED on Pin 13 for one second,
// then off for one second, and so on... PE 0010 2013 090509
// depending on your Arduino board, it may require a different pin 13
// or a built-in resistor so that you need only 13.

// http://www.arduino.cc/en/Tutorial/Blink

int ledPin = 13; // LED connected to digital pin 13

void setup()
{
  pinMode(ledPin, OUTPUT); // sets the digital pin as output
}

void loop()
{
  digitalWrite(ledPin, HIGH); // turns the LED on
  delay(1000); // waits for a second
  digitalWrite(ledPin, LOW); // turns the LED off
  delay(1000); // waits for a second
}
```

A community  
& philosophy

Arduino playground

Arduino playground

Search:

Projects Built with Arduino

Arduinoblog

Arduino Tutorial

Official Arduino page

Information on the Arduino Web

Arduino Forum

Arduino Projects Journal

EV3 Arduino Board

RobotC Control

Learning Electronics

Learning Programming

Arduino Robot and Arduino

Let the Games Begin

Robotics Technology

Discussions

Recent stories (233+ titles)

Programming the Microcontroller (911)

Arduino Newsfeed Published

Site Index | Contact | Upgrade

About Arduino.com

Home

Light Link

DarkLink Link

Electron Link

Thermowire Link

PowerLink

Feedback

The Arduino Idea

Arduinoblog with...

Hardware Ready (2023)

EV3

Processing

Publitas Data

:: About the Arduino Playground ::

responsible for this website. Help spread a wide variety of the uses of Arduino and contribute and interact from their collective research!

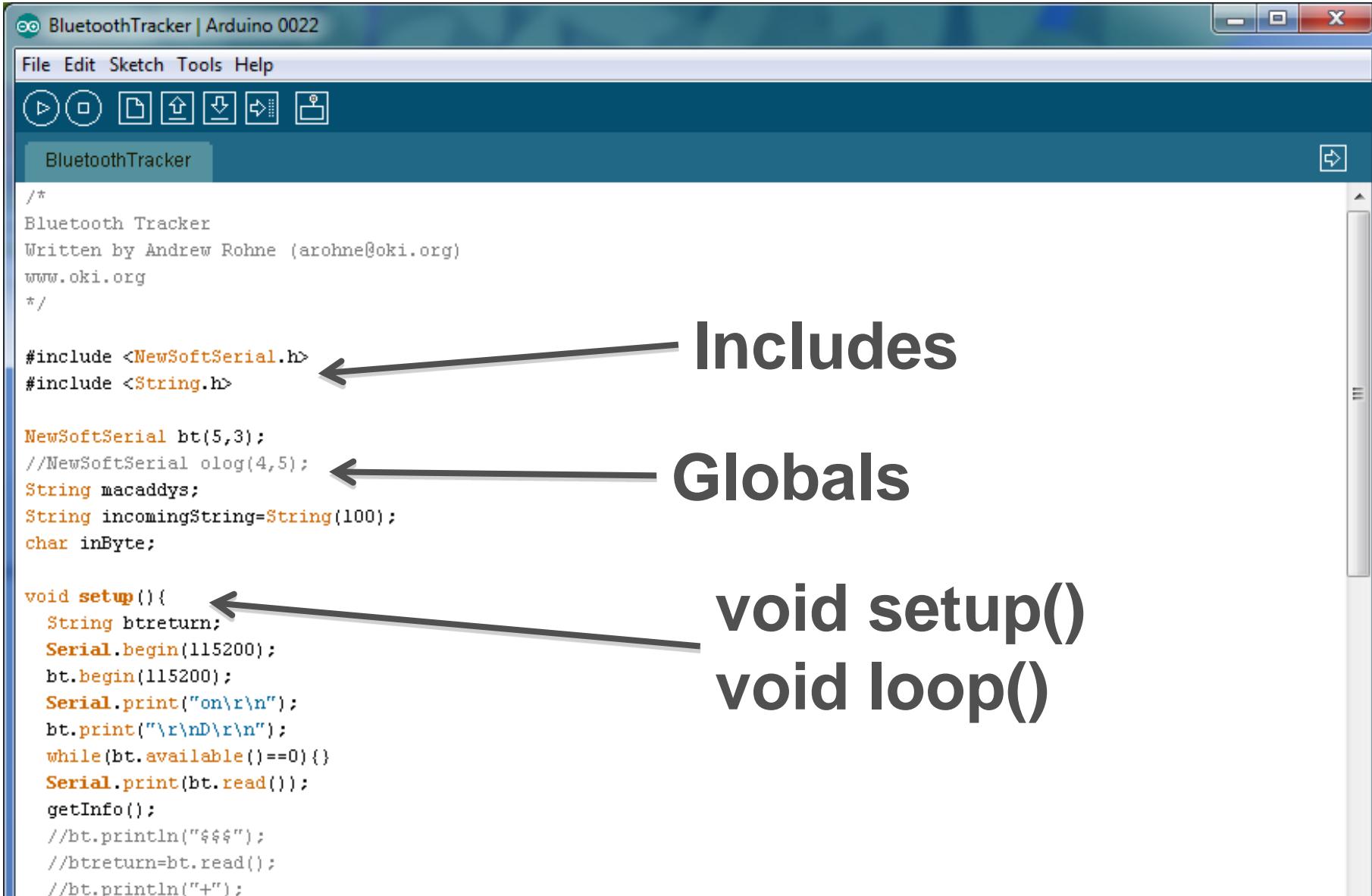
This is their place to work and share your own code, circuit diagrams, hardware, 3D prints, illustrations, tips and tricks, and after all the hard work, to show off your project!

Arduino Playground is a website in progress. We are still at the beta stage, so please help! If you have any suggestions, please send them to [feedback@arduino.cc](mailto:feedback@arduino.cc) and get your fingers typing!

:: RoadMap: What Needs to be Done? ::

There is a lot to do... most of the people only just use Arduino, serious programmers waiting for you to hit it hard... so... Please help us to a small instance of them! (personally, I personally think it's developed fine, though, it's a new or you are more than welcome to get in touch)

# Sketches



The image shows the Arduino IDE interface with a sketch named "BluetoothTracker" open. The code is as follows:

```
/*
Bluetooth Tracker
Written by Andrew Rohne (arohne@oki.org)
www.oki.org
*/

#include <NewSoftSerial.h>
#include <String.h>

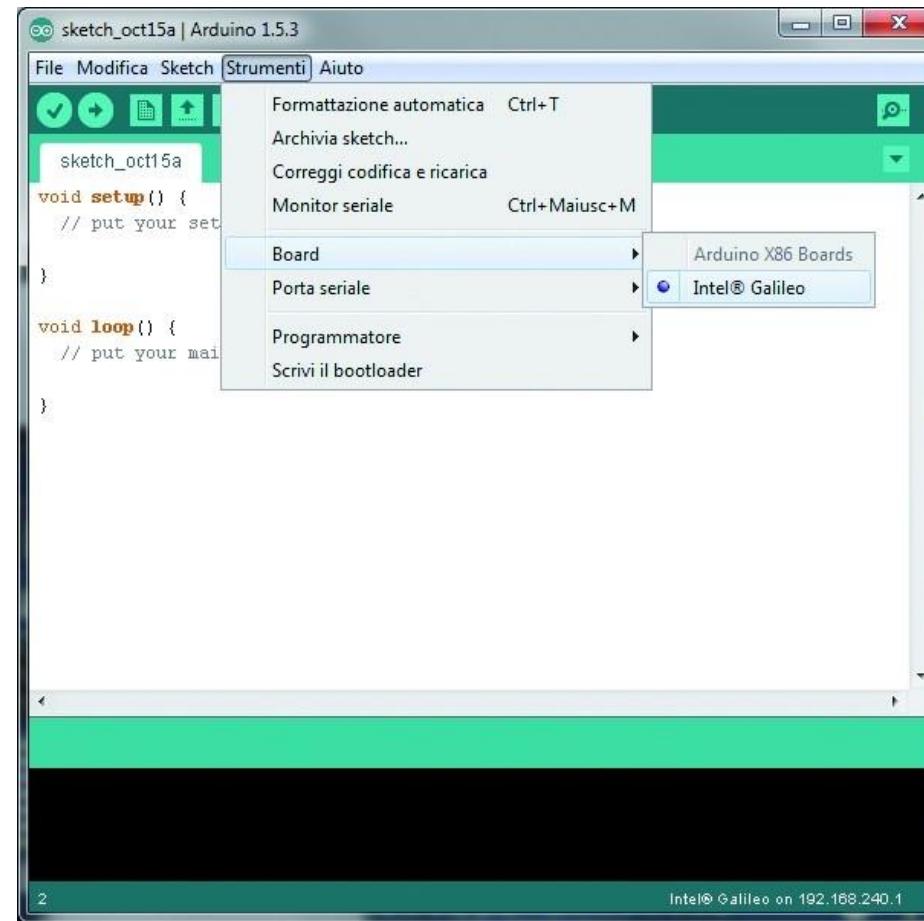
NewSoftSerial bt(5,3);
//NewSoftSerial olog(4,5);
String macaddys;
String incomingString=String(100);
char inByte;

void setup(){
  String btreturn;
  Serial.begin(115200);
  bt.begin(115200);
  Serial.print("on\r\n");
  bt.print("\r\nD\r\n");
  while(bt.available()==0){}
  Serial.print(bt.read());
  getInfo();
  //bt.println("$$$");
  //btreturn=bt.read();
  //bt.println("+");
}
```

Annotations with arrows point to specific sections of the code:

- An arrow points to the two `#include` statements with the label **Includes**.
- An arrow points to the variable declarations (`String macaddys`, `String incomingString`, `char inByte`) with the label **Globals**.
- An arrow points to the `void setup()` and `void loop()` functions with the label **void setup()  
void loop()**.

# Arduino의 개발환경(IDE)



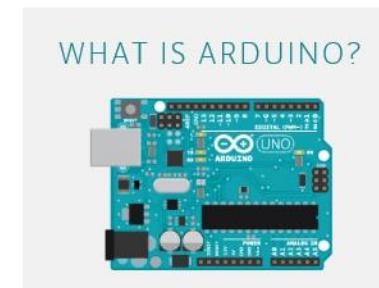
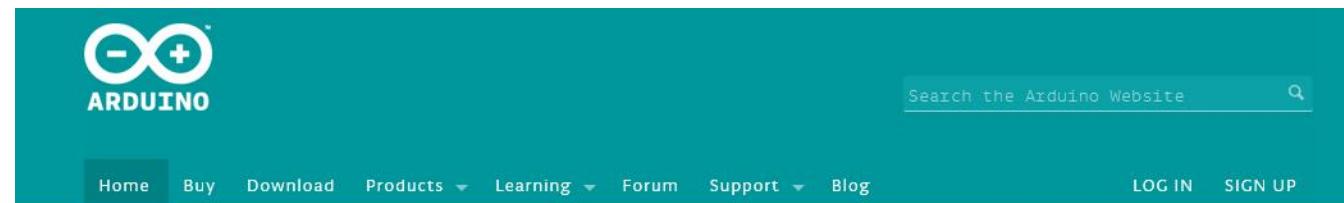
# Arduino IDE 설치

1. Intel Website에서 IDE를 다운로드 한다.

(<http://www.arduino.cc/> )

2. COM 포트를 설정한다.

3. IDE를 실행한다.



BUY AN ARDUINO

LEARN ARDUINO

ARDUINO AT HEART



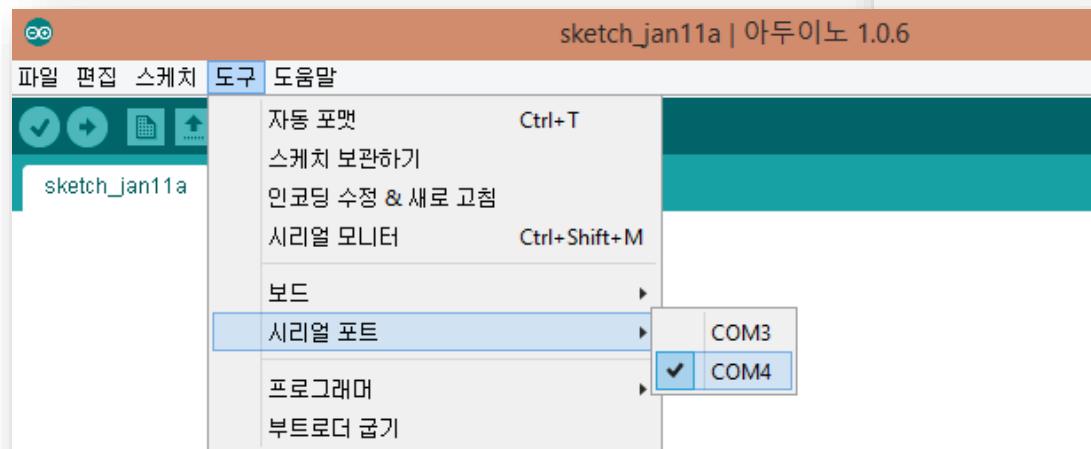
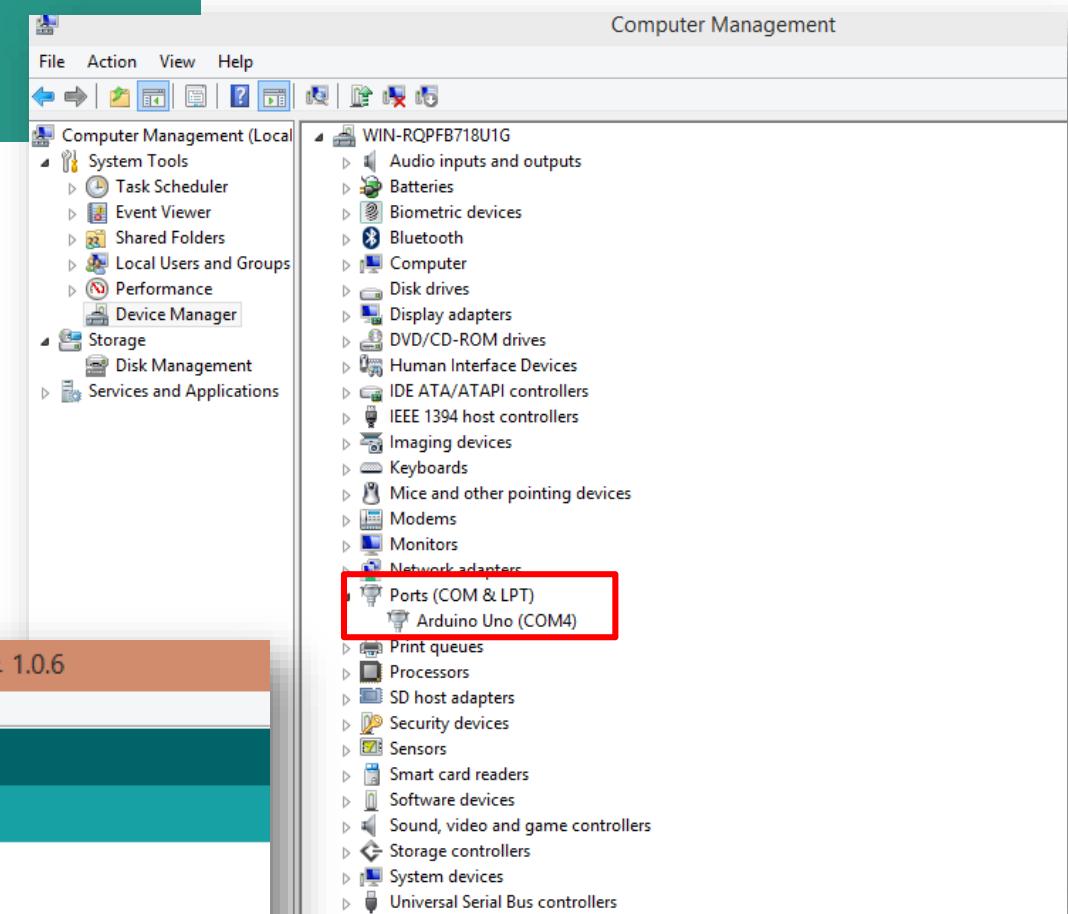
WHAT HAVE YOU BUILT  
WITH ARDUINO? INTERVIEW  
8&9 #MFROME14

ARDUINO MEGA PROTO  
SHIELD - BUILD YOUR...

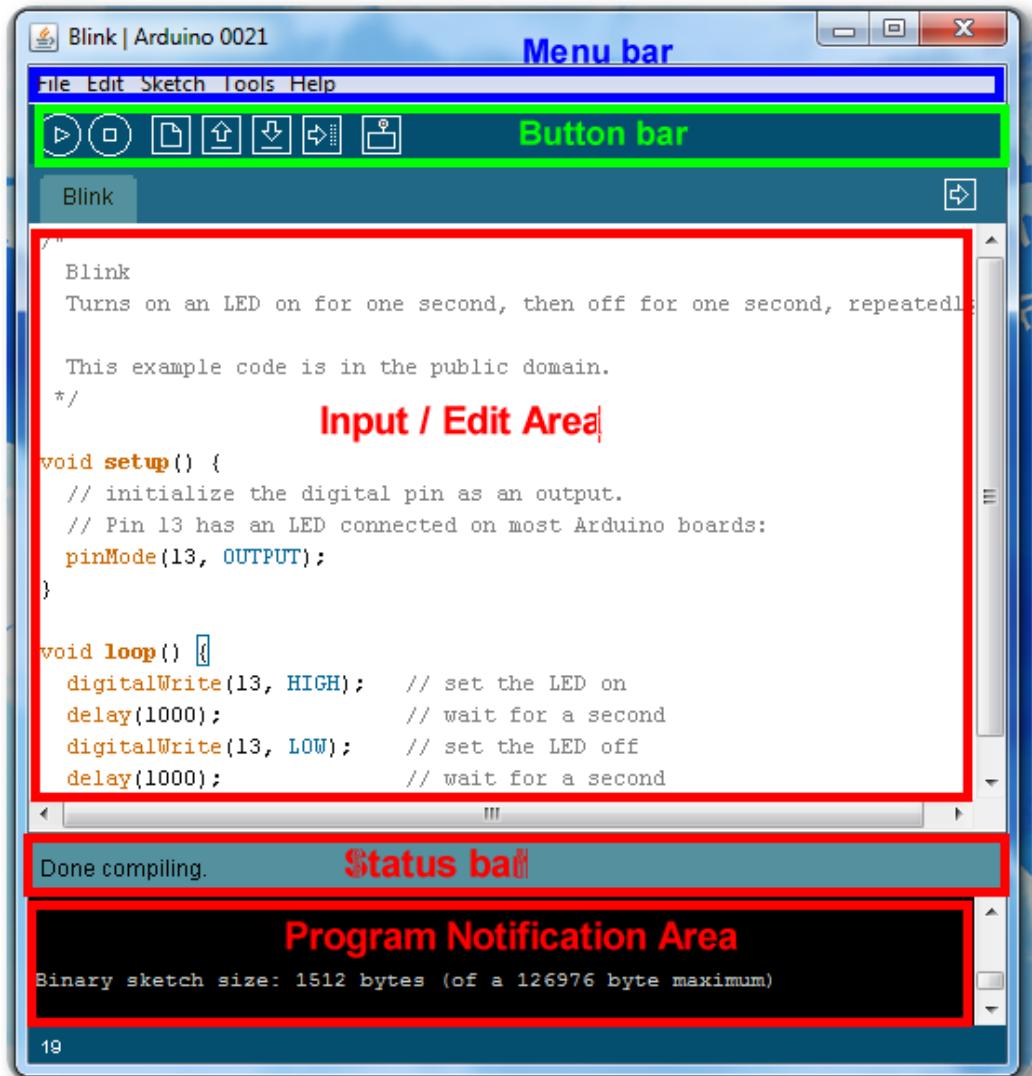


# Arduino IDE COM 포트 설정

1. Arduino를 PC와 연결한다.
2. 본인 PC에서 Arduino의 COM Port를 확인한다.
3. Arduino IDE에서 COM 포트를 설정한다.



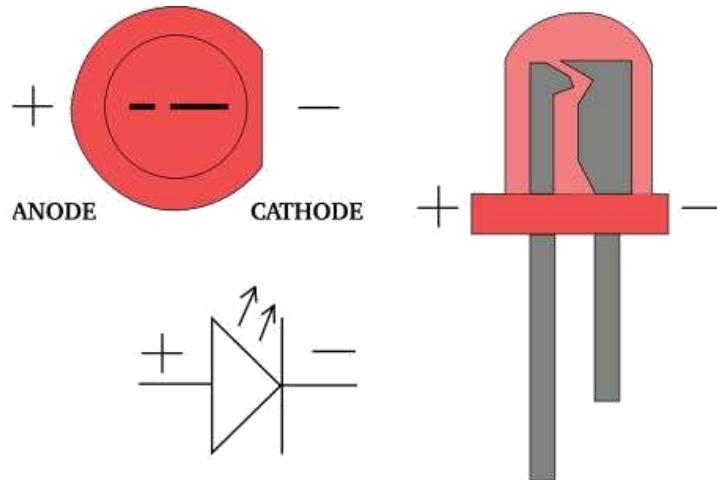
# Arduino IDE



1. Sketch programming
2. Compiling
3. Upload
4. Test

# Arduino 첫 번째 샘플

- 첫 번째 샘플 LED 점멸
  - File > Examples > Digital > Blink
  - 13번 Pin과 GND를 연결한다.



[www.instructables.com](http://www.instructables.com)



# Windows Platform

# Windows 10 IoT Core



Windows

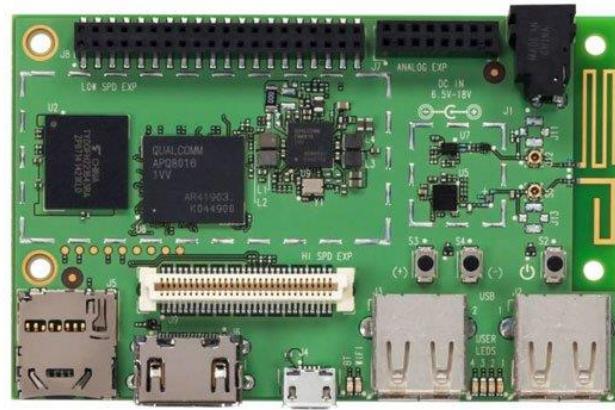
# Windows 10 IoT Devices



Raspberry Pi 2



Intel Galileo

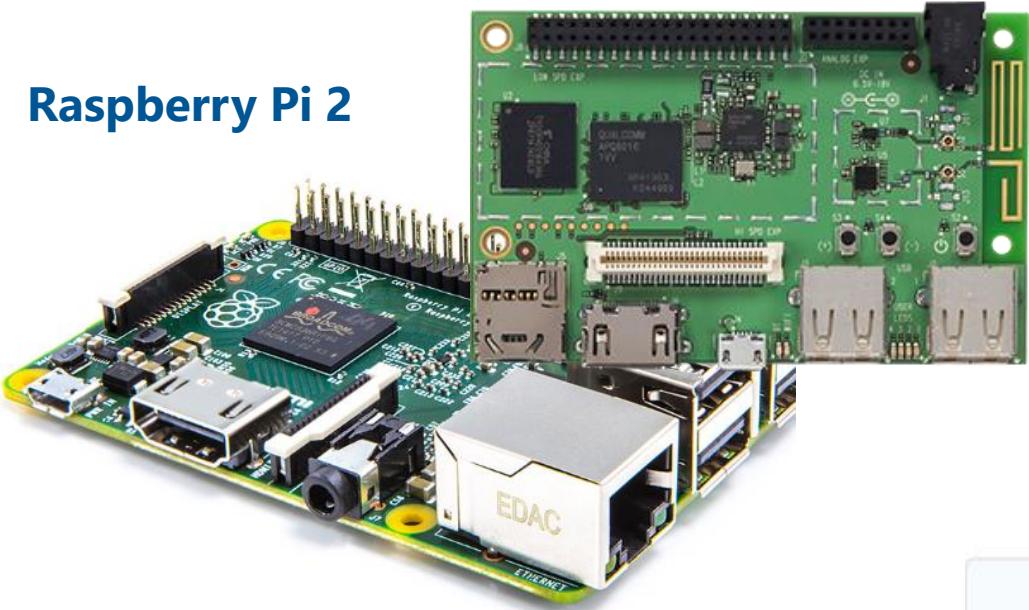


DragonBoard

# Devices Gateway

DragonBoard 410c

Raspberry Pi 2



6배 성능 향상된 '라즈베리파이2' 출시...윈도우10도 구동 가능

2015년 2월 3일 By 마이크로소프트웨어 서준석 기자



초소형 미니PC로 잘 알려진 '라즈베리파이(Raspberry Pi)'의 2세대 제품이 출시됐다. 성능은 6배 향상됐지만 가격은 여전히 이전 모델(라즈베리파이 B+)과 같은 35달러다.

DragonBoard 410c



Neo-W200



Neo-W100

IoT Gateway  
MDS테크놀러지



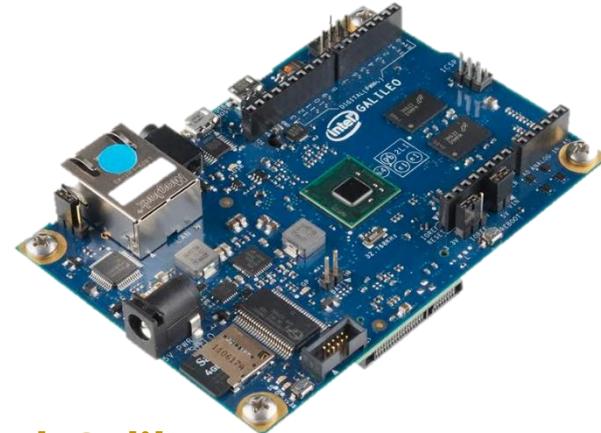
# Gateway Devices



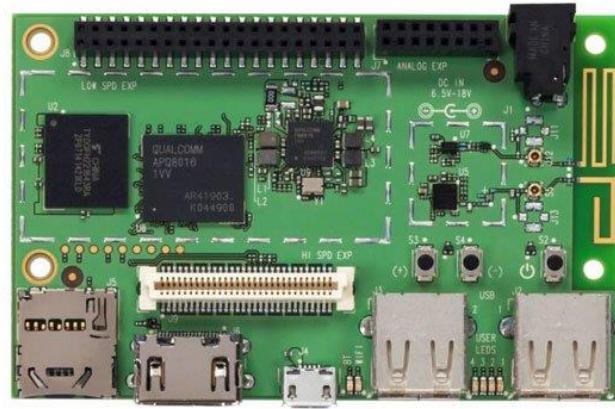
# Gateway Devices



Raspberry Pi 2



Intel Galileo



DragonBoard

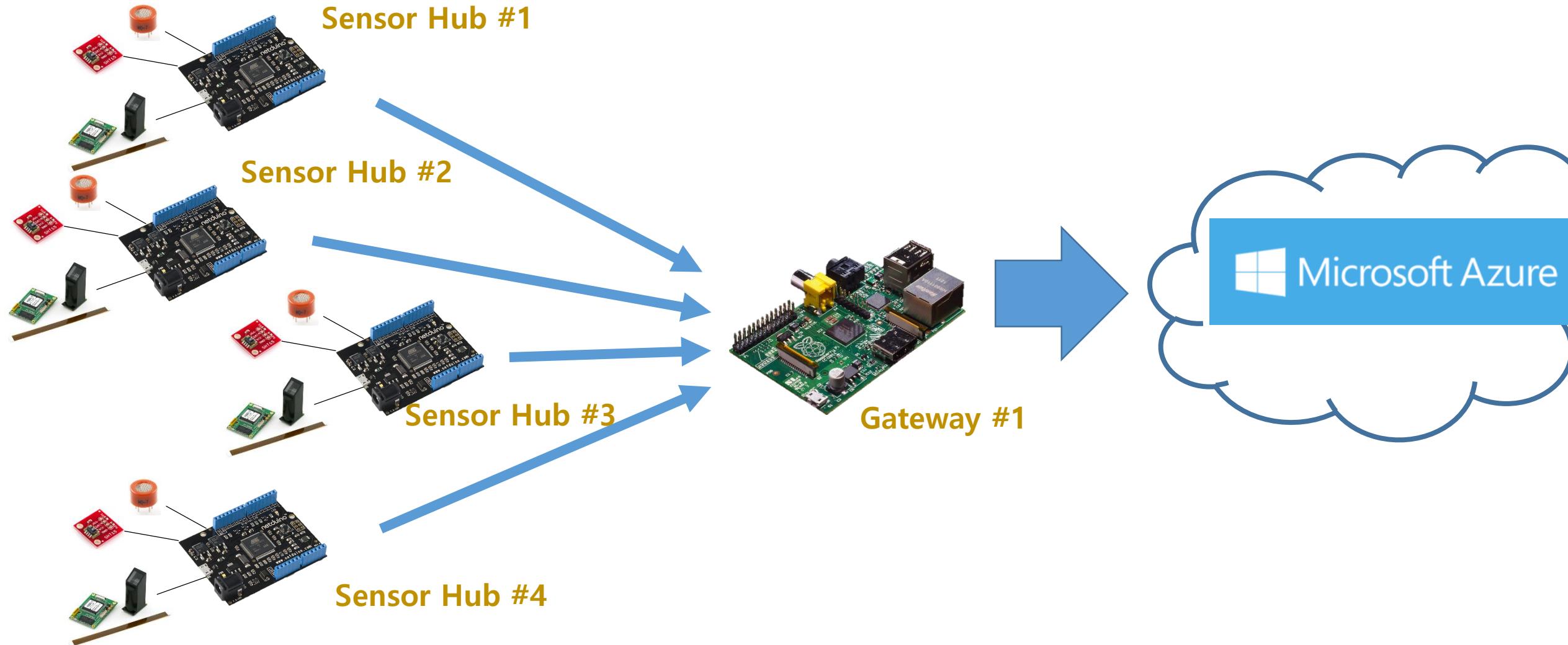


Neo-W200

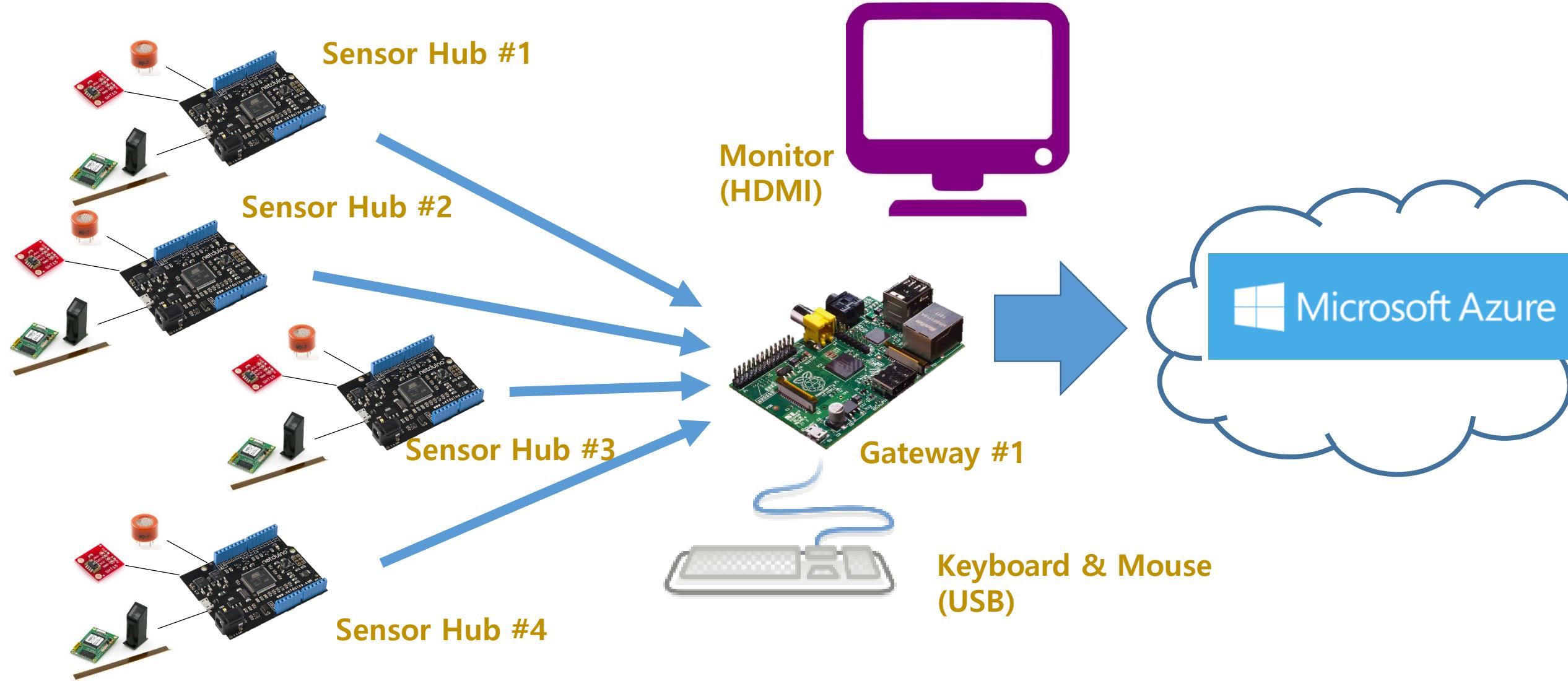


Neo-W100

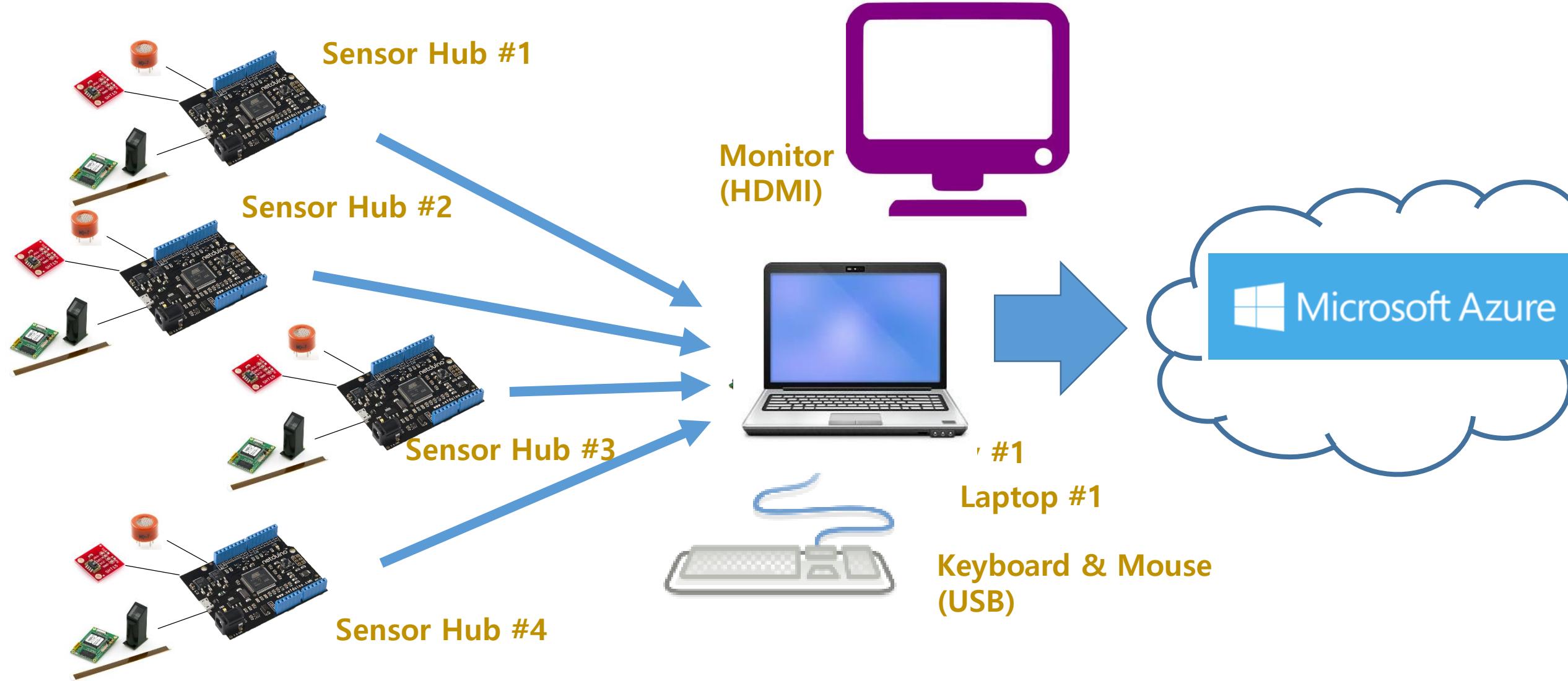
# Gateway Devices



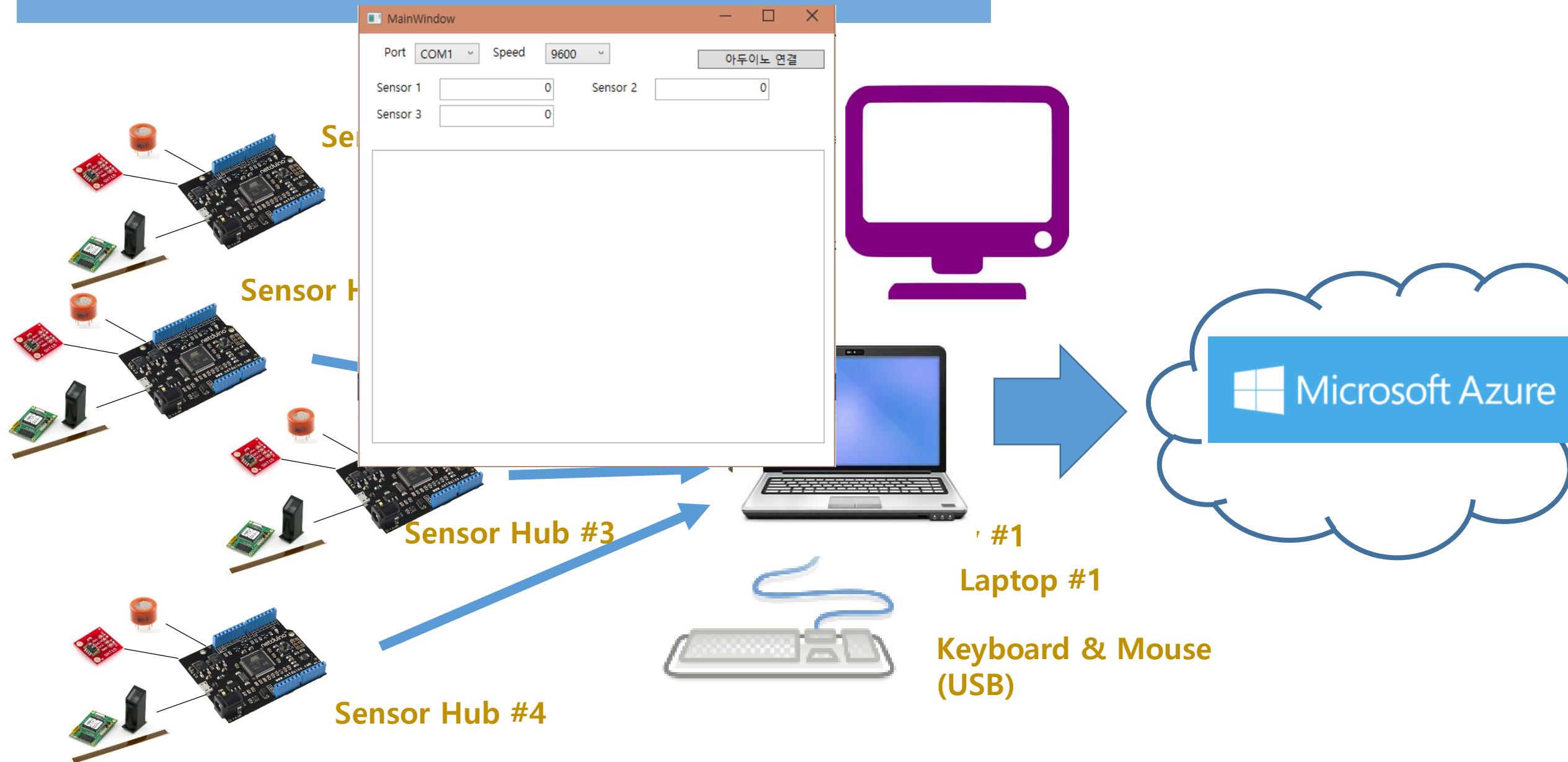
# Gateway Devices



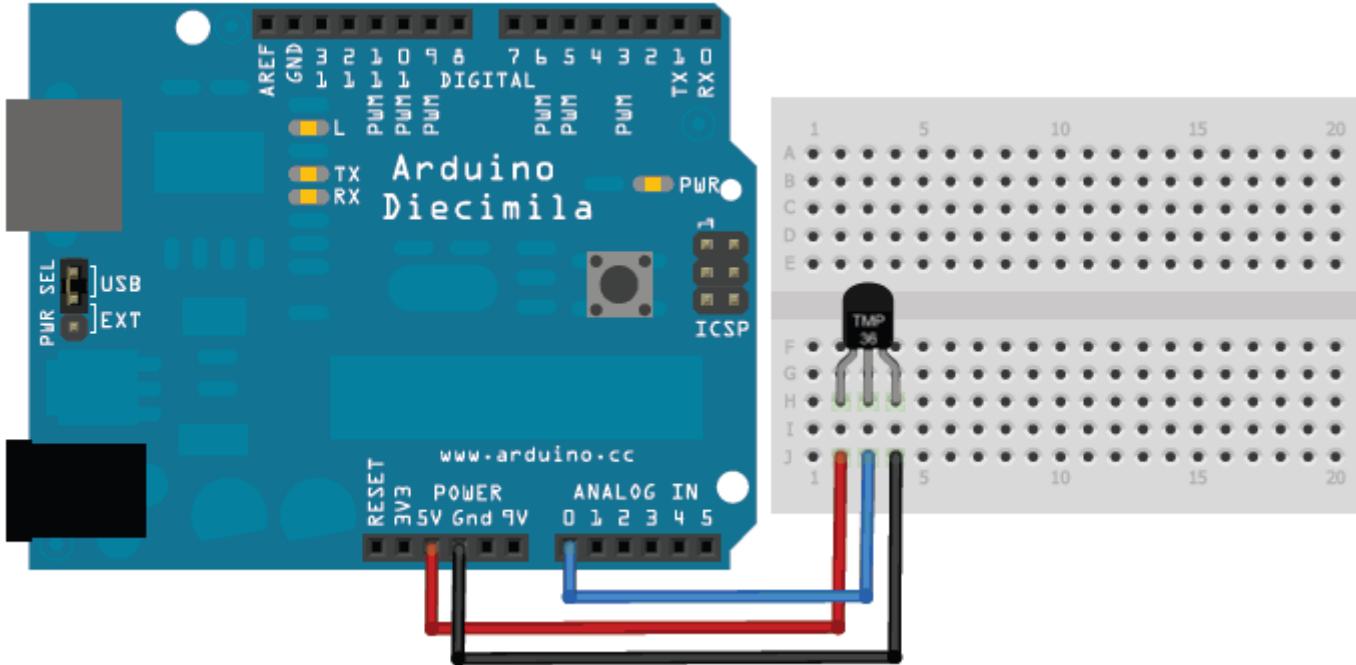
# Gateway Devices



# Gateway Devices



# 온도 센서 TMP36



# 온도 센서 TMP36

```
int sensorPin = 0; //TMP36의 Vout핀과 연결되는 아날로그 핀. 1도당 10mV 변함

void setup()
{
    Serial.begin(9600); //시리얼 콘솔로 결과를 확인하기 위해 PC와 연결 시작
}

void loop()           //계속 반복되는 코드
{
    // 온도 센서로부터 Voltage값을 읽어옴
    int reading = analogRead(sensorPin);

    // 읽어들인 값을 Voltage값으로 변환, 3.3V에 연결했다면 3.3으로 사용
    float voltage = reading * 5.0;
    voltage /= 1024.0;

    // Voltage 값을 출력
    Serial.print(voltage);
    Serial.println(" volts");
```

# 온도 센서 TMP36

```
// Voltage 값을 출력  
Serial.print(voltage);  
Serial.println(" volts");  
  
// 온도값을 출력  
float temperatureC = (voltage - 0.5) * 100; // 500mV를 뺀다음 10mV/'C 단위로 바꾸기위해 *100  
  
Serial.print(temperatureC);  
Serial.println(" degrees C");  
  
// 화씨 값으로 변환  
float temperatureF = (temperatureC * 9.0 / 5.0) + 32.0;  
Serial.print(temperatureF);  
Serial.println(" degrees F");  
  
delay(1000); // 1초 간격으로 출력하기 위해 대기  
}
```

# Microsoft IoT



개발자 기술 ▾

<https://dev.windows.com/ko-KR/iot>

Windows 개발자 센터

탐색 ▾

문서 ▾

다운로드

샘플

커뮤니티

프로그램

## 사물 인터넷

IoT(사물 인터넷)를 통해 장치, 센서, 클라우드, 데이터 및 상상을 통합할 수 있습니다.

지금 바로 시작



시작

프로젝트

문서 및 샘플

FAQ

다운로드

하드웨어

커뮤니티

Set up your PC

**Windows 10  
Visual Studio 2015**

([Visual Studio Community Edition](#))

**Windows IoT Core Templates**

(<https://visualstudiogallery.msdn.microsoft.com/55b357e1-a533-43ad-82a5-a88ac4b01dec>)

**Enable developer mode**

# Set up your Device

**Raspberry Pi 2**

**5V Micro USB power supply**

**8GB micro SD Card**

**HDMI cable and Monitor**

**Ethernet cable**

**USB to LAN**

**Micro SD card read**

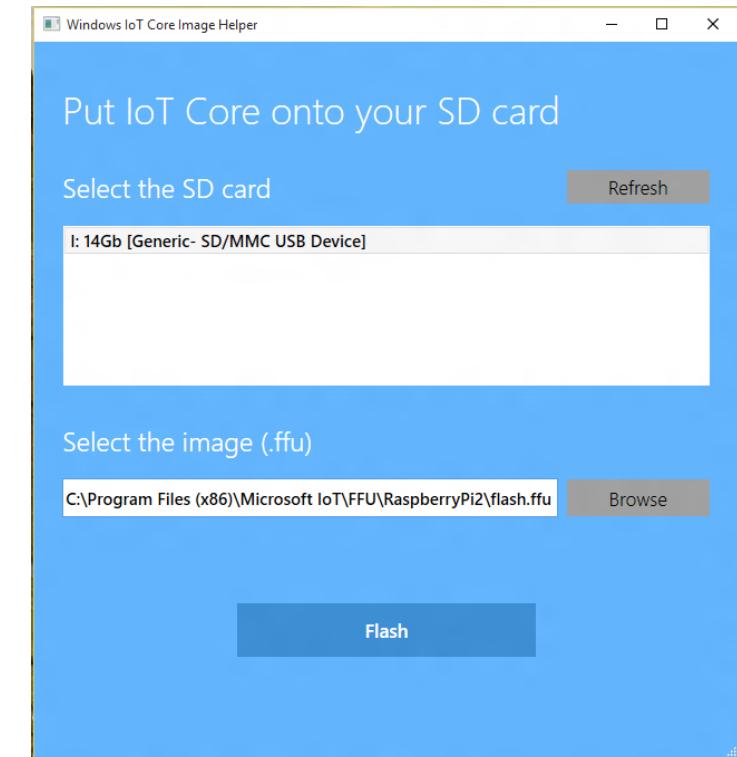
# Set up your Device

## Windows 10 IoT Core Image download

(<http://ms-iot.github.io/content/en-US/Downloads.htm>)

**Windows\_10\_IoT\_Core\_RPi2.msi**

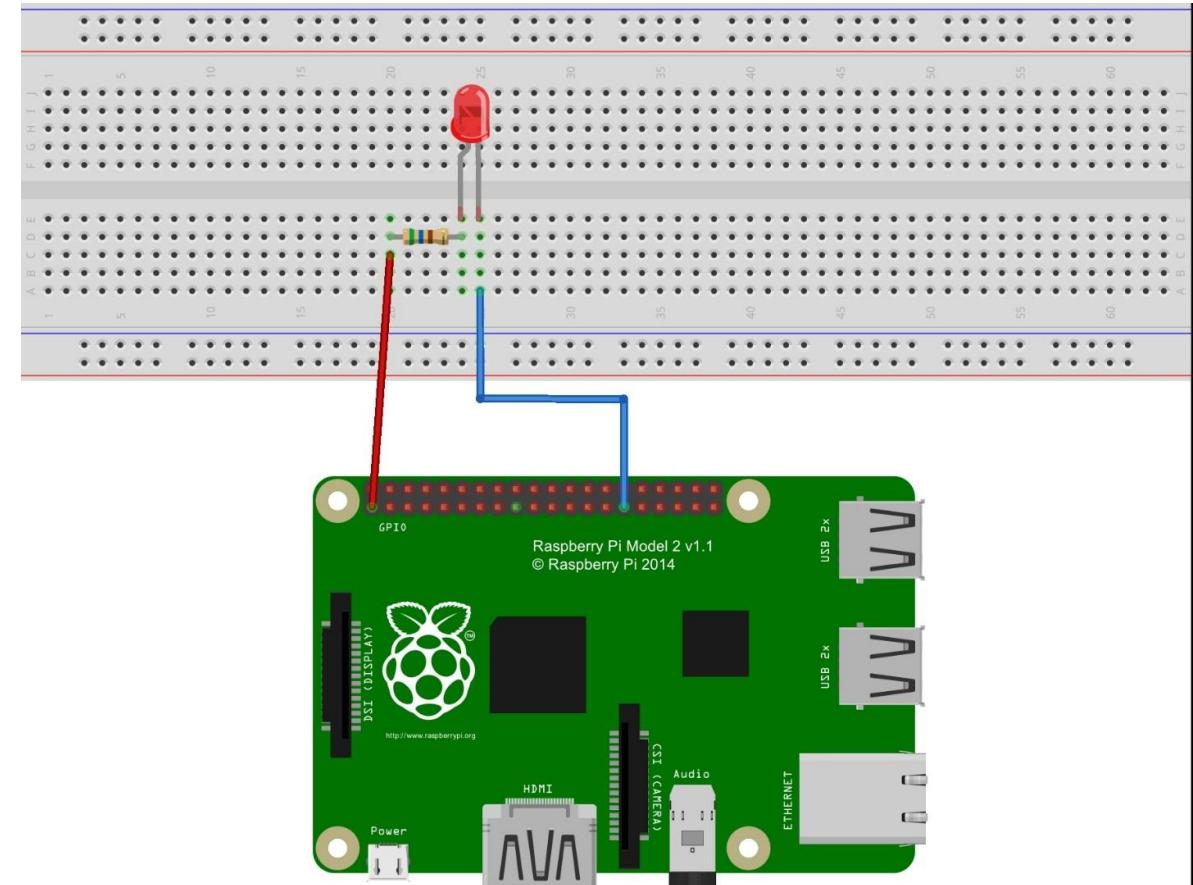
**WindowsIoTImageHelper**



# Set up your Device



3.3V PWR	1	2	5V PWR
I2C1 SDA	3	4	5V PWR
I2C1 SCL	5	6	GND
GPIO 4	7	8	Reserved
GND	9	10	Reserved
GPIO 17	11	12	GPIO 18
GPIO 27	13	14	GND
GPIO 22	15	16	GPIO 23
3.3V PWR	17	18	GPIO 24
SPI0 MOSI	19	20	GND
SPI0 MISO	21	22	GPIO 25
SPI0 SCLK	23	24	SPI0 CS0
GND	25	26	SPI0 CS1
Reserved	27	28	Reserved
GPIO 5	29	30	GND
GPIO 6	31	32	GPIO 12
GPIO 13	33	34	GND
GPIO 19	35	36	GPIO 16
GPIO 26	37	38	GPIO 20
GND	39	40	GPIO 21



fritzing

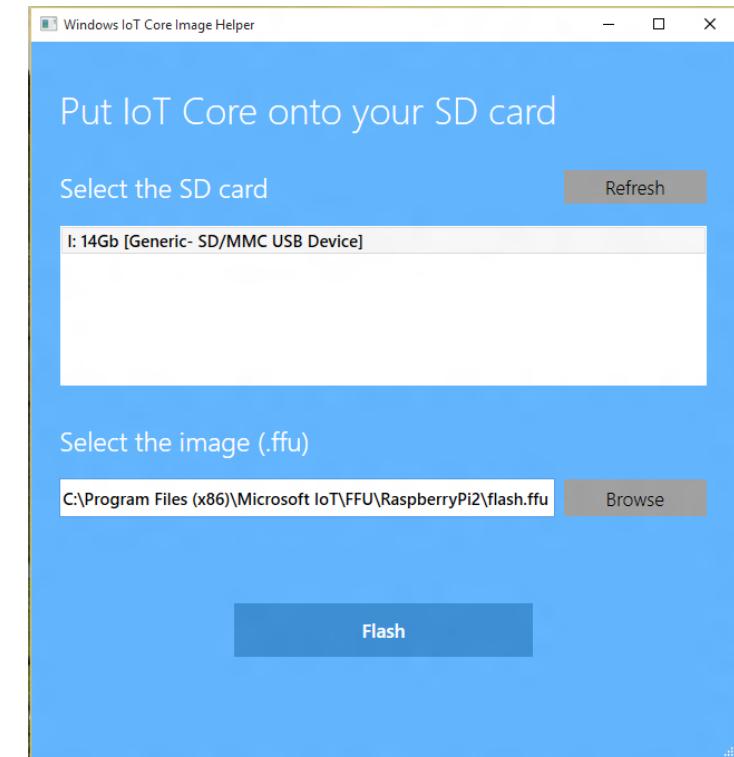
# Set up your Device

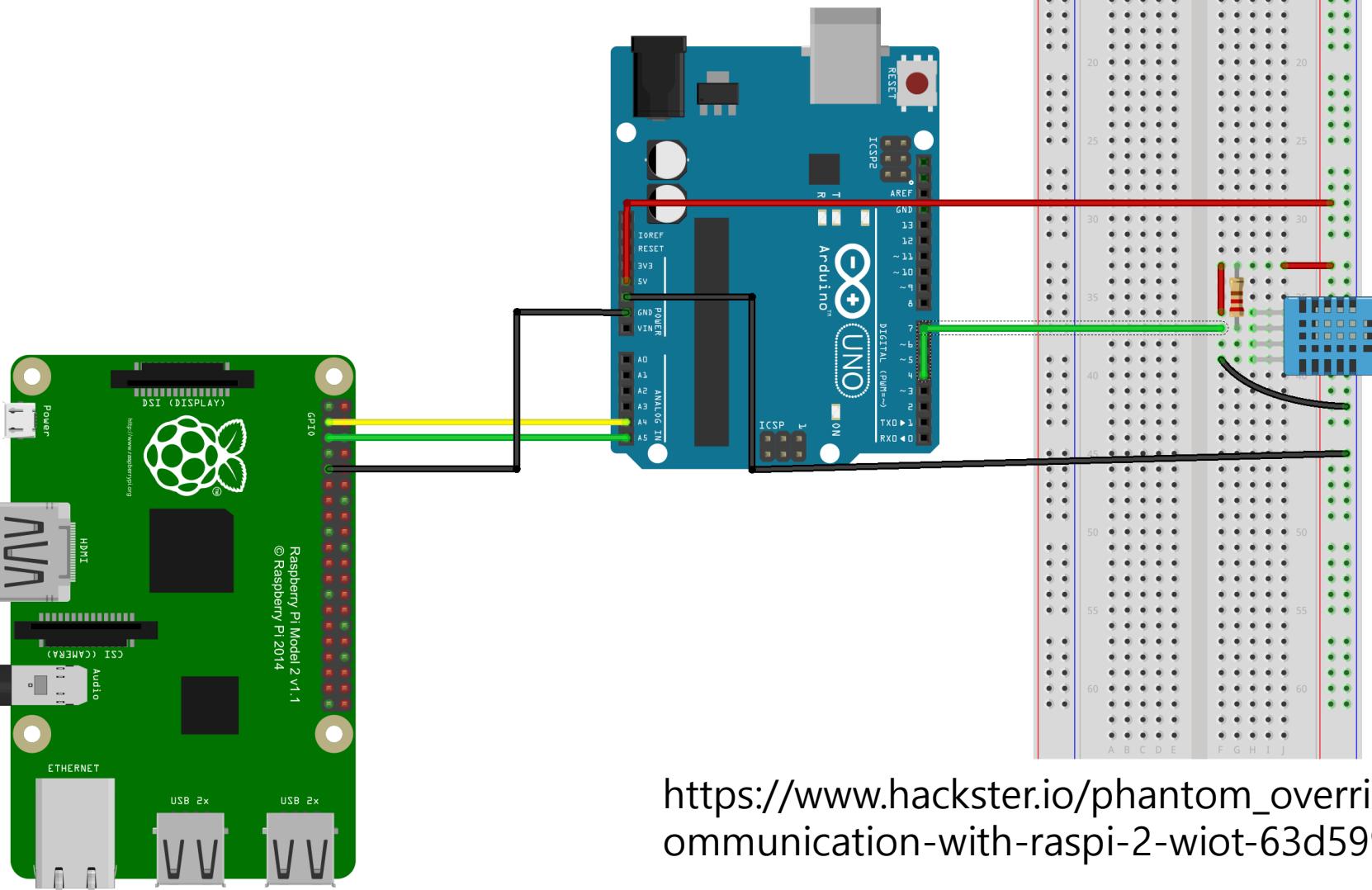
## Windows 10 IoT Core Image download

(<http://ms-iot.github.io/content/en-US/Downloads.htm>)

**Windows\_10\_IoT\_Core\_RPi2.msi**

**WindowsIoTImageHelper**





[https://www.hackster.io/phantom\\_override/arduino-i2c-communication-with-raspi-2-wiot-63d599](https://www.hackster.io/phantom_override/arduino-i2c-communication-with-raspi-2-wiot-63d599)