



Arduino Programming

Internet of Things

Ashwini Sudarshana

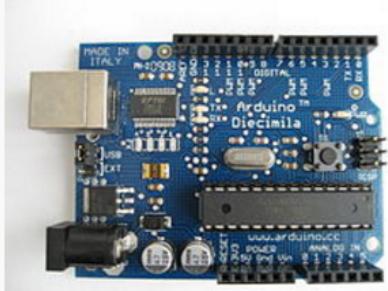
Alumni Initiatives - 'Wireless-School.org'

STEP, National Institute of Technology, Karnataka, Surathkal

www.Arduino.cc boards

The screenshot shows the official Arduino website at https://www.arduino.cc. The top navigation bar includes links for Home, Buy, Download, Products, Learning, Forum, Support, and Blog. A purple box highlights the 'Download' button, which is also highlighted by a large purple arrow pointing towards the main content area. The main content features a large 'WHAT IS ARDUINO?' section with an image of an Arduino Uno board, a 'BUY AN ARDUINO' button, and a 'LEARN ARDUINO' button. To the right, there's a 'Genuino' section for international products and a 'Search the Arduino Website' bar. The right side of the page has a prominent 'Download' heading, a 'MACCHINA POETICA' article thumbnail, and a 'ARDUINO DAY 2016' announcement. At the bottom, there's a 'GENUINO SWAGS' section with a t-shirt image and a 'BLOG' button.

Arduino boards



Arduino Diecimila in
Stoicheia



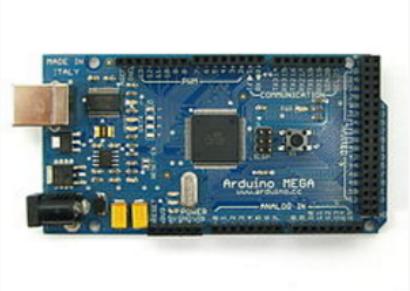
Arduino Duemilanove
(rev 2009b)



Arduino Uno



Arduino Leonardo



Arduino Mega



Arduino MEGA 2560 R3
(front side)^[a]



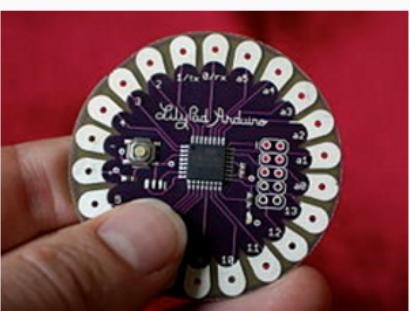
Arduino MEGA 2560 R3
(back side)^[a]



Arduino Nano

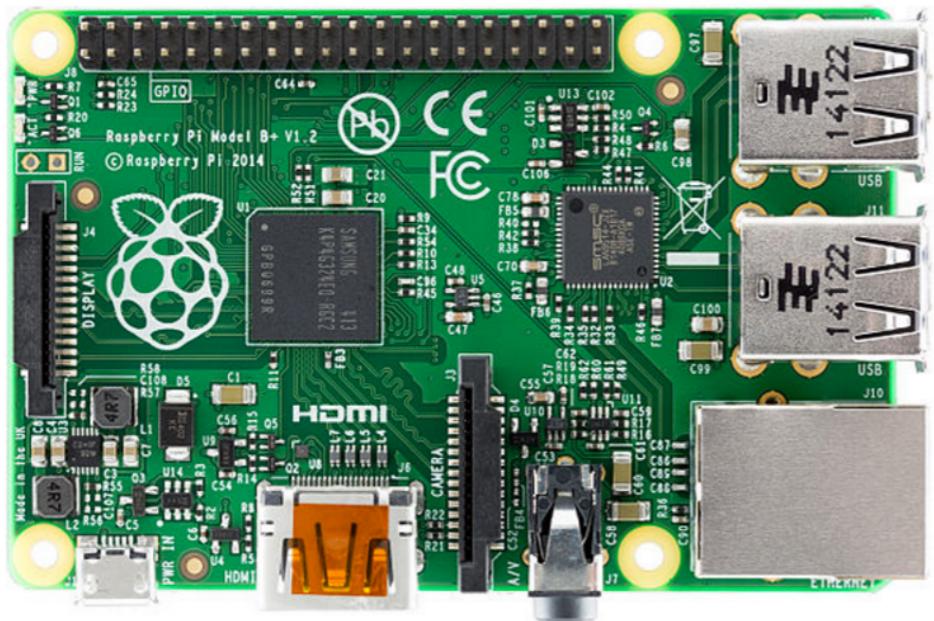


Arduino Due
(ARM Cortex-M3 core)



LilyPad Arduino (rev
2007)

Raspberry Pi 1



Raspberry Pi 1 model B+

Release date February 2012; 4 years ago

Introductory price US\$25 (model A, B+[1]), US\$20 (model A+), US\$35 (RPi 1 model B, RPi 2 model B), US\$30 (CM)

Operating system Linux (e.g. Raspbian), RISC OS, FreeBSD, NetBSD, Plan 9, Inferno, AROS

CPU 700 MHz single-core ARM1176JZF-S (model A, A+, B, B+, CM)[2]

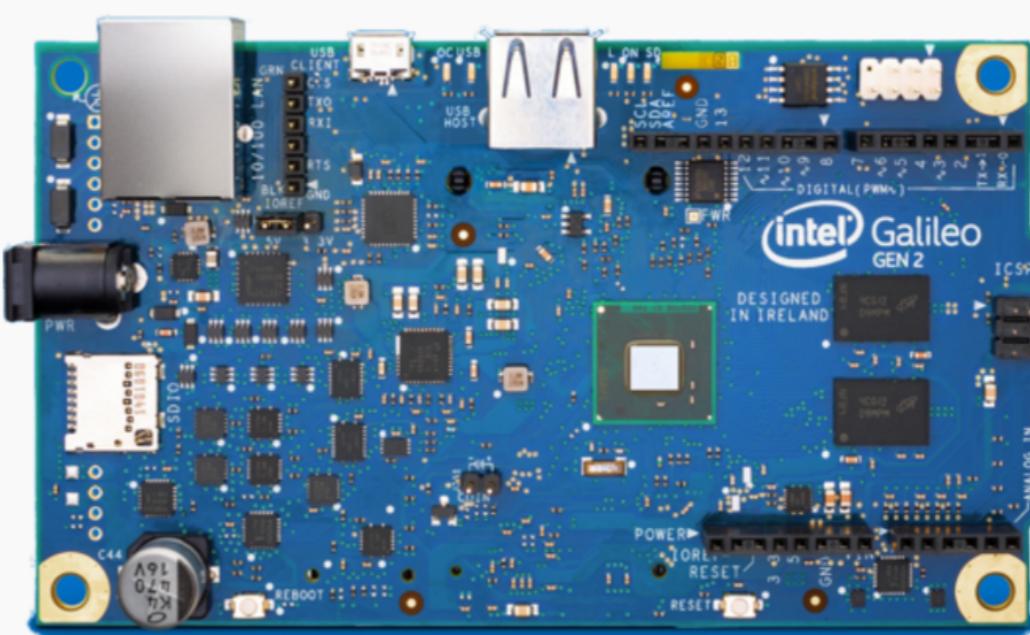
Memory 256 MB[3] (model A, A+, B rev 1)
512 MB (model B rev 2, B+, CM)

Storage SDHC slot (model A and B), MicroSDHC slot (model A+ and B+), 4 GB eMMC IC chip (model CM)

Graphics Broadcom VideoCore IV[2]

Power 1.5 W (model A), 1.0 W (model A+),
3.5 W (model B), 3.0 W (model B+) or
0.8 W (model Zero)

Intel Galileo Gen. 2



"Intel Galileo Gen. 2"

Developer Intel Corporation

Type Single-board computer

Release date Q2'14[3]

Introductory price US\$79.90[4]

Operating system Linux

CPU Intel Quark X1000 32-bit 400 MHz

Memory 256 MB

Storage Flash Memory 8M, EEPROM 8 kb,
Micro SD card slot upto 32GB

Power 15 W

Website www.intel.com ↗

123d.circuits.io

Bring ideas to life with free <https://123d.circuits.io> iTelematics

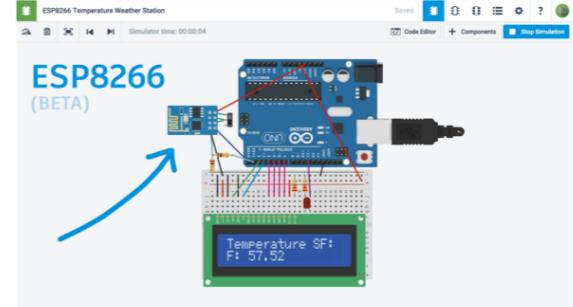
Overview Create Explore Learn Shop +

NEW: Check out ESP8266 Wifi Chip

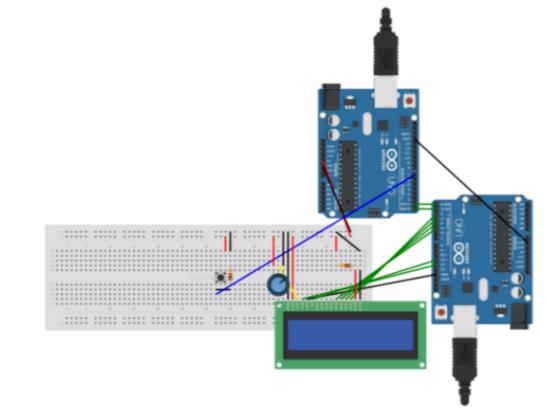
This is the beta release of the ESP8266 Wifi chip. We can't wait to see what you do with it.

Check out the example circuit here:

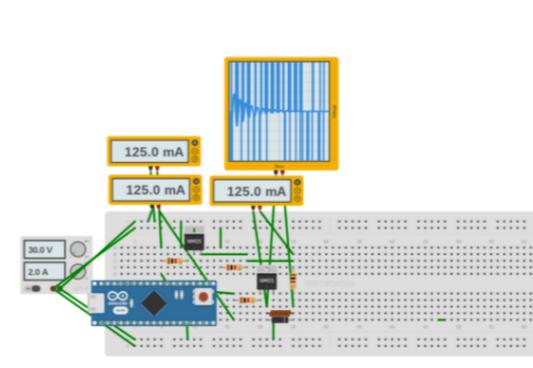
[Learn More](#)



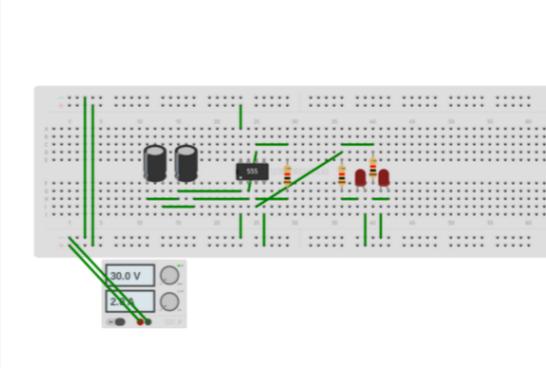
What others are doing



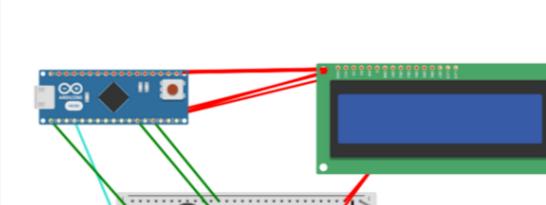
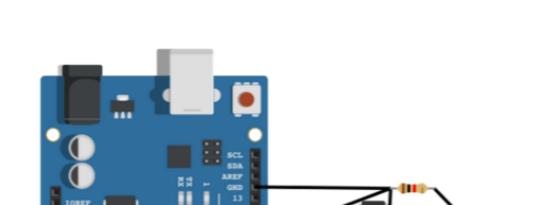
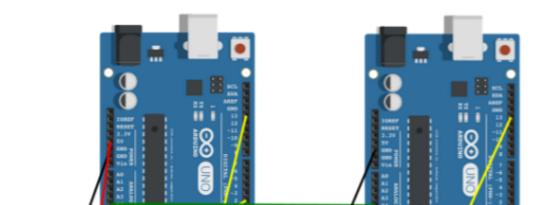
 **Serial communication between...**
Dirtuebus Dirtuebus



 **Solenoid Current Limiter**
Asad Zia



 **Train Crossing signal**
chris chris



Ardunio - Serial Communication

WS2: Serial Communication x iTelematics

https://123d.circuits.io/circuits/1638943-ws2-serial-communication#breadboard

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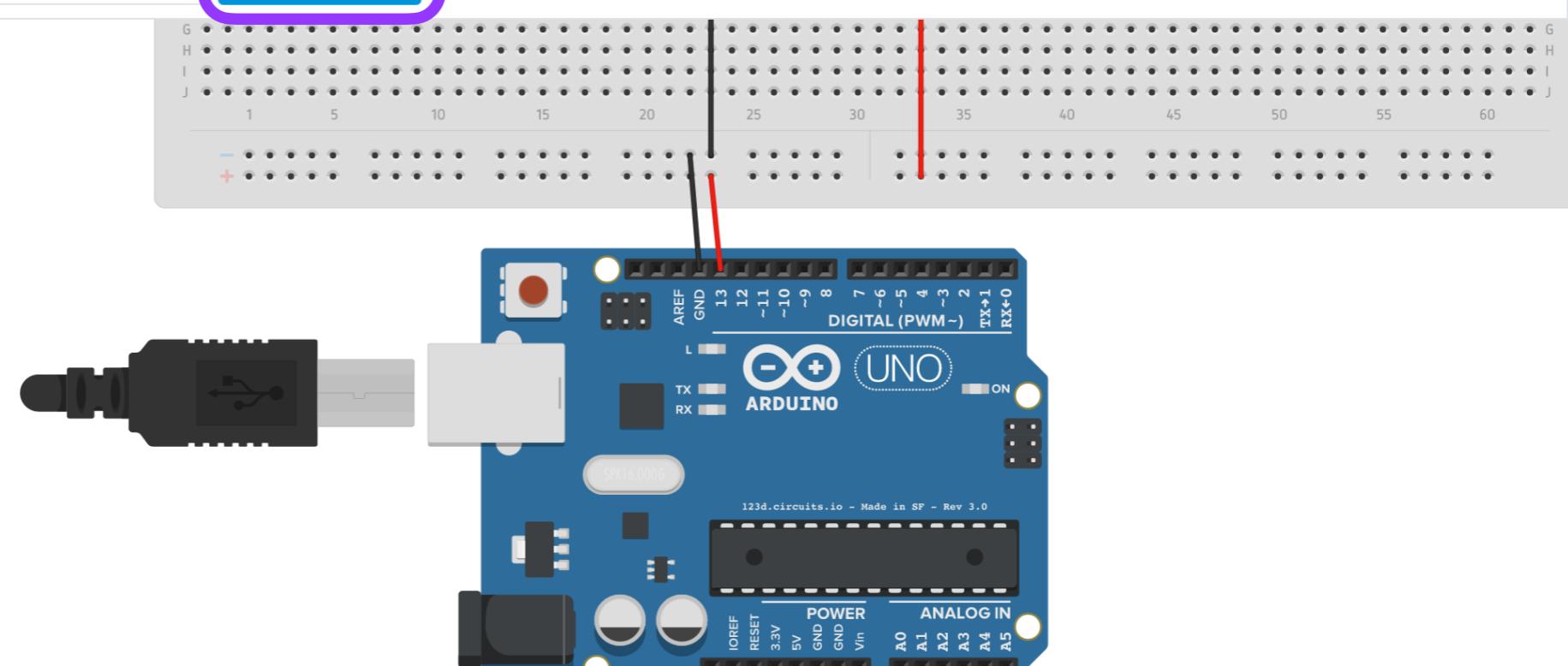
Electronics Lab (highlighted)

PCB Design

Circuit Scribe

MESH

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A breadboard simulation showing an Arduino Uno R3 connected to a USB port. The breadboard has two vertical columns of pins labeled G, H, I, J on the left and 1 through 60 on the right. A red vertical line highlights pin 35. Wires connect the Arduino's digital pins 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, and 1 to the breadboard. The Arduino board itself is blue with white text and features a USB port, a microcontroller chip, and various pins and components.

Start Simulation Code Editor (highlighted)

Upload & Run (highlighted)

Download Code Debugger (highlighted)

```
1 // Pin 13 has an LED connected on most Arduino boards.  
2 // give it a name:  
3 int led = 13;  
4  
5 bool isLightOn = false;  
6 int counter = 0;  
7 String val = "";  
8  
9 // the setup routine runs once when you press reset:  
10 void setup() {
```



Arduino

File

Edit

Sketch

Tools

Help



WS1_-_Serial_Communication | Arduino 1.6.7



WS1_-_Serial_Communication §

```
// Pin 13 has an LED connected on most Arduino boards.
```

```
int led = 13;
```

```
bool isLightOn = false;
```

```
int counter = 0;
```

```
String val = "";
```

```
// the setup routine runs once when you press reset:
```

```
void setup() {
```

```
  Serial.begin(9600); // opens serial port, sets data rate to 9600 bps
```

```
  while(!Serial)
```

```
  {
```

```
    ;
```

```
  }
```

```
  // initialize the digital pin as an output.
```

```
  pinMode(led, OUTPUT);
```

```
}
```

```
// the loop routine runs over and over again forever:  
void loop()  
{  
    if (Serial.available() > 0)  
    {  
        Serial.println("Light ON status: ");  
        Serial.print(counter);  
        Serial.println("Question?");  
    }  
  
    val = Serial.readString();  
  
    if(val.equalsIgnoreCase("OFF"))  
    {  
        digitalWrite(led, LOW);  
    }  
  
    if(val.equalsIgnoreCase("ON"))  
    {  
        digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)  
        isLightOn = true;  
    }  
  
    if(val.equals("OFF"))  
    {  
        digitalWrite(led, LOW); // turn the LED off by making the voltage LOW  
        isLightOn = false;  
    }  
  
    if(val.equals("BLINK"))  
    {  
        counter = 0;  
  
        do
```

Hack your vehicle

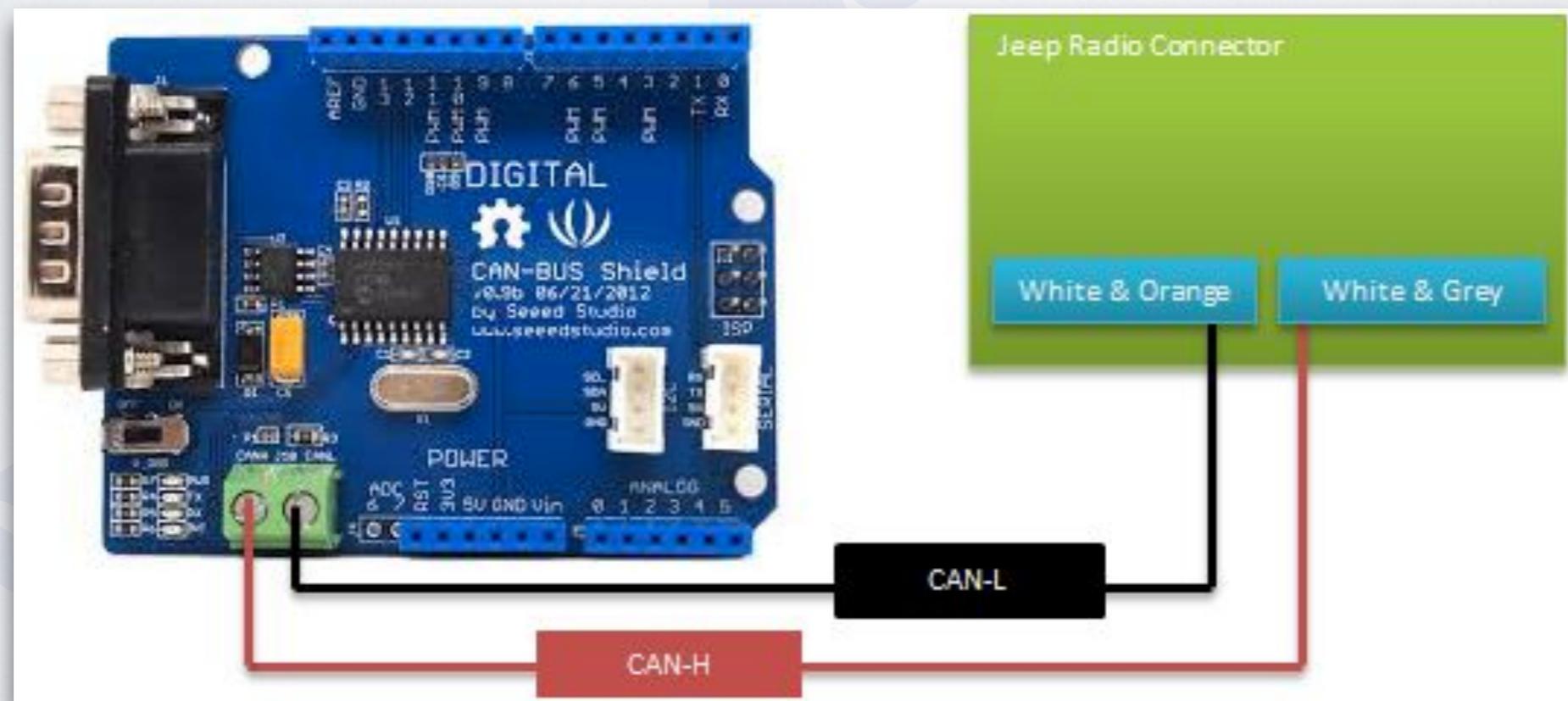
CAN Bus Shield



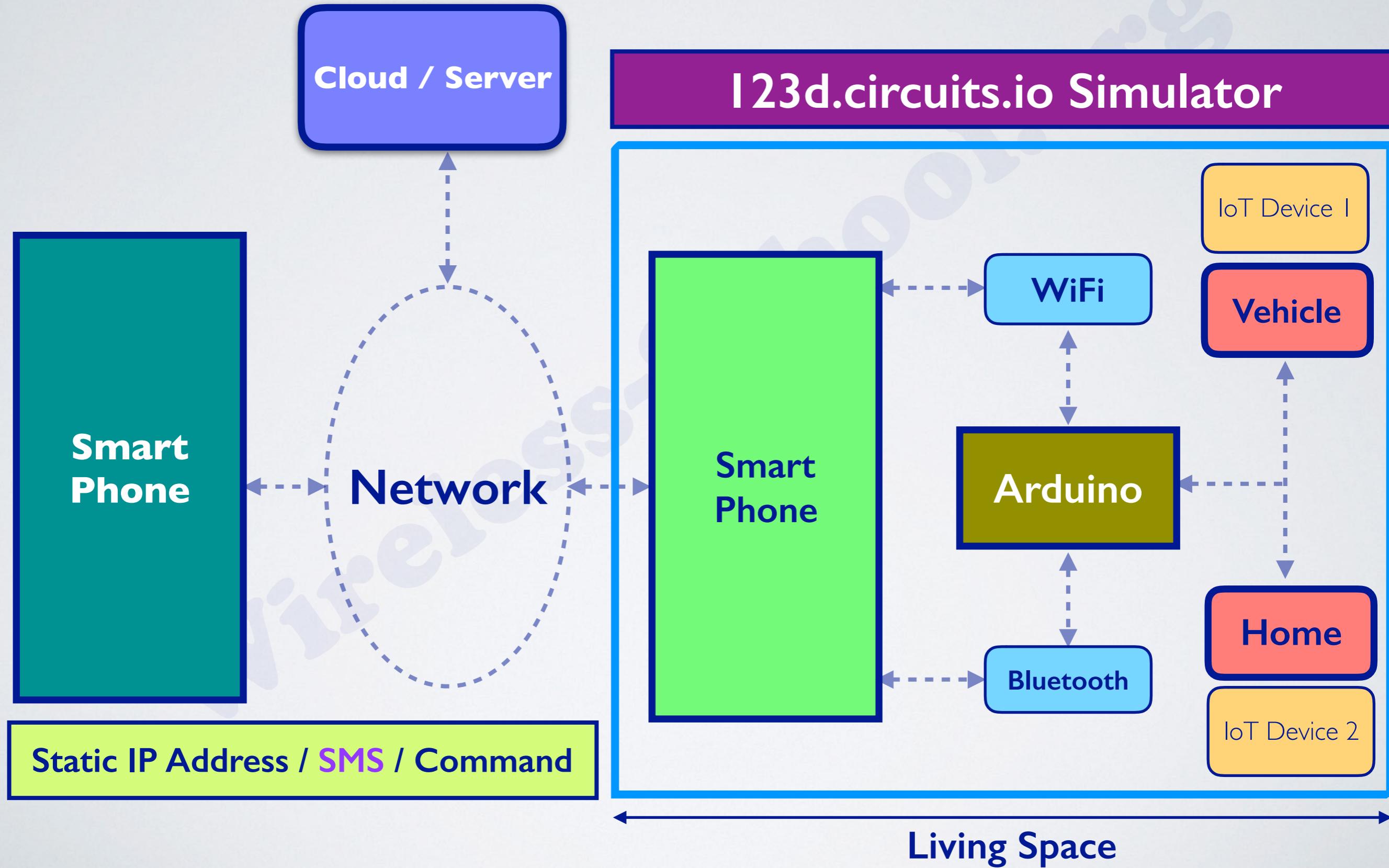
Arduino



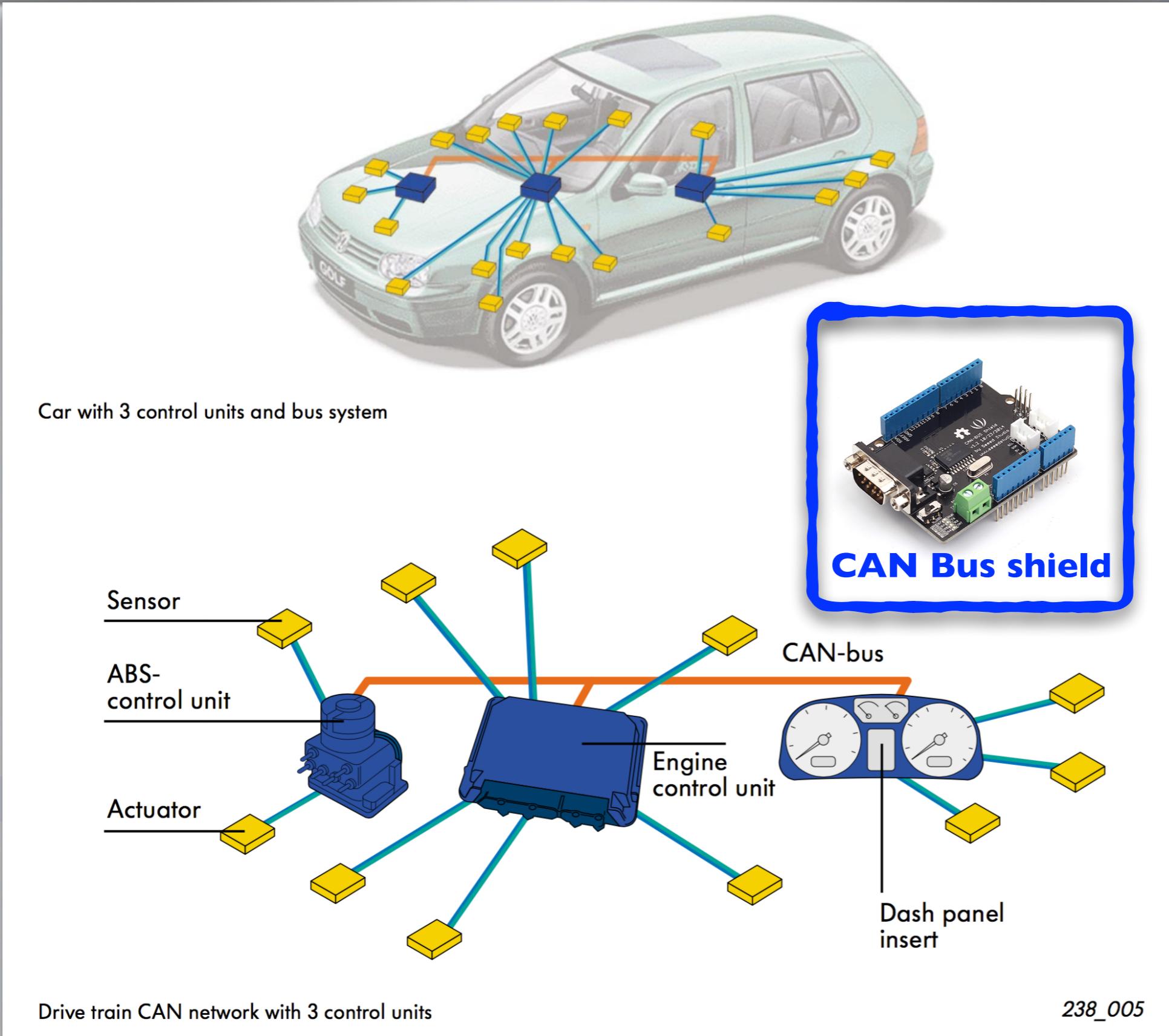
Vehicle



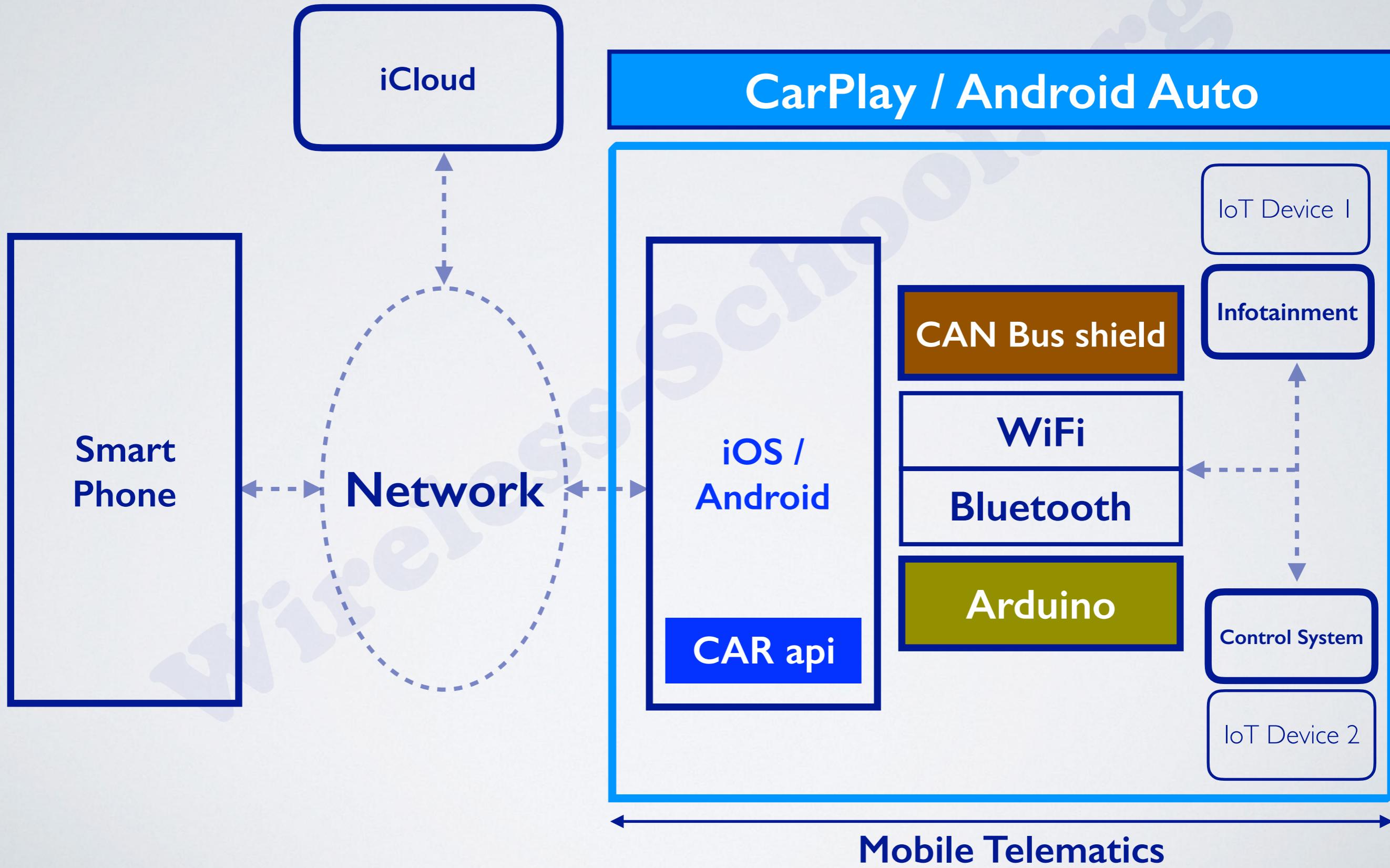
Generic IoT Communication



CAN Bus (Controller Area Network)

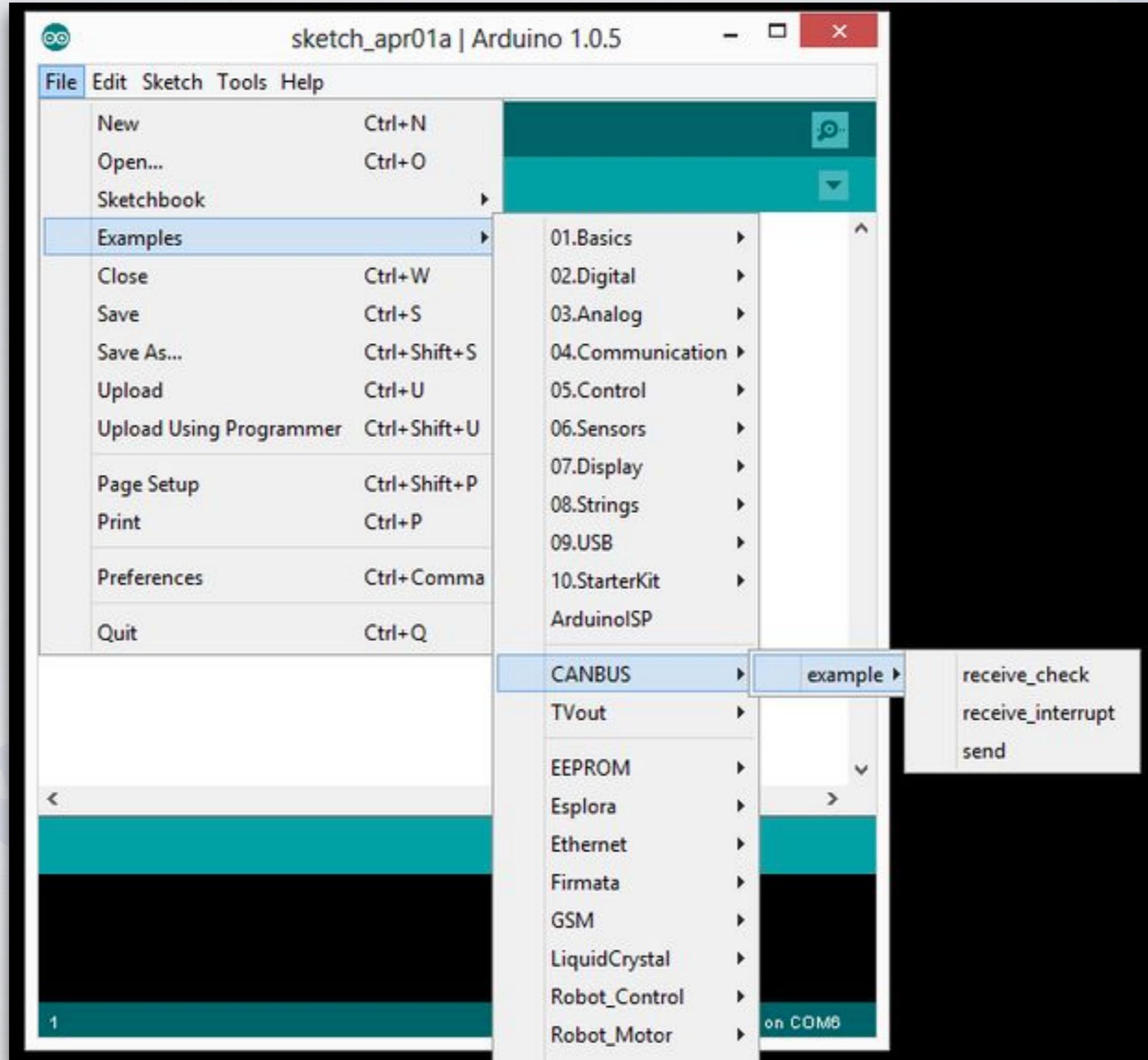


Connect & Control CAR



CAN Bus - Arduino example

http://www.libelium.com/downloads/documentation/canbus_communication_guide.pdf



Workshop - 123d.circuits.io

- 1. Simple LED demo**
- 2. Serial Communication**
- 3. RGB Color with Serial Communication**
- 4. Push Button**

Screenshot of the Autodesk 123D Circuits web interface showing a simple electronic circuit simulation.

Toolbar (Top):

- 123D Circuits
- WS1: Simple Demo | 12
- WS2: RGB Color | 123D
- WS2: Serial Communicati
- WS3: Push Button | 123
- WS4: VIDEO: Push button
- WS5: Arduino Serial Mo

Address Bar:

https://123d.circuits.io/circuits/1638832-ws1-simple-demo

User Interface Elements:

- AUTODESK 123D CIRCUITS logo
- Search bar: Search for designs, components or people
- New button
- User profile icon

Circuit Diagram:

The circuit is built on a breadboard. A 5V power source is connected to pin 45 of the breadboard. A resistor (labeled "Resistor") is connected between pin 45 and ground (pin 50). A red LED is connected in series with the resistor. A digital multimeter (DMM) is connected across the resistor to measure current (A), voltage (V), and resistance (R). A light bulb is connected in parallel with the LED. The circuit is labeled "123D.CIRCUITS.IO".

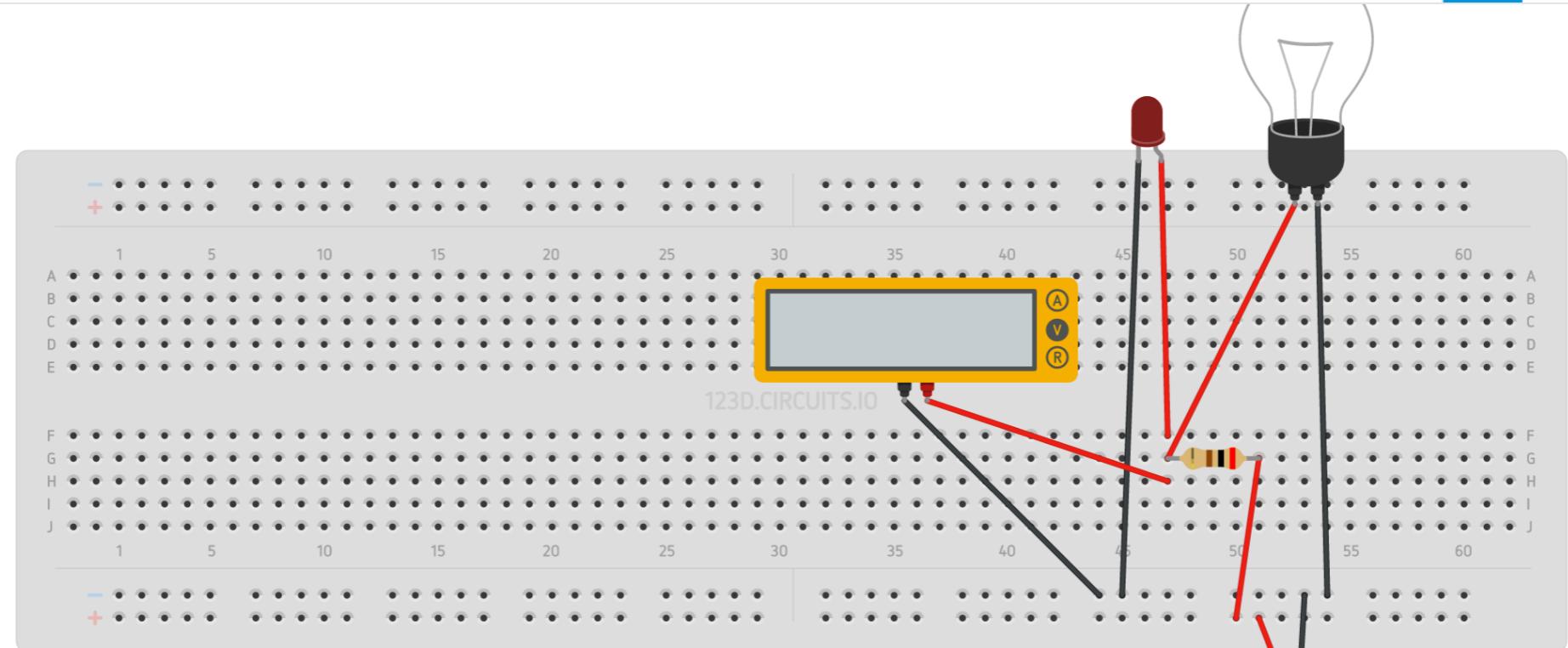
Component Editor (Bottom Left):

Resistor

Name: 1

resistance: 200 Ω

WS1: Simple Demo | Electronics Lab

[Edit](#)[Show more](#)[Start Simulation](#)[Code Editor](#)

Resistor

Name: 1

resistance: 200 Ω



AUTODESK
123D CIRCUITS

Search for designs, components or people

+ New

WS2: Serial Communication | Electronics Lab

Start Simulation Code Editor

123D.CIRCUITIO

Resistor

Name: 1

resistance: 100 Ω

```
// WS2: Serial Communication
// Made by Sudarshana Karkala
// License: CC-BY-SA 3.0
// Downloaded from: https://123d.circuits.io/circuits/1638943-ws2-serial-communication

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

bool isLightOn = false;
int counter = 0;
String val = "";

// the setup routine runs once when you press reset:
void setup() {

    Serial.begin(9600); // opens serial port, sets data rate to 9600 bps

    while(!Serial)
    {
        ;
    }

    // initialize the digital pin as an output.
    pinMode(led, OUTPUT);
}
```

```
// the loop routine runs over and over again forever:
void loop()
{
    if (Serial.available() > 0)
    {
        Serial.println("Light ON status: ");
        Serial.print(counter);
        Serial.println("Question?");
    }
    val = Serial.readString();
    if(val.equalsIgnoreCase("OFF")) {
        digitalWrite(led, LOW);
        isLightOn = false;
    }
    else if(val.equalsIgnoreCase("ON")) {
        digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
        isLightOn = true;
    }
    else if(val.equals("BLINK")) {
        counter = 0;
        do
        {
            digitalWrite(led, LOW);
            delay(1000);
            digitalWrite(led, HIGH);
            delay(1000);
            counter++;
        }
        while(counter < 10);
    }
}
```

Done Saving.

123D Circuits WS1: Simple Demo | 12 WS2: RGB Color | 123D WS2: Serial Communicat WS3: Push Button | 123 WS4: VIDEO: Push button WS5: Arduino Serial Mo

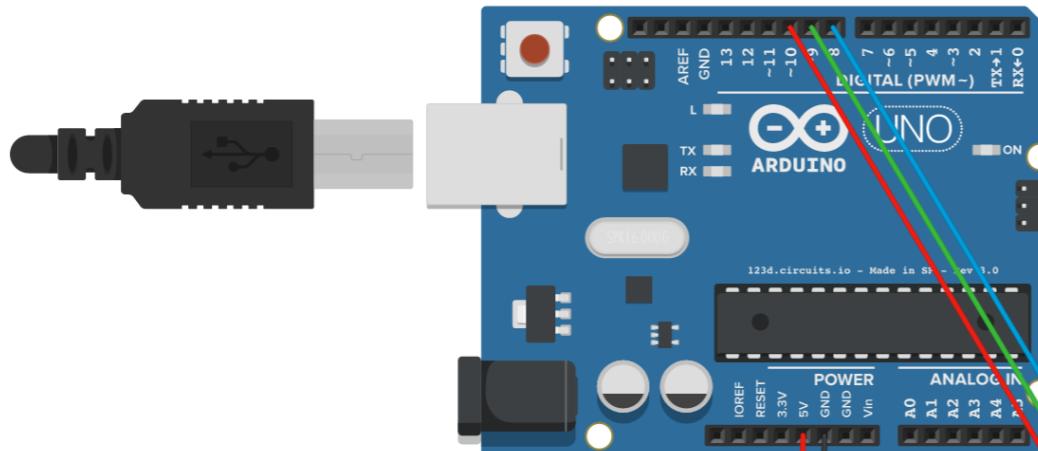
<https://123d.circuits.io/circuits/1663254-ws2-rgb-color>

AUTODESK 123D CIRCUITS ≡ 🔍 Search for designs, components or people + New 👤

WS2: RGB Color | Electronics Lab

Start Simulation Code Editor Edit Show more

Circuit Component Library Help



Resistor

Name kΩ

resistance kΩ



```
// WS3: RGB Color
// Made by Sudarshana Karkala
// License: CC-BY-SA 3.0
// Downloaded from: https://123d.circuits.io/circuits/1663254-ws2-rgb-color

// Output
int redPin = 10; // Red LED, connected to digital pin 10
int grnPin = 9; // Green LED, connected to digital pin 9
int bluPin = 8; // Blue LED, connected to digital pin 8

String val = "GRAY";

// Set up the LED outputs
void setup()
{
    Serial.begin(9600); // opens serial port, sets data rate to 9600 bps

    while(!Serial)
        ;
}

pinMode(redPin, OUTPUT); // sets the pins as output
pinMode(grnPin, OUTPUT);
pinMode(bluPin, OUTPUT);

}

void setRGBColor(int red, int green, int blue)
{
    analogWrite(redPin, red);
    analogWrite(grnPin, green);
    analogWrite(bluPin, blue);
}
```

```
// Main program: list the order of crossfades
void loop()
{
    if (Serial.available() > 0) {
        Serial.println("Light ON status: ");
    }
    val = Serial.readString();

    if(val.equalsIgnoreCase("RED")) {
        setRGBColor(255, 0, 0);
    }
    else if(val.equalsIgnoreCase("GREEN")) {
        setRGBColor(0, 255, 0);
    }
    else if(val.equalsIgnoreCase("BLUE")) {
        setRGBColor(0, 0, 255);
    }
    else if(val.equalsIgnoreCase("BLINK")) {
        int i = 0;
        while (i<10) {
            setRGBColor(255, 0, 0);
            delay(1000);
            setRGBColor(0, 255, 0);
            delay(1000);
            setRGBColor(0, 0, 255);
            delay(1000);
            i++;
        }
    }
    delay(1000);
}
```

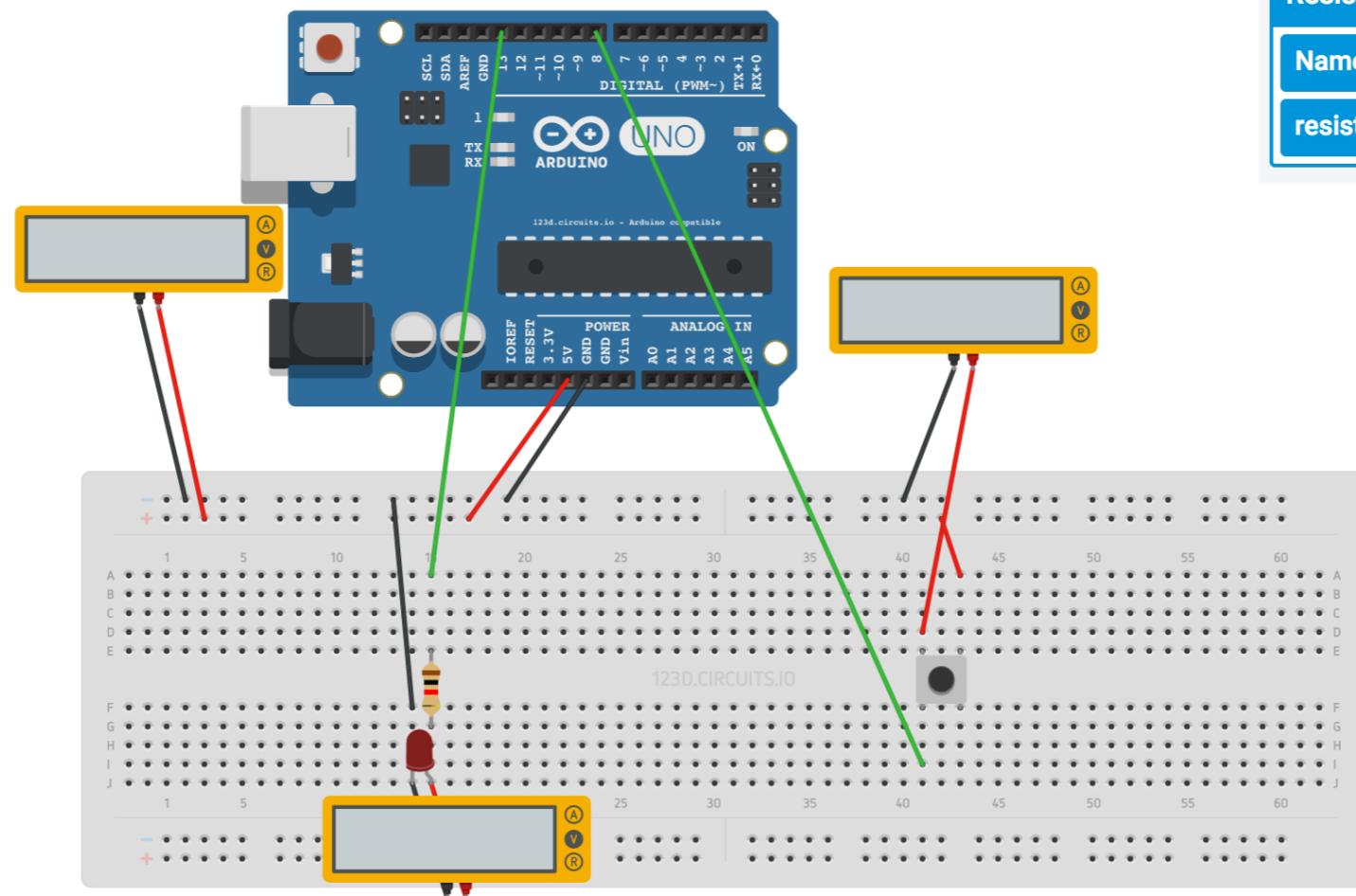
WS3: Push Button | Electronics Lab

Edit

Show more

 Start Simulation

 Code Editor



Name	1		
resistance	1	kΩ	↔



WS4-PushButton S

```
// -----
// / \ )__ / \ / __|_| - \__|_| / \_
// | | / | \ |) | | ( | | | / ( | | | | | | | | | | | |
// | / | | / | | | \ | | | | | | | | | | | | | | | | |
//
// WS4: Push Button
//
// Made by Sudarshana Karkala
// License: CC-BY-SA 3.0
// Downloaded from: https://123d.circuits.io/circuits/1638899-ws3-push-button
//
// Pin 13 has an LED connected on most Arduino boards.

int readAt = 8;
int writeAt = 13;

int val = LOW;

// the setup routine runs once when you press reset:
void setup() {
    // initialize the digital pin as an output.
    pinMode(writeAt, OUTPUT);
    pinMode(readAt, INPUT);
    digitalWrite(writeAt, val);

}

// the loop routine runs over and over again forever:
void loop() {
    val = digitalRead(readAt);
    digitalWrite(writeAt, val); // turn the LED on (HIGH is the voltage level)
}
```

|

Contact us

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+91 990 1966 341

Wireless-School.org
coming soon

“Thank You”

**“Education is the most powerful weapon
which you can use to change the world.”**

-Nelson Mandela