



Internet of Things Weather Station

IEEE Northern Virginia Section

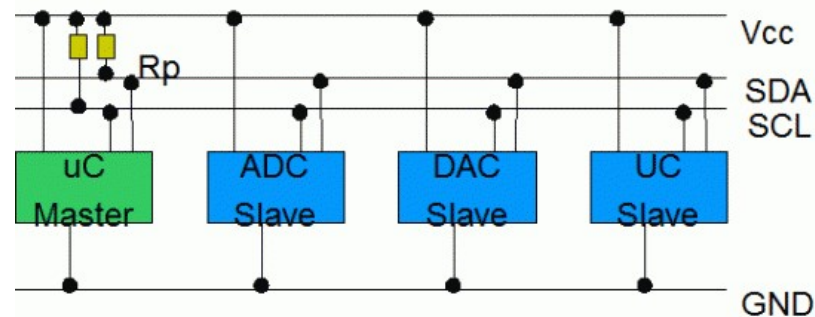
Hands-On Professional Development Series

June 4, 2016

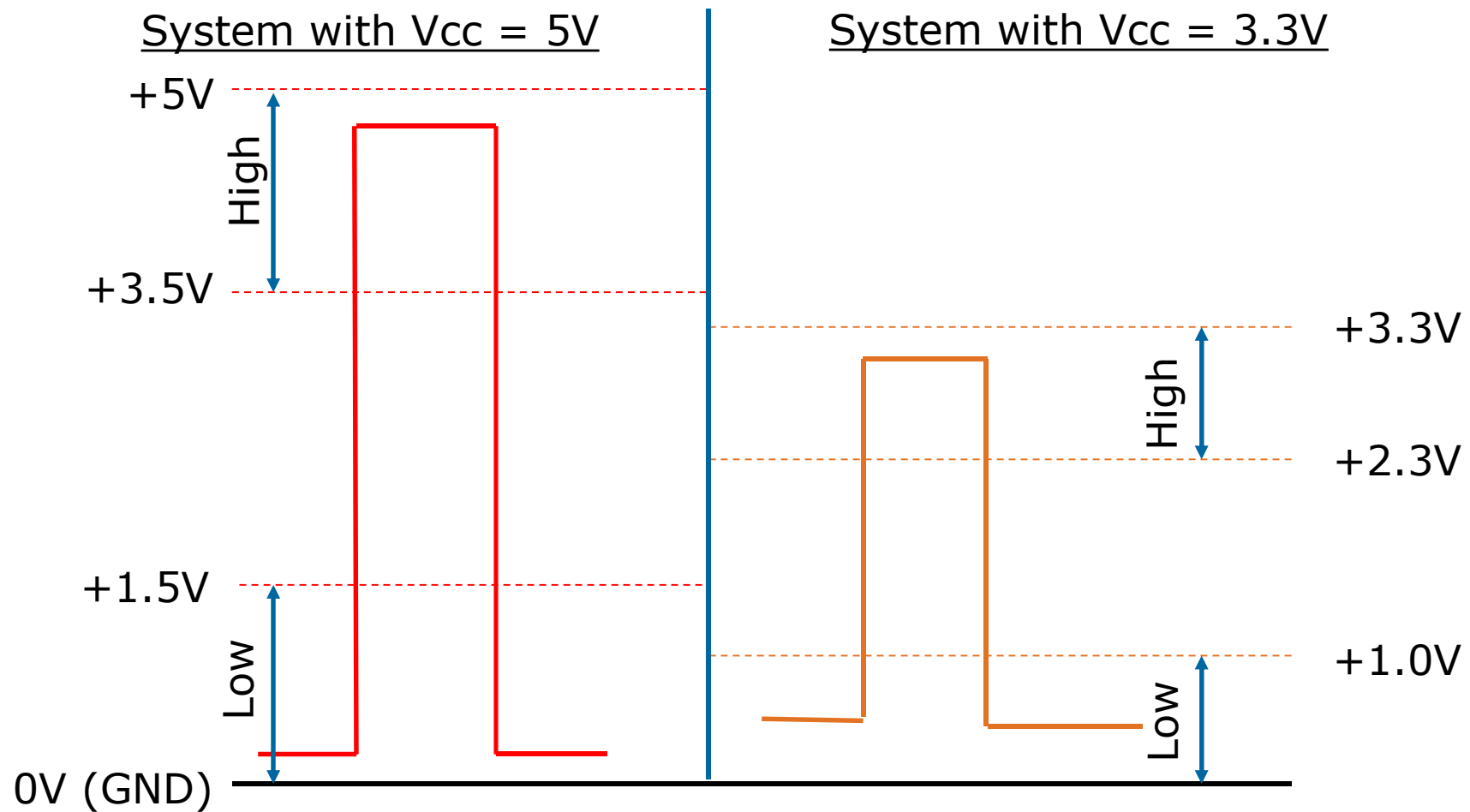
Sketch 02 – Hello World

Interface with the world

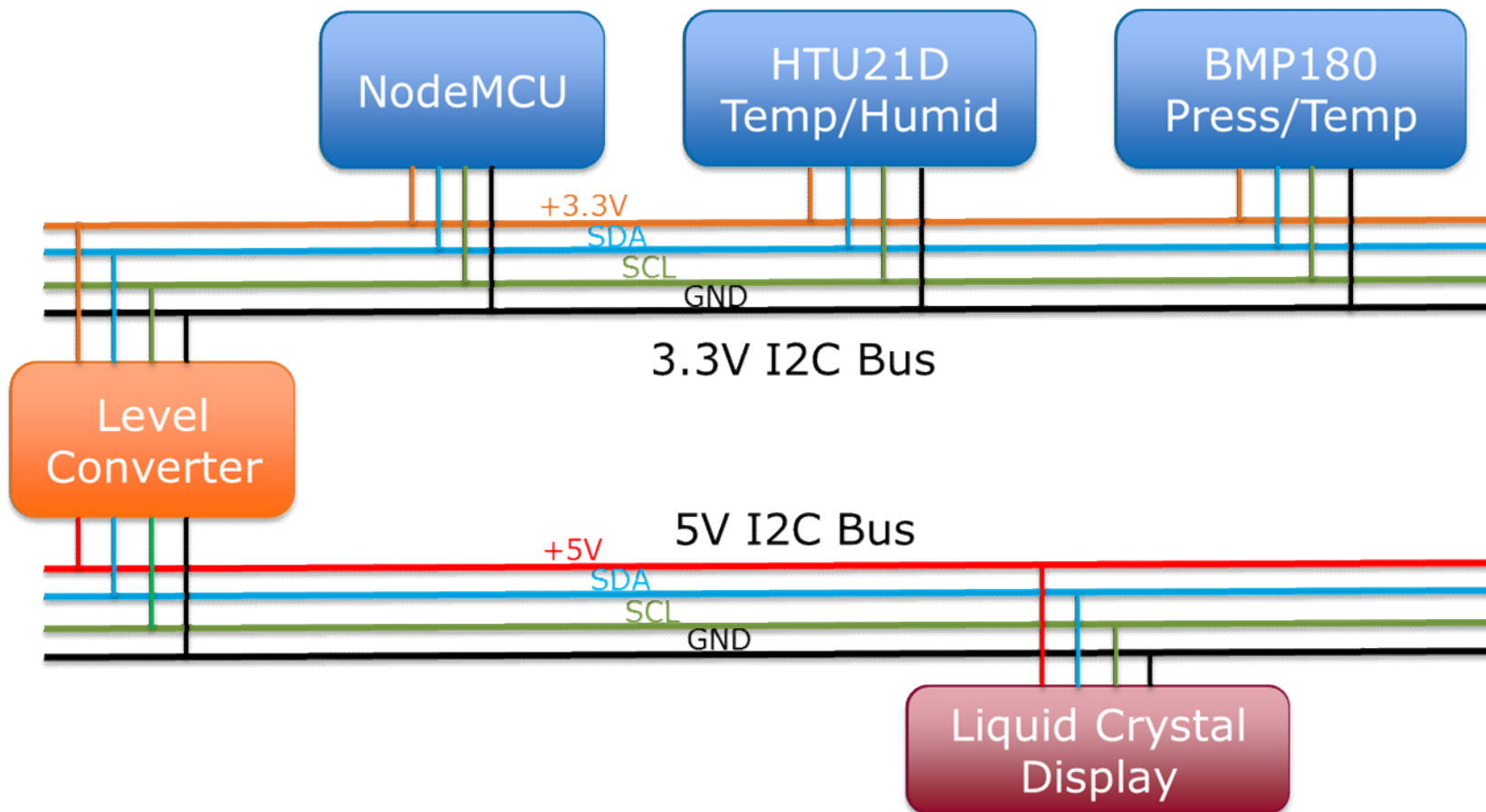
- Digital – Direct digital input or output HIGH or LOW
- Analog – Any signal that can be converted to a voltage
- Inter Integrated Circuit (I2C) – 2 wires + power and ground
 - Data is digital regardless of parameter being measured
 - Each device has unique address
 - Many components, sensors & small networks use I2C
 - Needs a “pullup” resistor on the SCL and SDA lines



I2C Signal Levels



Weather Station I2C Bus System

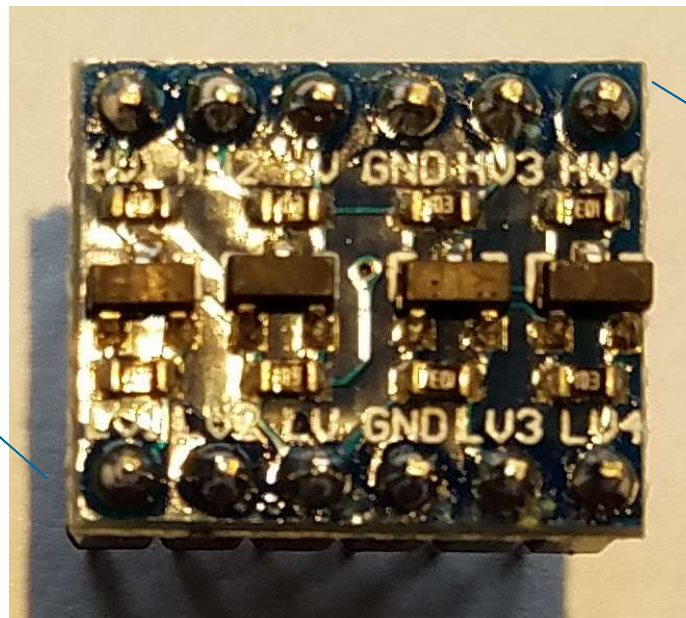


Level Shifter

4-Channel Bi-Directional Level Shifter

#1 #2 HV GND #3 #4

LV Side
(3.3Volts)



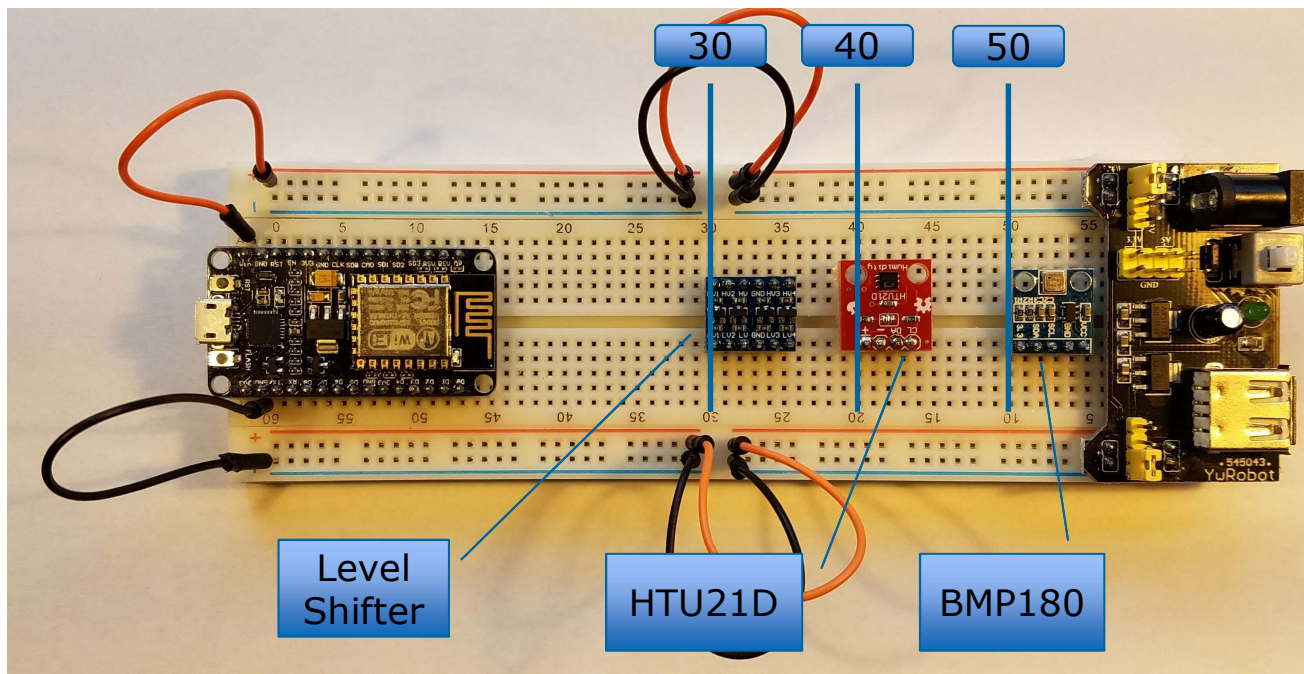
HV Side
(5 Volts)

#1 #2 LV GND #3 #4

Insert Components

1. Insert HTU21D with left pin (+) in column 40.
2. Insert BMP180 with left pin (3.3) in column 50.
3. Carefully insert photoresistor with one leg in column 25 and the other leg in +3.3V Rail.
4. Insert one leg of 4.7K resistor (Yellow, Blue, Red) into – Rail and the other leg into column 25.
5. Insert jumper from NodeMCU (AD0) column 13 to column 25. This jumper crosses the middle gap.

Parts Placement



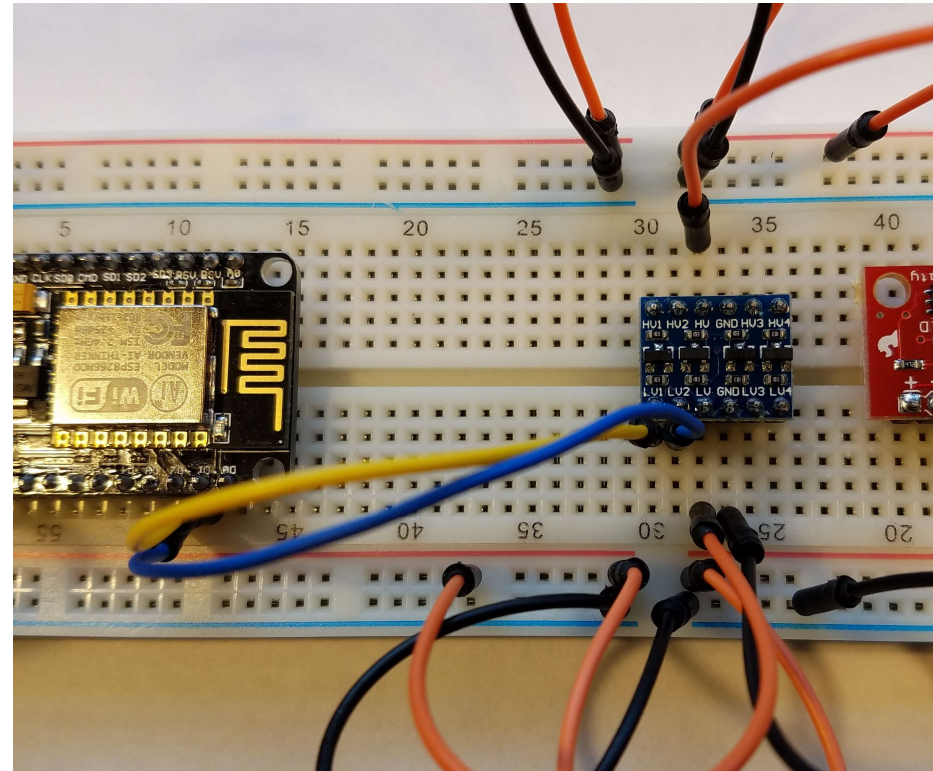
Connect the MCU to Level Shifter & LCD

1. Connect as follows:

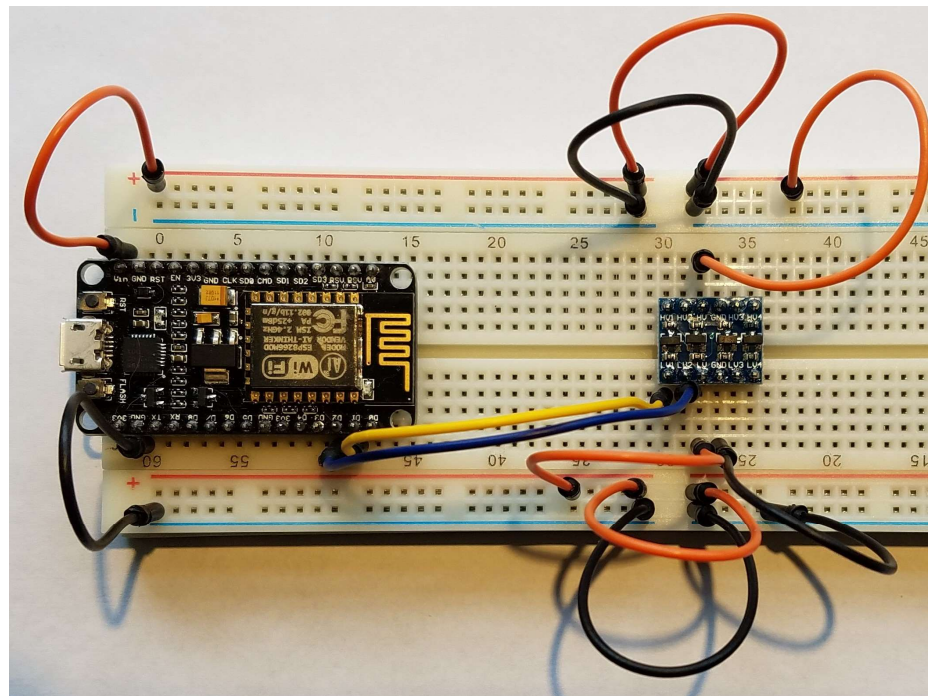
- **D1** (12) to **LV1** (30)
- **D2** (11) to **LV2** (31)
- **+3.3V** rail to **LV** (32)
- **- rail** to **GND** (33)
- **+5V** rail to **HV** (32 on top)

2. Use 4-wire ribbon to connect LCD to HV pins as follows:

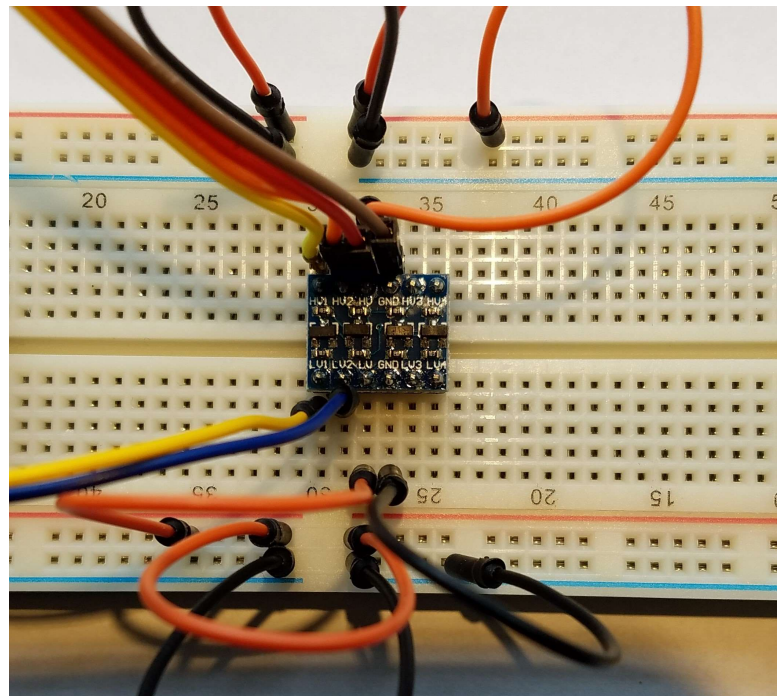
- **SCL** to **HV1** (30)
- **SDA** to **HV2** (31)
- **VCC** to **HV** (32)
- **GND** to **GND** (33)



NodeMCU to Level Shifter



Level Shifter to LCD



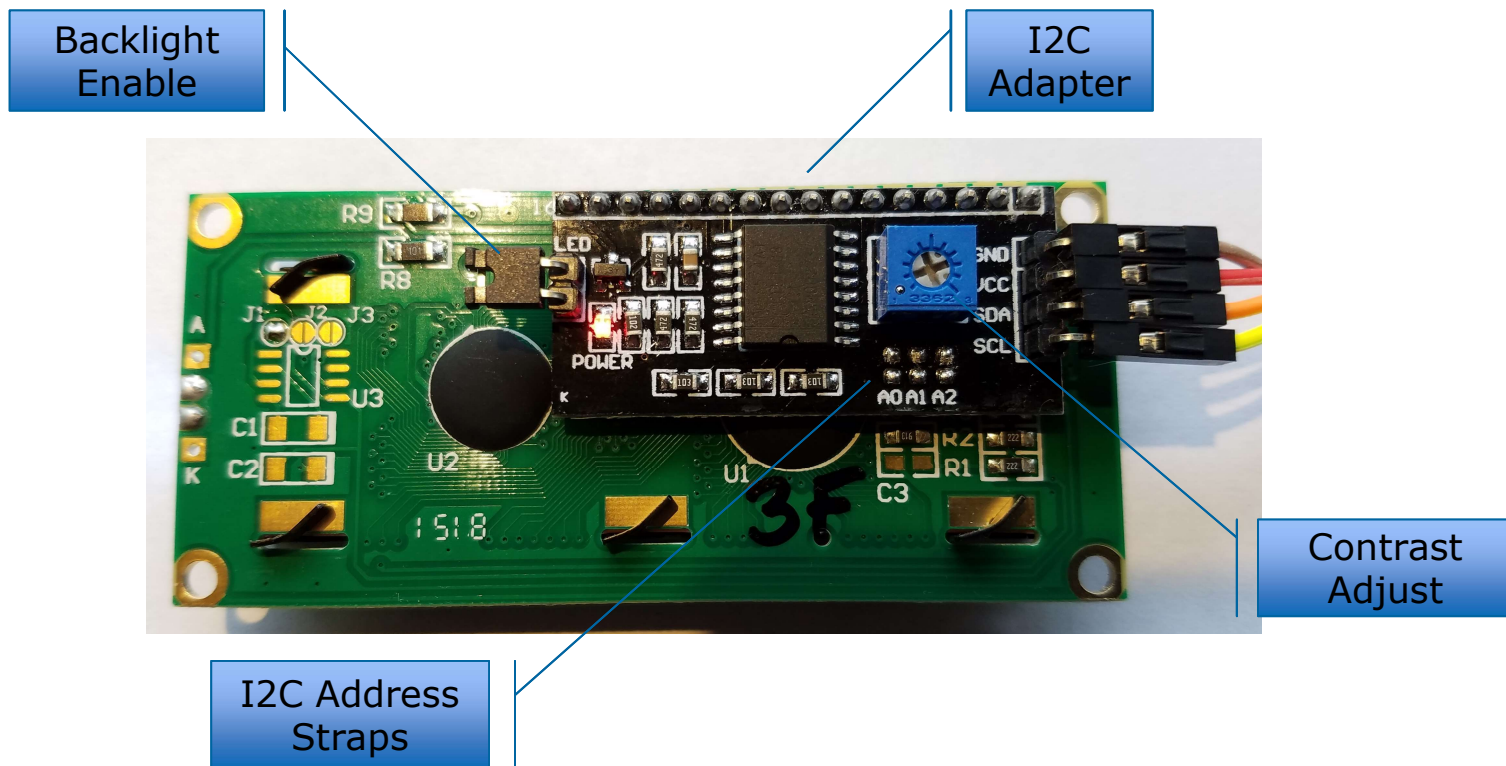
Install the LCD I2C library

- 1.Reconnect USB cable to NodeMCU
- 2.Run Arduino IDE
- 3.Open Sketch | Include Library | Add .ZIP Library
- 4.Navigate to Documents/Arduino
- 5.Click on:
Arduino-LiquidCrystal-I2C-library-master.zip
- 6.Click Open

Liquid Crystal Display

- Known as “1602” – 16 characters / 2 lines
- Strictly 5Volt device, 8-bit parallel interface
- Our units equipped with an I2C to parallel adapter
- Address defaults to 0x3F. (Sometimes!)
- Carefully adjust potentiometer for best contrast

LCD with I2C Adapter



IEEE_IoT_Sketch02_Hello_World

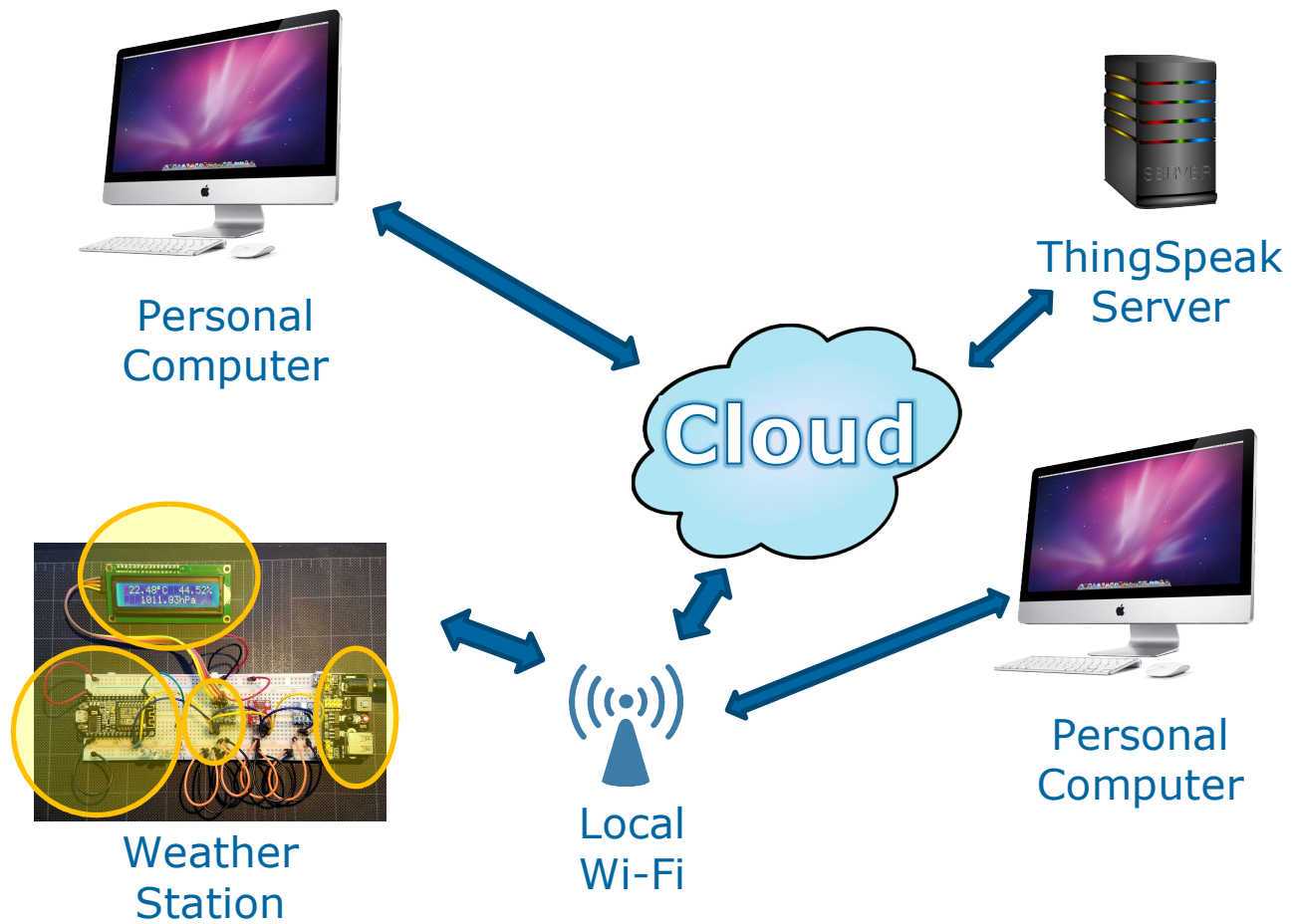
1. Open Arduino
2. File | Sketchbook | **IEEE_IoT_Sketch02_Hello_World**
3. Verify and Upload
4. View message on LCD
5. Adjust potentiometer if needed for contrast

Hello World

```
27 #include <Wire.h>           // I2C bus driver
28 #include <LiquidCrystal_I2C.h> // LCD display (I2C)
29
30 // ***** INSTANTIATE LCD *****
31 // usage: lcd(I2C address, number of characters per line, number of lines)
32 // use IEEE_IoT_I2C_scanner if address is not known
33
34 // usage LiquidCrystal_I2C object_name(I2C_address, columns, rows);
35 LiquidCrystal_I2C lcd(0x3f, 16, 2);
36
37 // ***** SETUP *****
38 void setup()
39 {
40     lcd.begin();           // initialize the lcd
41     lcd.backlight();       // turn on backlight
42     lcd.print("IEEE Northern VA"); // prints at (0, 0)
43     lcd.setCursor(2, 1);   // move to next line
44     lcd.print("Hello World"); // prints at second column
45 } //setup()
```

Accomplishments

- ▶ We now have a platform for a multitude of projects
- ▶ A Wi-Fi Enabled Processor
- ▶ Arduino-style C++ Coding
- ▶ Text-based Display
- ▶ Power Supply
- ▶ I2C Buses for 3.3V and 5V Systems



Questions?