App Inventor + IoT: Moisture Sensor

(with IoT Setup and Basic Connection tutorials completed)

This tutorial will help you get started with App Inventor + IoT and a moisture sensor on an Arduino 101 controller. We are also using a Seeed Grove shield for this tutorial. You do not need to use this board, but it does make things easier. The moisture sensor we recommend is the Grove moisture sensor.

Before you start, please complete the App Inventor + IoT Setup tutorial to set up your Arduino device.

- Connect the moisture sensor to the Grove board in the A2 pin connector.
- For this tutorial make sure **MOISTURE_SENSOR** is set to **ENABLED** and all others are set to **DISABLED.**
- You should also click the arrow button in the top left to upload the code.
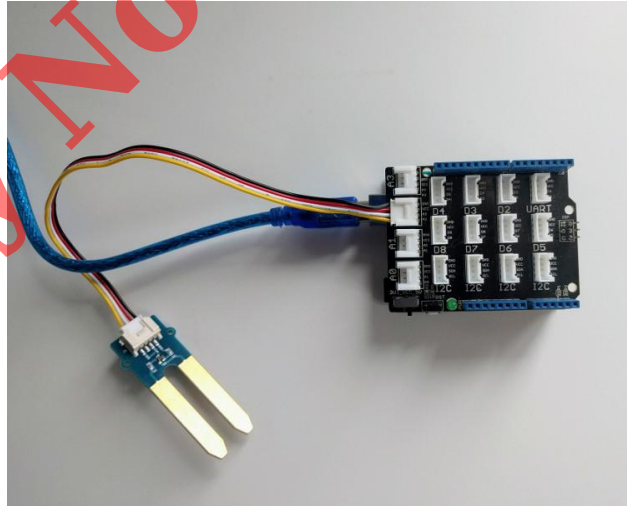
```
                    AIM-for-Things-Arduino101 | Arduino 1.8.1

 AIM-for-Things-Arduino101 §   Accelerometer.hh   Button.hh   Camera.hh   Console.hh   Fingerprint.hh   ▼ yros

  1 #define NAME              "App Inventor"    // no more than 11 characters
  2 #define DEBUGGING         ENABLED
  3
  4 #define ACCELEROMETER     DISABLED
  5 #define BUTTON            DISABLED
  6 #define CAMERA            DISABLED
  7 #define CONSOLE           DISABLED
  8 #define FINGERPRINT       DISABLED
  9 #define GYROSCOPE         DISABLED
 10 #define LED               DISABLED
 11 #define LIGHT_SENSOR      DISABLED
 12 #define MOISTURE_SENSOR   ENABLED
 13 #define PINS              DISABLED
 14 #define PROXIMITY         DISABLED
 15 #define PWM               DISABLED
 16 #define RGBLCD            DISABLED
 17 #define SERVO             DISABLED
 18 #define SOUND_RECORDER    DISABLED
 19 #define TEMPERATURE       DISABLED
 20
 21 // frequency to read sensor values in µs
 22 const unsigned long SENSOR_UPDATE_FREQ = 50000;
 23 const unsigned long IMU_READ_FREQ = 5000;
 24 const double IMU_FILTER_ALPHA = 0.5; //Alpha for accelerometer low pass filter
 25
 26 unsigned long nextSensorUpdate;
 27 unsigned long nextIMURead;
 28 double dt;
 29
 30 const uint8_t BITS[8] = { 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80 };
 31 const uint8_t MASK[8] = { 0xFE, 0xFD, 0xFB, 0xF7, 0xEF, 0xDF, 0xBF, 0x7F };
 32
 33 #include "common.h"
```

Next, you should complete the App Inventor + IoT Basic Connection tutorial to make a basic connection to the Arduino device. If you prefer, you can download the completed .aia file here.

The remaining steps all build off of the the starter code for Basic Connection tutorial and .aia:
- Drag a **Label** from the User Interface Palette and drop it between **LabelStatus** and **ListBLE**
  - Rename the **Label** "LabelData".
  - Change its text to "Data: ".
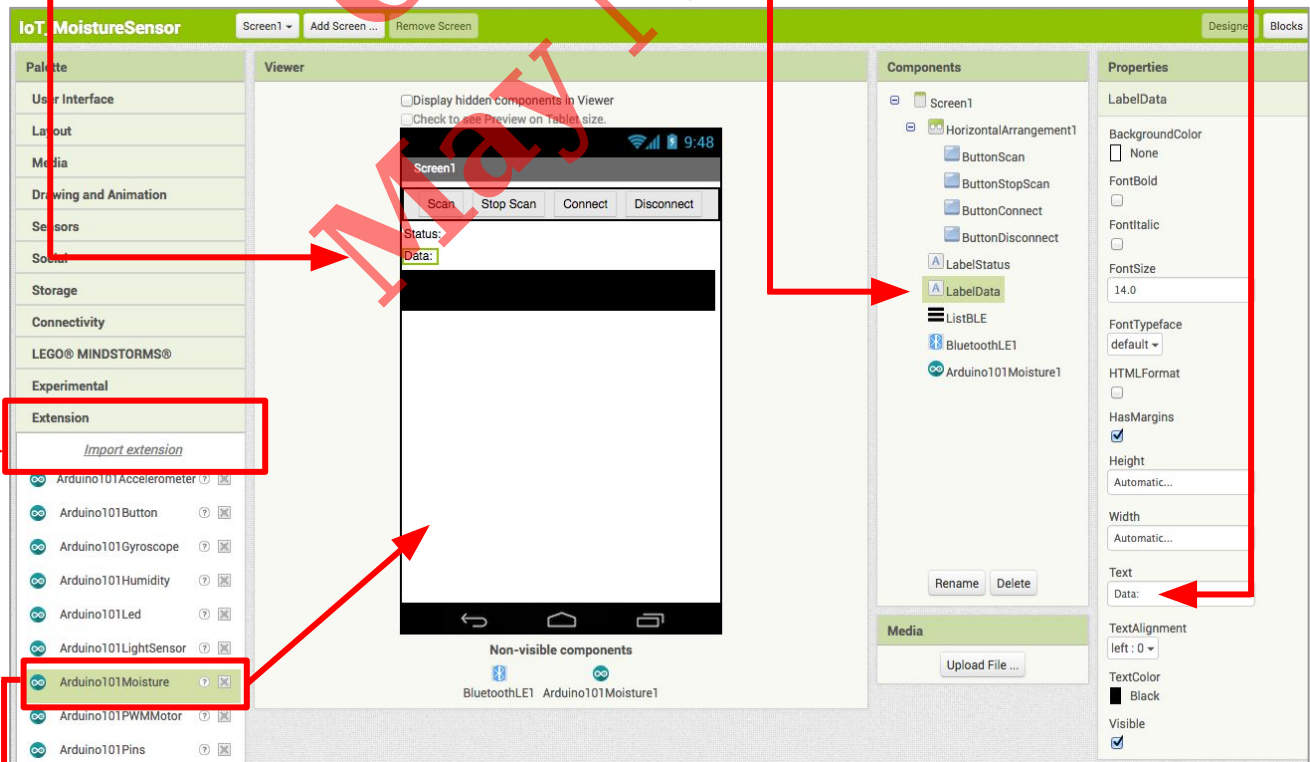
- In the Palette window, click on Extension at the bottom and then on "Import extension" and click on "URL".
  - Paste in this URL:
    http://iot.appinventor.mit.edu/assets/resources/edu.mit.appinventor.iot.arduino101.aix
- Add the **Arduino101Moisture** extension to your app by dragging it onto the Viewer.

Next, we need to let App Inventor know which pin on the Grove board the moisture sensor is connected to.

- Click on **Ardunio101Moisture1** in the Components pane.
- In the Properties pane under **BluetoothDevice**, select "BluetoothLE1".
- In the Properties pane under **Pin**, write in the <u>analog</u> pin that matches the one the moisture sensor is plugged into on the Grove board. (in this case A2)
  - *Note: You only need to put the number (2), not the letter "A".*
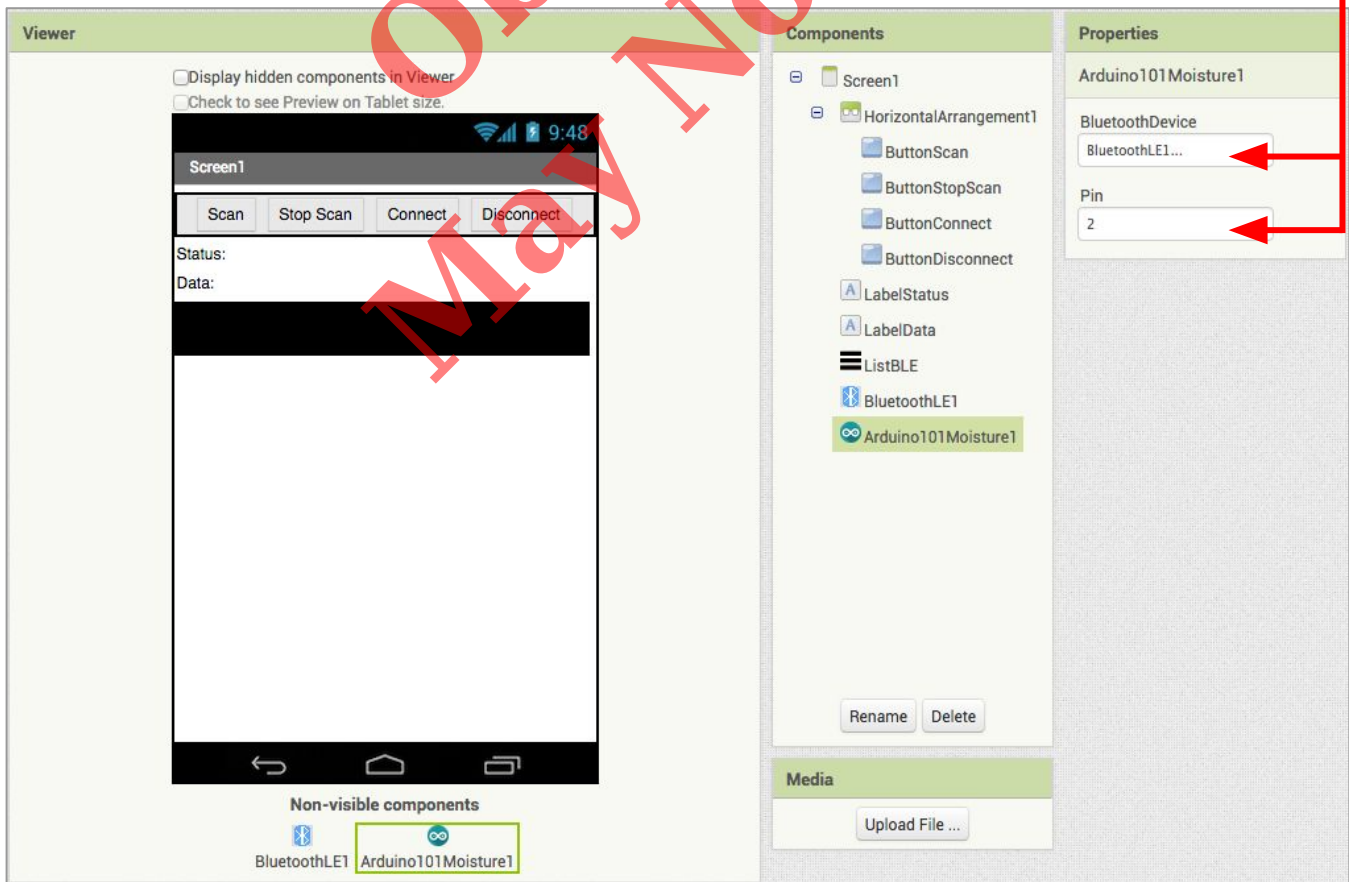
Now switch to the Blocks Editor view

We want to set up data updates when the sensor value on the Arduino changes.
- from the Arduino101Moisture1 drawer in the Blocks pane, add
  call Arduino101Moisture1.RequestMoistureUpdates to the existing
  when BluetoothLE1.Connected block you made in the Basic Connection
 tutorial.

Next we need to store the data we receive from the sensor. From the Variables
drawer in the Blocks pane, drag an **initialize global name to** block and name it
"moisture". From the Math drawer add a number block and set it to "0". We'll use
this to keep track of the sensor value.

Let's make a new procedure to display the current readings in the **LabelData**
when we get new data. You can create a procedure by dragging out a purple
procedure block from the Procedures drawer in the Blocks pane. Let's rename it
updateDataLabel.
- from LabelData in the Blocks pane, add **set LabelData.Text to.**
- from the Text drawer connect a **join** block.
  - From the Text drawer, connect a text block and type
    "Moisture: ".
  - From the Variables drawer connect a **get global moisture.**
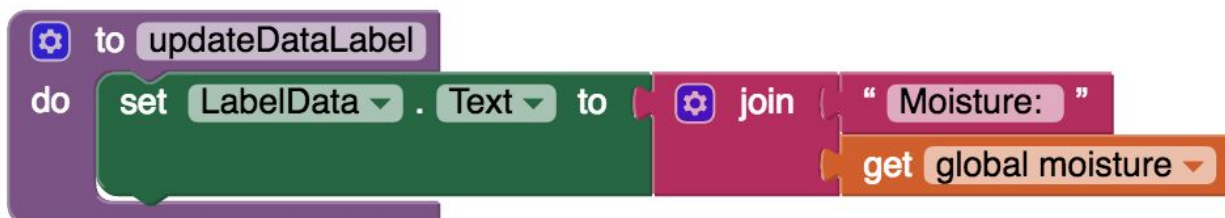
Finally, we need to call the procedure when this data is received.
- From the Arduino101Moisture1 drawer in the Blocks pane, drag in **when Ardunio101Moisture1.MoistureDataReceived'**
  - from the Variables drawer, add **set global moisture.**
  - Hover over the orange "moisture" in **.MoistureReceived** to see the **get moisture** block. Drag the **get moisture** block from this window and snap to **set global moisture.**
  - from the Procedures drawer, add **call updateDataLabel.**
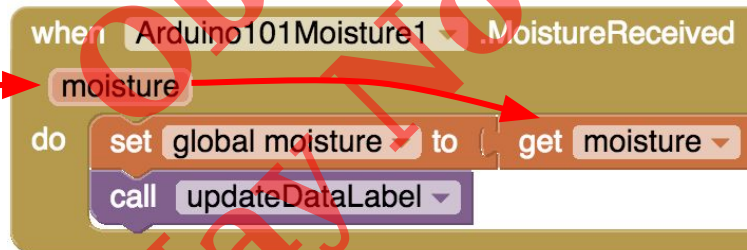
Your app should now be working! Connect your Arduino device using the MIT AI2 Companion (if you haven't already). Test it out by getting the moisture sensor wet (but not up to the wires). If it is working you should see the data label change.