App Inventor + IoT: Proximity Sensor

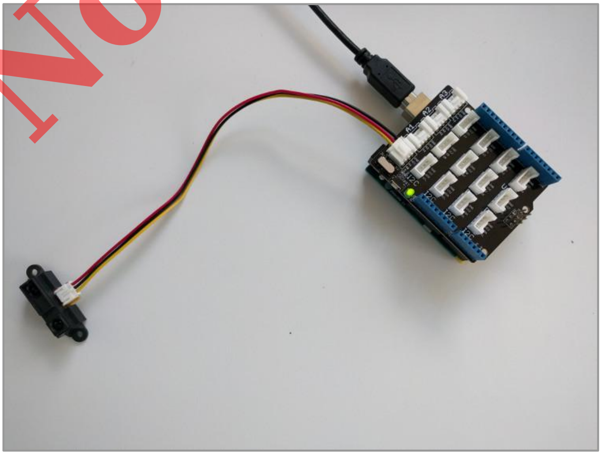
20 min

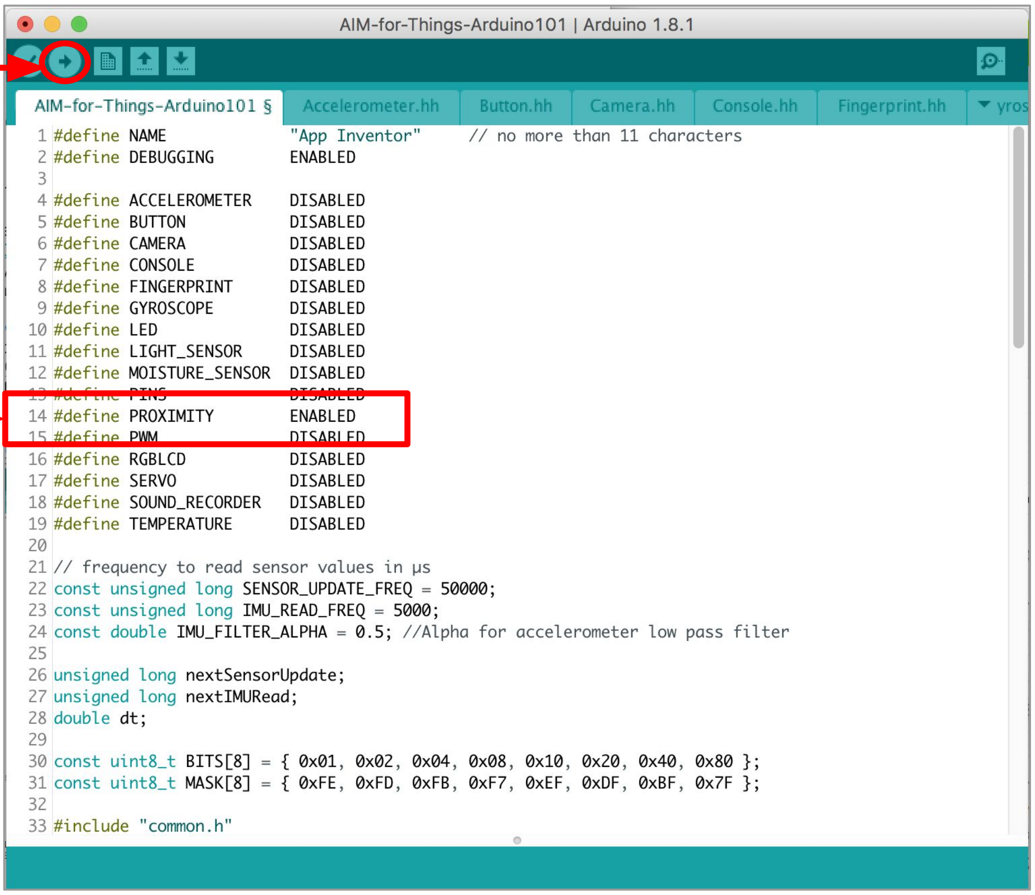
(with IoT Setup and Basic Connection tutorials completed)

This tutorial will help you get started with App Inventor + IoT and a proximity 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 proximity sensor we recommend is the Grove Infrared Proximity Sensor.

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

- Connect the proximity sensor to the Grove board in the A0 pin connector.
- For this tutorial make sure **PROXIMITY** 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.



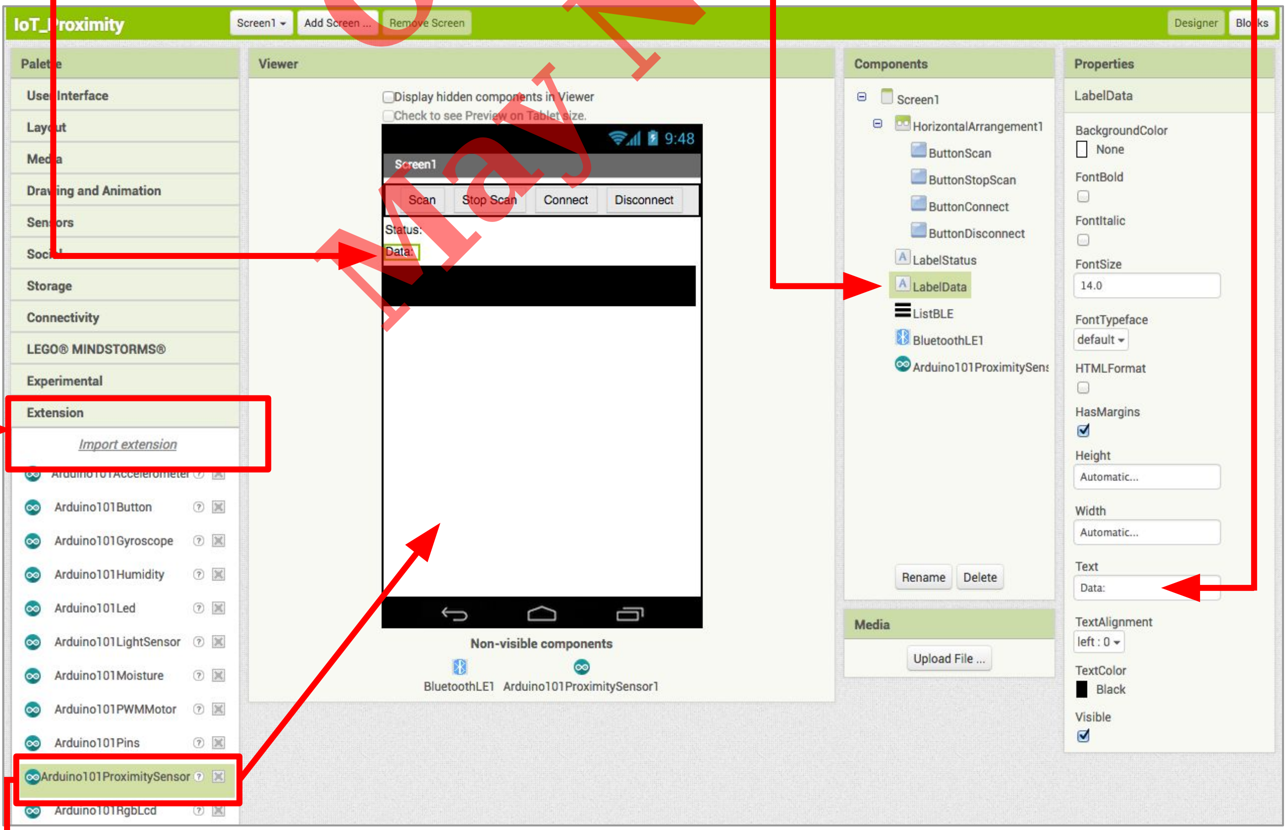

AIM-for-Things-Arduino101 | Arduino 1.8.1
AIM-for-Things-Arduino101 §
Accelerometer.hh
Button.hh
Camera.hh
Console.hh
Fingerprint.hh
yros

```
#define NAME              "App Inventor"     // no more than 11 characters
#define DEBUGGING         ENABLED

#define ACCELEROMETER     DISABLED
#define BUTTON            DISABLED
#define CAMERA            DISABLED
#define CONSOLE           DISABLED
#define FINGERPRINT       DISABLED
#define GYROSCOPE         DISABLED
#define LED               DISABLED
#define LIGHT_SENSOR      DISABLED
#define MOISTURE_SENSOR   DISABLED
#define PINS              DISABLED
#define PROXIMITY         ENABLED
#define PWM               DISABLED
#define RGBLCD            DISABLED
#define SERVO             DISABLED
#define SOUND_RECORDER    DISABLED
#define TEMPERATURE       DISABLED

// frequency to read sensor values in µs
const unsigned long SENSOR_UPDATE_FREQ = 50000;
const unsigned long IMU_READ_FREQ = 5000;
const double IMU_FILTER_ALPHA = 0.5; //Alpha for accelerometer low pass filter

unsigned long nextSensorUpdate;
unsigned long nextIMURead;
double dt;

const uint8_t BITS[8] = { 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80 };
const uint8_t MASK[8] = { 0xFE, 0xFD, 0xFB, 0xF7, 0xEF, 0xDF, 0xBF, 0x7F };

#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: ".



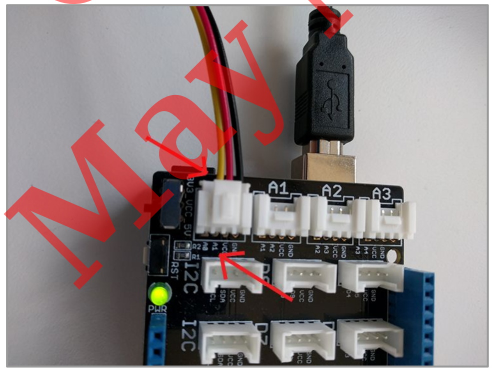
LabelData

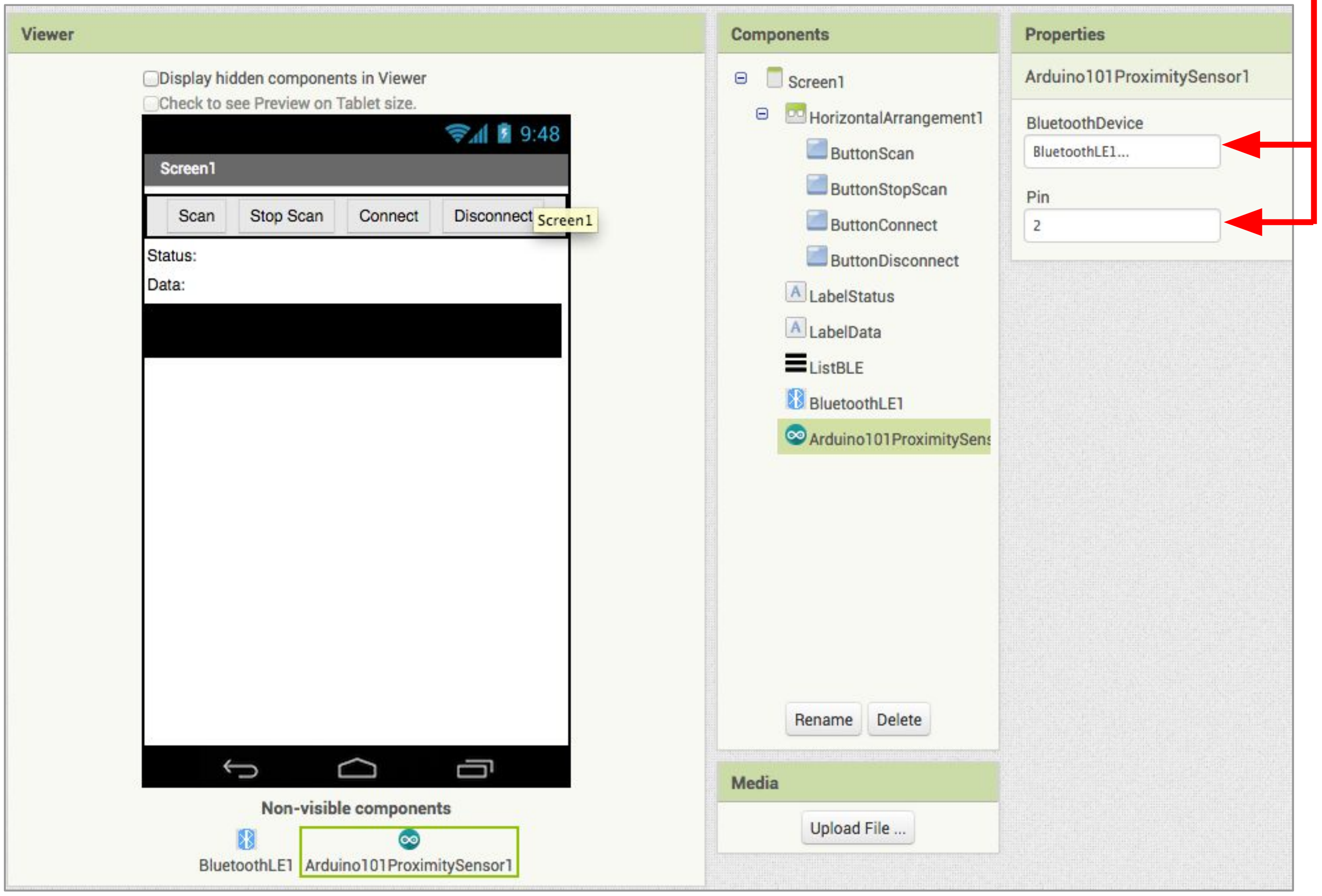
BackgroundColor: None
FontBold: ☐
FontItalic: ☐
FontSize: 14.0
FontTypeface: default
HTMLFormat: ☐
HasMargins: ✓
Height: Automatic...
Width: Automatic...
Text: Data:
TextAlignment: left : 0
TextColor: Black
Visible: ✓

- 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 **Arduino101ProximitySensor** 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 proximity sensor is connected to.

- Click on **Ardunio101ProximitySensor1** in the Components pane.
- In the Properties pane under **Pin**, write in the analog pin that matches the one the proximity sensor is plugged into on the Grove board, (in this case A0).
  - *Note: You only need to put the number (0), not the letter "A".*
  - *Another note: If your sensor wires look like the picture below, note that the yellow wire goes to the A1 pin, not A0 as you would think. Therefore, you should type the number 1 into the **Pin** property setting, not 0.*





Arduino101ProximitySensor1

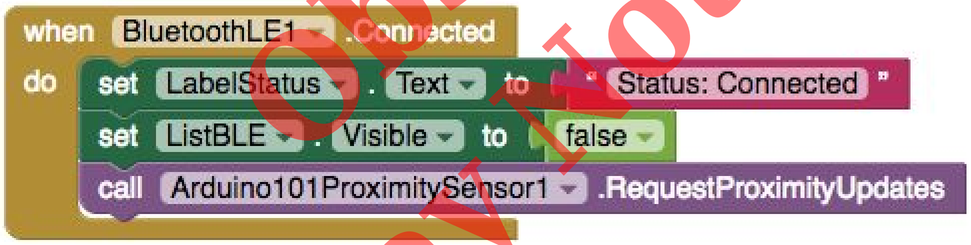
BluetoothDevice: BluetoothLE1...

Pin: 2

Now switch to the Blocks Editor view

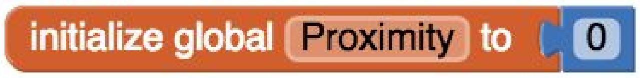
First, we want to request data updates when the sensor value on the Arduino changes.

- from the Arduino101ProximitySensor1 drawer in the Blocks pane, add **call Arduino101ProximitySensor1.RequestProximityUpdates** to the existing **when BluetoothLE1.Connected** block you made in the Basic Connection tutorial.



```
when BluetoothLE1 .Connected
do  set LabelStatus . Text to " Status: Connected "
    set ListBLE . Visible to false
    call Arduino101ProximitySensor1 .RequestProximityUpdates
```

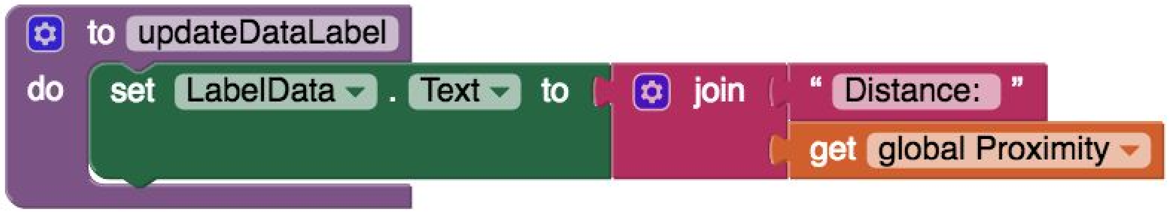
Next, we need to store the data we receive from the sensor. From the Variables drawer in the docs pane, drag an **initialize global name to** block and name it "Proximity". From the Math drawer add a number block and set it to "0". We'll use this to keep track of the sensor value.



```
initialize global Proximity to 0
```

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.**

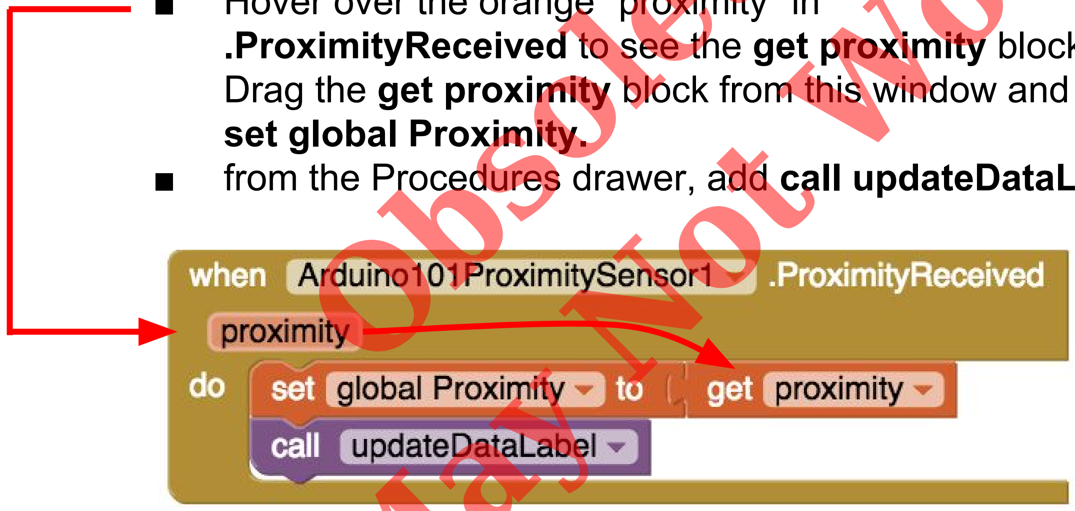
- from LabelData in the Blocks pane, add **set LabelData.Text to.**
- from the Text drawer connect a **join** block.
  - From the Text drawer, connect a text block and type **"Distance: ".**
  - From the Variables drawer connect a **get global Proximity.**



```
to updateDataLabel
do  set LabelData . Text to join " Distance: "
                                 get global Proximity
```

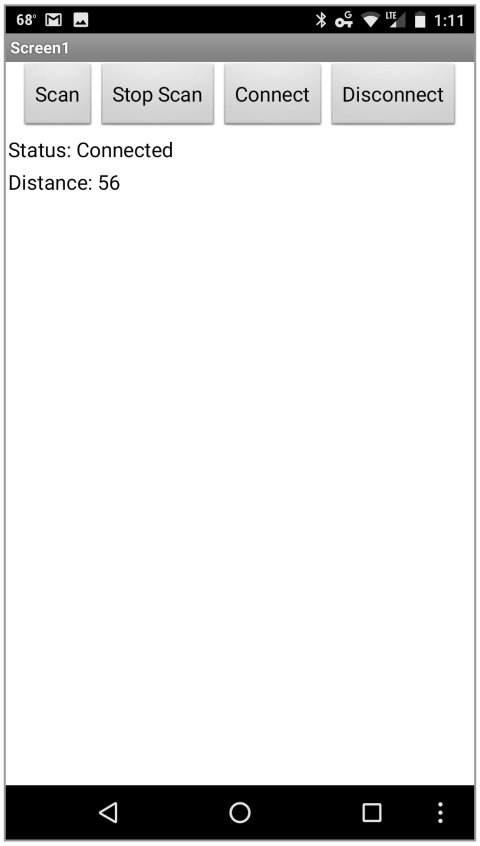
Finally, we need to call the procedure when this data is received.

- From Arduino101ProximitySensor1 drag **when Ardunio101ProximitySensor1.ProximitySensorDataReceived.**
  - from the Variables drawer, add **set global light.**
    - Hover over the orange "proximity" in **.ProximityReceived** to see the **get proximity** block. Drag the **get proximity** block from this window and snap to **set global Proximity.**
    - from the Procedures drawer, add **call updateDataLabel.**



```
when Arduino101ProximitySensor1 .ProximityReceived
  proximity
do  set global Proximity to  get proximity
    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 moving your hand closer and farther away from the sensor. If it is working, you should see the data label change.



Status: Connected
Distance: 56