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RECIPE



EdProsser

(<https://developer.ibm.com/recipes/author/edward-prosser/>)

ARM® mbed™ IoT Starter Kit (Part 1)

Connect an ARM mbed IoT starter kit to the Internet of Things Foundation, visualize the data in real time, and create an application.

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Requirements

ARM mbed Ethernet Starter Kit

(<http://developer.mbed.org/platforms/IBMEthernetKit/>) containing:

Recipe Palette
• Temperature Sensor (LM75B)

- Accelerometer (MMA7660)
- Potentiometer
- Joystick

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Author has not specified

Prepare



Getting your device ready.

1. Plug your boards together as shown on the quick start guide supplied with the kit.
2. Connect to a network with internet access using an Ethernet cable.
3. Connect to your computer using a USB cable supplied, using the connector on the board, as shown on the quick start guide.
4. The microcontroller appears as a drive on your computer names mbed.

Connecting to Internet of Things Foundation Quickstart Service



To connect your device to the Internet of Things Foundation Quickstart Service, you don't need to have signed up the IoT Foundation. The program is already present on the device so when you connect the platform to your computer, the device will automatically run in Quickstart mode.

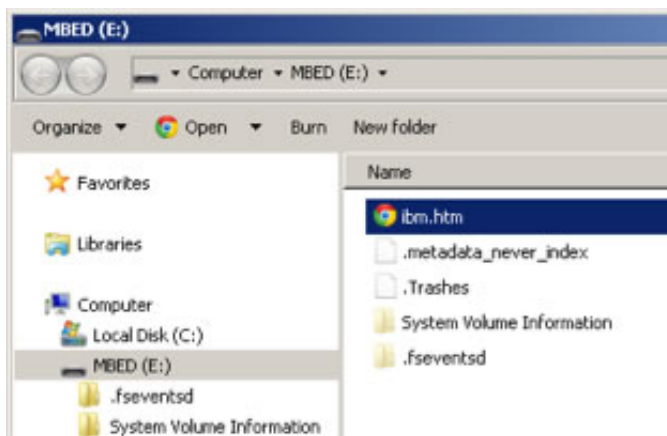
1. When you plug in your device, the connection light (picture) will initially glow yellow, while the connection is established, then turn green when the connection has been made.



Visualizing your data

After connecting your device to the Quickstart, the next step is visualizing your data. Real-time visualization of device data can be achieved by visiting the IBM IoT Foundation web page specific to your platform.

1. Open the **IBM.HTM** file on the mbed disk. This will redirect you automatically to the data feed visualization for your board.



2. Alternatively, to view the data from any other device, simple enter the Device ID (a twelve character string) in the box here (<https://quickstart.internetofthings.ibmcloud.com/?deviceId=#/>) and click Go to visualize your data. The Device ID can be found by scrolling down on the LCD screen using the joystick button on the board.

Creating an application to process device data

Using Bluemix, you can create an application to handle the data from your ARM mbed.

1. Go to IBM Bluemix (https://bluemix.net/?cm_mmc=developerWorks-_-dWdevcenter-_-recipes-_-lp).
 - *Note: If you are an existing IBM Bluemix user, simply log in as normal. If you are new to Bluemix, you can sign up for a free 30 day trial (<https://apps.admin.ibmcloud.com/manage/trial/bluemix.html>). (Unfortunately you will need now to wait for the Bluemix trial account confirmation email before continuing.)*
2. Select the Internet of Things Foundation Starter Boilerplate by click here (https://console.ng.bluemix.net/?ace_base=true%2F&cm_mmc=developerWorks-_-dWdevcenter-_-recipes-_-lp#/store/cloudOEPanels=store&appTemplateGuid=iot-template&fromCatalog=true) **or** by completing the following steps from you Bluemix dashboard (https://console.ng.bluemix.net/?ace_base=true%2F&cm_mmc=developerWorks-_-dWdevcenter-_-recipes-_-lp#/resources).
 - Under 'Cloud Foundry Apps' click Create App.
 - Select Web.
 - Click 'Browse Boilerplates'.
 - Select the Internet of Things Foundation Starter.
 - Type a name for your app.
 - **Optionally**, you can modify the host name, if left unmodified your application host will be your application name.
 - Click the Create button.
 - After a short wait, your application will start, the URL provided won't work until your application has been successfully staged, so be sure to wait until this process has finished.
3. Once your application starts, click the application URL to open the Node-RED Internet of Things landing page. This is displayed as a Routes URL on your dashboard.
4. On the Node-RED Internet of Things landing page, click **Go to your Node-RED flow editor** button to see your application flow.

Linking your Application and Device



Using your Node-RED work flow editor, you can configure your application to work with your connected device.

1. Double click the **IBM IoT App In** node in your Node-RED flow editor.
2. In the Authentication Type field, select Quickstart from the dropdown list.
3. Enter the Device ID of your board in the Device ID field.
 - *The Device ID of your board can be found by scrolling down on the LCD screen using the joystick button on a connected board.*
 - *Alternatively, the device ID of your connected mbed can be derived from the MAC address. Copy the MAC address from the visualization page, and remove the colons and make sure the letters are lowercase. For example: 01:23:45:67:89:AB becomes 0123456789ab.*
4. Click the Deploy button in the upper right of the Node-RED editor to deploy the changes to your flow.
5. Select the debug pane on the right, you should see raw data from the sensors on your connected device. The flow should be generating Temperature Status messages. If you hold your device in your hand you should see the temperature rise.
 - *Note: If you can't see both of these messages (the raw data and the temperature status messages), check that the switch on the right of both debug nodes is on.*

Your Node-RED application is now processing all data from your device and generating temperature status messages using data generated by your device.

Modifying your application

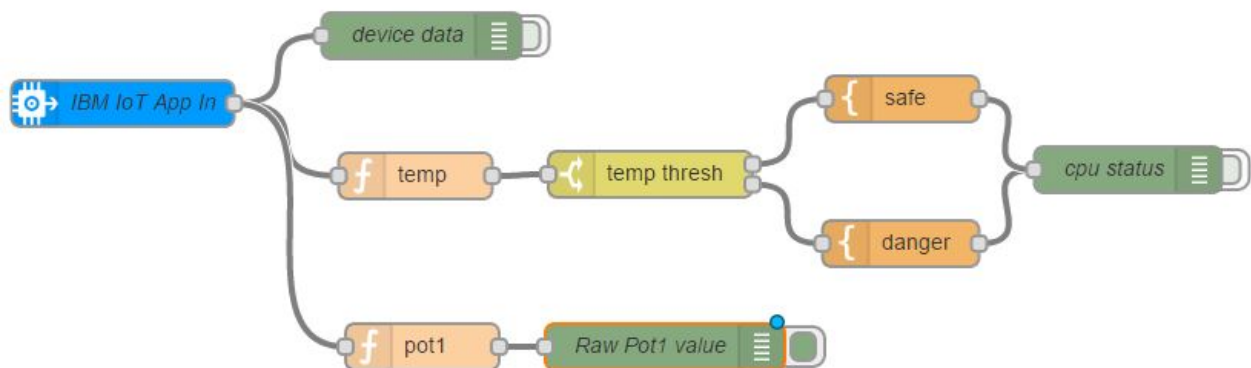


Using your Node-RED work flow editor, you can modify how your application works with your connected device. These steps will demonstrate how to change the temperature threshold values for the existing flow, and how to create a subflow which extracts the data from the potentiometer1 sensor on your connected mbed device.

1. Double click the **temp thresh** node in your Node-RED flow editor. This contains the rules that are used to determine whether the temperature is in 'safe' limits or not in the status messages. You can modify the behaviour of the flow by:
 - Changing the rules in the node, e.g. changing the threshold.
 - Click **OK**.

- Click **Deploy** to change the running instance of your application.
2. In order to create a new subflow that extracts the reading from the potentiometer1 sensor:
- Drag a **Function** node from the function section of the node palette on the left and drop it on the sheet near the **IBM IoT App In** node.
 - Click and drag the output connector of the **IBM IoT App In** node to the input of the **Function** node to create a connection between them.
 - Double click the **Function** node to open the javascript editor. Replace the existing code with the following to extract the value of potentiometer1:
- ```
return {payload:msg.payload.d.potentiometer1};
```
- Rename the node “pot1”.
  - Select **OK**.
  - Drag a **Debug** node from the output nodes palette. Connect the output of your “Pot1” node to the input of the **Debug** node and click **Deploy**.
  - The value of the potentiometer1 sensor should now appear in the debug pane. Twisting the potentiometer on the device will cause the value to change in near real time.
  - *Note: potentiometer1 is the bottom left potentiometer when the device is viewed with the ethernet cable at the top.*

Your flow should look similar to the following diagram.



## Ready to go further?



Now that you have connected your device to Quickstart and created your first application, go to **Part 2 of this recipe** (/iot/recipes/arm-starter-kit-part-2/) for details of how to register your device into a private Internet of Things Foundation

organisation and start sending commands to it.

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