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RECIPE



EdProsser

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ARM® mbed™ IoT Starter Kit (Part 2)

Connect your ARM mbed device and application to the IBM Bluemix Service, and send commands to your device from your application.

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Requirements

Before going through this recipe, you must have completed the steps in Part 1 of the ARM mbed IoT Starter Kit recipe. Find Part 1 here. (</remix/tutorials/arm-mbed-iot-starter-kit-part-1/>)

Recipe Palette

Skill level

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Adding the Internet of Things Foundation Bluemix Service to your application

Adding the Internet of Things Foundation Bluemix Service to your application creates a private Internet of Things Foundation organization that you can register your device to.

1. Select the Internet of Things service by clicking here (https://console.ng.bluemix.net/?ace_base=true%2F&cm_mmc=developerWorks-_dWdevcenter-_-recipes-_-lp#/store) OR by completing the following steps from your Bluemix dashboard:
 - Under 'Services & APIs', click 'Use Services or APIs'.
 - In the 'Internet of Things' section, select the Internet of Things Service.
2. Finish adding the service by completing the following steps:
 - Select the application you want to bind this service to.
 - **Optionally** modify the service name.
 - Click the **Create** button.
 - Select to **Restage** your application when prompted.
3. Under Services, select the Internet of Things service which has been created, this will take you to the Internet of Things Foundation Service dashboard.
4. Select the **Launch dashboard** button to access your Internet of Things Foundation organisation where you can add your device.

Adding your device to your Internet of Things Foundation Organization



From the Internet of Things Foundation service dashboard, access your IoT Foundation organisation and add your device to it.

1. Select the **Devices** tab.
2. Select **Add Device**.
3. Enter a device type.
4. Enter a device ID.
 - The device ID can be found by scrolling down on the LCD screen using the joystick button on a connected board. Alternatively, the device ID can be derived from your board's MAC address. Copy this from the Quickstart visualization page. Then remove all colons and make sure all letters are lowercase (ex. 01:23:45:67:89:AB becomes 0123456789ab)
5. During the next step of the device registration process you will get file configuration information containing the following details, copy these when you get them as you will need them in the next steps.
 - Organization ID
 - Device Type
 - Device ID
 - Authentication Method
 - Authentication Token

Adding registration credentials onto the device

When you added your device to your Internet of Things Foundation organization you were given device credentials. Your device will not send data to your organization until you add these credentials. You will add these using the mbed development environment.

1. To get the registration credentials onto your device, navigate to the IBMIoTClientEthernetExample (https://developer.mbed.org/teams/IBM_IoT/code/IBMIoTClientEthernetExample/) code repository.
2. Click 'Import this program' on the right. It will import the program into the online compiler, you will need to sign in, or create an account.
3. Expand the IBMIoTClientEthernetExample project and open the main .cpp file. Add the configuration details you were given when adding the device to your

Internet of Things Foundation service organization. The configuration details must be added using the following format:

```
// Configuration values needed to connect to IBM IoT Foundation #define ORG "quick start" // For a registered connection, replace with your org ID #define ID "" // For a registered connection, replace with your device id #define AUTH_TOKEN "" // For a registered connection, replace with your auth-token #define TYPE DEFAULT_TYPE_NAME // For a registered connection, replace DEFAULT_TYPE_NAME with your type in double quotes("")"
```

Note: Before compiling, ensure that the correct device target (FRDM-K64F) has been selected on the right of the online compiler toolbar (it will be its own platform).

4. Within the online compiler, click **Compile** and save the bin file to the mbed drive.
5. Wait for the LED to stop flashing, then press the reset button on the device, which is located to the left of the LCD screen on the top of your microcontroller. This will run the download program.
6. The device will then run in registered mode.

Link your application and registered device

Using your Node-RED work flow editor (accessed from your application URL in Bluemix), update the **IBM IoT App In** node to work with your registered device.

1. Return to your application dashboard in IBM Bluemix.
2. Select your application from the dashboard and click the application URL to open the Node-RED Internet of Things landing page.
 - *Note: Your application must be running for this to work, If your application has stopped for any reason, select the **Restart** button and wait for it to successfully restart.*
3. Select **Go to your Node-RED flow editor** button to view your application.
4. Double click the **IBM IoT App In** node in the flow editor.
5. Ensure that the node is configured with the following parameters:
 - Authentication: Bluemix Service
 - Input Type: Device Event

- Device Type: ALL
- Device ID: ALL
- Event: ALL
- Format: ALL

6. Click **OK** then **Deploy**.
7. Look at the debug pane to see the events and messages received from the devices that are registered to your organization.
8. You can configure the **IBM IoT App In** node to subscribe to events from a specific device by clearing **ALL** and supplying the Device ID from earlier in this recipe.

Sending commands from your application

When an mbed device is running in registered mode you can send it commands from an Internet of Things Foundation application. For example, the sample code that you have loaded into the device supports a simple command that will make the device's onboard LED blink at a specified rate.

1. You can try this out by writing an application which connects to the Internet of Things Foundation and publishes a message to the device.
2. Go to the Node-RED instance and the flow that was used earlier in the recipe. Navigate to the menu at the top right of the screen and select **Import from Clipboard**. Copy the JSON string from the text area below and paste it into the dialog box in Node-RED and select **OK**.

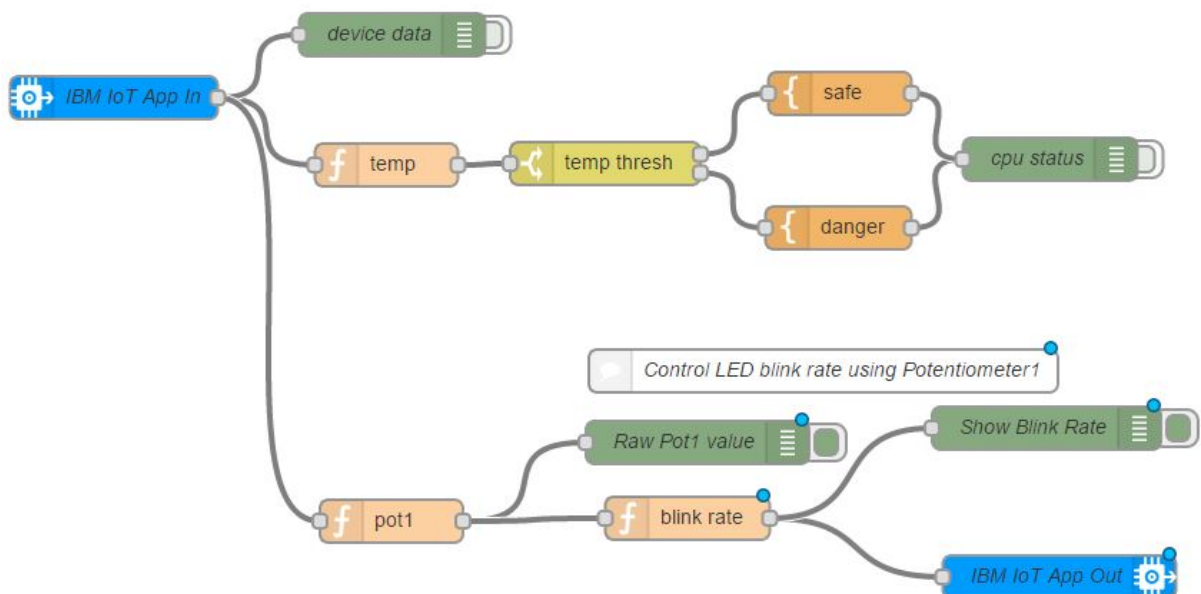
```
[
  {
    "id": "6fc0879c.903f78",
    "type": "ibmiot out",
    "authentication": "boundService",
    "apiKey": "",
    "outputType": "cmd",
    "deviceId": "160490130025",
    "deviceType": "iotsample-mbed-k64f",
    "eventCommandType": "blink",
    "format": "json",
    "data": "4",
    "name": "IBM IoT App Out",
    "service": "registered",
    "x": 847,
    "y": 518,
    "z": "cb4121a0.34bee",
    "wires": []
  },
  {
    "id": "bdf085cb.420f78",
    "type": "function",
    "name": "blink rate",
    "func": "rate = Math.round(msg.payload * 5);\nmsg.payload = \"{ \\\"rate\\\"\\\": \"+rate+ \" }\";\nreturn msg;",
    "outputs": 1,
    "x": 587,
    "y": 477,
    "z": "cb4121a0.34bee",
    "wires": [
      [
        "6fc0879c.903f78",
        "5bde5cc2.a421a4"
      ]
    ]
  },
  {
    "id": "5bde5cc2.a421a4",
    "type": "debug",
    "name": "Show Blink Rate",
    "active": true,
    "console": "false",
    "complete": "payload",
    "x": 838,
    "y": 414,
    "z": "cb4121a0.34bee",
  }
]
```

```

"wires": []
},
{
  "id": "1dc589ed.e23a76",
  "type": "comment",
  "name": "Control LED blink rate using Potentiometer1",
  "info": "The subflow converts the reading from potentiometer1 to a n LED blink rate between 0 and 5.nn0 turns the LED offnnA value bet ween 1 and 5 is the rate per second that the LED on the K64F will b link at.nnFinally the IoT Output node sends the blink command to th e device. ",
  "x": 682,
  "y": 374,
  "z": "cb4121a0.34bee",
  "wires": []
}
]

```

3. Wire the output of the function node that extracts the value of Pot1 to the input of the node labelled 'blink rate'.



4. Open the **IBM IoT Out** node and edit the configuration to include the following details:

- Authentication: Bluemix Service
- Output Type: Device Command
- Device Type: same as the **IBM IoT App In** node
- Device ID: The MAC address as earlier (lower cases with colons removed)
- Command Type: Blink

- Data: 1

5. Select **OK** and **Deploy**.

6. Now twist potentiometer 1 (positioned to the left of the device if the ethernet cable is at the top of the device) to cause the blue LED on the main board (not the application shield with the sensors) to flash at a rate between 1 and 5 times per second, or turn it off.

Note: Sending a rate of 0 will cause the LED to stop blinking.

Tutorial Tags

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