

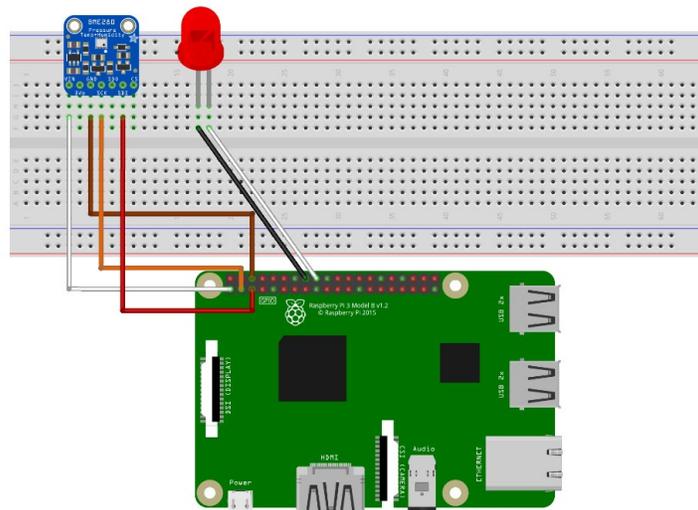
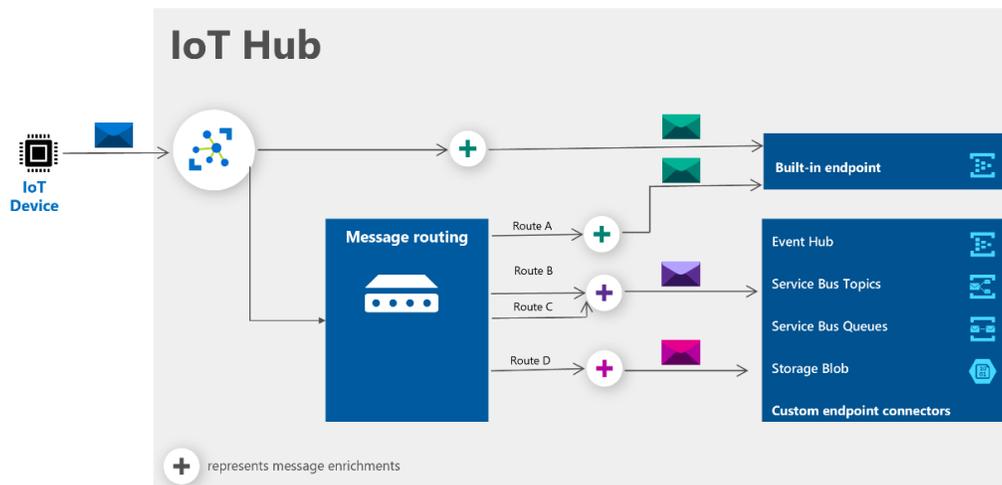
Module 06: Lab Experiment

Building IoT solutions using Raspberry Pi simulator and Azure IoT Hub

Overview: In this lab experiment, you will learn the basics of working with the [Raspberry Pi online simulator](#). You then learn how to seamlessly connect the Pi simulator to the cloud by using [Azure IoT Hub](#), which you can use to prototype Internet of Things (IoT) solutions that take advantage of Microsoft Azure services. It includes an Arduino-compatible board with rich peripherals and sensors, an open-source board package, and a rich [sample gallery](#).

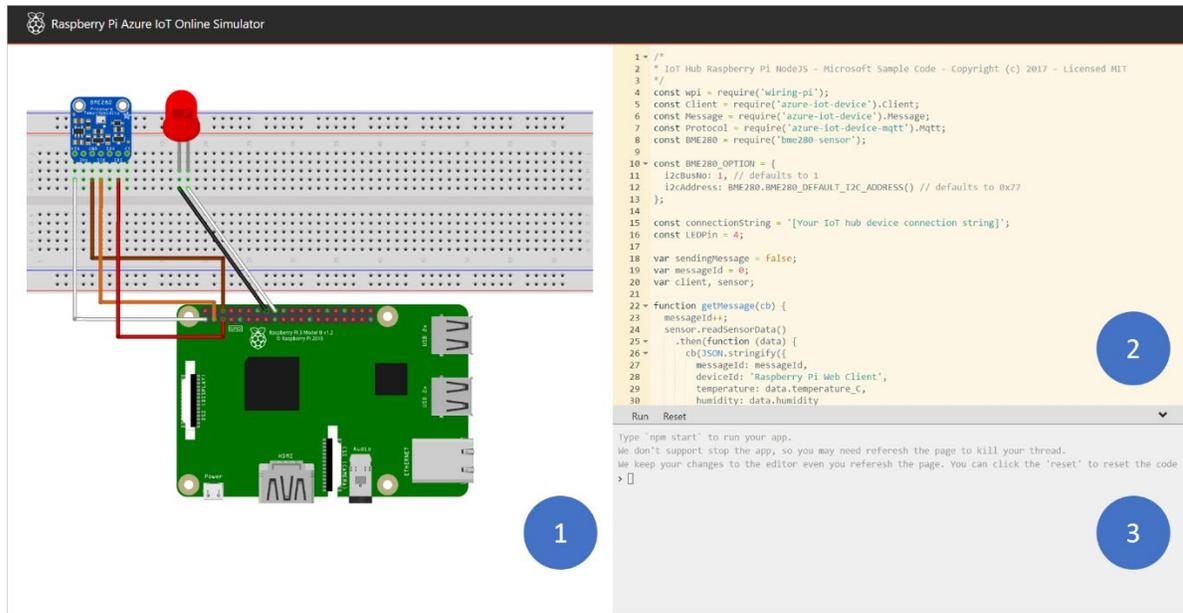
Hardware and Software Components:

- [Raspberry Pi online simulator](#)
- [Azure IoT Hub](#) [[Activate a free 30-day trial Microsoft Azure account](#)].
- A computer running Windows 10, macOS 10.10+ or Ubuntu 18.04+.



1. Step 1: Configure your Raspberry Pi web simulator

You need to configure your [Raspberry Pi online simulator](#) to connect it to the [Azure IoT Hub](#). First, open the [Raspberry Pi online simulator](#) page. There are three areas in the web simulator.



1. **Assembly area** - The default circuit is that a Raspberry Pi connects with a BME280 sensor and an LED. The area is locked in the preview version so you cannot do any customization.
2. **Coding area** - An online code editor for you to code with Raspberry Pi. The default sample application helps to collect sensor data from an BME280 sensor and send it to your Azure IoT Hub. The application is fully compatible with real Pi devices.
3. **Integrated console window** - It shows the output of your code. At the top of this window, there are three buttons.
 - **Run**: Run the application in the coding area.
 - **Reset**: Reset the coding area to the default sample application.
 - **Fold/Expand**: On the right side there is a button for you to fold/expand the console window.

2. Step 2: Create an IoT hub

Now, you will learn how to create an IoT hub using the [Azure portal](#), as follows:

- a) Sign in to the [Azure portal](#).
- b) From the Azure homepage, select the + **Create a resource** button, and then enter *IoT Hub* in the **Search the Marketplace** field.
- c) Select **IoT Hub** from the search results, and then select **Create**.
- d) On the **Basics** tab, complete the fields as follows:

- **Subscription:** Select the subscription to use for your hub.
- **Resource Group:** Select a resource group or create a new one. To create a new one, select **Create new** and fill in the name you want to use. To use an existing resource group, select that resource group. For more information, see [Manage Azure Resource Manager resource groups](#).
- **Region:** Select the region in which you want your hub to be located. Select the location closest to you. Some features, such as [IoT Hub device streams](#), are only available in specific regions. For these limited features, you must select one of the supported regions.
- **IoT Hub Name:** Enter a name for your hub. This name must be globally unique. If the name you enter is available, a green check mark appears.

Home > New > IoT hub

IoT hub

Microsoft

Basics | Size and scale | Tags | Review + create

Create an IoT Hub to help you connect, monitor, and manage billions of your IoT assets. [Learn more](#)

Project details
Choose the subscription you'll use to manage deployments and costs. Use resource groups like folders to help you organize and manage resources.

Subscription * ⓘ

Resource group * ⓘ
[Create new](#)

Region * ⓘ

IoT hub name * ⓘ

[Review + create](#) < Previous **Next: Size and scale >** [Automation options](#)

- e) Select **Next: Size and scale** to continue creating your hub. Then, select the **free tier** from the **Pricing and scale tier** dropdown menu.

Home > New > IoT hub

IoT hub

Microsoft

Basics **Size and scale** Tags Review + create

Each IoT hub is provisioned with a certain number of units in a specific tier. The tier and number of units determine the maximum daily quota of messages that you can send. [Learn more](#)

Scale tier and units

Pricing and scale tier * ⓘ S1: Standard tier ▼
[Learn how to choose the right IoT hub tier for your solution](#)

Number of S1 IoT hub units ⓘ 1
 Determines how your IoT hub can scale. You can change this later if your needs increase.

Azure Security Center On
 Turn on Azure Security Center for IoT and add an extra layer of threat protection to IoT Hub, IoT Edge, and your devices. [Learn more](#)

Pricing and scale tier ⓘ	S1	Device-to-cloud-messages ⓘ	Enabled
Messages per day ⓘ	400,000	Message routing ⓘ	Enabled
Cost per month	25.00 USD	Cloud-to-device commands ⓘ	Enabled
Azure Security Center ⓘ	0.001 USD per device per month	IoT Edge ⓘ	Enabled
		Device management ⓘ	Enabled

Advanced settings

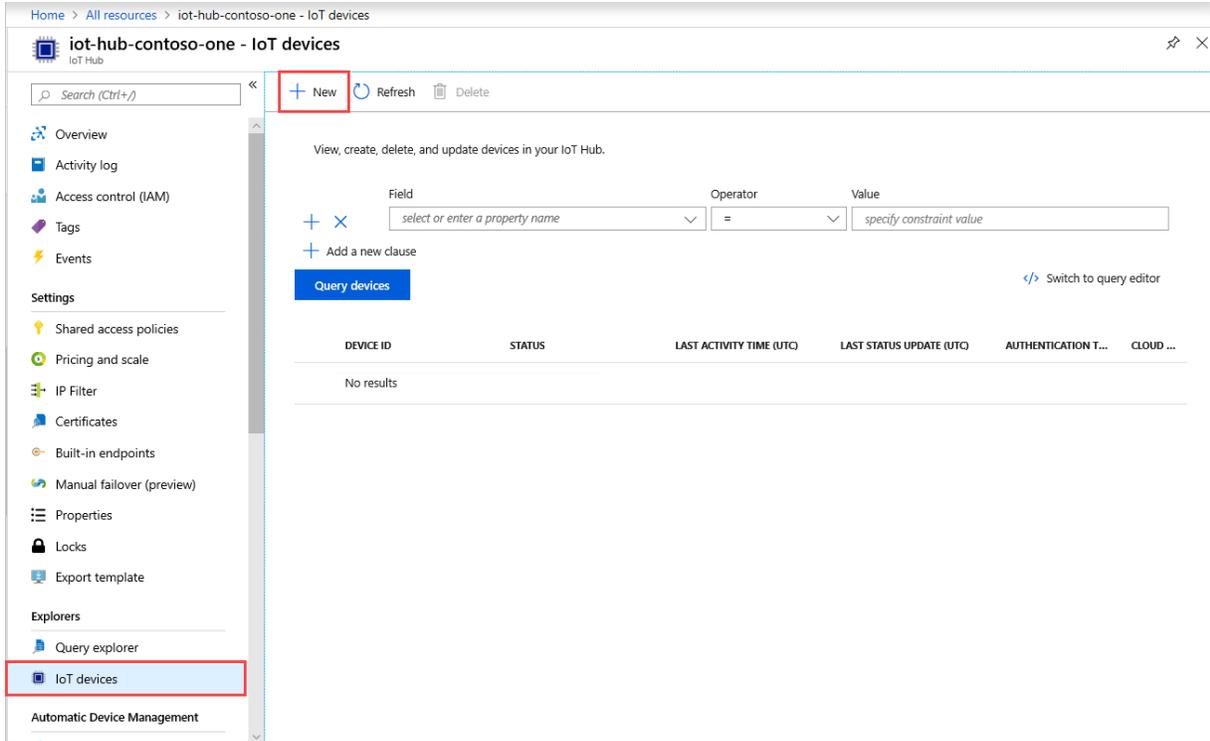
Review + create < Previous: Basics Next: Tags > [Automation options](#)

- f) Select **Next: Review + create** to review your choices.
- g) Select **Create** to create your new hub. Creating the hub takes a few minutes.

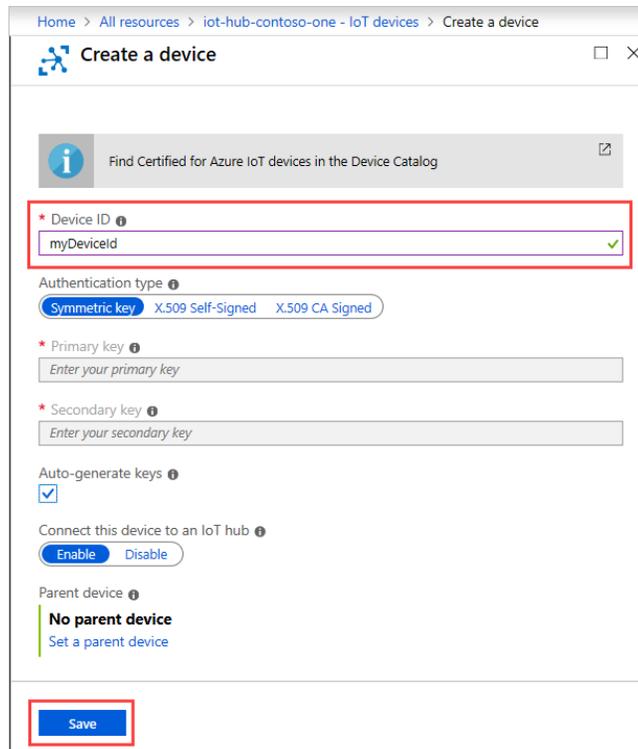
3. Step 3: Register your simulated Raspberry device as an IoT device in your IoT hub

A device must be registered with your IoT hub before it can connect. To do so, you need to create a device identity in the identity registry in your IoT hub, as follows:

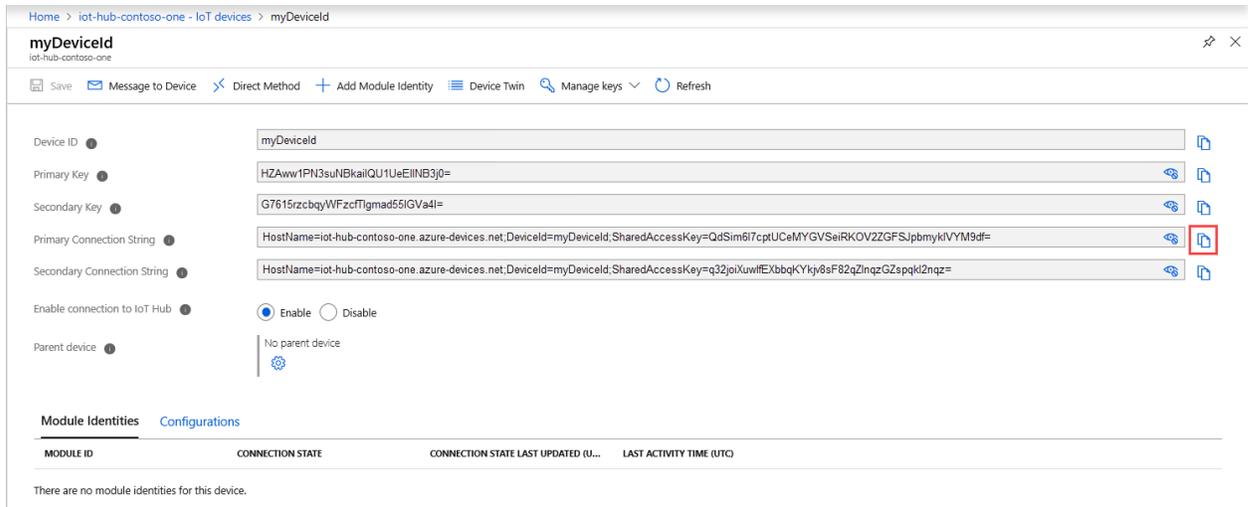
- a) In your IoT hub navigation menu, open **IoT Devices**, then select **New** to add a device in your IoT hub.



- b) In **Create a device**, provide a name for your new device, such as **myDeviceId**, and select **Save**. This action creates a device identity for your IoT hub.



- c) After the device is created, open the device from the list in the **IoT devices** pane. Copy the **Primary Connection String** to use later.



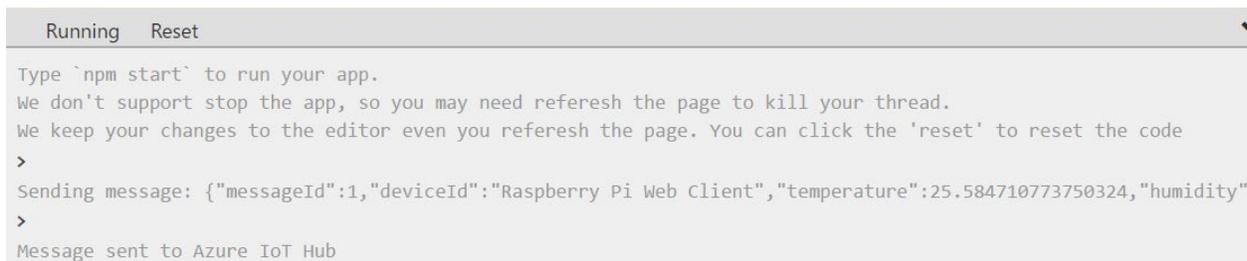
4. Step 4: Run a sample IoT application on Pi web simulator

- a) In coding area, make sure you are working on the default sample application. Replace the placeholder in Line 15 with the Azure IoT hub device connection string.

```

14
15 const connectionString = '[Your IoT hub device connection string]';
16 const LEDPin = 4;
17
    
```

- b) Select **Run** or type `npm start` to run the application.
- c) You should see the following output that shows the sensor data and the messages that are sent to your IoT hub.



- d) **Read the messages received by your hub:** One way to monitor messages received by your IoT hub from the simulated device is to use the Azure IoT Tools for Visual Studio Code.

Summary: This lab experiment showed you how to use the [Raspberry Pi online simulator](#) to connect to Azure IoT Hub. You also learned how to register your simulated Raspberry Pi as an IoT device in your IoT hub and run a sample application on your Raspberry Pi to send simulated sensor data to your IoT hub.