Workshop IBM Cloud and IBM Watson IoT Platform

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Introduction

IBM Cloud Catalog provides you with lots of services that can help to manage various aspects of your IT requirements. However, a developer would be interested in a service or set of services that shall expedite the process of configuring the IoT Application Development & deployment environment.

1. Browse to https://cloud.ibm.com/catalog and examine the IBM Cloud catalog. Note that you can also find Third Party services in the catalog.
2. Examine the categories on the left hand side of the screen.

A cloud application usually consists of one or more applications using several cloud services from the catalog. The Starter Kits section within the IBM Cloud Catalog offers you with a set of ready to use of one or more services, that are binded together with an Application of choice. In the scope of this workshop we will use the Internet of Things Platform Starter kit.

Create an IBMid on the IBM Cloud

In order to work in the IBM Cloud (formerly known as Bluemix) you need to register and get an IBMid. If you already have an IBMid, just log in to the IBM Cloud. Else, follow next steps to create one.

1. Go to https://cloud.ibm.com/login
2. Click Create an IBM Cloud account
3. Follow the steps to create you IBMid

You now can use the IBM Cloud. Lots of the available services has a free tier, so you can now start experimenting for free.

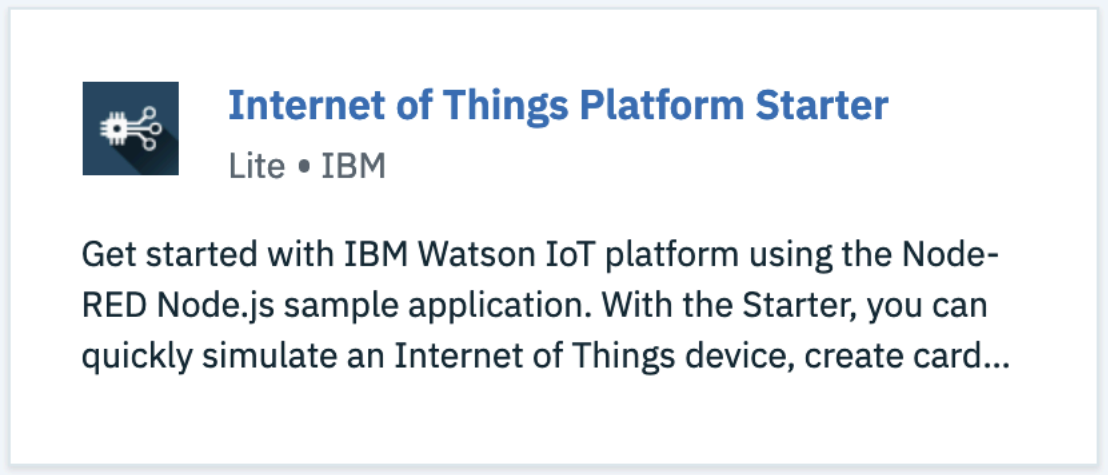
Deploy Internet of Things (IoT) Platform Starter service

The IoT Platform Starter service helps you deploy SDK for Node.js as your Application, with Watson IoT Platform service and the Cloudant NoSQL DB service binded to your IoT Application. Here, the Device and Gateway specific IoT events shall be managed and handled on the IoT Platform, while the Cloudant NoSQL DB acts as the default DB for your IoT requirements. Node-RED shall be the default User Interface and is considered one of the fastest means to begin your IoT Application development.

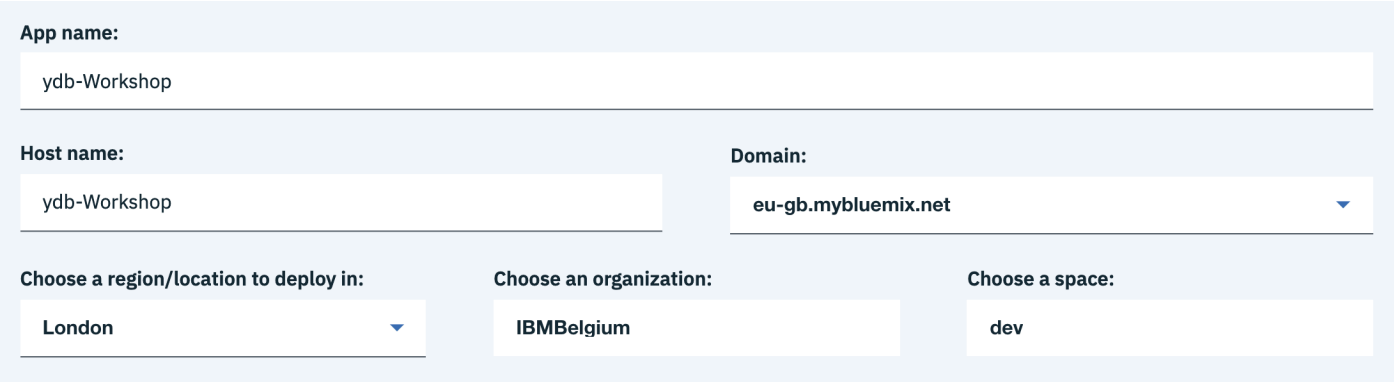
Following set of steps details out on the deployment of the IoT Platform Starter service:

1. Log into IBM Cloud (https://cloud.ibm.com/login) with your IBMid and access the Catalog.

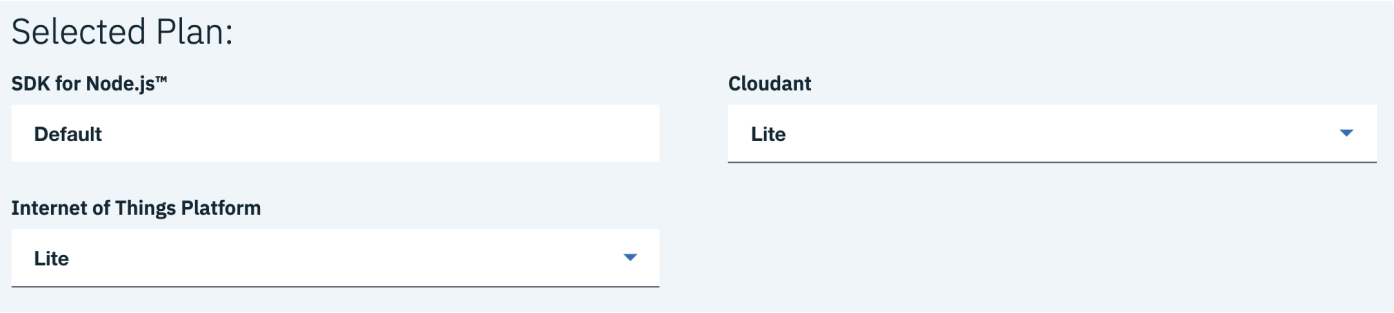
2. Choose to click on the ***Internet of Things Platform Starter*** service. This can be found in the "Starter Kits" section of the catalog.



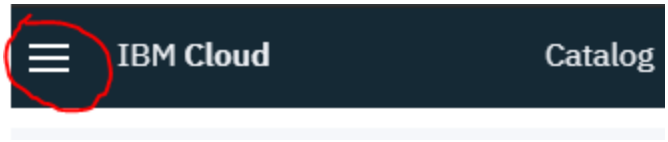
3. Provide a unique App Name (e.g. My-initials-Workshop), which shall be the Host name for your application, and keep the default values for Domain, Location, Organization and Space.



4. Keep the default plans for SDK for Node.js, Cloudant NoSQL DB and IoT Platform.



5. Click on ***Create***, provided on the bottom-right corner of the screen, to go ahead and deploy the Starter service
6. The deployment process takes couple of minutes to complete.
7. Click the Hamburger-menu on the top left corner and select Resource list.

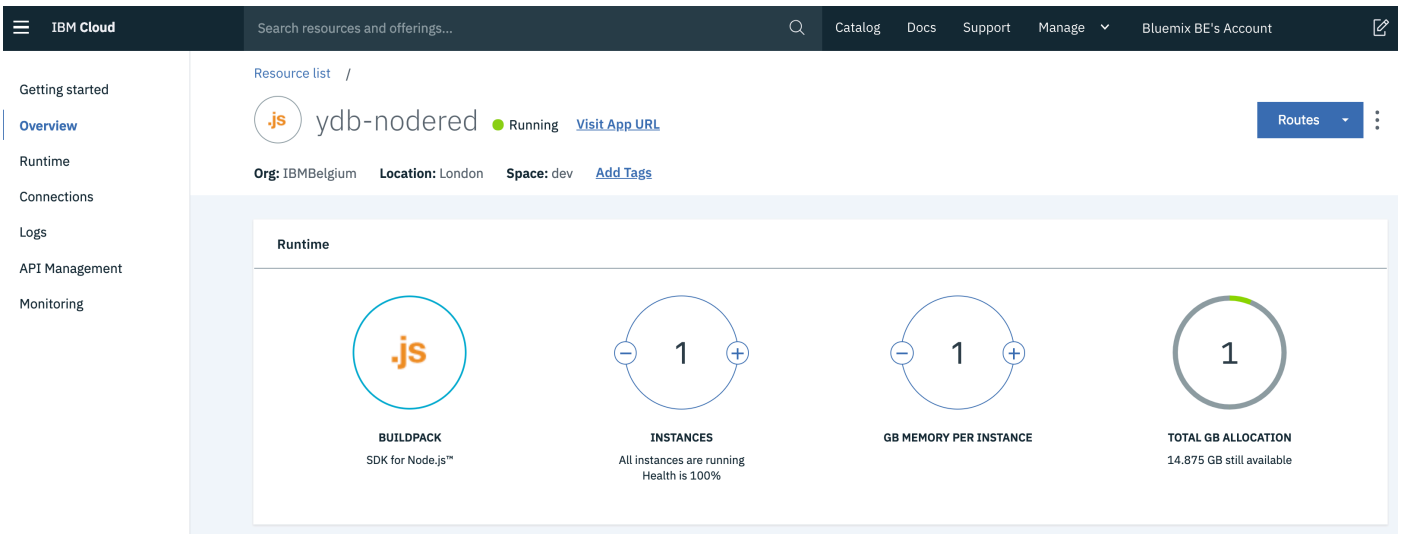


8. You should see your application with an Up & Running status (Green dot) along the IoT Platform Service and the Cloudant database.

   Note: if the application is not Starting or Running, start it manually using the three- dots-menu on the right.

9. Click on the application name to open the information page on IBM Cloud. Examine the menus on the left.

10. On the Overview page click on Visit App URL to browse to the Node-RED flow editor that you use to create your application.

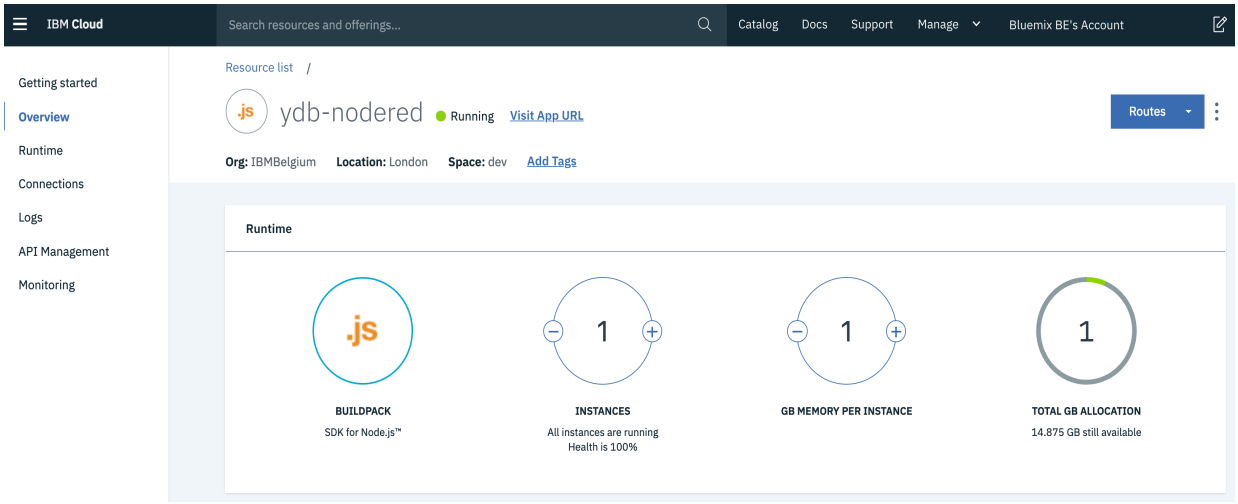


The IoTP Starter sample application

In this section you shall be introduced to the set of steps that help you get started with the IoTP Starter Application.

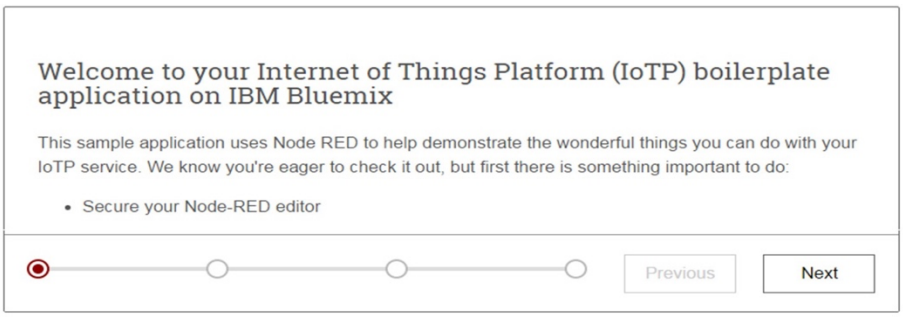
1. Browse to your IBM Cloud dashboard (hamburger-menu on the top left corner and select Dashboard).

2. Click on the application name to open the information page on IBM Cloud. Examine the menus on the left.



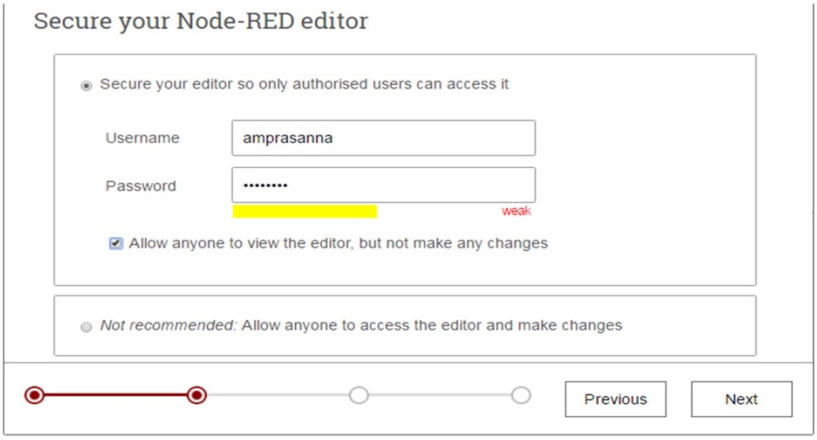
3. On the Overview page click on ***Visit App URL*** to browse to the Node-RED flow editor that you use to create your application.

4. As the Application launches, it prompts you to complete couple of steps: *Secure the Node-RED Editor* and optionally, allows you to *Browse available nodes*.



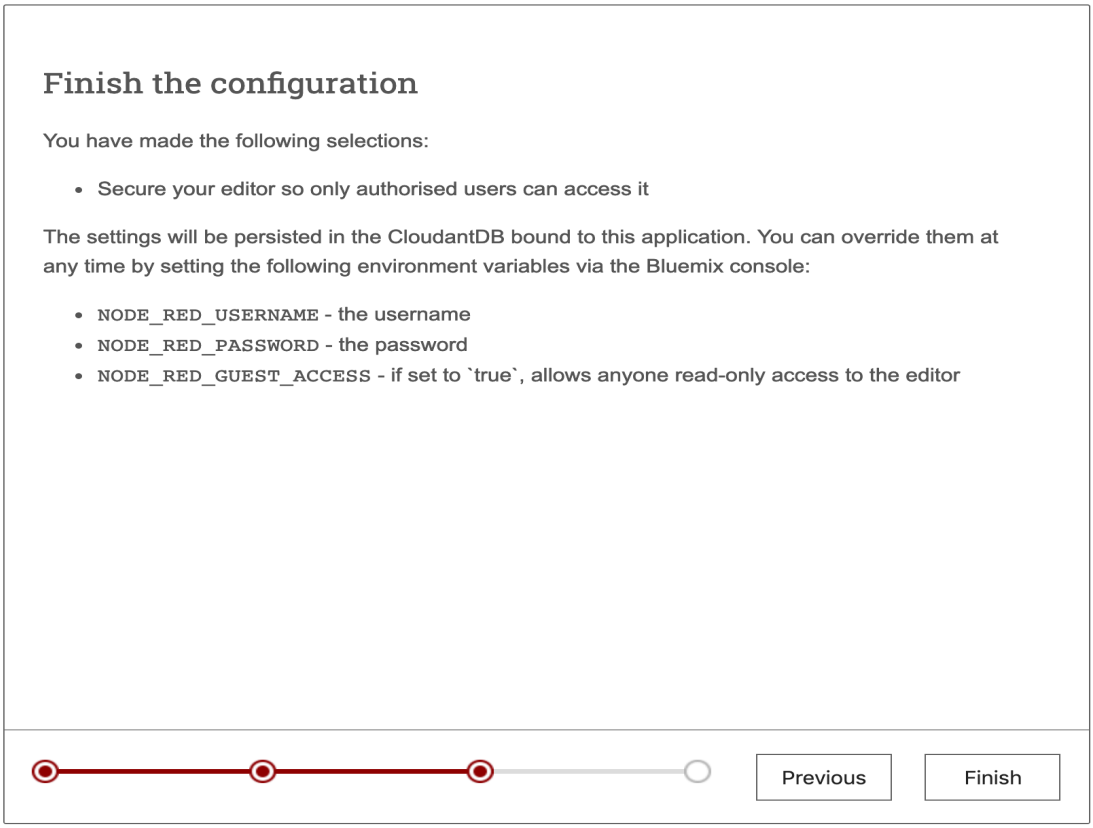
Click on Next to continue

To secure your Node-RED Editor and the flows associated with it, configure the credentials with a custom User ID and Password of your choice. Optionally, choose to grant access public in Read-Only mode or grant Write permission to all.

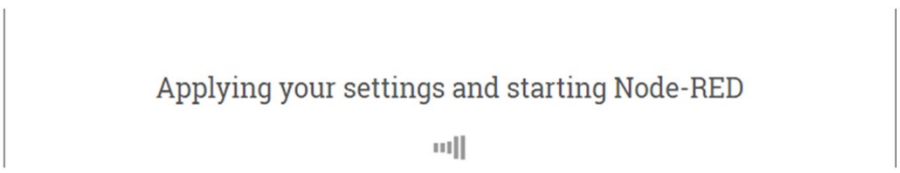


Click on ***Next*** to continue.

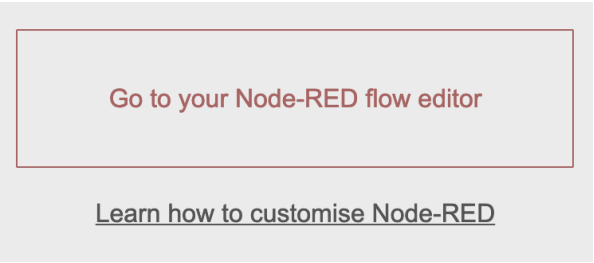
5. The last step in the configuration process summarizes your selections & choices. Click on ***Finish*** to complete the Application configuration.



6. The Configuration choices made shall take couple of moments to be applied to your current Application environment.



7. Post applying your Configuration settings, you are now good to start with your Node- RED editor. Click on the ***Go to your Node-RED flow editor*** to launch the editor and get started with your first flow.



Thus, you've successfully configured your IoTP Starter environment and have launched the Node-RED Editor, to begin with your IoT Programming, using a simple action of Drag-n-Drop of Nodes.

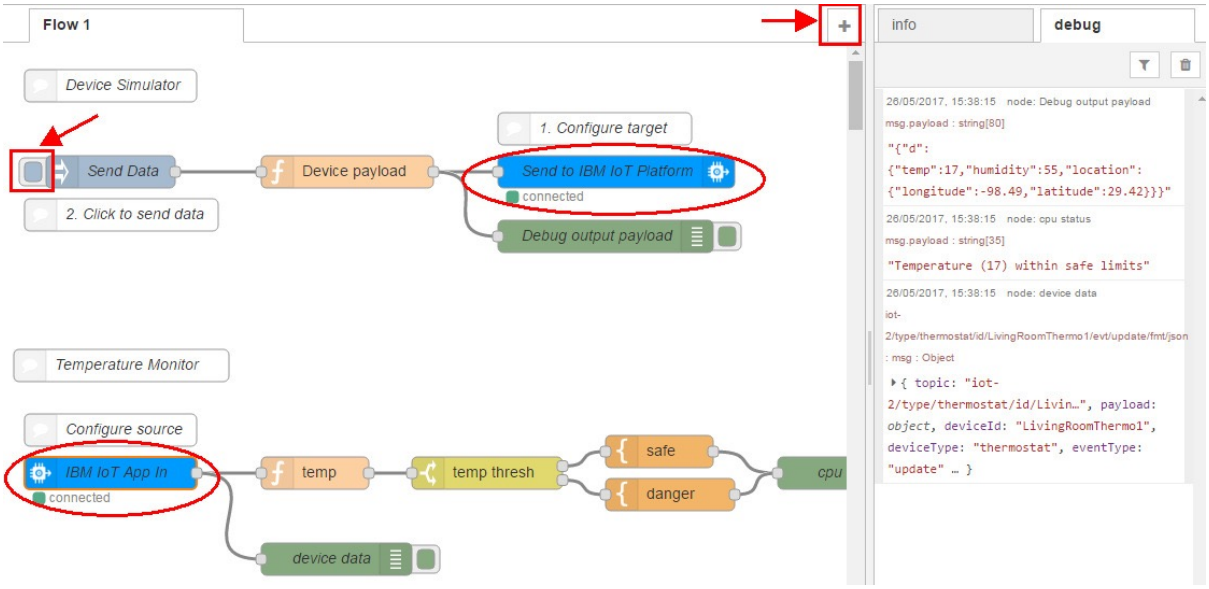
Understanding the sample flow

As the Node-RED Editor launches successfully, you will get to see a default flow that has been pre-loaded as part of the Application deployment. The intention is to help you get started with a sample flow and you can build on top of it, from here on.

As mentioned earlier, the Cloudant NoSQL DB and the IoT Platform service are binded to the Application. The flow depicts the use of both IBM IoT In & Out nodes, responsible for data write and data read to & from Application. Should you choose to start a new flow, then click on the + sign on the top – right corner of the canvas as shown.

The sample flow illustrates a scenario which is capturing data from a Temperature sensor. Monitoring the temperature data, you set thresholds to identify, whether the incoming data is within the Safe limits or not and publish the same, for further actionable analytics.

Click on the Inject node to initiate the flow. The values for sensors are picked up from the Simulator and are sent to IoT Platform. The data being sent can been seen in the Debug log as provided on the right-hand side pane. Analyzing the value of the sensor (in the scope of this IoT Recipe, a Temperature sensor), the Node-RED Application categorizes the value as Safe or Danger, accordingly.



The sample Node-RED flow mentioned here, depicts, how the data from devices is pushed into the IoT Platform and then analyzed using other Node-RED nodes, thus showcasing, how simple and easy it is, to get started with your own IoT Application, within minutes.

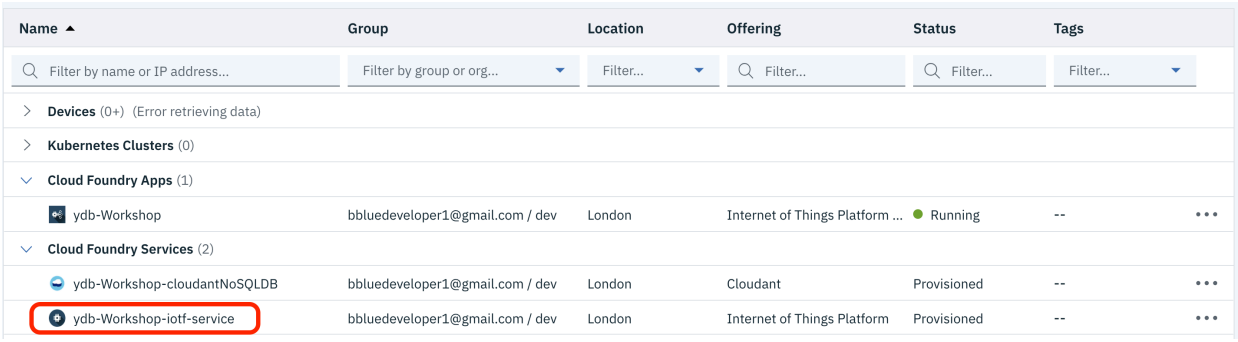
Devices in IBM Watson IoT Platform

The next step is to register the device which was created in Node-RED in the Watson IoT platform.

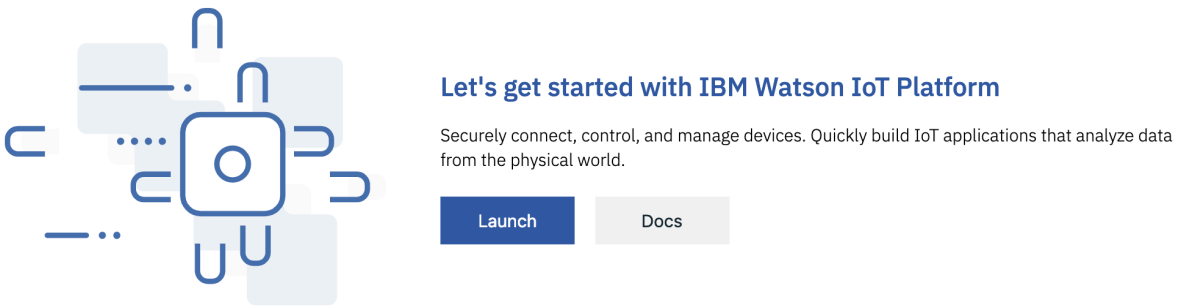
Open the IBM Watson IoT Platform

Go back to the IBM Cloud Dashboard. If needed follow the next steps.

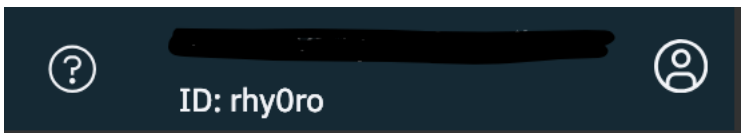
1. Open a browser window and go to https://cloud.ibm.com/login and login to your account.
2. Go to the Dashboard by clicking on the top left so-called “Hamburger-icon” and selecting “Dashboard”.
3. Within the Dashboard find the find the Internet of Things Platform service listed under “Cloud Foundry Services”. The name will be different from the one in this screenshot. Click on it to open the main page.



4. Observe the Welcome page click on ***Launch*** button to enter into the IBM Watson IoT Platform organization space. The IoT organization is a space used for connecting and managing devices to the IBM Watson IoT Platform, so that your applications can access their live and historical data.



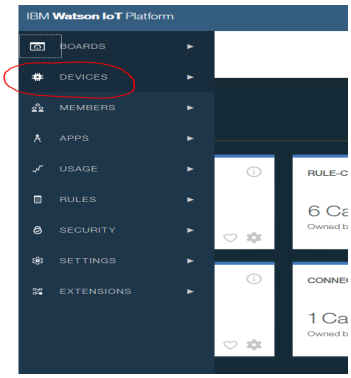
5. Observe the right top corner of the page, where you’ll find the six character Organization ID that is created for you to identify your instance of the Watson IoT Platform service. Here you can add, connect and manage your IoT devices.



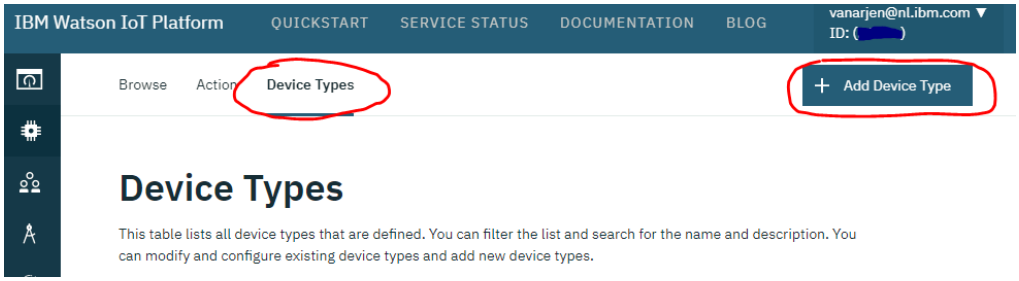
Create Device Type

Each device connected to the IBM Watson IoT Platform is associated with a device type. Device types are intended to be groups of devices which share common characteristics. So in order to add devices in IBM Watson IoT Platform, one need to create a device type. Following are the instructions for creating a Device Type

1. In the IBM Watson IoT Platform dashboard, click DEVICES menu.



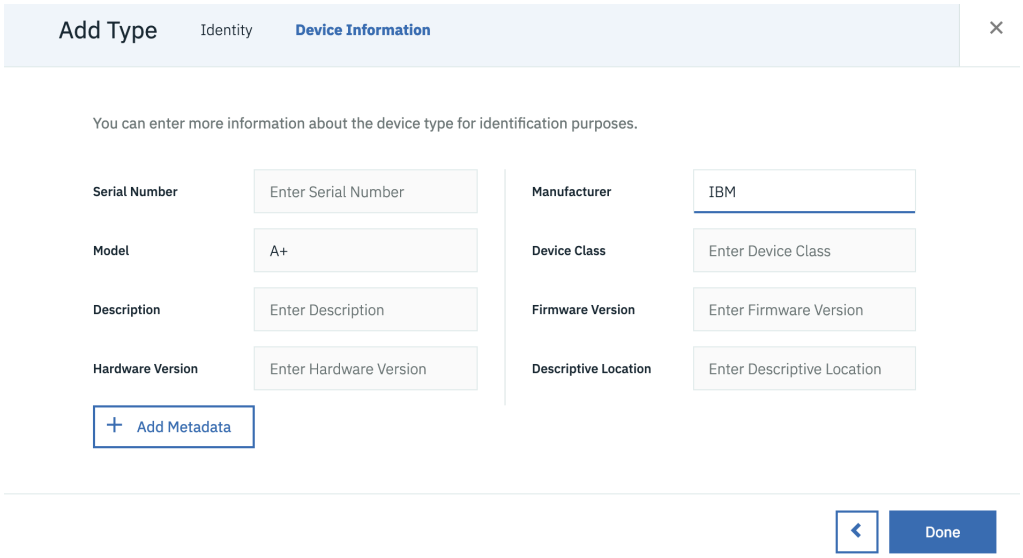
2. Select the Device Types tab, then click on the ***Add Device Type*** button as shown below.



3. Observe that there are two options provided now, namely Device type and Gateway type. As this recipe focuses on adding a device and not a gateway, select Device. (Gateways are a specialized class of devices in the IBM Watson IoT Platform. Gateways are devices which serve as access points to the IBM Watson IoT Platform for other devices. Gateway devices can register new devices and can send and receive data on behalf of devices connected to them. Refer to the documentation for more information about the Gateway)

4. Specify a name for the device type, use thermostat as this matches the sample Node- RED flow that we examined earlier. Optionally add a description and click Next.

5. Observe that a template page is given where you can select and define one or more attributes. All of these attributes are optional. They will be used as a template for new devices that are assigned this device type. Attributes that you do not define may still be edited individually later when you add the device. Define the selected attributes Manufacturer and Model as shown below, then click Done.

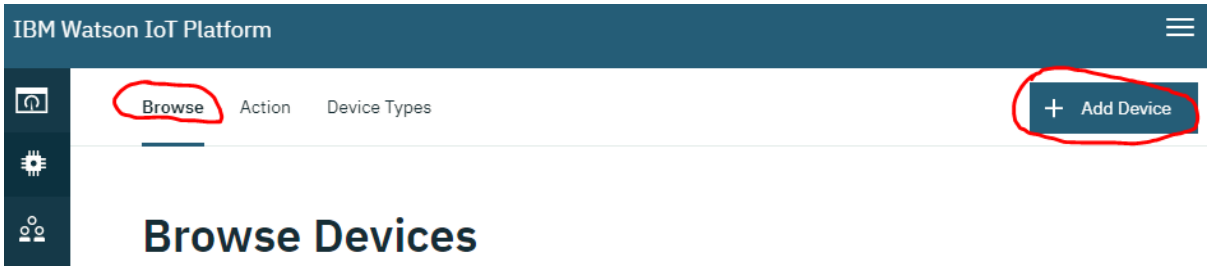


We have successfully created a device type in IBM Watson IoT Platform organization.

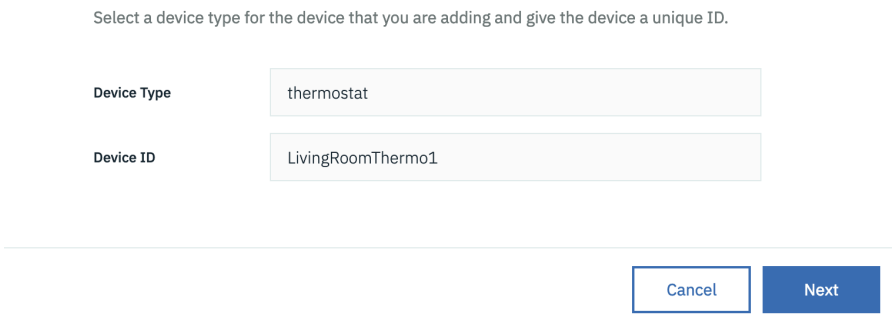
Add Device in IBM Watson IoT Platform

A device can be defined that has a connection to the internet and has data it wants to get into the cloud. And devices can accept commands from applications as well. You need to add the device in IBM Watson IoT Platform Organization before connecting it to the IoT. Carry out the following steps to add the device in IBM Watson IoT Platform,

1. In the IBM Watson IoT Platform dashboard choose the Devices menu on the left, click the Browse tab and then Add Device button as shown below.

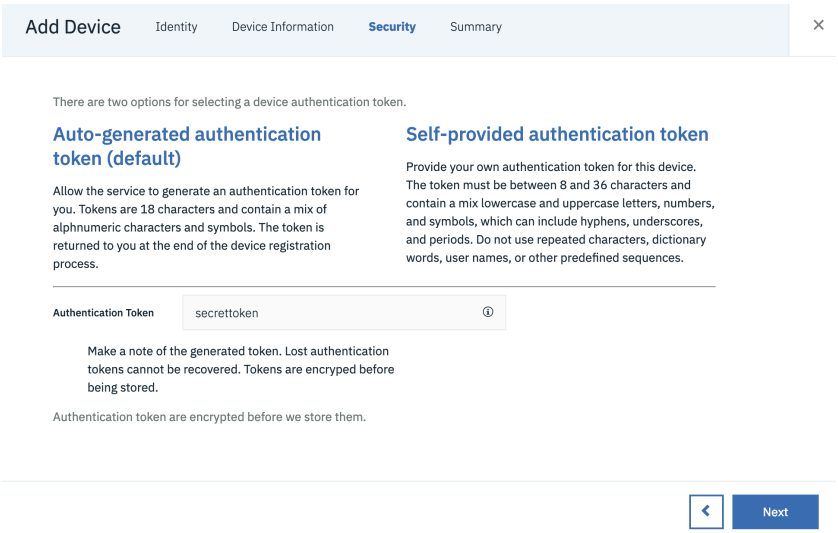


2. Choose the device type “**thermostat**” that we created in the last step. Enter a unique device id, in our case use “**LivingRoomThermo1**”, which will distinguish your device from all other devices that you might connect to the IoT (you can use 1 or something more sophisticated like your devices MAC address), then click Next as shown below.

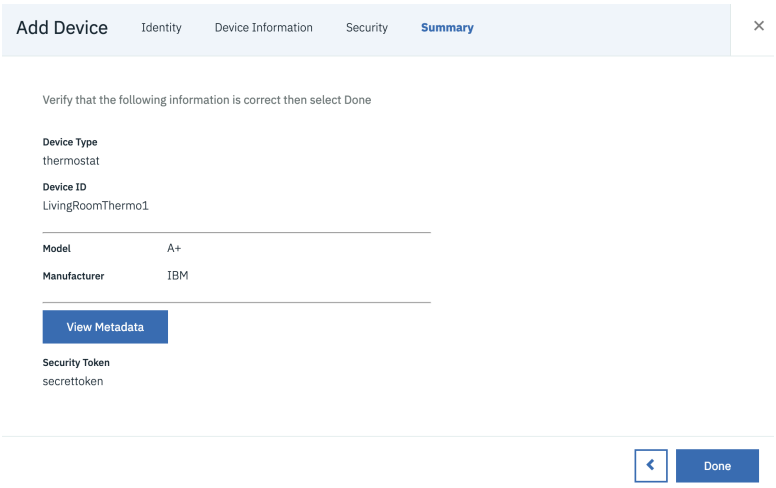


3. In the Device Information page you can enter more information about your device. Click Next.

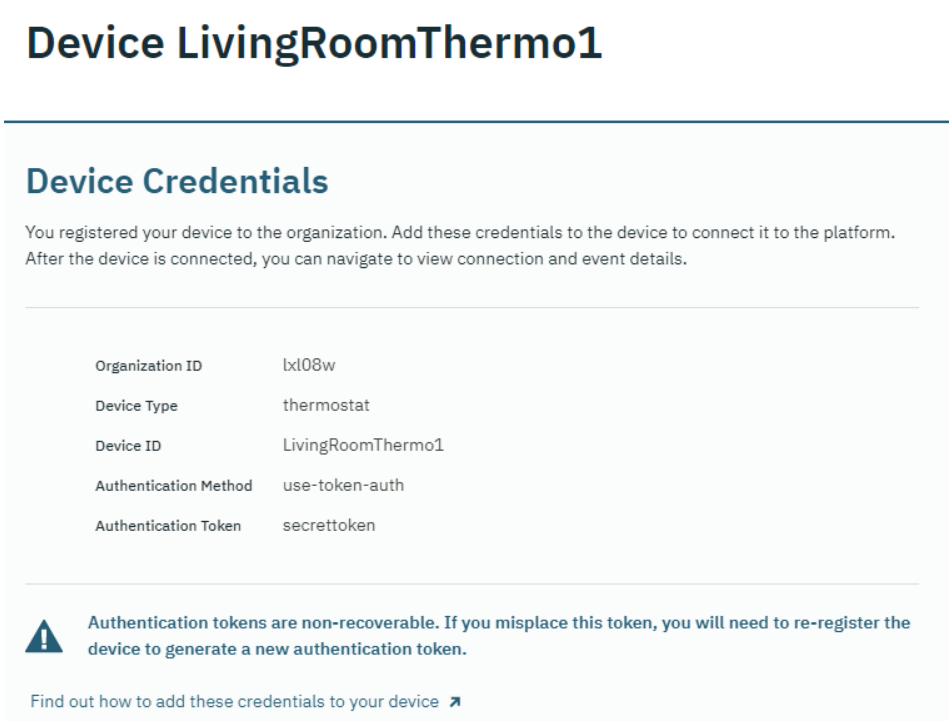
4. In the next page, you can either add your own authentication token, or allow the IBM Watson IoT Platform to generate a token for you. The IBM Watson IoT Platform generated token will be 18 characters long and will contain a mix of alphanumeric characters and symbols. The token will be returned to you at the end of the registration process. In case if you want to add your own token, enter the token as shown below, then click Next.



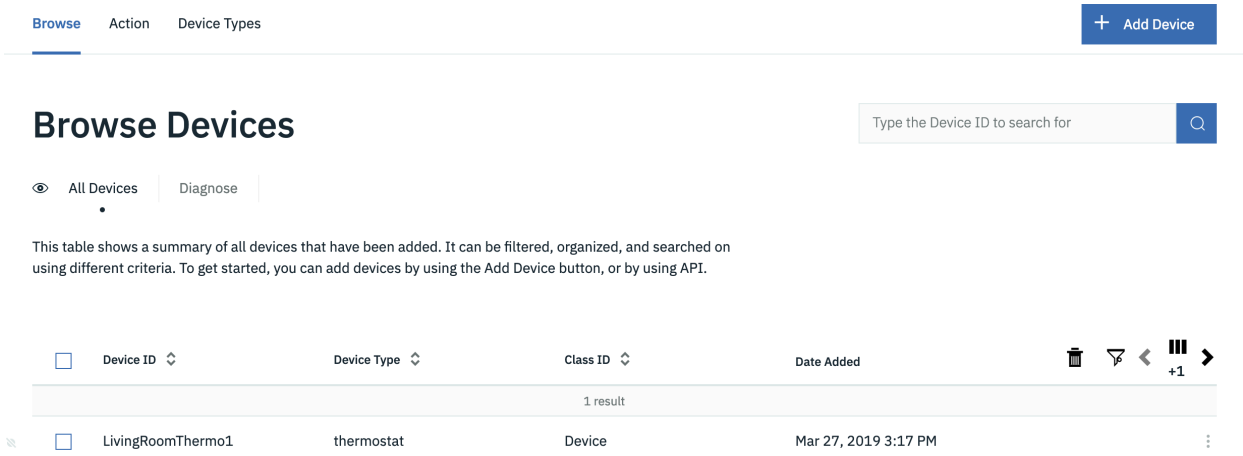
5. As shown below, you will be given a summary page to verify the details before adding the device to IBM Watson IoT Platform. Verify and click Done.



7. At this step, the device is registered to your Organization and you will be provided with the registration details as marked below. To get your device connected, you need to add the credentials to your device. So make a note of them, especially of the token since this is the last time that you'll see it.



8. Click the browser's Back button to get back to the main dashboard and observe that the device is added in your Organization.

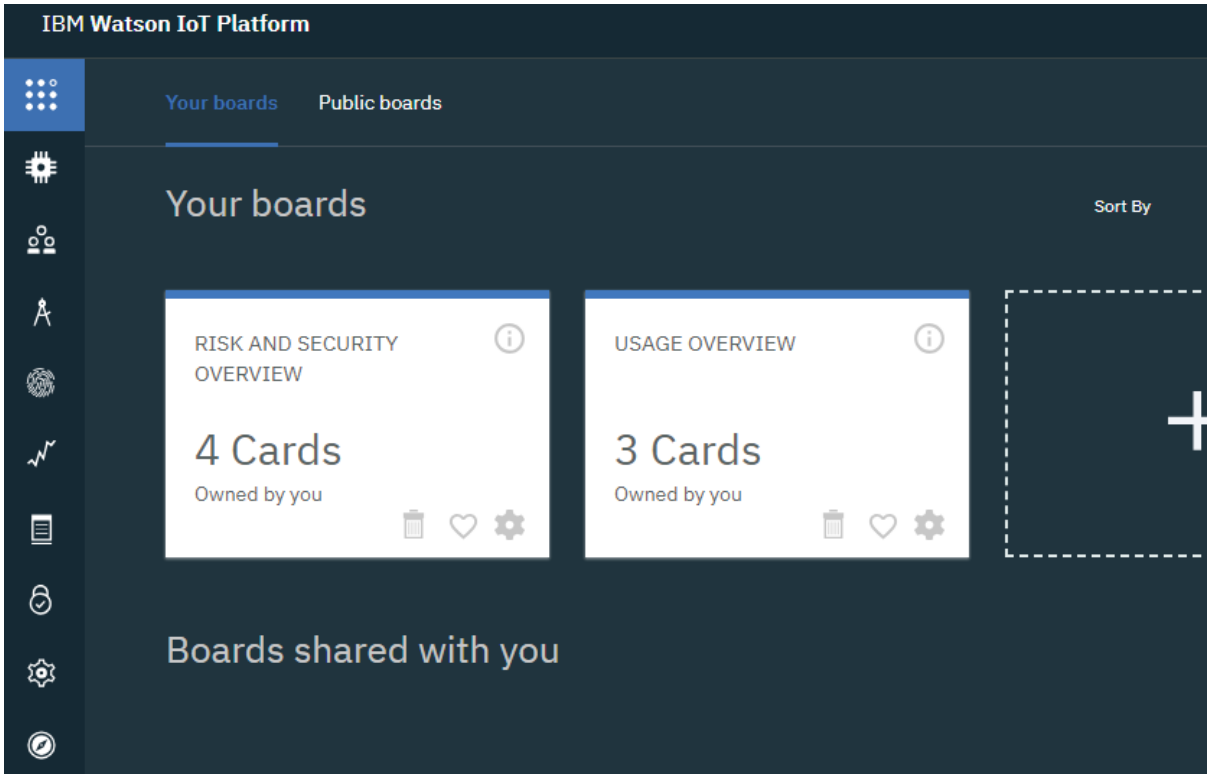


So, now we have successfully added a device in the IBM Watson IoT Platform organization.

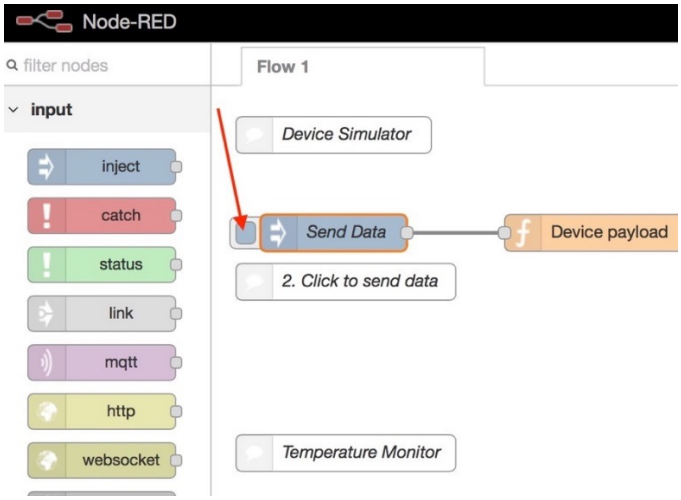
Explore

In the IBM Watson IoT Platform click on "Boards" (top icon) in the menu on the left. You will see an overview of all the board available to you:

1. Click the Usage Overview board to open it. You will see a number of so-called cards containing information about your devices. On the Risk and Security Overview board you'll find security information.



2. Go to the Browser tab which has the Node-RED editor open (if needed go back to the Dashboard in IBM Cloud to open it again). Click on the small button on the left side of the "Send Data" node to send device data to the Watson IoT Platform.



3. Go back to Watson IoT Platform. On the Devices page click the LivingRoomThermo1 device and click Recent Events. This will show the incoming events for this device. Since it has no history it will be empty. To see incoming data go back to Node-RED and send an event by again clicking the small button on the left of the Send Data node. Now you'll be able to see a recent event in Watson IoT Platform.

4. For better understanding play around with the Node-RED application and your de- vices.

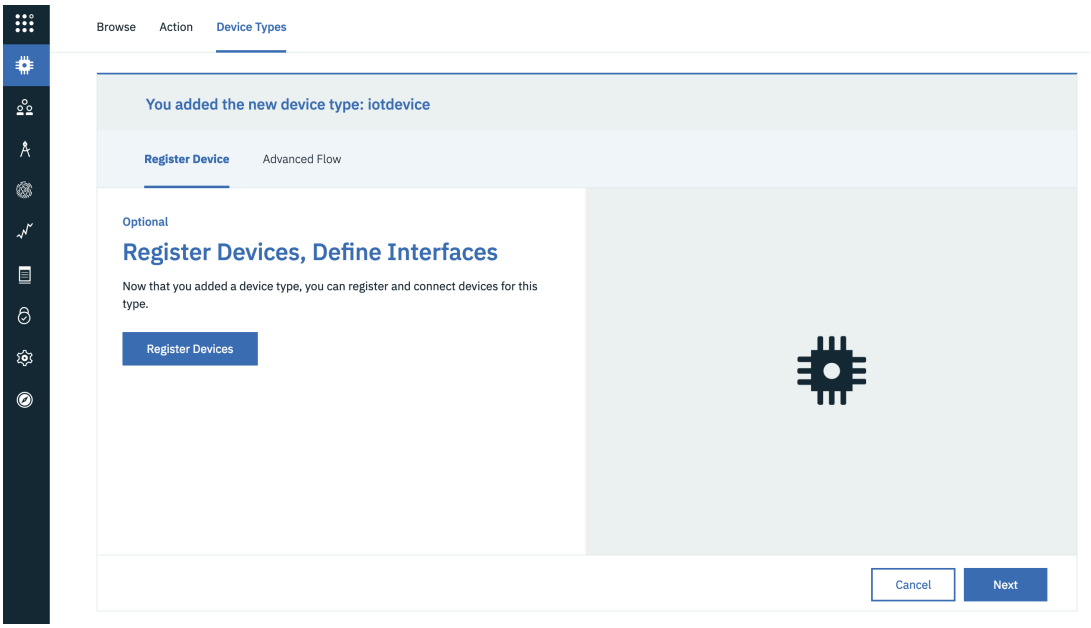
Work with built-in simulated devices

In operational situations you will connect real devices to the Watson IoT Platform and collect the device data for analysis purposes to improve your business. In the exercises above we've seen that you can use an application for data analysis, but also for device simulation. As an alternative Watson IoT Platform has a device simulator built in.

In this section we will explore the built in device simulation capability of Watson IoT Platform. We'll do that by registering a new device type and a new device.

Register a new device type and device

1. In Watson IoT Platform create a new Device Type as you have done earlier. Name it ***iotdevice***. Don't click next when you see this screen:



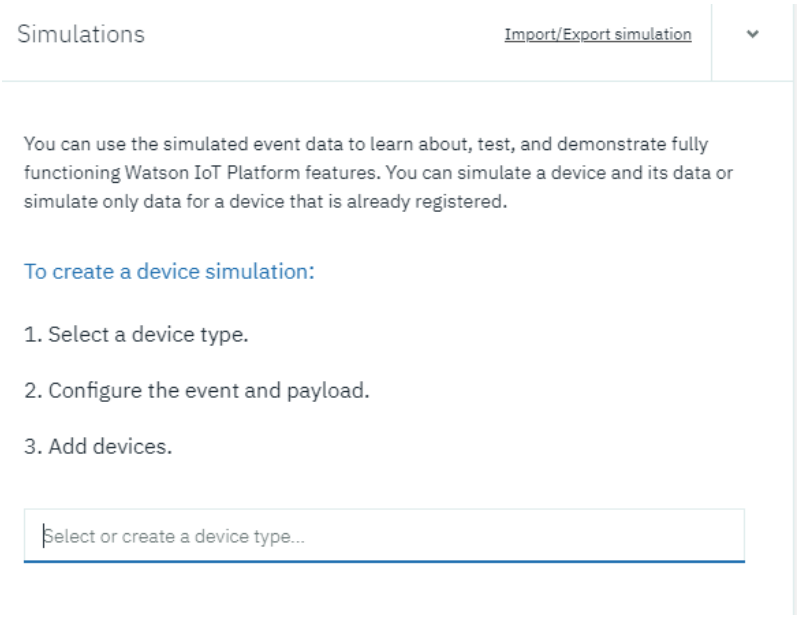
2. Now click Register Devices to add new devices using the newly created type. As de- vice ID use simdevice1 (or any other name that you prefer). No metadata is required, but enter some if you like. Use any authentication token that you prefer, or let the platform generate one for you.
3. Once you finished creating a new device type and a new device make sure the new device is shown on the Devices page of Watson IoT Platform.

Enable simulation

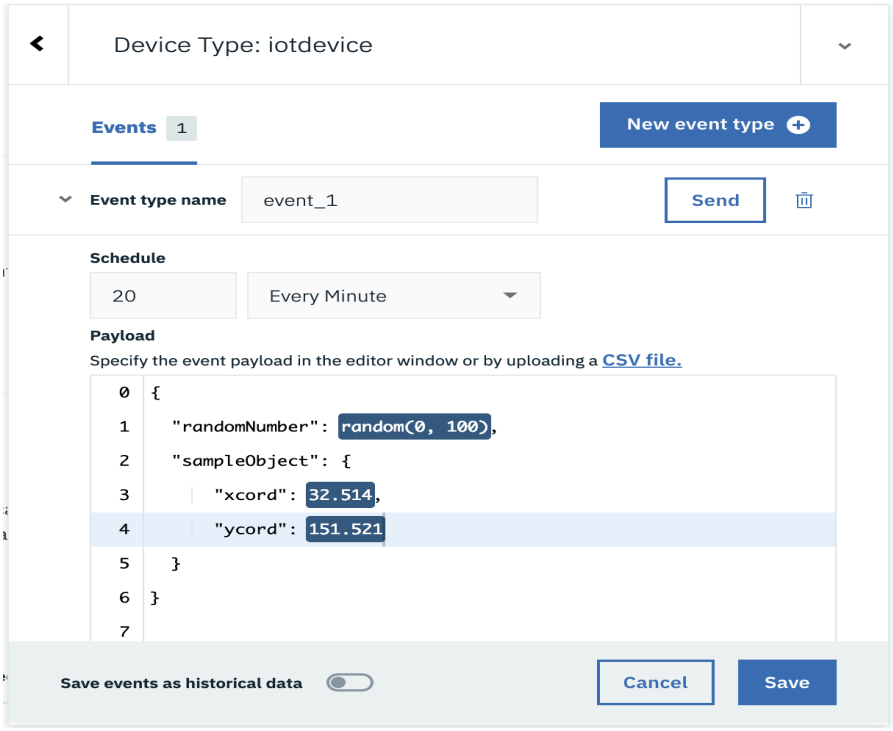
Before we can use the simulation feature of the platform we need to enable it.

1. To enable simulation, on the left menu click on Settings. Scroll down to the page to Device Simulator. Activate the Device Simulator.

2. At the bottom left you will find a tab "0 simulations running". Click on it and click ***Create Simulation***. Select iotdevice as the device type.

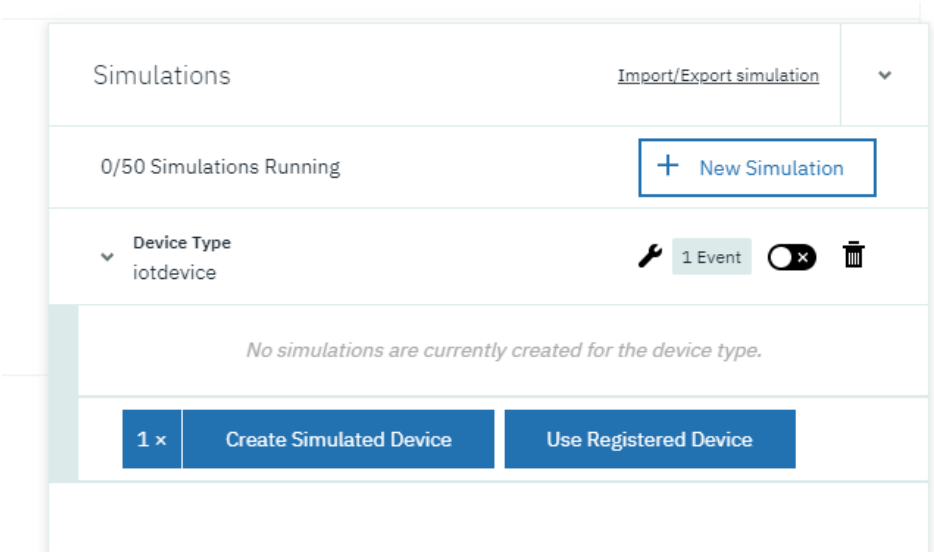


3. Click on new Event Type. Set the JSON message. You can use the sample message also or create your own JSON message as well. Click on ***Save***.



You have now created a Simulation, but no device is using this simulation yet. So let's select one.

1. Click ***Create Simulated Device***. A new device will be created and the simulation starts immediately.



2. You can also simulate a device that you already registered yourself. Click Use Registered Device and select the device that you created earlier (e.g. simdevice1).

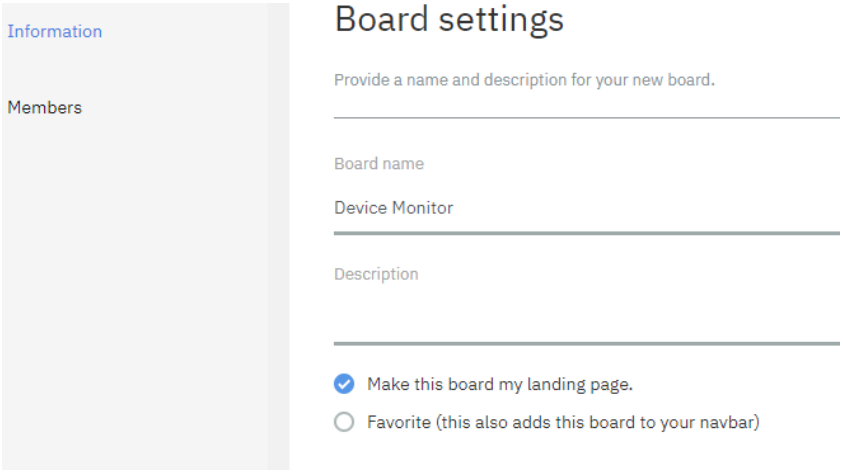
3. Now go to the Devices page of Watson IoT Platform, click on the simulated devices and check for events coming in in the Recent Events tab of these devices.

Create a device dashboard

Operators want to monitor the data coming from devices. So let's create a dashboard to monitor devices of type iotdevice.

1. On Watson IoT Platform go to the Boards page.

2. Click ***Create New Board*** and name it Device Monitor and make it your landing page.

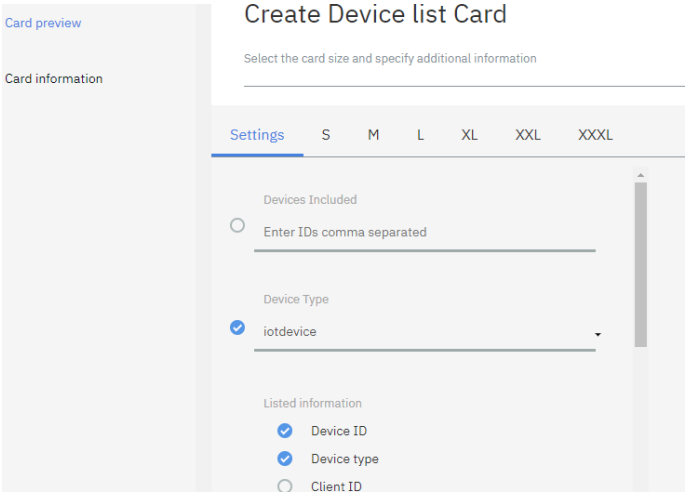


3. Click Next and Submit. A new Board is now created.
   A Board is a page on your dashboard. Open the new Board by clicking on it.

4. Click Add New Card. A Card is a widget on a dashboard.

5. Select Device List. This Card will show the devices of a specified device type.

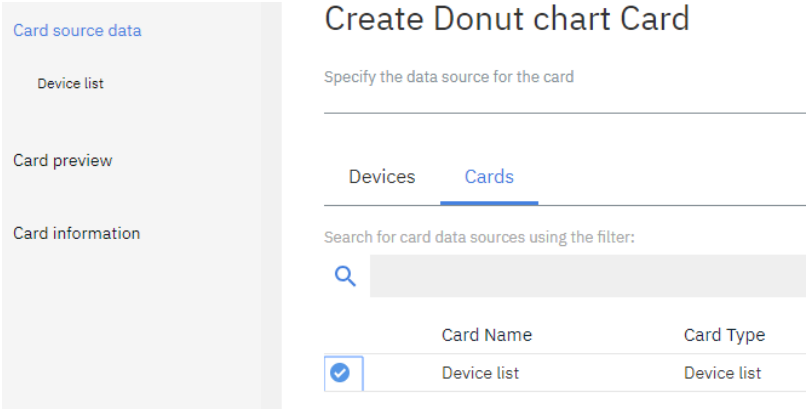
6. Click Settings, select ***iotdevice*** as the device type for this Card. Make sure to check the Device Type checkbox.



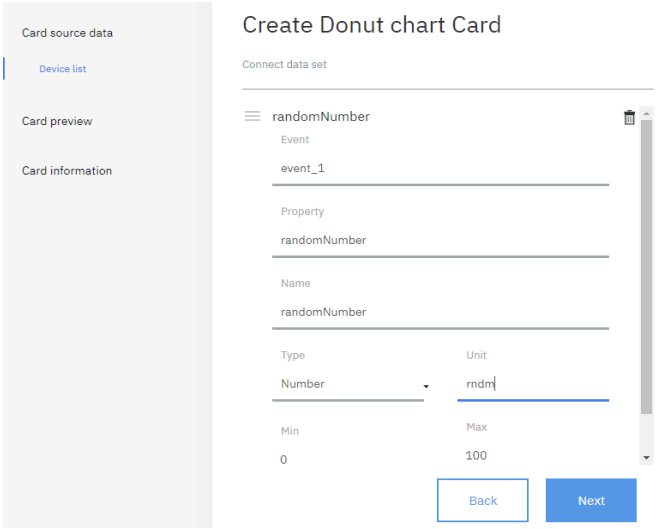
7. Click Next, enter a Title for the card and Submit. You will see the card showing all the devices of type ***iotdevice***.

8. Add a second Card, select the Donut Chart.

9. As Card Source Data use the previously created Device List card. Click Next.



10. Create a new data set. Use the simulated event and the randomNumber as property.



11. Click Next and Next, choose a Title, e.g. Random Number and click Submit.

12. Now you see two cards on your Device Monitor page. On the Device List you can select the device that you want to monitor. The Donut chart will show the random number of the selected device.

Additional exercises

It is fun to play around and explore all the features of the IBM Watson IoT Platform and the IBM Cloud. Here are some additional exercises that you can do on your own:

1. You can add a Device Map card to your page that shows the location of the simulated devices on a map. To do this you have to change the gps-coordinates that are sent by the device to an appropriate value. Tip: use Google Maps to find gps coordinates.

2. You can enhance your Node-RED flow to receive the device data from the simulated devices and analyse this data. Do this by creating a new tab on your flow editor, add the appropriate nodes, configure and connect them and deploy the flow. On the Internet there is a lot of material to be found that will help you do this. To give you a head start go to the IBM Developer Works Recipes: https://developer.ibm.com/recipes/tutorials/category/internet-of-things-iot/

3. You can build end-user dashboards with your Node-RED application. To do so there are dashboard nodes available that you can add to your Node-RED pallet. Find a description how to do this in the recipe Visualize Virtual Sensor data using Dashboard Nodes (https://developer.ibm.com/recipes/tutorials/visualize-virtual-sensor-data-using-dashboard-nodes).

Have fun!

Conclusion

So far we demonstrated how to setup an IBM Watson IoT Platform Organization, create a Device Type and register a Device using the IBM Watson IoT Platform dashboard, and we explored how to visualize and analyse device data.

Where to go from here?

1. Browse through various tutorials available in DeveloperWorks Recipes to know how to connect specific devices to IBM Watson IoT Platform, visualize the events originating from these devices, control, process and analyze these device events using applications. Say, for example, if you want to connect a Raspberry Pi device, Arduino or similar device to IBM Watson IoT Platform, search for the appropriate recipe. More recipes on https://developer.ibm.com/recipes/.

Note that Recipes are community-created content. They are neither monitored nor endorsed by IBM. If you find inappropriate content, please use Report Abuse to let us know. For more information on community content, please refer to our Terms of Use.

2. Browse through various IBM IoT Programming guides (https://console.bluemix.net/docs/services/IoT/index.html) to develop your own device or application code. There are several client libraries available for use with the IBM Watson IoT Platform. The client libraries are designed to allow users to interact with their devices and applications using their preferred language, and to simplify this interaction as much as possible.