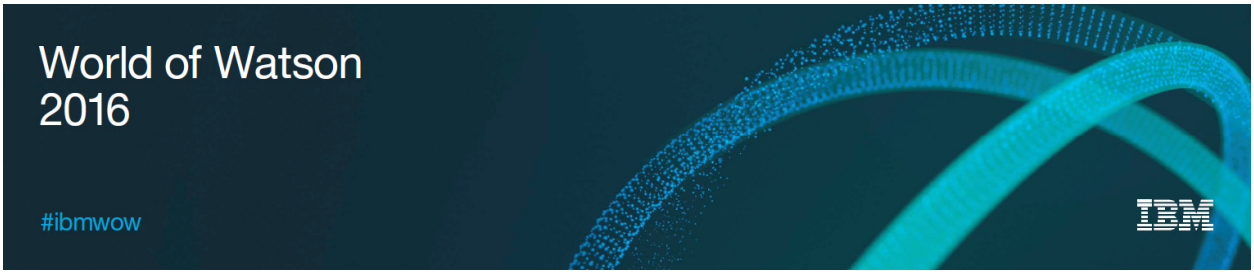

Hands-on Lab Instructions

Session 3282

Integrating IBM Watson IoT Platform and IBM Blockchain

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Download Lab Instructions From

http://ibm.biz/wowiotlab

Table of Contents

Overview

Section 1: Setup IBM Bluemix

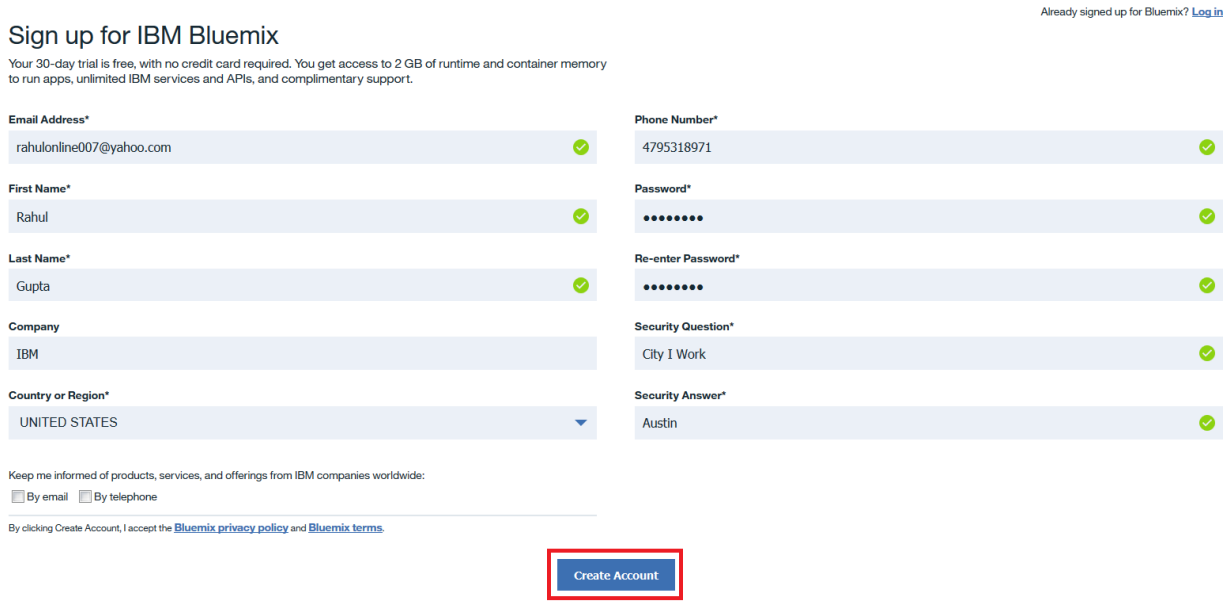
Signup for Bluemix: New User

- This lab requires a IBM Bluemix account. If you don't have access to IBM Bluemix already, you can register for a 30-day free trial at the following URL:

  https://console.ng.bluemix.net/registration

- Fill all the details and then click on ***Create Account*** to complete the registration process. Check your email inbox to complete the registration as shown in figure below.

Note: Please check the Junk folder if you don't see email from ***The Bluemix Team*** in your email inbox.

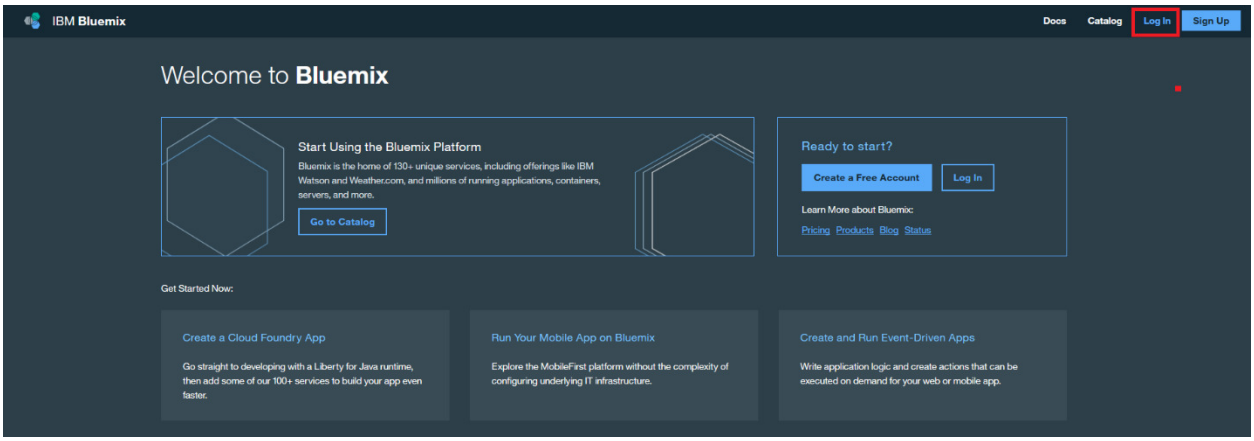


Log-In Bluemix: New and existing users

- If you already have a IBM Bluemix account, you can directly login using the URL below:

https://console.ng.bluemix.net/

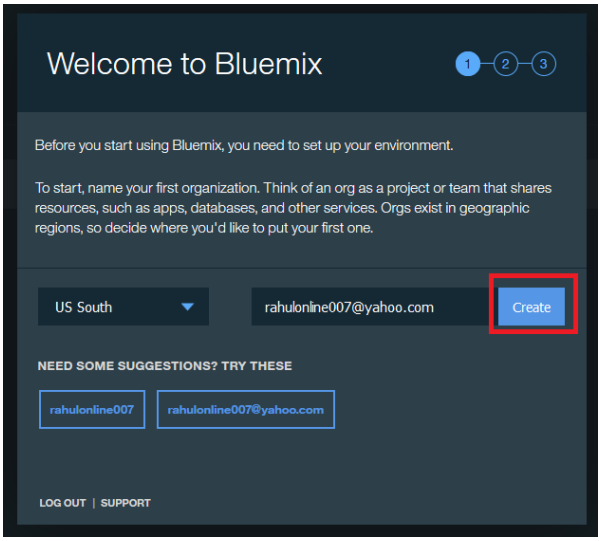
- Click on the Log-In button to login.



Create Bluemix organization: New user

- Once you have logged into IBM Bluemix create a Bluemix organization following the steps in the image below. Create an organization with your Bluemix account email id.

Note: *Existing Bluemix users can ignore this step*

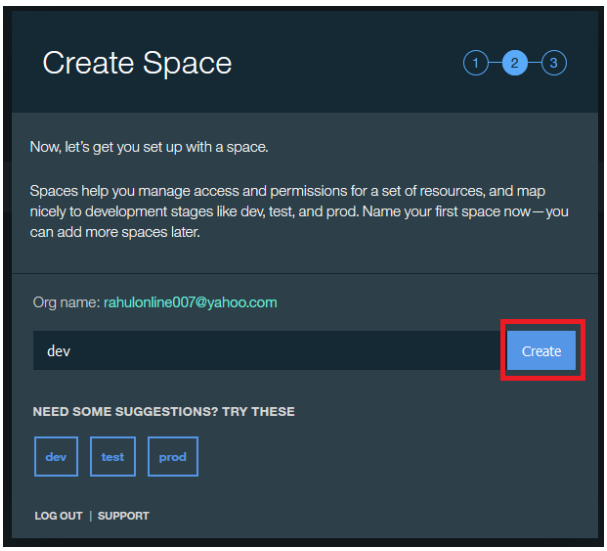


An organization is the highest concept. When you create an account you get your own "organization". You can invite others to your organization, can get invited to join other organizations or create organizations.

Create Bluemix space: New user

- Create a space with name **dev**

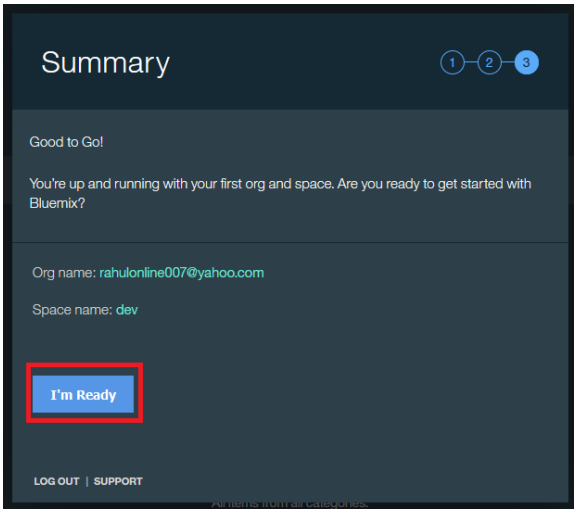
Note: *Existing Bluemix users can ignore this step*



Spaces are used to group related applications and services together. There can be multiple spaces within an organization. When an application or service is created they are assigned a specific space.

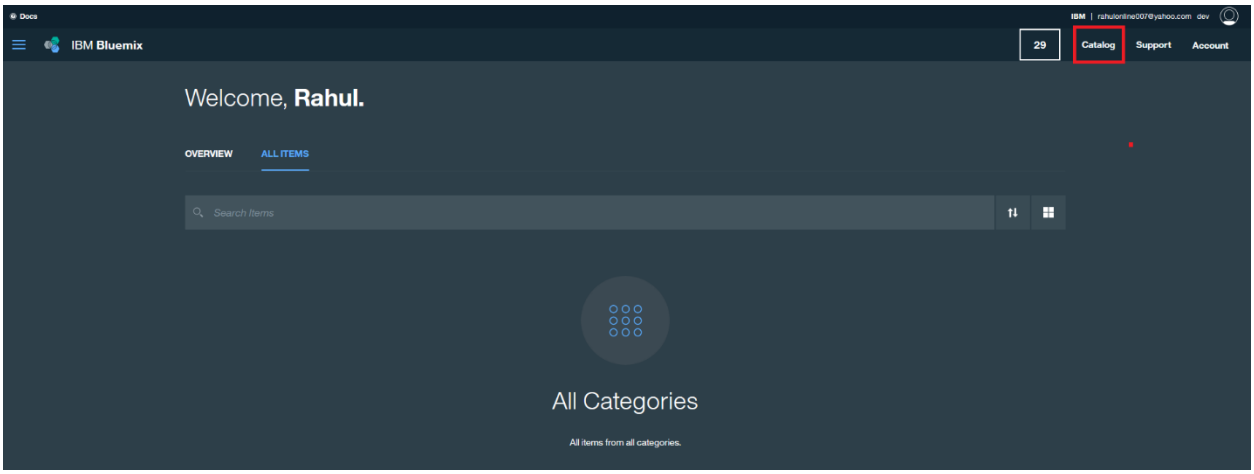
Complete creation of Bluemix organization and space: New user

- This step completes the setup of Bluemix organization and space. You can now proceed with creation of IBM Watson IoT Platform and IBM Blockchain services in the next step.

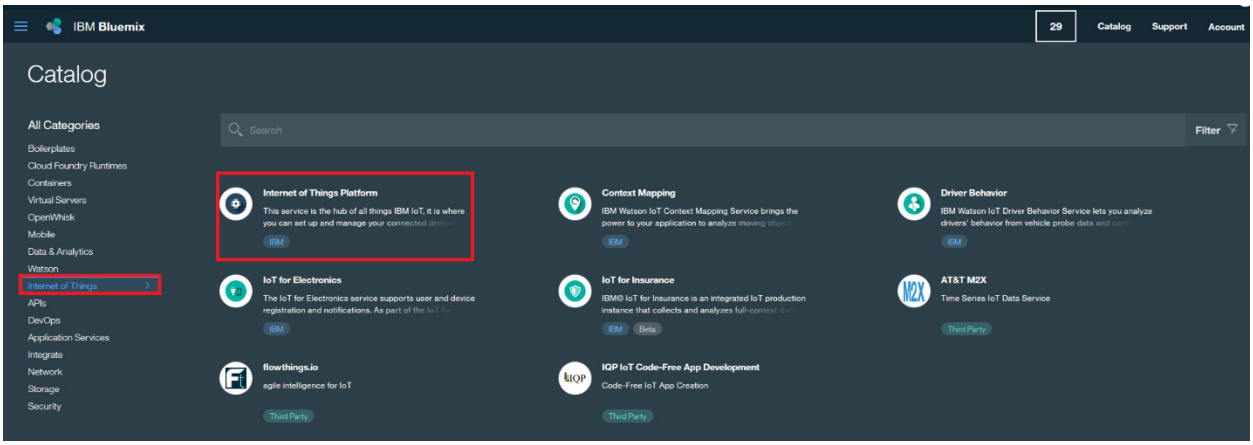


Create IBM Watson IoT Platform Organization

- Once you have logged in IBM Bluemix, click on the **Catalog** to browse the different services offered in IBM Bluemix platform.

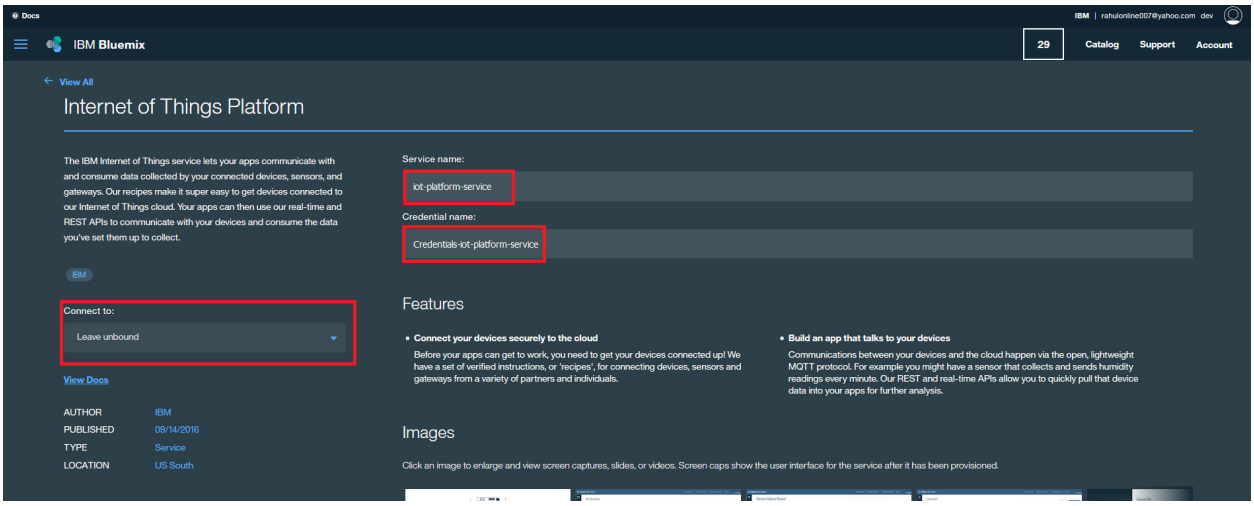


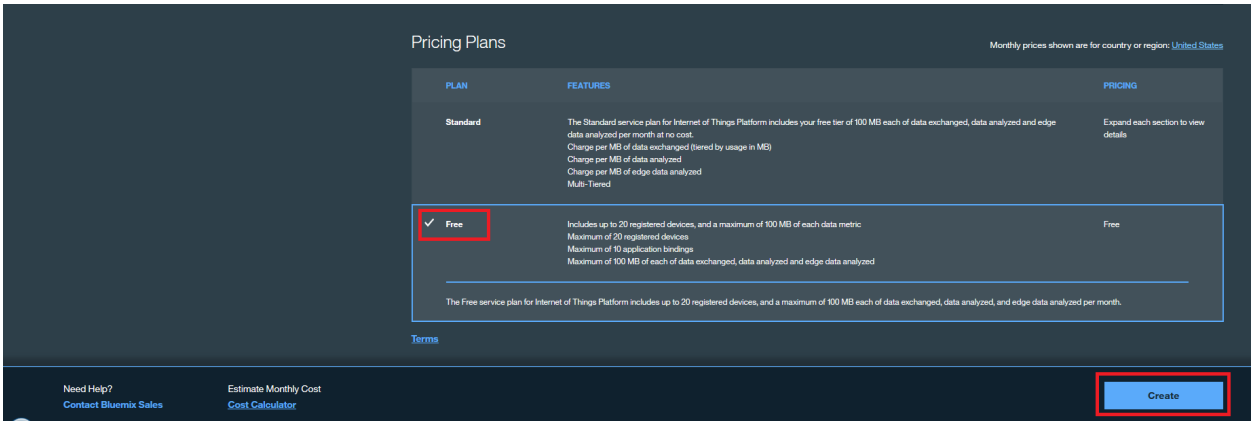
- In the services catalog select **Internet of Things** in the left menu and then click on **Internet of Things Platform**



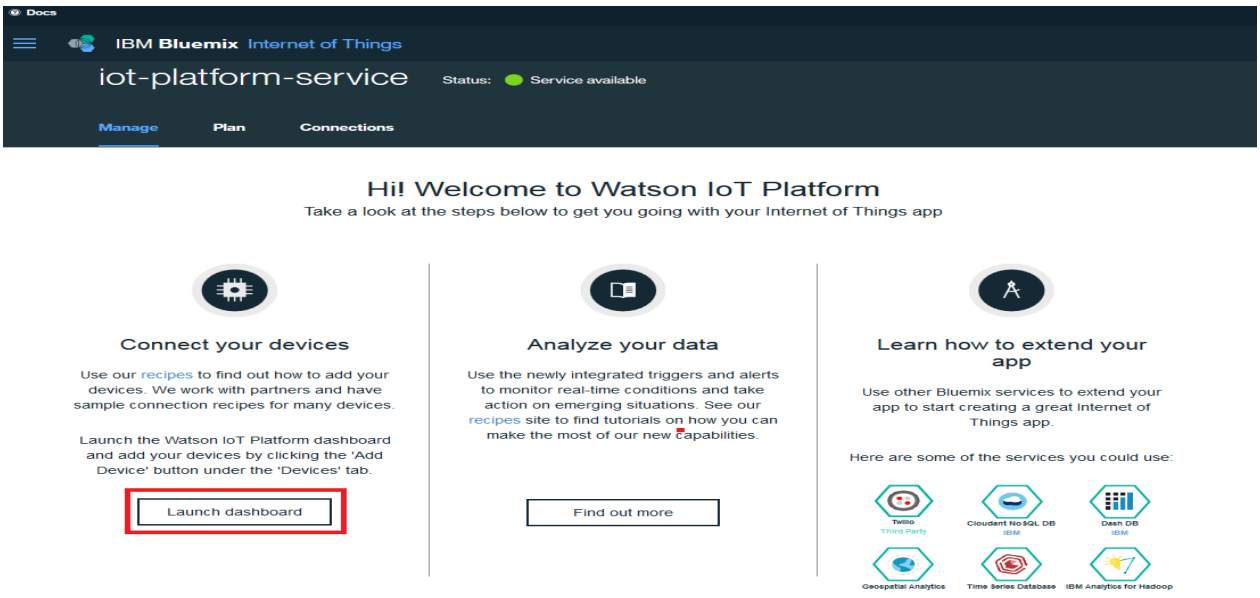
- To create the IBM Watson Internet of Things Platform, enter following details or something easier which could be remembered:
  - **Service Name:** iot-platform-service
  - **Credentials Name:** Credentials- iot-platform-service
  - **Pricing Plans –** Free

- Click on the **Create** button the create a new instance of IBM Watson IoT Platform service in IBM Bluemix.





- Once the service is created you can launch the IBM Watson IoT Platform dashboard by clicking the **launch dashboard** button.

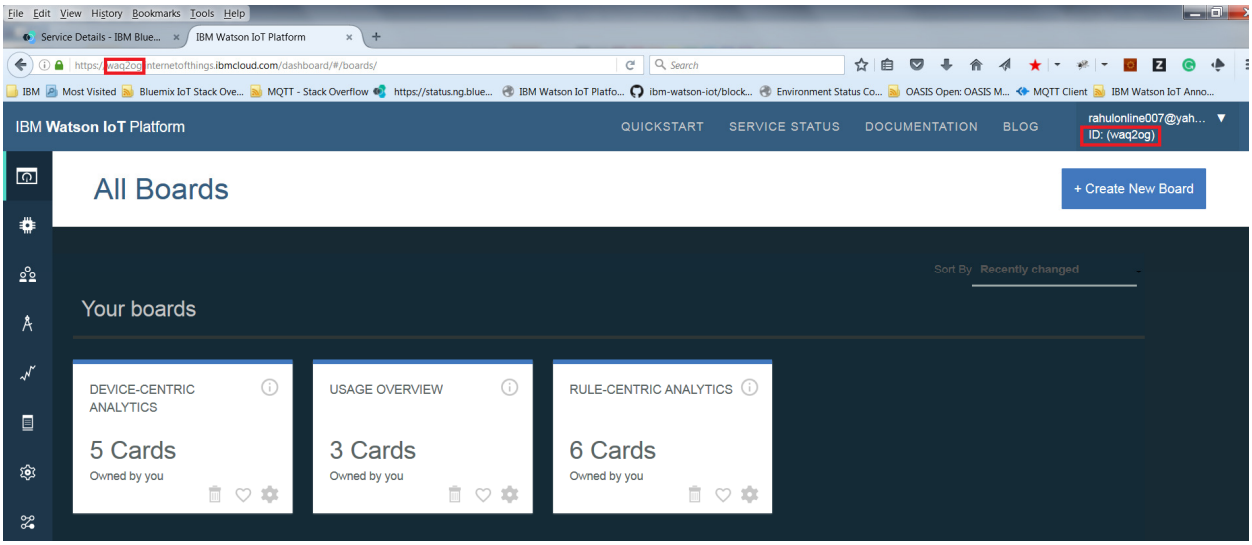


- Watson IoT Dashboard will be opened in a new browser tab. Familiarize yourself with the dashboard and specially the IoT Platform organization ID.

Note: The Watson IoT Platform organization ID is different from the IBM Bluemix organization ID

- Copy the Organization ID in a notepad.

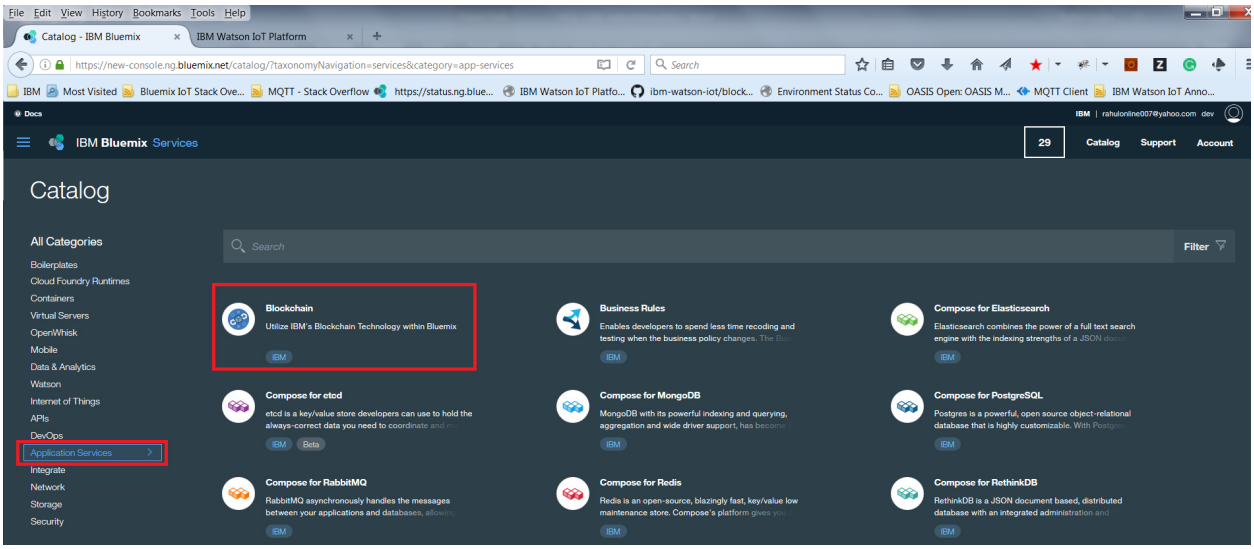
Note: In the image below the organization ID is highlighted in the rectangular box, every IoT Platform service has a unique organization ID.



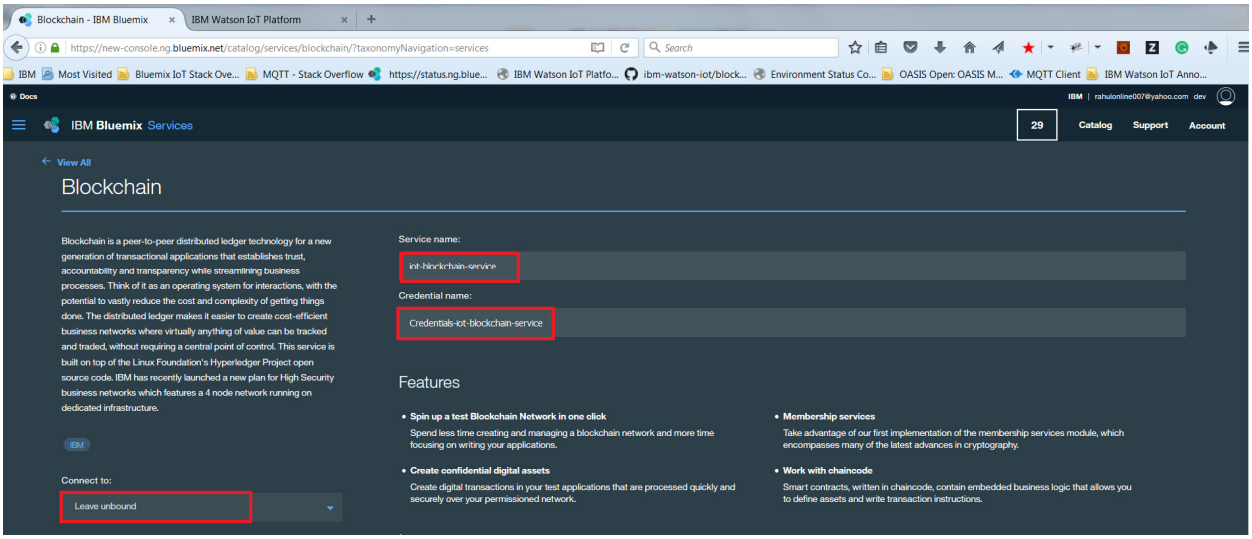
- This completes the creation of IBM Watson IoT Platform service and we can now proceed with creation of IBM Blockchain service.

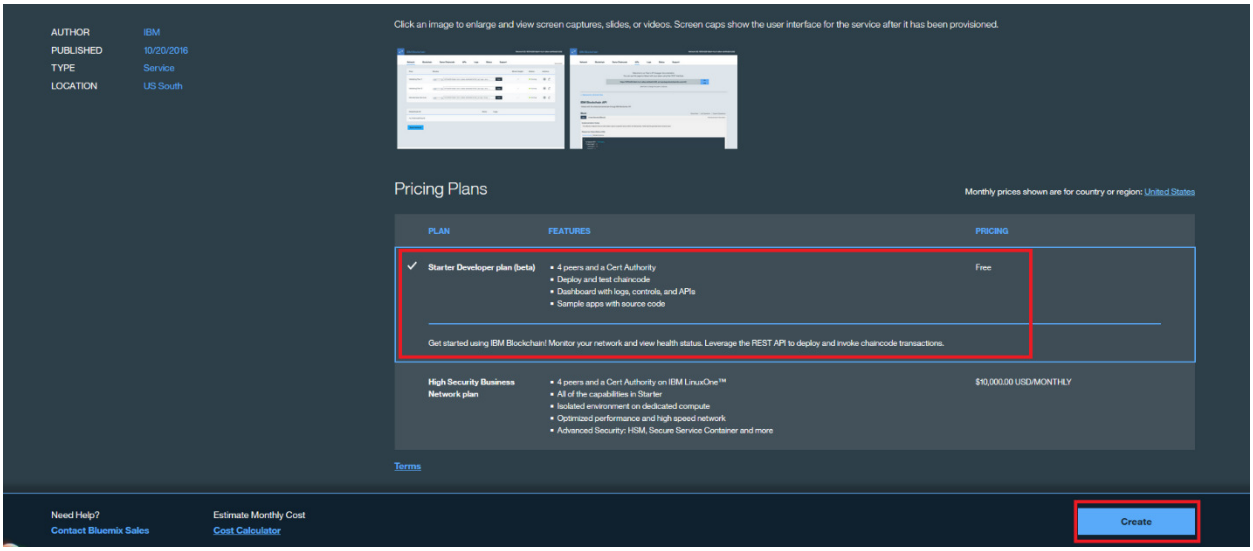
Create IBM Watson IoT Blockchain Service

- To create IBM Blockchain service, get back the IBM Bluemix **catalog**
- Click on the **Application Service** in the catalog menu
- Select **IBM Blockchain** as shown in the image on next page.

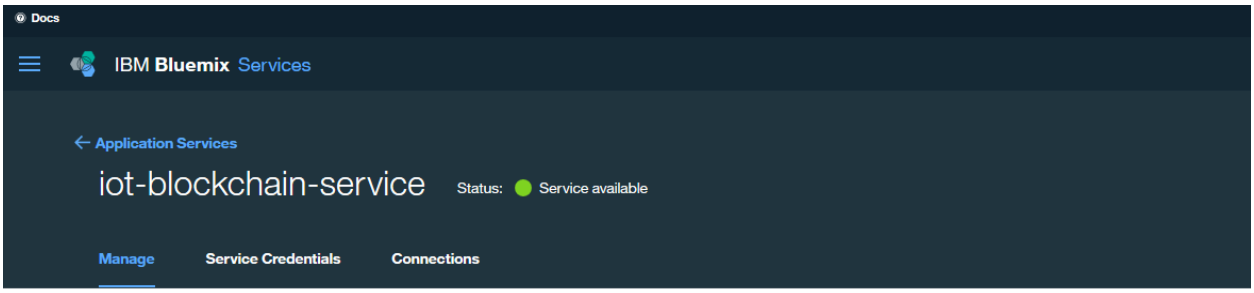


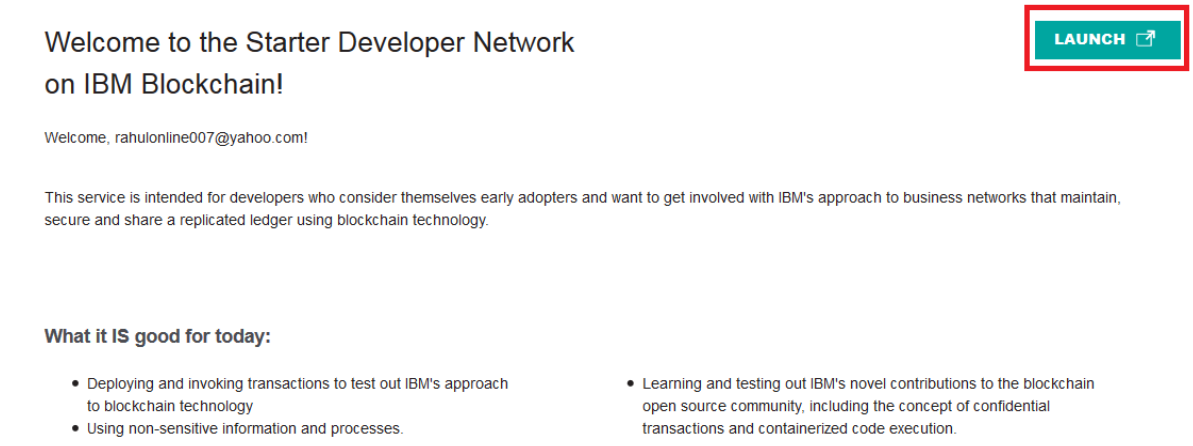
- To create the IBM Blockchain service, enter following details or something easier which could be remembered:
  - **Service Name:** iot-blockchain-service
  - **Credentials Name:** Credentials- iot-blockchain-service
  - **Pricing Plans –** Starter Developer Plan (Beta)



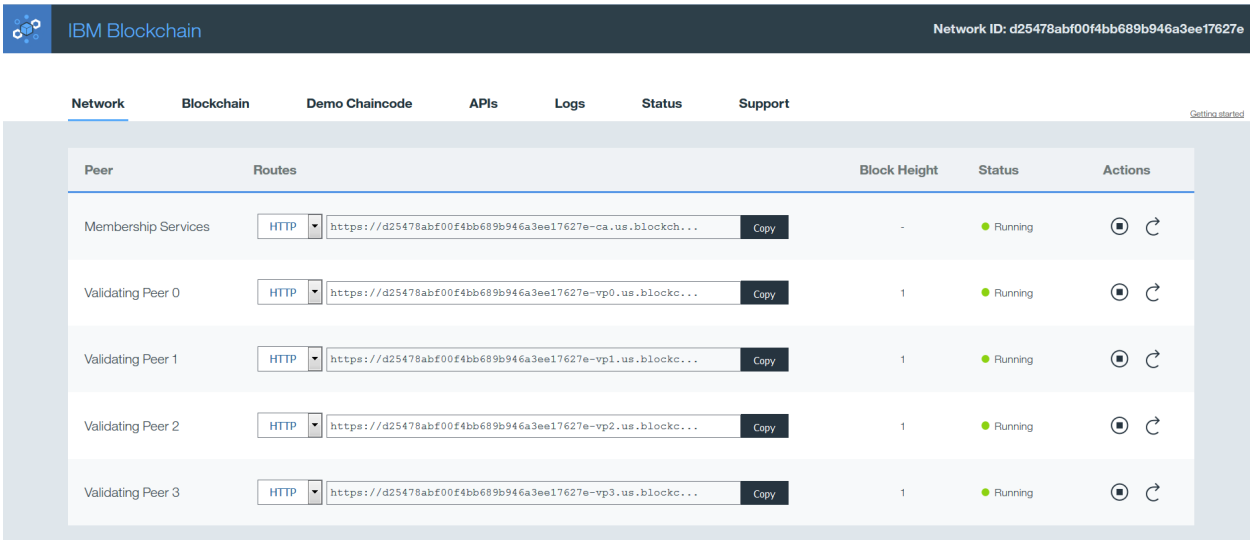


- Once the IBM Blockchain service is created, click on the Launch Button and that will launch the IBM Blockchain service dashboard in a new browser Tab window.





- IBM Blockchain service is now instantiated and ready to be used.
- This service is provisioned with four validating peer and one member ship CA (certificate authority) server.



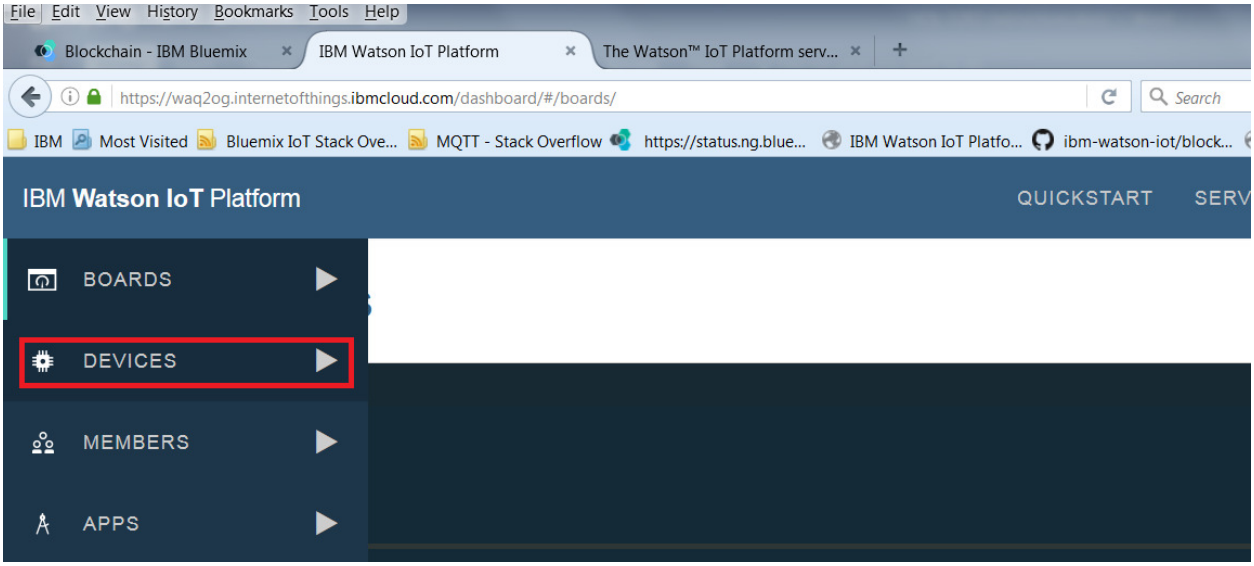
We have now created the IBM Bluemix service for the new users and later created the IBM Watson IoT Platform and IBM Blockchain service in Bluemix.

Note – Please don't close the browser tabs for IBM Watson IoT Platform dashboard and IBM Blockchain dashboard.

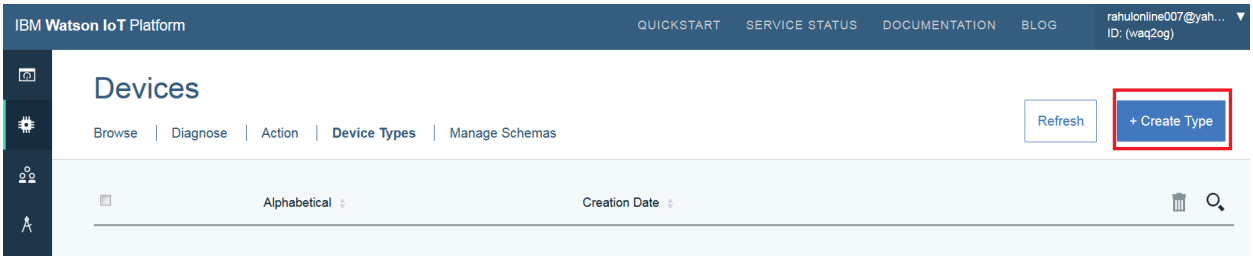
Section 2: Configure IBM Watson IoT Platform devices and application access

Create ELEVATOR device type

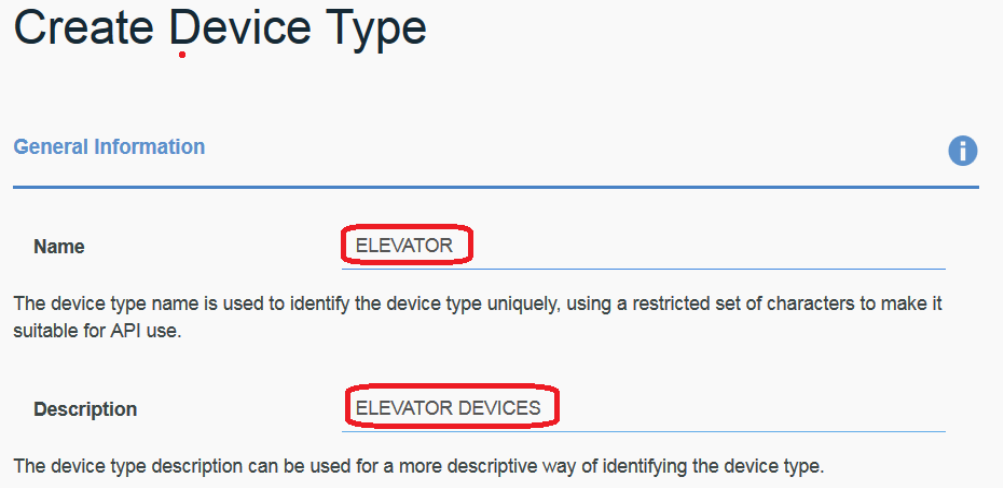
- Go to the IBM Watson IoT Platform dashboard tab in the browser window
- Click on **Devices**



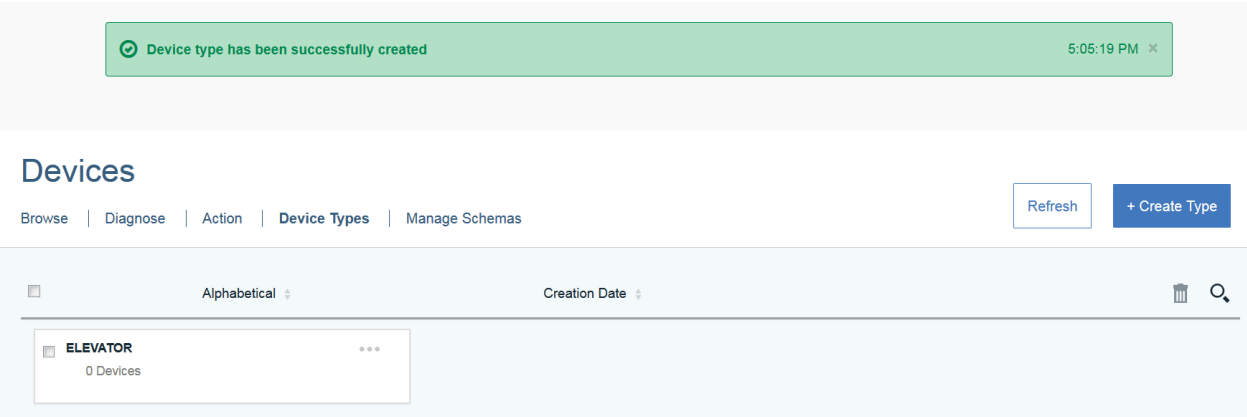
- Click on **Device Types** tab and then click **Create Type** button



- Create Device Type, Provide device name as **ELEVATOR** and description as **ELEVATOR DEVICES**

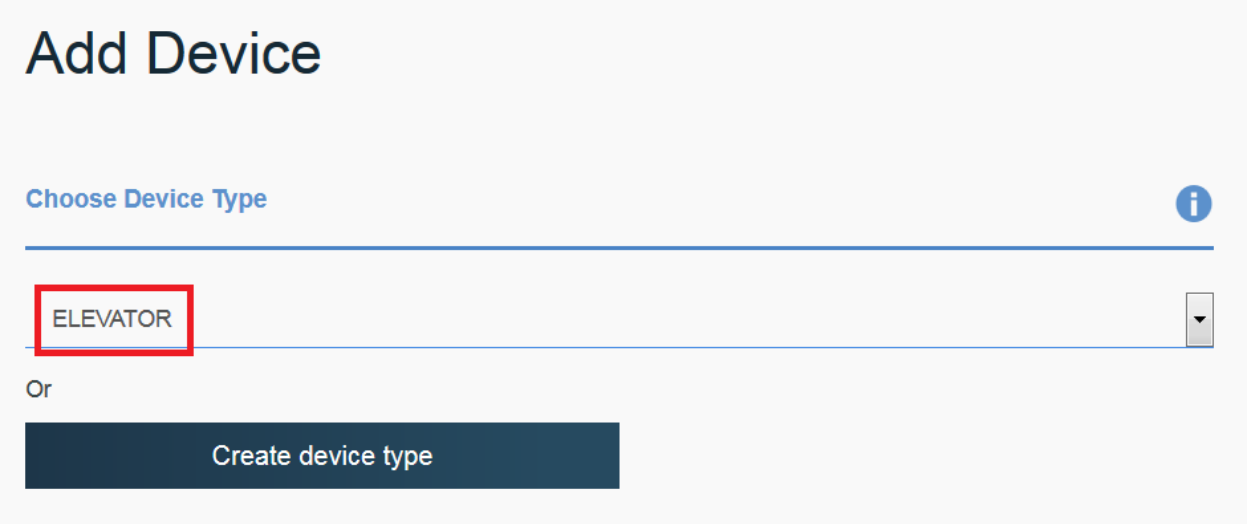


- Click on **Next** button
- Click **Next** on templates without selecting anything
- Click **Next** button in Submit Information
- Click Create button to create the **ELEVATOR** device type
- If device type ELEVATOR is successfully created, you will see a device type ELEVATOR in the dashboard

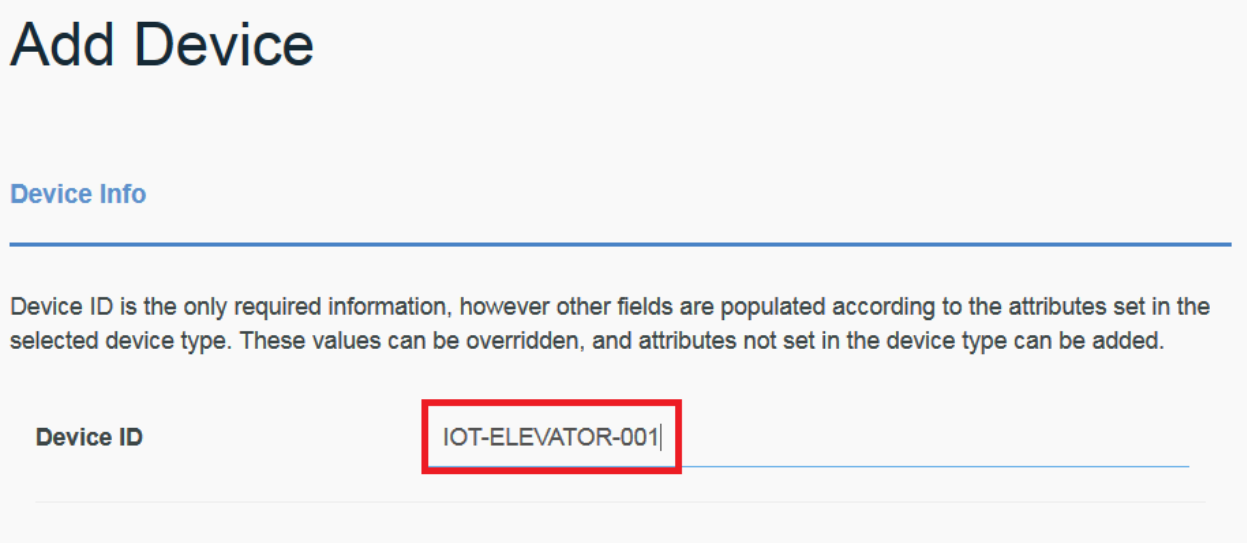


Add a device IOT-ELEVATOR-001 of device type ELEVATOR

- Go to the IBM Watson IoT Platform dashboard
- Click on **Devices**
- Click on **Browse** tab and then click on **Add Device** button
- To add a device, select the device type previously created: **ELEVATOR**



- Click **Next**
- Enter Device ID as: **IOT-ELEVATOR-001**



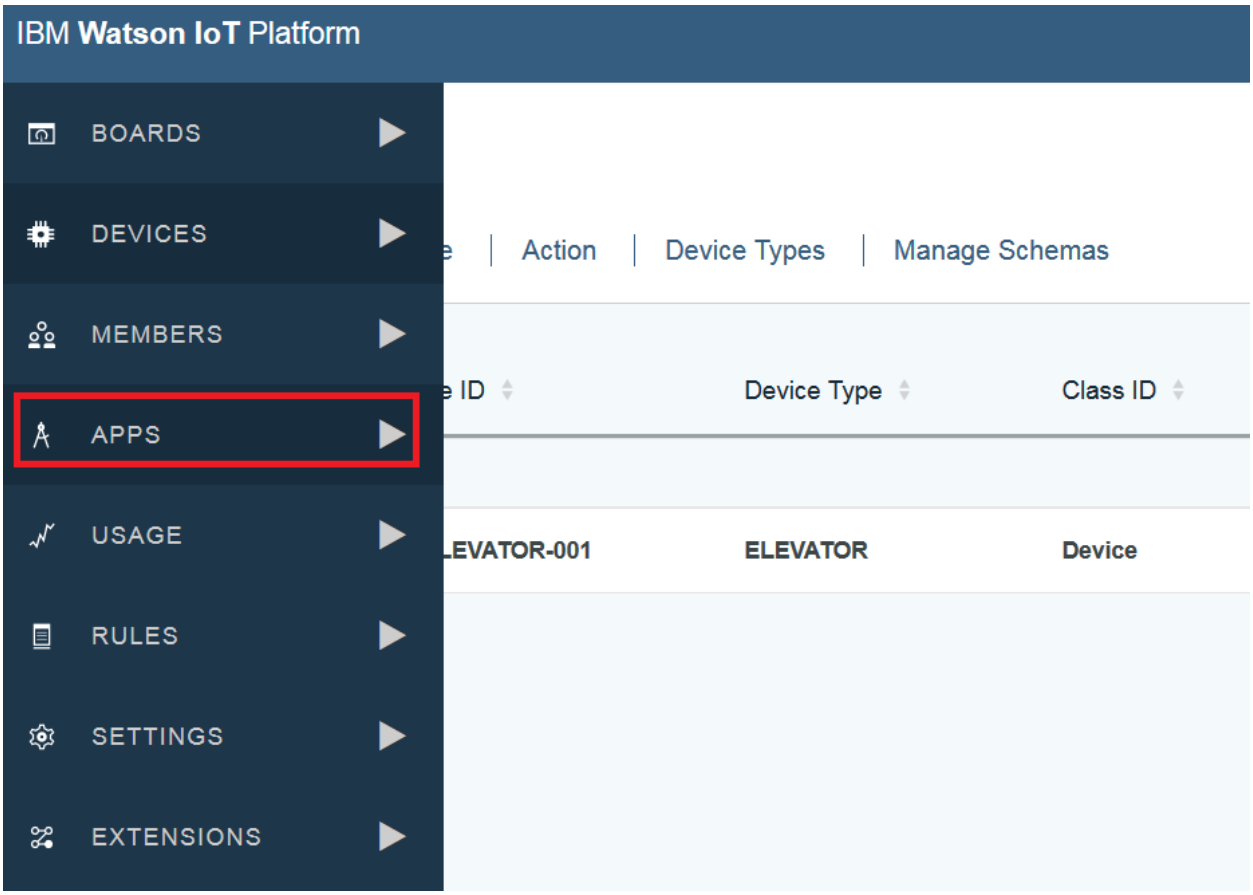
- Click **Next** on the Device Infor page
- Click **Next** on the Metadata page
- Click **Next** on the Security page
- Click **Next** on the Summary page
- Copy Organization ID, Device Type, Device ID into a notepad

Organization ID	waq2og
Device Type	ELEVATOR
Device ID	IOT-ELEVATOR-001
Authentication Method	token
Authentication Token	Tw)!9eea(Gceoi0nTM

- IOT-ELEVATOR-001 device of device type ELEVATOR is now created. Close the device creation page and this device will now be visible in the dashboard.

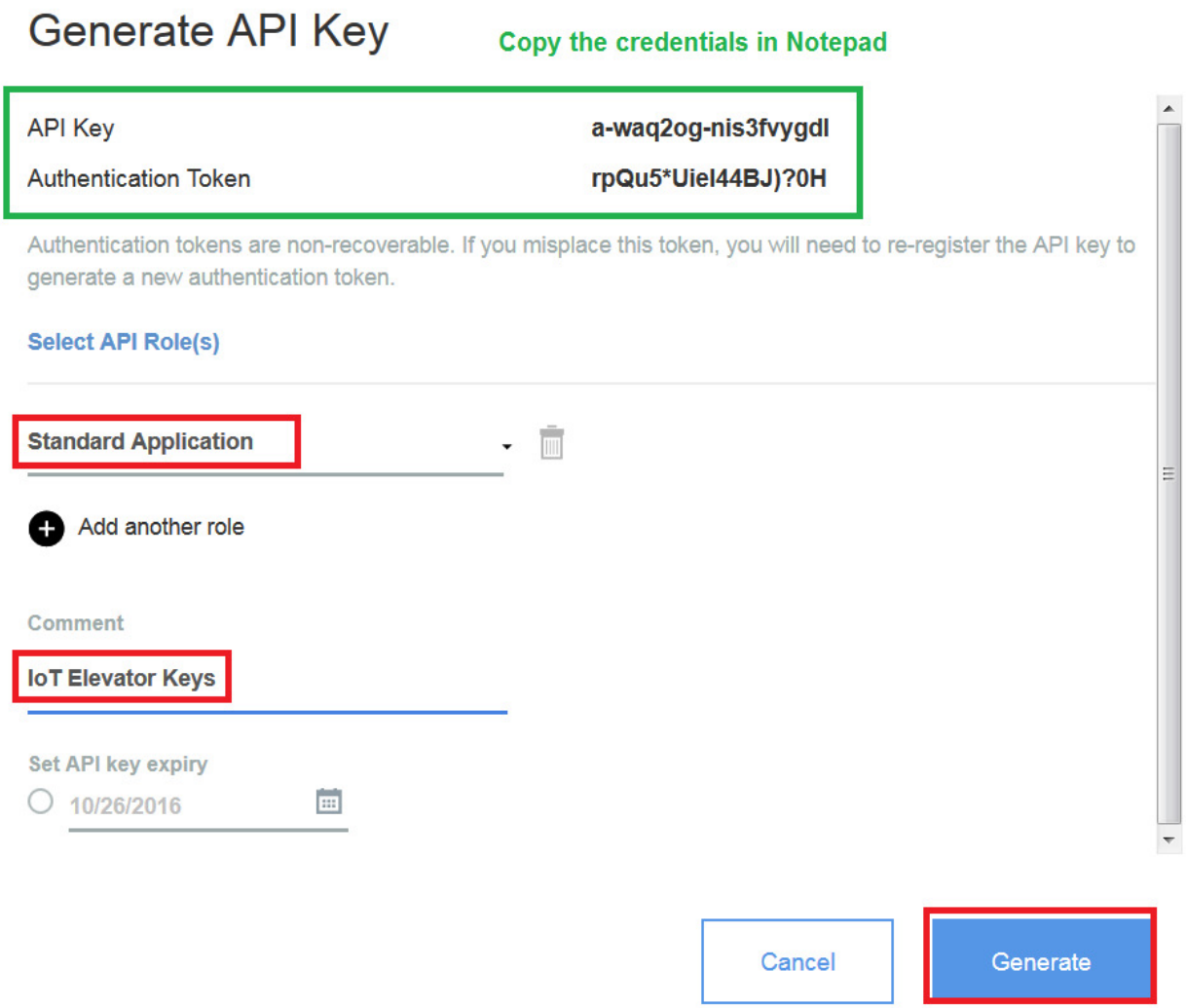
Generate API Keys to access this device from Elevator simulator application

- Application credentials created in this step will be used by the simulator
- Go to the IBM IoT Watson Platform dashboard and click on APPS



- Click on Generate API Key

- Select Standard Application and add comments for the keys
- Before clicking **Generate**, *copy* the API Keys and Authentication Token in a notepad. These credentials will be used later in the elevator simulator

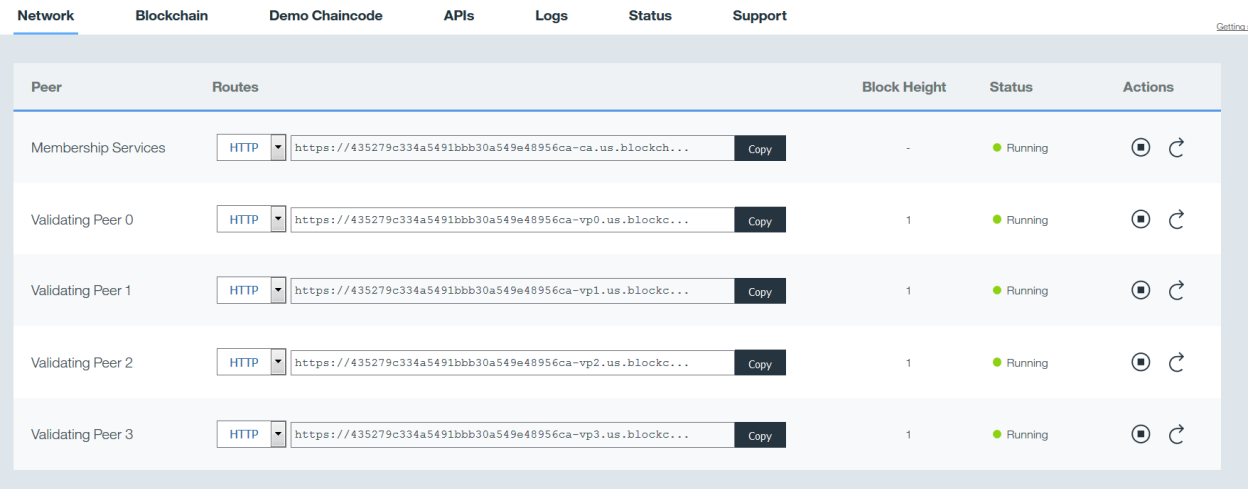


This completes the basic configuration on IBM Watson IoT Platform. We will revisit the Blockchain specific configurations after deploying the smart contract and completing the Blockchain configuration in next section.

Section 3: Register Blockchain users and deploy smart contract

Blockchain Peer assignment and roles

- Go to the IBM Blockchain tab open previously in the browser
- In the network tab, you will see five peers in the network tab



In this lab, we will use three validating peers for three virtual business organizations:

Validating Peers	**Business Organizations**
Validating Peer 0	This peer will be used by the elevator company to have access to the data transmitted by the elevator to capture any anomalies and compliance
Validating Peer 1	This peer will be used by the customer who has purchased an elevator from the Elevator Company
Validating Peer 2	This peer will be used by the government agency who has the audit the elevators for safety and compliance

Note: The IoT Blockchain Service and IoT Watson IoT Platform service is created on behalf of the elevator company

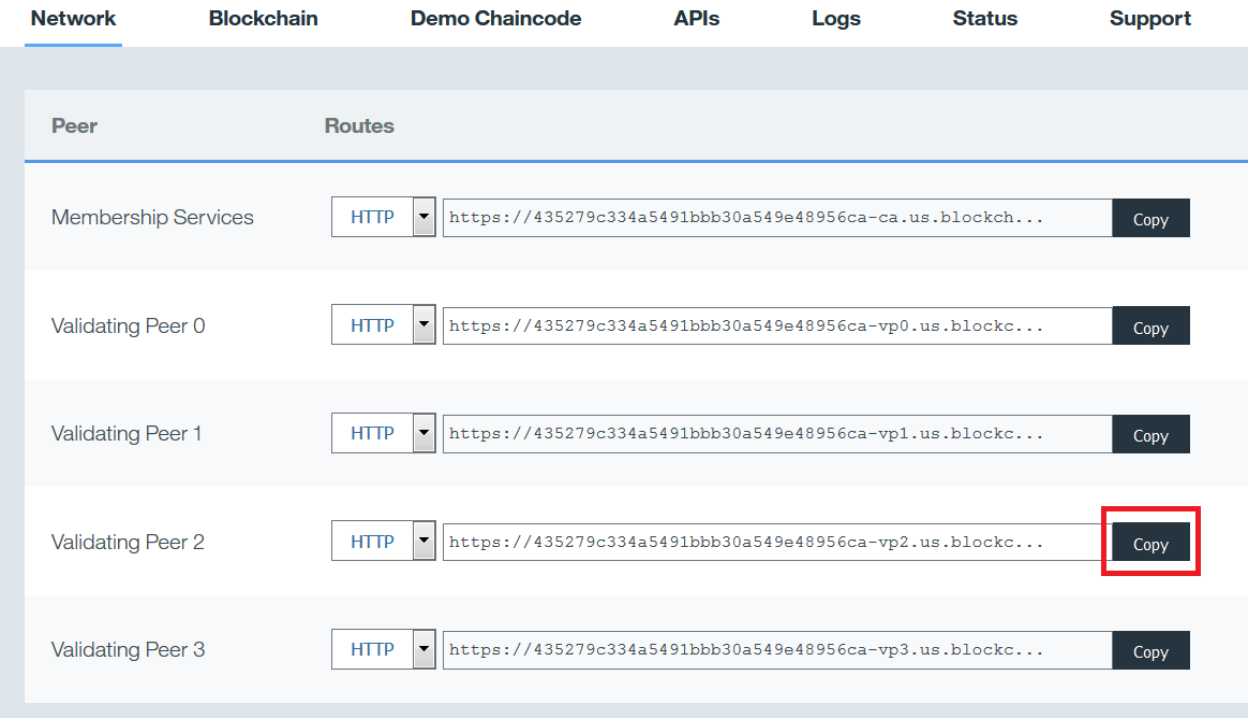
Register users from different organization with validating peers.

Note: IBM Blockchain service provides REST API for user registration, but in this lab, we will use a user interface for user registration.

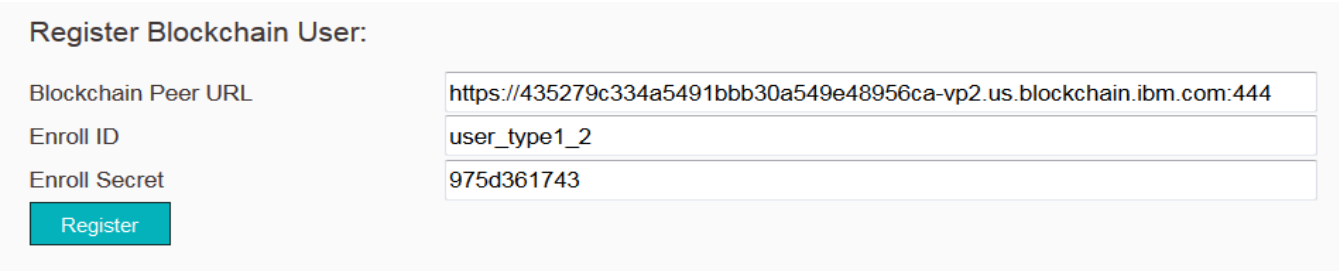
- In a new browser tab open this URL https://ibm.biz/wowsimulator
- Click on Register Users and Deploy Contract

Register a user from the government organization

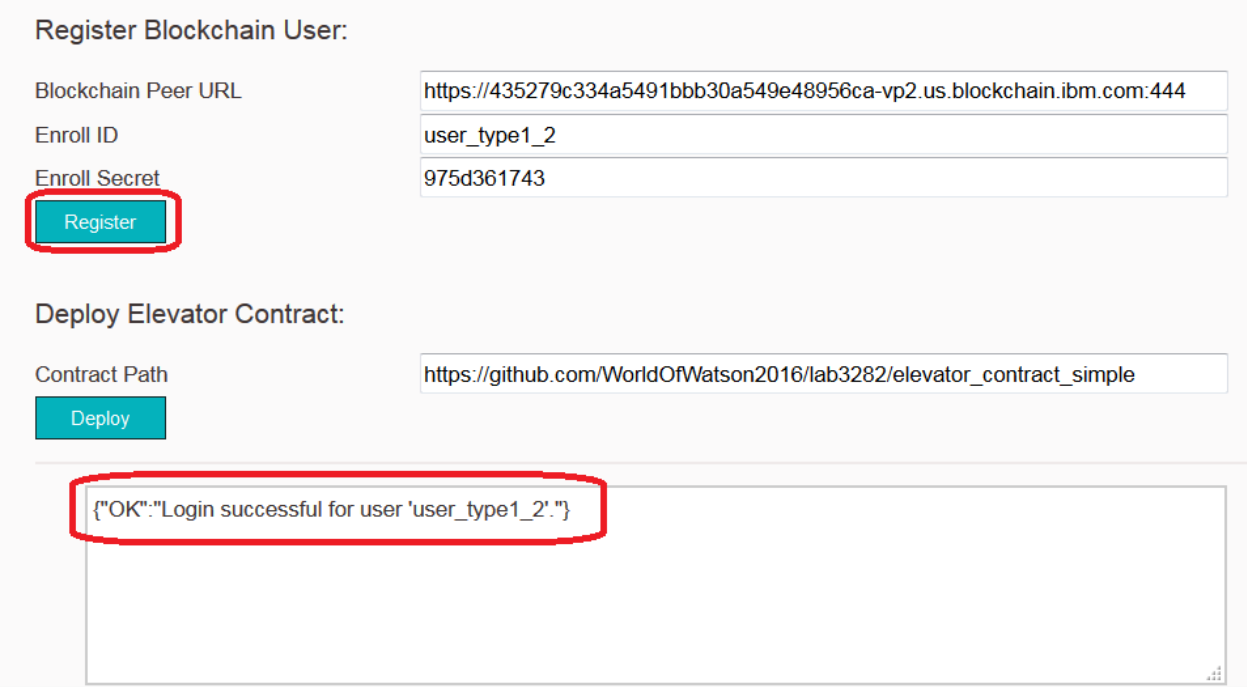
- Go to the Networks tab in IBM Blockchain Dashboard and copy the URL for Validation Peer 2



- At the right bottom of Network tab right click and open service credentials in a new tab
- Find the secret of user **"user_type1_2".** This secret will be needed for user registration with Validating Peer 2 of Blockchain
- Go back to the Register Users and Deploy Contract page on simulator application
- Enter the URL for Validating Peer 2 in Block Chain Peer URL text field
- Enter the username in Enroll ID text field
- Enter the secret in Enroll Secret text field



- Once the user is registered you will see the message as shown in image on next page



Register a user from the customer organization who purchased an Elevator

- Go to the Networks tab in IBM Blockchain Dashboard and copy the URL for Validation Peer 1
- At the right bottom of Network tab right click and open service credentials in a new tab
- Find the secret of user **"user_type1_1".** This secret will be needed for user registration with Validating Peer 1 of Blockchain
- Go back to the Register Users and Deploy Contract page on simulator application
- Enter the URL for Validating Peer 1 in Block Chain Peer URL text field
- Enter the username in Enroll ID text field
- Enter the secret in Enroll Secret text field
- Once the user is registered you will see the message as shown in image on next page

Register a user from Elevator manufacturing company

- Go to the Networks tab in IBM Blockchain Dashboard and copy the URL for Validation Peer 0
- At the right bottom of Network tab right click and open service credentials in a new tab
- Find the secret of user **"user_type1_0".** This secret will be needed for user registration with Validating Peer 0 of Blockchain
- Go back to the Register Users and Deploy Contract page on simulator application
- Enter the URL for Validating Peer 0 in Block Chain Peer URL text field
- Enter the username in Enroll ID text field
- Enter the secret in Enroll Secret text field
- Once the user is registered you will see the message as shown in image on next page

Deploy the Elevator contract

In this lab as the Blockchain network is owned by the Elevator manufacturing company, we will deploy the smart contract to the Validating Peer 0. The Smart Contract or often called as chaincode and will be deployed to each validating peer in this network.

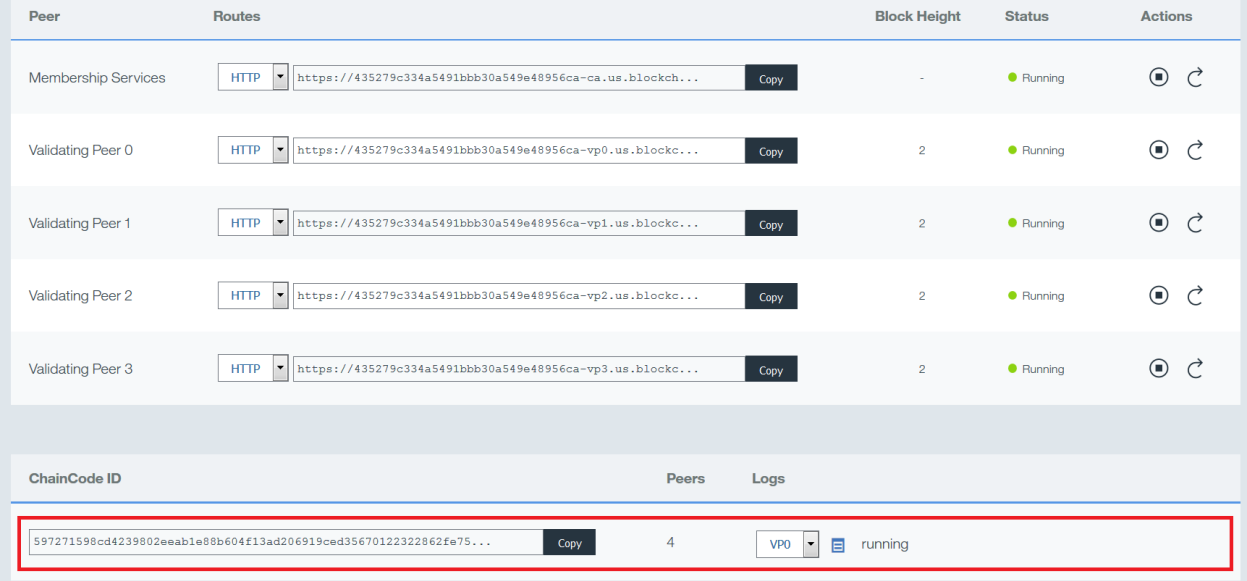
Elevator contract is already created and hosted in a public GitHub repository for you to have a look later: https://github.com/WorldOfWatson2016/lab3282/tree/master/elevator_contract_simple

- Go to the Networks tab in IBM Blockchain Dashboard and copy the URL for Validation Peer 0
- At the right bottom of Network tab right click and open service credentials in a new tab
- Find the secret of user **"user_type1_0".** This secret will be needed for user registration with Validating Peer 0 of Blockchain
- Go back to the Register Users and Deploy Contract page on simulator application
- Enter the URL for Validating Peer 0 in Block Chain Peer URL text field
- Enter the username in Enroll ID text field
- Enter the secret in Enroll Secret text field
- Click on the deploy Button

Note: The REST API to deploy the contract is asynchronous and the deployed contract may take three – four minutes to complete the deployment in all the four validating peers.

The response message contains the Chaincode ID. Every deployed chaincode gets a unique chaincode id in the Blockchain network. This Chaincode ID will be needed for integration with Watson IoT Platform but we can get this from Blockchain dashboard.

- In the Networks tab of Blockchain dashboard, observe the deployed chaincode on all the four validating peers in this Blockchain network.



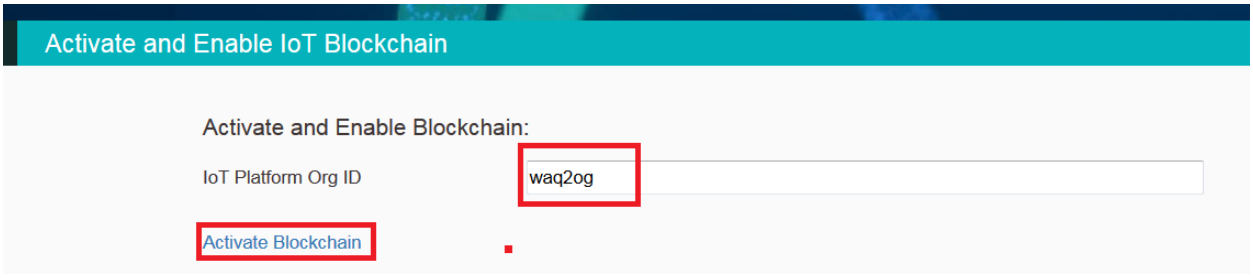
- The ChainCode ID could be copied when needed from the Copy button of the deployed contract
- Go to the Blockchain tab in IBM Blockchain dashboard and you would observe the first Block in the Blockchain network.
- This Block is for the chaincode deployed in the previous steps.

DATE	TYPE	UUID	CHAINCODE ID	PAYLOAD
10/25 12:52am UTC	DEPLOY	n/a	597271598cd4...	init{"version":"1.0"}

Section 4: Activate Blockchain features in IBM Watson IoT Platform

Note: The IBM Watson IoT Blockchain features used in this lab are still under development and are unsupported

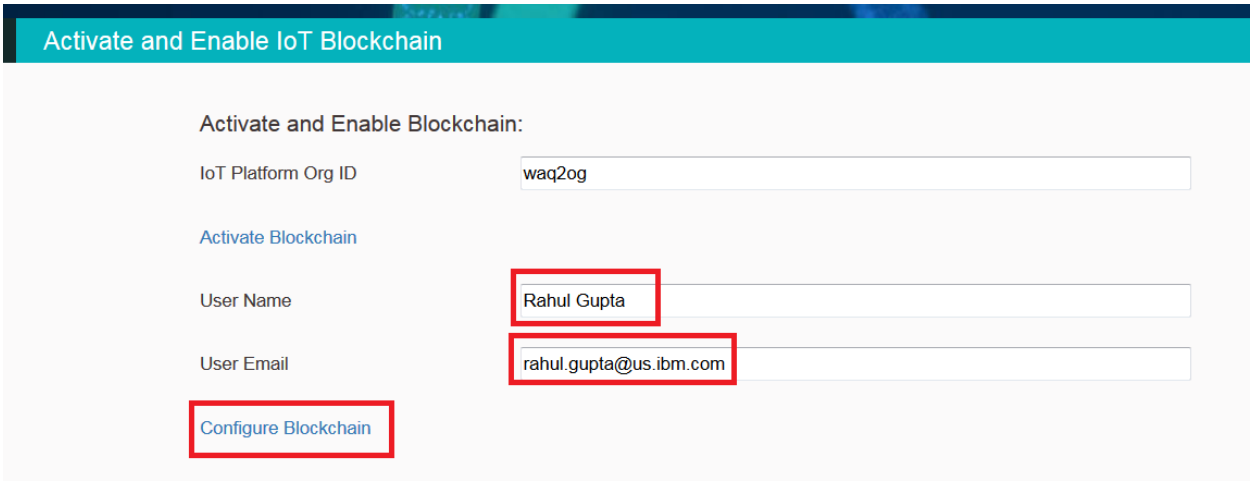
- To activate the IBM Blockchain integration in IBM Watson IoT Platform, open the simulator (https://ibm.biz/wowsimulator) in new tab
- Click on Activate and Enable Blockchain
- To activate Blockchain features in IBM Watson IoT Platform, enter the IoT Platform Organization ID and click **Activate Blockchain**.



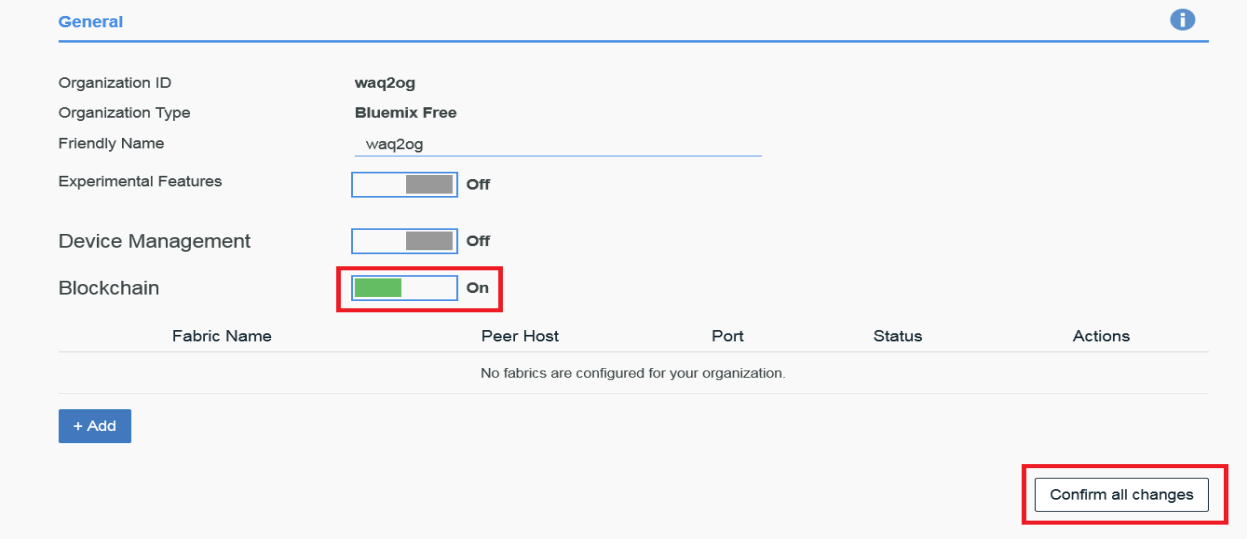
- This will activate Blockchain and you will see following JSON in the browser

```
{"activated":true,"enabled":false}
```

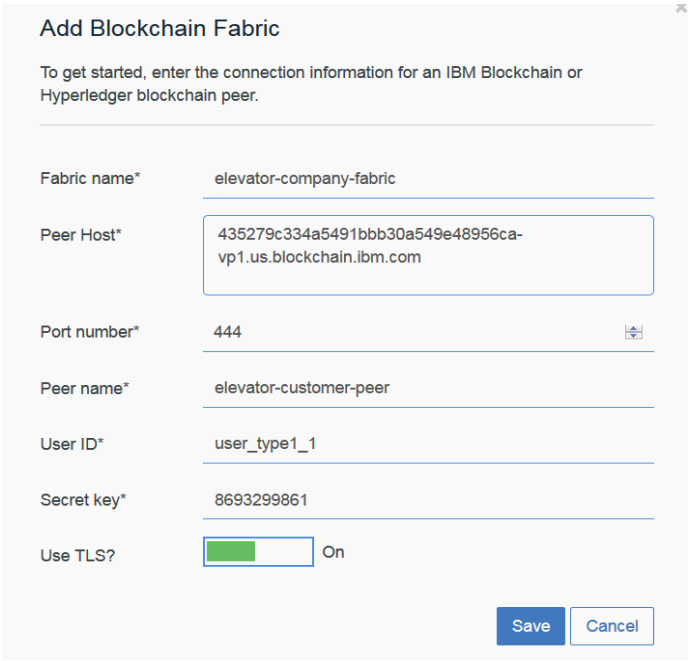
- Click back on the browser and you will reach the same page again
- Enter your name in the User Name text box
- Enter your email in the User Email text box
- Click on Configure Blockchain



- Now you will be navigated to the IBM Watson IoT Platform to configure Blockchain
- Enable Blockchain by clicking on the toggle button and Confirm all changes



- Click on the Add button to add the Blockchain validating peer details of the Elevator manufacturing company
- In the Add Blockchain Fabric form click enter following details
    - **Fabric Name** – elevator-company-fabric
    - **Peer Host** – Copy the host name for Validating Peer 1 from the IBM Blockchain dashboard, use just the hostname remove https and port 444
    - **Port Number** – 444
    - **Peer Name** – elevator-customer-peer
    - **User Id -** user_type1_1 (Use the user ID used earlier for registration with Validating Peer 1**)**
    - **User Secret –** Enter the secret key for user user_type1_1



- Click Save
- Click again on Confirm All Changes

Section 5: Configure and connect Elevator simulator to IoT Watson IoT Platform

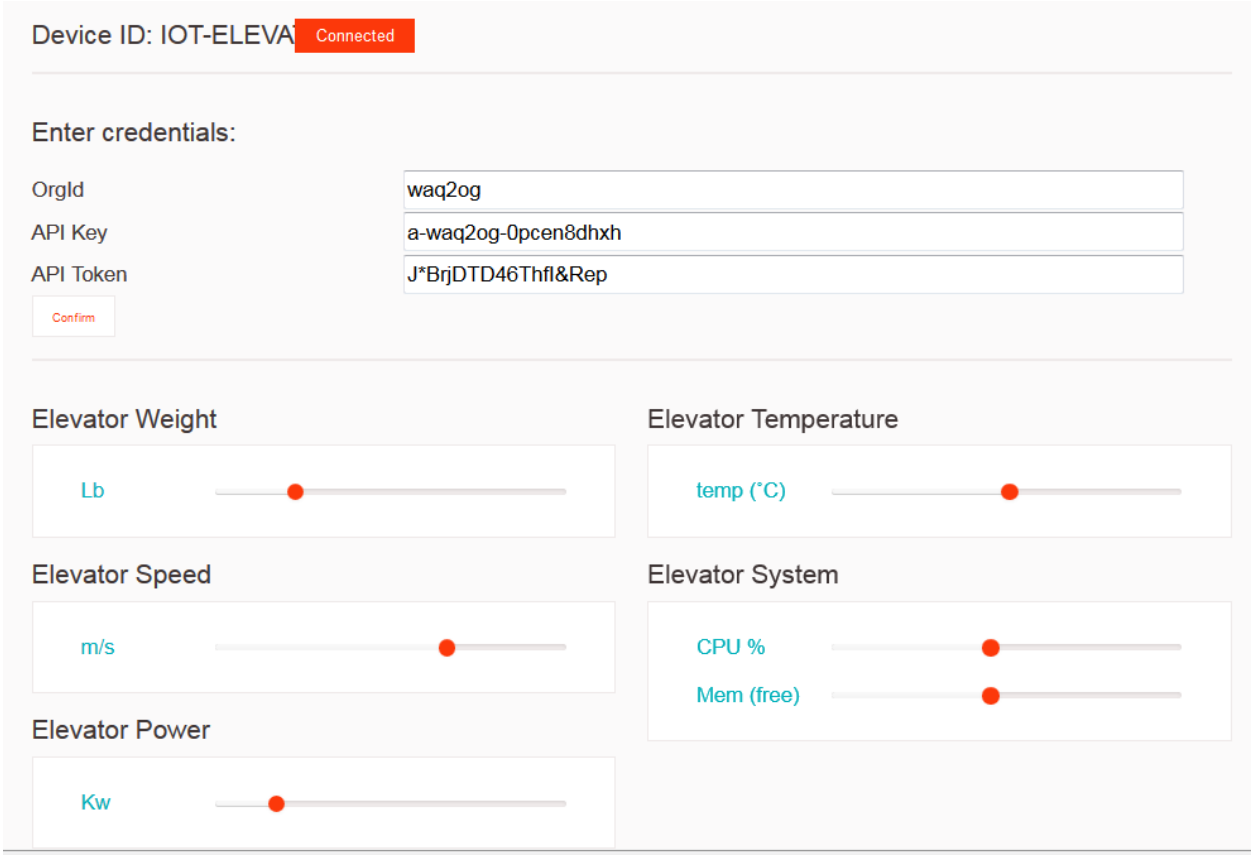
This section will help you configure a virtual elevator simulator. This elevator connects to the IBM Watson IoT Platform and sends data with following fields:

AssetID	This element in the data shows the ID of the elevator
Weight	This element in the data shows the weight of passengers in the elevator
Speed	This element in the data shows the speed of the elevator wagon
Power	This element in the data shows the power consumption by the elevator
Temperature	This element in the data shows the temperature of the elevator
System	This element in the data shows the CPU and memory consumed by a microcomputer inside the elevator

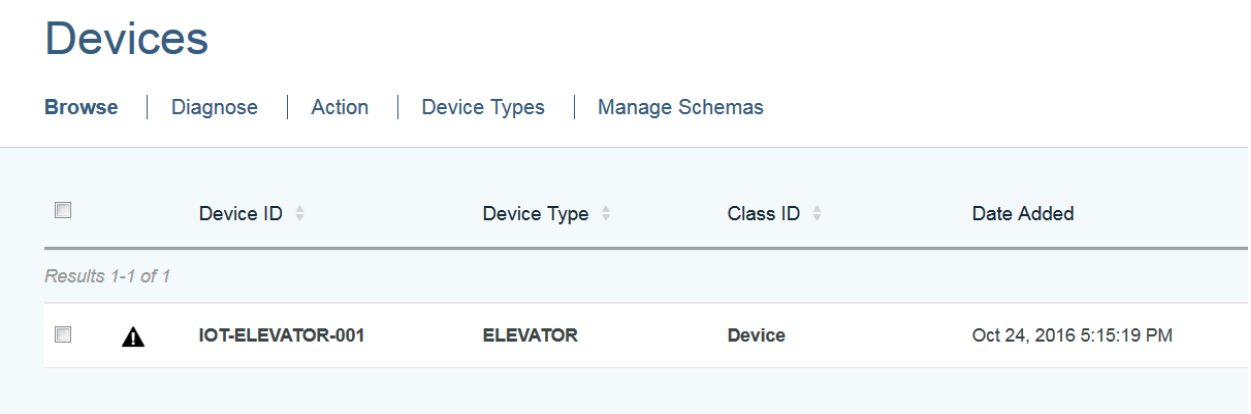
- Data from the elevator is sent in following JSON format


```
{
        "d": {
                "assetID": "IOT-ELEVATOR-001",
                "weight": 96,
                "speed": 7,
                "power": 78,
                "temperature": 34,
                "system": {
                        "cpu": 0.51,
                        "memory": 459990484
                }
        }
}
```


- To access the simulator, open a new tab in the browser window and go to url https://ibm.biz/wowsimulator
- Then click on Elevator Device Simulator
- Enter the IBM Watson Platform Org ID in the OrgID text box
- Enter the application API key in API Key text box. (This key was copied in notepad previously)
- Enter the application API Token in the API Token text box (This token was copied in notepad previously)
- Click on Confirm button
- This will connect the virtual elevator IOT-ELEVATOR-001 to IBM Watson IoT Platform
- Messages from the simulator will be sent at a frequency of every 2 seconds



- You can validate if the messages are reaching the IBM Watson IoT Platform by going back to the device IOT-ELEVATOR-001 created previously.



- Double click on device IOT-ELEVATOR-001 and under recent events you could see all the events from the elevator transmitted every two seconds

Recent Events

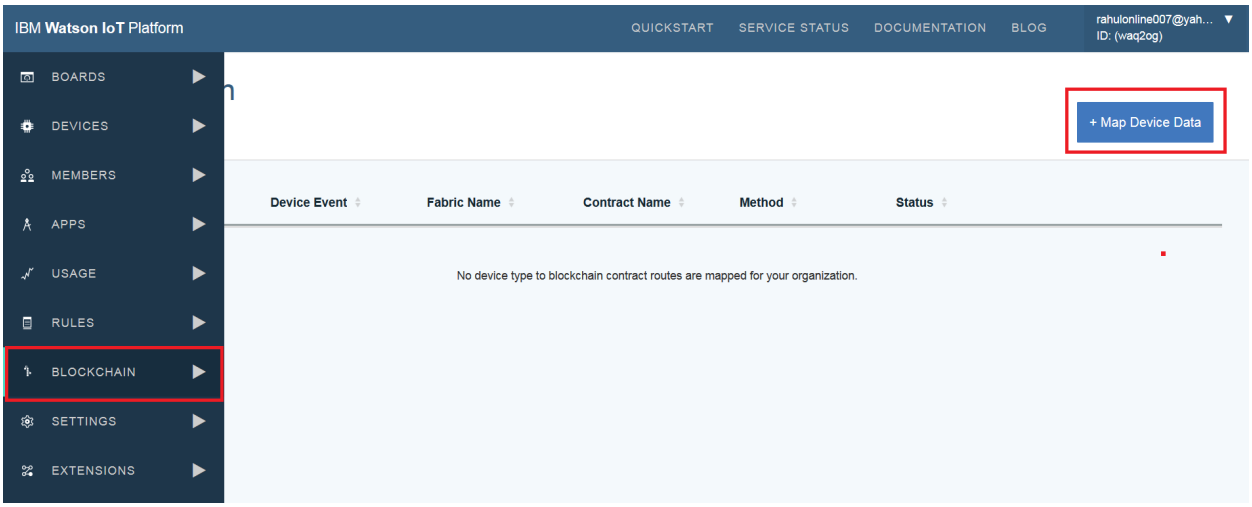
Event	Format	Time Received
data	json	Oct 24, 2016 10:34:25 PM
data	json	Oct 24, 2016 10:34:27 PM
data	json	Oct 24, 2016 10:34:29 PM
data	json	Oct 24, 2016 10:34:31 PM
data	json	Oct 24, 2016 10:34:33 PM
data	json	Oct 24, 2016 10:34:35 PM
data	json	Oct 24, 2016 10:34:37 PM
data	json	Oct 24, 2016 10:34:39 PM
data	json	Oct 24, 2016 10:34:41 PM
data	json	Oct 24, 2016 10:34:43 PM

- Data is now getting transmitted from Elevator simulator to IBM Watson IoT Platform
- In Section 6 we will configure the integration routes between IBM Watson IoT Platform and the Blockchain fabric

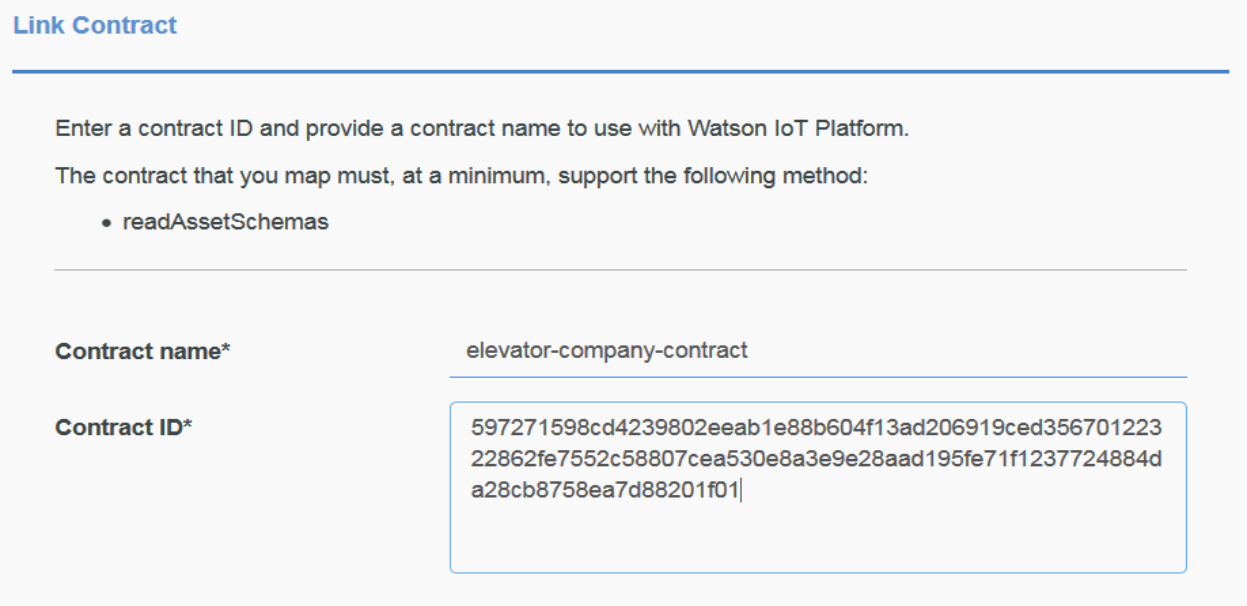
Section 6: Configure Integration routes between IBM Watson IoT Platform and IBM Blockchain

In this section, we will create routes to transmit data received on IBM Watson IoT Platform to the IBM Blockchain.

- Go to the IBM Watson IoT Platform dashboard and click on Blockchain icon like below



- Then click on the Map Device Data button
- Add Route wizard will open
- In the Device type and Event form enter
    - **Device type**: ELEVATOR
    - **Event:** data
- Click Next
- In the Select Fabric form
    - **Fabric Name**: elevator-company-fabric
- Click Next
- In the Link Contract form
    - **Contract name:** elevator-company-contract
    - **Contract ID:** Copy the chaincode ID from the IBM Blockchain networks tab and paste it here in this form



- Click Next
- In the Device data mapping form select the Contract method as **updateAsset**.

Note: This schema for this method is pulled from the Elevator contract. The incoming data event for the simulator will now be mapped to this schema

- Enter following details to complete the schema mapping

Schema Property	Map to incoming JSON data
assetID	d.assetID
weight	d.weight
temperature	d.speed
speed	d.power
power	d.temperature
System	
cpu	d.system.cpu
memory	d.system.memory

- Click Next
- Click Finish on summary page to complete the device data mapping to Blockchain

Summary

Verify that the fabric, contract, and device property mapping information is correct and then click Finish to create the route mapping.

Device type	ELEVATOR
Event	data
Fabric name	elevator-company-fabric
Contract name	elevator-company-contract
Contract method	updateAsset
Contract ID	597271598cd4239802eeab1e88b604f13ad206919ced35670122322862fe7552c58807cea530e8a3e9e28aad195fe71f1237724884da28cb8758ea7d88201f01

Data Mapping

Device Property		Contract Attribute
d.assetID	→	assetID
d.weight	→	weight
d.temperature	→	temperature
d.speed	→	speed
d.power	→	power
d.system.cpu	→	system.cpu
d.system.memory	→	system.memory

- You shall now see a Blockchain route created in IBM Watson IoT Platform

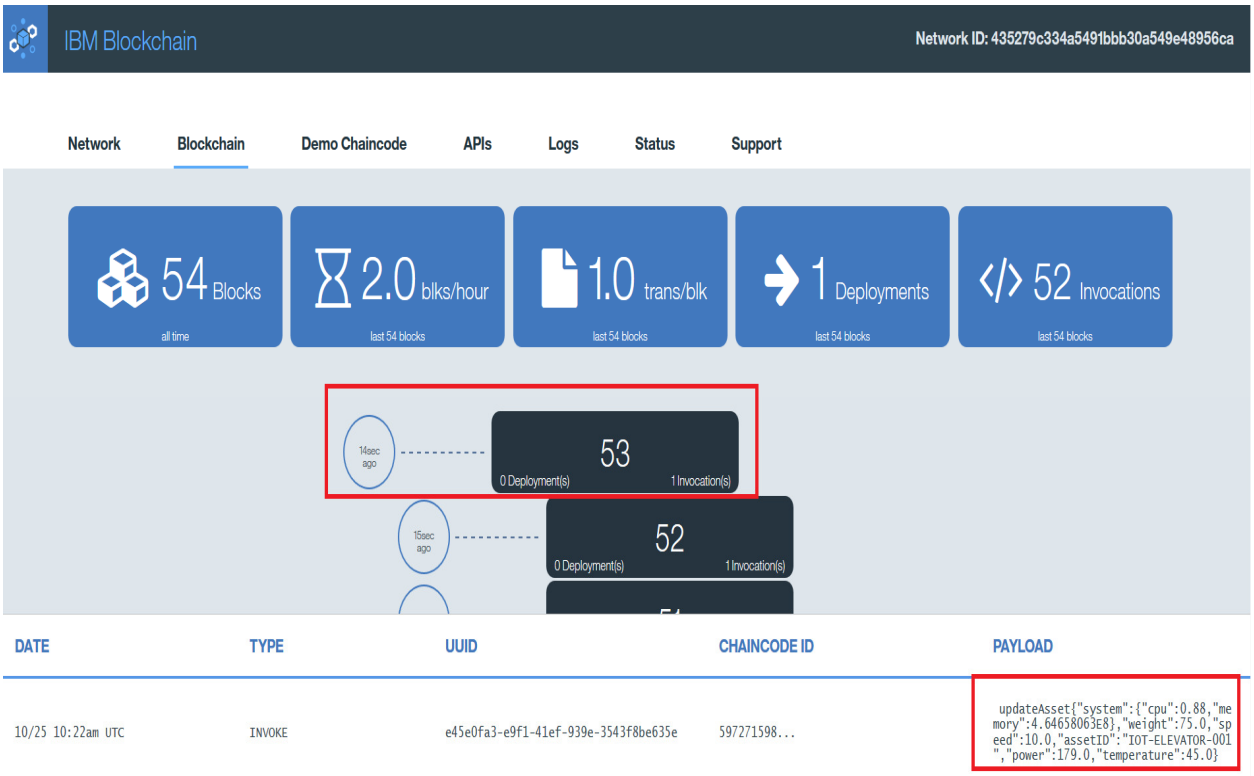
Blockchain

Routes

+ Map Device Data

Device Type	Device Event	Fabric Name	Contract Name	Method	Status
ELEVATOR	data	elevator-company-fabric	elevator-company-contract	updateAsset	Enabled

- To validate if the events from Elevator device IOT-ELEVATOR-001 are reaching the IBM Blockchain, go to the IBM Blockchain service dashboard and click on Blockchain tab
- You shall see the new incoming Blocks
- Click on one of the Blocks to see the data in that block in this public ledger



- Now we have data coming from Elevator installed at a customer location into Blockchain in the next section we will configure how the Elevator company and Government agency can access this data from Blockchain network for audits, compliance and services.

Section 7: Access Elevator data in Blockchain: Elevator manufacturing company

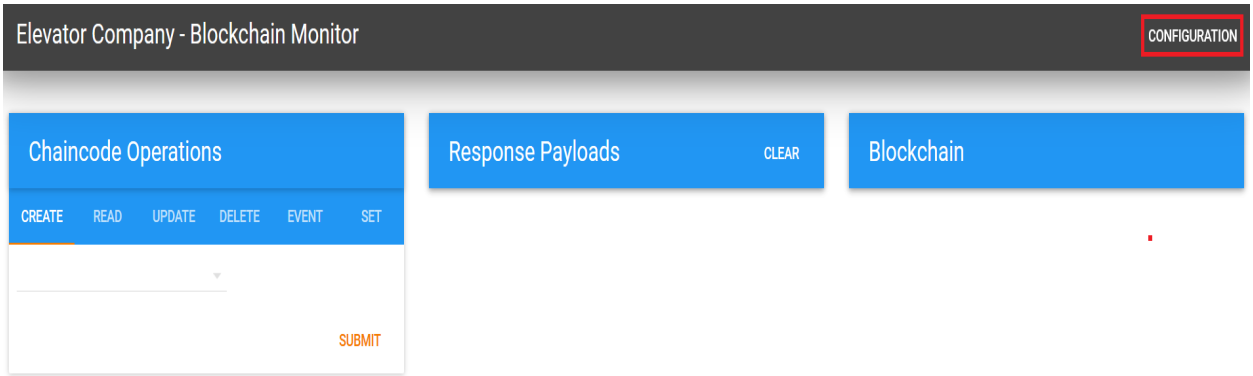
The Elevator manufacturing company needs access to the data from Elevator so it can have visibility for any malfunctioning in elevator and could take immediate actions. This will help them provide better services to their customers and clear any audits and compliance issues.

The Blockchain network is owned by the Elevator company and they have a registered a user user_type1_0 with validating peer 0.

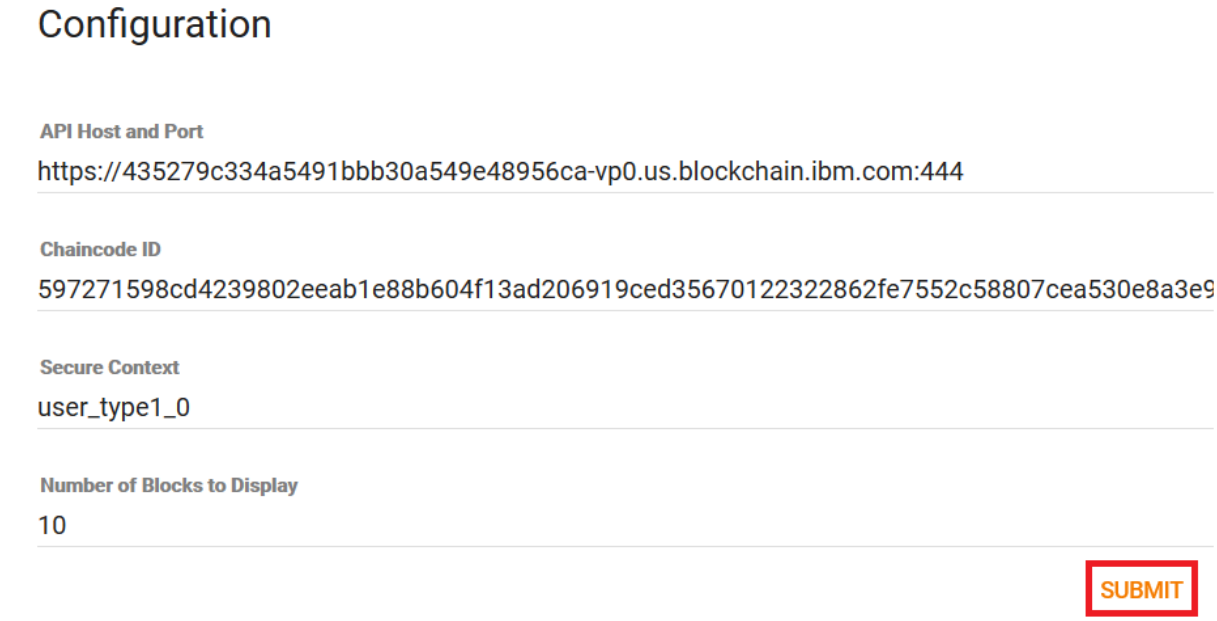
The elevator at the customer site is sending data direction to blockchain through validating peer 1 using the IBM Watson IoT Platform integration.

In this step, we will provide an ability for the Elevator company to watch the data transmitted by the elevator IOT-ELEVATOR-001 to the Blockchain network.

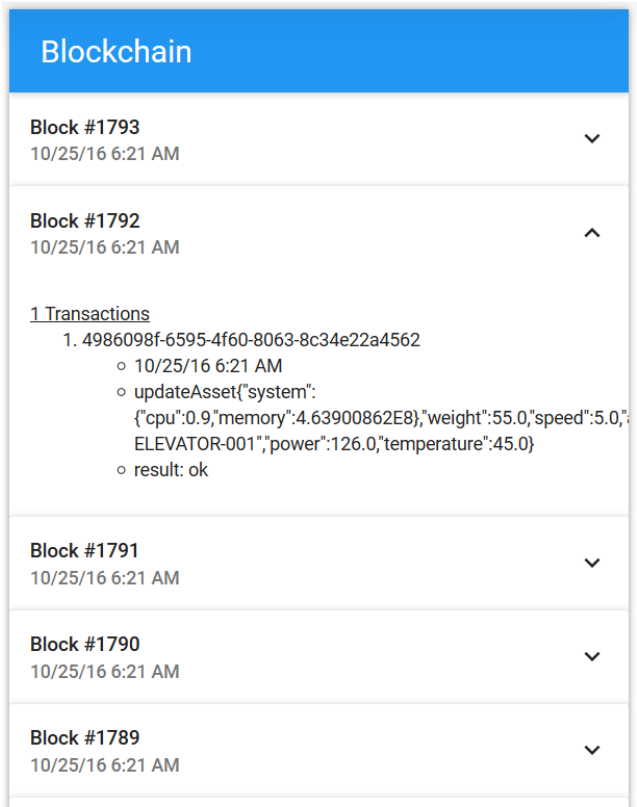
- In a new browser tab open this URL https://ibm.biz/wowsimulator
- Click on Elevator Company Blockchain Monitor
- This will open a Blockchain monitoring application in a new tab
- Click on Configuration on the top right corner of this application



- In the configuration form enter the validating peer host and port for Validating Peer 0 (This information could be captured from the IBM Blockchain dashboard)
- Enter the Chaincode ID for the Elevator Contract (This information could be captured from the IBM Blockchain dashboard)
- In Secure Context enter: **user_type1_0**
- In Number of Block to display: 10
- Then click on SUBMIT

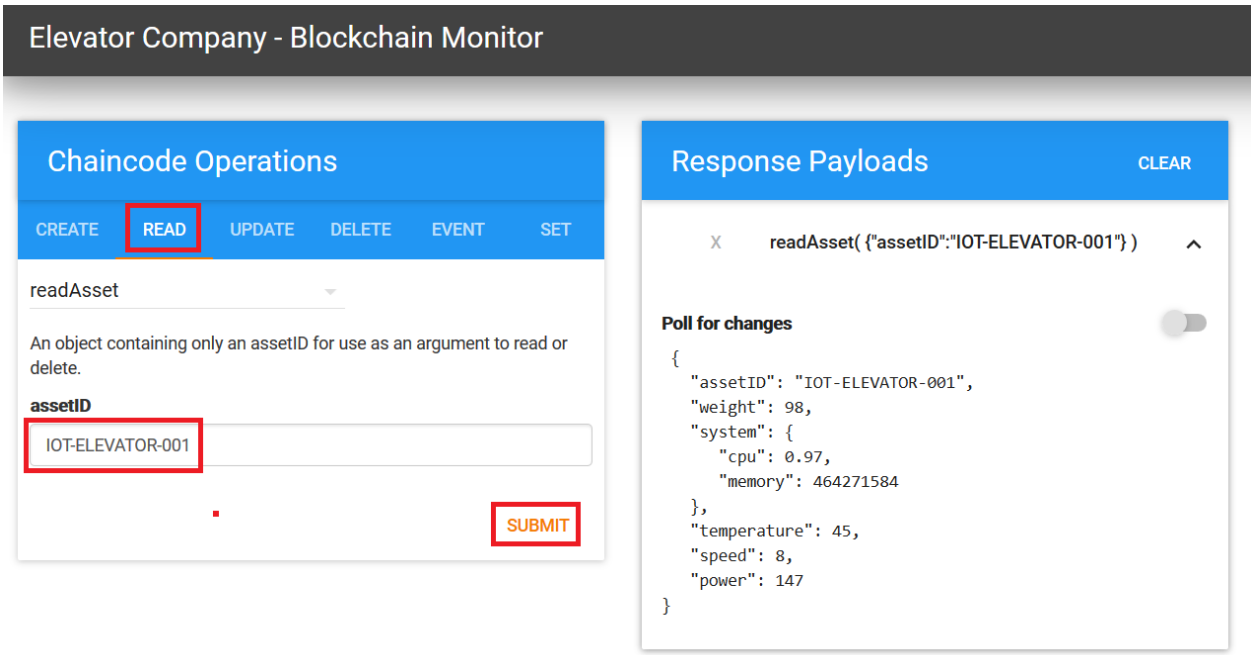


- This configuration will now start reading the last ten blocks of data on the Elevator contract
- Image below shows the latest blocks of data transmitted by the elevator at customer location



- You can also read the latest state of a specific elevator by providing the assetID of the elevator
- Select READ in Chaincode Operations and enter the assetID as IOT-ELEVATOR-001

- Click Submit
- This will provide the latest state of the elevator IOT-ELEVATOR-001 in Blockchain



Section 8: Access Elevator data in Blockchain: Government agency

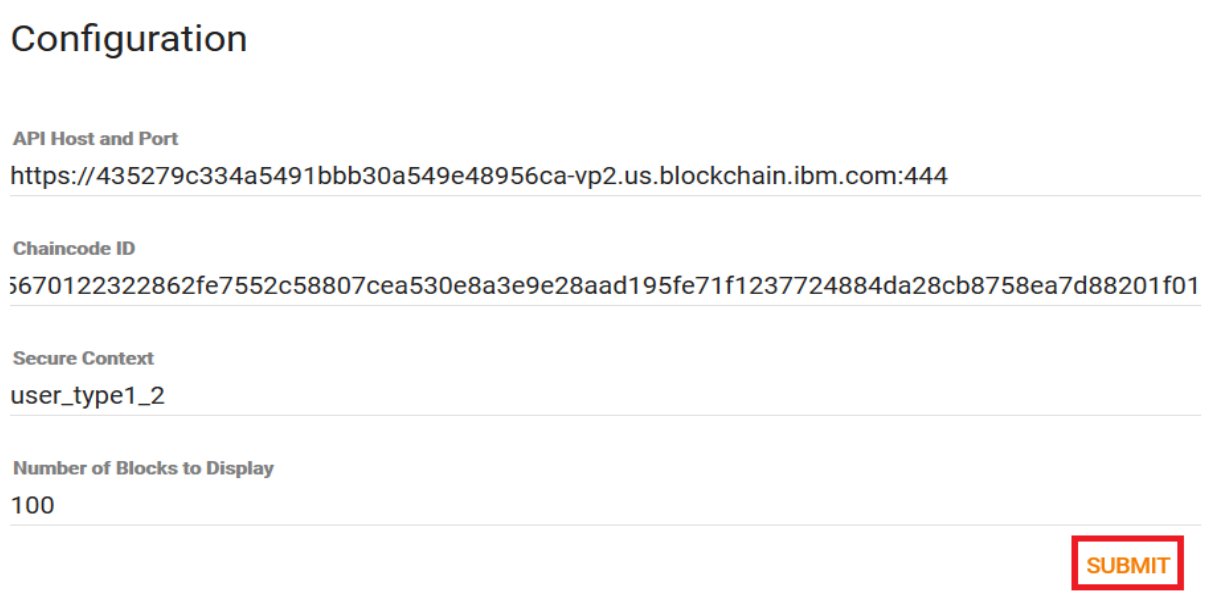
The Government agency needs access to the data from Elevator so it can have visibility for any malfunctioning in elevator and this information could be used for elevator security inspections and certification. This will help the Government agency for the transparent inspection process.

The Government agency is registered in Blockchain network through Validating Peer 2 with user user_type1_2.

The elevator at the customer site is sending data directly to the blockchain through validating peer 1 using the IBM Watson IoT Platform integration.

In this step, we will provide an ability for the Government agency to watch the data transmitted by the elevator IOT-ELEVATOR-001 to the Blockchain network.

- In a new browser tab open this URL https://ibm.biz/wowsimulator
- Click on Government Blockchain Monitor
- This will open a Blockchain monitoring application in a new tab
- Click on Configuration on the top right corner of this application
- In the configuration form enter the validating peer host and port for Validating Peer 2 (This information could be captured from the IBM Blockchain dashboard)
- Enter the Chaincode ID for the Elevator Contract (This information could be captured from the IBM Blockchain dashboard)
- In Secure Context enter: **user_type1_2**
- In Number of Block to display: 100
- Then click on SUBMIT



- This configuration will now start reading the last hundred blocks of data from the Elevator contract
- This step completes the lab 3282

Summary

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