The banner features a dark teal background with abstract, glowing blue and white curved lines on the right side. The text 'World of Watson 2016' is in white on the left, with the hashtag '#ibmwow' below it and the IBM logo on the right.

World of Watson  
2016

#ibmwow

IBM

## 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>

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## Overview

IBM Watson IoT Platform enables IoT devices to send data to private blockchain ledgers for inclusion in shared transactions with tamper-resistant records. Blockchain's distributed replication allows your business partners to access and supply IoT data without the need for central control and management.

All business partners can verify each transaction, preventing disputes and ensuring each partner is held accountable for their individual roles in the overall transaction.

### Integrate Watson IoT Platform with Blockchain:

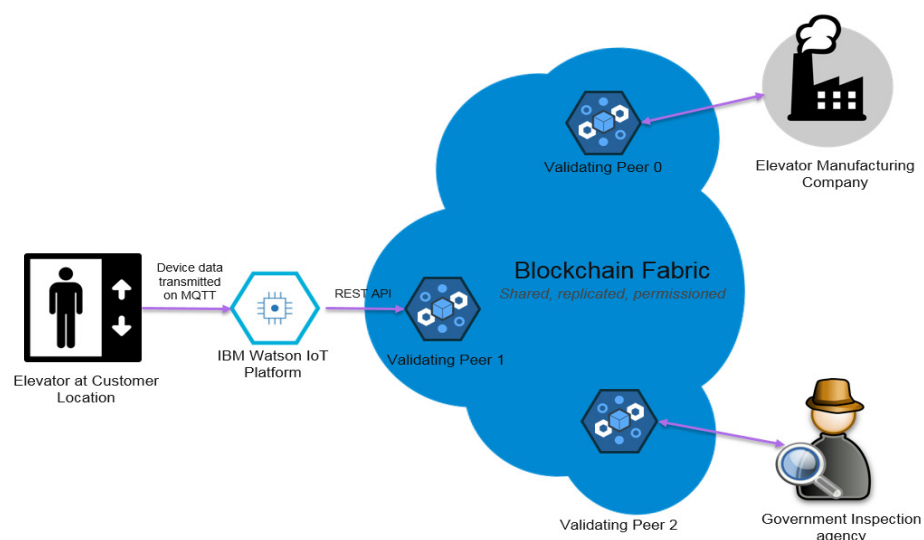
The Watson IoT Platform has a built-in capability that lets you add selected IoT data to a private blockchain. The protected data is shared among only the business partners involved with the transaction.

IBM Blockchain provides the private blockchain infrastructure of distributed peers that replicates the device data and validates the transaction through secure contracts. IBM Watson IoT Platform translates existing device data, from one or more device types, into the format needed by the Blockchain contract APIs. The Blockchain contract doesn't need to know the specifics of your device data. Watson IoT Platform filters device events and sends only the required data to the contract.

### Hands on Lab overview:

In this hands-on lab, you will create a Blockchain network for an elevator manufacturing company. The company allows its customers and government agencies to participate in this Blockchain network. The elevator manufacturing company installs elevators at their customer location and configures the elevator device data to be sent into IBM Blockchain using the IBM Watson IoT Platform. Once the data reaches Blockchain it cannot be changed.

Elevator manufacturer can use this data for customer service and detecting any malfunctions. The Government agencies can use the data in blockchain for inspection and security compliance. None of the parties have to request data from each other and the data is available in unchangeable format in the Blockchain network.



If you require assistance during the lab, please ask  
an instructor.



## 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.

#### Sign up for IBM Bluemix

Already signed up for Bluemix? [Log in](#)

Your 30-day trial is free, with no credit card required. You get access to 2 GB of runtime and container memory to run apps, unlimited IBM services and APIs, and complimentary support.

Email Address*	Phone Number*
<input type="text" value="rahulonline007@yahoo.com"/>	<input type="text" value="4795318971"/>
First Name*	Password*
<input type="text" value="Rahul"/>	<input type="password" value="••••••"/>
Last Name*	Re-enter Password*
<input type="text" value="Gupta"/>	<input type="password" value="••••••"/>
Company	Security Question*
<input type="text" value="IBM"/>	<input type="text" value="City I Work"/>
Country or Region*	Security Answer*
<input type="text" value="UNITED STATES"/>	<input type="text" value="Austin"/>

Keep me informed of products, services, and offerings from IBM companies worldwide:  
☐ By email ☐ By telephone

By clicking Create Account, I accept the [Bluemix privacy policy](#) and [Bluemix terms](#).

Create Account

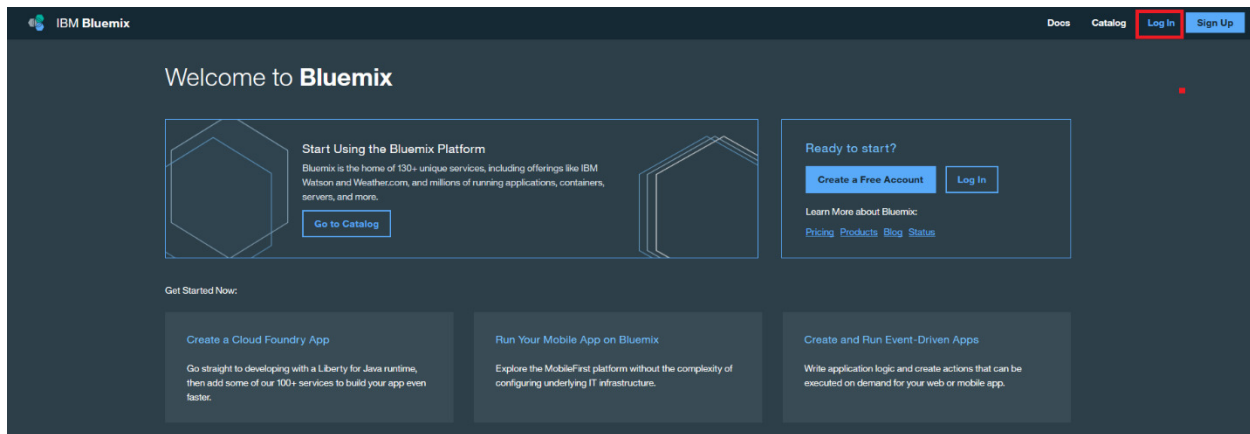
### Log-In Bluemix: New and existing users

- 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.

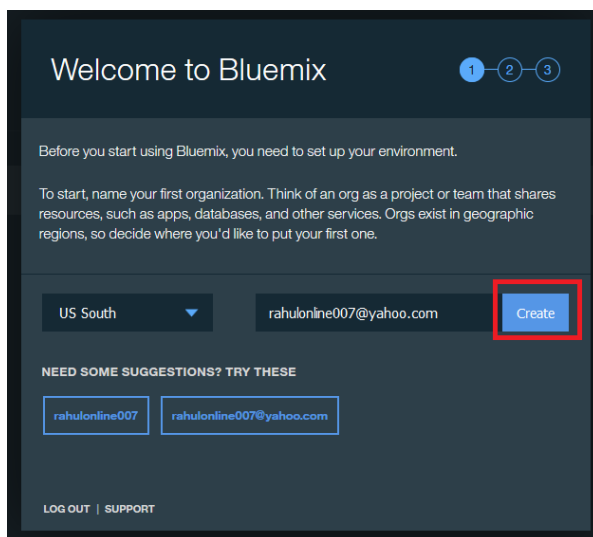




## Create Bluemix organization: New user

- 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



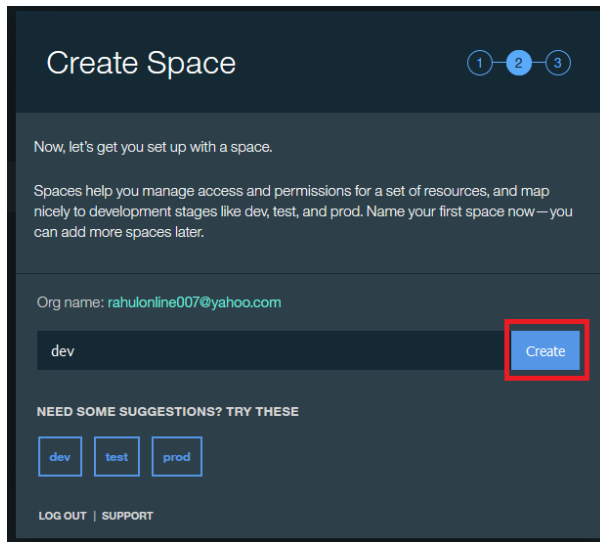
An organization is the highest concept. When you create an Dashboard will be opened IBM Bluemix account you get your own "organization". You can invite others to your organization, can get invited to join other organizations or create organizations.



## Create Bluemix space: New user

- Create a space with name **dev**

**Note:** Existing Bluemix users can ignore this step



Create Space

Now, let's get you set up with a space.

Spaces help you manage access and permissions for a set of resources, and map nicely to development stages like dev, test, and prod. Name your first space now—you can add more spaces later.

Org name: rahulonline007@yahoo.com

dev

Create

NEED SOME SUGGESTIONS? TRY THESE

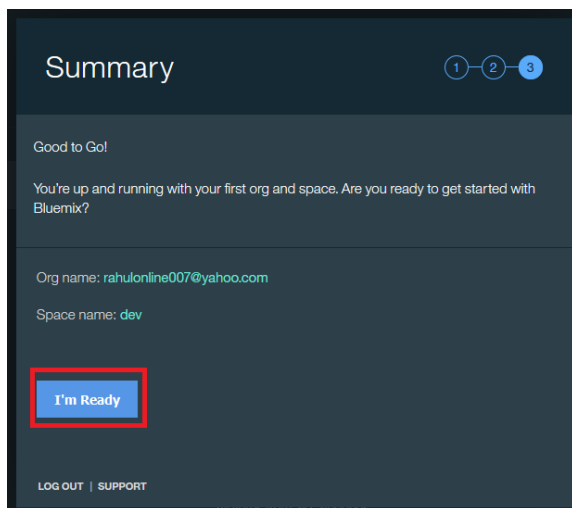
dev test prod

LOG OUT | SUPPORT

*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.



Summary

Good to Go!

You're up and running with your first org and space. Are you ready to get started with Bluemix?

Org name: rahulonline007@yahoo.com

Space name: dev

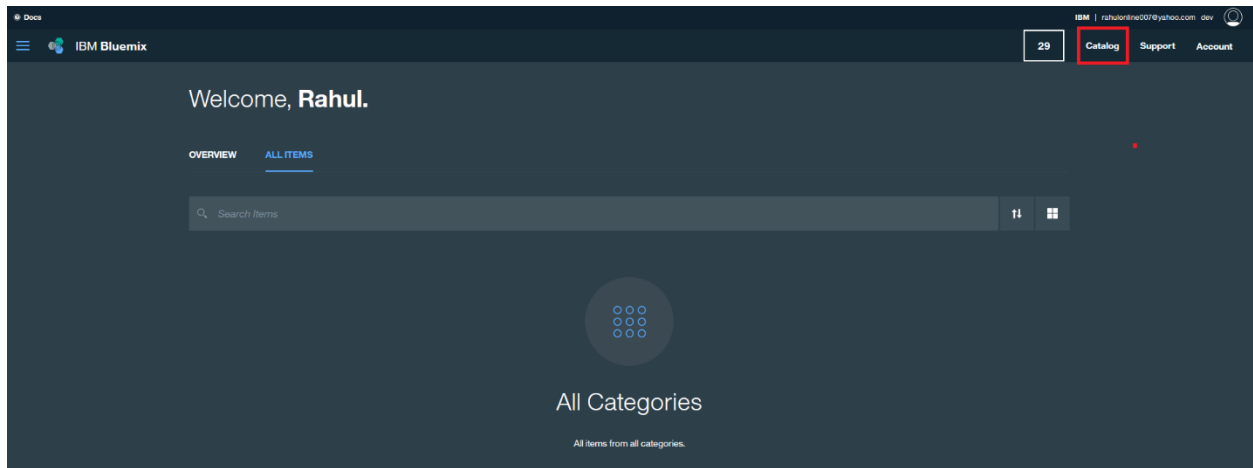
I'm Ready

LOG OUT | SUPPORT

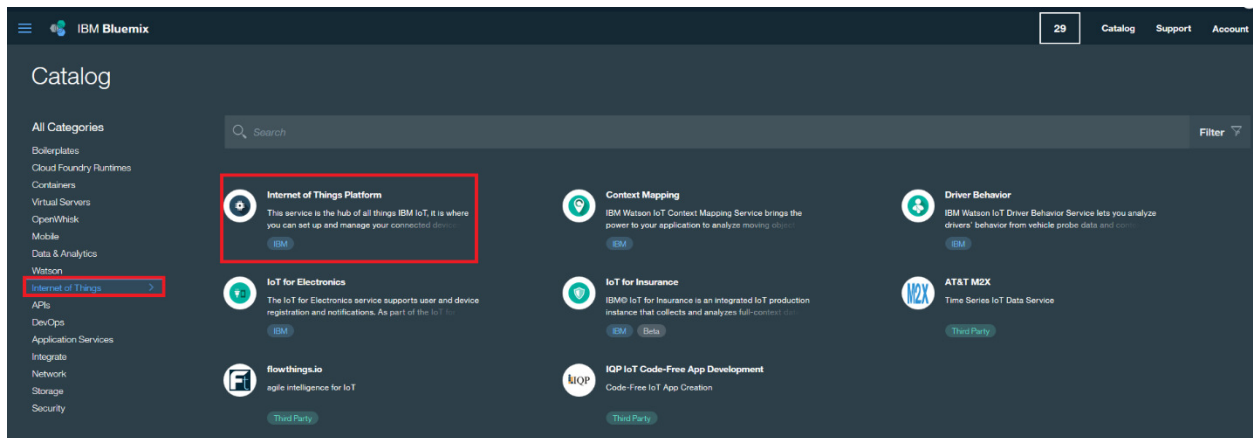


## Create IBM Watson IoT Platform Organization

- 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** service



- To create the IBM Watson Internet of Things Platform service, 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 to create a new instance of IBM Watson IoT Platform service in your IBM Bluemix space.





IBM Bluemix Internet of Things Platform

The IBM Internet of Things service lets your apps communicate with and consume data collected by your connected devices, sensors, and gateways. Our recipes make it super easy to get devices connected to our Internet of Things cloud. Your apps can then use our real-time and REST APIs to communicate with your devices and consume the data you've set them up to collect.

Service name: **iot-platform-service**

Credential name: **Credentiale-iot-platform-service**

Connect to: **Leave unbound**

Features

- **Connect your devices securely to the cloud**  
Before your apps can get to work, you need to get your devices connected up! We have a set of verified instructions, or 'recipes', for connecting devices, sensors and gateways from a variety of partners and individuals.
- **Build an app that talks to your devices**  
Communications between your devices and the cloud happen via the open, lightweight MQTT protocol. For example you might have a sensor that collects and sends humidity readings every minute. Our REST and real-time APIs allow you to quickly pull that device data into your apps for further analysis.

Images

Click an image to enlarge and view screen captures, slides, or videos. Screen caps show the user interface for the service after it has been provisioned.

AUTHOR: IBM  
PUBLISHED: 09/14/2016  
TYPE: Service  
LOCATION: US South

Pricing Plans

Monthly prices shown are for country or region: **United States**

PLAN	FEATURES	PRICING
Standard	The Standard service plan for Internet of Things Platform includes your free tier of 100 MB each of data exchanged, data analyzed and edge data analyzed per month at no cost. Charge per MB of data exchanged (tiered by usage in MB) Charge per MB of data analyzed Charge per MB of edge data analyzed Multi-Tiered	Expand each section to view details
<b>Free</b>	Includes up to 20 registered devices, and a maximum of 100 MB of each data metric: Maximum of 20 registered devices Maximum of 10 application bindings Maximum of 100 MB of each of data exchanged, data analyzed and edge data analyzed	Free

The Free service plan for Internet of Things Platform includes up to 20 registered devices, and a maximum of 100 MB each of data exchanged, data analyzed, and edge data analyzed per month.

[Terms](#)

Need Help? [Contact Bluemix Sales](#) | Estimate Monthly Cost [Cost Calculator](#) | **Create**

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

IBM Bluemix Internet of Things

iot-platform-service Status: ● Service available

[Manage](#) [Plan](#) [Connections](#)

**Hi! Welcome to Watson IoT Platform**  
Take a look at the steps below to get you going with your Internet of Things app

**Connect your devices**

Use our [recipes](#) to find out how to add your devices. We work with partners and have sample connection recipes for many devices.

Launch the Watson IoT Platform dashboard and add your devices by clicking the 'Add Device' button under the 'Devices' tab.

**Launch dashboard**

**Analyze your data**

Use the newly integrated triggers and alerts to monitor real-time conditions and take action on emerging situations. See our [recipes](#) site to find tutorials on how you can make the most of our new capabilities.

**Find out more**

**Learn how to extend your app**

Use other Bluemix services to extend your app to start creating a great Internet of Things app.

Here are some of the services you could use:

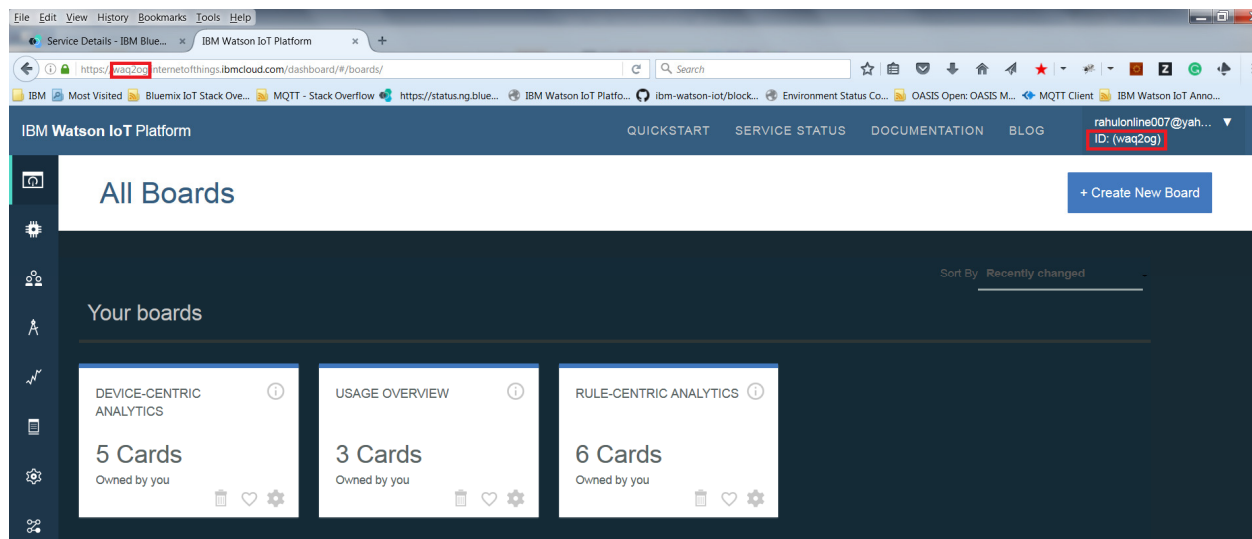


- Watson IoT Dashboard will open in a new browser tab. Familiarize yourself with the dashboard and specifically the IoT Platform organization ID.

**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 in Red, every IoT Platform service has a unique organization ID.

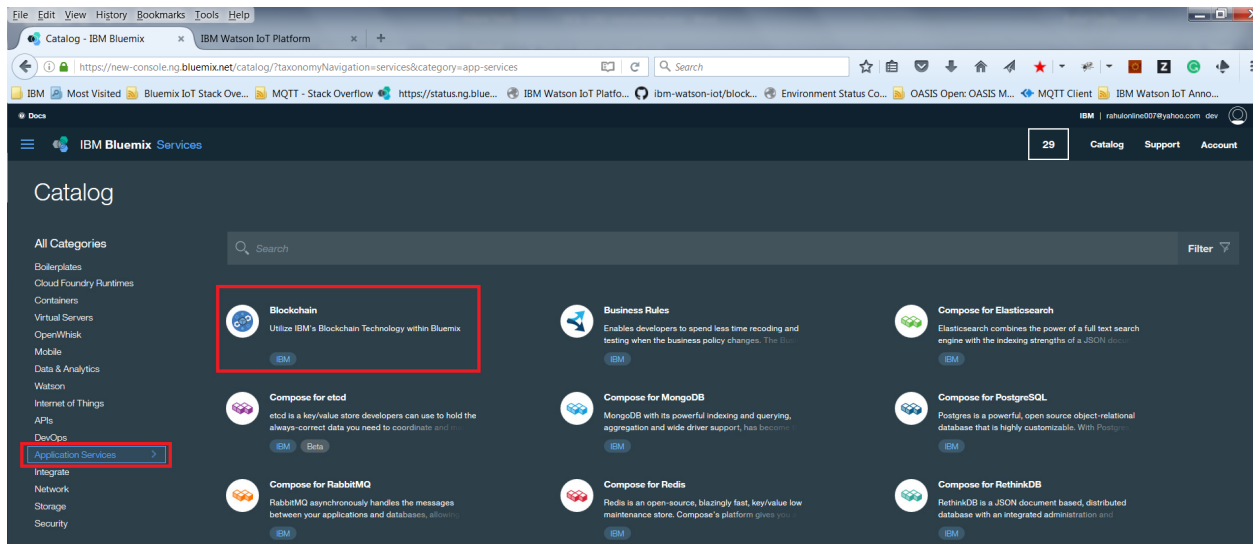


- This completes the creation of IBM Watson IoT Platform service and we can now proceed with creation of IBM Blockchain service.

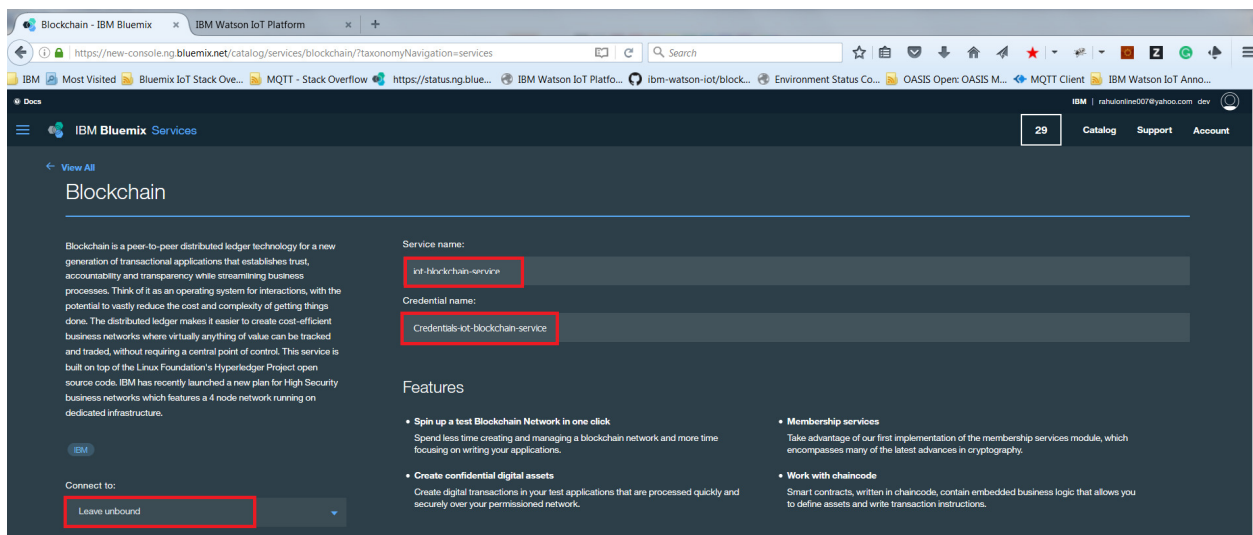
### Create IBM Watson IoT Blockchain Service

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



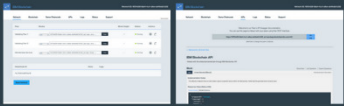


- To create the IBM Blockchain service, enter following details or something easier which could be remembered:
- **Service Name:** *iot-blockchain-service*
  - **Credentials Name:** *Credentials- iot-blockchain-service*
  - **Pricing Plans – Starter Developer Plan (Beta)**



AUTHOR IBM  
PUBLISHED 10/20/2016  
TYPE Service  
LOCATION US South

Click an image to enlarge and view screen captures, slides, or videos. Screen caps show the user interface for the service after it has been provisioned.



### Pricing Plans

Monthly prices shown are for country or region: [United States](#)

PLAN	FEATURES	PRICING
✓ Starter Developer plan (Beta)	<ul style="list-style-type: none"> <li>4 peers and a Cert Authority</li> <li>Deploy and test chaincode</li> <li>Dashboard with logs, controls, and APIs</li> <li>Sample apps with source code</li> </ul>	Free
High Security Business Network plan	<ul style="list-style-type: none"> <li>4 peers and a Cert Authority on IBM LinuxOne™</li> <li>All of the capabilities in Starter</li> <li>Isolated environment on dedicated compute</li> <li>Optimized performance and high speed network</li> <li>Advanced Security: HSM, Secure Service Container and more</li> </ul>	\$10,000.00 USD/MONTHLY

Get started using IBM Blockchain! Monitor your network and view health status. Leverage the REST API to deploy and invoke chaincode transactions.

[Terms](#)

Need Help? [Contact Bluemix Sales](#) | [Estimate Monthly Cost](#) [Cost Calculator](#)

[Create](#)

- 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.

Docs

IBM Bluemix Services

← Application Services

iot-blockchain-service Status: ● Service available

[Manage](#) [Service Credentials](#) [Connections](#)

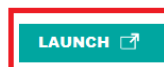
## Welcome to the Starter Developer Network on IBM Blockchain!

Welcome, rahulonline007@yahoo.com!


This service is intended for developers who consider themselves early adopters and want to get involved with IBM's approach to business networks that maintain, secure and share a replicated ledger using blockchain technology.

### What it IS good for today:











- Deploying and invoking transactions to test out IBM's approach to blockchain technology
- Using non-sensitive information and processes.
- Learning and testing out IBM's novel contributions to the blockchain open source community, including the concept of confidential transactions and containerized code execution.



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


IBM Blockchain
Network ID: d25478abf00f4bb689b946a3ee17627e

Network
Blockchain
Demo Chaincode
APIs
Logs
Status
Support
Getting started

Peer	Routes	Block Height	Status	Actions
Membership Services	<div>HTTP</div> <div>https://d25478abf00f4bb689b946a3ee17627e-ca.us.blockch...</div> <div>Copy</div>	-	Running	 
Validating Peer 0	<div>HTTP</div> <div>https://d25478abf00f4bb689b946a3ee17627e-vp0.us.blockc...</div> <div>Copy</div>	1	Running	 
Validating Peer 1	<div>HTTP</div> <div>https://d25478abf00f4bb689b946a3ee17627e-vp1.us.blockc...</div> <div>Copy</div>	1	Running	 
Validating Peer 2	<div>HTTP</div> <div>https://d25478abf00f4bb689b946a3ee17627e-vp2.us.blockc...</div> <div>Copy</div>	1	Running	 
Validating Peer 3	<div>HTTP</div> <div>https://d25478abf00f4bb689b946a3ee17627e-vp3.us.blockc...</div> <div>Copy</div>	1	Running	 

So far we have created the IBM Bluemix account for the new users and later created the IBM Watson IoT Platform and IBM Blockchain service in this Bluemix account.

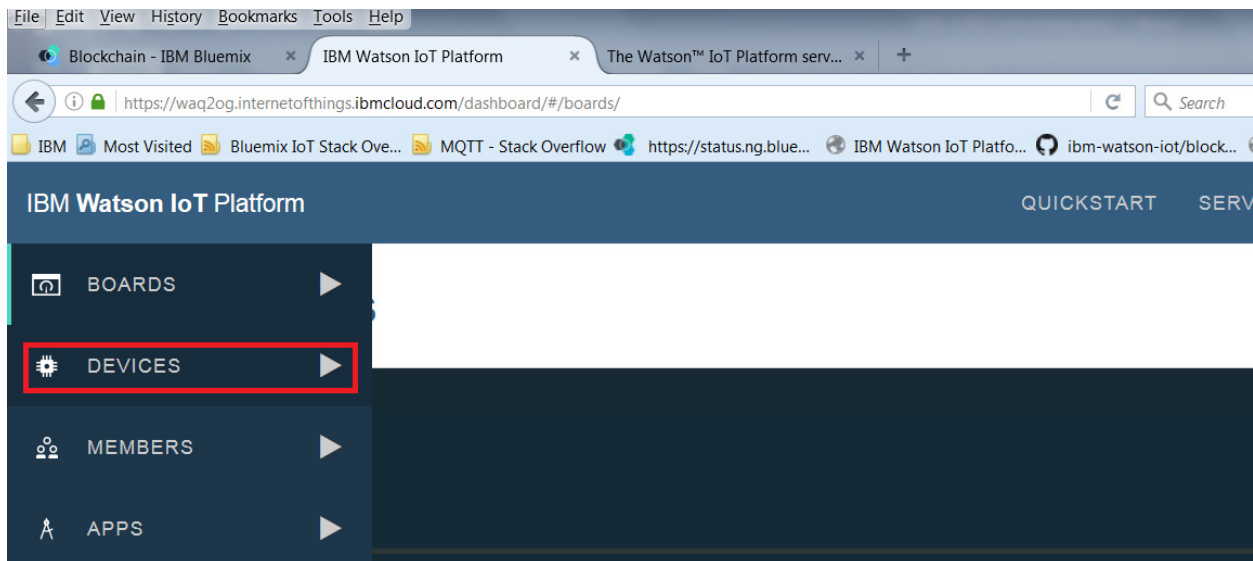
**Note** – Please don't close the browser tabs for IBM Watson IoT Platform dashboard and IBM Blockchain dashboard services. They will be used in the later sections.



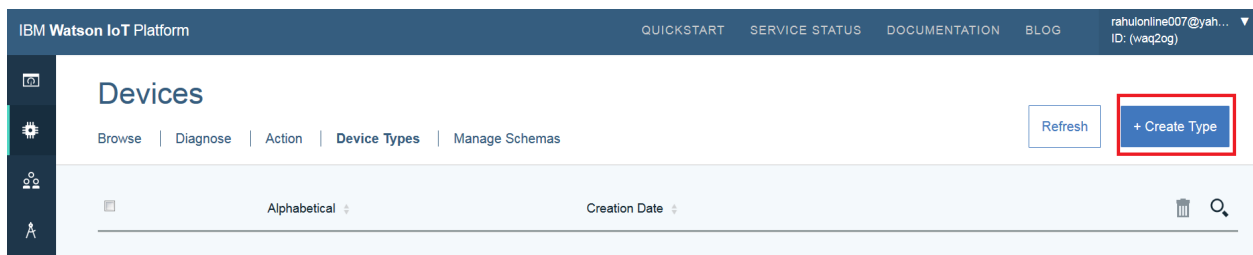
## Section 2: Configure IBM Watson IoT Platform devices and application access

### Create ELEVATOR device type

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



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



- In the Create Device Type wizard, enter device type **Name** as **ELEVATOR** and **Description** as **ELEVATOR DEVICES**



# Create Device Type

## General Information

Name

ELEVATOR

The device type name is used to identify the device type uniquely, using a restricted set of characters to make it suitable for API use.

Description

ELEVATOR DEVICES

The device type description can be used for a more descriptive way of identifying the device type.

- Click on the **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 as shown in image below

Device type has been successfully created

5:05:19 PM ✕

## Devices

Browse | Diagnose | Action | **Device Types** | Manage Schemas

Refresh

+ Create Type



Alphabetical

Creation Date



ELEVATOR

...

0 Devices

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

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



# Add Device

## Choose Device Type



ELEVATOR

Or

Create device type

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

# Add Device

## Device Info

Device ID is the only required information, however other fields are populated according to the attributes set in the selected device type. These values can be overridden, and attributes not set in the device type can be added.

Device ID

IOT-ELEVATOR-001

- Click **Next** on the Device Information 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. This information will be required later.

Organization ID

Device Type

Device ID

Authentication Method

Authentication Token

waq2og

ELEVATOR

IOT-ELEVATOR-001

token

Tw)!9eea(Gceoi0nTM






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

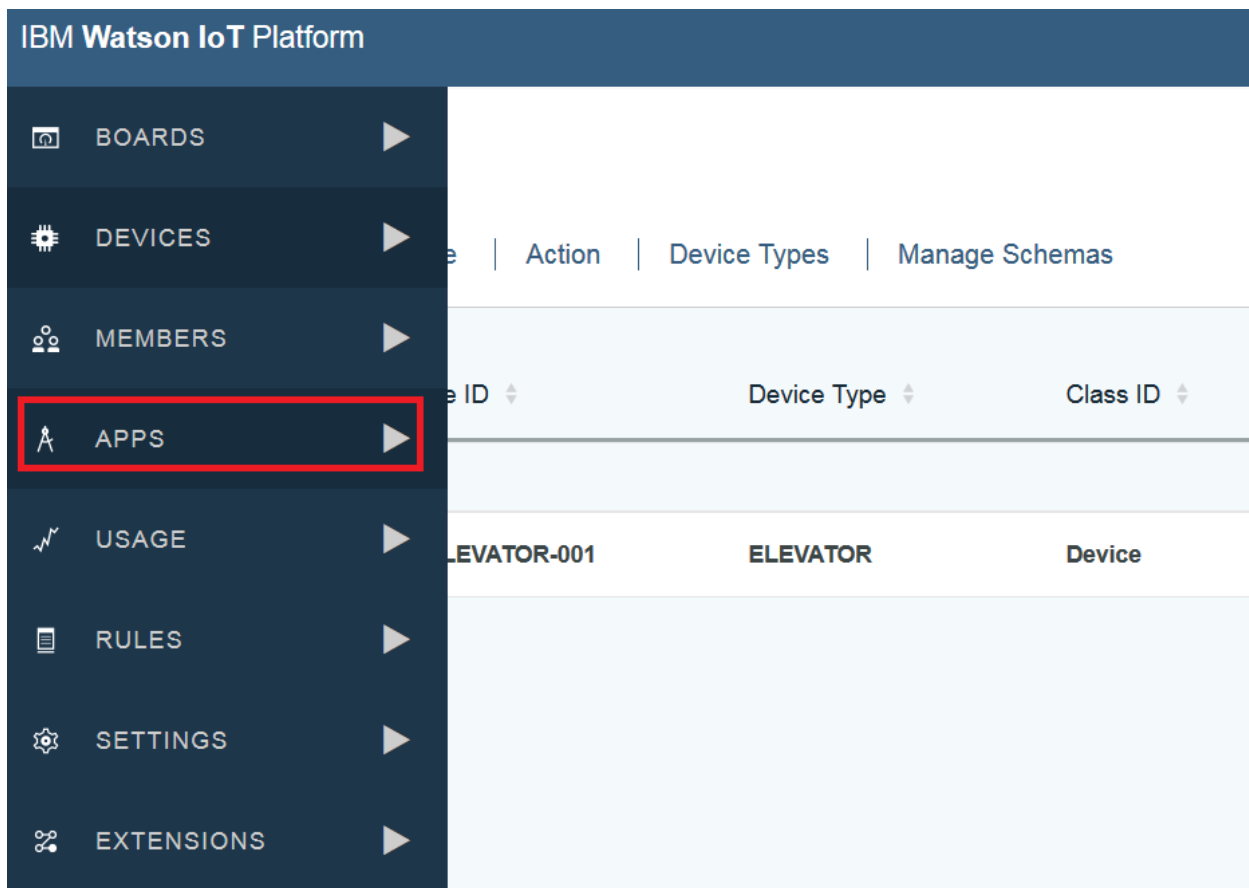
## Devices

[Browse](#) | [Diagnose](#) | [Action](#) | [Device Types](#) | [Manage Schemas](#)

	Device ID	Device Type	Class ID
Results 1-1 of 1			
	<b>IOT-ELEVATOR-001</b>	<b>ELEVATOR</b>	Device

[Generate API Keys to access this device from Elevator simulator application](#)

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



IBM Watson IoT Platform

- BOARDS
- DEVICES
- MEMBERS
- APPS**
- USAGE
- RULES
- SETTINGS
- EXTENSIONS

[Browse](#) | [Diagnose](#) | [Action](#) | [Device Types](#) | [Manage Schemas](#)

	Device ID	Device Type	Class ID
	<b>IOT-ELEVATOR-001</b>	<b>ELEVATOR</b>	Device

- 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

## Generate API Key

Copy the credentials in Notepad

API Key	a-waq2og-nis3fvygdl
Authentication Token	rpQu5*Uiel44BJ)?0H

Authentication tokens are non-recoverable. If you misplace this token, you will need to re-register the API key to generate a new authentication token.

Select API Role(s)

Standard Application

+ Add another role

Comment

IoT Elevator Keys

Set API key expiry

10/26/2016

Cancel Generate

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 the next section.



## Section 3: 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 JSON elements:

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 virtual 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 two seconds



Device ID: IOT-ELEVATOR-001 Connected

Enter credentials:

OrgId	waq2og
API Key	a-waq2og-0pcen8dhxh
API Token	J*BrjDTD46Thfl&Rep
<button>Confirm</button>	

Elevator Weight

Lb

Elevator Temperature

temp (°C)

Elevator Speed

m/s

Elevator System

CPU %

Mem (free)


Elevator Power

Kw

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

## Devices

[Browse](#) | [Diagnose](#) | [Action](#) | [Device Types](#) | [Manage Schemas](#)

	Device ID	Device Type	Class ID	Date Added
Results 1-1 of 1				
	IOT-ELEVATOR-001	ELEVATOR	Device	Oct 24, 2016 5:15:19 PM

- Double click on device IOT-ELEVATOR-001 and under recent events you can 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 the virtual elevator simulator to IBM Watson IoT Platform service



## Section 4: Register Blockchain users and deploy smart contract

### Blockchain Peer assignment and roles

- Go back to the IBM Blockchain dashboard
- In the network tab in the IBM Blockchain dashboard, you will observe five peers

Network

Blockchain

Demo Chaincode

APIs

Logs

Status

Support

Gettinou

Peer	Routes	Block Height	Status	Actions
Membership Services	<div>HTTP</div> <div>https://435279c334a5491bbb30a549e48956ca-ca.us.blockch...</div> <div>Copy</div>	-	Running	<div></div> <div></div>
Validating Peer 0	<div>HTTP</div> <div>https://435279c334a5491bbb30a549e48956ca-vp0.us.blockc...</div> <div>Copy</div>	1	Running	<div></div> <div></div>
Validating Peer 1	<div>HTTP</div> <div>https://435279c334a5491bbb30a549e48956ca-vp1.us.blockc...</div> <div>Copy</div>	1	Running	<div></div> <div></div>
Validating Peer 2	<div>HTTP</div> <div>https://435279c334a5491bbb30a549e48956ca-vp2.us.blockc...</div> <div>Copy</div>	1	Running	<div></div> <div></div>
Validating Peer 3	<div>HTTP</div> <div>https://435279c334a5491bbb30a549e48956ca-vp3.us.blockc...</div> <div>Copy</div>	1	Running	<div></div> <div></div>

In this lab, we will use three validating peers by three different organizations:

Validating Peers	Business Organizations
Validating Peer 0	This peer will be used by the elevator manufacturing 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, which must 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 manufacturing 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 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

Network	Blockchain	Demo Chaincode	APIs	Logs	Status	Support
Peer		Routes				
Membership Services		HTTP		https://435279c334a5491bbb30a549e48956ca-ca.us.blockch...		
Validating Peer 0		HTTP		https://435279c334a5491bbb30a549e48956ca-vp0.us.blockc...		
Validating Peer 1		HTTP		https://435279c334a5491bbb30a549e48956ca-vp1.us.blockc...		
Validating Peer 2		HTTP		https://435279c334a5491bbb30a549e48956ca-vp2.us.blockc...		
Validating Peer 3		HTTP		https://435279c334a5491bbb30a549e48956ca-vp3.us.blockc...		

- 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 in simulator application
- Enter the URL for Validating Peer 2 in **Block Chain Peer URL** text field
- Enter the username **user\_type1\_2** in **Enroll ID** text field
- Enter the secret for user\_type1\_2 in **Enroll Secret** text field

**Register Blockchain User:**

Blockchain Peer URL	https://435279c334a5491bbb30a549e48956ca-vp2.us.blockchain.ibm.com:444
Enroll ID	user_type1_2
Enroll Secret	975d361743

Register

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



### Register Blockchain User:

Blockchain Peer URL	<code>https://435279c334a5491bbb30a549e48956ca-vp2.us.blockchain.ibm.com:444</code>
Enroll ID	<code>user_type1_2</code>
Enroll Secret	<code>975d361743</code>
<input type="button" value="Register"/>	

### Deploy Elevator Contract:

Contract Path	<code>https://github.com/WorldOfWatson2016/lab3282/elevator_contract_simple</code>
<input type="button" value="Deploy"/>	

```
{"OK": "Login successful for user 'user_type1_2'."}
```

### 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 in simulator application
- Enter the URL for Validating Peer 1 in **Block Chain Peer URL** text field
- Enter the username **user\_type1\_1** in **Enroll ID** text field
- Enter the secret for user\_type1\_1 in **Enroll Secret** text field
- Once the user is registered you will see the success message, as shown in the image on next page





### Register Blockchain User:

Blockchain Peer URL	<code>https://435279c334a5491bbb30a549e48956ca-vp1.us.blockchain.ibm.com:444</code>
Enroll ID	<code>user_type1_1</code>
Enroll Secret	<code>8693299861</code>
<input type="button" value="Register"/>	

### Deploy Elevator Contract:

Contract Path	<code>https://github.com/WorldOfWatson2016/lab3282/elevator_contract_simple</code>
<input type="button" value="Deploy"/>	

```
{"OK": "Login successful for user 'user_type1_1'."}
```

### 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 in simulator application
- Enter the URL for Validating Peer 0 in **Block Chain Peer URL** text field
- Enter the username **user\_type1\_0** in **Enroll ID** text field
- Enter the secret for user\_type1\_0 in **Enroll Secret** text field
- Once the user is registered you will see the success message, as shown in the image on next page



### Register Blockchain User:

Blockchain Peer URL	<code>https://435279c334a5491bbb30a549e48956ca-vp0.us.blockchain.ibm.com:444</code>
Enroll ID	<code>user_type1_0</code>
Enroll Secret	<code>b981e02eae</code>
<input type="button" value="Register"/>	

### Deploy Elevator Contract:

Contract Path	<code>https://github.com/WorldOfWatson2016/lab3282/elevator_contract_simple</code>
<input type="button" value="Deploy"/>	

```
{"OK": "Login successful for user 'user_type1_0'."}
```

### 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, it 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 review later:  
[https://github.com/WorldOfWatson2016/lab3282/tree/master/elevator\\_contract\\_simple](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 in simulator application
- Enter the URL for Validating Peer 0 in **Block Chain Peer URL** text field
- Enter the username **user\_type1\_0** in **Enroll ID** text field
- Enter the secret for user\_type1\_0 in **Enroll Secret** text field
- Click on the **Deploy** Button

**Note:** The REST API's to deploy the smart contract/chaincode are asynchronous and the deployment of the contract may take three – four minutes to complete on all the four validating peers in the Blockchain network.



## Deploy Elevator Contract:

Contract Path

[https://github.com/WorldOfWatson2016/lab3282/elevator\\_contract\\_simple](https://github.com/WorldOfWatson2016/lab3282/elevator_contract_simple)

Deploy

```
{
  "jsonrpc": "2.0",
  "result": {
    "status": "OK",
    "message": "597271598cd4239802eeab1e88b604f13ad206919ced35670122322862fe7552c58807cea530e8a3e9e28aad195fe71f1237724884da28cb8758ea7d88201f01",
    "id": 101010
  }
}
```

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 service, but this could be obtained from the IBM Blockchain dashboard later.

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

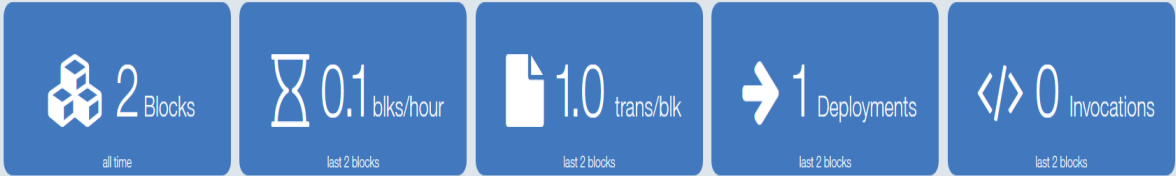
Peer	Routes	Block Height	Status	Actions
Membership Services	<div>HTTP <a href="https://435279c334a5491bbb30a549e48956ca-ca.us.blockch...">https://435279c334a5491bbb30a549e48956ca-ca.us.blockch...</a> Copy</div>	-	Running	
Validating Peer 0	<div>HTTP <a href="https://435279c334a5491bbb30a549e48956ca-vp0.us.blockc...">https://435279c334a5491bbb30a549e48956ca-vp0.us.blockc...</a> Copy</div>	2	Running	
Validating Peer 1	<div>HTTP <a href="https://435279c334a5491bbb30a549e48956ca-vp1.us.blockc...">https://435279c334a5491bbb30a549e48956ca-vp1.us.blockc...</a> Copy</div>	2	Running	
Validating Peer 2	<div>HTTP <a href="https://435279c334a5491bbb30a549e48956ca-vp2.us.blockc...">https://435279c334a5491bbb30a549e48956ca-vp2.us.blockc...</a> Copy</div>	2	Running	
Validating Peer 3	<div>HTTP <a href="https://435279c334a5491bbb30a549e48956ca-vp3.us.blockc...">https://435279c334a5491bbb30a549e48956ca-vp3.us.blockc...</a> Copy</div>	2	Running	

ChainCode ID	Peers	Logs
<div>597271598cd4239802eeab1e88b604f13ad206919ced35670122322862fe75... Copy</div>	4	<div>VPO  running</div>

- The ChainCode ID can be copied when needed using the Copy button of the deployed contract
- Go to the Blockchain tab in IBM Blockchain dashboard and you will observe the first Block in the Blockchain network.
- This Block is for the chaincode just deployed in the previous step.





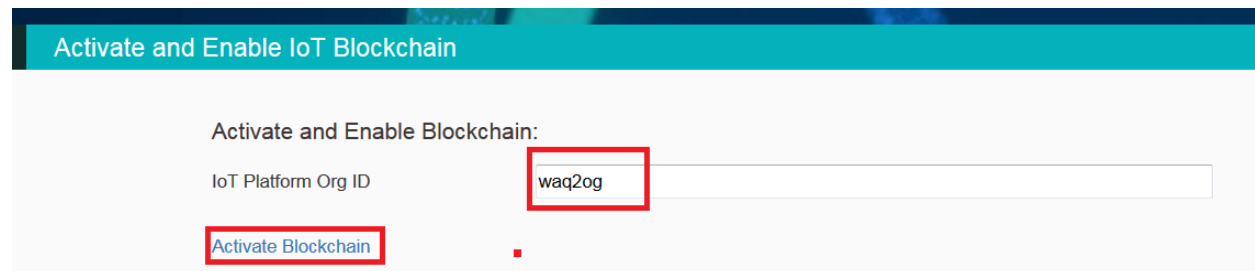
DATE	TYPE	UUID	CHAINCODE ID	PAYLOAD
10/25 12:52am UTC	DEPLOY	n/a	597271598cd4...	init{"version": "1.0"}



## Section 5: 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 a new browser 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**.



Activate and Enable IoT Blockchain

Activate and Enable Blockchain:

IoT Platform Org ID

[Activate Blockchain](#)

- This will activate Blockchain and you will see following JSON in the browser `{"activated":true,"enabled":false}`
- Click back button in the browser and you will reach the same page again and can continue with configuration
- Enter your name in the **User Name** text box
- Enter your email in the **User Email** text box
- Click on **Configure Blockchain**



Activate and Enable IoT Blockchain

Activate and Enable Blockchain:

IoT Platform Org ID

[Activate Blockchain](#)

User Name

User Email

[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



**General** i

---

Organization ID: waq2og  
 Organization Type: Bluemix Free  
 Friendly Name: waq2og

Experimental Features: ☐ Off  
 Device Management: ☐ Off  
 Blockchain: ☒ On

Fabric Name	Peer Host	Port	Status	Actions
No fabrics are configured for your organization.				

[+ Add](#)

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 wizard and 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*

**Add Blockchain Fabric**

To get started, enter the connection information for an IBM Blockchain or Hyperledger blockchain peer.

---

Fabric name\*

Peer Host\*

Port number\*

Peer name\*

User ID\*

Secret key\*

Use TLS? ☒ On

Save
Cancel

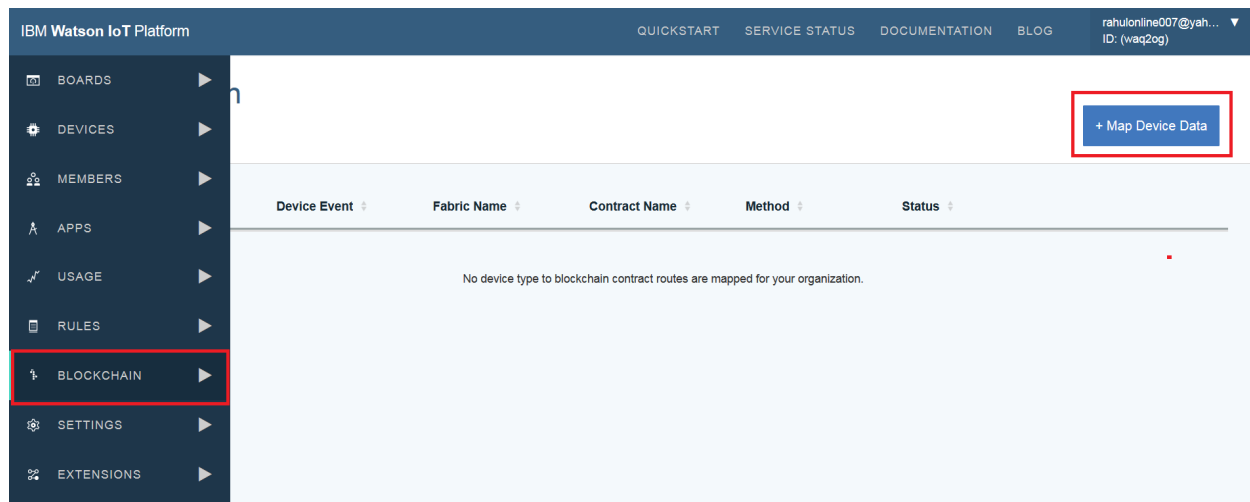
- Click **Save**
- Click again on **Confirm All Changes**



## 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 IBM Blockchain service.

- Go to the IBM Watson IoT Platform dashboard and click on Blockchain icon in the left menu as shown in image below



- 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



## Link Contract

Enter a contract ID and provide a contract name to use with Watson IoT Platform.

The contract that you map must, at a minimum, support the following method:

- readAssetSchemas

Contract name\*

elevator-company-contract

Contract ID\*

597271598cd4239802eeab1e88b604f13ad206919ced356701223  
22862fe7552c58807cea530e8a3e9e28aad195fe71f1237724884d  
a28cb8758ea7d88201f01|

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

**Note:** The schema for the updateAsset 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 must now see a Blockchain route created in IBM Watson IoT Platform

## Blockchain

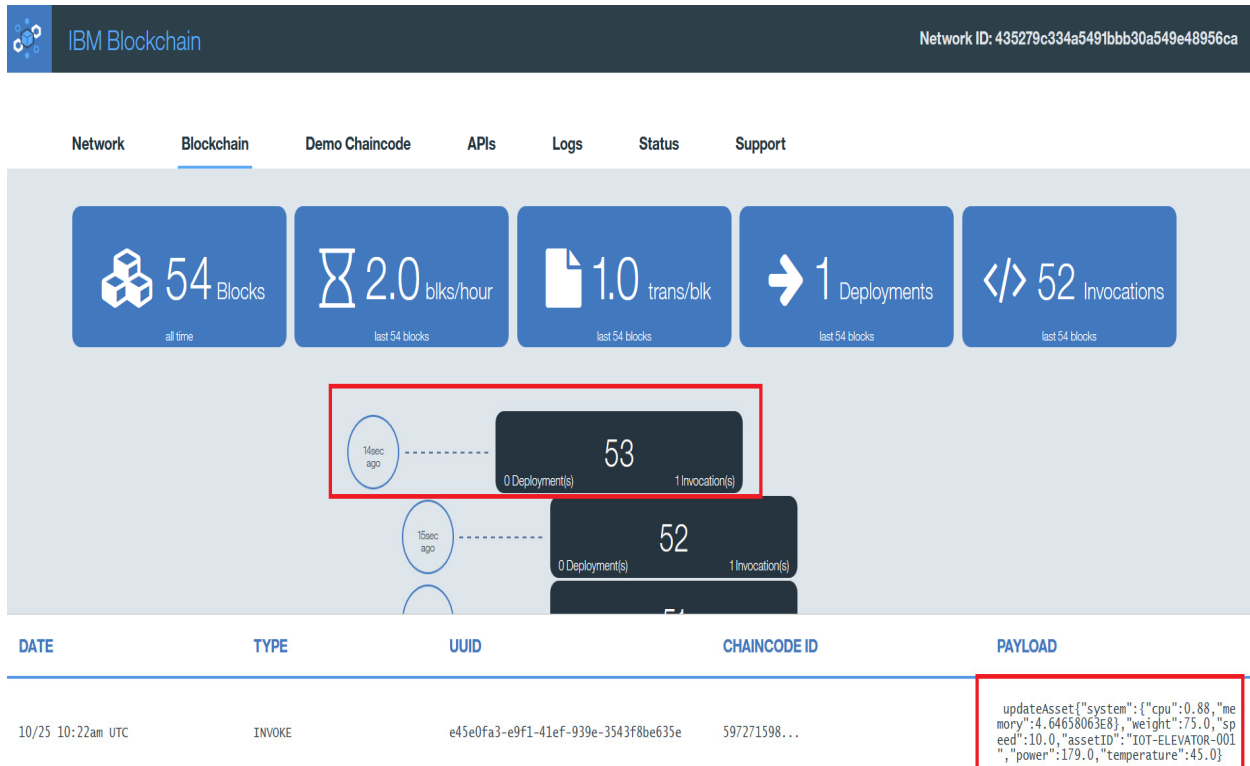
Routes

+ 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 blocks of data getting created
- Click on one of the blocks to see the data coming from the elevator device IOT-ELEVATOR-001





- Now we have the data coming from Elevator IOT-ELEVATOR-001 installed at a customer location into Blockchain. In the next sections, we will configure how the Elevator company and Government agency can access this data from Blockchain network for audits, compliance and customer service.



## 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 can take immediate actions. This will help them provide better service to their customers and clear any audits and compliance issues.

The Blockchain network is owned by the Elevator company and they have a registered user **user\_type1\_0** with **validating peer 0**.

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

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** in the top right corner of this application

- In the configuration form enter the validating peer host and port for Validating Peer 0 (This information can 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 as shown in the image on next page



# Configuration

## API Host and Port

https://435279c334a5491bbb30a549e48956ca-vp0.us.blockchain.ibm.com:444

## Chaincode ID

597271598cd4239802eeab1e88b604f13ad206919ced35670122322862fe7552c58807cea530e8a3e9

## Secure Context

user\_type1\_0

## Number of Blocks to Display

10

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 to the elevator manufacturer

Blockchain	
Block #1793 10/25/16 6:21 AM	▼
Block #1792 10/25/16 6:21 AM	▲
<u>1 Transactions</u> 1. 4986098f-6595-4f60-8063-8c34e22a4562 <ul style="list-style-type: none"><li>10/25/16 6:21 AM</li><li>updateAsset({"system": {"cpu":0.9,"memory":4.63900862E8},"weight":55.0,"speed":5.0,"ELEVATOR-001","power":126.0,"temperature":45.0})</li><li>result: ok</li></ul>	
Block #1791 10/25/16 6:21 AM	▼
Block #1790 10/25/16 6:21 AM	▼
Block #1789 10/25/16 6:21 AM	▼

- You can also read the latest state of a specific elevator by providing the **assetID** of the elevator



- Select READ in Chaincode Operations portlet and enter the **assetID** as *IOT-ELEVATOR-001*
- Click **Submit**
- This will provide the latest state of the elevator IOT-ELEVATOR-001 in Blockchain

## Elevator Company - Blockchain Monitor

### Chaincode Operations

CREATE **READ** UPDATE DELETE EVENT SET

readAsset

An object containing only an assetID for use as an argument to read or delete.

**assetID**

IOT-ELEVATOR-001

SUBMIT

### Response Payloads

CLEAR

X readAsset( {"assetID":"IOT-ELEVATOR-001"} ) ^

**Poll for changes** ☐

```
{
  "assetID": "IOT-ELEVATOR-001",
  "weight": 98,
  "system": {
    "cpu": 0.97,
    "memory": 464271584
  },
  "temperature": 45,
  "speed": 8,
  "power": 147
}
```



## 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 inspections and security certification. This will help the Government agency for the transparent inspection process and without asking the manufacturer or customer to share this information.

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 routes.

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** in 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 as shown in the image below

### Configuration

API Host and Port

<https://435279c334a5491bbb30a549e48956ca-vp2.us.blockchain.ibm.com:444>

Chaincode ID

5670122322862fe7552c58807cea530e8a3e9e28aad195fe71f1237724884da28cb8758ea7d88201f01

Secure Context

user\_type1\_2

Number of Blocks to Display

100

SUBMIT

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



## Summary

Blockchain is a technology for a new generation of transactional applications that establishes trust, accountability and transparency while streamlining business processes.

This lab demonstrated how data from IoT devices could be transmitted to the IBM Blockchain network using the IBM Watson IoT Platform and help enable business processes with trust and unchangeable and immutable records transmitted from IoT devices.



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