

Hands-on Lab: 2234

Integrating IBM Watson IoT Platform and IBM Blockchain

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Download Lab Instructions From

<http://ibm.biz/iciotlab>





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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:

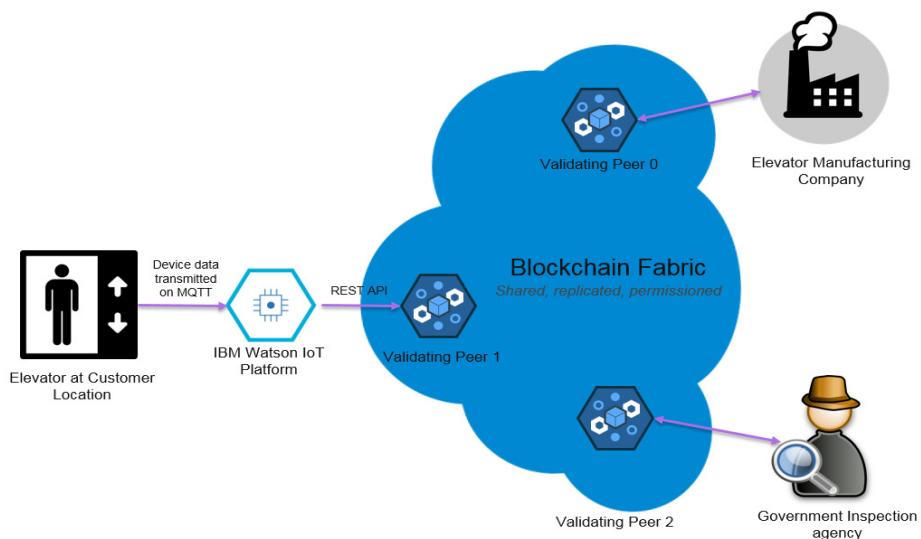
The Watson IoT Platform has a built-in capability that lets you add selected IoT data to a private blockchain. The protected data is shared among only the business partners involved with the transaction.

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.

First Name*
Rahul

Last Name*
Gupta

Company

Country or Region*
United States

Phone Number*
9999999999

Password*

Re-enter Password*

I'm not a robot reCAPTCHA
Privacy - Terms

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.

Welcome to Bluemix, the home of 130+ unique services. Start building immediately.

[Create a free account](#)

Learn more:
[Pricing](#) [Catalog](#) [Docs](#) [Support](#)

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

Create organization

Before you start using Bluemix, you need to set up your environment.

To start, name your first organization. Think of an org as a project or team that shares resources, such as apps, databases, and other services. Orgs exist in geographic regions, so decide where you'd like to put your first one.

US South rahul.guptaaustin@yahoo.com **Create**

NEED SOME SUGGESTIONS? TRY THESE

[rahul.guptaaustin](#) [rahul.guptaaustin@yahoo.com](#)

LOG OUT | SUPPORT

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: [rahul.guptaaustin@yahoo.com](#)

dev **Create**

NEED SOME SUGGESTIONS? TRY THESE

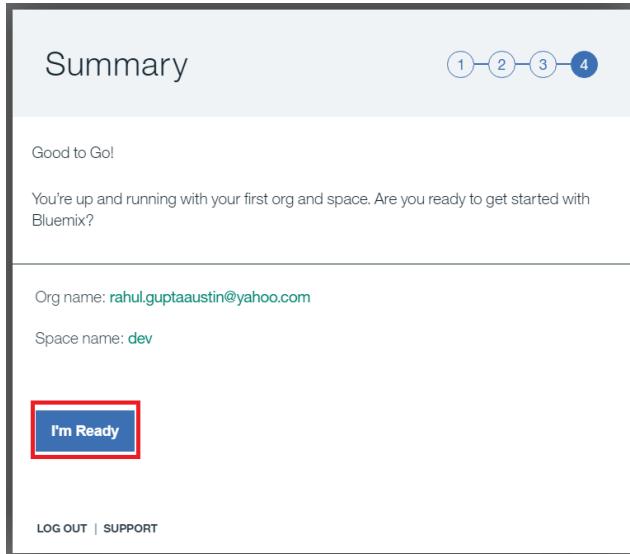
[dev](#) [test](#) [prod](#)

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.

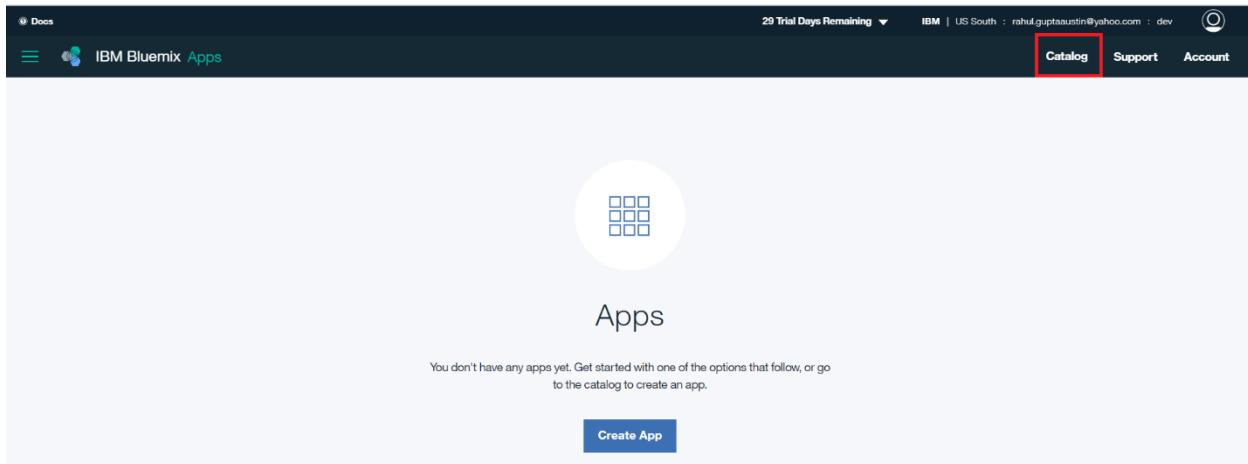
Complete creation of Bluemix organization and space: New user

- 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.



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.



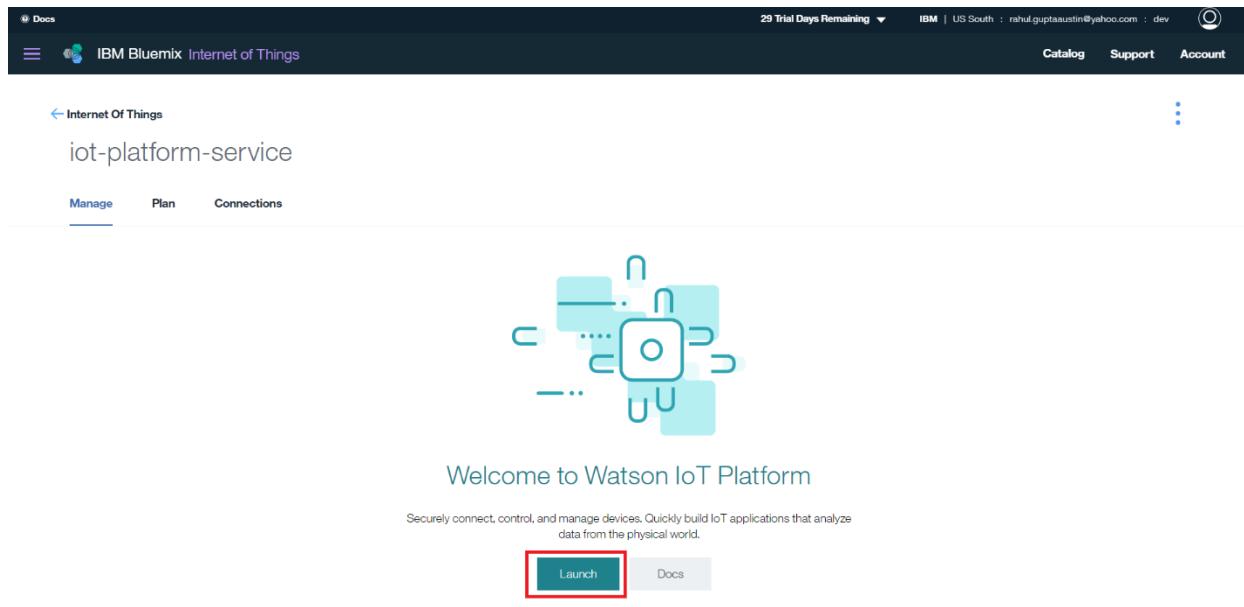
- In the services catalog select **Internet of Things** in the left menu and then click on **Internet of Things Platform** service

The screenshot shows the IBM Bluemix Catalog interface. On the left, there's a sidebar with 'All Categories' and sections for 'Infrastructure', 'Apps', and 'Services'. Under 'Services', 'Watson' is expanded, and 'Internet of Things' is selected, highlighted with a red box. The main area displays various IoT services: 'Internet of Things Platform' (selected), 'Context Mapping', 'Driver Behavior', 'IoT for Electronics', 'IoT for Insurance', 'AT&T Flow Designer', 'M2X', 'AT&T M2X', 'Car Diagnostic API', 'flowthings.io', 'IQP IoT Code-Free App Development', and 'XpertRule Decision Automation for node-RED'. Each service has a brief description and a small icon. The 'Internet of Things Platform' box is also highlighted with a red box.

- 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*
 - **Pricing Plans – Lite**
- Click on the **Create** button the create a new instance of IBM Watson IoT Platform service in your IBM Bluemix space.

The screenshot shows the 'Internet of Things Platform' service page in the IBM Bluemix Catalog. The 'Service name:' field contains 'iot-platform-service' (highlighted with a red box). The 'Connect to:' dropdown is set to 'Leave unbound' (highlighted with a red box). The 'Features' section includes 'Connect', 'Analyze in real time', 'Information Management', and 'Risk and Security management'. At the bottom, there are 'Need Help?' and 'Estimate Monthly Cost' buttons, and a 'Cost Calculator' link. A large blue 'Create' button is highlighted with a red box.

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



Welcome to Watson IoT Platform

Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.

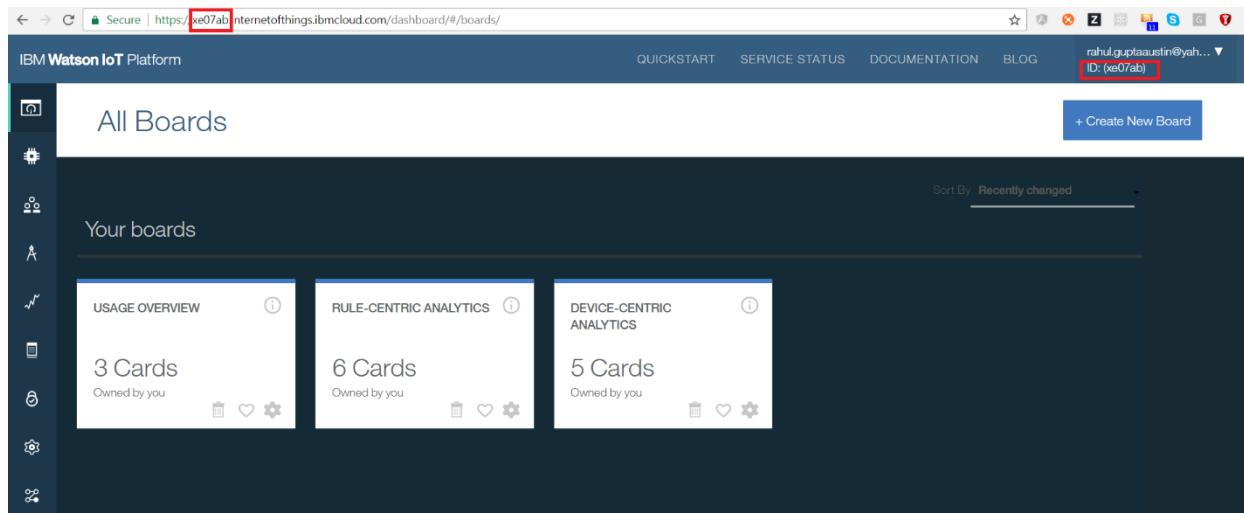
Launch Docs

- 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 into a notepad or Text Editor.

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.



All Boards

Sort By: Recently changed

USAGE OVERVIEW 3 Cards Owned by you

RULE-CENTRIC ANALYTICS 6 Cards Owned by you

DEVICE-CENTRIC ANALYTICS 5 Cards Owned by you

+ Create New Board

- 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.

The screenshot shows the IBM Bluemix Catalog interface. The top navigation bar includes 'Docs', '29 Trial Days Remaining', 'IBM | US South : rahul.guptaaustin@yahoo.com : dev', 'Catalog', 'Support', and 'Account'. On the left, there's a sidebar with 'All Categories' and sections for 'Infrastructure', 'Apps', 'Services', and 'Integrate'. The 'Application Services' section is expanded, showing various services like 'Blockchain', 'Session Cache', 'WebSphere Application Server', etc. The 'Blockchain' service is highlighted with a red box. The main content area lists more services with their icons and brief descriptions.

- 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)**

The screenshot shows the 'Blockchain' service creation page in the IBM Bluemix Catalog. The top navigation bar is identical to the previous screenshot. The 'Blockchain' service is selected. The 'Service name' field contains 'iot-blockchain-service' and the 'Credential name' field contains 'Credentials- iot-blockchain-service', both highlighted with red boxes. The 'Connect to:' dropdown is set to 'Leave unbound'. The 'Features' section lists 'Create a Dynamic Distributed Network', 'Provision resources', and 'Embed Logic on the Network'. The 'Create' button at the bottom right is also highlighted with a red box.

- Once the IBM Blockchain service is created, click on the **Launch Dashboard** button and that will launch the IBM Blockchain service dashboard in a new browser tab window.

Welcome to the IBM Blockchain Service

Launch Dashboard

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

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.

Peer	Routes	Discovery	Block Height	Status	Actions
Membership Services	gRPC grpcs://97a98b21089f4f8ab219acacf81d0660	-	-	Running	Details Logs
Validating Peer 0	HTTP https://97a98b21089f4f8ab2...	4/ 4	1	Running	Details Logs
Validating Peer 1	HTTP https://97a98b21089f4f8ab2...	4/ 4	1	Running	Details Logs
Validating Peer 2	HTTP https://97a98b21089f4f8ab2...	4/ 4	1	Running	Details Logs
Validating Peer 3	HTTP https://97a98b21089f4f8ab2...	4/ 4	1	Running	Details Logs

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**

The screenshot shows the IBM Watson IoT Platform dashboard. The left sidebar has menu items: BOARDS, DEVICES (which is highlighted with a red box), MEMBERS, APPS, and USAGE. The main content area shows a table of devices with columns: Device Type, Class ID, Date Added, and Location. There are buttons for Refresh, + Add Device, and a search/filter icon. The status bar at the bottom of the table says: "This table shows a summary of all added devices. It can be filtered, organized, and searched on multiple device criteria. You can get started by adding devices using the Add Device button at the bottom of the page, or by using our API."

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

The screenshot shows the Devices page. The top navigation bar has links: QUICKSTART, SERVICE STATUS, DOCUMENTATION, BLOG, and a user profile. The main content area shows a table of devices with columns: Device Type, Class ID, Date Added, and Location. There are buttons for Refresh, + Create Type (which is highlighted with a red box), and a search/filter icon. The status bar at the bottom of the table says: "This table shows a summary of all added devices. It can be filtered, organized, and searched on multiple device criteria. You can get started by adding devices using the Add Device button at the bottom of the page, or by using our API."

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

The screenshot shows the "Create Device Type" wizard. The first step is "General Information". It has fields for "Name" (ELEVATOR) and "Description" (ELEVATOR DEVICES), both of which are highlighted with red boxes. There is a note below the "Name" field: "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." There is also a note below the "Description" field: "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

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**

- 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 or Text Editor. This information will be required later.

Organization ID	xe07ab
Device Type	ELEVATOR
Device ID	IOT-ELEVATOR-001
Authentication Method	token
Authentication Token	-u1UX84p2EwgJ9Qzzn

- **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.

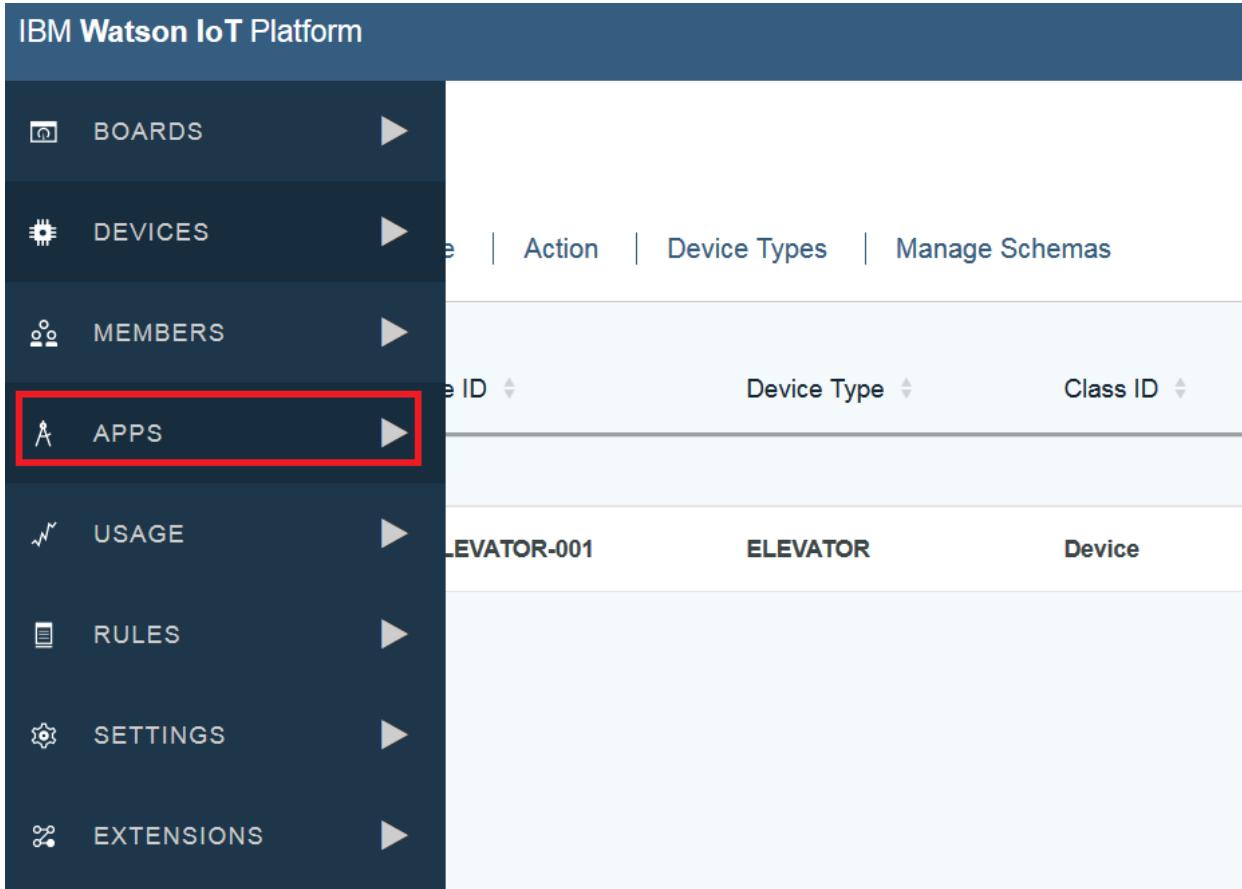
Devices

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

<input type="checkbox"/>	Device ID	Device Type	Class ID
Results 1-1 of 1			
<input type="checkbox"/>	IOT-ELEVATOR-001	ELEVATOR	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**



The screenshot shows the IBM Watson IoT Platform dashboard. The left sidebar contains a navigation menu with the following items: BOARDS, DEVICES, MEMBERS, APPS, USAGE, RULES, SETTINGS, and EXTENSIONS. The APPS item is highlighted with a red box. The main content area shows a table with columns: Device ID, Device Type, and Class ID. There is one entry in the table: Device ID: ELEVATOR-001, Device Type: ELEVATOR, and Class ID: Device. Above the table, there are buttons for Action, Device Types, and Manage Schemas.

- Click on **Generate API Key**
- Select **Standard Application** and add comments for the keys
- Before clicking **Generate**, *copy* the API Keys and Authentication Token from the screen into a notepad or Text Editor. These credentials will be used later in the elevator simulator

Generate API Key

Copy the credentials in notepad

API Key	a-xe07ab-y0www4ls8c
Authentication Token	cPqUJN7DIYNArc9y7!

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

What are they?

 Add another role

Comment

IoT Elevator Keys

Set API key expiry

03/18/2017



[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/icsimulator>
- 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 or Text Editor previously)
- Enter the application API Token in the **API Token** text box (This token was copied in notepad or Text Editor 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 Connected

Enter credentials:

OrgId	xe07ab
API Key	a-xe07ab-y0wwv4ls8c
API Token	cPqUJN7DIYNArc9y7!

Confirm

Elevator Weight

Lb 100

Elevator Temperature

temp (°C) 25

Elevator Speed

m/s 10

Elevator System

CPU % 90

Mem (free) 100

Elevator Power

Kw 5

- 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

<input type="checkbox"/>	Device ID	Device Type	Class ID	Date Added
Results 1-1 of 1				
<input type="checkbox"/>	▲ 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



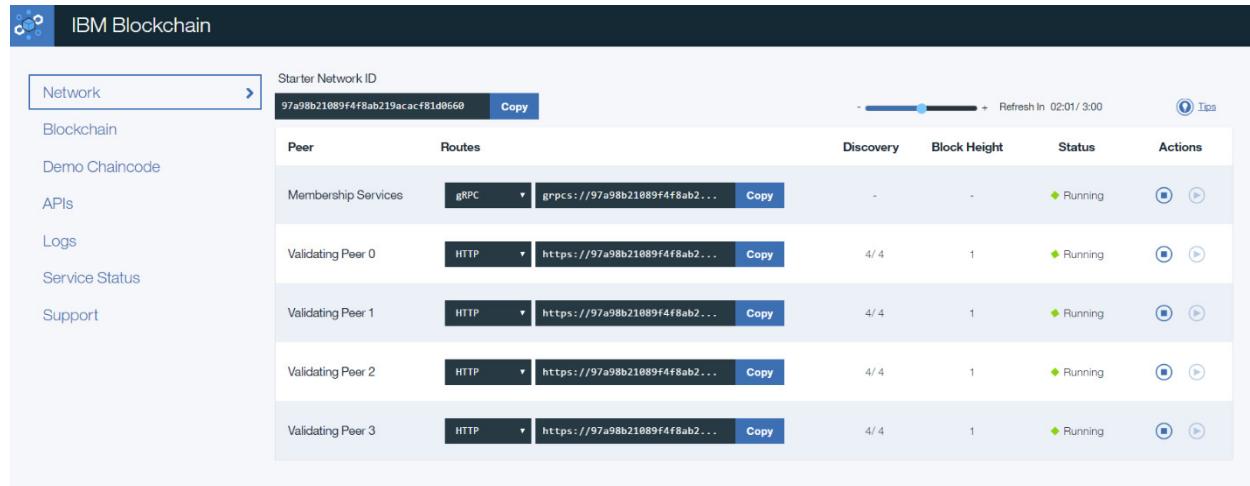
Event	Format	Time Received
data	json	Mar 16, 2017 11:25:04 PM
data	json	Mar 16, 2017 11:25:06 PM
data	json	Mar 16, 2017 11:25:08 PM
data	json	Mar 16, 2017 11:25:10 PM
data	json	Mar 16, 2017 11:25:12 PM
data	json	Mar 16, 2017 11:25:14 PM
data	json	Mar 16, 2017 11:25:16 PM
data	json	Mar 16, 2017 11:25:18 PM
data	json	Mar 16, 2017 11:25:20 PM
data	json	Mar 16, 2017 11:25:22 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



The screenshot shows the IBM Blockchain dashboard with the 'Network' tab selected. The 'Starter Network ID' is 97a98b21089f4f8ab219acacf81d0660. The 'Peer' table lists five peers:

Peer	Routes	Discovery	Block Height	Status	Actions
Membership Services	gRPC Copy	-	-	Running	 
Validating Peer 0	HTTP Copy	4/4	1	Running	 
Validating Peer 1	HTTP Copy	4/4	1	Running	 
Validating Peer 2	HTTP Copy	4/4	1	Running	 
Validating Peer 3	HTTP Copy	4/4	1	Running	 

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/icsimulator>
- 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

Peer	Routes	Discovery	Block Height	Status	Actions
Membership Services	gRPC	grpcs://97a98b21089f4f8ab2...	Copy	-	Running
Validating Peer 0	HTTP	https://97a98b21089f4f8ab2...	Copy	4/4	1
Validating Peer 1	HTTP	https://97a98b21089f4f8ab2...	Copy	4/4	1
Validating Peer 2	HTTP	https://97a98b21089f4f8ab2...	Copy	4/4	1
Validating Peer 3	HTTP	https://97a98b21089f4f8ab2...	Copy	4/4	1

- At the right bottom of Network tab, right click and open **service credentials** in a new tab

Peer	Routes	Discovery	Block Height	Status	Actions
Membership Services	gRPC	grpcs://dfe953829bb54dc780...	Copy	-	Running
Validating Peer 0	HTTP	https://dfe953829bb54dc780...	Copy	4/4	2031
Validating Peer 1	HTTP	https://dfe953829bb54dc780...	Copy	4/4	2031
Validating Peer 2	HTTP	https://dfe953829bb54dc780...	Copy	4/4	2031
Validating Peer 3	HTTP	https://dfe953829bb54dc780...	Copy	4/4	2031

Open link in new tab
Open link in new window
Open link in incognito window

Save link as...
Copy link address

Inspect
Service Credentials

- 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	<input type="text" value="https://97a98b21089f4f8ab219acacf81d0660-vp2.us.blockchain.ibm.com:5001"/>
Enroll ID	<input type="text" value="user_type1_2"/>
Enroll Secret	<input type="text" value="7e82ed0c6d"/>
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	<input type="text" value="https://97a98b21089f4f8ab219acacf81d0660-vp2.us.blockchain.ibm.com:5001"/>
Enroll ID	<input type="text" value="user_type1_2"/>
Enroll Secret	<input type="text" value="7e82ed0c6d"/>
<input type="button" value="Register"/>	

Deploy Elevator Contract:

Contract Path	<input type="text" value="https://github.com/iot-ic-2017/lab2234/IC17-2234-Presentation"/>
<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	<input type="text" value="https://97a98b21089f4f8ab219acacf81d0660-vp1.us.blockchain.ibm.com:5001"/>
Enroll ID	<input type="text" value="user_type1_1"/>
Enroll Secret	<input type="text" value="07d36332f3"/>
<input type="button" value="Register"/>	

Deploy Elevator Contract:

Contract Path	<input type="text" value="https://github.com/iot-ic-2017/lab2234/IC17-2234-Presentation"/>
<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://97a98b21089f4f8ab219acacf81d0660-vp0.us.blockchain.ibm.com:5001</code>
Enroll ID	<code>user_type1_0</code>
Enroll Secret	<code>97704f73e5</code>
Register	

Deploy Elevator Contract:

Contract Path	<code>https://github.com/iot-ic-2017/lab2234/IC17-2234-Presentation</code>
Deploy	
<pre>{"OK":"Login successful for user 'user_type1_0'."}</pre>	

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/iot-ic-2017/lab2234/tree/master/elevator_simple_contract

- 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 two – three minutes to complete on all the four validating peers in the Blockchain network.

Deploy Elevator Contract:

Contract Path

https://github.com/iot-ic-2017/lab2234/elevator_simple_contract

Deploy

```
{"jsonrpc":"2.0","result":{"status":"OK","message":"06d4a6ff41e6438a94e6f7928cc379f11b74e1b22c1bb1e962750c1a2b483d5eb2dceddb8f4440e68837a338b4e24314afb2d33168d2ba60705bf748eecdःa54"},"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.

IBM Blockchain
Refresh In 01:46/ 3:00
Tips

Network
dfe953829bb54dc780307070f24a6627
Copy

Blockchain

Peer	Routes	Discovery	Block Height	Status	Actions
Membership Services	gRPC grpcs://dfe953829bb54dc780...	-	-	Running	View Logs
Validating Peer 0	HTTP https://dfe953829bb54dc780...	4/ 4	2	Running	View Logs
Validating Peer 1	HTTP https://dfe953829bb54dc780...	4/ 4	2	Running	View Logs
Validating Peer 2	HTTP https://dfe953829bb54dc780...	4/ 4	2	Running	View Logs
Validating Peer 3	HTTP https://dfe953829bb54dc780...	4/ 4	2	Running	View Logs

Service Status

Chaincode ID	Peers	Logs	Status
06d4a6ff41e6438a94e6f7928cc379f11b74e1b22c1bb1e962750c1a2b483d5eb2dceddb8f4440e68837a3...	3	VP0	Running

- 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.

IBM Blockchain

Network Starter Network ID: dfe953829bb54dc780307070f24a0627 Copy Tip

Blockchain Overview [Connected to Validating Peer 0]

Blockchain Overview

Blockchain Metrics:

- BLOCKS:** 2
- BLOCKS SPEED:** 0.4
- TRANSACTION ACTIVITY:** 1.0
- DEPLOYMENTS:** 1
- INVOCATIONS:** 0

Block Activity:

Time	Block #	Deployments	Invocations	Date	Type	UUID	Chaincode ID	Payload
5min 24sec ago	1	1	0	03/17 05:18am UTC	DEPLOY	06d4a6ff41a6438a94a6f7928cc379f11b74e1b22c1b1e962750c1a2b483d5eb2dcedd8f4440e68837a338b4e24314afb2d33168d2ba60705bf748eeecdba54	n/a	↓ init ↑ "versi on": "1.0 "]
4hr 49min ago	0	Genesis						

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/icsimulator>) 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 Configure Blockchain:

IoT Platform Org ID	xe07ab
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 Configure Blockchain:

IoT Platform Org ID	xe07ab
Activate Blockchain	
User Name	Rahul Gupta
User Email	rahul.gupta@us.ibm.com
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

The screenshot shows the 'General' tab of the IBM Blockchain dashboard. It includes fields for Organization ID (xe07ab), Organization Type (Bluemix Free), Friendly Name (xe07ab), Experimental Features (Off), Device Management (Off), and Blockchain (On). The 'Blockchain' switch is highlighted with a red box. Below the table, a message says 'No fabrics are configured for your organization.' At the bottom left is a '+ Add' button, and at the bottom right is a 'Confirm all changes' button, which is also highlighted with a red box.

- 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 number (for e.g. 5002 or other port number)
 - **Port Number** – *5002*
 - **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*

The screenshot shows the 'Add Blockchain Fabric' wizard. It has a header 'Add Blockchain Fabric' and a sub-instruction 'To get started, enter the connection information for an IBM Blockchain or Hyperledger blockchain peer.' The form fields are as follows:

Fabric name*	elevator-company-fabric
Peer Host*	dfe953829bb54dc780307070f24a0627-vp1.us.blockchain.ibm.com
Port number*	5002
Peer name*	elevator-customer-peer
User ID*	user_type1_1
Secret key*	572e90c148
Use TLS?	On

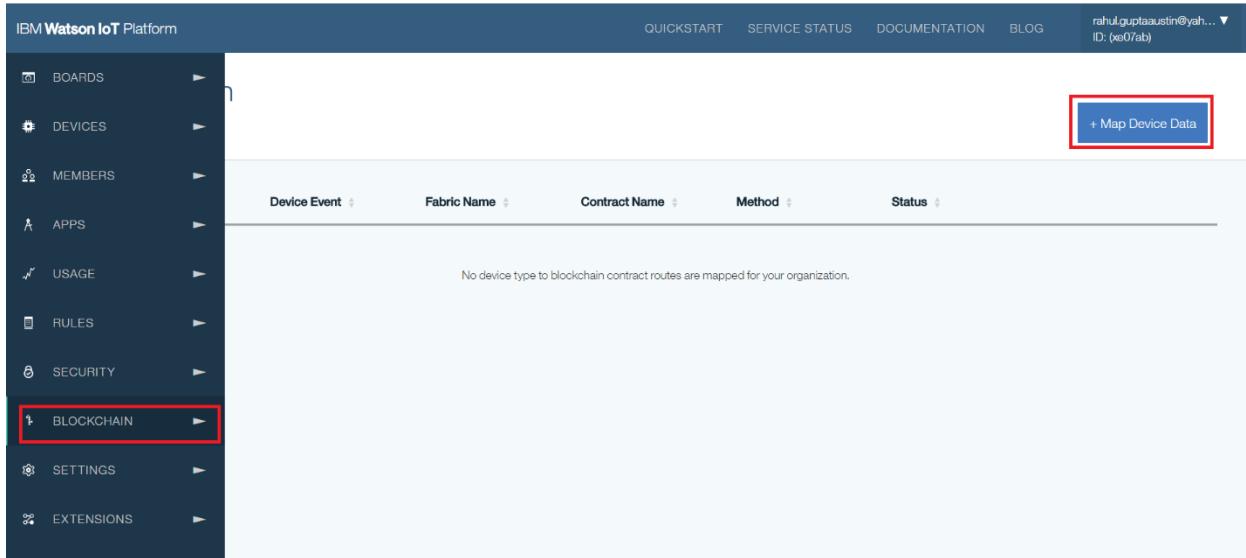
At the bottom are 'Save' and 'Cancel' buttons.

- 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.temperature
speed	d.speed
power	d.power
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	06d4a6ff41e6438a94e6f7928cc379f11b74e1b22c1bb1e962750c1a2b483 d5eb2dceddb8f4440e68837a338b4e24314afb2d33168d2ba60705bf74 8eecdबa54

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

Blockchain Overview

Block Activity

Time	Block #	Deployments	Invocations	Date	Type	UUID	Chaincode ID	Payload
14sec ago	13	0	1	03/17 05:40am UTC	INVOKE	f6f73da4-4425-4219-96f8-17aff722c3a	r06d4a6ff41ea...	updateAsset {"system": {"memory":4.58416137E8, "cpu":0.86}, "assetID": "IOT-ELEVATOR-001", "temperature":45.0, "weight":161.0, "power":104.0, "speed":10.0}
16sec ago	12	0	1					
17sec ago	11	0	1					
19sec ago	10	0	1					

- 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

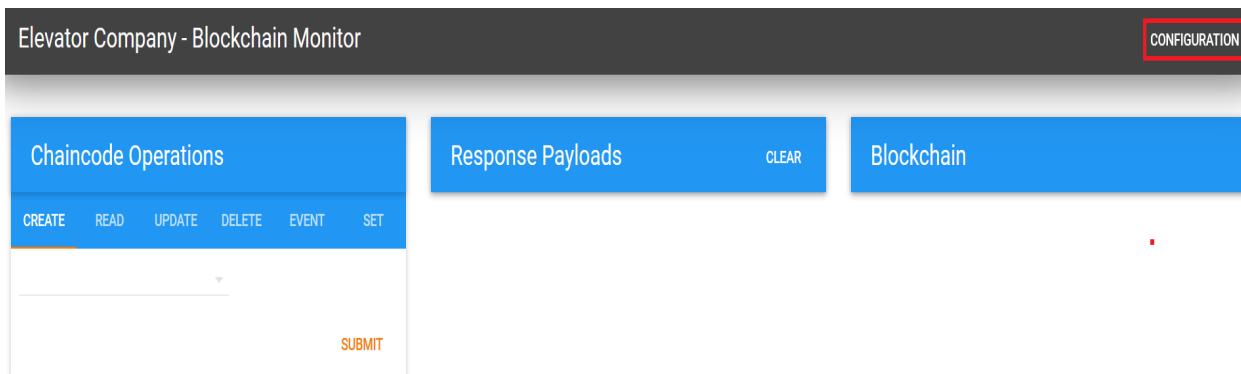
The Elevator manufacturing company needs access to the data from Elevator so it can have visibility for any malfunctioning in elevator and can take immediate actions. This will help them provide better service to their customers and clear any audits and compliance issues.

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/icsimulator>
- 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://dfe953829bb54dc780307070f24a0627-vp0.us.blockchain.ibm.com:5002>

Chaincode ID

06d4a6ff41e6438a94e6f7928cc379f11b74e1b22c1bb1e962750c1a2b483d5eb2dcddb8f4440e6883

Secure Context

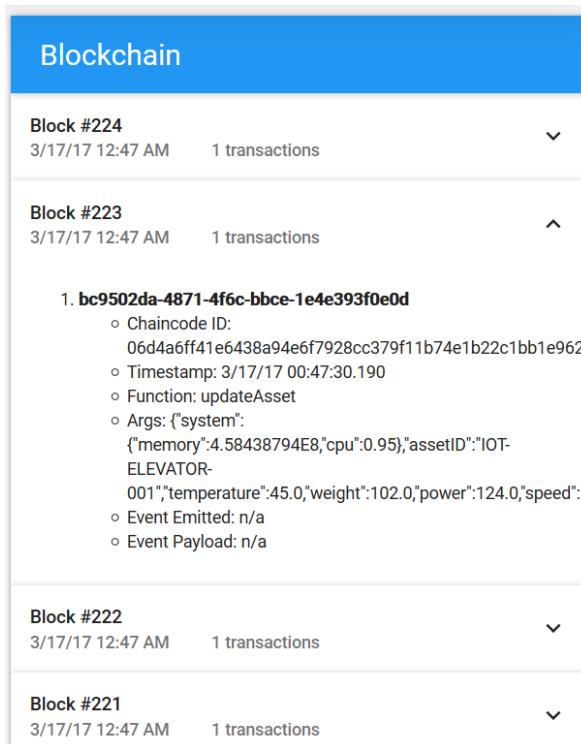
user_type1_0

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 #224
3/17/17 12:47 AM 1 transactions

Block #223
3/17/17 12:47 AM 1 transactions

1. **bc9502da-4871-4f6c-bbce-1e4e393f0e0d**

- Chaincode ID: 06d4a6ff41e6438a94e6f7928cc379f11b74e1b22c1bb1e962750c1a2b483d5eb2dcddb8f4440e6883
- Timestamp: 3/17/17 00:47:30.190
- Function: updateAsset
- Args: {"system": {"memory":4.58438794E8,"cpu":0.95}, "assetID": "IOT-ELEVATOR-001", "temperature":45.0,"weight":102.0,"power":124.0,"speed":8}
- Event Emitted: n/a
- Event Payload: n/a

Block #222
3/17/17 12:47 AM 1 transactions

Block #221
3/17/17 12:47 AM 1 transactions

- 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 - IBM InterConnect 2017

Chaincode Operations

UPDATE **READ** CREATE REPLACE DELETE EVENT SET

readAsset

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

assetID

SUBMIT

Response Payloads

CLEAR

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

Poll for changes

assetID: IOT-ELEVATOR-001
weight: 98
system:
 cpu: 1
 memory: 458709222
temperature: 45
speed: 10
power: 132

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/icsimulator>
- 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://dfe953829bb54dc780307070f24a0627-vp2.us.blockchain.ibm.com:5002`

Chaincode ID

`e962750c1a2b483d5eb2dceddb8f4440e68837a338b4e24314afb2d33168d2ba60705bf748eecdबa54`

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.

Next Steps

You can try using the Real-Time Insights functionality for analyzing the data coming from Elevator and triggering events based on rules and actions. To learn more about how to use Real Time Insights refer the recipe below.

<https://developer.ibm.com/recipes/tutorials/using-rules-and-actions-with-ibm-watson-iot-platform-cloud-analytics/>