



Connecting IoT Devices to Watson IoT with Node-RED

AP Cloud 2018 Workshop

AP Cloud Team

Miracle Software Systems, Inc.

Connecting IoT Devices to Watson IoT with Node-RED

Overview

In this lab the user will create a Bluemix IoT Service and will add Logistics Simulator Device to the IoT Platform Cloud in Registered mode. It will send events like - Fuel, Emission, Tyre Pressure, Air Bag, Temperature, and Speed to the IBM IoT Cloud.

Pre-Requisites

The following installations will need to be completed for this lab to be run successfully,

- Active email ID for registering with Bluemix
- Download and Install NodeJS
- Test Editor such as Sublime Text (or) Notepad ++

Technology Involved

- IBM Bluemix(PaaS)
- Watson IoT Platform
- Node-RED
- Miracle's Logistics Simulator

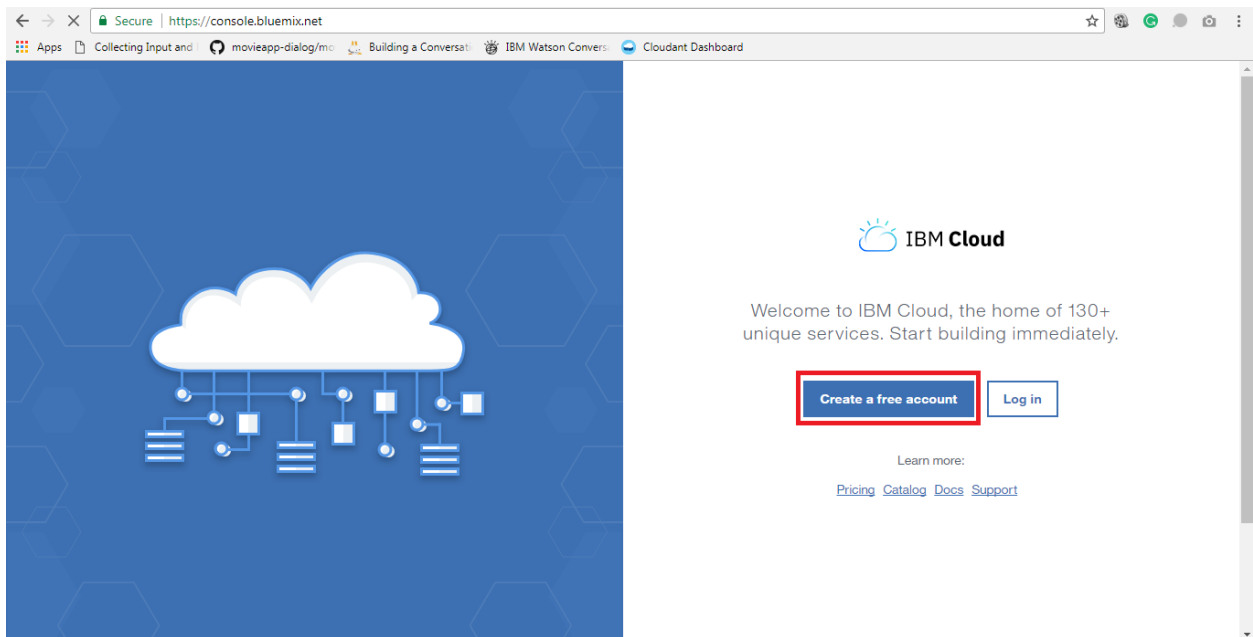
Lab Steps

So, let us get started with the lab!

Step #1 | Create IBM Bluemix account


The first step will be to make sure that we have access to the IBM Bluemix Console with either the free trial option (or) the paid subscription option.

Login to Bluemix at <http://bluemix.net> (or) Register today at <https://console.ng.bluemix.net/registration/>



Click on Create a free account, and fill the fields as required.

A screenshot of the IBM Cloud account creation form. The left side has a blue background with white text: 'Sign up for an IBMid and create your IBM Cloud account', 'Build on IBM Cloud for free with no time restrictions', 'Guaranteed free development with Lite plans', 'Start on your projects right away', 'Get \$200 on us to try paid services', and 'Ready to get started? Sign up today!'. The right side is a white form with the heading 'Already have an IBM Cloud account? Log in'. It contains input fields for 'Email*', 'First Name*', 'Last Name*', 'Company', 'Country or Region*' (with 'United States' selected), and 'Phone Number*'. A 'Privacy - Terms' link is at the bottom right.



Sign up for an IBMid and create your IBM Cloud account

Build on IBM Cloud for free with no time restrictions

Guaranteed free development with Lite plans
Develop worry-free and at no cost with cap based Lite plan services for as long as you like.

Start on your projects right away
Skip entering your credit card info and get working in just a few short steps.

Get \$200 on us to try paid services
Ease into cloud pricing or try something new with \$200 in credit available for 1 month upon upgrade.

Ready to get started? Sign up today!

Country or Region*

United States

Phone Number*

9493415290

Password*


.....

Keep me informed of products, services, and offerings from IBM companies worldwide.


☒ By email ☐ By telephone

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

Create Account



After Clicking on "**Create Account**", confirmation mail will be sent to the registered mail id. Click on Confirm account and then Login to your Bluemix account.



Log in to IBM

Don't have an IBMid?
[Create an account](#)

Log in with your company
credentials (SSO)

Need help? [Contact the IBM Help Desk](#)

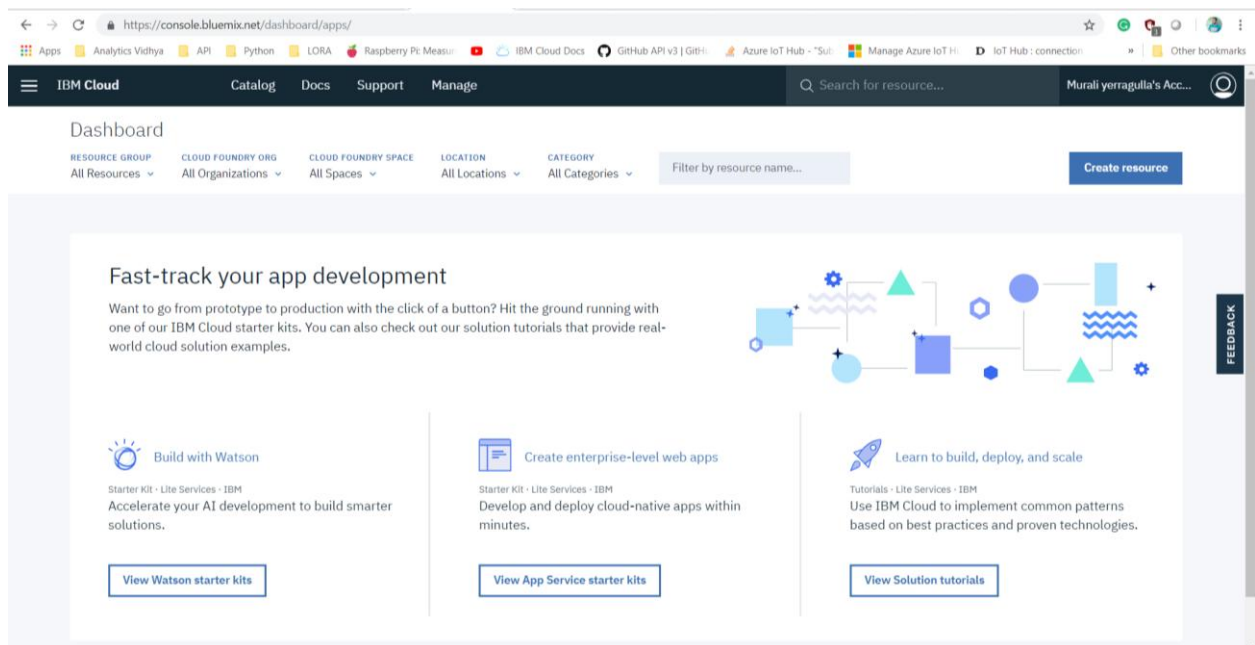
IBMid [Forgot IBMid?](#)

Password [Forgot password?](#)

☐ Remember me [?](#) [Log in](#)

[Contact](#) [Privacy](#) [Terms of use](#) [Accessibility](#)

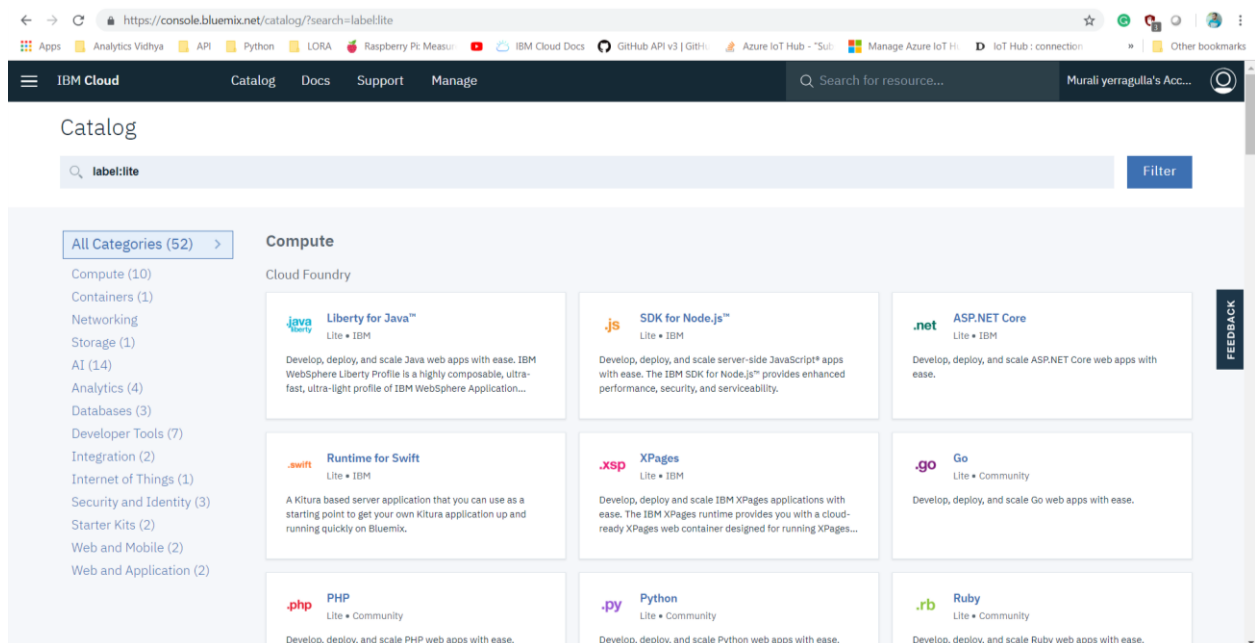
After you login, you can see the dashboard where you can take a look at your applications and services.



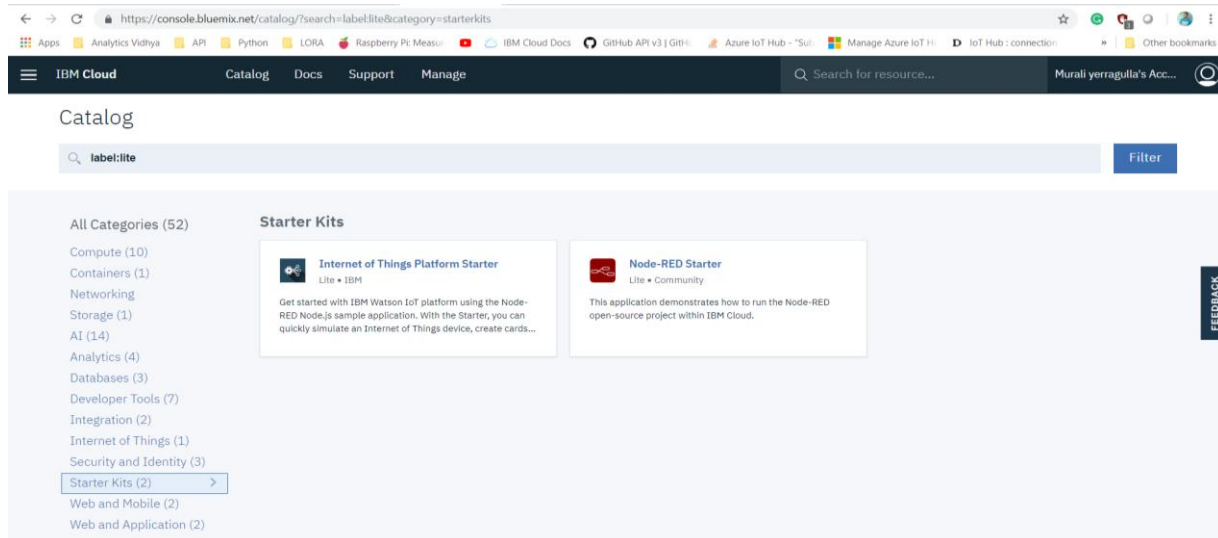
The next step will be to take your application and deploy it back to Bluemix so that you can share it with your friends.

Step #2 | Create Application and Watson IoT Service

Click on **Catalog**, for creating the application.

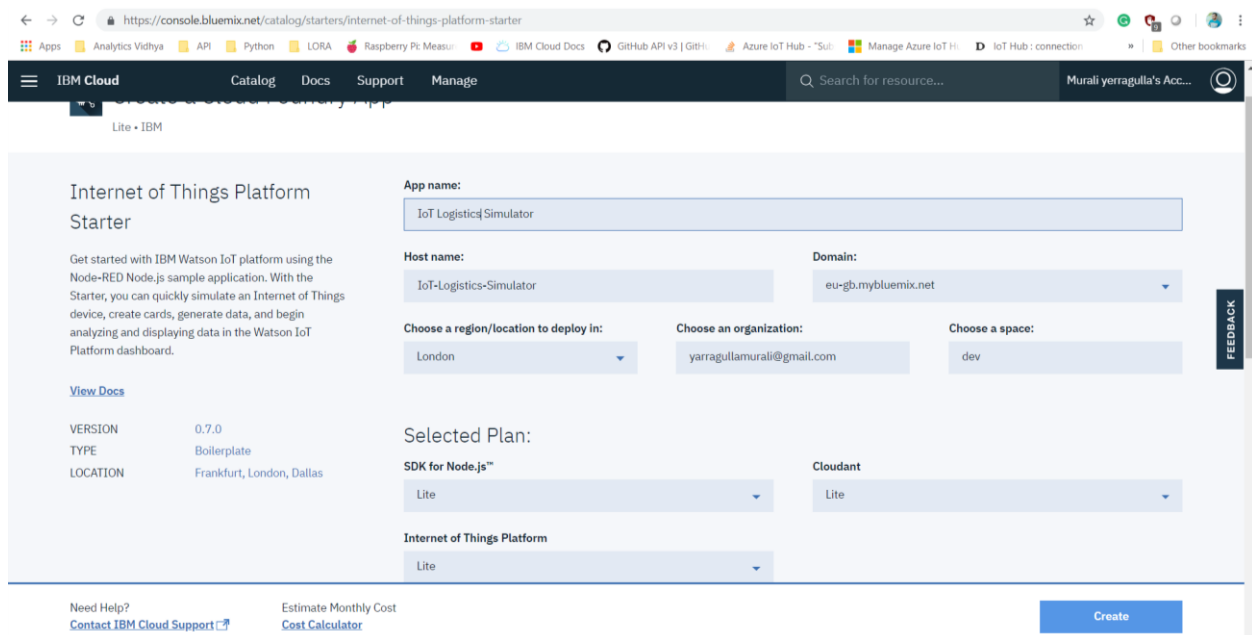


Click on Starter Kits in left side pane, and then you will be provided with available services. Select **"Internet of Things Platform Starter"**



The Starter Kit will have **"SDK for Node.js"** and **"Cloudbant NoSQL DB"** services by default for us to use as services. It will also have **Node-RED** pre-installed for you.

Give a unique name to your application here and click on **"Create"**. Application names must be unique as they will be on a public domain.

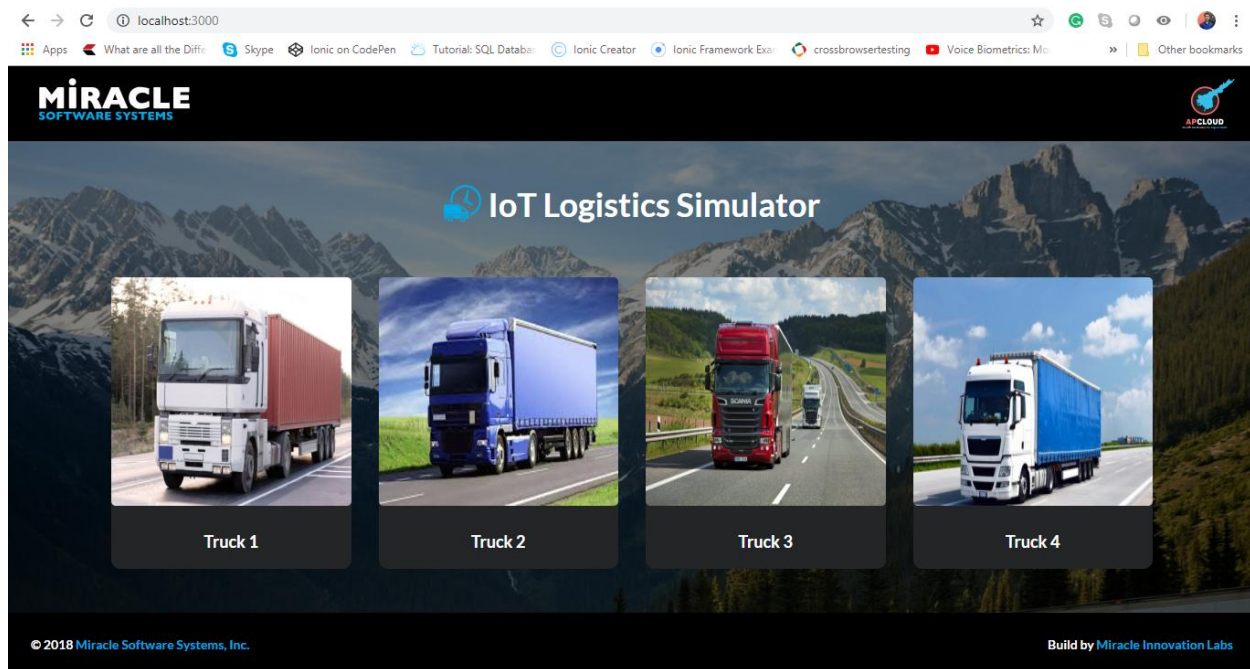


Note - Once created, the application will take about 2 minutes for staging and start running.

Step #3 | Run the Logistic Simulator

You can download the Simulator file from [<GitHub link>](#) send the vehicle data to the IBM Watson IoT Platform.

Run the index.html file to go to the Logistic Simulator Dashboard and it can be used to simulate Truck events, for example - Speed, Fuel, Tyre Pressure and Location.



Step #4 | Register your Truck (Simulator)

Go back to your Bluemix account and click on your application.

The screenshot shows the IBM Cloud Dashboard. The top navigation bar includes 'IBM Cloud', 'Catalog', 'Docs', 'Support', and 'Manage'. A search bar is present on the right. The main content area is titled 'Dashboard' and includes filters for 'RESOURCE GROUP', 'CLOUD FOUNDRY ORG', 'CLOUD FOUNDRY SPACE', 'LOCATION', and 'CATEGORY'. A 'Create resource' button is in the top right.

Cloud Foundry Applications

Name	Region	CF Org	CF Space	Memory (MB)	Status
IoT Logistics Simulator1	London	yarragullamurali@...	dev	256	Running (0/1)

Services

Name	Location	Resource Group	Plan	Details	Service Offering
Cloudant-wq	London	Default	Lite	Provisioned	Cloudant

Cloud Foundry Services

Name	Region	CF Org	CF Space	Plan	Service Offering
IoT Logistics Simulator1-cloudantNoSQLDB	London	yarragullamurali@...	dev	Lite	cloudantNoSQLDB
IoT Logistics Simulator1-iotf-service	London	yarragullamurali@...	dev	iotf-service-free	iotf-service

Click on **“Internet of Things Service”**.

Click on **“Launch Dashboard”** button. This will take you to your IoT Platform Organization space.

The screenshot shows the 'Launch Dashboard' for the 'IoT Logistics Simulator1-iotf-service'. The top bar shows 'Dashboard /' and the service name. Below this, it displays 'Location: London', 'Org: yarragullamurali@gmail.com', and 'Space: dev'. A progress bar indicates '0.32% Used | 199.35 Megabyte exchanged available'. A 'Details' link is on the right.

Let's get started with IBM Watson IoT Platform

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

[Launch](#) [Docs](#)

Ready for the next level?

IBM Watson IoT Platform Journey

- ☒ **Lite**
The Lite service plan provides a lightweight development environment to get you started with the connectivity capabilities of Watson IoT Platform.
- ☐ **Non-Production**
The Non-Production service plan is a full-featured, fully-integrated offering that enables you to explore Watson IoT Platform to see how the service can fit into your IoT environment.
- ☐ **Production**
The Production service is a fully managed SaaS offering that enables you to manage and analyze enterprise IoT data.

As the Organization is new, there will be no registered devices so, click on “**Device Type**”.

IBM Watson IoT Platform

Device Types

Add Type Identity Device Information

Device types group devices that have similar characteristics, such as model number, firmware version, or location. Give the device type a unique name and a description that identifies characteristics that are shared by devices of this type.

Type Or

Name Trucks

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

Description

Cancel Next

Observe that we have 2 options. As we want to create a Device Type and not a Gateway, click "**Device**".

Specify a name for the device type to be added and give description (Optional). For example you can give "**Trucks**" for "Name" field. Click on "**Next**".

IBM Watson IoT Platform

Device Types

Add Type Identity Device Information

Select Type

Device types group devices that have similar characteristics, such as model number, firmware version, or location. Give the device type a unique name and a description that identifies characteristics that are shared by devices of this type.

Type Or

Name Trucks

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

Description

Cancel Next

If you want to insert any **"Device Information"**, you can insert it here (This is optional). Click on **"Done"**.

The screenshot shows the 'Add Type' dialog box in the IBM Watson IoT Platform. The dialog has two tabs: 'Identity' and 'Device Information'. The 'Device Information' tab is active, showing a form with the following fields:

Field	Value
Serial Number	Enter Serial Number
Model	Enter Model
Description	Enter Description
Hardware Version	Enter Hardware Version
Manufacturer	Enter Manufacturer
Device Class	Enter Device Class
Firmware Version	Enter Firmware Version
Descriptive Location	Enter Descriptive Location

Below the fields is a button labeled '+ Add Metadata'. At the bottom right of the dialog are 'Cancel' and 'Done' buttons.

Click on **"Add Device"** on top right corner.

When prompted, **"Select the Existing Device Type"** as **"Trucks"** and provide the Device ID, then click on **Next**.

The screenshot shows the 'Add Device' dialog box in the IBM Watson IoT Platform. The dialog has four tabs: 'Identity', 'Device Information', 'Security', and 'Summary'. The 'Identity' tab is active, showing a form with the following fields:

Field	Value
Device Type	Trucks
Device ID	Truck1

At the bottom right of the dialog are 'Cancel' and 'Next' buttons.

Below the dialog is the 'Browse Devices' section, which includes a search bar labeled 'Type the Device ID to search for' and a 'Search' button. Below the search bar is a table with the following data:

Device ID	Device Name
Truck1	Truck1

Below the table is a note: 'This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on.'

If you want to insert any "Device Information", you can insert it here (This is optional).

The screenshot shows the 'Add Device' form in the IBM Watson IoT Platform. The 'Device Information' tab is selected. The form contains several input fields for device identification:

- Serial Number: Enter Serial Number
- Model: Enter Model
- Description: Enter Description
- Hardware Version: Enter Hardware Version
- Manufacturer: Enter Manufacturer
- Device Class: Enter Device Class
- Firmware Version: Enter Firmware Version
- Descriptive Location: Enter Descriptive Location

There is a '+ Add Metadata' button at the bottom left and a 'Next' button at the bottom right.

In the Next page, you can either add your own authentication token, or allow the IoT Platform to generate a token for you. If you want to add your own token, enter the token. Otherwise leave the field empty. Click on "**Next**".

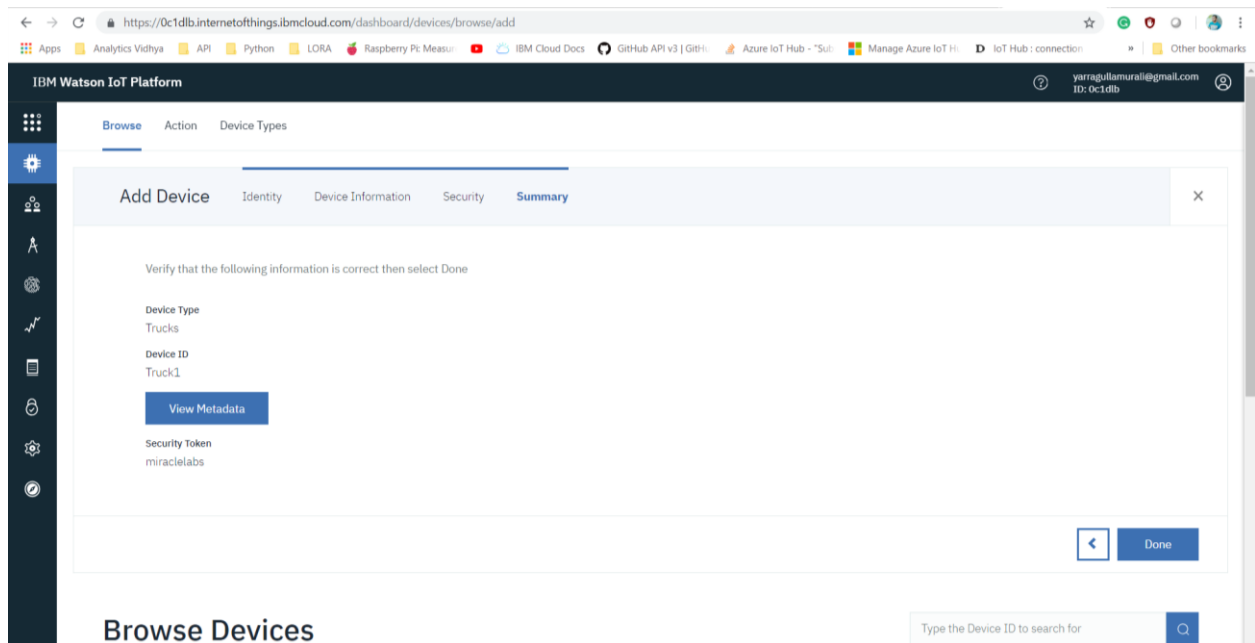
The screenshot shows the 'Add Device' form in the IBM Watson IoT Platform, now on the 'Security' tab. It presents two options for selecting a device authentication token:

- Auto-generated authentication token (default)**: Allow the service to generate an authentication token for you. Tokens are 18 characters and contain a mix of alphanumeric characters and symbols. The token is returned to you at the end of the device registration process.
- Self-provided authentication token**: Provide your own authentication token for this device. The token must be between 8 and 36 characters and contain a mix of lowercase and uppercase letters, numbers, and symbols, which can include hyphens, underscores, and periods. Do not use repeated characters, dictionary words, user names, or other predefined sequences.

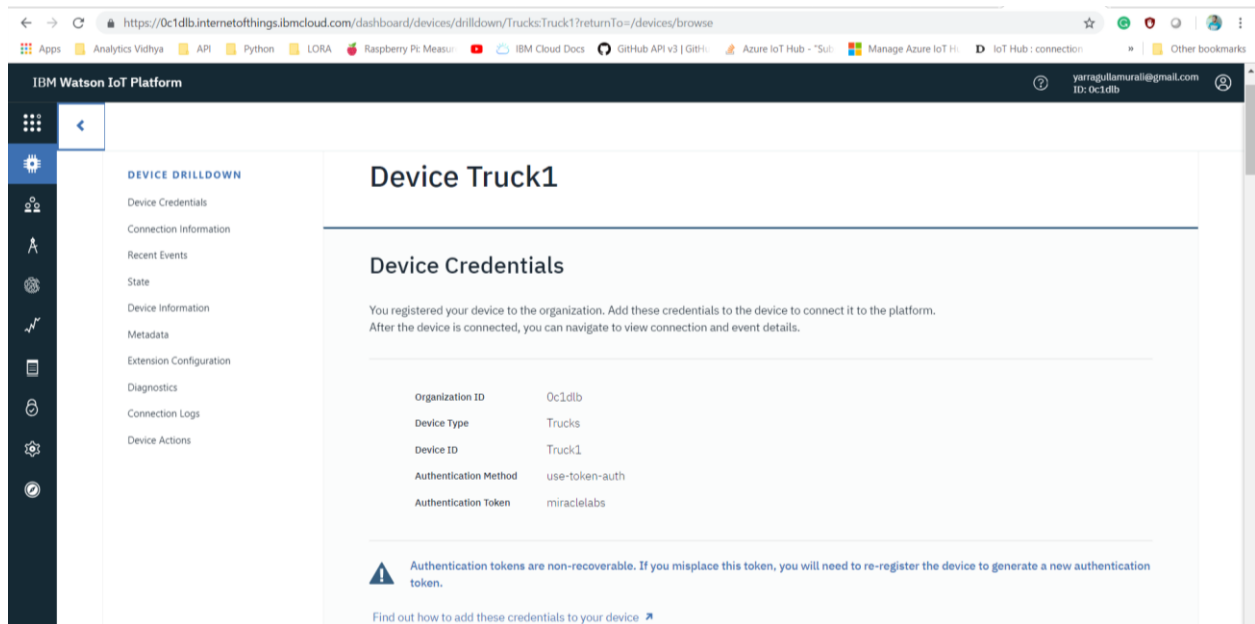
An 'Authentication Token' input field is shown with the value 'miraclelabs'. Below it, a note states: 'Make a note of the generated token. Lost authentication tokens cannot be recovered. Tokens are encrypted before being stored. Authentication token are encrypted before we store them.'

Navigation buttons include a back arrow and a 'Next' button at the bottom right.

Click on "**Done**".



Click on "**Done**", then the Device Type is created successfully. After registering, store the credentials for the registered device.



Step #5 | Configure the Simulator

For your simulator to communicate sensor events via MQTT to the IoT Platform we will need to configure it with the required endpoints and the registrations details. Go to your application and open the **server.js** file.

Update the details of the file with the configuration details as mentioned in the comments. The following are the details that you should have with you to modify the file,

var orgId = "<your-Organization-ID>"

var deviceType = "<your-device-Type>"

var deviceId = "<your-device-ID>"

var deviceToken = "<your-device-Token>"



```
1
2 var iotf = require("ibmiotf");
3 var express=require('express');
4 var app = express();
5 const bodyParser=require('body-parser');
6 var server = require('http').Server(app);
7 var io = require('socket.io')(server);
8
9 var port=3000;
10 app.get('/',function(req,res){
11   res.sendFile( __dirname+ '/index.html');
12 });
13 app.use(bodyParser.urlencoded({extended: true}));
14
15 app.use(bodyParser.json());
16
17 app.use(bodyParser.json());
18 app.use(express.static(__dirname + '/'));
19 app.use(function(req, res, next)
20 {
21   res.header("Access-Control-Allow-Origin", "*");
22   res.header("Access-Control-Allow-Headers", "*");
23   next();
24 });
25 var config1 = {
26   "org" : "hdlxmj",
27   "id" : "Truck1",
28   "type" : "thing",
29   "auth-method" : "token",
30   "auth-token" : "digitalsummit@2107"
31 }
```

Save the file and re-load the index.html file in a browser. You can now return back to the IoT Dashboard and see that your device is connected to the cloud.

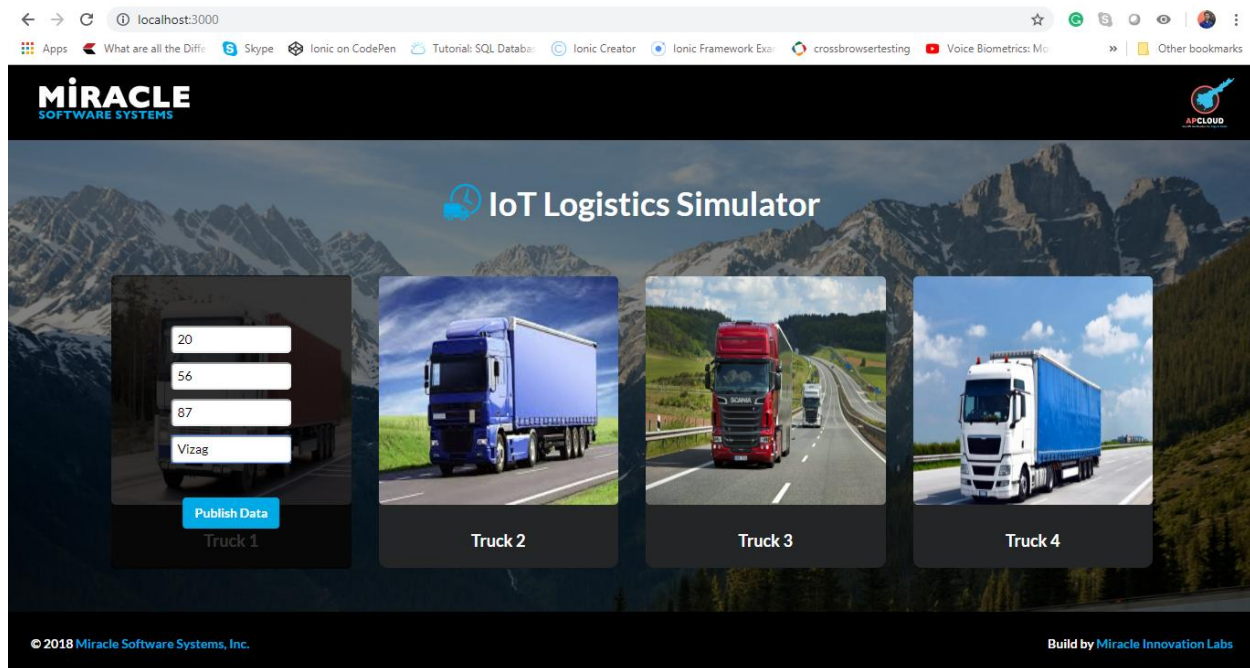
Open Command Prompt, and go to the application directory and run app.js file



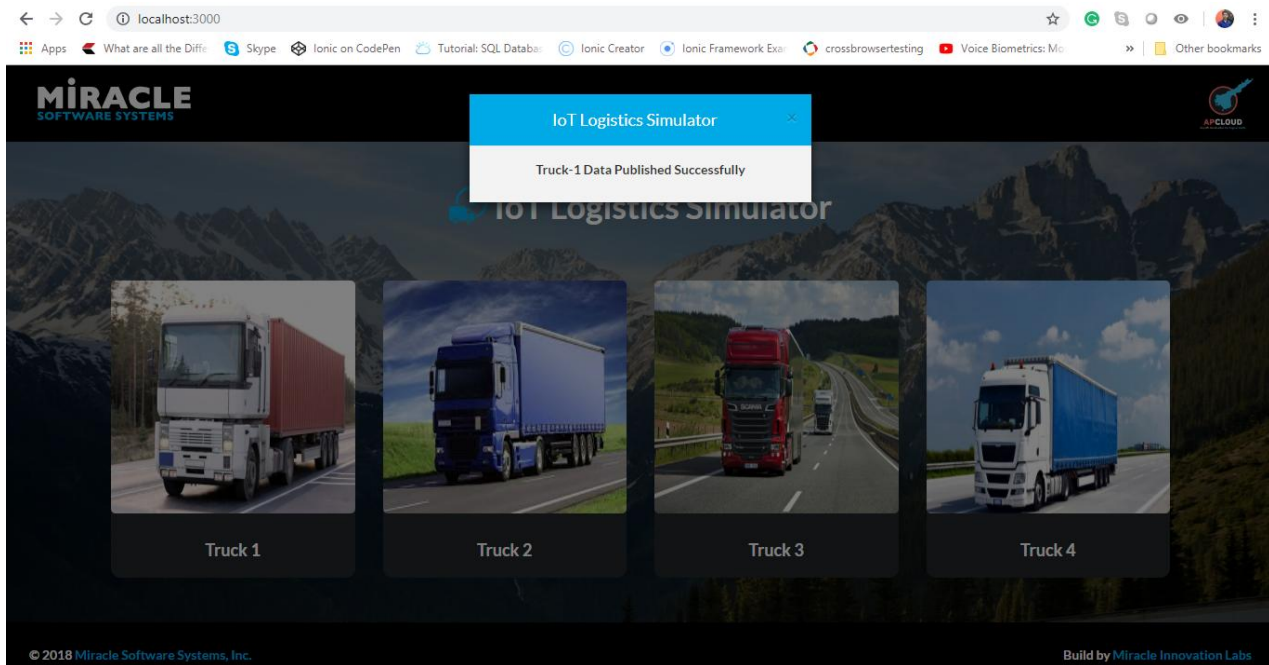
```
C:\Windows\System32\cmd.exe - node server.js
F:\IoT Logistics Simulator\simulator-20171205T144206Z-001\simulator>node server.js
server running at 3000
```

Step #6 | Publishing the Data to Watson IoT platform

Go to Logistic Simulator dashboard. Place your mouse control over **Truck 1**. Fuel details will appear on top right corner. Give any values for the fields and click on **“Publish Data”**.



If the data is published successfully to Watson IoT platform, then a pop-up appears.



Open Command prompt for viewing the JSON response.

```
C:\Windows\System32\cmd.exe - node server.js
P:\IoT Logistics Simulator\simulator-20171205T144206Z-001\simulator>node server.js
Server running at 3000
Data: {"name":"Truck1","speed":"45","fuel":"67","tyrepres":"89","loc":"90"}
Device1 is connected...
```

Go back to Watson IoT Dashboard for checking the JSON payload

IBM Watson IoT Platform

QUICKSTART SERVICE STATUS DOCUMENTATION BLOG jp142311@gmail.com ID: (hdlxmj)

Browse Diagnose Action Device Types Manage Schemas + Add Device

This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.

Device ID	Device Type	Class ID	Date Added	Descriptive Location
RFID	thing	Device	29 Nov 2017 21:25	
Truck1	thing	Device	4 Dec 2017 18:35	

Identity Device Information **Recent Events** State Logs

Showing Raw Data | The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
myevt1	[{"name": "Track1", "speed": "12", "fuel": "23", "t...	json	a few seconds ago

IBM Watson IoT Platform

QUICKSTART SERVICE STATUS DOCUMENTATION BLOG jp142311@gmail.com ID: (hdlxmj)

Browse Diagnose Action Device Types Manage Schemas + Add Device

This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.

Device ID	Device Type	Class ID	Date Added	Descriptive Location
RFID	thing	Device	29 Nov 2017 21:25	
Truck1	thing	Device	4 Dec 2017 18:35	

Identity Device Information **Recent Events** State Logs

Showing Raw Data | The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
myevt1	[{"name": "Track1", "speed": "12", "fuel": "23", "t...	json	3 minutes ago

Event Payload

Event Name myevt1

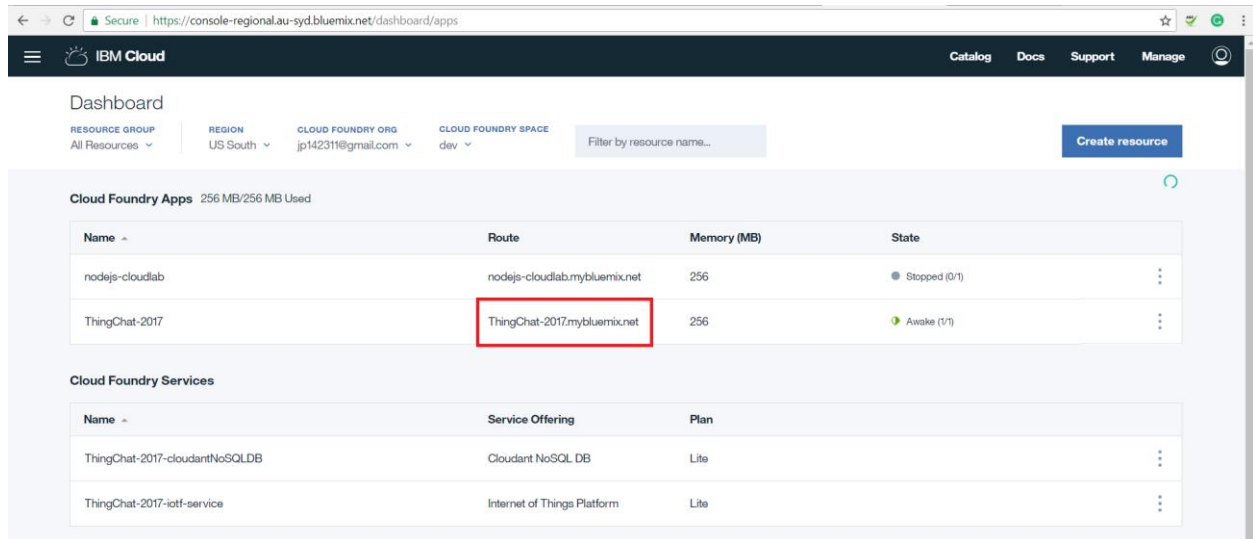
Time Received 2017-12-07T18:23:26.099Z

```

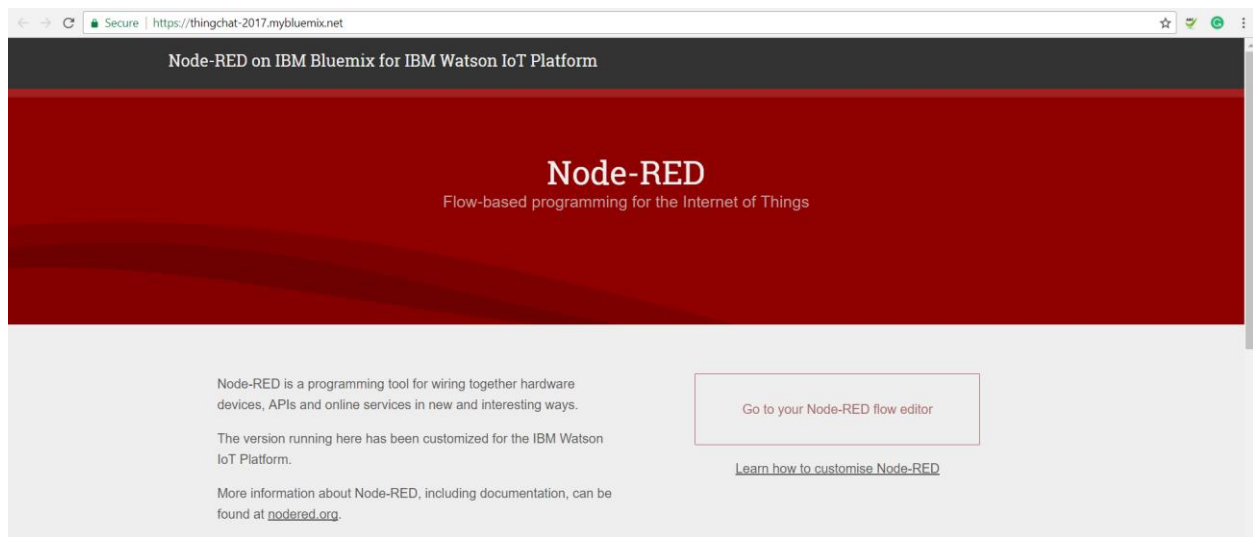
1 {
2   "name": "Track1",
3   "speed": "12",
4   "fuel": "23",
5   "tyrespres": "3",
6   "loc": "3333"
7 }
```

Step #7 | Persisting your data with Node-RED and Cloudbant

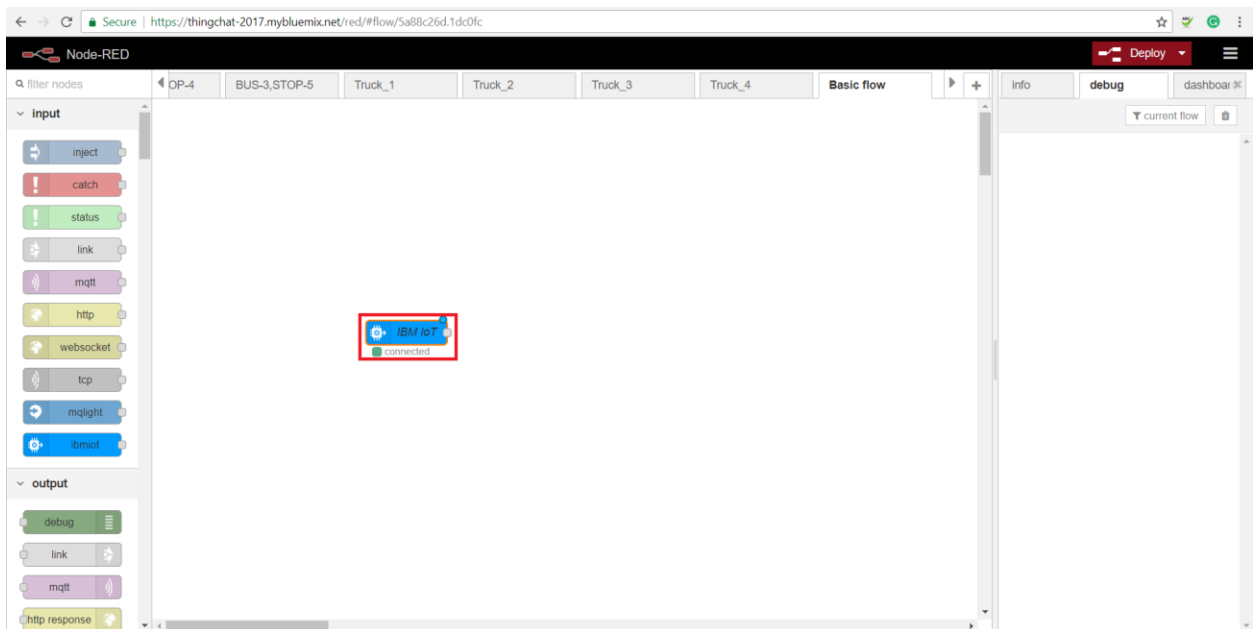
Go to your Bluemix Application Dashboard and click on **Route**



This will redirect you to Node Red tool in Bluemix. Click on **"Go to your Node-RED Flow Editor"**

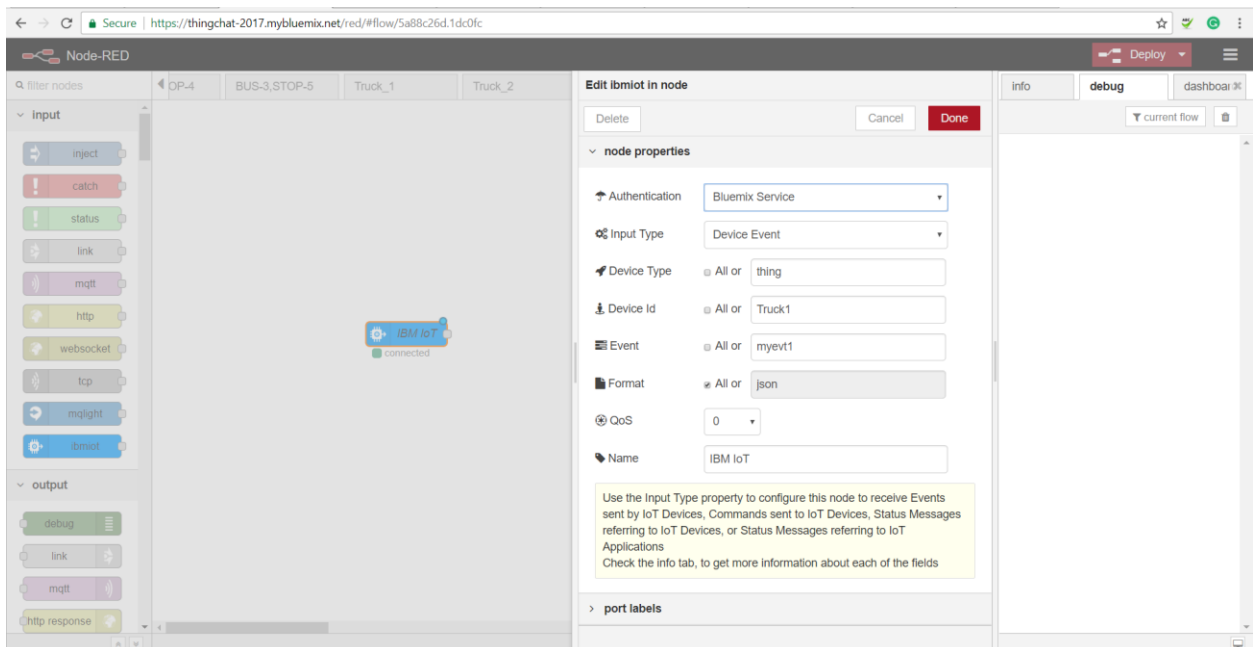


Node Red Flow sheet will be opened with a set of input and output nodes. Drag and drop **"IBM IoT"** node onto the flow sheet.

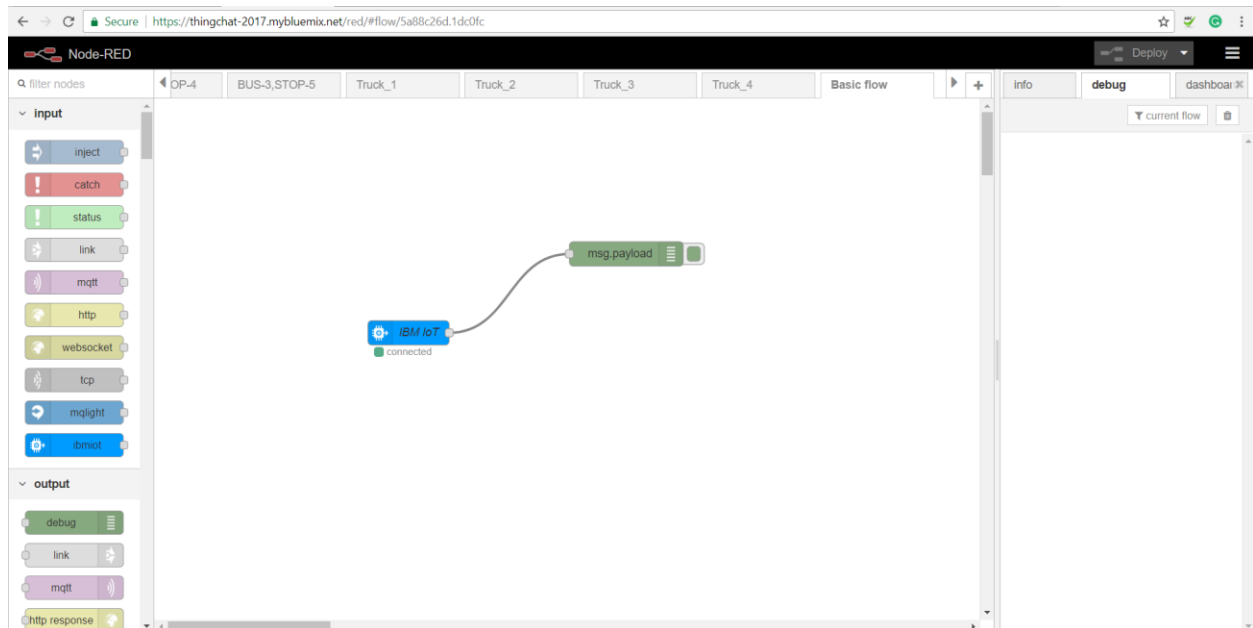


Double click on the "IBM IoT" node. Give the following for prompted fields,

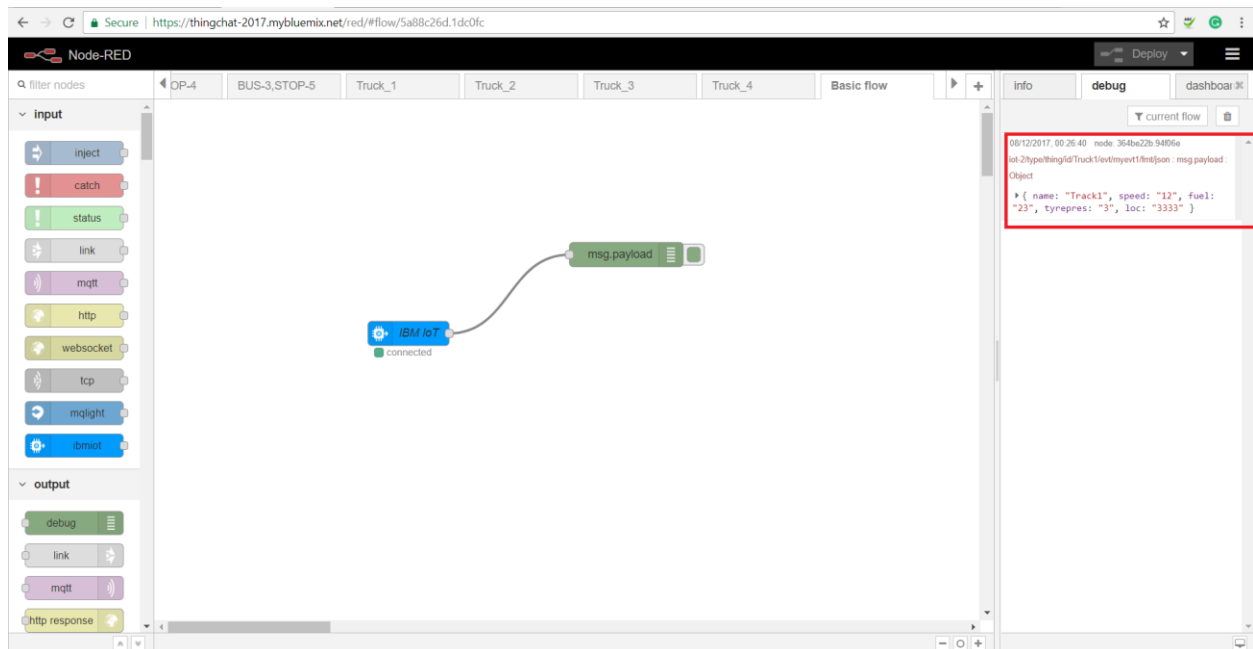
Field	Value
Authentication	Bluemix Service
Input Type	Device Event
Device Id	<Your-Device-ID(MAC ID)>
Format	JSON



Drag and drop a **"debug"** node from the list of Output nodes present in the left side menu. Give connection to both the nodes and click on **"Deploy"**.



Go to Logistic Simulator dashboard. Send the events and click **Publish Data**, then the data will be sent to Node-RED.



Step #8 | Create Dashboard using Node-RED

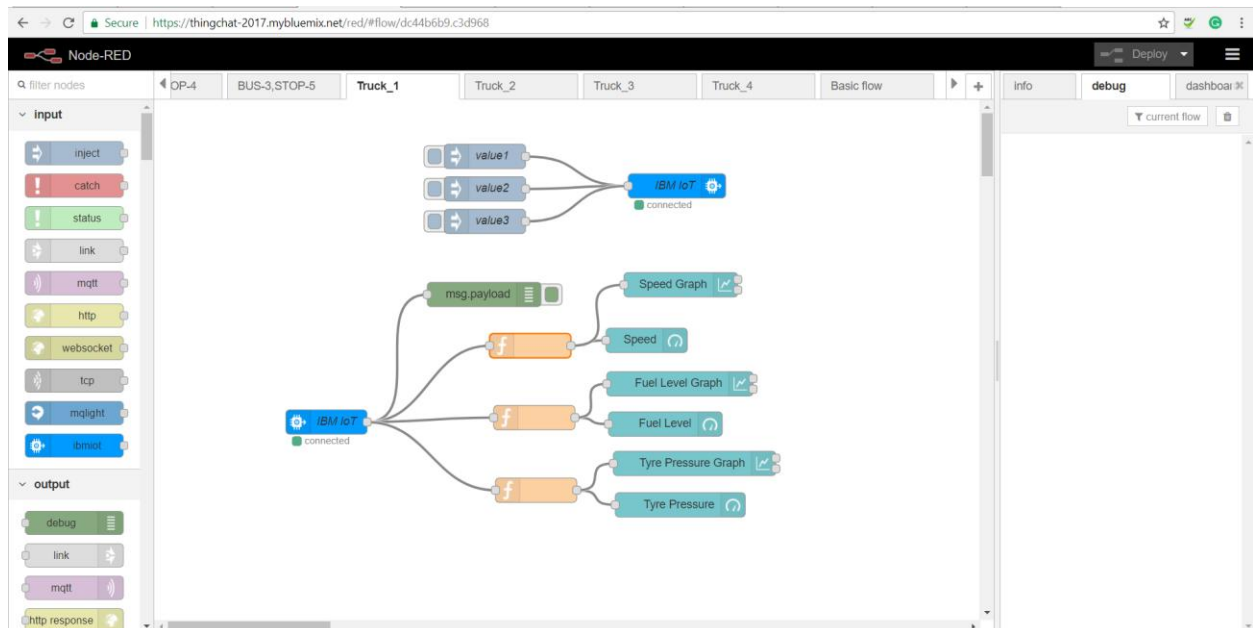
Dashboard module provides a set of nodes in Node-RED to quickly create a live data dashboard.

Install Dashboard node using, **`npm i node-red-dashboard`**

The dashboard layout should be considered as a grid. It contains all the elements which are used for creating Dashboard - offering graphs, gauges, basic text as well as sliders and inputs.

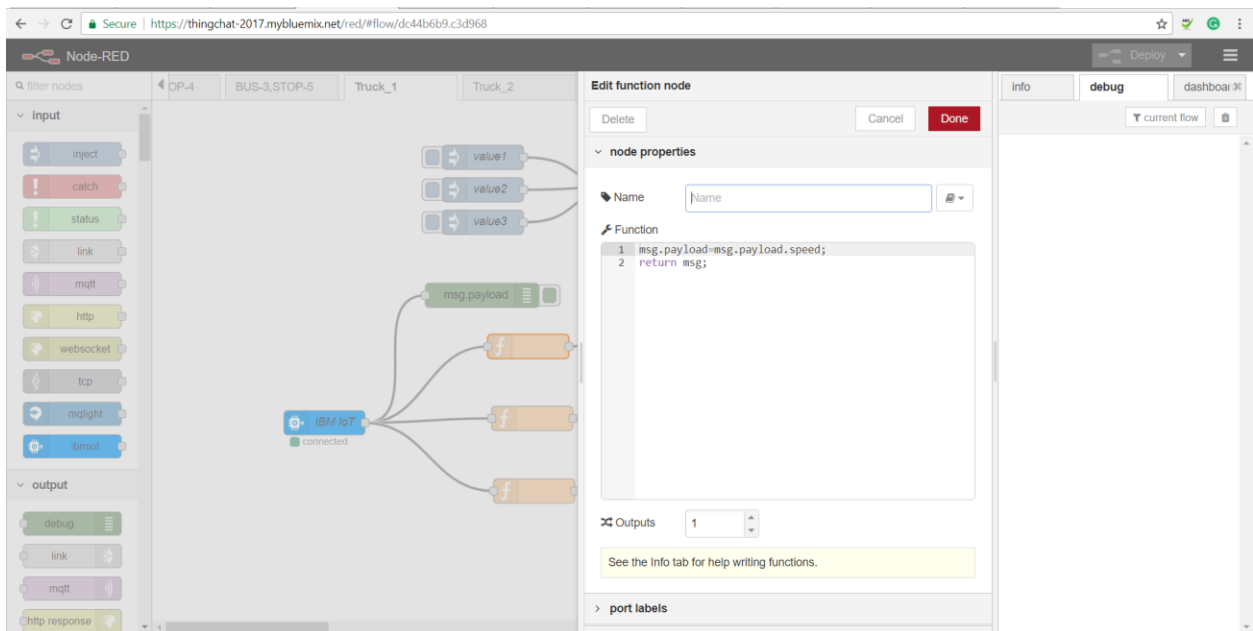
We'll create a simple dashboard element that displays the vales of the truck in the form of graph and gauges.

Drag and drop the gauges and graphs along with one function as below for 3 different parameters.

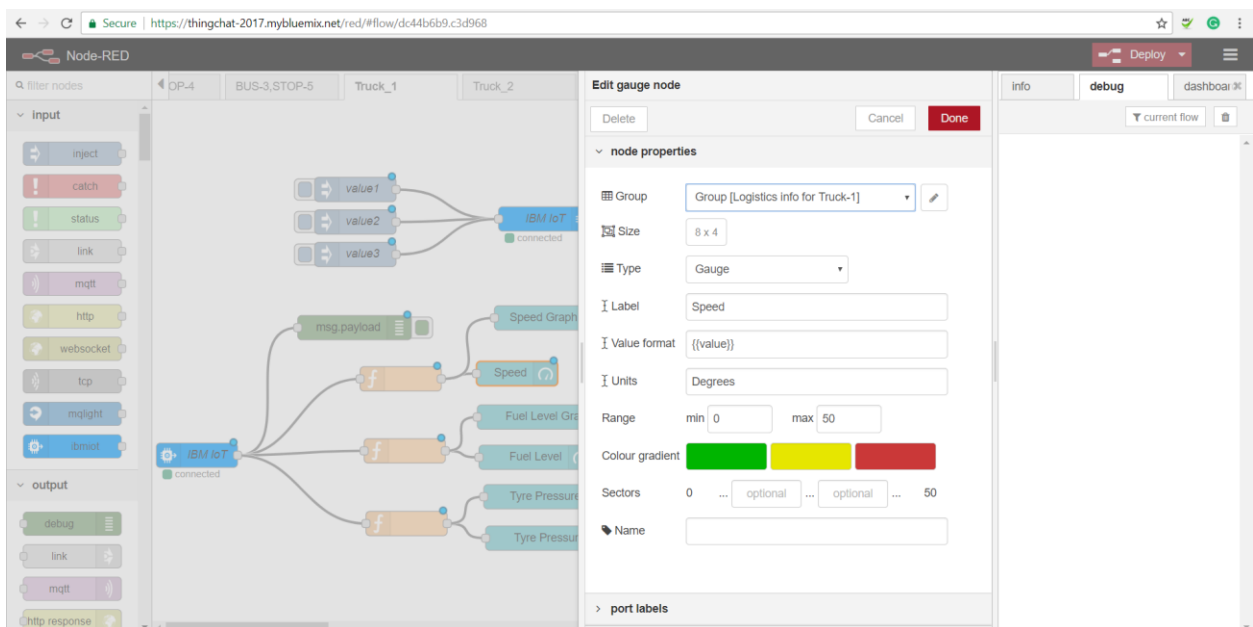


Click on the Function node and copy the below snippet,

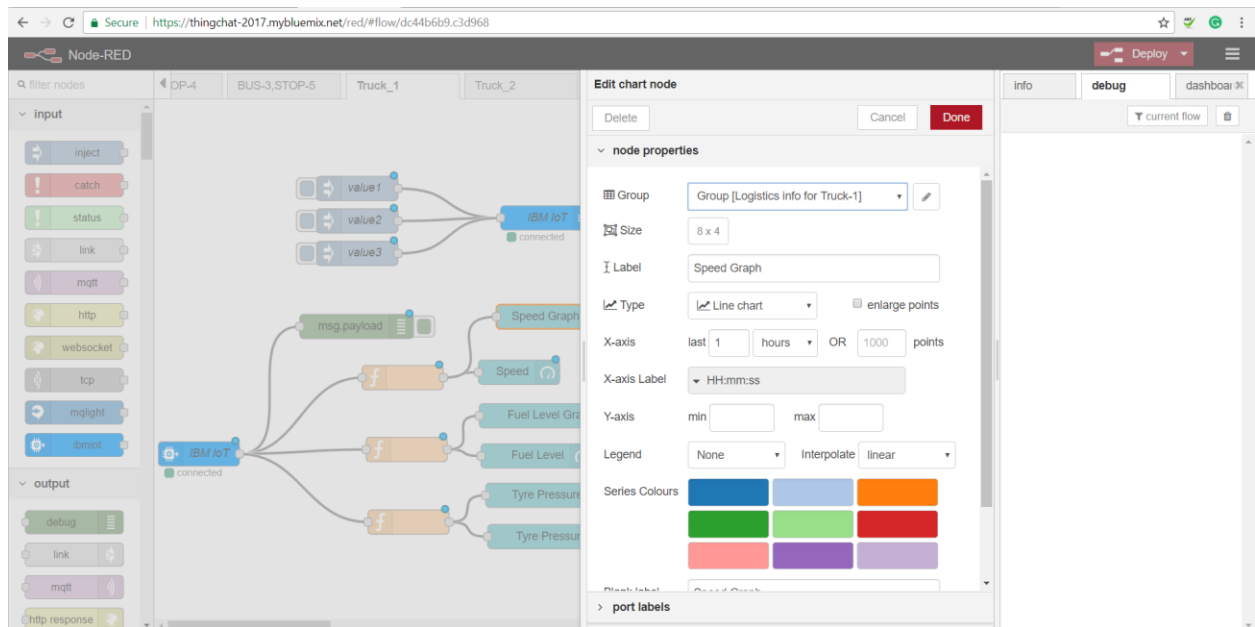
```
msg.payload=msg.payload.speed;  
return msg;
```



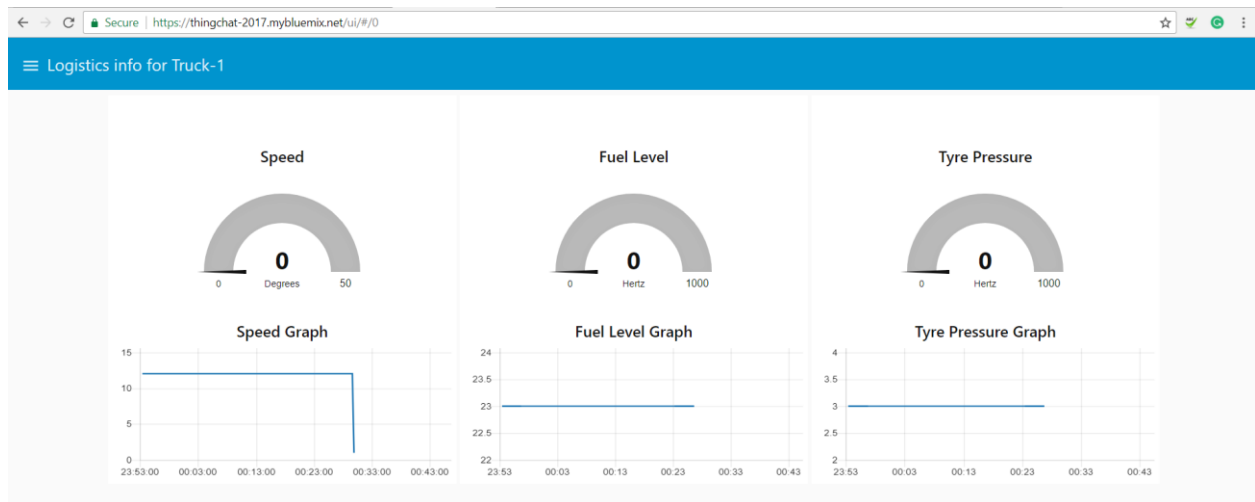
Click on Graph node and add the below details as shown



Click on Gauge node and add the below details as shown.



Open <http://< application-name>/ui>, for viewing the dashboard



Now, send the data from the Logistic Dashboard as above, you can see the change in Gauges and Graphs.

