

Niagara MQTT integration with IBM Bluemix cloud platform

- Introduction
 - Architecture
 - IBM Cloud Configuration details
- IBM Bluemix references
- Working with IBM Bluemix: example process
 - Create a Service in IBM Bluemix
 - Create an Application
 - Configure a Niagara MQTT Client

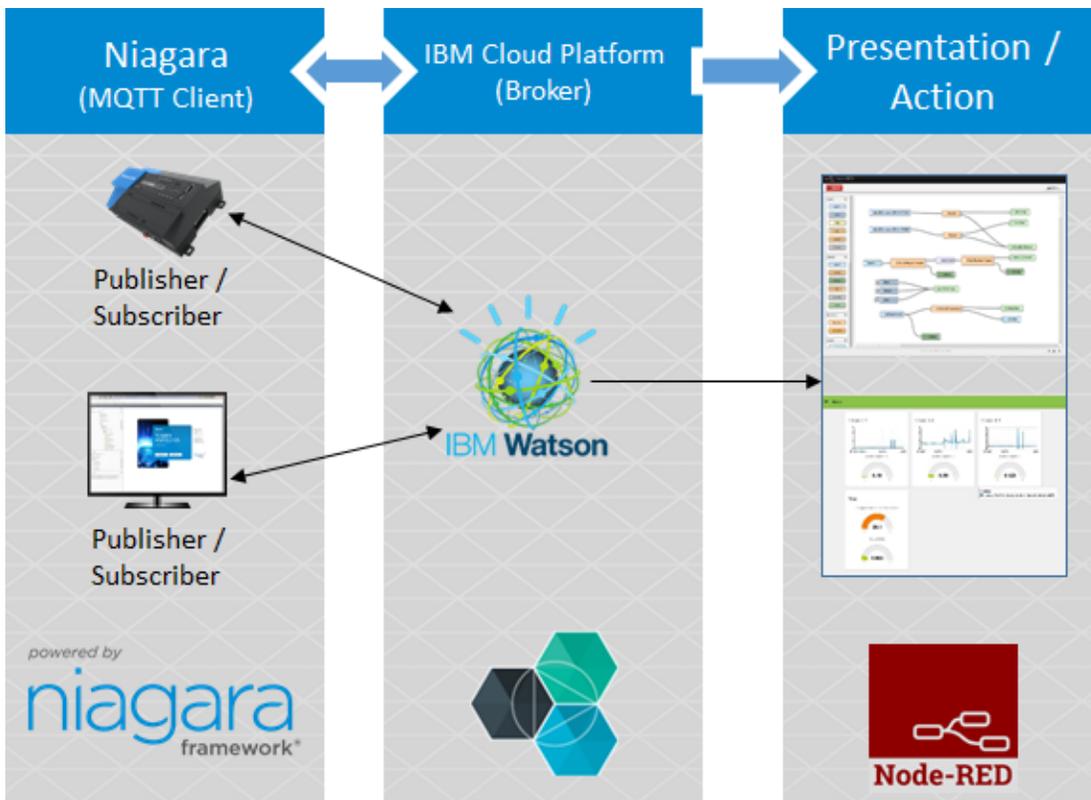
Introduction

MQ Telemetry Transport (MQTT), is a lightweight messaging protocol. MQTT is designed for constrained devices and low-bandwidth, high-latency or unreliable networks. MQTT uses publish / subscribe (push / pull) messaging transport to help small footprint Machine to Machine (M2M) and INTERnet Of Things (IOT) platforms.

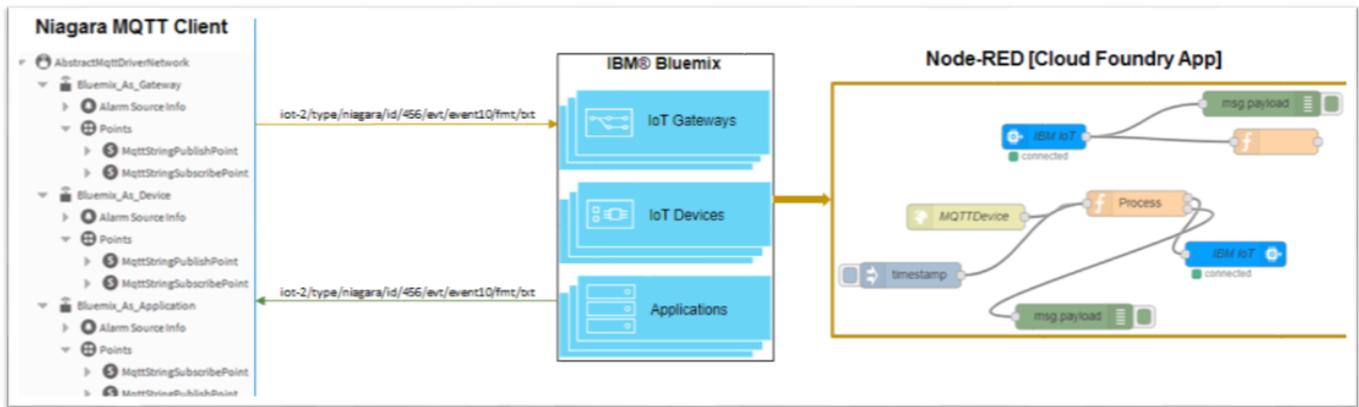
The following article demonstrates the use of the Niagara MQTT driver to publish and subscribe Niagara points to IBM's Bluemix IoT platform.

For more details on IBM's Bluemix refer to: <https://www.ibm.com/cloud-computing/bluemix/what-is-bluemix>

Architecture



The images below show the integration of IBM Bluemix cloud with the Niagara MQTT Client (AbstractMqttDriverNetwork).



IBM Cloud Configuration details

The MQTT client can be configured as three different types in IBM Cloud platform, as applications, devices and gateways. The following table shows the ID syntax and format for the different type of clients.

Client type	ID	MQTT Client ID format
Applications	a	a:orgId:appld
Devices	d	d:orgId:deviceType:deviceId
Gateways	g	g:orgId:typeld:deviceId

The following are the properties list examples to configure Bluemix applications, devices, and gateways type of clients.

Required configuration for Bluemix Application as a MQTT client

Broker IP: 3rvz05.messaging.internetofthings.ibmcloud.com (3rvz05 is a dynamically generated ORG ID from Bluemix, this has to be replaced as per your account in Bluemix or IBM cloud platform)

Client ID: a:3rvz05:cloudBlueMix (Format: a:orgId:appld)

UserName (API Key): xxxxxxxxxxxx (Auto Generated)

Password (Token): xxxxxxxxxxxx (Auto Generated)

iot-2/type/niagara/id/456/evt/event11/fmt/txt - **Publisher**

iot-2/type/niagara/id/456/evt/event10/fmt/txt - **Subscriber**

For more information on connecting and integrating your applications, refer to: [MQTT connectivity for applications](#)

Required configuration for Bluemix Device as a MQTT client

Broker IP: 3rvz05.messaging.internetofthings.ibmcloud.com (3rvz05 is a dynamically generated ORG ID from Bluemix, this has to be replaced as per your account in Bluemix or IBM cloud platform)

Client ID: d:3rvz05:Dev:Abhi123 (Format: d:orgId:deviceType:deviceId)

UserName (API Key): use-token-auth (Default User Name)

Password (Token): xxxxxxxx (Password provided by User)

iot-2/evt/12/fmt/txt - **Publisher**

iot-2/cmd/mqtt/fmt/txt - **Subscriber**

For more information on connecting and integrating your devices, refer to: [MQTT connectivity for devices](#)

Required configuration for Bluemix Gateway as a MQTT client

Broker IP: 3rvz05.messaging.internetofthings.ibmcloud.com (3rvz05 is a dynamically generated ORG ID from Bluemix, this has to be replaced as per your account in Bluemix or IBM cloud platform)

Client ID: g:3rvz05:gatewayMQTT:GMQTT123 (Format: g:orgId:typeld:deviceId)

UserName (API Key): use-token-auth (Default User Name)

Password (Token): xxxxxxxx (Password provided by User)

iot-2/type/gatewayMQTT/id/GMQTT123/evt/status/fmt/json - **Publisher**

IBM Bluemix references

Reference links	Description
Bluemix Apps & Service	This links to the IBM Bluemix Dashboard of Apps and Service. This page requires an account for login. You can sign up for a free 30 account.
Node-Red in Bluemix	This is a link to the Node-RED browser-based editor that you can use to wire together flows that can be deployed to the runtime in a single click.
Node-Red Editor (refer to Flow 3 tab)	This is a link to the Node-Red Editor with example flows that show application, device, and gateway nodes. The sample nodes are wired together and connected through process nodes to connect to an output node. The output node can send commands to a device or send an event on behalf of a device. Select nodes in Flow 3 tab to read more information about each node.
Bluemix Application and Services	This link will take you to the IBM Bluemix application services page for your account, region, organization and space.
Watson IoT Platform All Dashboards	This links to a page that provides access to all dashboards.
Bluemix Service Launch	This link is to the device dashboard.
Watson IoT Platform Apps Board	This link is to the platform applications dashboard.
Docs and MQTT Helper links	<ul style="list-style-type: none">• MQTT connectivity for applications• MQTT messaging• MQTT Helper

Working with IBM Bluemix: example process

The following is a step-by-step example process that includes three tasks:

- [Create a Service](#)
- [Create an Application](#)
- [Configuring a Niagara MQTT Client](#)

Create a Service in IBM Bluemix

- Go to the IBM Bluemix homepage.
- Click on the **Create Service** button to create a service.
- Name the service, as desired for example **“hacksample5_2-iotf-service”**.

hacksample5_2 hacksample5-2.mybluemix.net 512 1 0 Stopped

All Services (4) Create Service

Services 699/2000 Used

NAME	SERVICE OFFERING	PLAN	ACTIONS
Blockchain-hc	Blockchain	Starter Developer plan (beta)	⋮
hack5-1	Push Notifications	Basic	⋮
hacksample5_2-cloudantNoSQLDB	Cloudant NoSQL DB	Shared	⋮
hacksample5_2-iotf-service	Internet of Things Platform	Lite	⋮

- Click on the added service “**hacksample5_2-iotf-service**” and launch it. It will navigate to the **Watson IoT Platform**.

Internet of Things / hacksample5_2-iotf-service

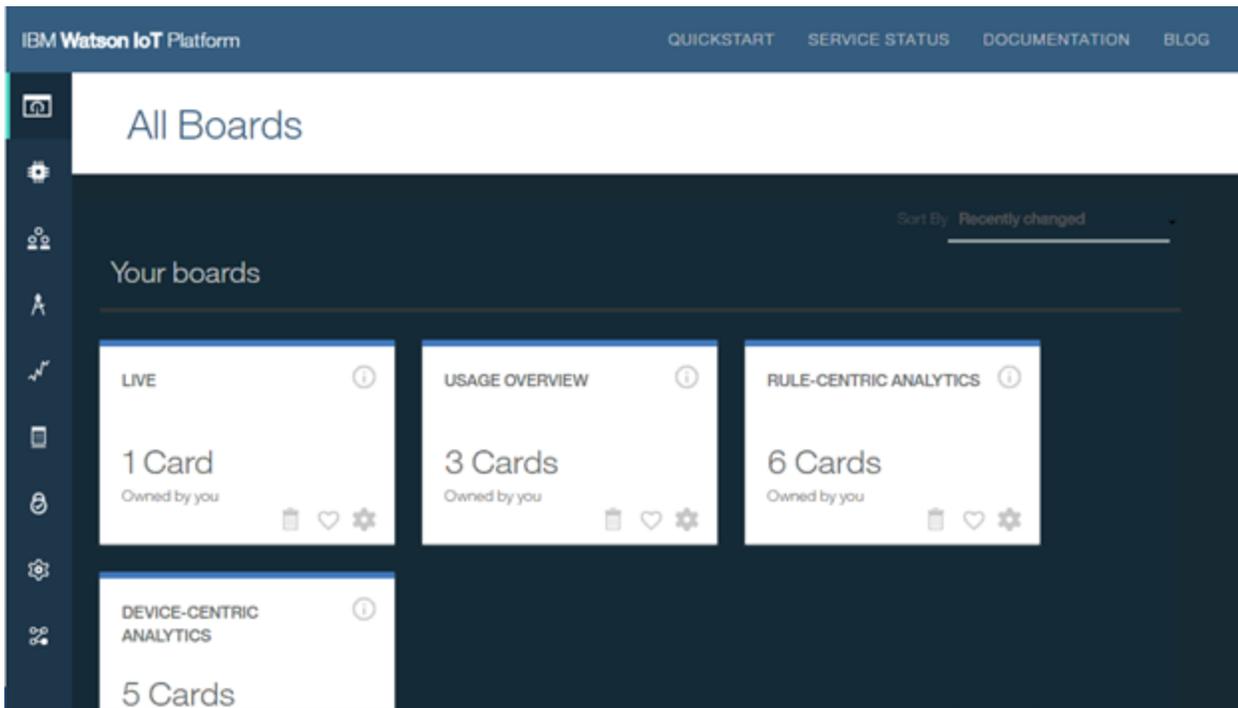
hacksample5_2-iotf-service Details

Welcome to Watson IoT Platform

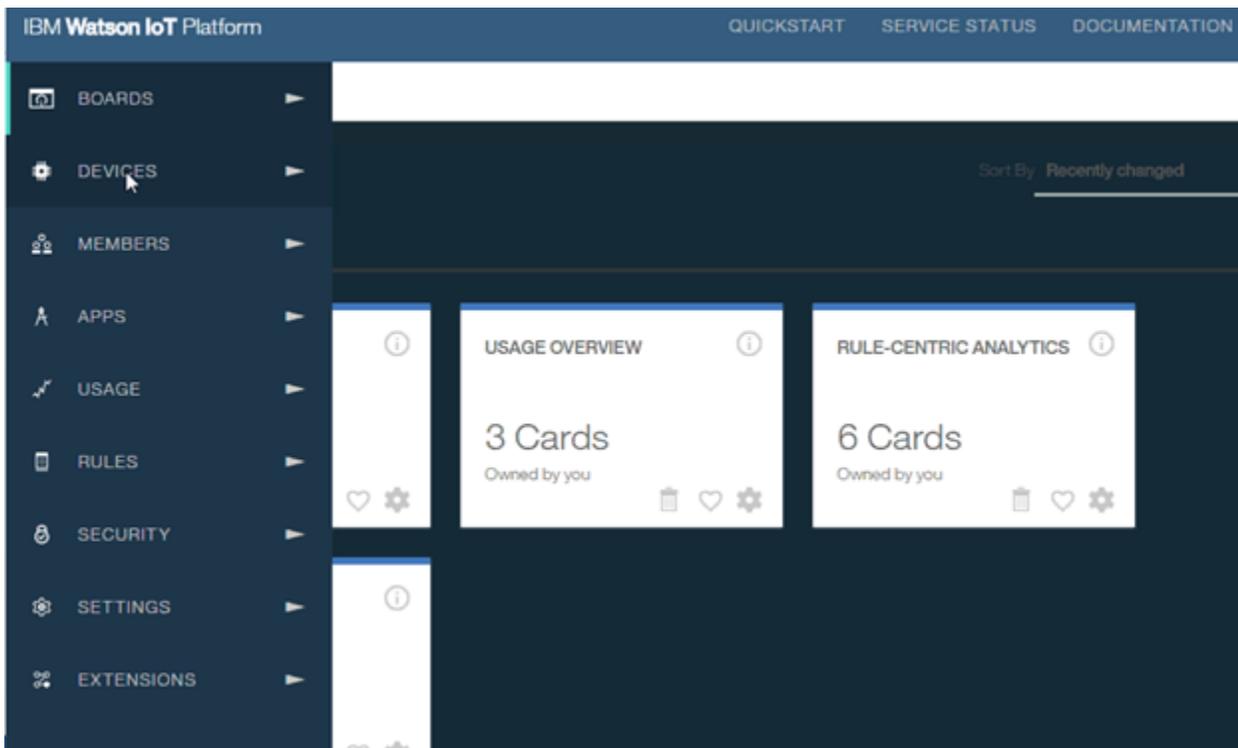
Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.

Launch Docs

- Navigate to the toolbar at the left-side of **Watson IoT Platform** page.
- Click on the **Boards** icon to see 'All Boards' page.
- Create a new board as required.



- Select the **Devices** option on the toolbar to open the 'Devices' page.



- Click on **+ Add Device** button to add device.

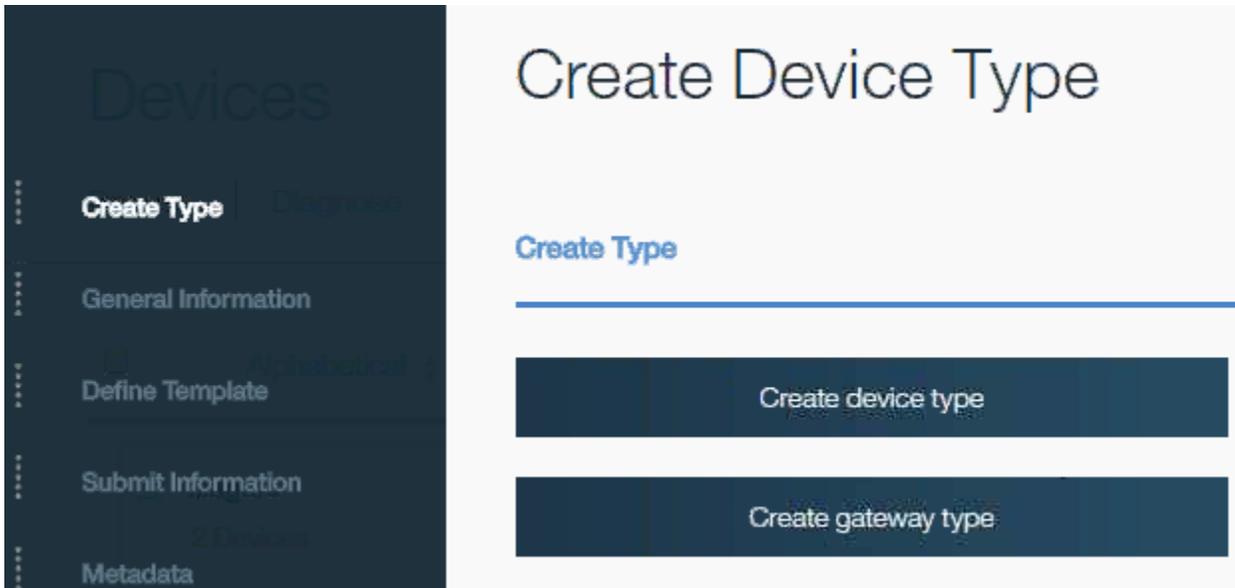
Devices

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

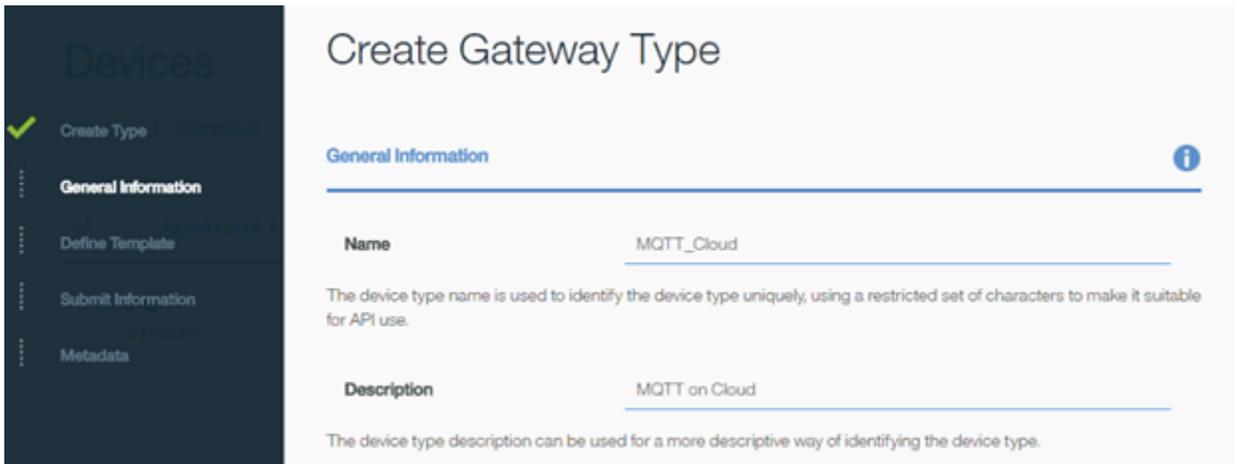
Refresh

+ Add Device

- Click on **Create device type** button to create device or **Create gateway type** button to create Gateway, as desired.



- If you click on the **Create gateway type** button to create Gateway, 'Create Gateway Type' page opens.
Note: You can use the same procedure for the **Create device type**.
- In the 'Create Gateway Type' page, do as follows:
- In the **Name** field, name the device, as desired.
- In the **Description** field, add description of the device.



- You can select the template from the 'Define Template' option, if it is required.

Network IoT

Devices

- ✓ Create Type
- ✓ General Information
- Define Template**
- Submit Information
- Metadata

Create Gateway Type

Define Template

Use the options below to select attributes for the device type. All of these attributes are optional. They will be used as a template for new devices that are assigned this device type. Attributes you do not define may still be edited individually on devices that are assigned this device type.

<input type="checkbox"/> Serial Number ...	<input type="checkbox"/> Description ...
<input type="checkbox"/> Manufacturer ...	<input type="checkbox"/> Firmware Version ...
<input type="checkbox"/> Model ...	<input type="checkbox"/> Hardware Version ...
<input type="checkbox"/> Class ...	<input type="checkbox"/> Descriptive Location ...

Network IoT

Devices

- ✓ Create Type
- ✓ General Information
- ✓ Define Template
- Submit Information**
- Metadata

Create Gateway Type

Submit Information

You did not select any fields in the Define Template step. It is not mandatory to do so, but if you wish to define attributes that will act as a template for new devices that are assigned this device type, you may go back to that step and revise your decision - the fields you select will then appear here.

- Provide the Metadata information, if required. This field is optional.

Network IoT

Devices

- ✓ Create Type
- ✓ General Information
- ✓ Define Template
- ✓ Submit Information
- Metadata**

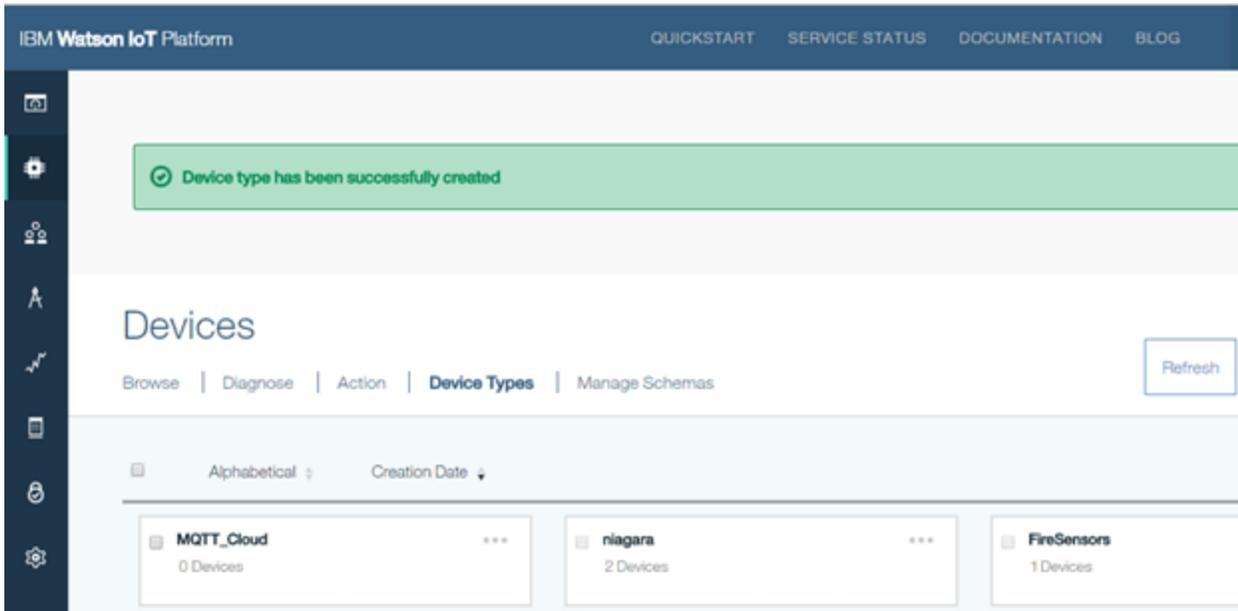
Create Gateway Type

Metadata (optional)

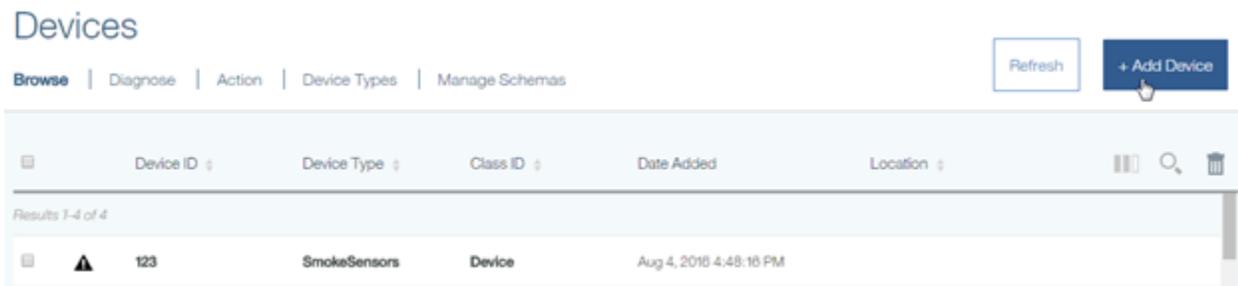
Metadata must be added as JSON; plain text cannot be used.

1 |

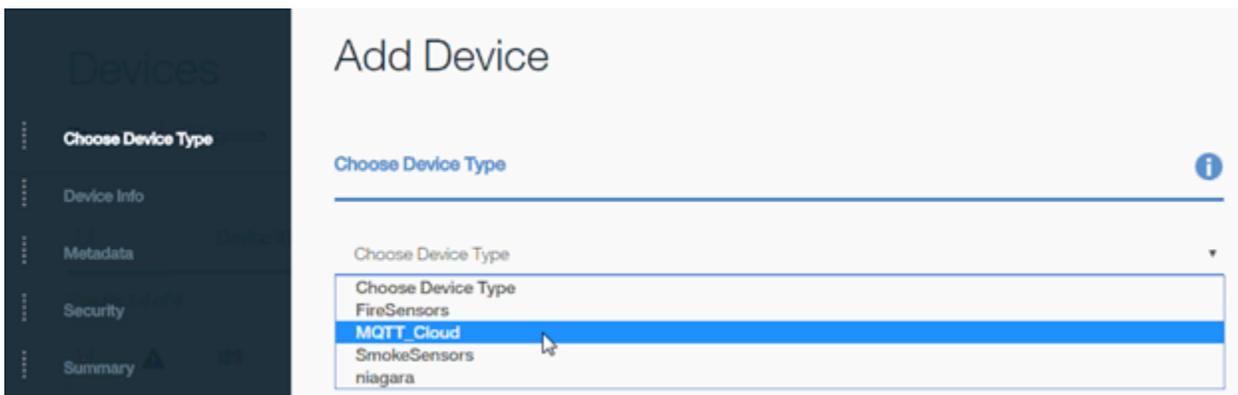
- Click on 'Add' button to add Gateway.



- Go to the 'Browse' tab of the **Devices** page.
- Click on **+Add Device** button to add device, the **Add Device** page opens.



- Go to the 'Choose Device Type' drop-down list and select the added gateway device type.



- Enter the 'Device ID' in the Device Info section.

The screenshot shows the 'Add Device' form with the 'Device Info' section active. The left sidebar has 'Choose Device Type' checked with a green checkmark. The 'Device Info' section is highlighted in the sidebar. The main content area shows the 'Device ID' field with the value 'MQTT_Cloud'. Below the field is a '+ Additional fields' link. A blue horizontal line separates the 'Device Info' section from the 'Metadata' section below.

Devices

- ✓ Choose Device Type
- Device Info**
- Metadata
- Security
- Summary

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 MQTT_Cloud

+ Additional fields

- Provide the Metadata information, if required. This field is optional.

The screenshot shows the 'Add Device' form with the 'Metadata' section active. The left sidebar has 'Choose Device Type' and 'Device Info' checked with green checkmarks. The 'Metadata' section is highlighted in the sidebar. The main content area shows the 'Metadata (optional)' section with an information icon. Below the section is a text input field with a blue border and a light blue background. A blue horizontal line separates the 'Metadata' section from the 'Security' section below.

Devices

- ✓ Choose Device Type
- ✓ Device Info
- Metadata**
- Security
- Summary

Add Device

Metadata (optional) i

Metadata must be added as JSON; plain text cannot be used.

1 |

- Provide a token to the device, if required. This field is optional.
- If you do not provide a token, it generates token automatically.

Add Device

Security

You have two options:

Auto-generated authentication token

Allow the service to generate an authentication token for you. The token will be 18 characters long and will contain a mix of alphanumeric characters and symbols. The token will be returned to you at the end of the registration process.

Self-provided authentication token

Provide your own authentication token for this device. The token must be between 8 and 36 characters long, and should contain a mix of lower and upper case letters, numbers, and symbols (hyphen, underscore, exclamation-point, ampersand, at sign, question mark, period, right and left parentheses are permitted). The token should be free of repetition, dictionary words, user names, and other predefined sequences.

Provide a token (optional)

Authentication tokens are encrypted before we store them.

We are not able to recover lost authentication tokens. Ensure you make a note of the authentication token after clicking Add.

Manufacturer -

Model -

Class -

Description -

Firmware Version -

Hardware Version -

Descriptive Location -

Authentication Token

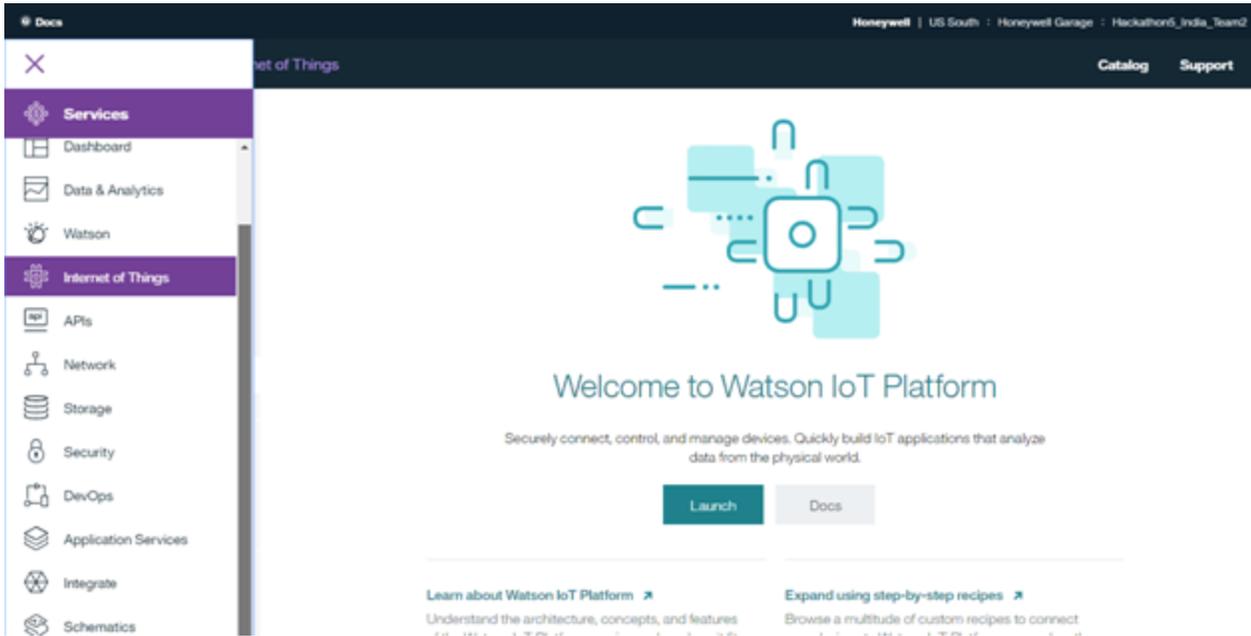
Metadata |

- The Gateway is created with ID as shown below:

- Create the device using the same procedure.
- Click on the **Launch** button to launch the 'Watson IoT Platform' to view the devices.

Create an Application

- Go to the toolbar and select **Services - Internet of Things**.



- This opens the below page that shows the list of added device and gateway under the device dashboard. For example, 'Abhi123' as Device & 'GMQTT123'.

IBM Watson IoT Platform

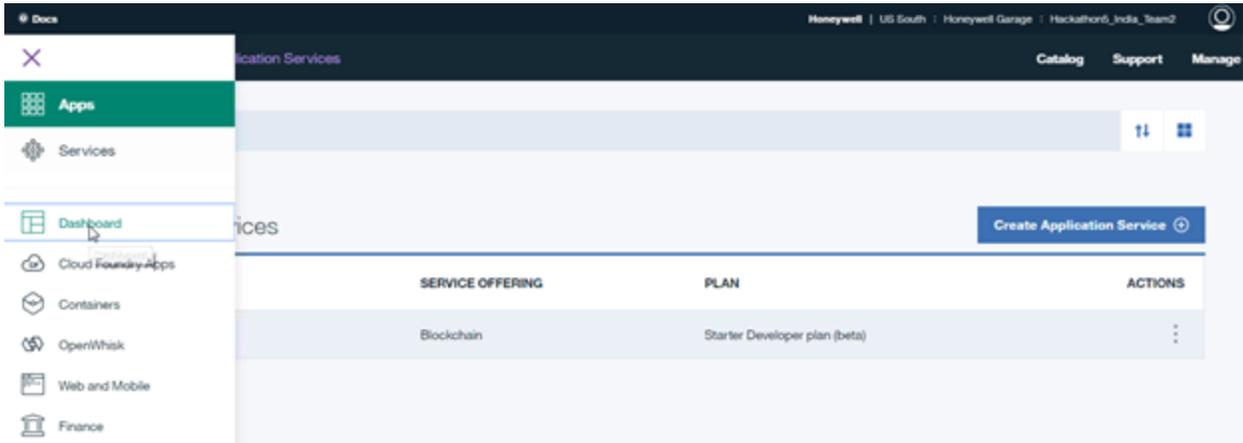
QUICKSTART SERVICE STATUS DOCUMENTATION

Devices

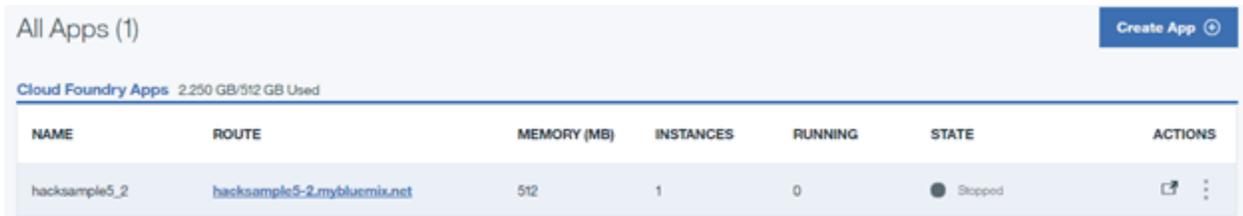
Browse | Diagnose | Action | Device Types | Manage Schemas

	Device ID	Device Type	Class ID	Date Added	Location
Results 1-4 of 4					
	123	SmokeSensors	Device	Aug 4, 2018 4:48:16 PM	
	Abhi123	Dev	Device	Jul 4, 2017 4:21:57 PM	
	GMQTT123	gatewayMQTT	Gateway	Jul 5, 2017 3:31:37 PM	
	b827ebc67aa6	FireSensors	Device	Aug 4, 2018 5:41:38 PM	

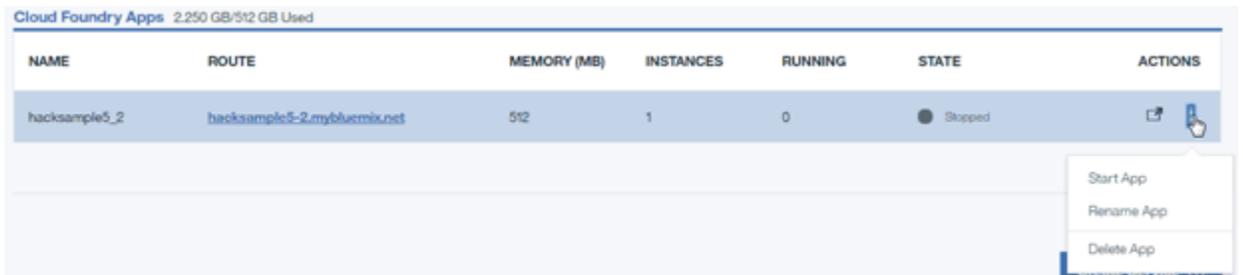
- Navigate to **Apps - Dashboard** to create an application by clicking **Create App** button.



- Integrate with Node-RED under Cloud foundry.



- Click on the Actions icon and select the Start App option to start the application.



- Click on added application.



- Select the Overview option and click on the 'Visit App URL'. This opens the 'Node-RED in Bluemix' page.

The screenshot shows the IBM Bluemix Cloud Foundry Apps interface. The top navigation bar includes 'Catalog', 'Support', and 'Manage'. The left sidebar lists navigation options: 'Getting started', 'Overview', 'Runtime', 'Connections', 'Logs', 'Monitoring', and 'API Management'. The main content area displays the application 'hacksample5_2' in a 'Running' state. Below this, a 'Runtime' section provides four key metrics:

Metric	Value
BUILDPACK (SDK for Node.js™)	.js
INSTANCES (All instances are running, Health is 100%)	1
MB MEMORY PER INSTANCE	512
TOTAL MB ALLOCATION (509.25 GB still available)	512

- Navigate to the Node-RED application by clicking the **Go to your Node-RED flow editor**.

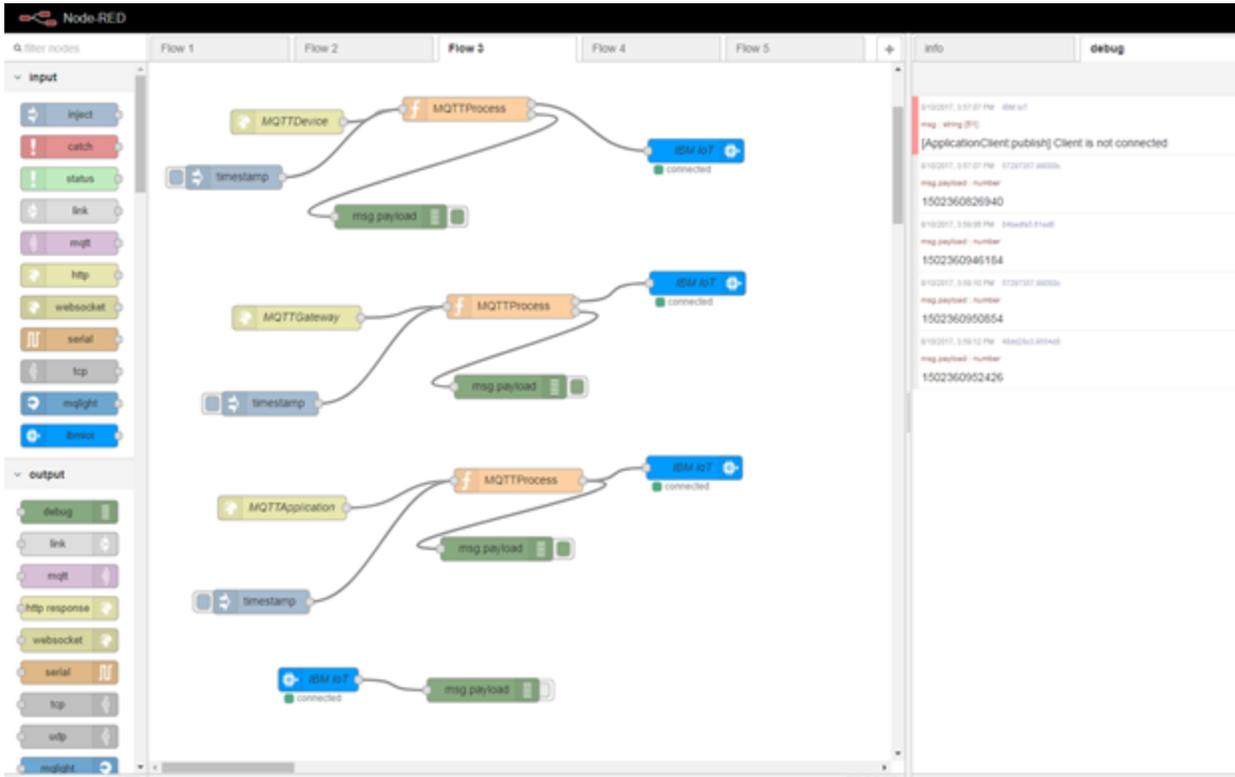
The screenshot shows the landing page for 'Node-RED in Bluemix for IBM Watson IoT Platform'. The page features the following text:

Node-RED in Bluemix
A visual tool for wiring the Internet of Things
IBM Watson IoT Platform

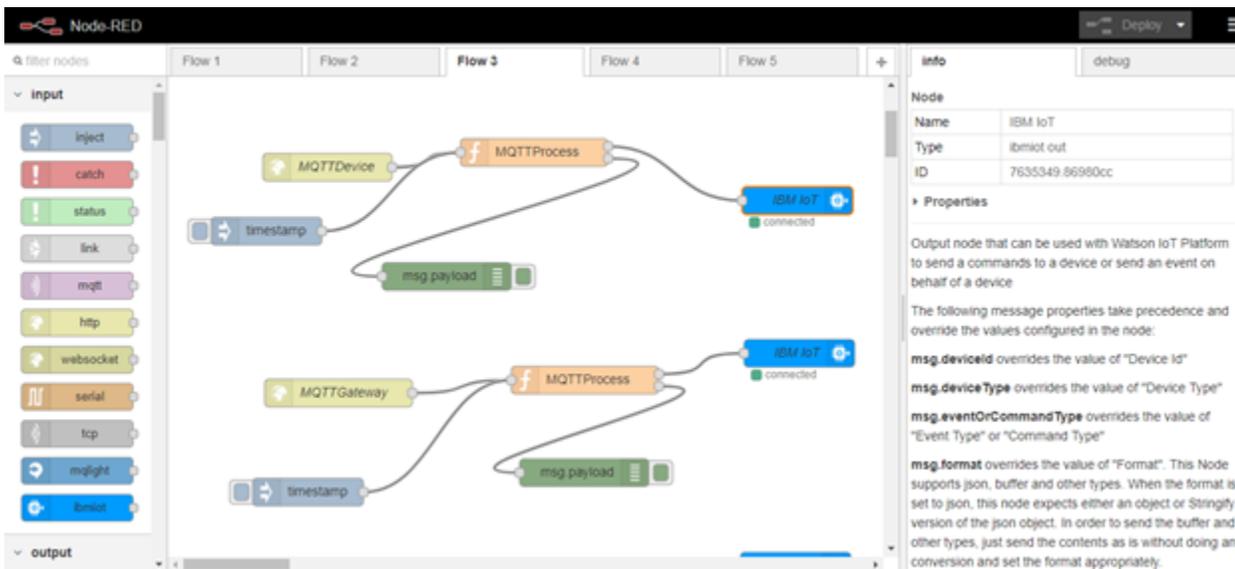
Node-RED provides a browser-based editor that makes it easy to wire together flows that can be deployed to the runtime in a single click.

[Go to your Node-RED flow editor](#)

- Create a logic using the Node-RED flow editor with the help of available components.



- Click on 'Info' tab to get the detail information about the selected component .



- Click on the added component to set the parameters as shown in the images below:

Node-RED

filter nodes

Flow 1 Flow 2 Flow 3

input

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- serial
- tcp
- mqttlight
- ibmiot

output

- debug

MQTTDevice

timestamp

msg payload

MQTTGateway

MQTTProcess

MQTTApplication

ibmiot out node

Cancel Done

Authentication: Bluemix Service

Output Type: Device Command

Device Type: Dev

Device Id: Abhi123

Command Type: mqtt

Format: txt

Data: msg.payload.status

QoS: 0

Name: IBM IoT

Note: If there is a property in the message that corresponds to any of the values entered above, then the property in the message takes precedence. See the info tab for more details.
Example JSON device event: {"d":{"myName":"Arduino Uno", "temperature":969}}

Node-RED

filter nodes

Flow 1 Flow 2 Flow 3

input

- inject
- catch
- status
- link
- mqtt

MQTTDevice

timestamp

msg payload

MQTTProcess

http in node

Cancel Done

Method: GET

URL: /test

Name: MQTTDevice

Node-RED

filter nodes

Flow 1 Flow 2 Flow 3

input

- inject
- catch
- status
- link
- mqtt

MQTTDevice

timestamp

msg payload

MQTTProcess

function node

Cancel Done

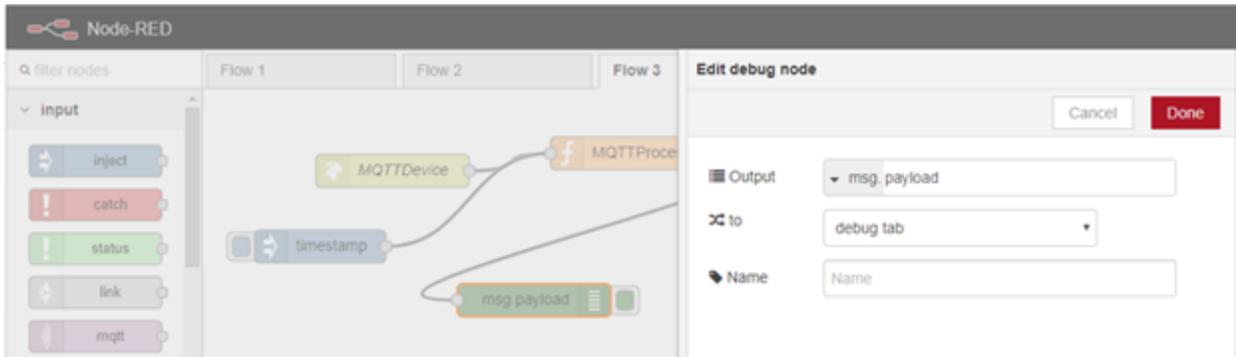
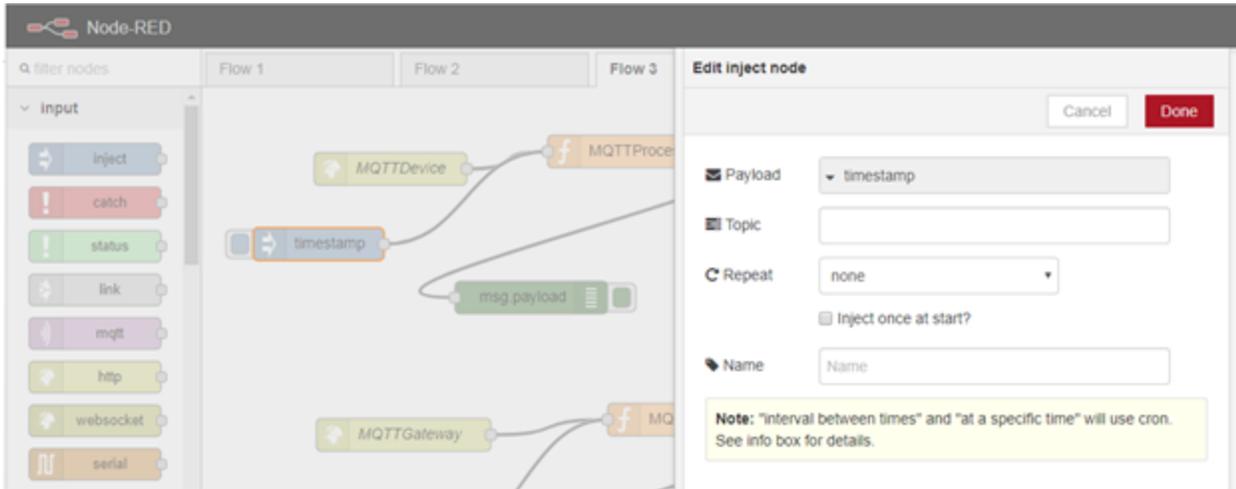
Name: MQTTProcess

Function

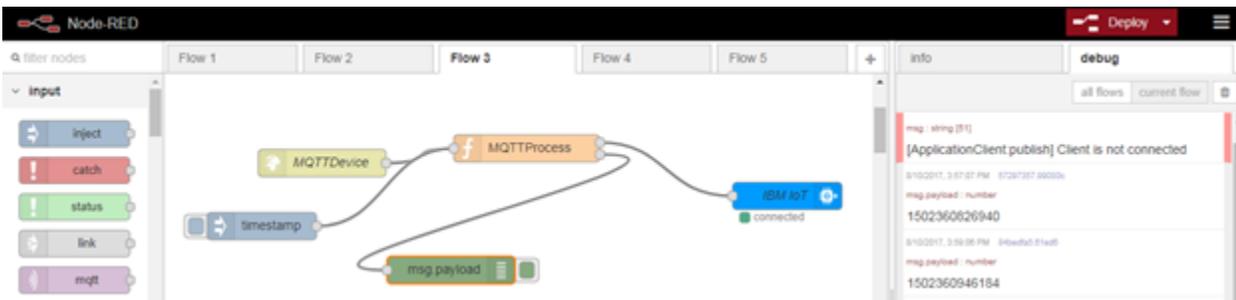
```

1 //msg.payload = "MQTT as a Device"
2 return [msg,msg];

```



- Click on **Deploy** button to deploy the changes.



Configure a Niagara MQTT Client

Please note that the following is just an example on configuring Niagara Abstract MQTT driver as a MQTT client with IBM Bluemix cloud platform, for more detail on Niagara Abstract MQTT driver please refer to the driver's user manual.

- Add the `AabstractMQTTDriverNetwork` under the Drivers node from the `abstractMqttDriver` palette.
- Add the three MQTT client devices under the `AabstractMQTTDriverNetwork` from the `abstractMqttDriver` palette. Name these devices, as desired.

For example, here these are renamed as Bluemix_As_Gateway, Bluemix_As_Device, Bluemix_As_Application as shown below:

The screenshot shows a network management interface. On the left is a navigation tree under 'My Network'. The tree is expanded to show 'Station (testCloud2)' > 'Config' > 'Drivers' > 'AbstractMqttDriverNetwork'. Under 'AbstractMqttDriverNetwork', three items are listed: 'Bluemix_As_Gateway', 'Bluemix_As_Device', and 'Bluemix_As_Application'. On the right is a 'Database' table with the following data:

Name	Type	Exts	Status	Health
Bluemix_As_Gateway	Abstract Mqtt Driver Device	+	[ok]	Ok [10-Aug-17 4:53 PM IST]
Bluemix_As_Device	Abstract Mqtt Driver Device	+	[ok]	Ok [10-Aug-17 4:53 PM IST]
Bluemix_As_Application	Abstract Mqtt Driver Device	+	[ok]	Ok [10-Aug-17 4:53 PM IST]

- Configure the “Bluemix_As_Gateway” as shown in the image below:

My Host: IE3BLT3VB2N62.global.ds.honeywell.com (testCloud2) : Station (testCloud2) : Config : Drivers : AbstractMqttDriverNetwork : Bluemix_As_Gateway

Nav

My Network

- My Host: IE3BLT3VB2N62.global.ds.honeywell.com (testCloud2)
 - My File System
 - My Modules
 - Platform
 - Station (testCloud2)
 - Alarm
 - Config
 - Services
 - Drivers
 - NiagaraNetwork
 - AbstractMqttDriverNetwork
 - Bluemix_As_Gateway**
 - Bluemix_As_Device
 - Bluemix_As_Application
 - Apps
 - Files
 - Hierarchy
 - History

Property Sheet

Bluemix_As_Gateway (Abstract Mqtt Driver Device)

Status	{ok}
Enabled	<input checked="" type="checkbox"/> true
Fault Cause	
Health	Ok [10-Aug-17 4:53 PM IST]
Alarm Source Info	Alarm Source Info
Poll Frequency	Normal
Points	Mqtt Client Driver Point Device Ext
Clean Session	<input type="checkbox"/> false
Enable L W T	<input type="checkbox"/> false
Topic For L W T	
Qos For L W T	Fire And Forget (0)
Retained For L W T	<input checked="" type="checkbox"/> true
Message For L W T	
Keep Alive	60 [0 - max]
Connection Timeout	300 [0 - max]
Broker Ip Address	3rvz05.messaging.internetofthings.ibmcloud.com
Broker Port	8883 [0 - max]
Client I D	g:3rvz05:gatewayMQTT:GMQTT123
Status Message	Ping Success: Connected to Broker.
Connection Type	User Login Over SSL
Ssl Version	TLSv1.0+
Username And Password	Username: use-token-auth Password:
Send Enum As	<input checked="" type="checkbox"/> TAG

- Configure the “Bluemix_As_Device” as shown in the image below:

My Host: IE3BLT3VB2N62.global.ds.honeywell.com (testCloud2) : Station (testCloud2) : Config : Drivers : AbstractMqttDriverNetwork : Bluemix_As_Device

Nav

My Network

- My Host: IE3BLT3VB2N62.global.ds.honeywell.com (testCloud2)
 - My File System
 - My Modules
 - Platform
 - Station (testCloud2)
 - Alarm
 - Config
 - Services
 - Drivers
 - NiagaraNetwork
 - AbstractMqttDriverNetwork
 - Bluemix_As_Gateway
 - Bluemix_As_Device**
 - Bluemix_As_Application
 - Apps
 - Files
 - Hierarchy
 - History

Property Sheet

Bluemix_As_Device (Abstract Mqtt Driver Device)

Status	(ok)
Enabled	<input checked="" type="checkbox"/> true
Fault Cause	
Health	Ok [10-Aug-17 4:53 PM IST]
Alarm Source Info	Alarm Source Info
Poll Frequency	Normal
Points	Mqtt Client Driver Point Device Ext
Clean Session	<input type="checkbox"/> false
Enable L W T	<input type="checkbox"/> false
Topic For L W T	
Qos For L W T	Fire And Forget (0)
Retained For L W T	<input checked="" type="checkbox"/> true
Message For L W T	
Keep Alive	60 [0-max]
Connection Timeout	300 [0-max]
Broker Ip Address	3rvz05.messaging.internetofthings.ibmclor
Broker Port	8883 [0-max]
Client I D	d:3rvz05:Dev:Abh1123
Status Message	Ping Success: Connected to Broker.
Connection Type	User Login Over SSL
Ssl Version	TLSv1.0+
Username And Password	Username: use-token-auth Password: ●●●●●●
Send Enum As	<input checked="" type="checkbox"/> TAG

- Configure the “Bluemix_As_Application” as shown in the image below:

My Host : IE3BLT3VB2N62-global.ds.honeywell.com (testCloud2) : Station (testCloud2) : Config : Drivers : AbstractMqttDriverNetwork : Bluemix_As_Application

Nav

My Network

- My Host : IE3BLT3VB2N62-global.ds.honeywell.com (testCloud2)
 - My File System
 - My Modules
 - Platform
 - Station (testCloud2)
 - Alarm
 - Config
 - Services
 - Drivers
 - NiagaraNetwork
 - AbstractMqttDriverNetwork
 - Bluemix_As_Gateway
 - Bluemix_As_Device
 - Bluemix_As_Application**
 - Apps
 - Files
 - Hierarchy
 - History

Property Sheet

Bluemix_As_Application (Abstract Mqtt Driver Device)

Status	[ok]
Enabled	<input checked="" type="checkbox"/> true
Fault Cause	
Health	Ok [10-Aug-17 4:58 PM IST]
Alarm Source Info	Alarm Source Info
Poll Frequency	Normal
Points	Mqtt Client Driver Point Device Ext
Clean Session	<input type="checkbox"/> false
Enable L W T	<input type="checkbox"/> false
Topic For L W T	
Qos For L W T	Fire And Forget (0)
Retained For L W T	<input checked="" type="checkbox"/> true
Message For L W T	
Keep Alive	60 [0-max]
Connection Timeout	300 [0-max]
Broker Ip Address	3rvz05.messaging.internetofthings.ibmclou
Broker Port	8883 [0-max]
Client I D	a:3rvz05:cloudBlueMix
Status Message	Ping Success: Connected to Broker.
Connection Type	UserLogin Over SSL
Ssl Version	TLSv1.0+
Username And Password	Username: a-3rvz05-rbifmvgc8a Password: ●●●●●●
Send Enum As	<input checked="" type="checkbox"/> TAG

- Publish the topic from the Niagara MQTT Client to the Bluemix Broker.

