Lab 4: IBM Watson IoT Platform

For Avnet BCM4343W IoT Starter Kit

This application demonstrates the Avnet BCM4343W IoT board connected via IBM Watson IoT to additional Bluemix cloud services. Zentri's example Bluemix application (after minor edits) is built and programmed to the board using ZentriOS SDK.
This then communicates via WiFi with an MQTT broker implemented in the cloud by IBM Watson IoT, which also hosts a "QuickStart" webpage for real-time charting of the Light Sensor and RSSI (WiFi signal strength) measurements from the board.

The periodic measurements (sent by the board) received via the Watson IoT QuickStart interface, are then also evaluated and routed through a Node-RED defined "Flow" to generate Bluemix based email notifications, a custom dashboard visualization and a database that is populated with a history of measurements over time.

Requirements

- Avnet BCM4343W IoT Starter Kit
- ZentriOS SDK, (version 3.2.0.2 or later)
- A Serial console application (such as TeraTerm or Putty)
- IBM Bluemix Account

Lab Description

This Lab procedure is partitioned into the following sections:

A. Set up your Zentri Application (ZAP)
B. Verify! - Using IBM QuickStart charting webpage
C. Create your Bluemix IoT application
D. Wire your Bluemix functionality using Node-RED Visual Editor
E. Verify! - Using Node-Red Debug Monitor
F. Register your device in Bluemix Services
G. Create a Custom Dashboard
H. Create Schema
I. Create Cards for the Dashboard
J. Verify! - Using custom Dashboard Display
K. Create a Device Schema for Email Alerts
L. Create an Email Alert Rule
M. Verify! - Using Email Notification Alerts
N. Configure NodeRED to store data in Cloudant DB
O. Verify! - Using Cloudant DB
P. Further Database storage using DashDB

We start by making edits to the C source code to support the onboard light sensor. Because Lab 4 uses different code, the ZAP will need to be compiled and reprogrammed onto the Avnet board. First time execution requires the network credentials to be entered (from the command-line, in serial console) for local WiFi access point, after which the ZAP reboots and connects to IBM Watson IoT's MQTT broker, which also provides visual verification of the received data on IBM's Quickstart Charting webpage.

The user then defines custom rules and "wiring" from the IoT device to other IBM Bluemix services using Node RED, a visual editor. Node-RED's built-in debug monitor is used here for further verification.

A custom dashboard is implemented using Bluemix's concept of 'boards' and 'cards'. First, a 'board' (dashboard) must be created to host the cards (ie. widgets: line graphs, donut charts, gauges etc.), which then provide multiple options for visualizing the data.

Email alerts are set-up by creating a device schema to extract attributes from incoming measurement data. An IF-THEN rule defines a light sensor threshold and destination email address. Shining a light on the light sensor will trigger an email alert to be generated.

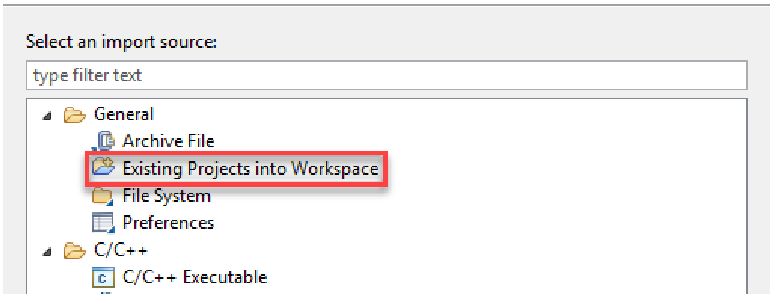
The native Bluemix application comes with a database service called Cloudant. After proper configuration, a Cloudant node is inserted into the Node RED code to direct data to be collected by the database. Cloudant provides various services for data analysis.

Procedure

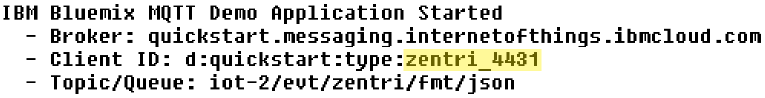
A. Set up the Zentri Application (ZAP)

1) Download the provided Lab4Demo.zip project source files and extract the Lab4Demo folder to the Zentri workspace (...\Zentri\workspace).

2) In the Zentri interface, right click in the Zentri Project Explorer, then click "Import..." to import Lab 4 the same way as Lab 2.



3) Once imported, program Lab 4 onto your board in the usual manner – Right click on the "Lab4Demo" folder -> ZentriOS - > Build/Download/Run. You should see again your DeviceID reported to the serial console in the format Zentri_XXXX, (XXXX being the last four digits of your device's MAC address)

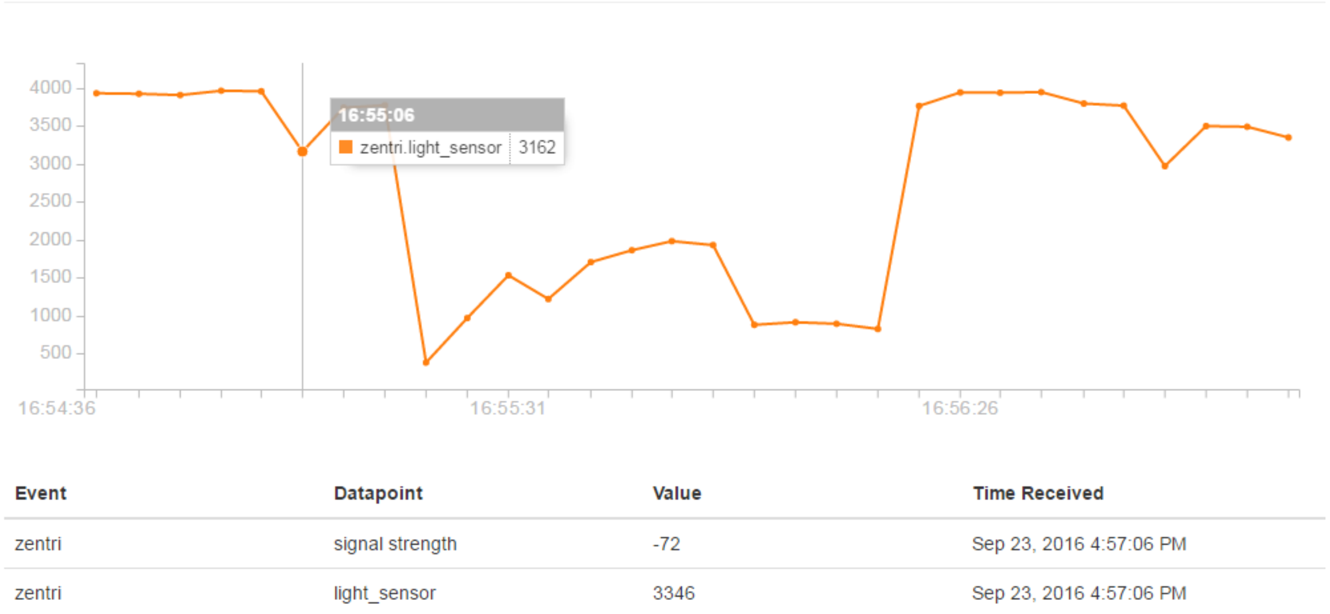


```
IBM Bluemix MQTT Demo Application Started
  - Broker: quickstart.messaging.internetofthings.ibmcloud.com
  - Client ID: d:quickstart:type:zentri_4431
  - Topic/Queue: iot-2/evt/zentri/fmt/json
```

B. Verify! - Using IBM QuickStart charting webpage

4) Verify your board is publishing correctly at this point by using the IBM QuickStart charting webpage (link below). Accept IBM's terms of use, then enter your Device ID and press Go.

https://quickstart.internetofthings.ibmcloud.com/



Event	Datapoint	Value	Time Received
zentri	signal strength	-72	Sep 23, 2016 4:57:06 PM
zentri	light_sensor	3346	Sep 23, 2016 4:57:06 PM

5) Click on **light_sensor** (under the Datapoint sources listed), and observe the chart that then displays…
(values between 0 and 4000, that change when a shadow is cast on the light sensor, indicate proper operation)

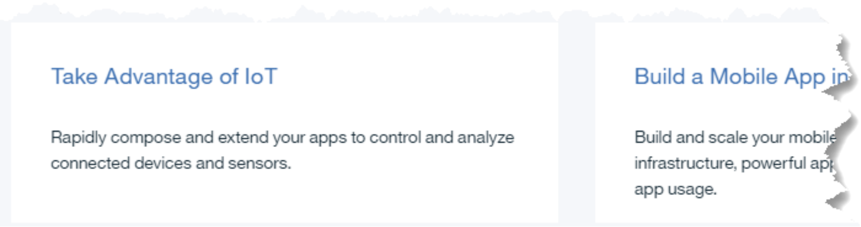
6) Click on **signal_strength** to have the chart switch to displaying the reported RSSI WiFi signal strength -dBm values (shielding the wireless module by cupping your hand over it should increase the negative -dBm values reported)

C. Create your Bluemix application:

7) Log in to the console page of IBM Bluemix:

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

8) Scroll down and click on the "Take Advantage of IoT" box



Take Advantage of IoT

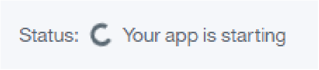
Rapidly compose and extend your apps to control and analyze connected devices and sensors.

Build a Mobile App in

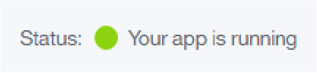
Build and scale your mobile
infrastructure, powerful ap
app usage.

9) In the **App Name** field, give your application a unique name, leave the other fields as is, then click "Create".

10) Give Bluemix 2-10 minutes to start your application. Monitor the Status indicator at the top of screen.
"Status:" should change to green once it is running.



Status: Your app is starting

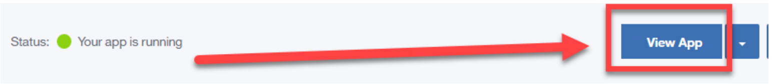


Status: ● Your app is running

TROUBLESHOOTING: If your app is not running, try clicking stop and then start on the right side of the screen to reboot the Bluemix IoT application.

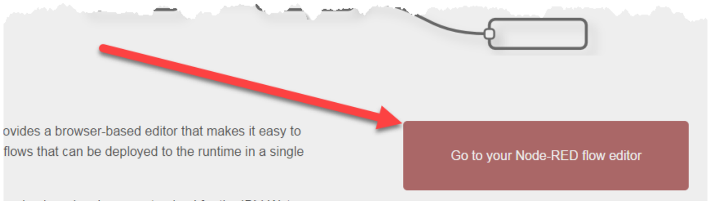
D. Wire your Bluemix functionality using Node-RED Visual Editor

11) From your dashboard, click on “View App” on the right hand side to access the Node RED editor.



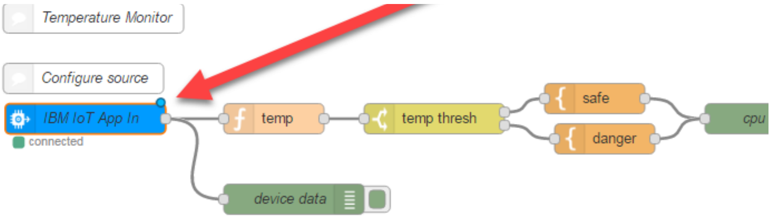
Status: Your app is running

12) Click the red “Go to your Node-RED flow editor” button.

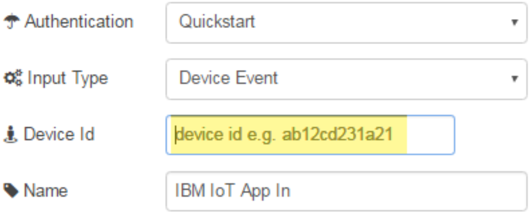


ovides a browser-based editor that makes it easy to
flows that can be deployed to the runtime in a single

13) You should now see two default “flows”. Double click the node called “IBM IoT App In” to edit.

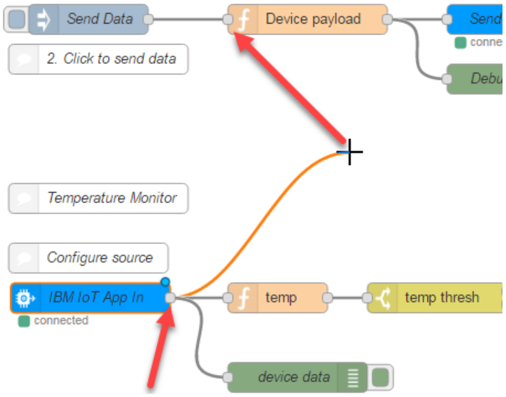


14) Enter in your Device ID to the appropriate box and make sure the Authentication is set to “Quickstart”, then press “Done”.



Authentication	Quickstart
Input Type	Device Event
Device Id	device id e.g. ab12cd231a21
Name	IBM IoT App In

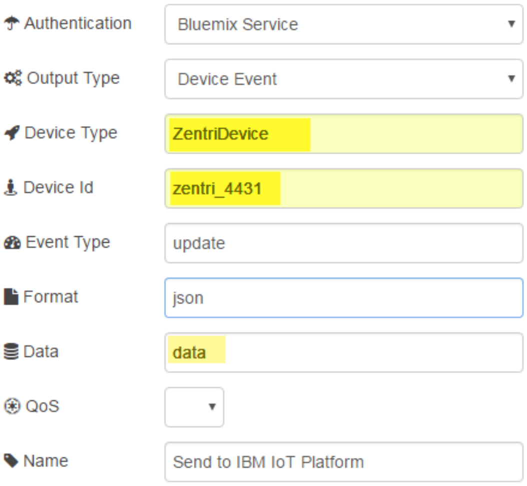
15) In your Node RED flow editor, click the tiny box to the right end of the “IBM IoT App In” Node to create a wire, then drag this wire to connect it to the “Device Payload” Node to link the output of “IBM IoT App In” to the input of “Device Payload”.



16) Double click the “Device payload” node to edit its properties and overwrite all of the pre-existing code with the following:

```
msg = {payload: JSON.stringify(msg.payload)};
return msg;
```

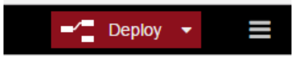
17) Edit the “Send to IBM IoT Platform” node and make the highlighted changes (add your own unique Zentri_XXXX ID).



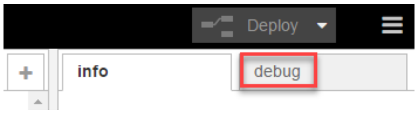
Authentication	Bluemix Service
Output Type	Device Event
Device Type	ZentriDevice
Device Id	zentri_4431
Event Type	update
Format	json
Data	data
QoS	
Name	Send to IBM IoT Platform

E. Verify! - Using Node-Red Debug Monitor

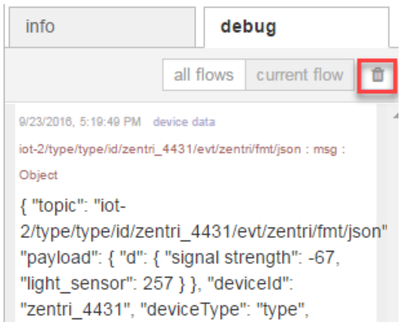
18) Click on the **Deploy** button (top right corner) to execute your Node-RED changes…



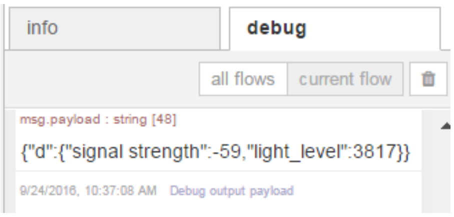
19) Immediately below this button, (2nd tab of Node-RED right-side panel) is the debug monitor which allows you to monitor one or more Debug nodes within your Node RED flow.
To begin, make sure your board is currently publishing to Watson IoT (ie. step 2 of this recipe), then click on the ‘debug’ tab:



20) You should now see published data in the debug console (what is displayed depends on which debug monitors are enabled) To clear this panel, you can click on the trash bin icon at any time.

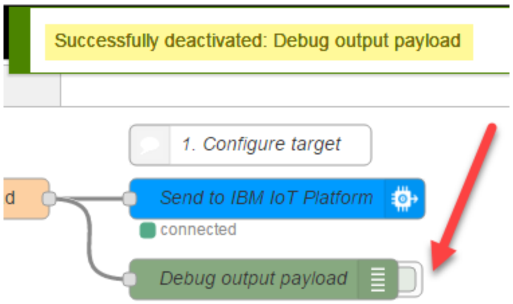


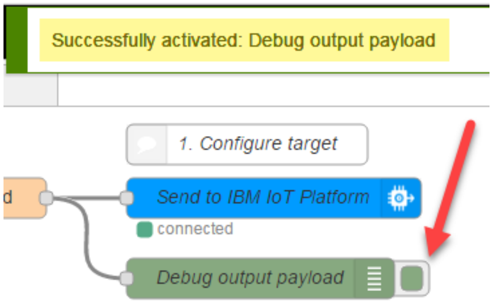
```
9/23/2016, 5:19:49 PM   device data
iot-2/type/type/id/zentri_4431/evt/zentri/fmt/json : msg :
Object
{ "topic": "iot-
2/type/type/id/zentri_4431/evt/zentri/fmt/json"
"payload": { "d": { "signal strength": -67,
"light_sensor": 257 } }, "deviceId":
"zentri_4431", "deviceType": "type",
```



```
msg.payload : string [48]
{"d":{"signal strength":-59,"light_level":3817}}
9/24/2016, 10:37:08 AM   Debug output payload
```

21) The debug monitor displays the JSON info that reaches whichever debug nodes are presently enabled
Enable/Disable debug nodes by clicking the small tab that sticks out right-side of each debug node (grey = OFF, green = ON)

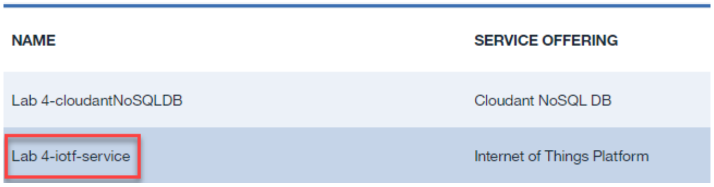

Successfully deactivated: Debug output payload


Successfully activated: Debug output payload

F. Register your device in Bluemix Services:

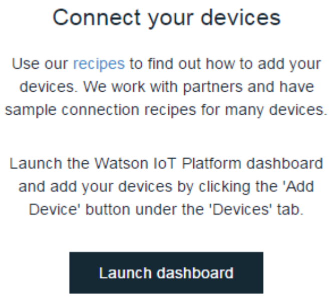
22) Go back to your device's IBM dashboard:

a. Go to https://console.ng.bluemix.net/dashboard/applications/ and scroll down to select the appropriate 'iotf-service'.



NAME	SERVICE OFFERING
Lab 4-cloudantNoSQLDB	Cloudant NoSQL DB
Lab 4-iotf-service	Internet of Things Platform

b. Click on "Launch Dashboard" under "Connect your devices".

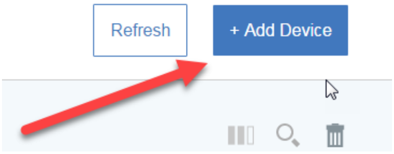


Connect your devices

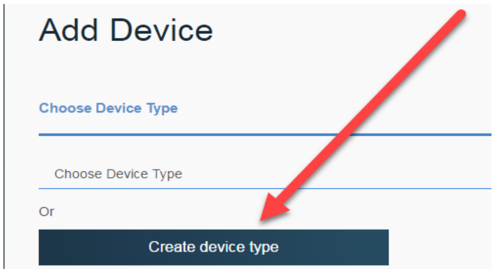
Use our recipes to find out how to add your devices. We work with partners and have sample connection recipes for many devices.

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

23) Hover your mouse over the icons to the left to open up the pop-out menu, then select "Devices". Click "Add Device" in the top right corner of the screen.



24) Click on "Create device type", then click "Create device type" again.



Add Device

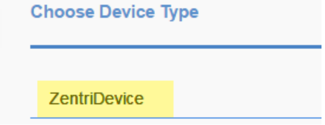
Choose Device Type

Choose Device Type

Or

25) Enter "ZentriDevice" for the Name and add an optional description.

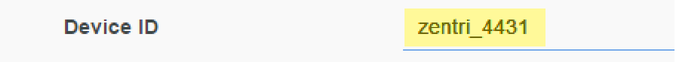
26) Click **Next** to skip through rest of the windows and click "Create". You should now see the "ZentriDevice" device type.



Choose Device Type

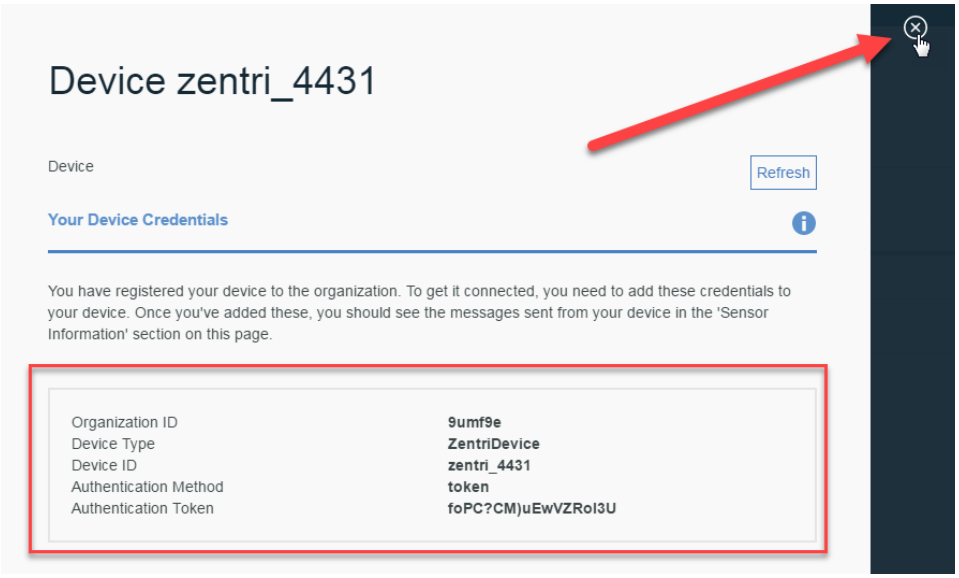
ZentriDevice

27) Click "Next" and enter in your "zentri_XXXX" device ID from earlier.



Device ID zentri_4431

28) Click "Next" two times to skip through the subsequent windows, review the summary page and then click "Add". Keep a copy of the "Device Credentials" and click on the "X" button in the top right corner when you are ready to move on.



Device zentri_4431

Device

Your Device Credentials

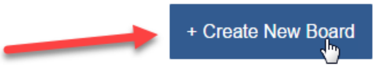
You have registered your device to the organization. To get it connected, you need to add these credentials to your device. Once you've added these, you should see the messages sent from your device in the 'Sensor Information' section on this page.

Organization ID	9umf9e
Device Type	ZentriDevice
Device ID	zentri_4431
Authentication Method	token
Authentication Token	foPC?CM)uEwVZRoI3U

Note: G, H, I, J, K, L, M explore Real-Time Insights (RTI) functions

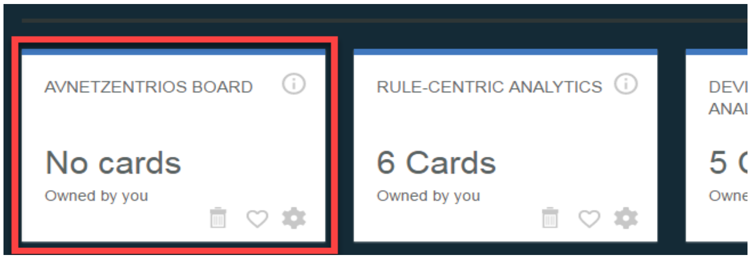
G. Create your Custom Dashboard

29) Hover your cursor on the left side of the screen until the pop out menu appears, then select "Boards". This will load a new page with all of your dashboards - click on "Create New Board" in the top right corner of the screen.



30) Enter a name for your board and an optional description. Click on “Next” when complete and then click on ‘create’.

31) Double-click your newly created board.



AVNETZENTRIOS BOARD

No cards

Owned by you

RULE-CENTRIC ANALYTICS

6 Cards

Owned by you

DEVI ANAI

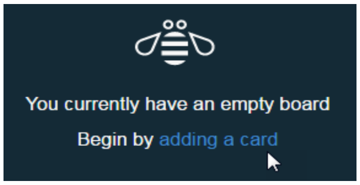
5 C

Owne

H. Create Cards for the Dashboard

32) To view the data coming from your board, you will need to create “cards”

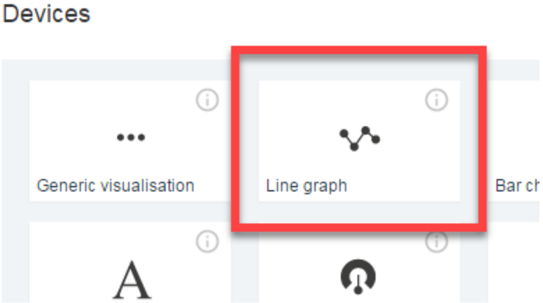
33) Click on ‘+ Add New Card’



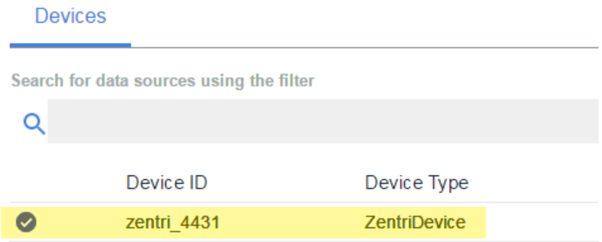
You currently have an empty board

Begin by adding a card

34) Select “Line graph” under “Devices”.



35) You should now see the device we just created under the devices tab - select this and click “Next”.

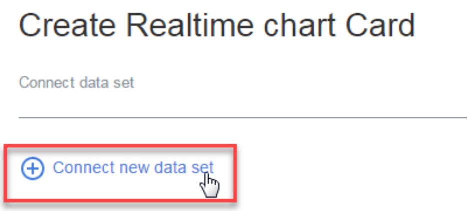


Devices

Search for data sources using the filter

	Device ID	Device Type
✓	zentri_4431	ZentriDevice

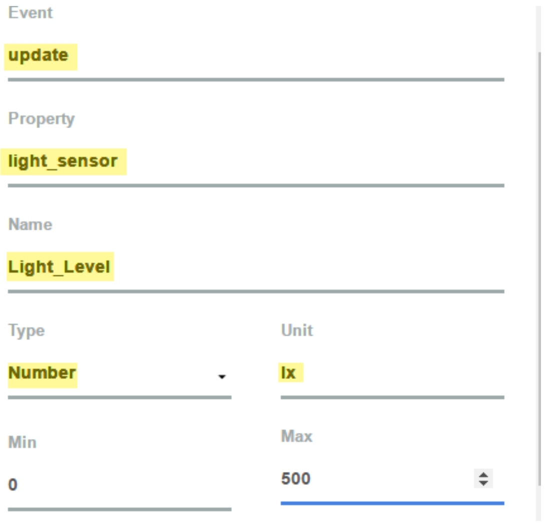
36) Select “Connect new data set”.



Create Realtime chart Card

Connect data set

37) Enter the following parameters for “Light_Level” to monitor the light sensor then click Next:



Event: update

Property: light_sensor

Name: Light_Level

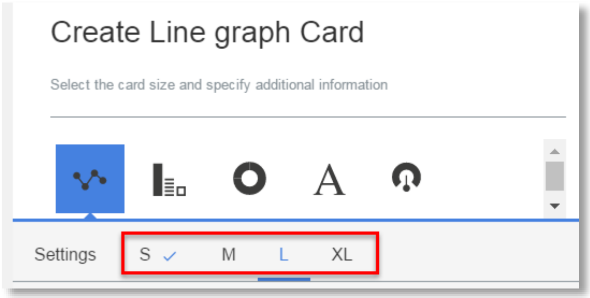
Type: Number

Unit: lx

Min: 0

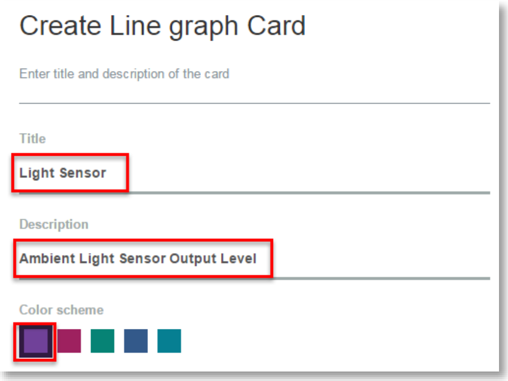
Max: 500

38) Choose a Size, Title, Description and Color Scheme for your Line Graph then continue and press “Submit” when complete.



Create Line graph Card

Select the card size and specify additional information



Create Line graph Card

Enter title and description of the card

Title: Light Sensor

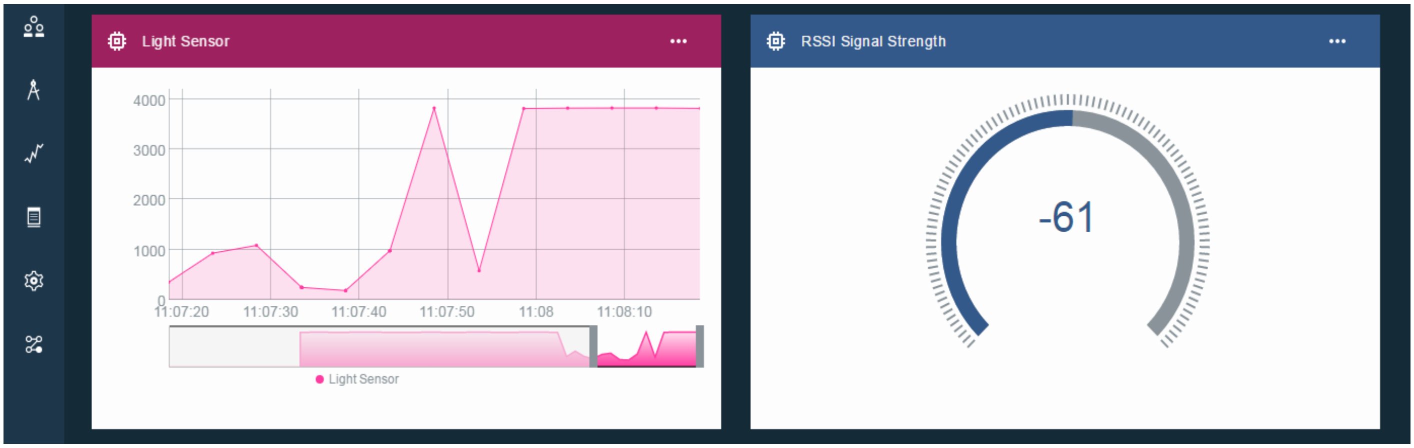
Description: Ambient Light Sensor Output Level

Color scheme: 🟪 🟥 🟩 🟦 🟦

39) Repeat this exercise creating an additional card (this time choose the gauge widget) for **RSSI Signal Strength**

I. Verify! - Using custom Dashboard Display

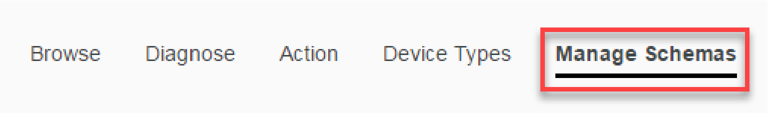
40) Once your card is set up, try applying a light on the light sensor of the Avnet board to test your dashboard display!



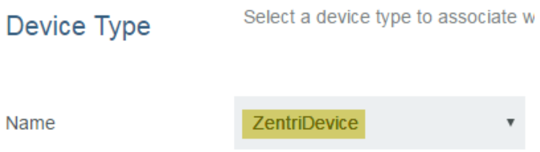
J. Create a Device Schema for Email Alerts

41) Hover your cursor on left side of the screen until the pop-out menu appears, then select "Devices"

42) Select the "Manage Schemas" tab on the top menu to create a device schema.



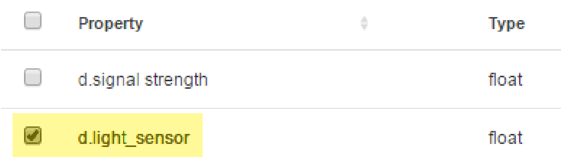
43) Click "Add Schema" In the top right corner, select "ZentriDevice" for your device type and press "Next"


Device Type

Select a device type to associate w

Name ZentriDevice ▾

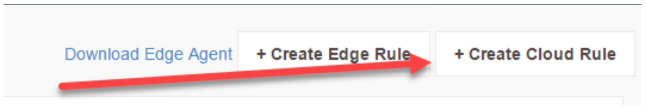
44) Now you will need to select properties of your device for the schema to relay to the email notification rule.
Click on "Add Property" and then select the "From Connected" tab, which will automatically import published properties.
Check the box next to the "light_sensor" property and click 'Finish'.



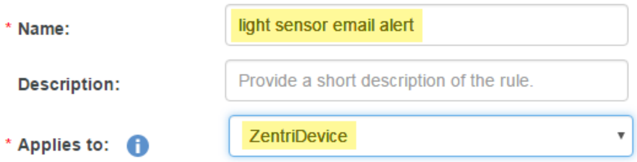
☐	Property	Type
☐	d.signal strength	float
☑	d.light_sensor	float

K. Create an Email Alert Rule

45) Hover your cursor over the icons to the left of the page to open the pop-up menu again. Select "Rules" and then click on "Create Cloud Rule".



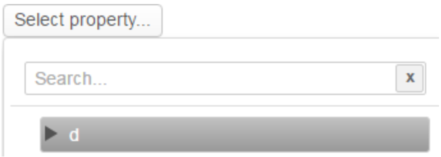
46) Enter a name for your rule, an optional description and select the "ZentriDevice" schema in the "Applies to:" box.

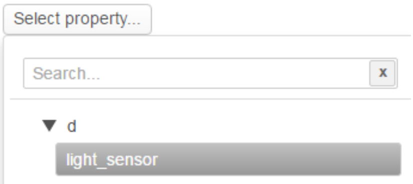

* Name: light sensor email alert

Description: Provide a short description of the rule.

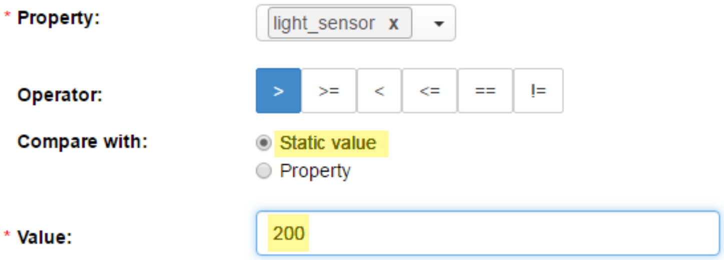
* Applies to: ZentriDevice

47) Click next when complete and you should see an "IF/THEN" Diagram. Click on the "New Condition" box and "Select Property" to choose the property for the condition, then click on the triangle icon next to "d" to open up a drop-down list of additional nested properties – select the "light_sensor" property.





48) Leave the operator as ">" and enter a reasonable value for the "Value:" box to compare whether the light is on or off.

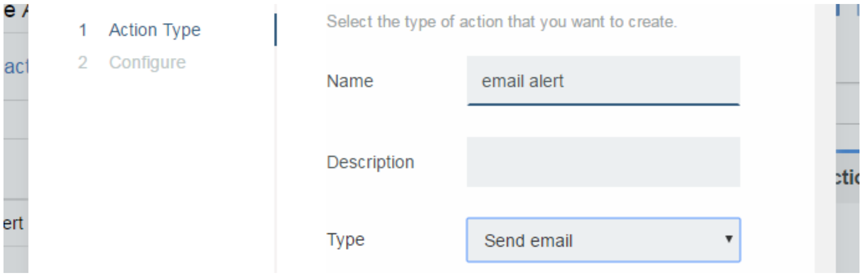

* Property: light_sensor x

Operator: > >= < <= == !=

Compare with: ● Static value ○ Property

* Value: 200

49) Now select the "New action" box to create a response to the IF condition. Click on "Add Action" and give your action a unique name and description, then select "send email" for "Type". Press "Next" when complete.


1 Action Type
2 Configure

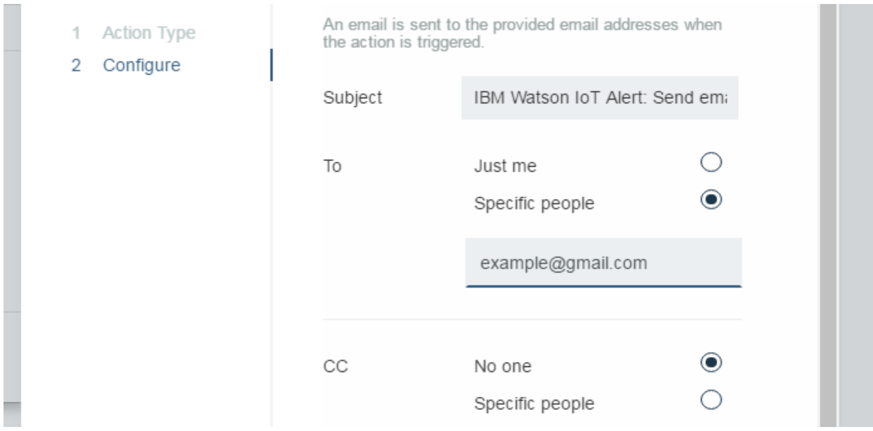
Select the type of action that you want to create.

Name: email alert

Description:

Type: Send email

50) Edit the subject line if you wish, and select “Specific People” under the “To” header.
Enter the email address you wish the notification to be sent to (You can also include additional CC email addresses)



1 Action Type
2 Configure

An email is sent to the provided email addresses when the action is triggered.

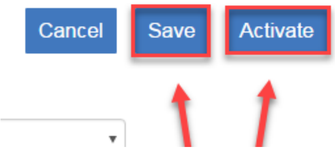
Subject: IBM Watson IoT Alert: Send emi

To: Just me ○ Specific people ●

example@gmail.com

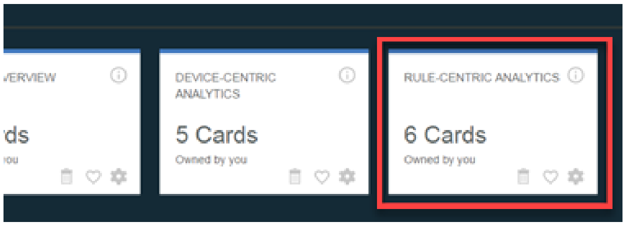
CC: No one ● Specific people ○

51) When complete, press ‘finish’ and double click the name of your action to select it. Click on “save” and “activate” on the top right corner of the main rule menu to start your email alert application.

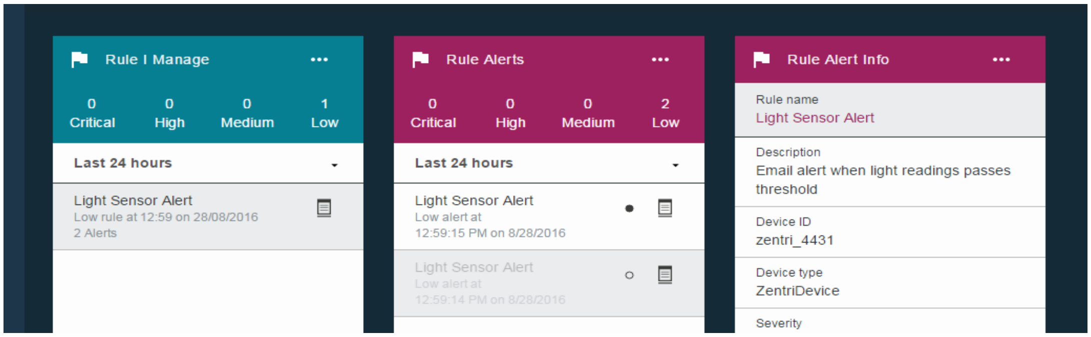


L. Verify! - Using Email Notification Alerts

52) Hover your cursor over the left pop-out bar to go back to “Boards”. Select the “Rule-Centric Analytics” board.



53) You will now see several pre-built cards that display rule-related information. Shine a light on the light sensor to trigger the email notification rule and see how these cards react.



Rule I Manage

0 Critical 0 High 0 Medium 1 Low

Last 24 hours

Light Sensor Alert
Low rule at 12:59 on 28/08/2016
2 Alerts

Rule Alerts

0 Critical 0 High 0 Medium 2 Low

Last 24 hours

Light Sensor Alert ●
Low alert at
12:59:15 PM on 8/28/2016

Light Sensor Alert ○
Low alert at
12:59:14 PM on 8/28/2016

Rule Alert Info

Rule name
Light Sensor Alert

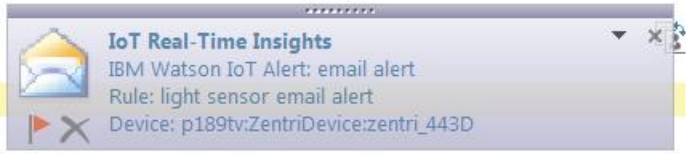
Description
Email alert when light readings passes threshold

Device ID
zentri_4431

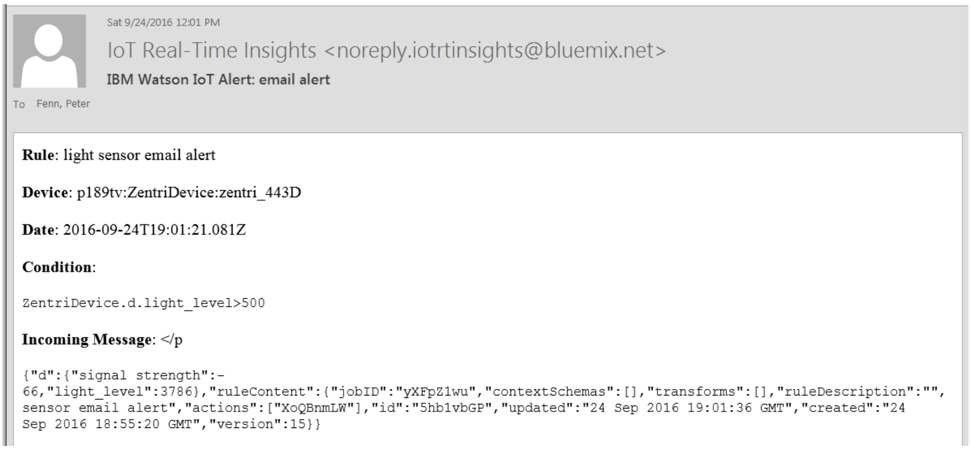
Device type
ZentriDevice

Severity

54) Check your email to see the incoming notifications on changes to the light level.



IoT Real-Time Insights
IBM Watson IoT Alert: email alert
Rule: light sensor email alert
Device: p189tv:ZentriDevice:zentri_443D



Sat 9/24/2016 12:01 PM
IoT Real-Time Insights <noreply.iotrtinsights@bluemix.net>
IBM Watson IoT Alert: email alert
To Fenn, Peter

Rule: light sensor email alert

Device: p189tv:ZentriDevice:zentri_443D

Date: 2016-09-24T19:01:21.081Z

Condition:

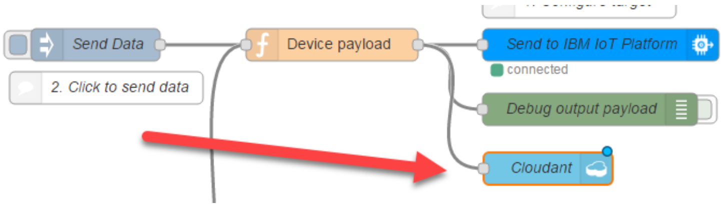
```
ZentriDevice.d.light_level>500
```

Incoming Message: </p

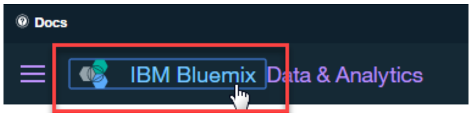
```
{"d":{"signal strength":-
66,"light_level":3786},"ruleContent":{"jobID":"yXFpZ1wu","contextSchemas":[],"transforms":[],"ruleDescription":"",
sensor email alert","actions":["XoQBnmLW"],"id":"5hb1vbGP","updated":"24 Sep 2016 19:01:36 GMT","created":"24
Sep 2016 18:55:20 GMT","version":15}}
```

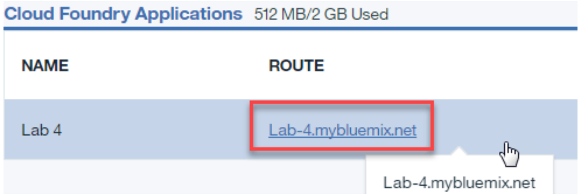
M. Configure NodeRED to store data in Cloudant DB

55) Now return to your NodeRED flow and insert the Cloudant end node into your flow in the following manner. This will store incoming data into your Cloudant database (the other Cloudant node is for retrieving stored data).



TROUBLESHOOTING: If lost, go back to the console page by clicking on the logo (https://console.ng.bluemix.net), scroll down and select your application link.

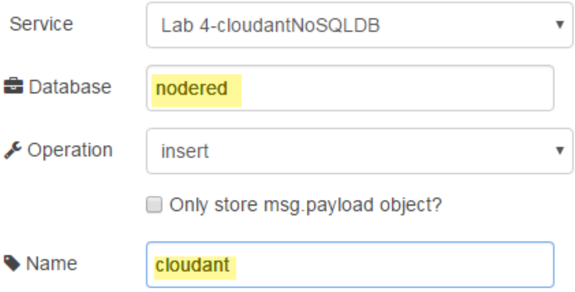




Cloud Foundry Applications 512 MB/2 GB Used

NAME	ROUTE
Lab 4	Lab-4.mybluemix.net

56) Configure your node with the highlighted properties (leave the rest as default. Hit "Deploy" when complete.



Service: Lab 4-cloudantNoSQLDB

Database: nodered

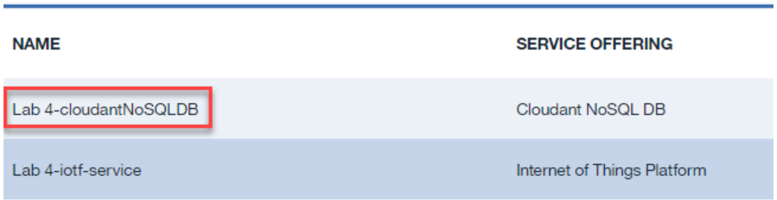
Operation: insert

☐ Only store msg.payload object?

Name: cloudant

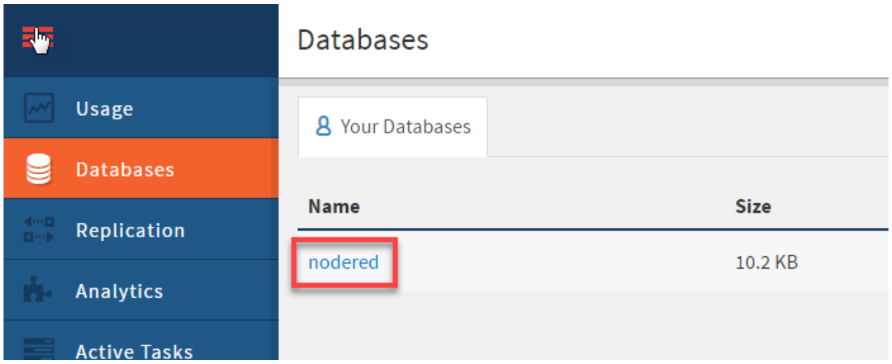
N. Verify! – Using Cloudant DB

57) Make sure your board is powered, then access your Cloudant Database by going back to the console page (https://console.ng.bluemix.net), to select the Cloudant service for your application.



NAME	SERVICE OFFERING
Lab 4-cloudantNoSQLDB	Cloudant NoSQL DB
Lab 4-iotf-service	Internet of Things Platform

58) Click on "Launch" to access your database on the following page. At this time, you should only see one database called "nodered" under the "Databases" tab.



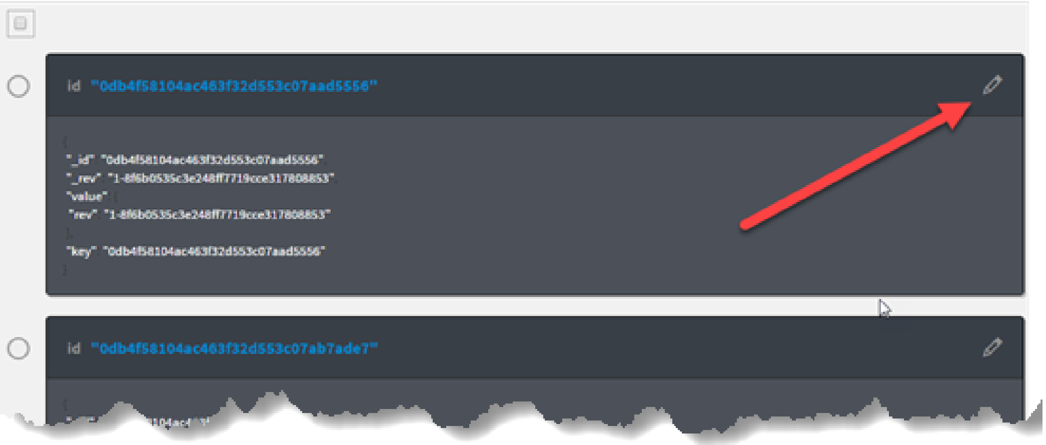
Databases

- Usage
- Databases
- Replication
- Analytics
- Active Tasks

Your Databases

Name	Size
nodered	10.2 KB

59) Select “nodered” and you will see a list of entries corresponding to the messages published by your board. To view these entries in further detail, click on the pencil icon to the top right corner.

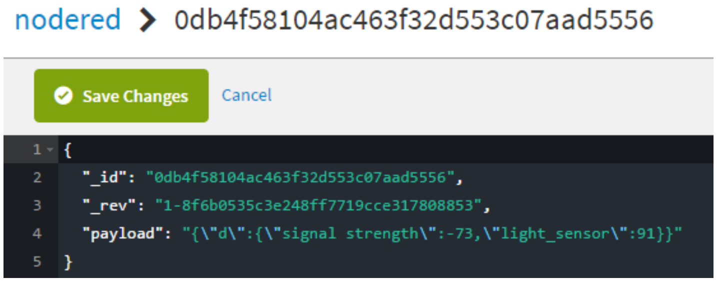


```
id "0db4f58104ac463f32d553c07aad5556"

{
"_id" "0db4f58104ac463f32d553c07aad5556"
"_rev" "1-8f6b0535c3e248ff7719cce317808853"
"value" {
"rev" "1-8f6b0535c3e248ff7719cce317808853"
},
"key" "0db4f58104ac463f32d553c07aad5556"
}
```

```
id "0db4f58104ac463f32d553c07ab7ade7"
```

60) You should now see, directly, the JSON code published by your board:

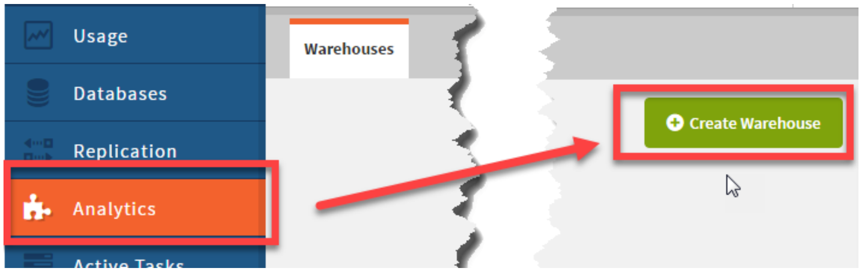


nodered > 0db4f58104ac463f32d553c07aad5556

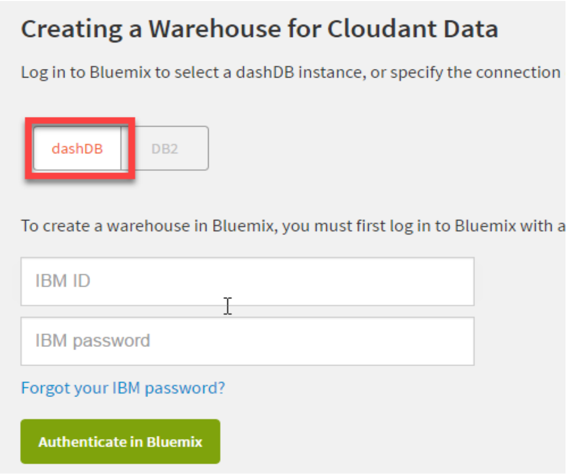
```
{
  "_id": "0db4f58104ac463f32d553c07aad5556",
  "_rev": "1-8f6b0535c3e248ff7719cce317808853",
  "payload": "{\"d\":{\"signal strength\":-73,\"light_sensor\":91}}"
}
```

P. Further Database storage using DashDB (Optional)

61) DashDB is a cloud data warehouse service by IBM for deeper offline reporting and analytics (Cloudant is a NoSQL database whereas DashDB is a SQL database). Click on the "Analytics" tab and then "Create Warehouse".



62) Make sure "dashDB" is selected on top, then login with your IBM credentials.



Creating a Warehouse for Cloudant Data

Log in to Bluemix to select a dashDB instance, or specify the connection

dashDB DB2

To create a warehouse in Bluemix, you must first log in to Bluemix with a

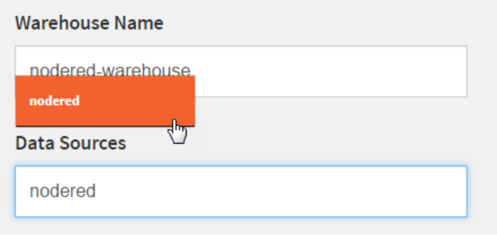
IBM ID

IBM password

Forgot your IBM password?

Authenticate in Bluemix

63) Give your warehouse a name and enter in "nodered", the CloudantDB name, under "Data Sources". "nodered" should then pop up – click it (the "Data Sources" field will become blank but don't worry about typing in "nodered" again). Leave the rest as is, then "Create Warehouse" (the "Customize Schema?" option can be explored to customize your tables in dashDB).



Warehouse Name

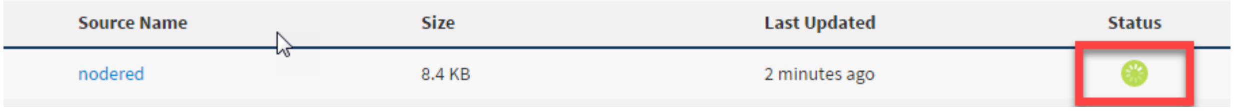
nodered-warehouse

nodered

Data Sources

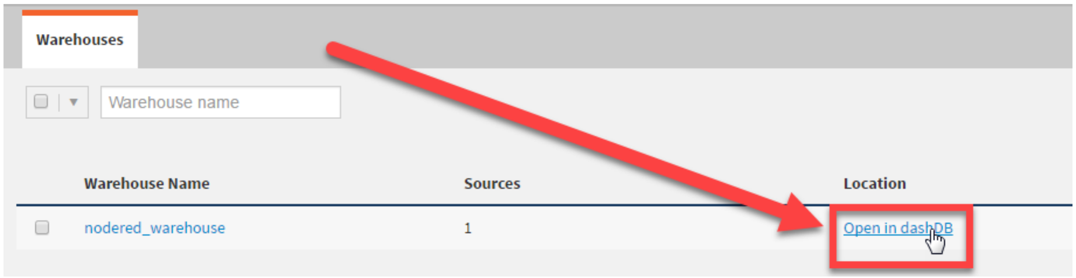
nodered

64) You can currently only create one warehouse up to 10GB of storage. Click on your "nodered_warehouse" and to view your source database and make sure that there is a green dot under "Status". It does not matter if the green dot is still loading – you can still view your dashDB tables.



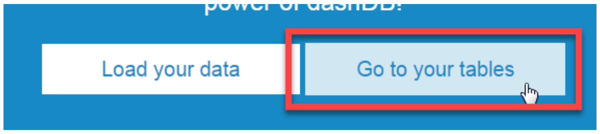
Source Name	Size	Last Updated	Status
nodered	8.4 KB	2 minutes ago	●

65) Go back to your warehouses and double click "Open in dashDB".

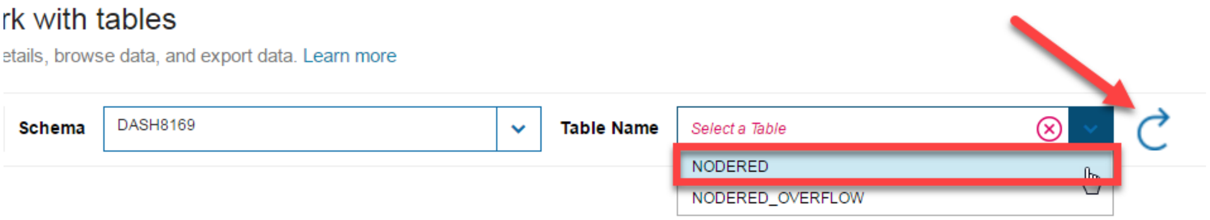


Warehouse Name	Sources	Location
nodered_warehouse	1	Open in dashDB

66) A dashDB page should open up in a new browser tab – Click on "Go to your tables".



67) Select "NODERED" under tables to load data from your nodered CloudantDB, then click on the refresh icon next to it.


rk with tables

etails, browse data, and export data. Learn more

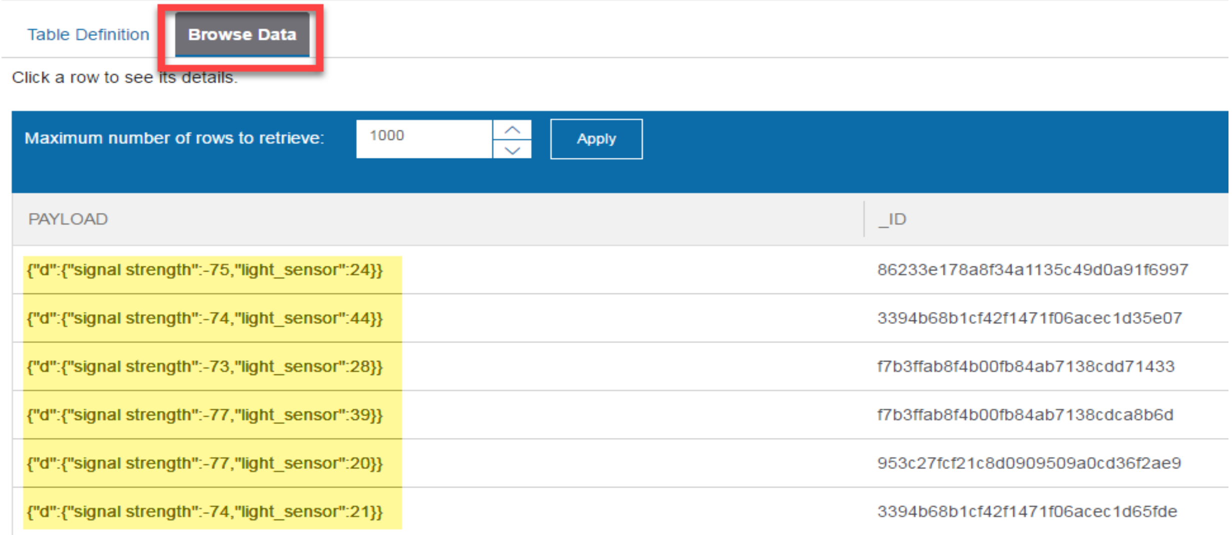
Schema DASH8169

Table Name Select a Table

NODERED

NODERED_OVERFLOW

68) You will now see data published in the dashDB table. Selecting the "Browse Data" tab will show the published JSON code.



Click a row to see its details.

Maximum number of rows to retrieve: 1000

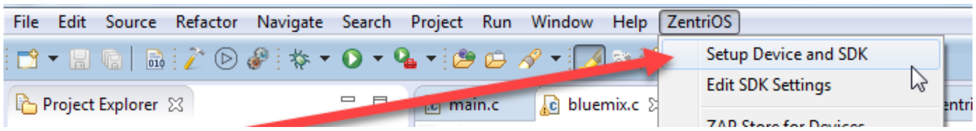
PAYLOAD	_ID
{"d":{"signal strength":-75,"light_sensor":24}}	86233e178a8f34a1135c49d0a91f6997
{"d":{"signal strength":-74,"light_sensor":44}}	3394b68b1cf42f1471f06acec1d35e07
{"d":{"signal strength":-73,"light_sensor":28}}	f7b3ffab8f4b00fb84ab7138cdd71433
{"d":{"signal strength":-77,"light_sensor":39}}	f7b3ffab8f4b00fb84ab7138cdca8b6d
{"d":{"signal strength":-77,"light_sensor":20}}	953c27fcf21c8d0909509a0cd36f2ae9
{"d":{"signal strength":-74,"light_sensor":21}}	3394b68b1cf42f1471f06acec1d65fde

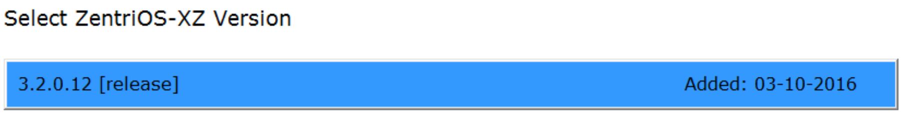
69) This concludes Lab 4

Appendix A: ZentriOS “Setup Device and SDK”

- If you commenced this project with a new BCM4343W IoT Kit that has not been initialized with ZentriOS, there is an additional step required before you can interact with the board from the Zentri IDE.

- In this case, after connecting the USB cable from the BCM4343W IoT Starter Kit to your computer, select the “ZentriOS” tab from the main menu and click “Setup Device and SDK”.
  Select the latest OS version when prompted, then click “Finish” once the process has completed.





Select ZentriOS-XZ Version

3.2.0.12 [release] Added: 03-10-2016

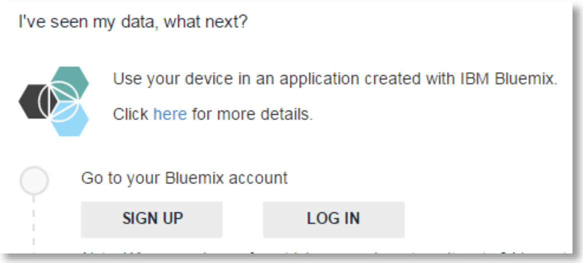
- Note! In the workshop setting, this step should *not* be done if the board has already been provisioned as it will download and program over a megabyte to the board (internal flash and SPI flash) and if a different version OS inadvertently selected then and SDK update (over 55 MB) will also be downloaded!

Appendix B: IBM Bluemix Account Setup

For simplicity in the Avnet IoT Workshops “Sandbox” IBM Bluemix accounts are used, where these are accessed using a temporary password. For continued development, it is necessary to set-up your own IBM Bluemix account.

The procedure to do this is listed below…

1) Register and log-in to the IBM Bluemix site: https://new-console.ng.bluemix.net/
Notes:
- Allow for some delay in the response when logging-in
- You can also get to the Bluemix site using the Log In button in the right sidebar…



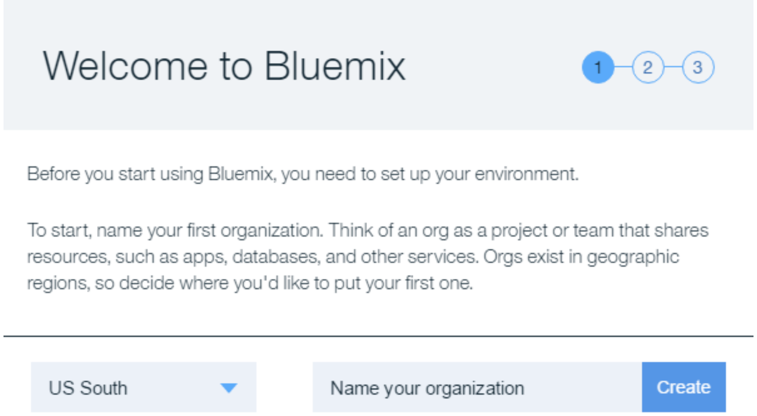
I've seen my data, what next?

Use your device in an application created with IBM Bluemix.

Click here for more details.

Go to your Bluemix account

2) If this is your first time logging on, you will be prompted with the following dialogue.
Make sure the region is selected as “US South” and enter a unique organization name.



Welcome to Bluemix

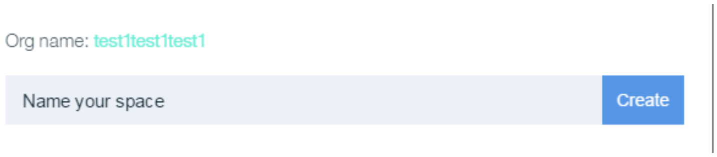
Before you start using Bluemix, you need to set up your environment.

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

Name your organization

3) Next, give a unique name for your first space.



Org name: test1test1test1

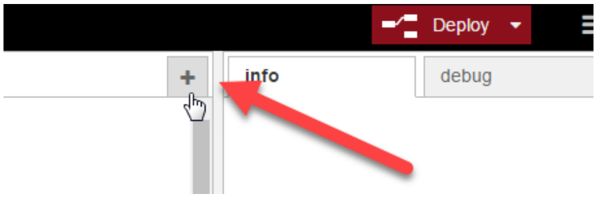
Name your space

4) When finished, click “I’m Ready” and give Bluemix a minute to set things up.

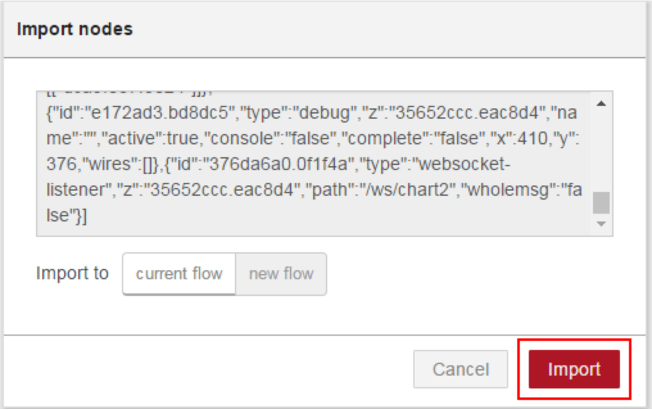
Appendix C: Import & Configure the Flow for HTML Dashboard

Node RED allows you to set up your own HTML page through its http nodes. To set up your HTML dashboard for data visualization, you must import the node red code through the following process.

1) Click the "+" sign in the top right corner of your flow canvas to create a new one.

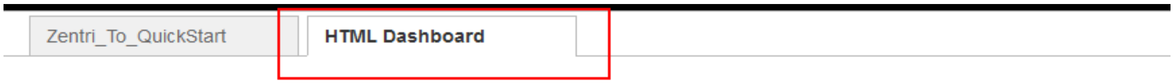


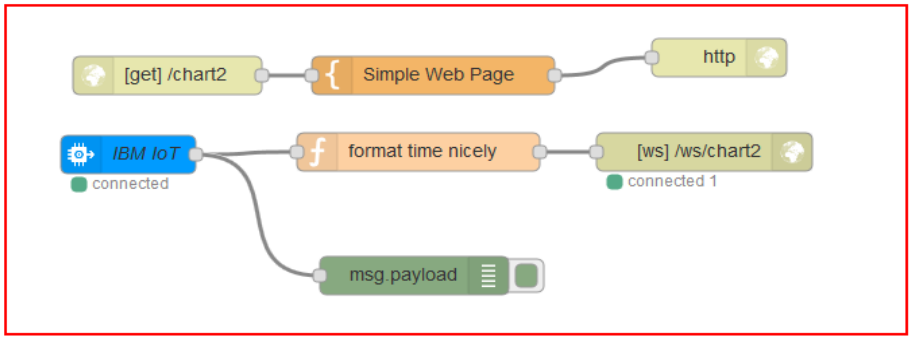
2) Import the given nodered code into your node red workspace by holding down "control & I" to bring up the import menu. Copy and paste the code from the "Nodered HTML Dashboard Code" file to the "Import nodes" box.


Import nodes

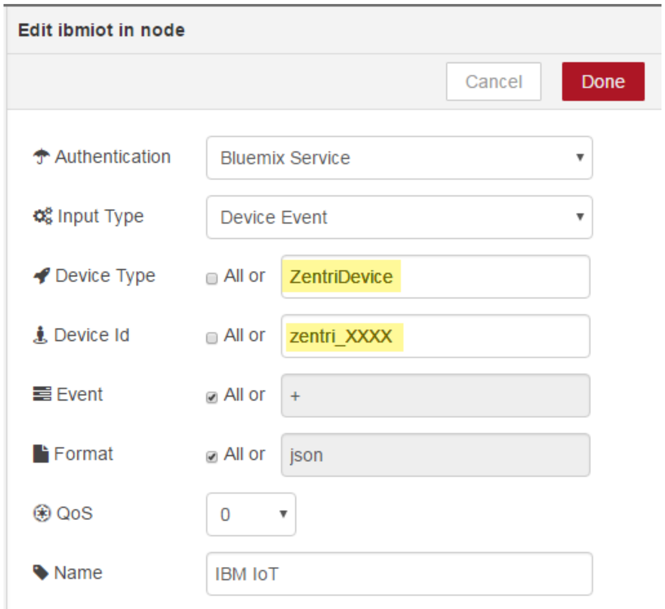
```
{"id":"e172ad3.bd8dc5","type":"debug","z":"35652ccc.eac8d4","na
me":"","active":true,"console":"false","complete":"false","x":410,"y":
376,"wires":[]},{"id":"376da6a0.0f1f4a","type":"websocket-
listener","z":"35652ccc.eac8d4","path":"/ws/chart2","wholemsg":"fa
lse"}]
```

3) You should now see the imported code appearing as the following nodes:





4) Enter your own unique Device ID to the "IBM IoT" node (Zentri_XXXX, where XXXX is the last four digits of your device's MAC address) and make sure that the Device Type is written as "ZentriDevice".



Edit ibmiot in node

Authentication: Bluemix Service

Input Type: Device Event

Device Type: □ All or ZentriDevice

Device Id: □ All or zentri_XXXX

Event: ☑ All or +

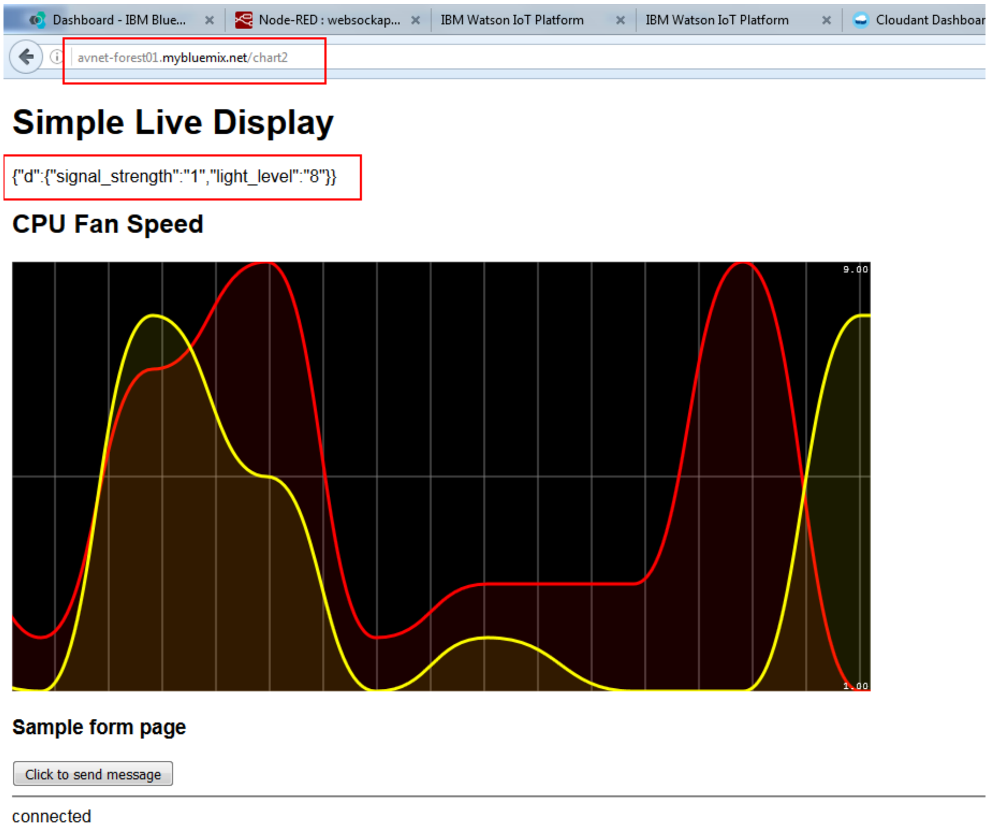
Format: ☑ All or json

QoS: 0

Name: IBM IoT

5) Open up the URL listed in the HTTP Node – /chart2 – feel free to make any appropriate edits if you wish:

http://<YOUR APPLICATION NAME GOES HERE>.mybluemix.net/**chart2**



avnet-forest01.mybluemix.net/chart2

Simple Live Display

{"d":{"signal_strength":"1","light_level":"8"}}

CPU Fan Speed

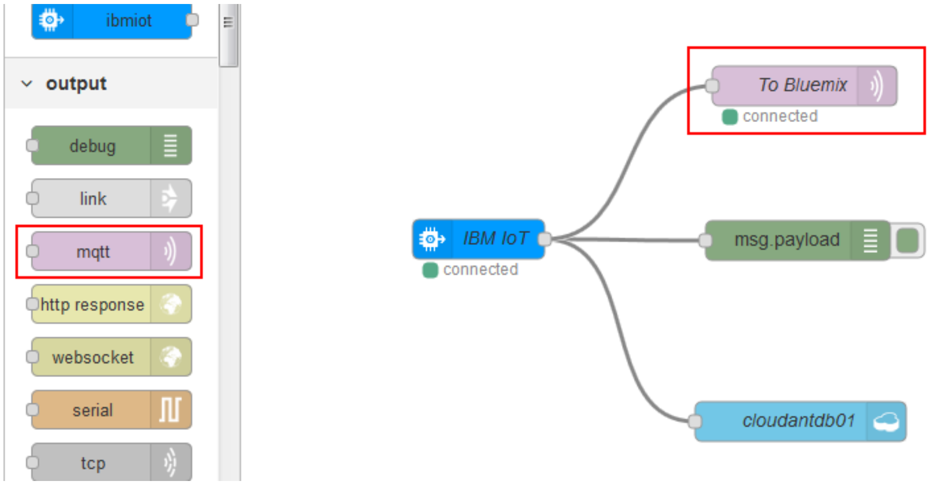
Sample form page

connected

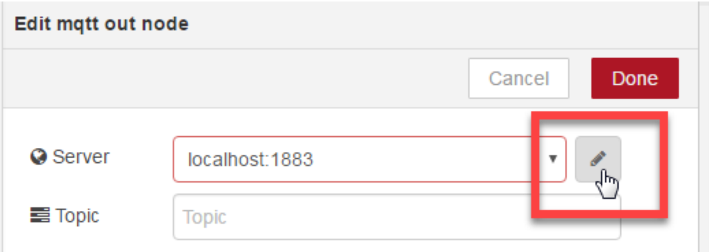
Appendix D: Set up MQTT Node Into the Canvas and Configure

You can also use NodeRED to set up an MQTT connection from your flow to IBM Bluemix Services with authentication token verification, which was configured in the device registration.

1) First, drag and drop the "mqtt" node into your flow canvas and connect it to the "IBM IoT" node as shown in the diagram:



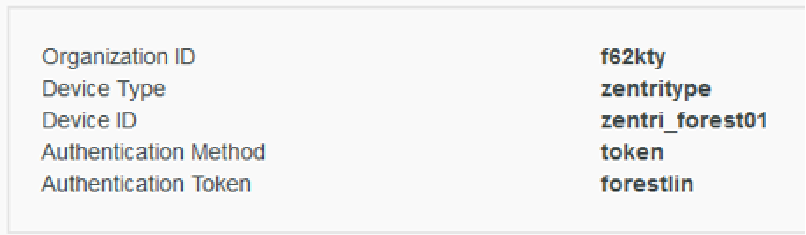
2) Open up the MQTT node properties to edit – click on the pencil icon.



Server: localhost:1883

Topic: Topic

3) Refer back to your device credentials for your "Server" and "Client ID" listed in the following formats:

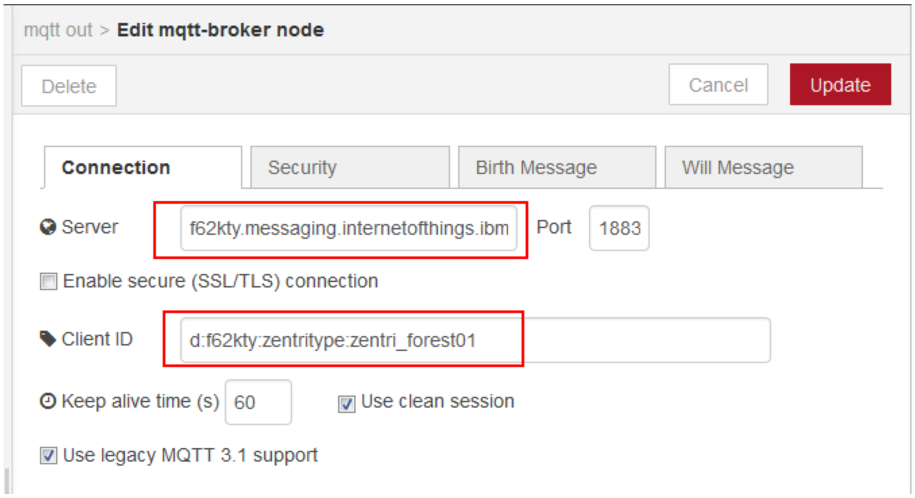


Organization ID	f62kty
Device Type	zentritype
Device ID	zentri_forest01
Authentication Method	token
Authentication Token	forestlin

Server: <Organization ID>.messaging.internetofthings.ibmcloud.com

Client ID: d: <Organization ID>:ZentriDevice:<Device ID>

4) Once you have your "Server" and "Client ID", fill them out under the "Connection" tab.



Server f62kty.messaging.internetofthings.ibm Port 1883

□ Enable secure (SSL/TLS) connection

Client ID d:f62kty:zentritype:zentri_forest01

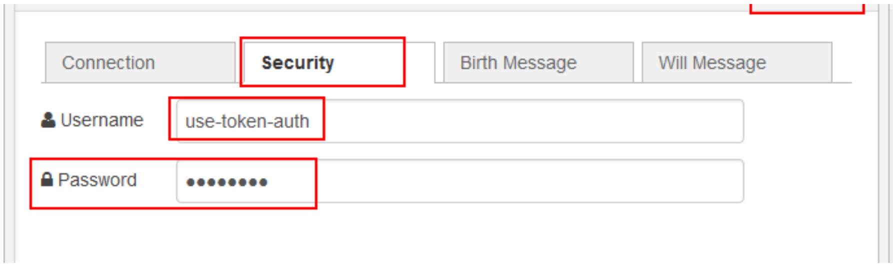
Keep alive time (s) 60 ☑ Use clean session

☑ Use legacy MQTT 3.1 support

5) Click on the “Security” tab, and enter in the following for “Username” and “Password”. Click “Update” when finished.

Username: use-token-auth

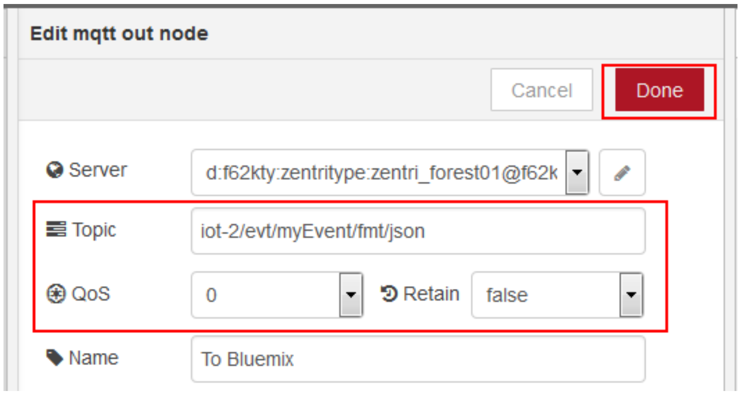
Password: <Enter Your Authentication Token>



Username use-token-auth

Password ••••••••

6) Set the other parameters: **Topic:** iot-2/evt/myEvent/fmt/json, **QoS:** = 0, **persistence**: = false, then press “Done”.



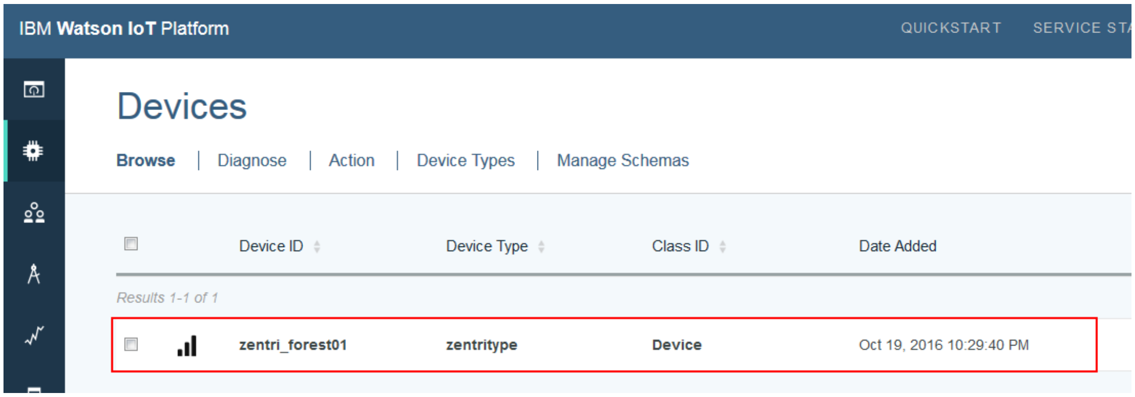
Server d:f62kty:zentritype:zentri_forest01@f62k

Topic iot-2/evt/myEvent/fmt/json

QoS 0 Retain false

Name To Bluemix

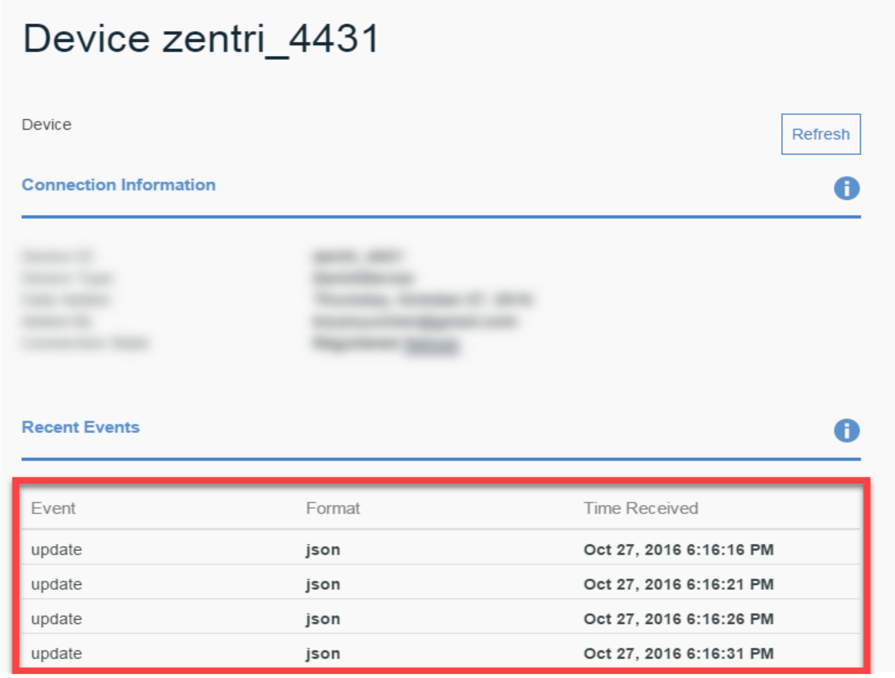
7) Make sure your device is powered and running the program, then go to your Device Dashboard to verify the MQTT connection and view published messages!



Devices

Results 1-1 of 1

□		Device ID	Device Type	Class ID	Date Added
□		zentri_forest01	zentritype	Device	Oct 19, 2016 10:29:40 PM



Device zentri_4431

Device

Connection Information

Recent Events

Event	Format	Time Received
update	json	Oct 27, 2016 6:16:16 PM
update	json	Oct 27, 2016 6:16:21 PM
update	json	Oct 27, 2016 6:16:26 PM
update	json	Oct 27, 2016 6:16:31 PM

Useful Links:

ZentriOS SDK download:
https://docs.zentri.com/zentrios/wz/latest/sdk/user-guide/getting-started

Avnet IoT Kit documents and reference designs:
http://cloudconnectkits.org/product/avnet-bcm4343w-iot-starter-kit

IBM Watson IoT QuickStart webpage:
https://quickstart.internetofthings.ibmcloud.com/#

IBM Bluemix site
https://new-console.ng.bluemix.net/