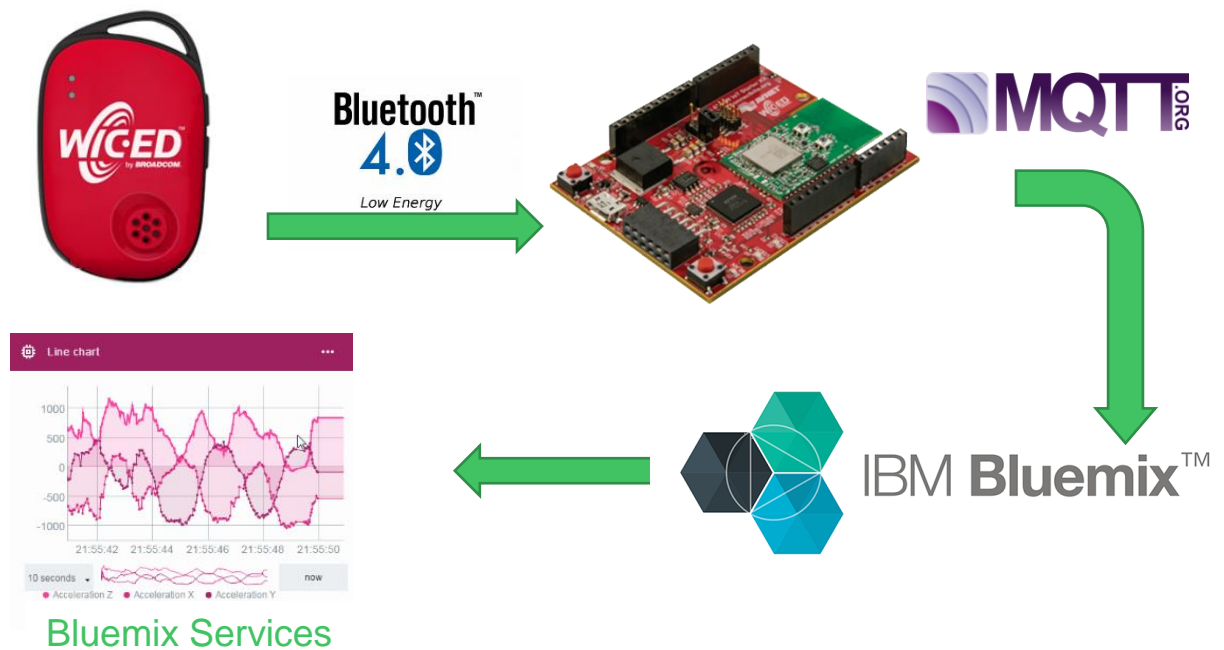


# WICED Sense 2 BLE Tag to IBM Bluemix Visualizations

By Bryan Chen

*This application demonstrates connection of the WICED Sense 2 BLE tag device to IBM Bluemix Cloud Services through the ZentriOS Platform running on the Avnet BCM4343W board as an IoT gateway device.*



## Requirements:

- [Avnet BCM4343W IoT Starter Kit](#)
- [WICED Sense 2](#) (including CR2032 coin cell)
- ZentriOS SDK, (version 3.2.0.2 or later)
- A Serial console application (such as TeraTerm or Putty)
- IBM Bluemix Account

## Application Description

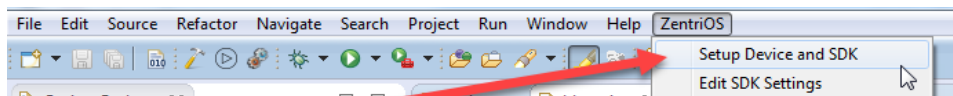
The main function of the application is to bridge the Avnet Board to the Bluemix cloud through the ZentriOS Platform. First, a demo Zentri Application (ZAP) 'ble2bluemix' is programmed onto the Avnet board. The user then connects the board to a local WiFi access point through Zentri's command API. The user then works with Node RED, a visual tool to wire together hardware devices, API's and online services with a built-in debugging monitor, to route the MQTT connection to Bluemix Services, wherein the device is registered through its 'device ID'. Bluemix Services provides a wide range of services to the data sent to the cloud – in this case, the dashboarding presentations.

Dashboarding is done through Bluemix's concept of 'boards' and 'cards'. First, a 'board' or dashboard, must be created as a platform for the cards, which can come in various forms such as line graphs, donut charts, gauges etc., thus providing multiple visual options for representing the data. Cards import properties directly published by the Avnet board.

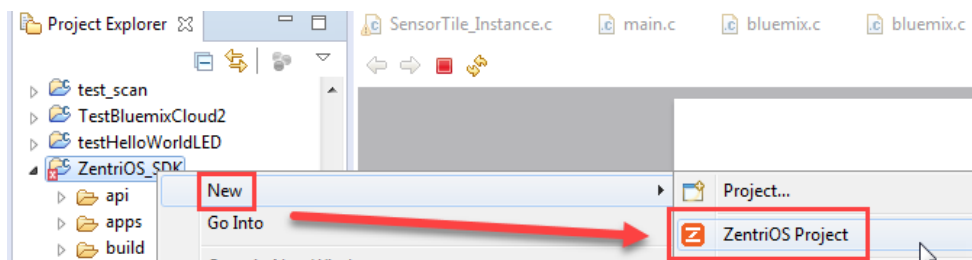
Once the software is setup, the user simply 'wakes' the WICED Sense 2 to commence advertising. The Avnet board will pick up the advertisements through BLE scanning, establish a connection, and then publish the appropriate data to Bluemix services through established credentials, where it will be displayed on the dashboard.

## Instructions

1. Install the 'ble2bluemix' Firmware
  - a. If not already installed, download and install the latest version of ZentriOS SDK (link posted at end of this tutorial). When finished, open Zentri.
  - b. Connect a USB cable from the Avnet BCM4343W IoT Starter Kit to your computer. Select the "ZentriOS" tab on the top bar and click "Setup Device and SDK". Select the appropriate version when prompted and click "Finish" when complete.



- c. Right click in the Project Explorer space, select *New->ZentriOS Project*.

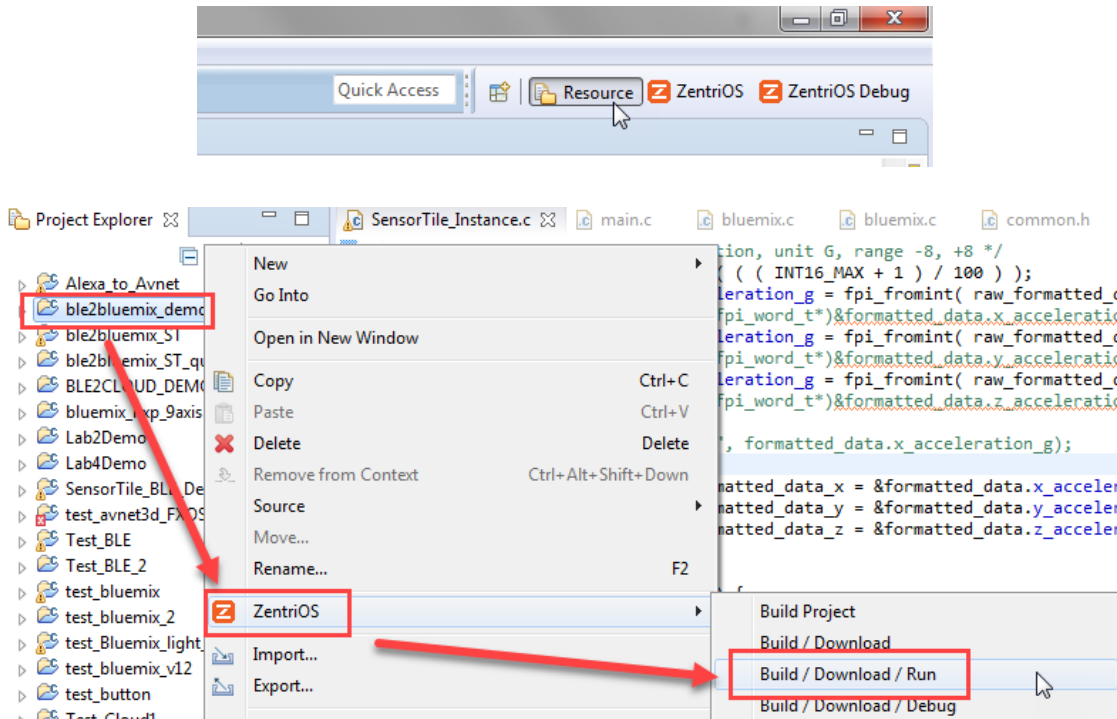


- d. Enter a name for your project and click "next". Look for the 'ble2bluemix' demo project under the 'cloud' folder and double click to select it. Then click on "Create Project".



2. Run ble2bluemix

- a. Making sure that you are in the 'Resource' perspective, Right click on the *ble2bluemix* demo folder, select "ZentriOS", then click on "Build / Download / Run".



- b. After successful build and download of this application to the hardware, open a *serial console* application to view the output from the hardware (Make sure the correct COM port is selected, Baud rate = *115200*, other settings = 8N1N).
- c. You will need to provide the WiFi network settings to your board from this serial console. Start with a mouse click on the console window, press the enter key once to enter command mode, then type "*network\_up -s*" into the console.

```
Ready
> network_up -s
Scanning for networks...
! 29 networks found
```

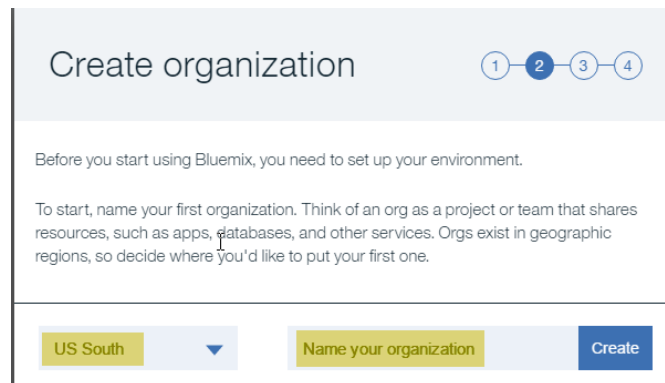
- d. Locate your network and its '#' on the list that appears. Enter your network number into the console followed by the password. Once connected, type "*save*" to have the device remember the network.

```
Type the number # that matches your Network: 11
Type the password for your Network       : 1234!
In progress
[2000-01-01 | 00:42:20: Associating to ASUS]
> > Security type from probe: WPA2-AES
Obtaining IPv4 address via DHCP
IPv4 address: 192.168.43.203
[2000-01-01 | 00:42:28: Associated]
> save
Saved
Success
```

**TROUBLESHOOTING:** If you are having issues connecting your board to local WiFi, try utilizing a mobile hotspot instead.

3. Set up your Bluemix Environment

- c. Register and log on to the IBM Bluemix site: <https://console.ng.bluemix.net/>
- d. Make sure the region is selected as “*US South*” and enter a unique organization name.



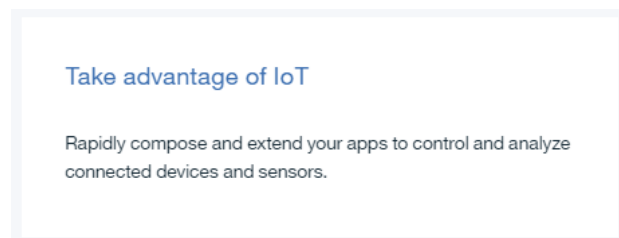
- e. Next, give a unique name for your first space and click “*I’m Ready*” when complete.

4. Create your Bluemix application

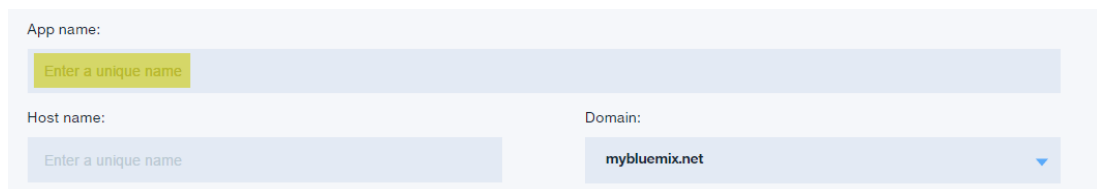
- c. You should now be redirected to the console page of IBM Bluemix:

<https://console.ng.bluemix.net/dashboard/apps/>

- d. Scroll down and click on the “*Take Advantage of IoT*” box.



- e. Give your application a unique name, leave the rest of the fields as is, then click “*create*”.



- f. Give Bluemix 2-10 minutes to start your application. You will see the status change to indicate this.

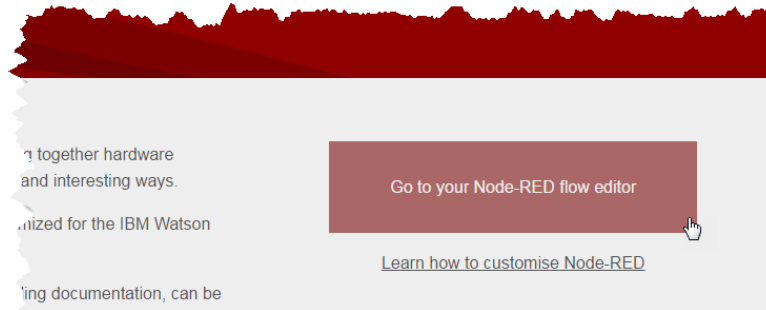


5. Edit via Node RED

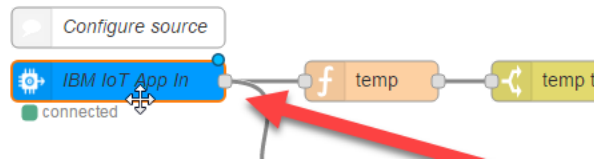
- a. Click on “*Visit App URL*” next to the app name to access the Node RED editor.



- b. Click through the ‘*Secure your Node-RED editor*’ dialog, based on your preferences.
- c. When complete, click the red “*Go to your Node-RED flow editor*” button.

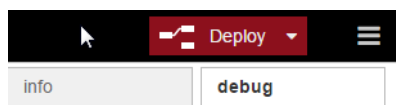


- d. Now edit the node labeled ‘*IBM IoT App In*’ to match the highlighted changes. Set device ID as in AV04. This will allow your application to receive the MQTT messages.

A configuration panel for the "IBM IoT App In" node. It has several settings:

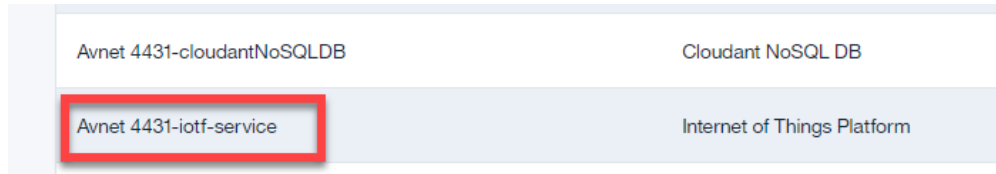
- Authentication: Bluemix Service (dropdown)
- Input Type: Device Event (dropdown)
- Device Type: All or ZentriDevice (checkbox and text input)
- Device Id: All or zentri\_4431 (checkbox and text input)
- Event: All or update (checkbox and text input)
- Format: All or json (checkbox and text input)
- QoS: 0 (dropdown)
- Name: IBM IoT App In (text input)

- e. Click on “*Deploy*” in the upper right hand corner to save your changes.



6. Register your device in Bluemix Services
  - a. Go to your Bluemix console and scroll down to select the appropriate iotf service.

<https://new-console.ng.bluemix.net/#all-items>



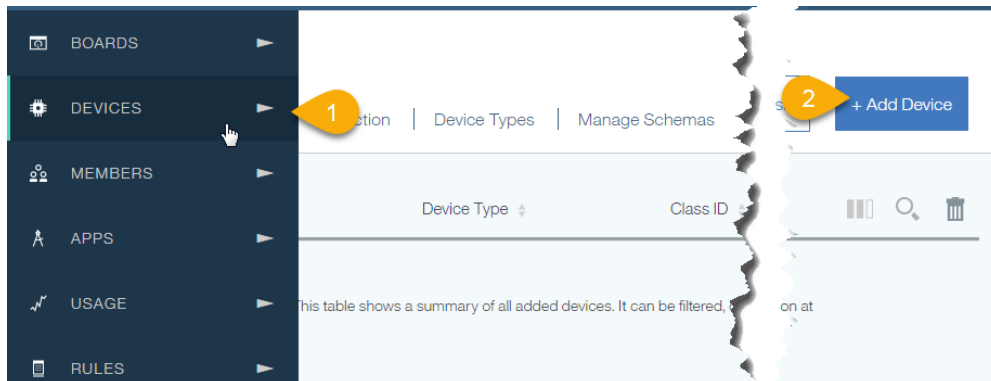
- b. Click on *“Launch”* to access your Bluemix Services dashboard:

## Welcome to Watson IoT Platform

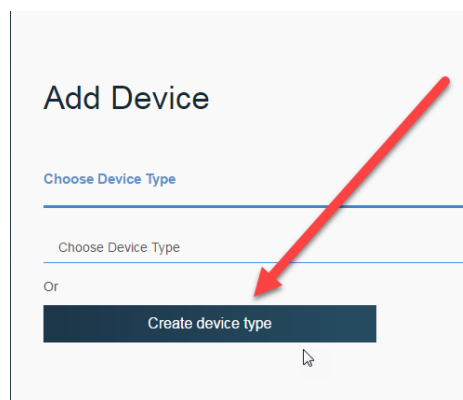
Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.



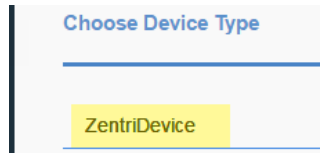
- c. Hover your mouse over the icons to the left to open up the pop-out menu, then select *“Devices”*. Click *“Add Device”* in the top right corner of the screen.



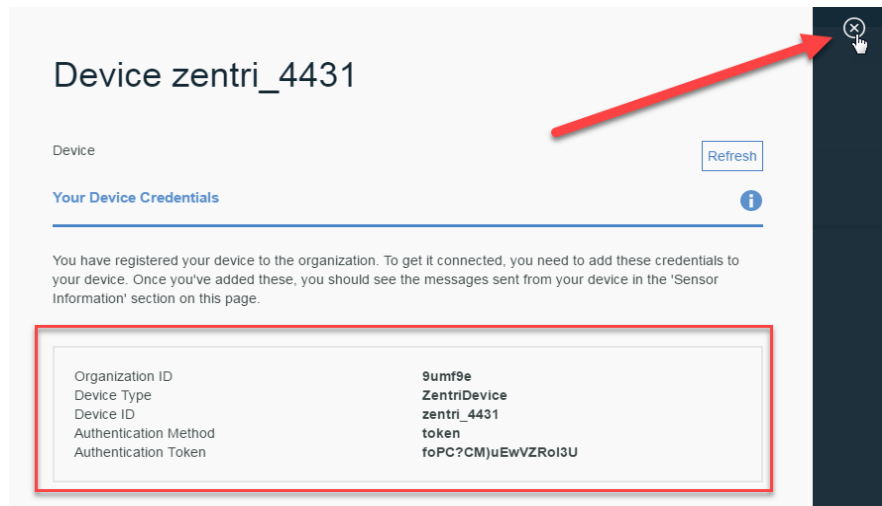
- d. Click on *“Create device type”*, then click *“Create device type”* again.



- e. Enter “ZentriDevice” for the Name and add an optional description and click next to skip through rest of the windows until you reach the last page - Metadata. Click “Create” and you should now see a “ZentriDevice” device type.



- f. Click “Next” and enter in your “zentri\_XXXX” device ID from earlier. Skip through the remaining windows and keep a copy of the *Device Credentials* at the end.



## 7. Finish Running ble2bluemix

- a. Go back to your serial console program and enter the ‘*Organization ID*’ and ‘*Authentication Token*’ from above using the following commands and then enter “*save*” again to save this information. Reboot the board afterwards.

```
set bluemix.org_id <org_id>
set bluemix.device_token <device_token>
save
reboot
```

- b. You should now see on the serial console that the board is starting its BLE scan. Press the ‘*wake*’ button on the WICED Sense 2 to begin BLE advertising.



- c. The Bluetooth address of the Sense 2 will appear on the serial console. Run the following command with <BD\_ADDR> being the reported Bluetooth address:  

```
set ble2cloud.sensor_bdaddr <BD_ADDR>
```
- d. You should see a flurry of publish messages reported.

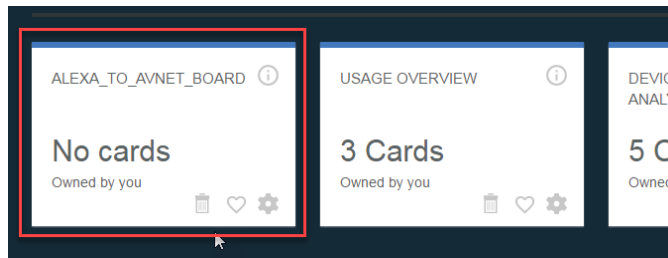
```
WICED Sense2 Kit (00:10:18:01:A0:AE) is found. Connecting to sensor
WICED Sense2 Kit ready and streaming data to Bluemix
Send PUBLISH frame
Send PUBLISH frame
Send PUBLISH frame
Send PUBLISH frame
Send PUBLISH frame
Send PUBLISH frame
Send PUBLISH frame
```

8. Create a Bluemix Dashboard

- a. Now you will need to create a new “board” (dashboard). 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.

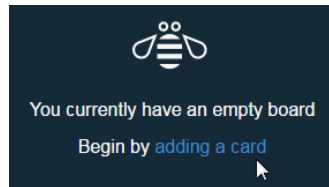


- b. Enter a name for your board and an optional description.
- c. Click on “Next” when complete and then click on create. Your newly created board should now appear accordingly.

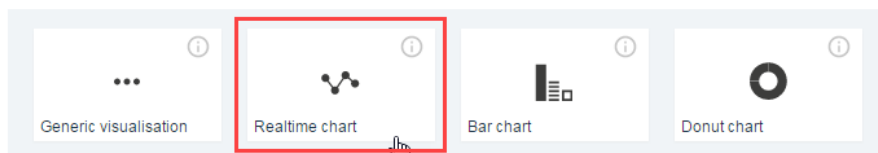


9. Create Cards for your Dashboard

- d. To view the data coming from your board, you will need to create “cards”. Double click on your board and add a new card.

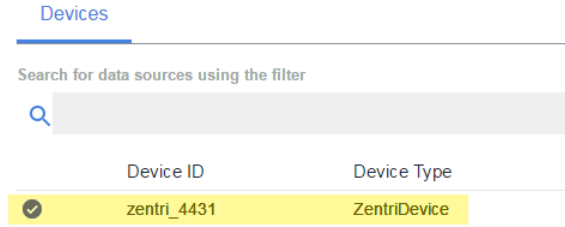


- e. Select “Realtime chart” under “Devices”.





- f. You should see the registered device under the devices tab - select it and click “Next”.



- g. Click “Connect new data set”.

## Create Realtime chart Card

Connect data set



- h. Select ‘update’ for Event, choose a *property* to display and give a *name* for your card. The rest of the parameters are optional. Click *Next* when complete:

Event

update

Property

Acceleration X

Name

WICED Sense 2 Acceleration X

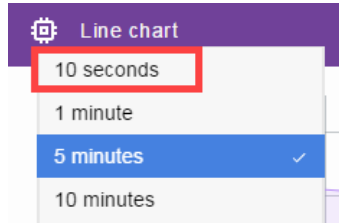
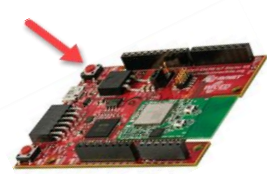
Type	Unit
Number	
Min	Max
0	100

- i. Choose a Size, Title, Description and Color Scheme for your Line Graph then continue. *L* or *XL* is suggested for better viewing. Press “Submit” when complete.

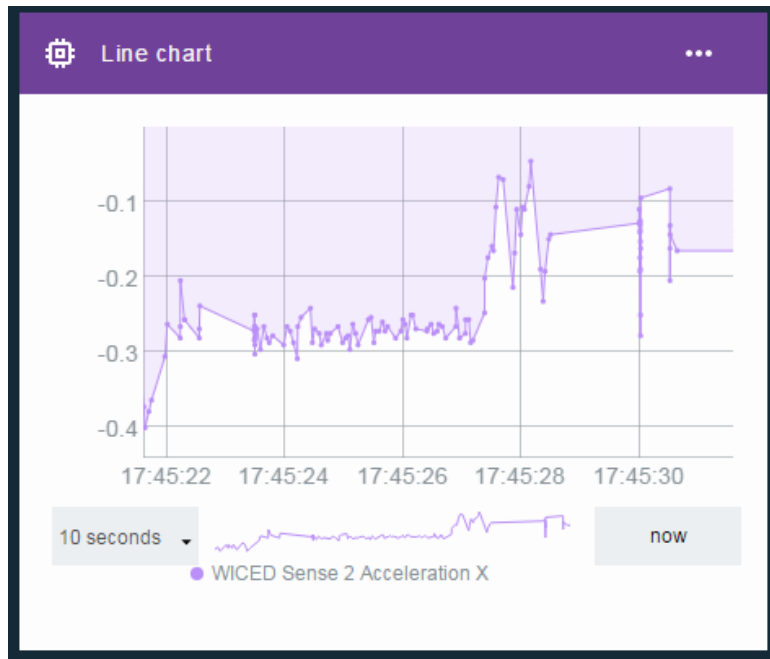


10. Verify! - Using Custom Dashboard Display

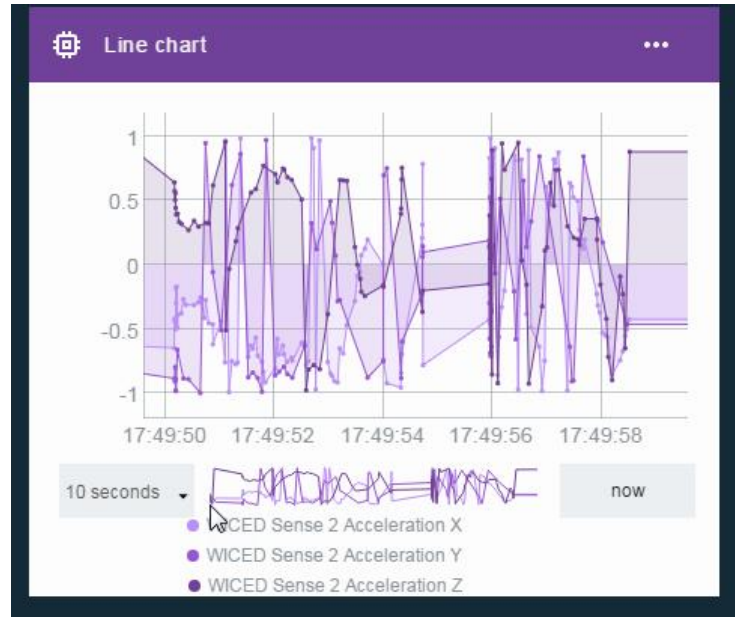
- a. Press the reset button on the board to reboot the program if you had stopped it earlier.
- b. Be sure to change the timing increments of your chart to 10 seconds for better accelerometer reading display.



- c. Try applying a light on the light sensor of the Avnet board to test your dashboard display!



11. Challenge! Try to figure out how to display multiple data plots on one chart.



#### LINKS:

##### Avnet BCM4343W IoT Starter Kit:

<http://cloudconnectkits.org>

##### WICED Sense 2 BLE Tag

<http://www.cypress.com/documentation/development-kitsboards/bcm9wicedsense2-evaluation-and-development-kit>

##### ZentriOS SDK Download:

<https://docs.zentri.com/wifi/sdk/latest/user-guide/getting-started>

##### IBM Bluemix Console Page

<https://new-console.ng.bluemix.net/>

## Author: Bryan Chen



With a passion for robotics and home automation, Bryan is a part-time EE/CS intern within Avnet's engineering team, while busy with full-time final year UCLA Electrical Engineering studies, focused on signals and systems.

He is a key contributor of reference designs, having published multiple applications using Avnet's versatile BCM4343W Wi-Fi & BT/BLE SoC module, taking-on challenging connectivity designs with BLE, cloud platforms and Alexa voice interfacing.

# Revision History

Date	Version	Revision
20 June 17	01	Initial Release