

# How to Build a Public Cloud with MX-AOPC UA Server and Logger

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Released on April 14, 2017

### About Moxa

Moxa is a leading provider of edge connectivity, industrial networking, and network infrastructure solutions for enabling connectivity for the Industrial Internet of Things. With over 30 years of industry experience, Moxa has connected more than 50 million devices worldwide and has a distribution and service network that reaches customers in more than 70 countries. Moxa delivers lasting business value by empowering industry with reliable networks and sincere service for industrial communications infrastructures. Information about Moxa's solutions is available at [www.moxa.com](http://www.moxa.com).

### How to Contact Moxa

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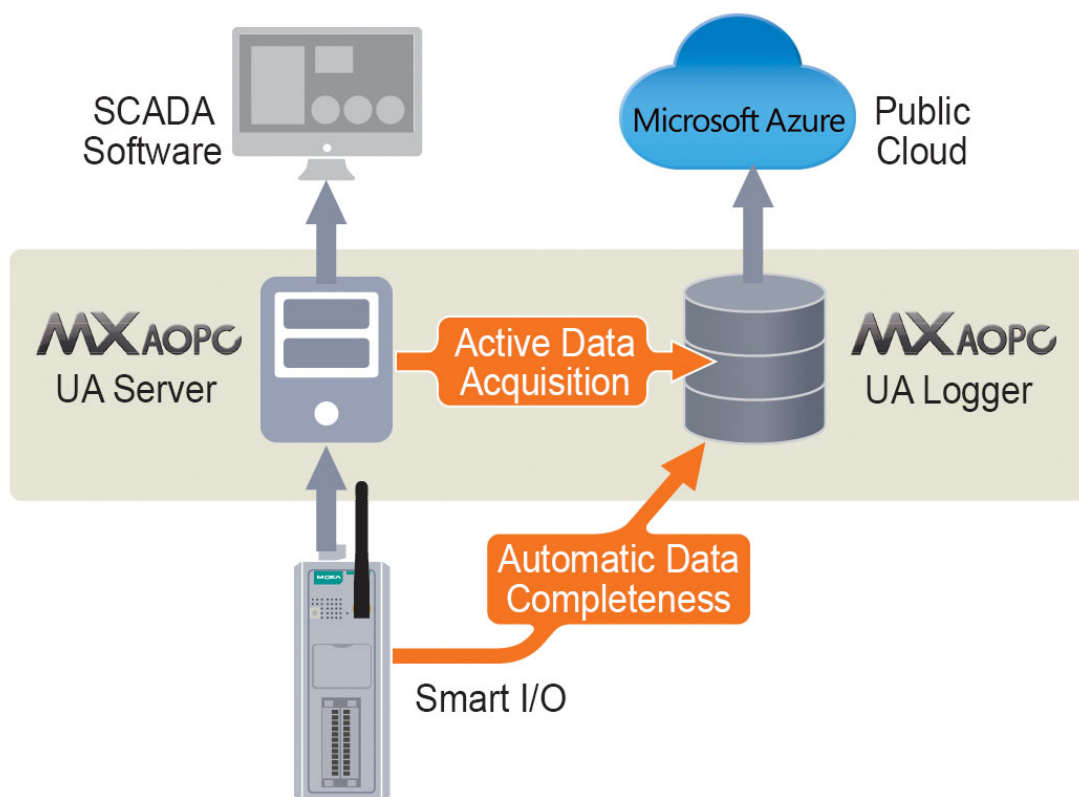
**MOXA**<sup>®</sup>  
Reliable Networks ▲ Sincere Service

## Connecting Your Devices to the Cloud

Public clouds provided by third-party cloud service providers, such as Microsoft Azure, give companies ready access to online servers, data storage, and applications.

Moxa's MX-AOPC UA Server and MX-AOPC UA Logger employ a tag-centric service that makes it easy to connect I/O devices to a public cloud. A tag-centric service represents each I/O value and the status of each I/O device with a unique tag. Tags can be easily sent to the MX-AOPC UA Server for use by a SCADA system, or to a private or public cloud for storage and further analysis.

With MX-AOPC UA Server and MX-AOPC UA Logger, connecting remote field site I/O devices to the cloud can be done easily.



Take the following five steps to build your own cloud service:

1. **Install MX-AOPC UA Server and UA Logger on your PC**
2. **Configure your Moxa I/O device to send tags to MX-AOPC UA Server**
3. **Apply for an Azure account**
4. **Send data to Azure**
5. **Process data in Azure and create a Power BI dashboard**

## **1. Install MX-AOPC UA Server and Logger on your PC**

The MX-AOPC UA Server and MX-AOPC UA Logger software can be downloaded for free from Moxa's website:

Software download page:

[http://www.moxa.com/product/MX-AOPC\\_UA\\_Suite.htm](http://www.moxa.com/product/MX-AOPC_UA_Suite.htm)

Latest software versions:

- MX-AOPC UA Server v1.6
- MX-AOPC UA Logger v1.1

Refer to the user's manuals for MX-AOPC UA Server and MX-AOPC UA Logger for step-by-step installation instructions:

User's manual download page:

[http://www.moxa.com/support/sarch\\_result.aspx?prod\\_id=3049&type\\_id=7&type=doc](http://www.moxa.com/support/sarch_result.aspx?prod_id=3049&type_id=7&type=doc)

User's manual titles:

- MX-AOPC UA Server User's Manual
- MX-AOPC UA Logger User's Manual

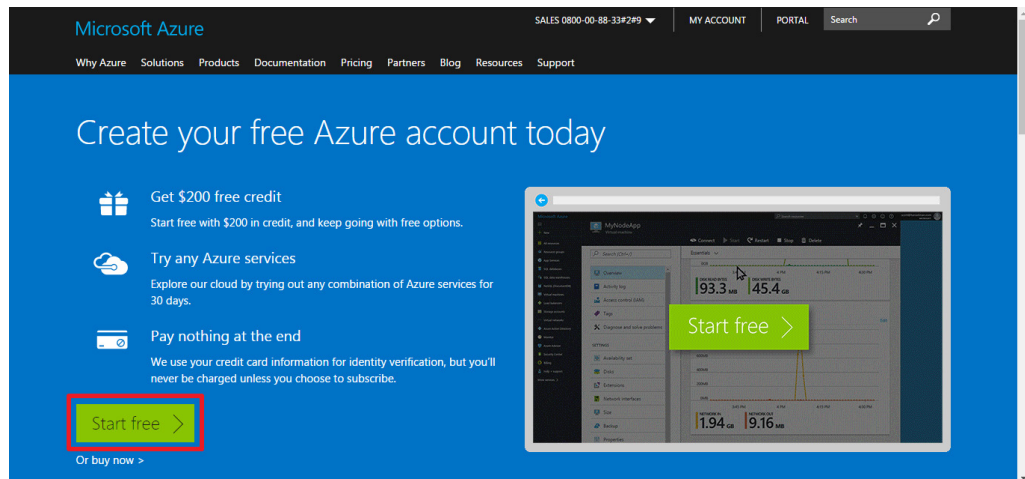
## **2. Configure your Moxa I/O device to send tags to MX-AOPC UA Server**

Since there are minor differences in how different Moxa I/O devices are configured, refer to the user's manual for your Moxa I/O device for information on how to configure the device to send tags to MX-AOPC UA Server.

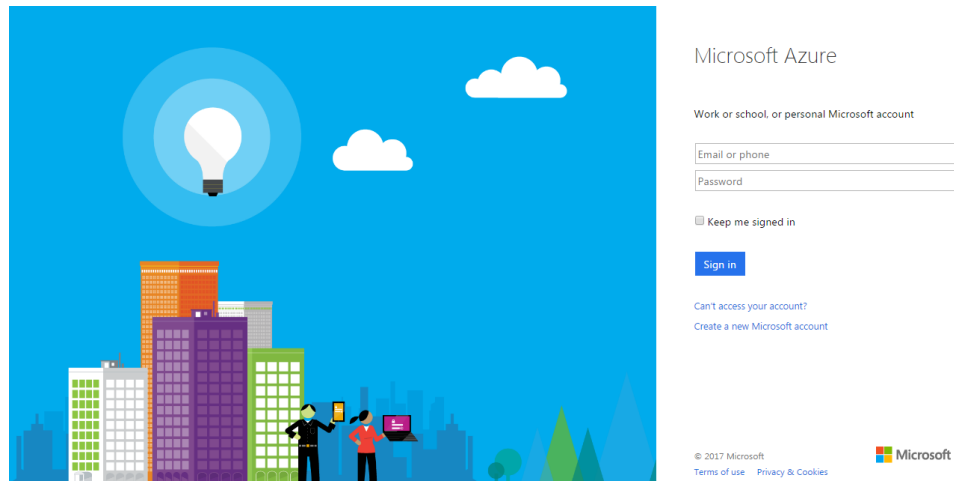
### 3. Apply for an Azure account

Take the following steps to apply for a free Microsoft Azure account.

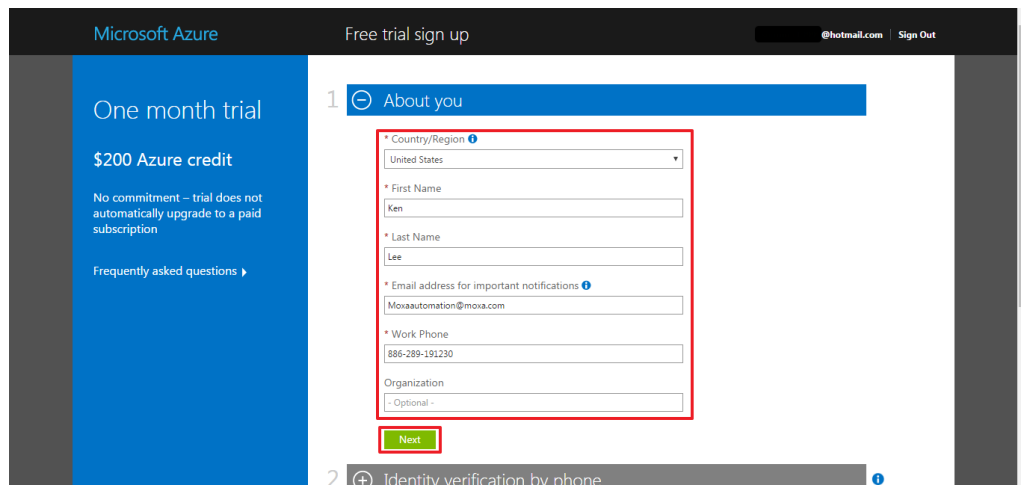
- Step 1. Click <https://azure.microsoft.com/en-us/free/?b=17.09c> to link to the Microsoft Azure website and then click the **Start free** button near the bottom of the page.



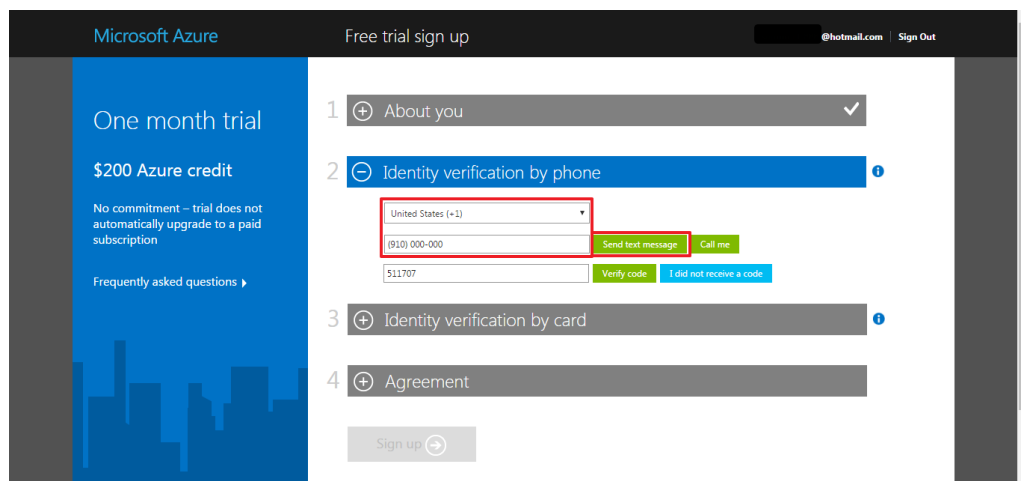
- Step 2. Sign in with an existing "Microsoft account" or click **Create a new Microsoft account** to proceed.



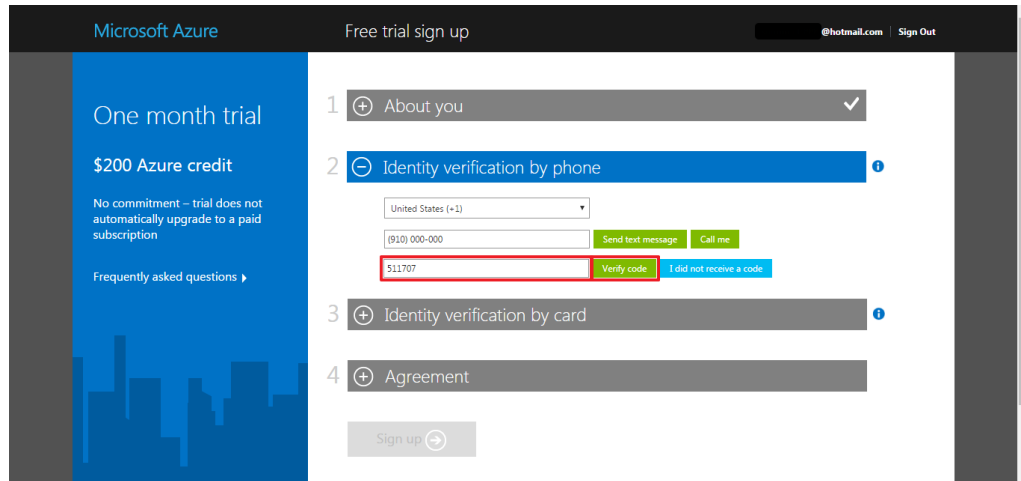
Step 3. Enter the required information under "About you" and then click **Next**.



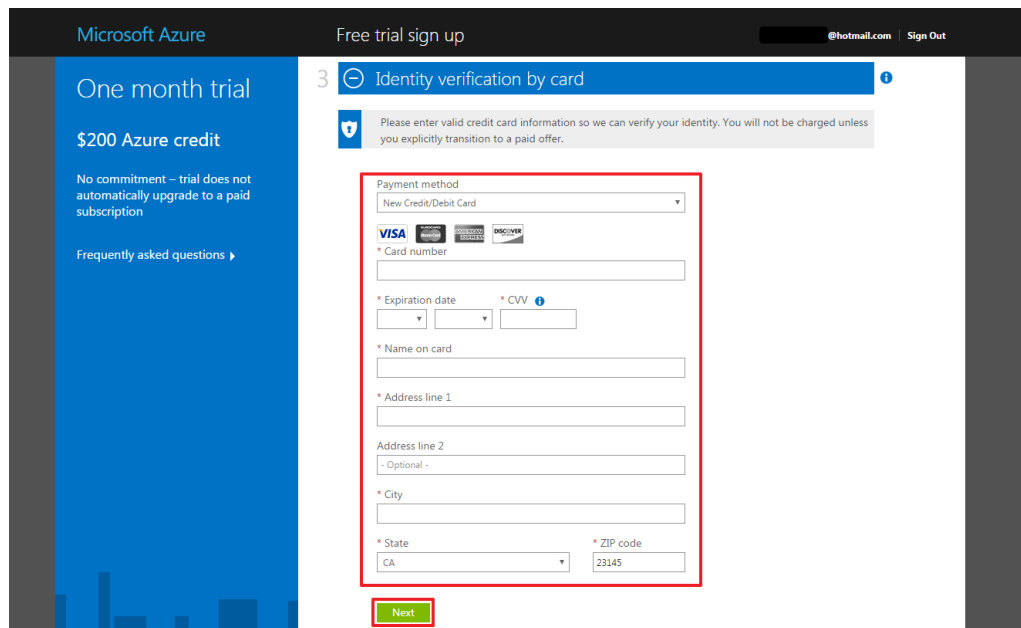
Step 4. Input your phone number under "Identity verification by phone" and then click **Send text message** or **Call me** to proceed. In this example, we are using the **Send text message** option.



Step 5. Microsoft will send a verification code to your phone. Enter the code in the box provided, and then click **Verify code**.

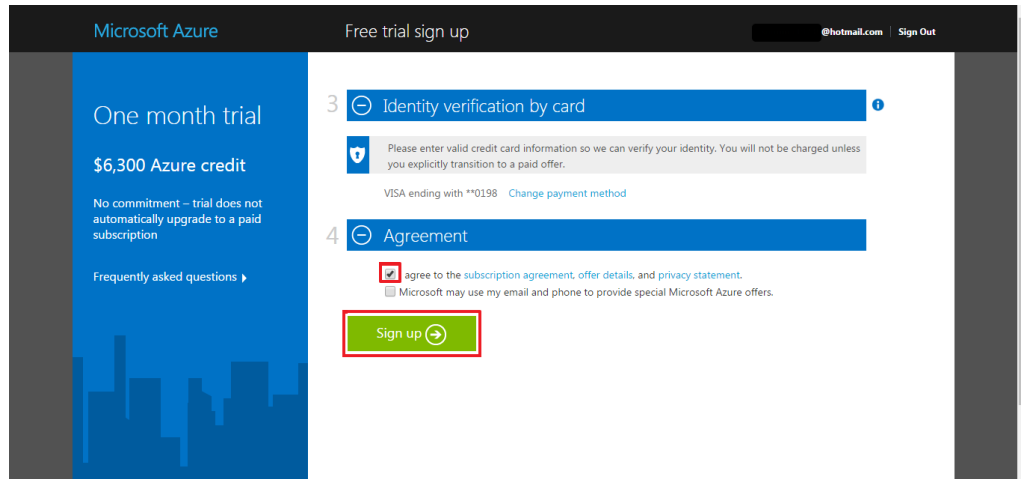


Step 6. Provide the required information under "Identity verification by card" and then click **Next**. Microsoft will not charge your credit card during the one-month trial period.

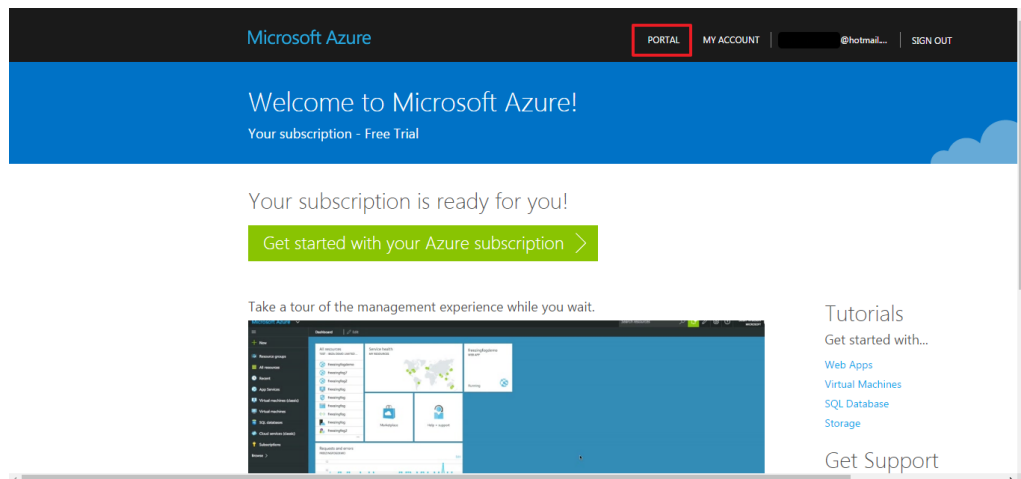


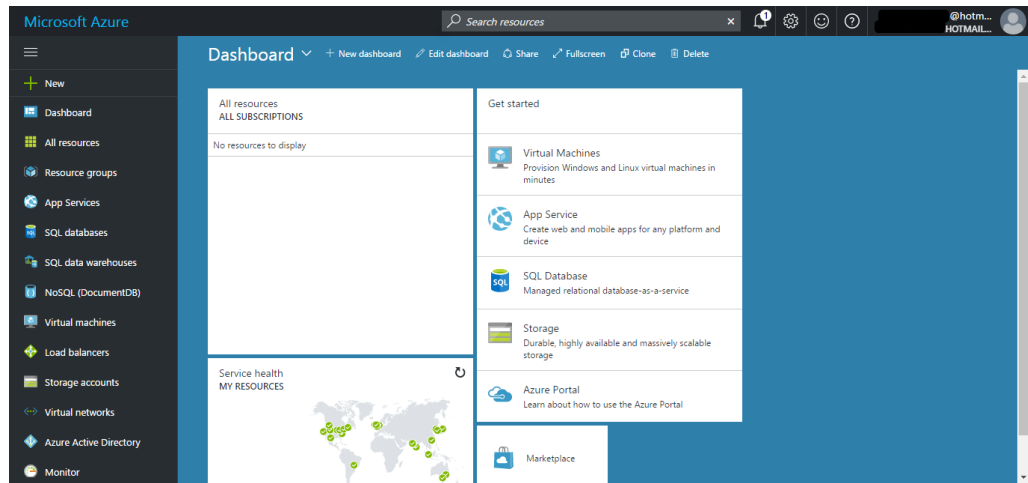
Step 7. Read the subscription agreement, and then select the “I agree to the subscription agreement, offer details, and privacy statement” checkbox. Click the **Sign up** button to request activation of your trial account.

*Note: Do not close or refresh the browser while your request is being processed.*



Step 8. When your subscription request has been approved, the browser should display a “Your subscription is ready for you!” message. Click the **PORTAL** button on the top toolbar to open your personal Azure page.

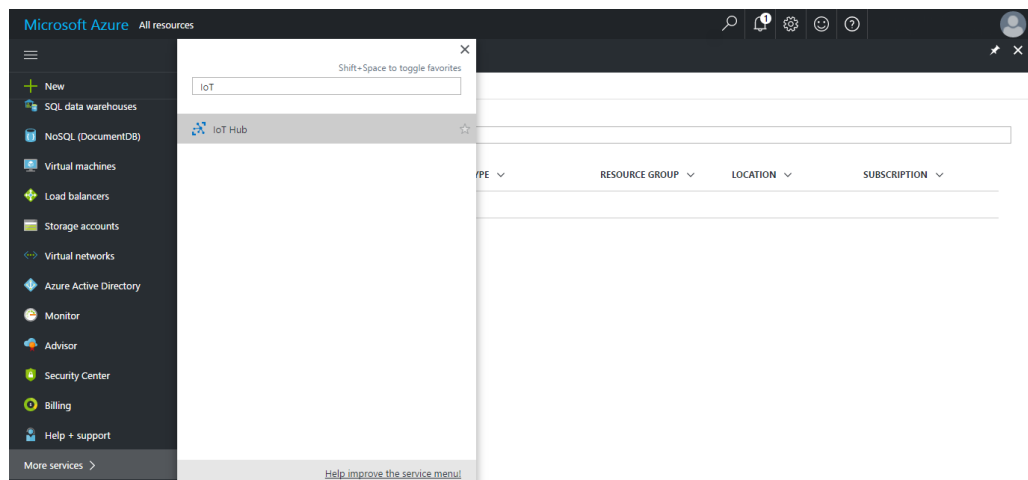




### 4. Send data to Azure

In order to send data to Azure, you need to create an "IoT Hub" service to receive the data, and then configure your MX-AOPC UA Server and MX-AOPC UA Logger to send data to the IoT Hub. Take the following steps to send your data to Azure.

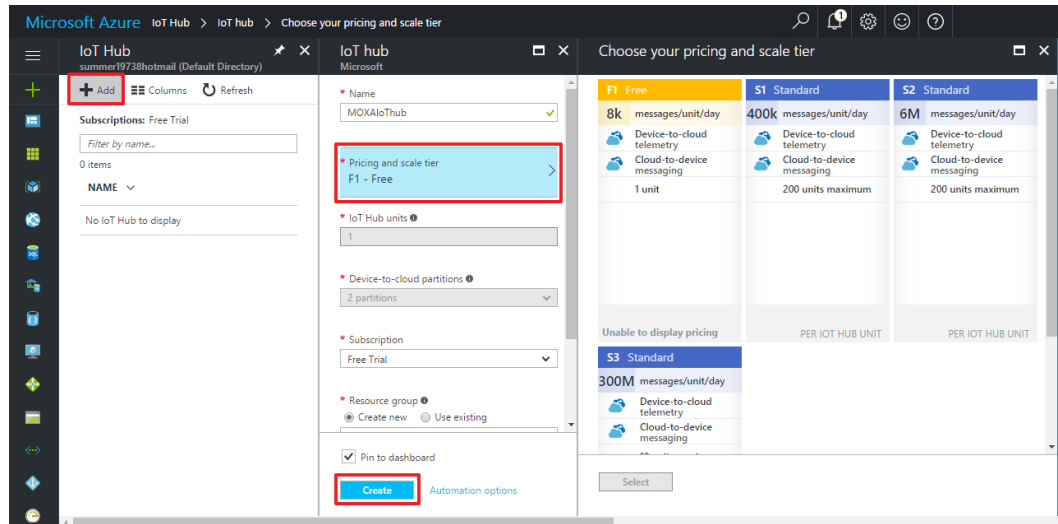
Step 1. Search for "IoT" to locate Azure's **IoT Hub** service.





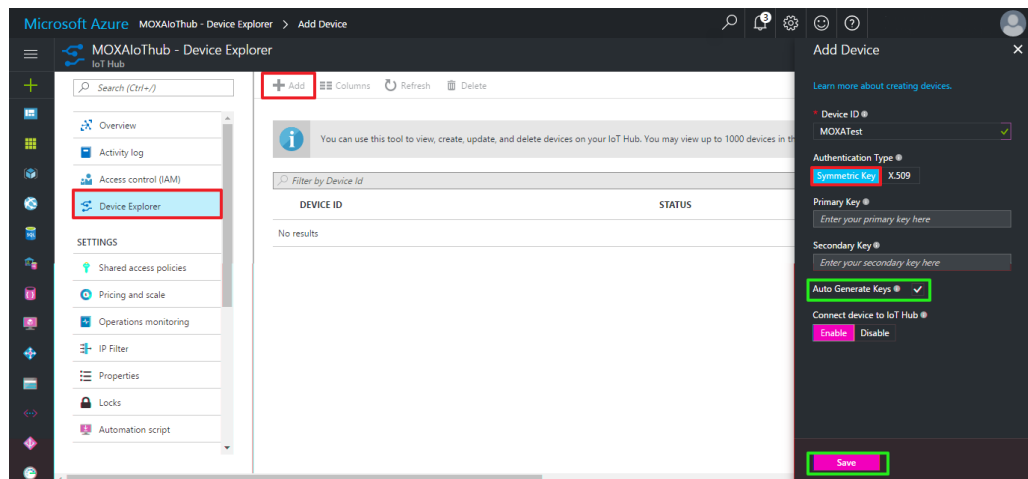
Step 2. Click the **+Add** button in the upper left corner of the browser window to add a new IoT Hub service, and then select the **F1 Free** pricing option under “Choose your pricing and scale tier.”

Click the **Create** button near the bottom of the window to proceed.



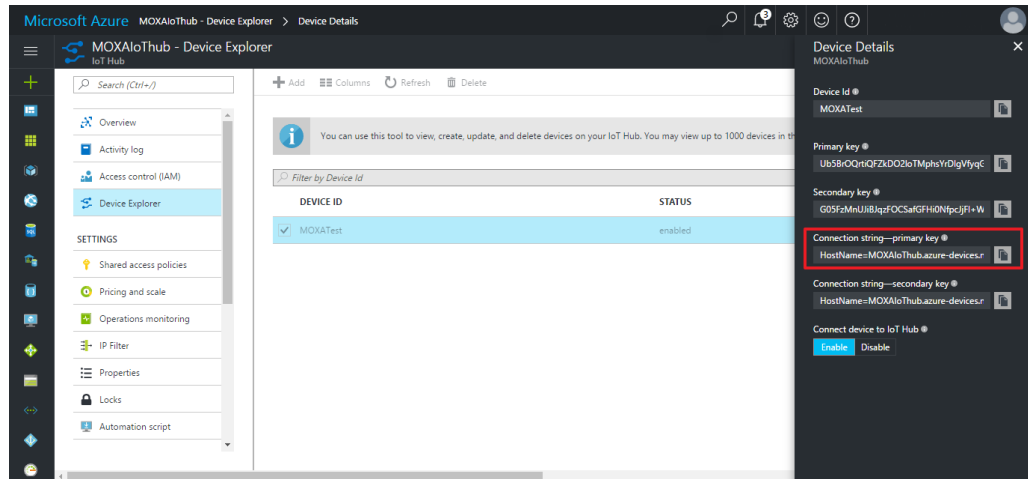
Step 3. Click **Device Explorer** in the left menu of your newly created IoT Hub Service, and then add a new device. The “Add Device” section is located on the far right side of the browser window.

Click the **Save** button at the bottom of the window to save your settings.

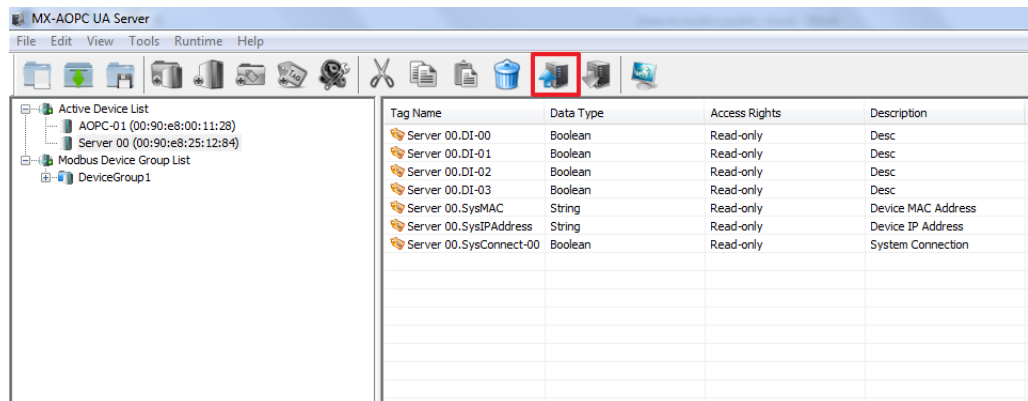


Step 4. Your new device will be listed under "DEVICE ID" in the middle panel of the browser window. Select the checkbox in front of the device name, and then copy the "Connection string—primary key" located in the right panel. You will need this connection string when you configure MX-AOPC UA Server to send data to your Azure account.

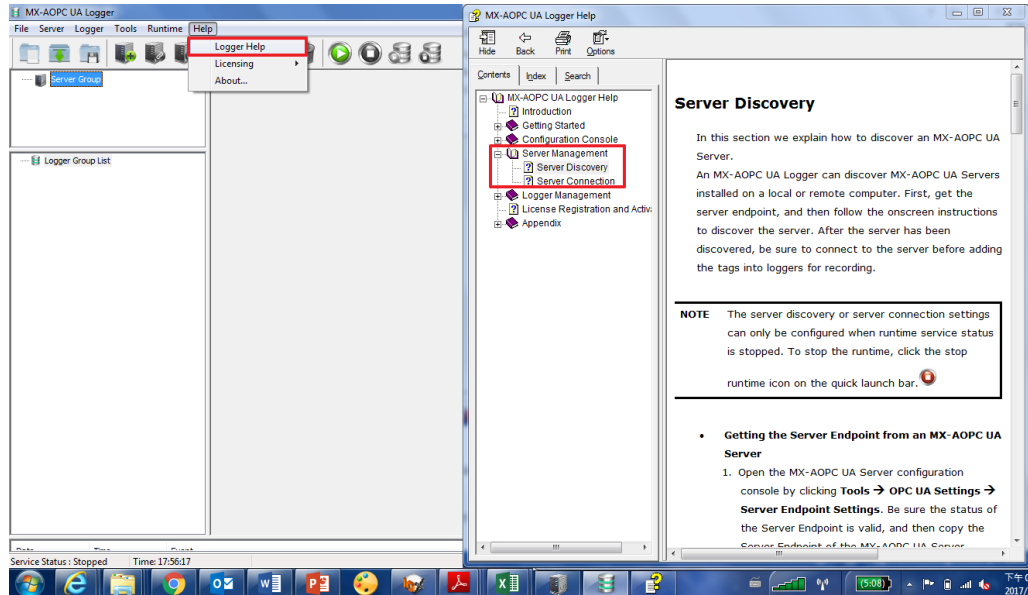
Azure is now ready to receive tags from MX-AOPC UA Server.



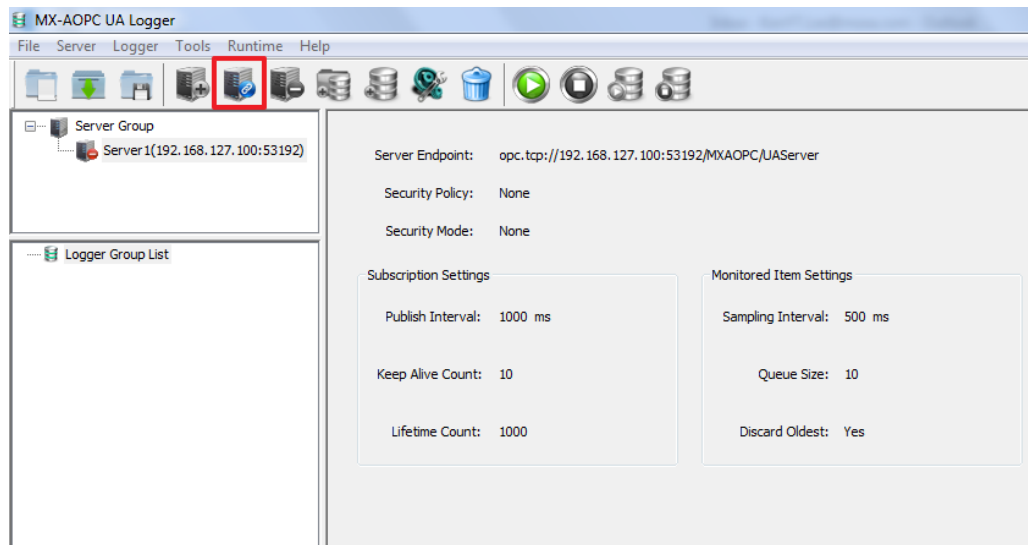
Step 5. Run MX-AOPC UA Server from your PC's start menu, and then click the "Get Configuration from Server" icon on the menu bar. Devices that are uploading tags to the server will be listed in the left panel, and the tags you configured in Step 2 above will be listed in the right panel.



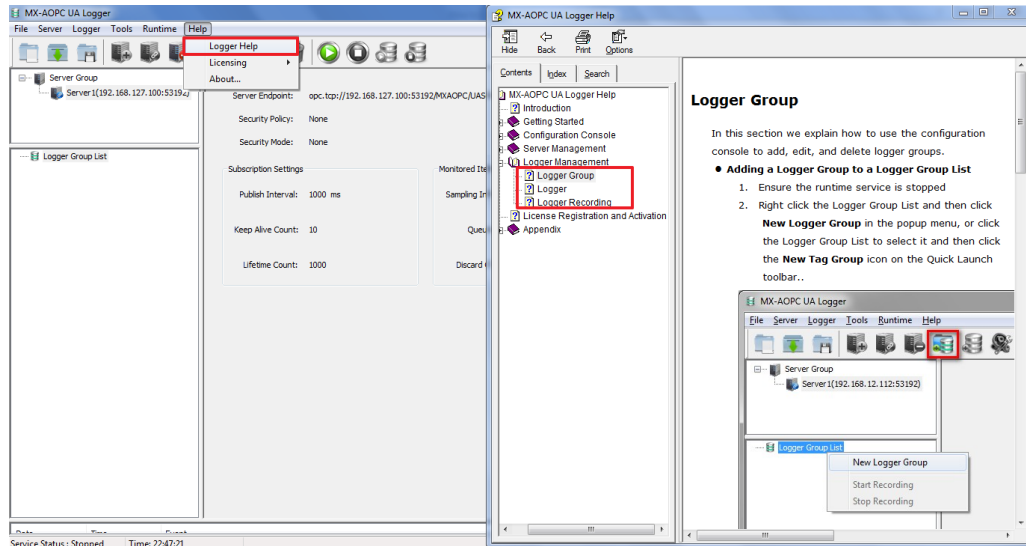
Step 6. Run MX-AOPC UA Logger from your PC's start menu, and then click **Help → Logger Help** from the top menu bar. Follow the instructions in the "Server Management" section to connect MX-AOPC UA Logger to MX-AOPC UA Server.



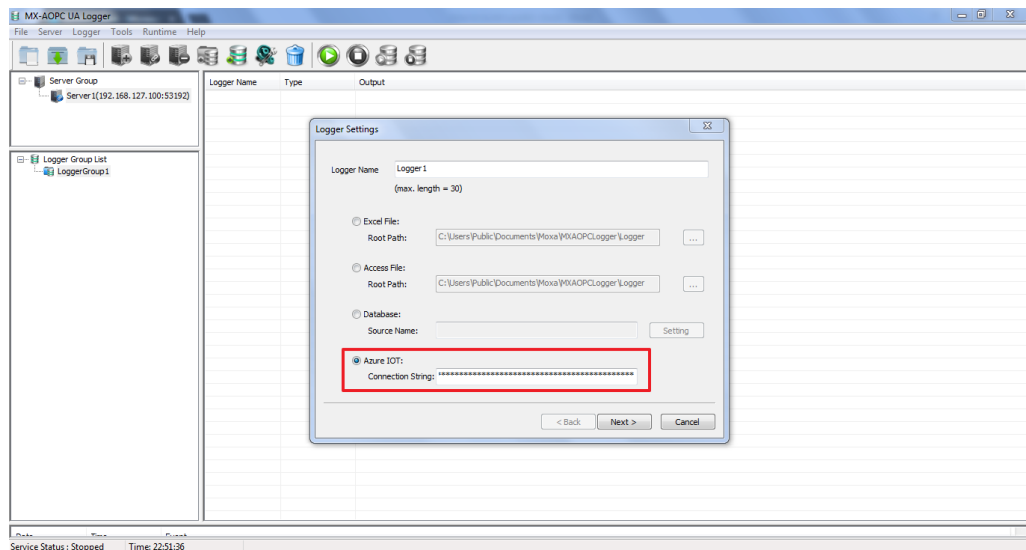
Step 7. Click the **Connect** icon on the top menu bar to connect to MX-AOPC UA Server.



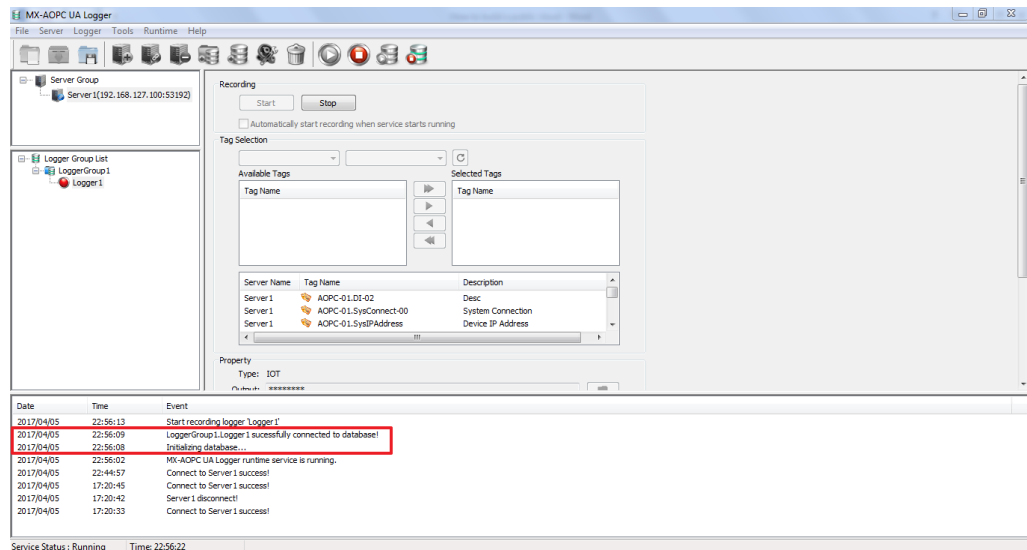
Step 8. Click **Help** → **Logger Help** on the top menu, and then follow the instructions in the “Logger Management” section to create a logger to send tags to your Azure public cloud.



Step 9. Select the “Azure IOT” option in the **Logger Settings** dialog and then paste in the connection string of the devices that you created in the Azure IoT Hub Service in Step 4.



Step 10. Refer to the Help section discussed in Step 8 above for instructions on how to select tags and on how to start the service and recording function. If Logger is successfully connected to Azure, “[Logger Group Name] [Logger Name] successfully connected to database!” should appear in the event log in the bottom panel of the MX-AOPC UA Logger window.



**Note: Open Source “Device Explorer” Utility**

An open source utility named “Device Explorer” can be used to monitor the updated tags in real time. The utility can be downloaded from the following web page:

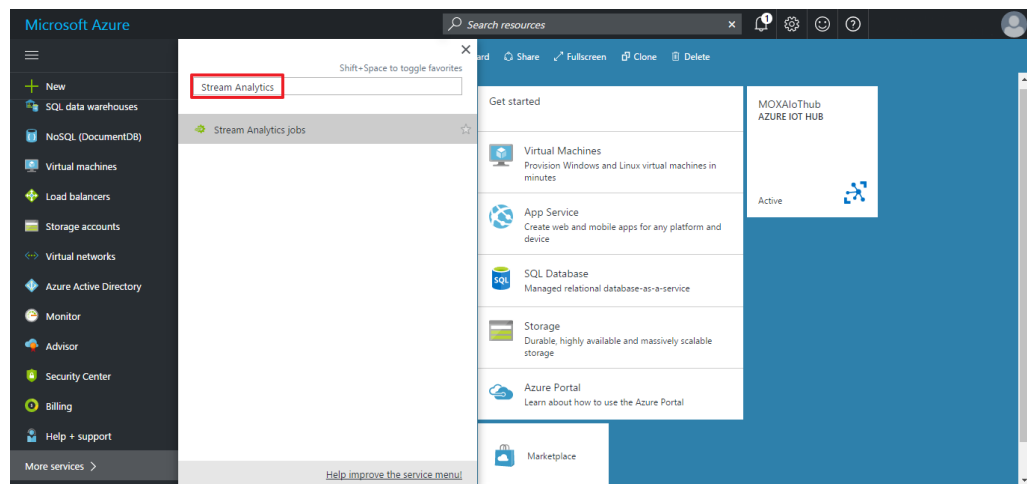
<https://github.com/Azure/azure-iot-sdk-csharp/tree/master/tools/DeviceExplorer>

## 5. Process data in Azure and create a Power BI dashboard

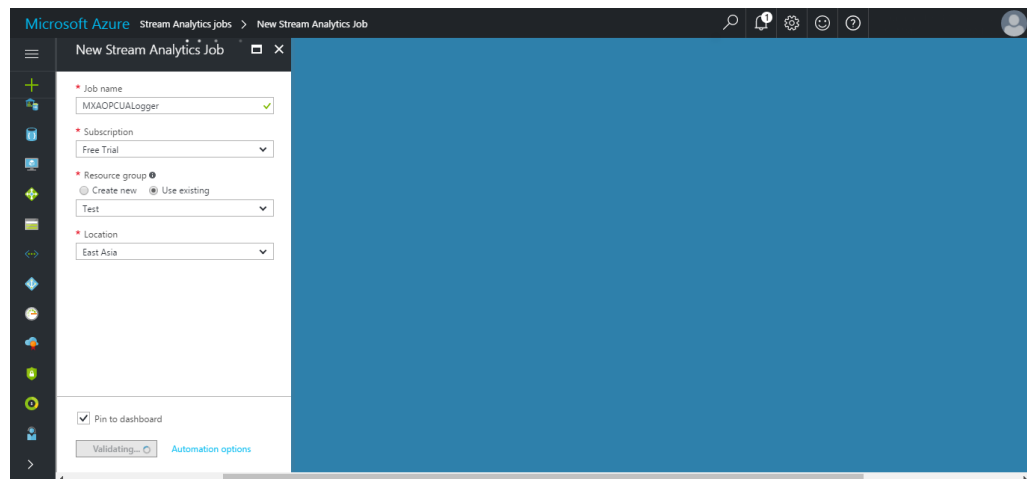
Use the "Stream Analytics jobs" and "Power BI" services to process the uploaded data and create a customized dashboard. "Stream Analytics jobs" is used to stream data from your IoT Hub to other services, such as the Power BI service, SQL Server, etc. The data can be stored in the cloud and then reused by other services. Below, we describe how to use "Power BI" to create a customized dashboard for displaying the data uploaded by MX-AOPC UA Logger.

Take the following steps to configure the "Stream Analytics jobs" and "Power BI" services:

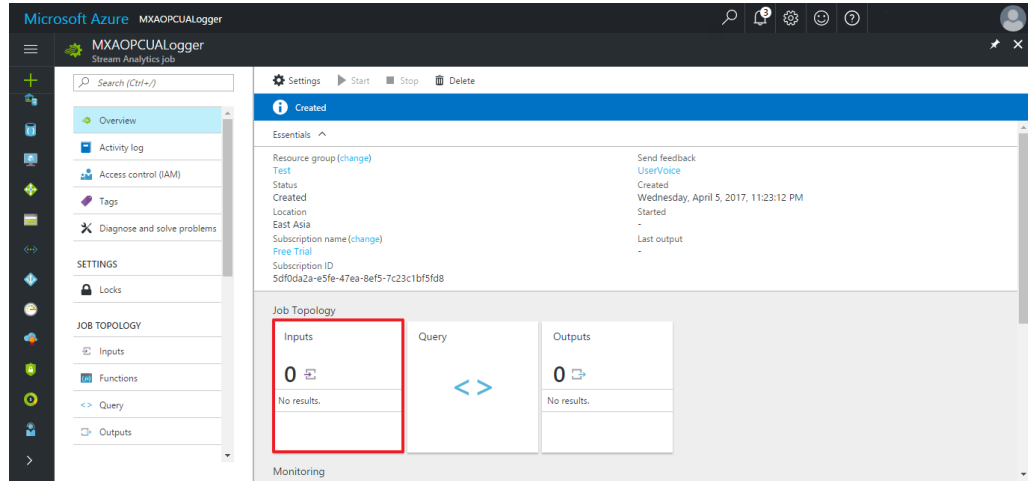
Step 1. Search for "Stream Analytics" to locate the Stream Analytics jobs service.



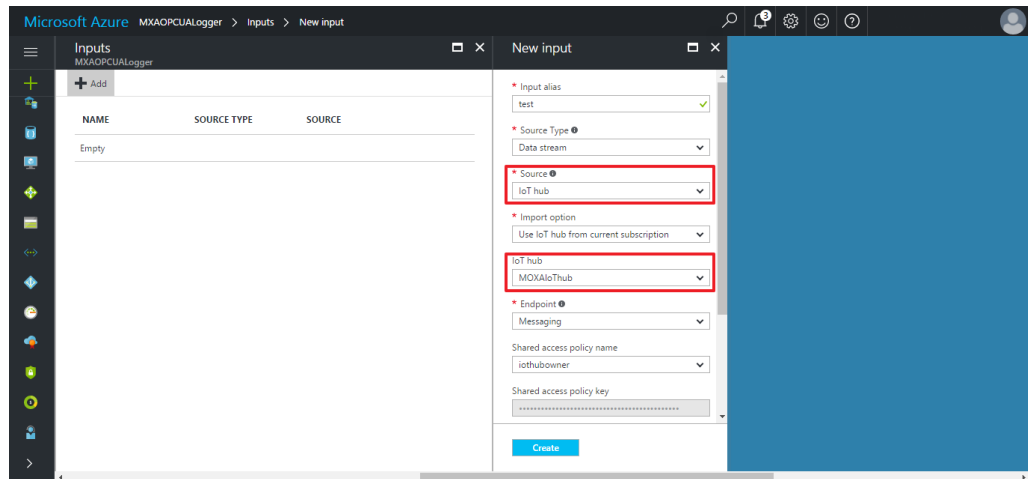
Step 2. Create a new Stream Analytics job.



Step 3. Click **Inputs** under “Job Topology” to assign your IoT Hub service as the data input source.

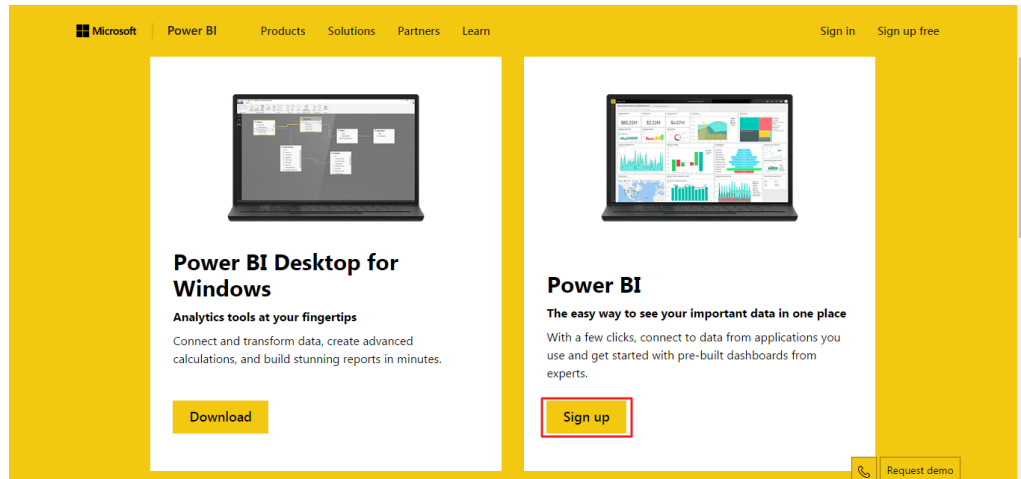


Step 4. Choose “IoT hub” from the “Source” dropdown list, and then select the IoT hub service you created from the “IoT hub” dropdown list.

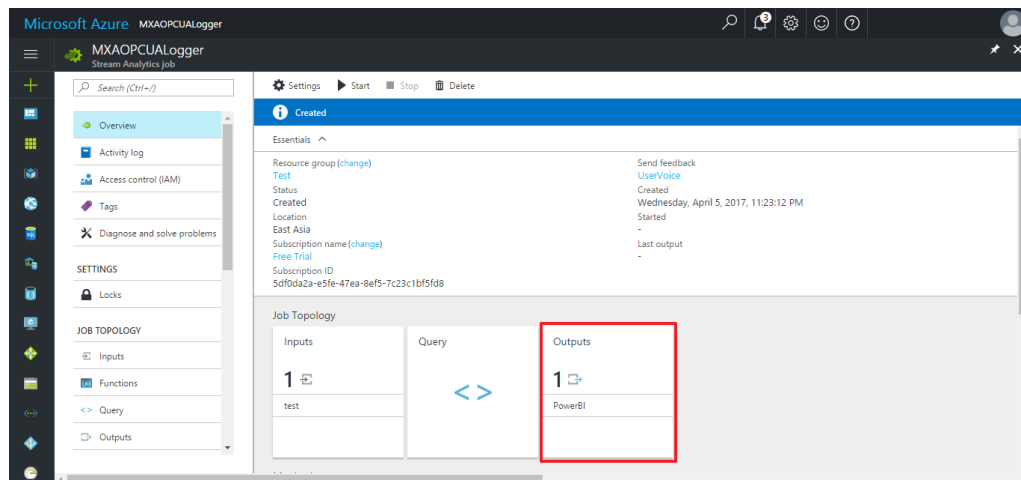


Step 5. Before configuring the Outputs for the Stream Analytics job, you first need to create a Power BI account in Azure. Click the following link and follow the onscreen instructions to sign up for Power BI:

<https://powerbi.microsoft.com/en-us/get-started/>.

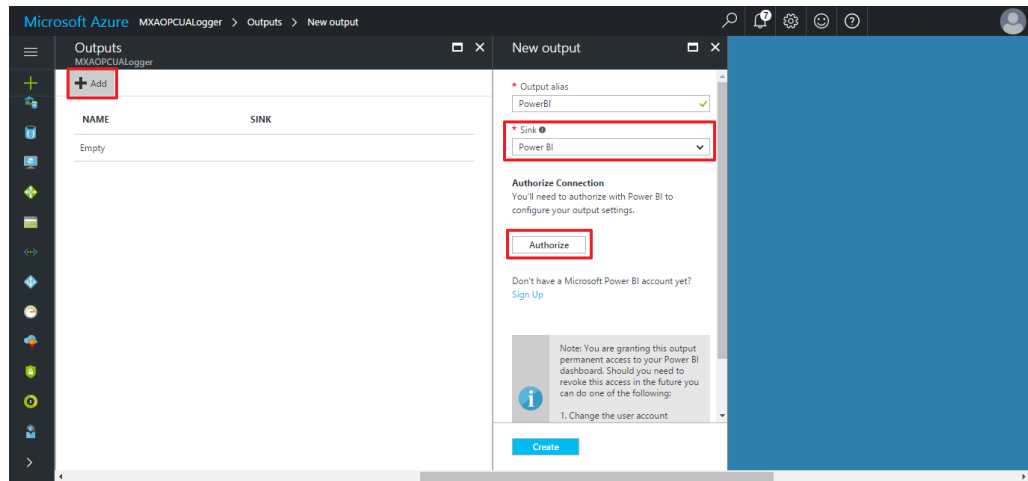


Step 6. Select Outputs under "Job Topology" to assign the data output sink. The data output sink is the Power BI service you will use to create your web dashboard.

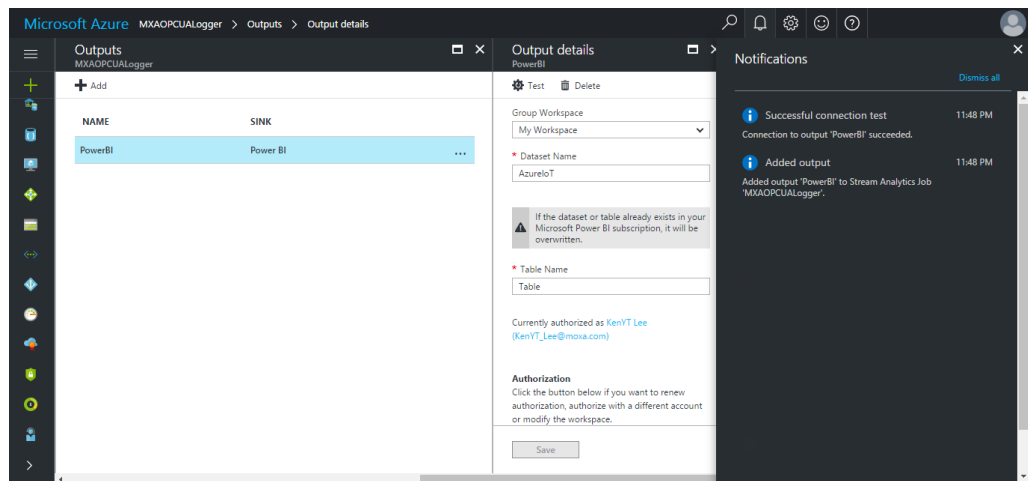




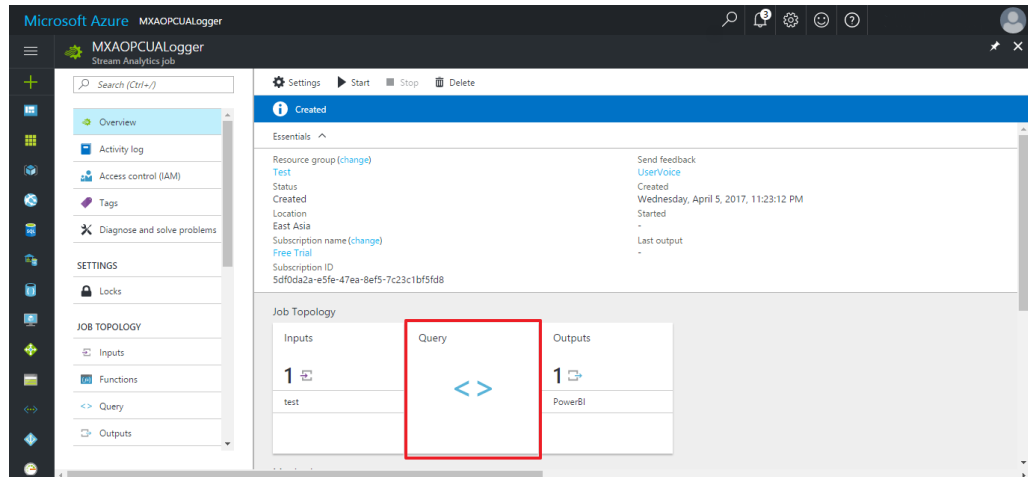
Step 7: Click Authorize and then log in with your Power BI account.



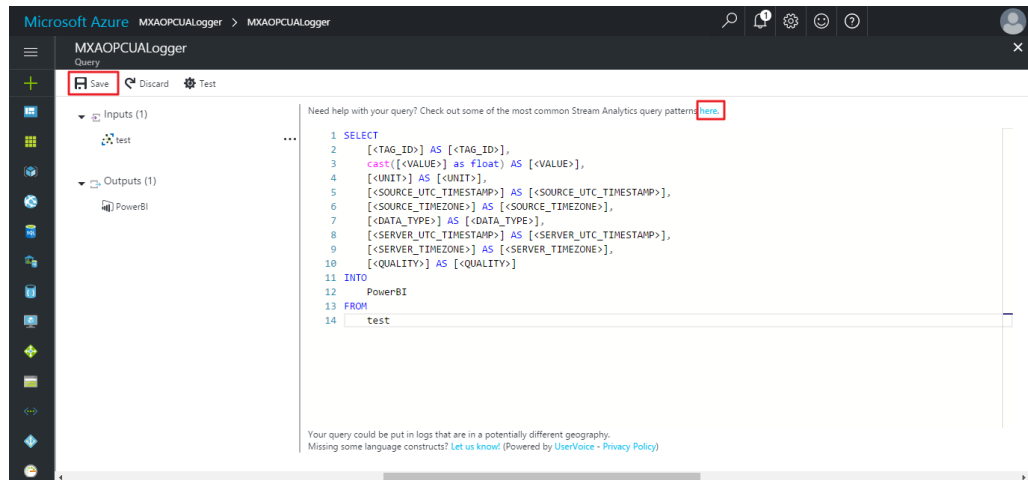
Step 8. Check the "Notifications" section in the right panel. If Power BI is configured correctly, you should see "Connection to output [Name of output] succeeded" under "Successful connection test."



- Step 9. Select **Query** under “Job Topology” to define the query between inputs and outputs. In this step, you will use the data fields you defined (e.g., SOURCE\_UTC\_TIMESTAMP) when you configured the Logger to send data to Azure.



- Step 10. Click **Save** to save your Query settings. To view additional instructions on how to define a Query, click the **here** link above the Query listing.



The sample Query shown in the above screenshot is listed below. Note that the content of the SELECT statement depends on the data field you chose when you configured your logger. Before saving the Query, first remove parts of the statement that are not needed. For example, if you do not want to display the <server time zone> field on your dashboard, remove the line

```
[<SERVER_TIMEZONE>] AS [<SERVER_TIMEZONE>],
```

from the Query statement.

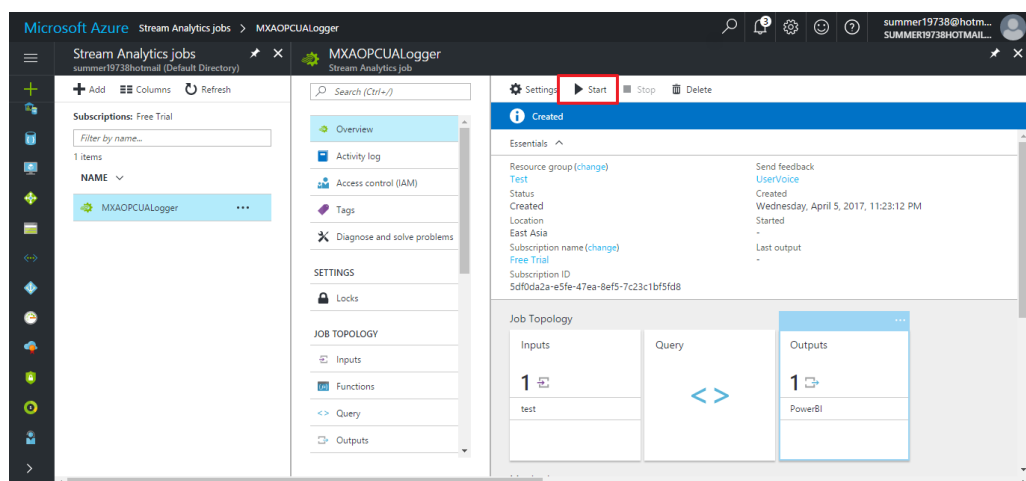
```
SELECT
    [<TAG_ID>] AS [<TAG_ID>],
    cast([<VALUE>] as float) AS [<VALUE>],
    [<UNIT>] AS [<UNIT>],
    [<SOURCE_UTC_TIMESTAMP>] AS [<SOURCE_UTC_TIMESTAMP>],
    [<SOURCE_TIMEZONE>] AS [<SOURCE_TIMEZONE>],
    [<DATA_TYPE>] AS [<DATA_TYPE>],
    [<SERVER_UTC_TIMESTAMP>] AS [<SERVER_UTC_TIMESTAMP>],
    [<SERVER_TIMEZONE>] AS [<SERVER_TIMEZONE>],
    [<QUALITY>] AS [<QUALITY>]
INTO
    PowerBI
FROM
    test
```

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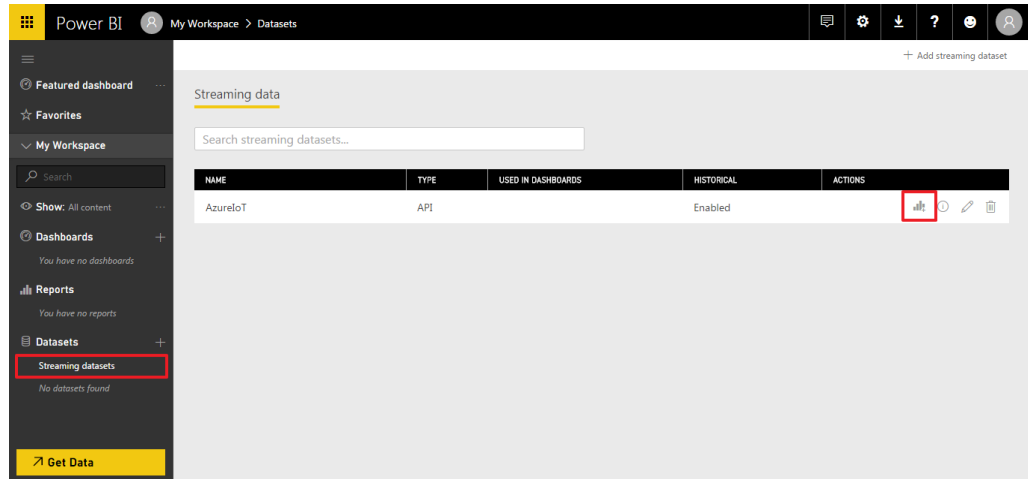
**Note:** The VALUE data field needs to be converted from string data type to floating data type to allow Power BI to recognize the value as a floating data type.

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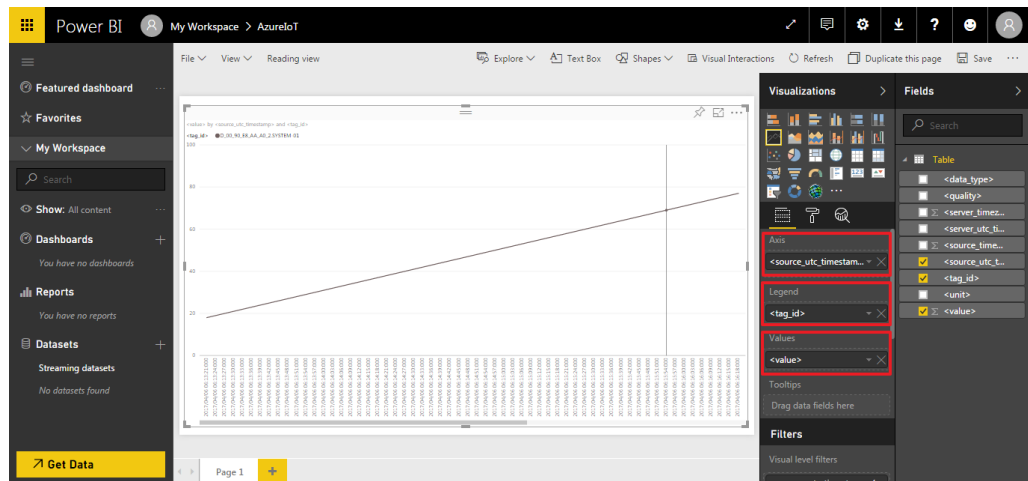
Step 11. Click **Start** to run the Stream Analytics job.



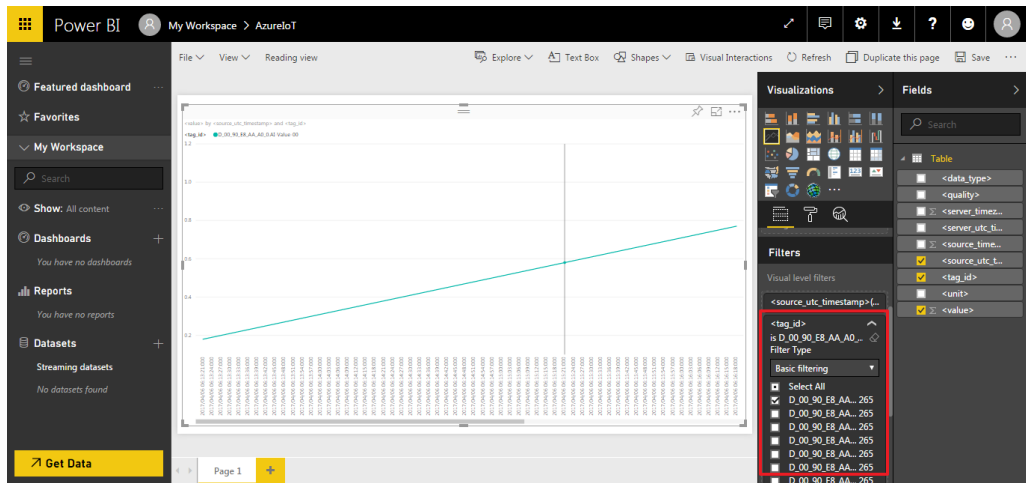
Step 12. Click **Streaming datasets** in the left panel of the Power BI console to view the item you are streaming, and then click the **Create report** icon under "ACTIONS" to create the dashboard charts.



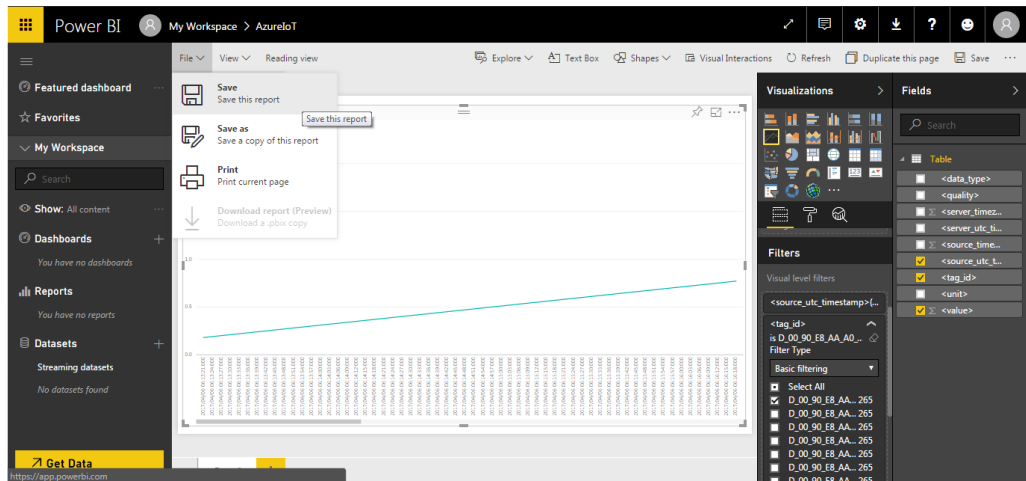
Step 13. Select the "Visualizations" you would like to display from the menu in the right panel, and then select which data fields you would like to match to the available domains. For example, to show a time-value relationship, you could match <source\_utc\_timestamp> to the Axis domain, <tag\_id> to the Legend domain, and <value> to the Values domain.



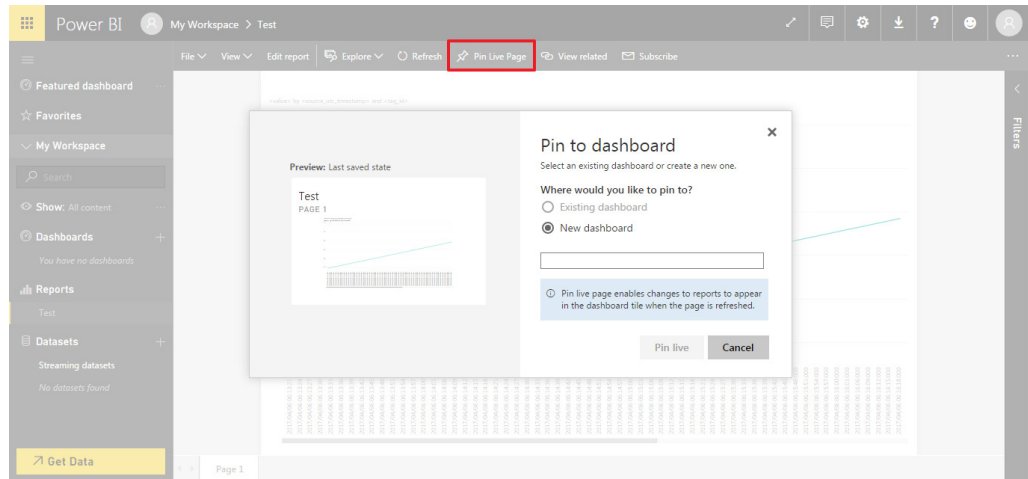
Step 14. Use the "Filters" tool to select which <tag\_id> items will be shown on the chart.



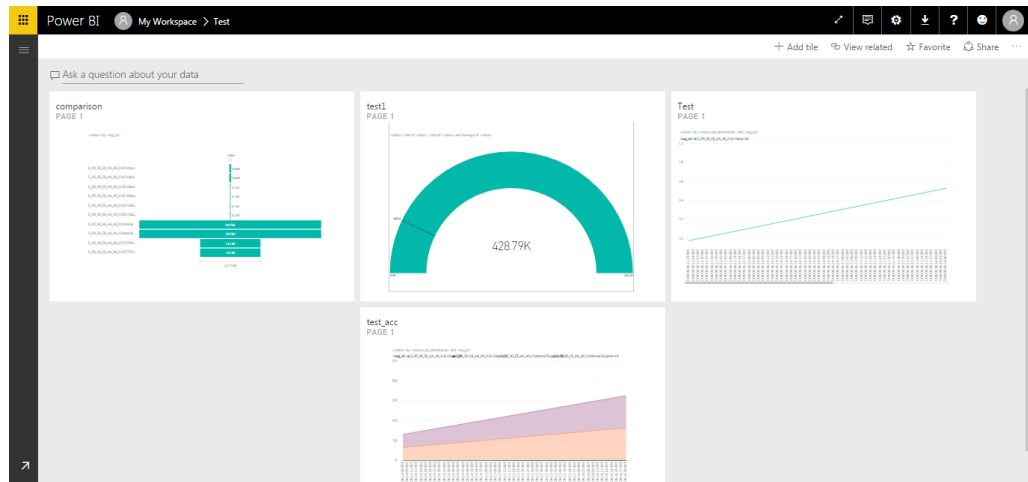
Step 15. Click **Save** to save the report. Once saved, the report will appear under "Reports" in the left menu.



Step 16. Under "Reports" in the left menu, click the name of the report you just saved, and then click "Pin to dashboard" to pin the report to the dashboard that will be accessible from your public cloud.



Step 17. To complete the configuration of your web dashboard, repeat Steps 11 to 15 for each of the reports you would like to pin to the dashboard.



**Note: Information for Advanced Users**

Azure supports various built-in services, such as Web App + SQL Server, that can be used to design customized dashboards accessible via your public cloud. Click the following link to view Microsoft Azure’s Web Apps Documentation:

<https://docs.microsoft.com/en-us/azure/app-service-web/>