## References

* Azure Stream Analytics <https://azure.microsoft.com/en-us/services/stream-analytics/>
* Azure Storage Account <https://azure.microsoft.com/en-us/services/storage/>
* Azure Blob Storage <https://azure.microsoft.com/en-us/services/storage/blobs/>
* Azure SQL Database <https://azure.microsoft.com/en-us/services/sql-database/>

## Requirements

* Must complete the first hands-on lab.
  + 2 simulated devices with C# and Node.js SDKs

## Goals

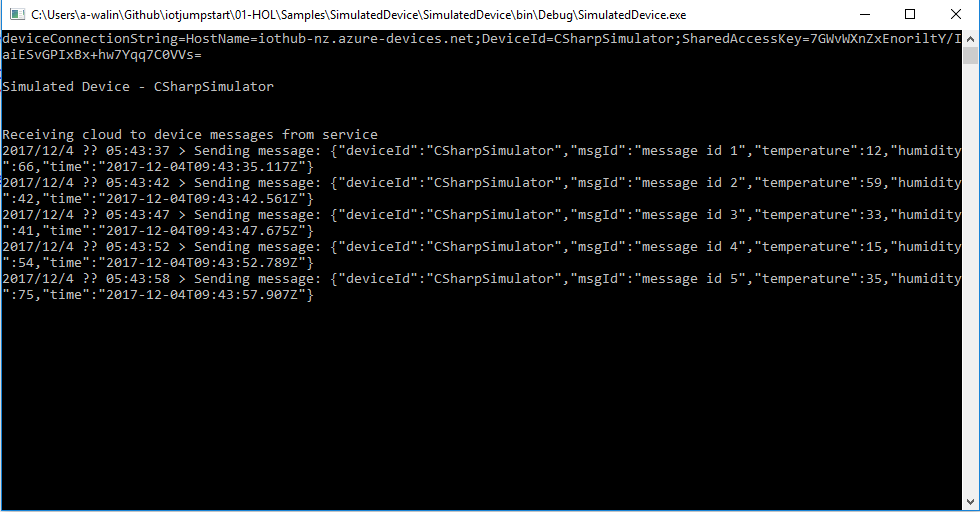
* Historic Data Processing in Azure Stream Analytics
  + Input

1. Get the telemetry data from IoT Hub
   * Output
2. Process the telemetry data into Azure SQL database.
3. Process the telemetry data into Blob Storage. (Container: telemetry)

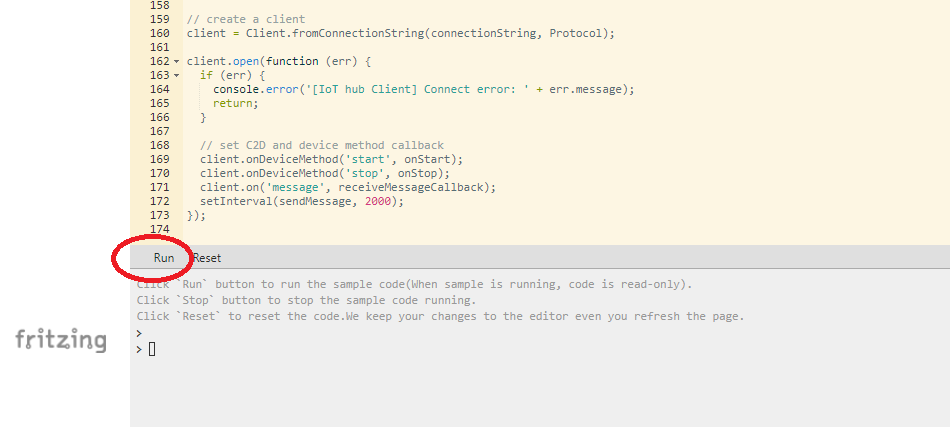
## Step 1: Run the simulated devices

* Run the executable file (SimulatedDevice.exe) or press F5 to debug in the Visual Studio.
  + The executable file should be located at

C:\Users\<username>\Documents\Visual Studio 2019\Projects\SimulatedDevice\SimulatedDevice\bin\Debug

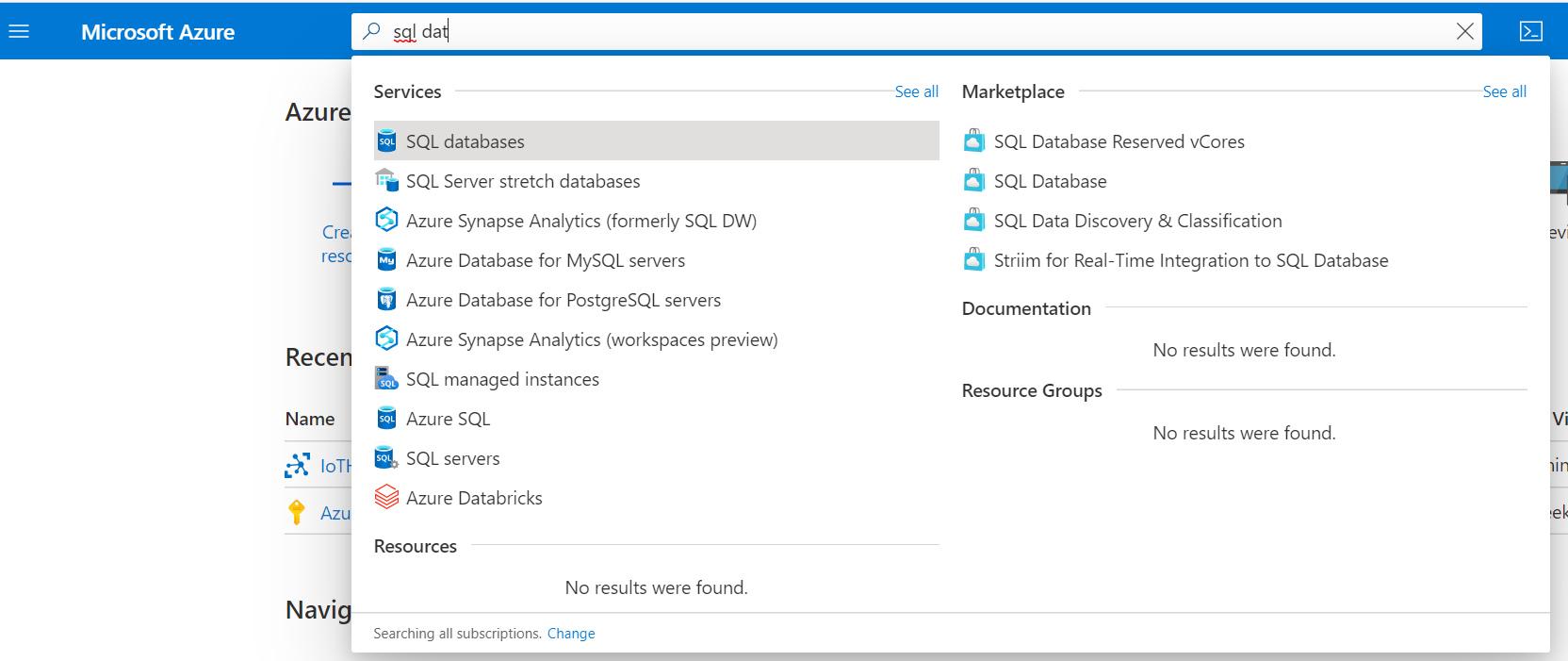


* Run your code on [Raspberry Pi Azure Online Simulator](https://azure-samples.github.io/raspberry-pi-web-simulator/).

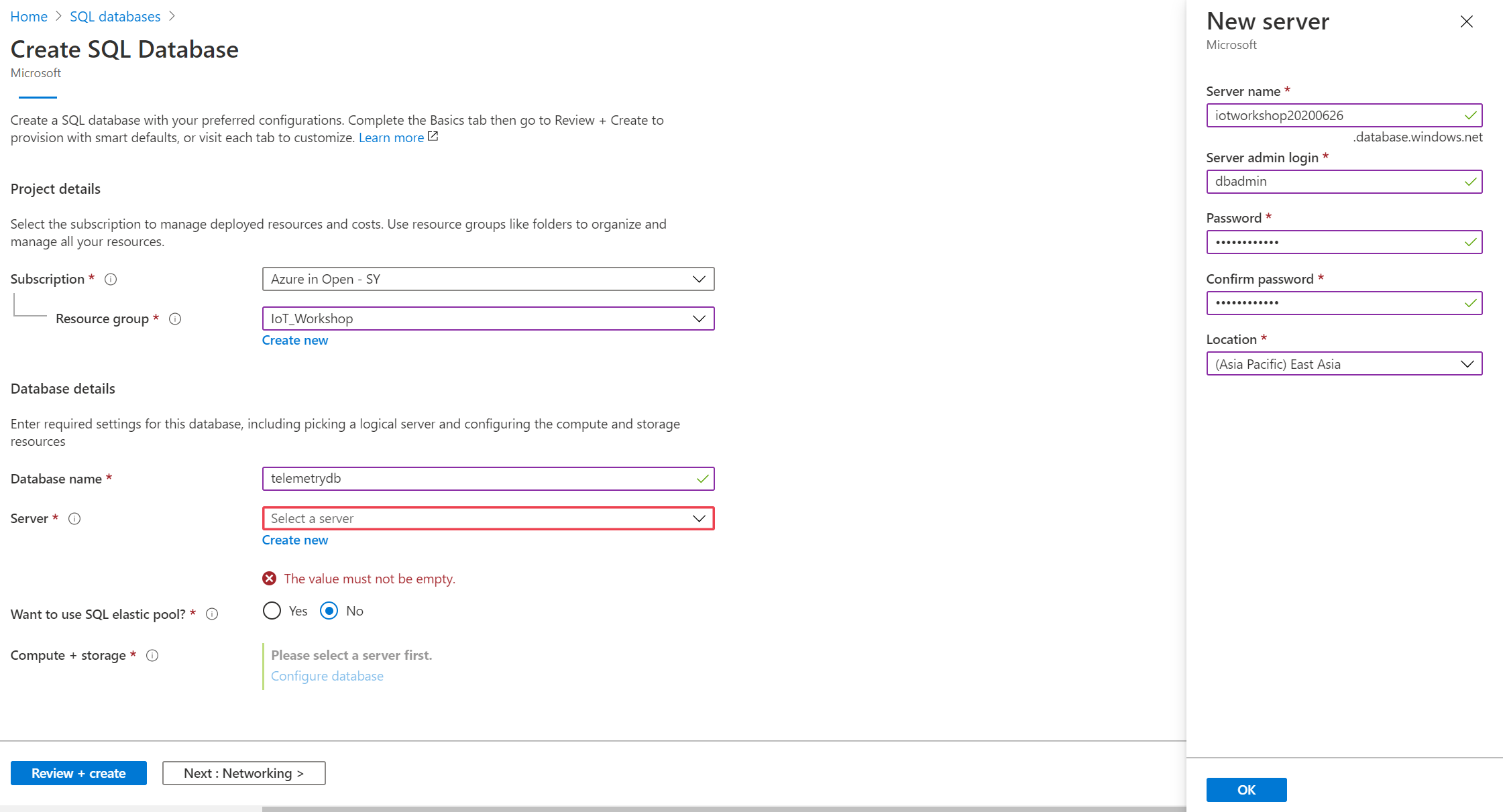


## Step 2: Create Azure SQL Database for the historic data

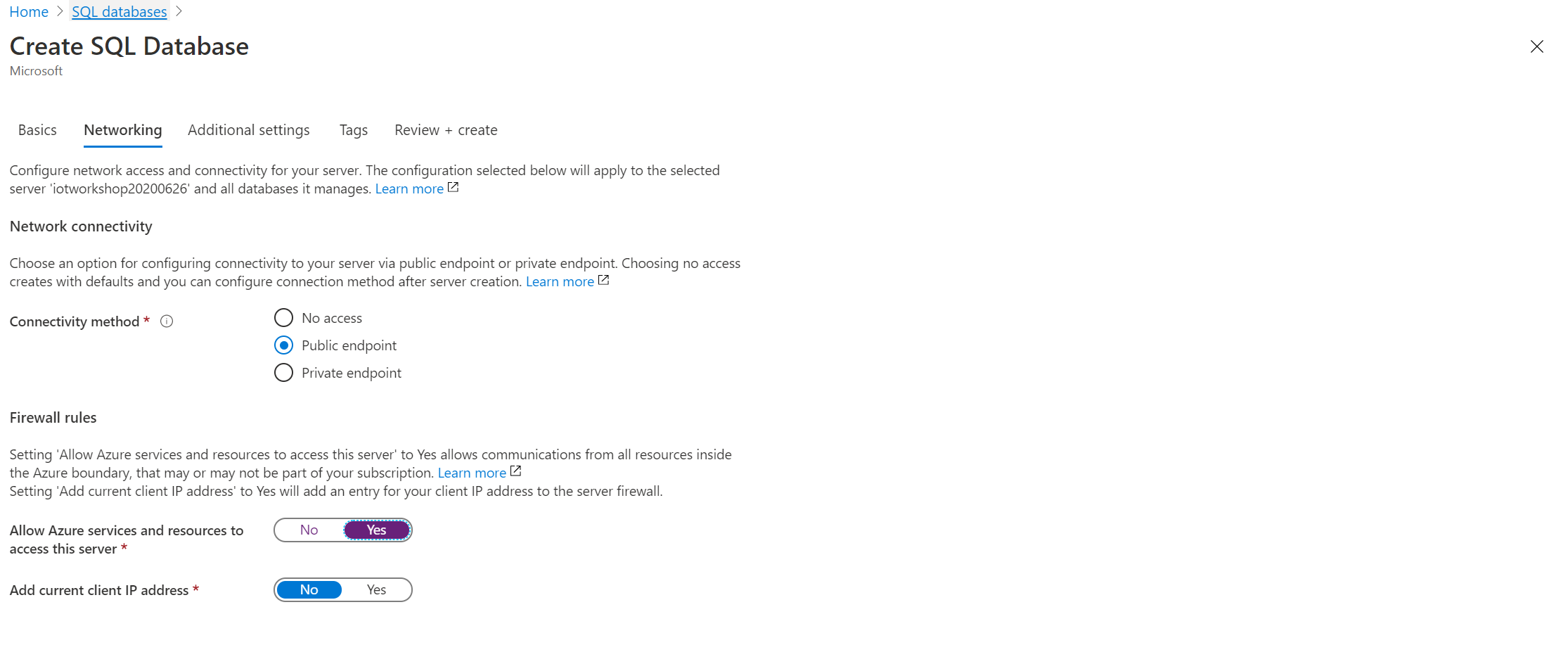
* Login Azure Portal <https://portal.azure.com>
* Search the **SQL Database**.



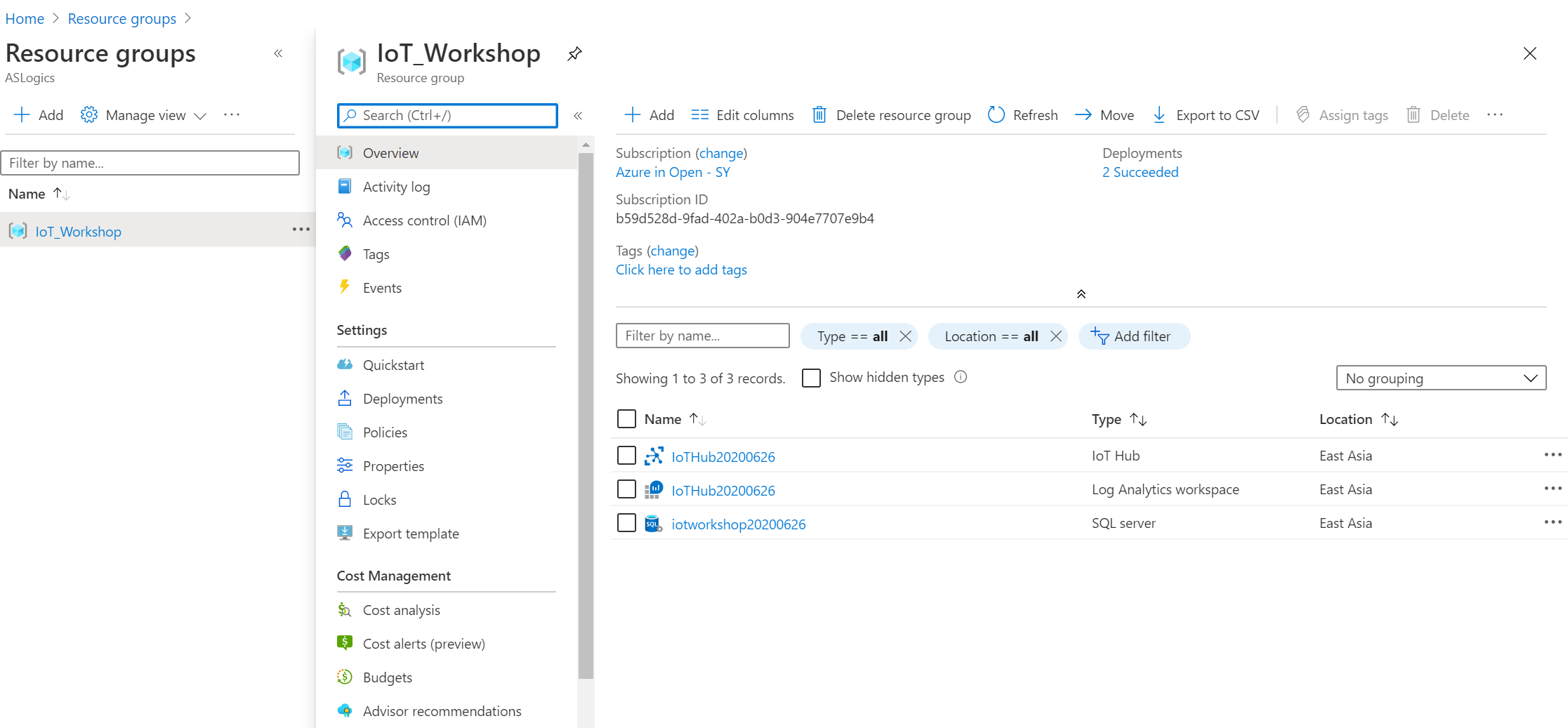
* Create the SQL Database
  + Database name: **telemetrydb (it must be fixed in this workshop)**
  + Select the same resource group
  + Source: **Blank database**
  + Server
    - Server name: **iotworkshop112101** (URL unique, for example)
    - Server admin login: **dbadmin** (for example)
    - Password: **demo1234567!** (for example)
    - Location: **East Asia**
  + Pricing Tier: **Basic** (Configure this in compute + storage)

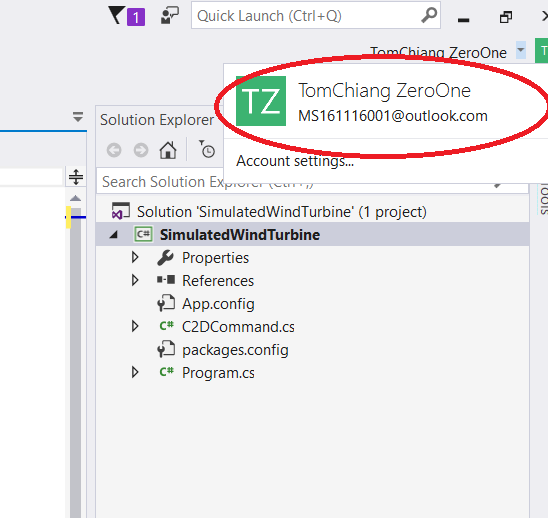
* + **Allow Azure services and resources to access this resource**



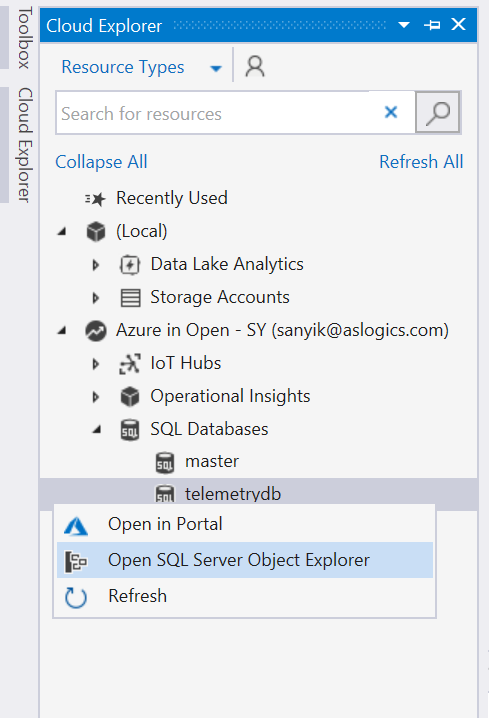
* + Wait for a few minutes to deploy it, then you can find the SQL Server and SQL database in your resource group.



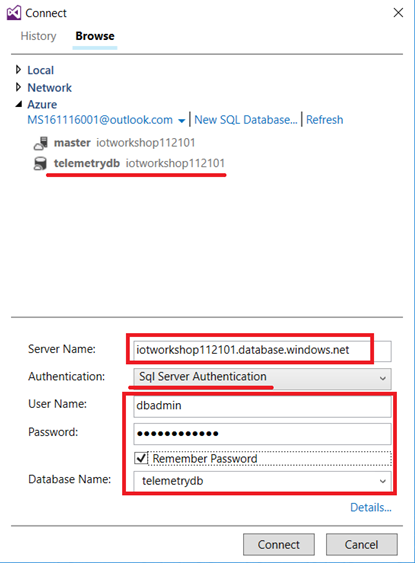
* Create the schema of database
  + Login your azure account in **Visual Studio**



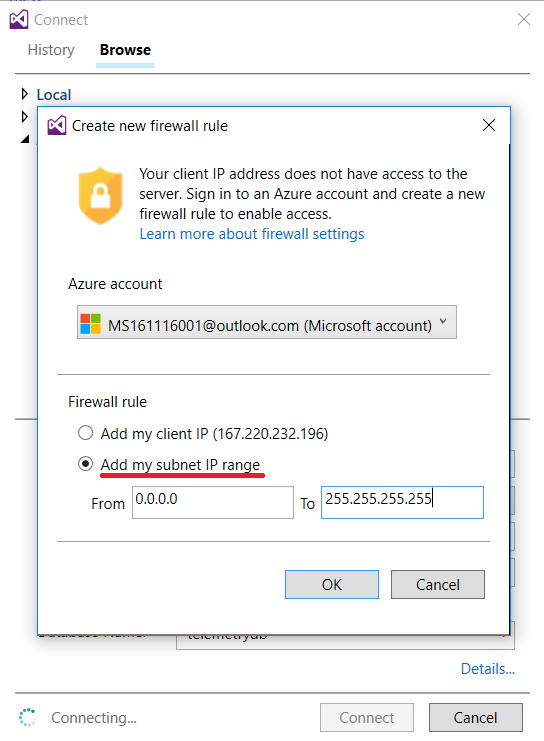
* + Find your Azure SQL Database in **Server Explorer**



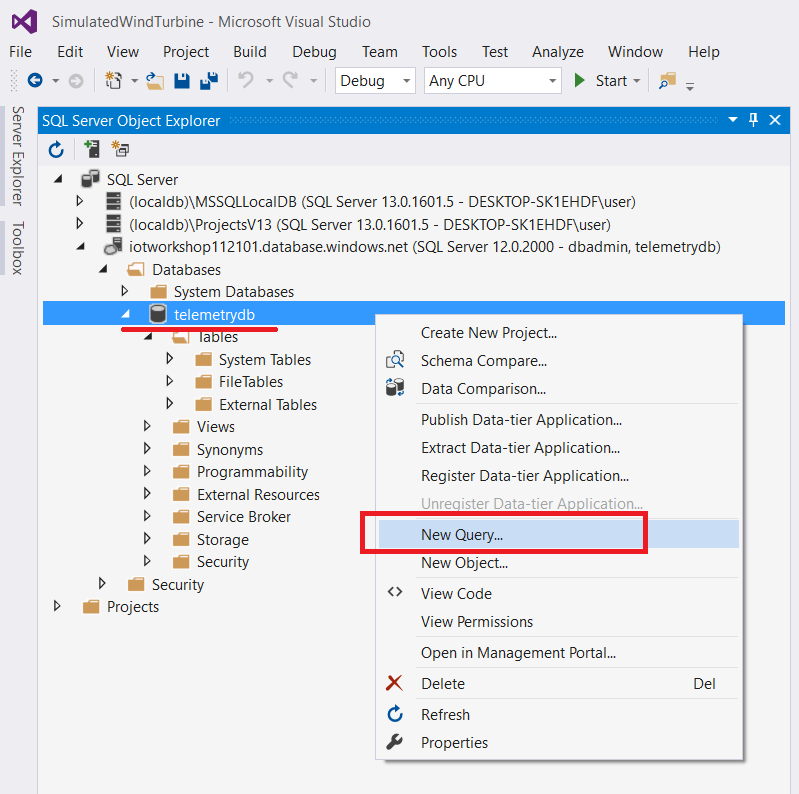
* + Right click the **telemetrydb** to open **SQL Server Object Explorer** (or open it from View of the top toolbar)
* Server Name: **iotworkshop112101** (for example)
* Database admin & password: as your previous configurations
* Database Name: **telemetrydb**



* + Create new firewall rule
    - From **0.0.0.0** to **255.255.255.255** (demo purpose)



* + **New Query** to create new schema



* + Paste the following scripts and execute it.

CREATE SCHEMA [Prod]

CREATE TABLE [Prod].[HistoricData]

(

[Id] INT IDENTITY (1, 1) NOT NULL,

[DeviceId] NVARCHAR(128) NOT NULL,

[MessageId] NVARCHAR(128) NOT NULL,

[Temperature] FLOAT(10) NOT NULL,

[Humidity] FLOAT(10) NOT NULL,

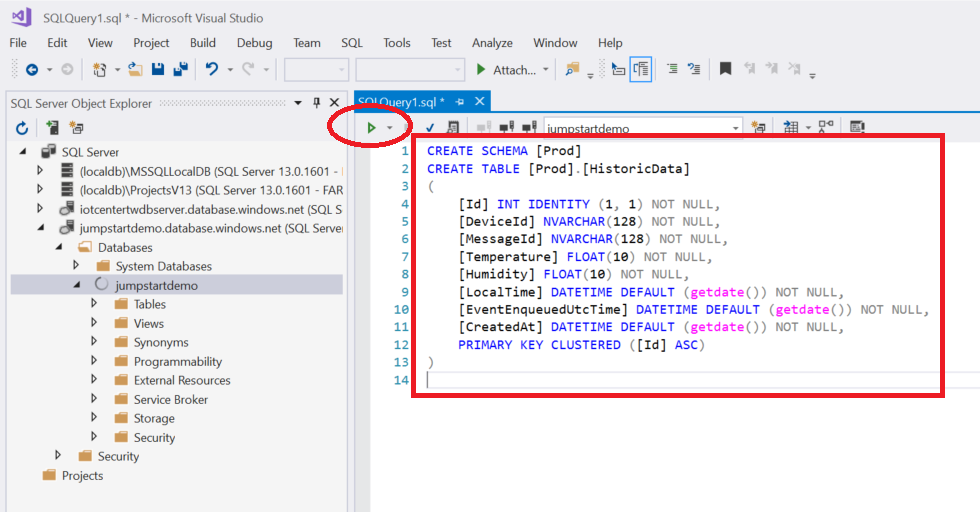
[LocalTime] DATETIME DEFAULT (getdate()) NOT NULL,

[EventEnqueuedUtcTime] DATETIME DEFAULT (getdate()) NOT NULL,

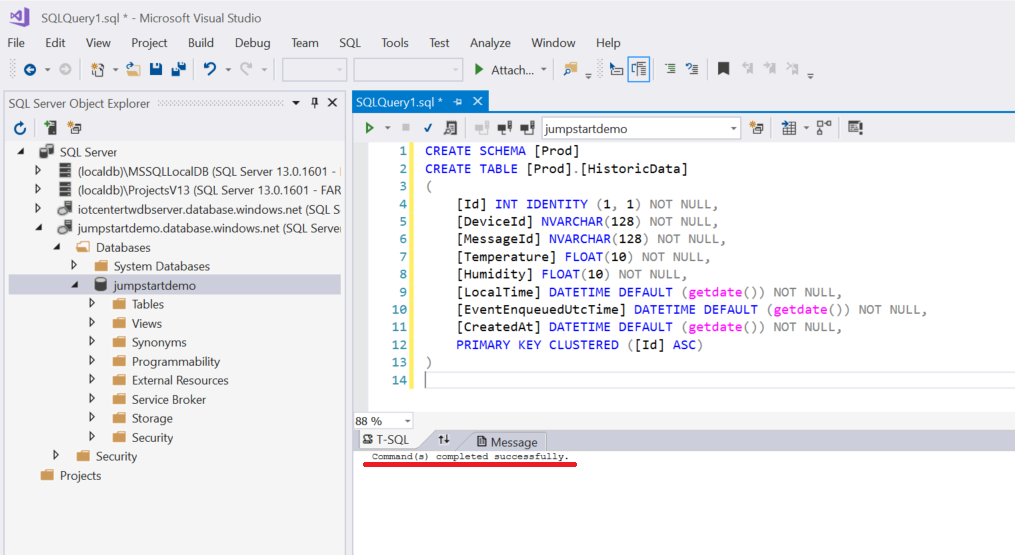
[CreatedAt] DATETIME DEFAULT (getdate()) NOT NULL,

PRIMARY KEY CLUSTERED ([Id] ASC)

)

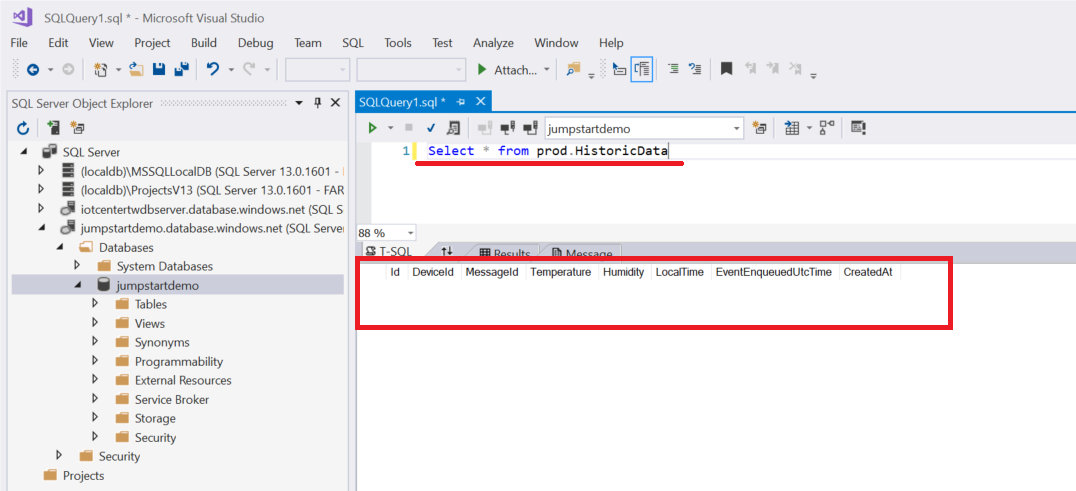


* + Confirm the result of execution.



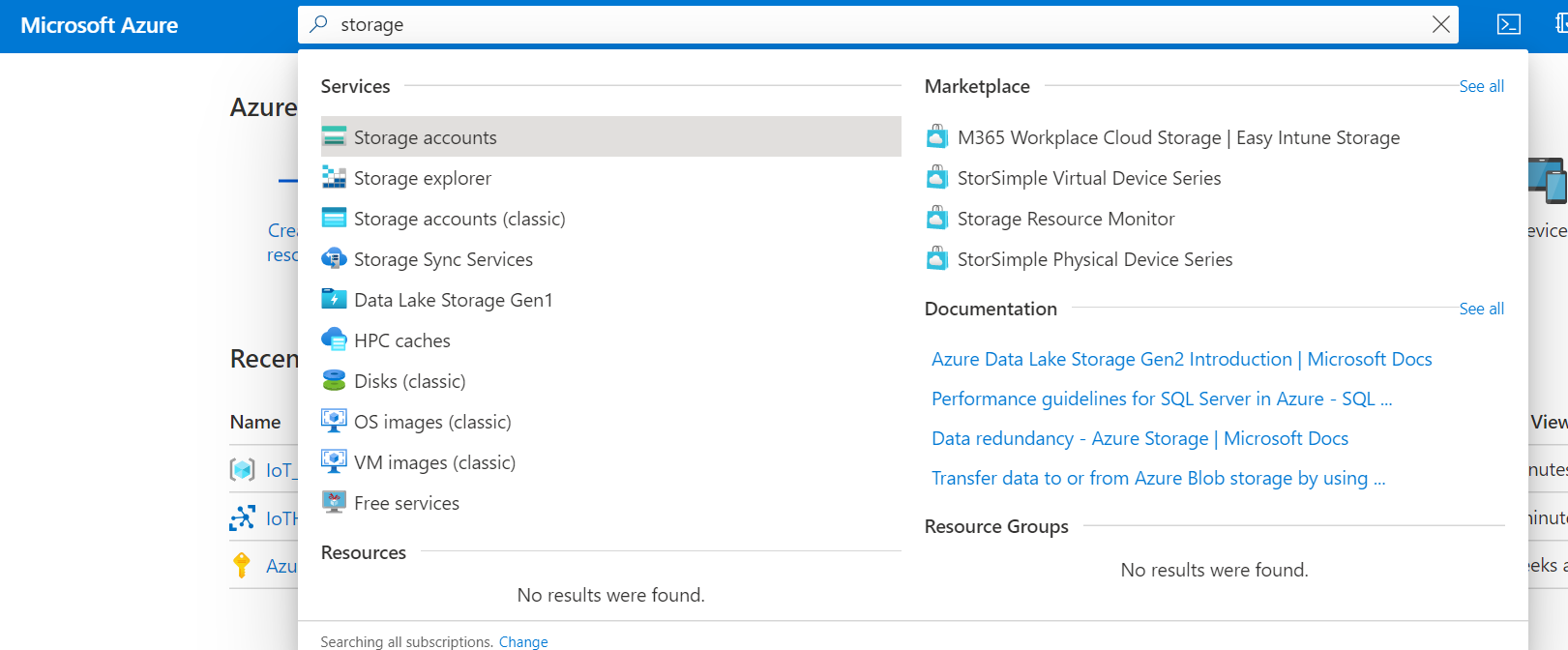
* + Watch the schema we created

Select \* from prod.HistoricData

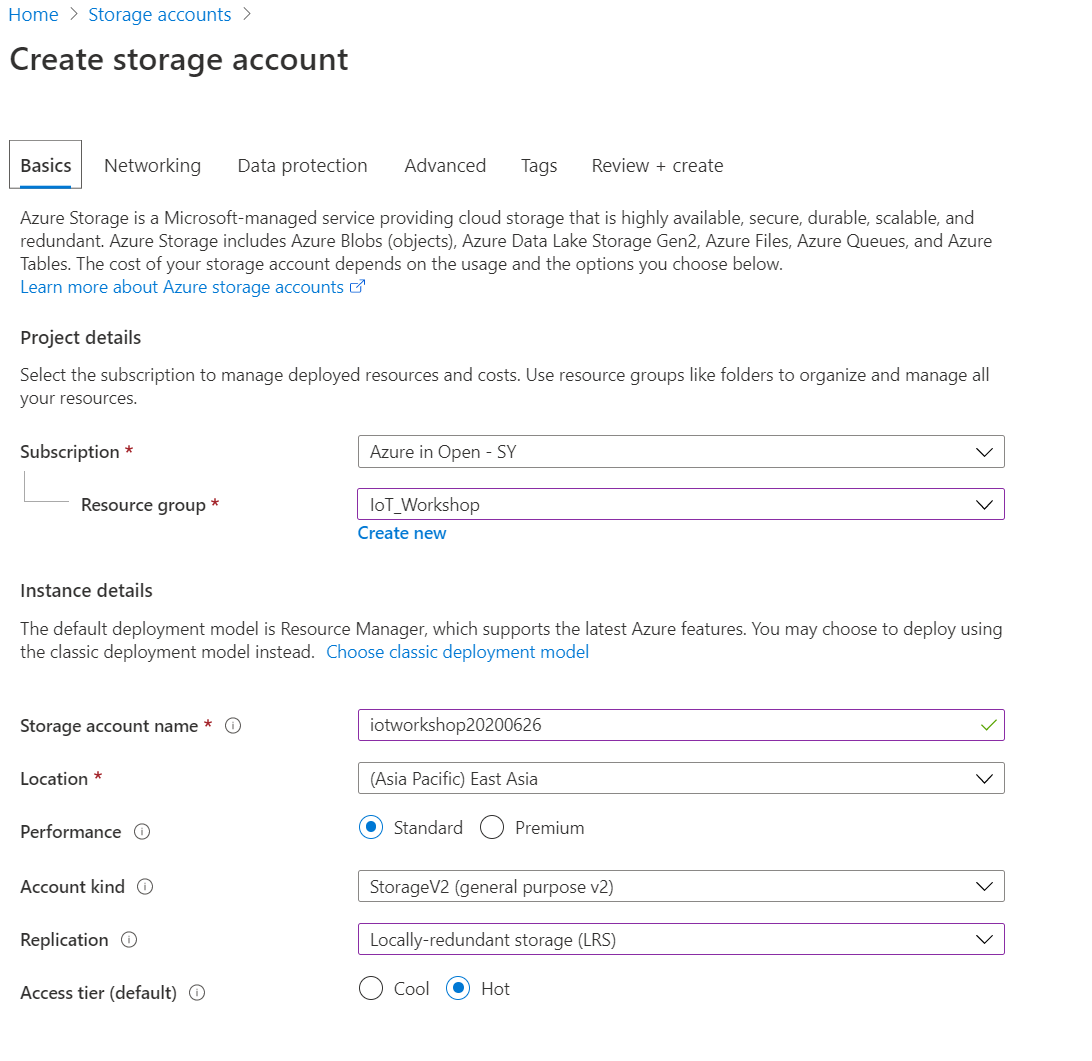


## Step 3: Create a Blob for telemetry data

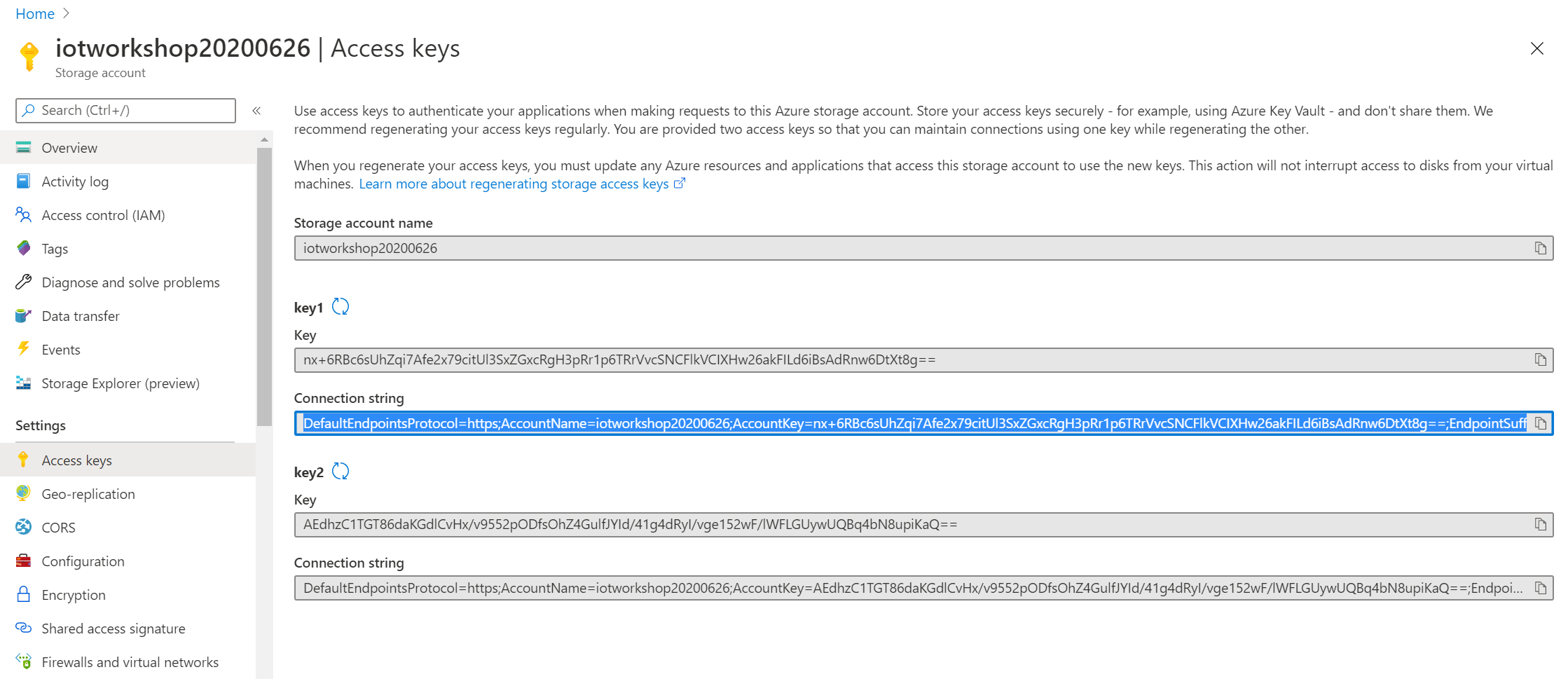
* Provision a Storage Account for Blob
  + Login Azure Portal <https://portal.azure.com>
  + Search the **Storage account** and create it.



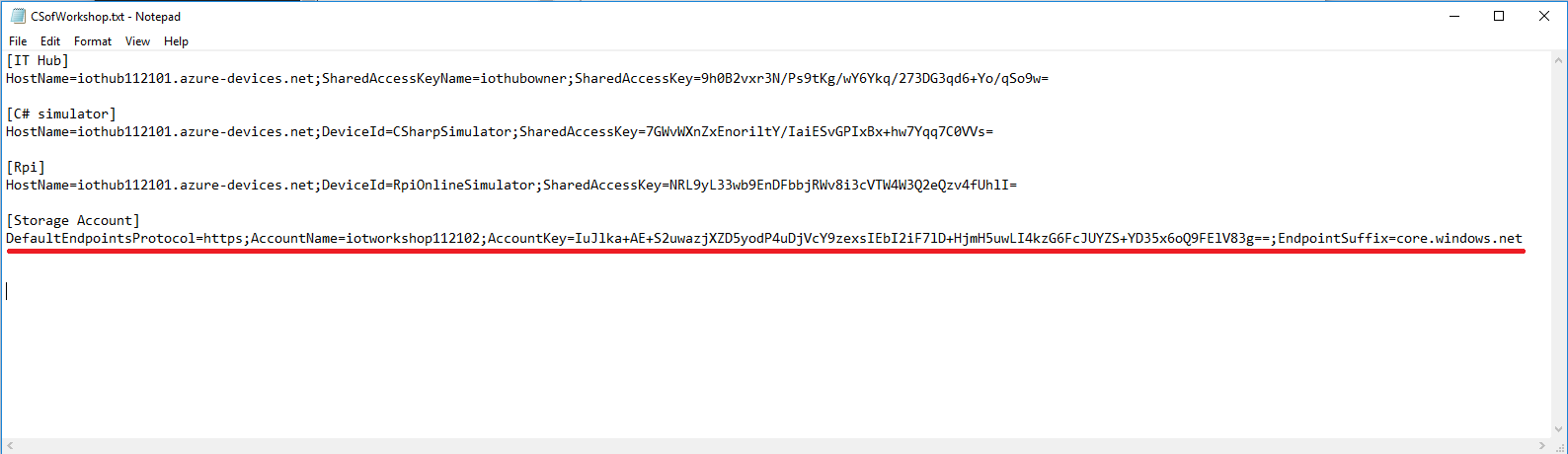
* + Create storage account
    - Name: **iotworkshop112102** (According to your preferences)
    - Account kind: **General purpose**
    - Use existing resource group



* + Create and wait for the deployment.
  + Navigate to Access keys of Storage account.
  + Get the connection string of Storage Account

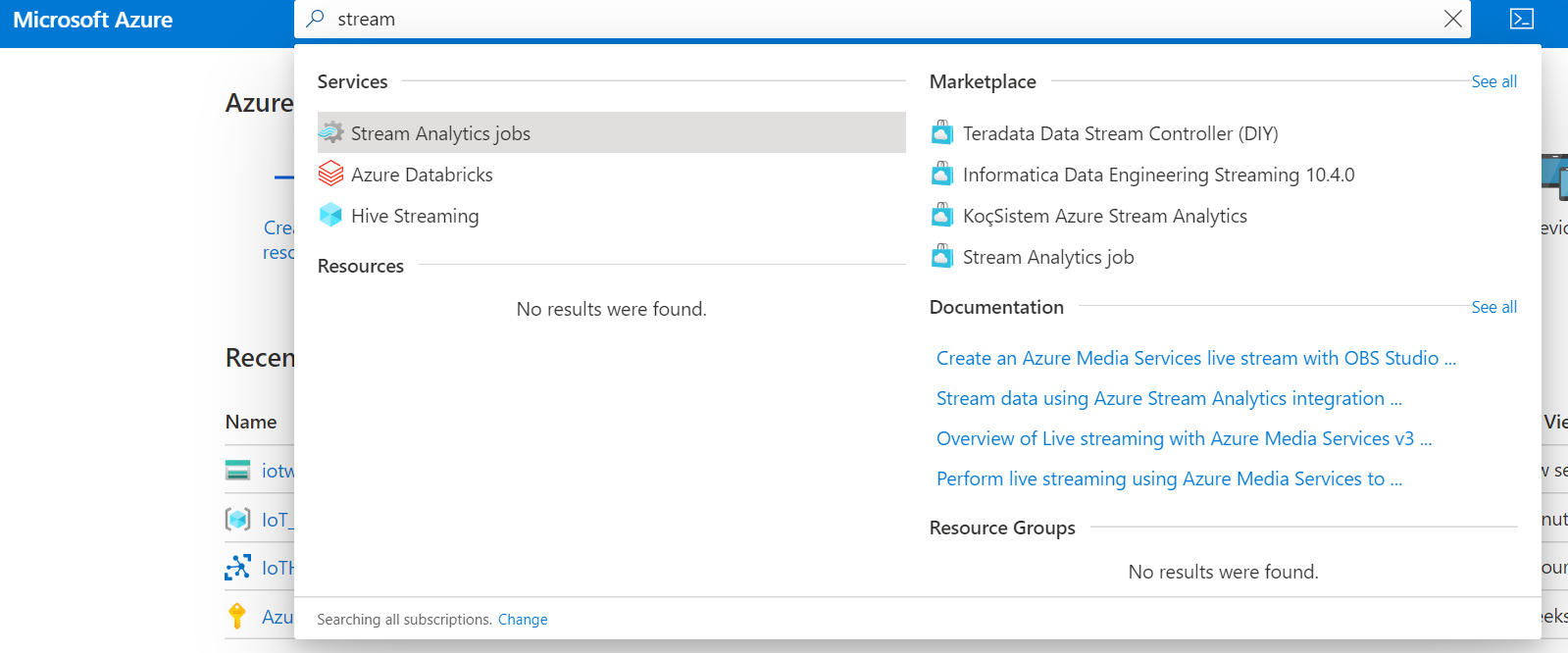


* + Save it for the later used

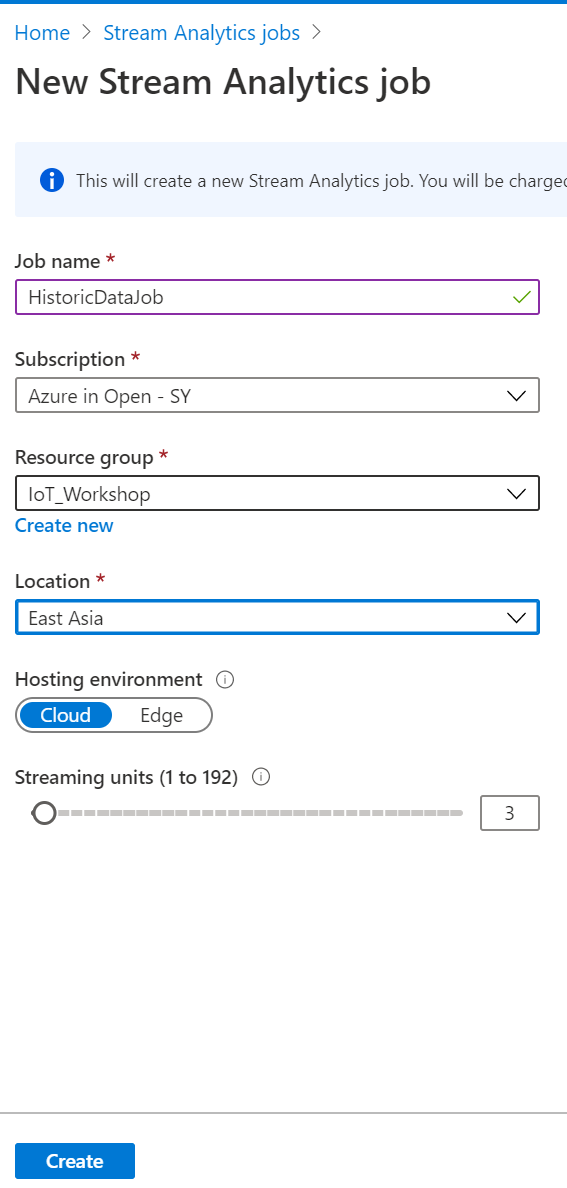


## Step 4: Create a Stream Analytics Job for Historic Data (SQL DB and Blob)

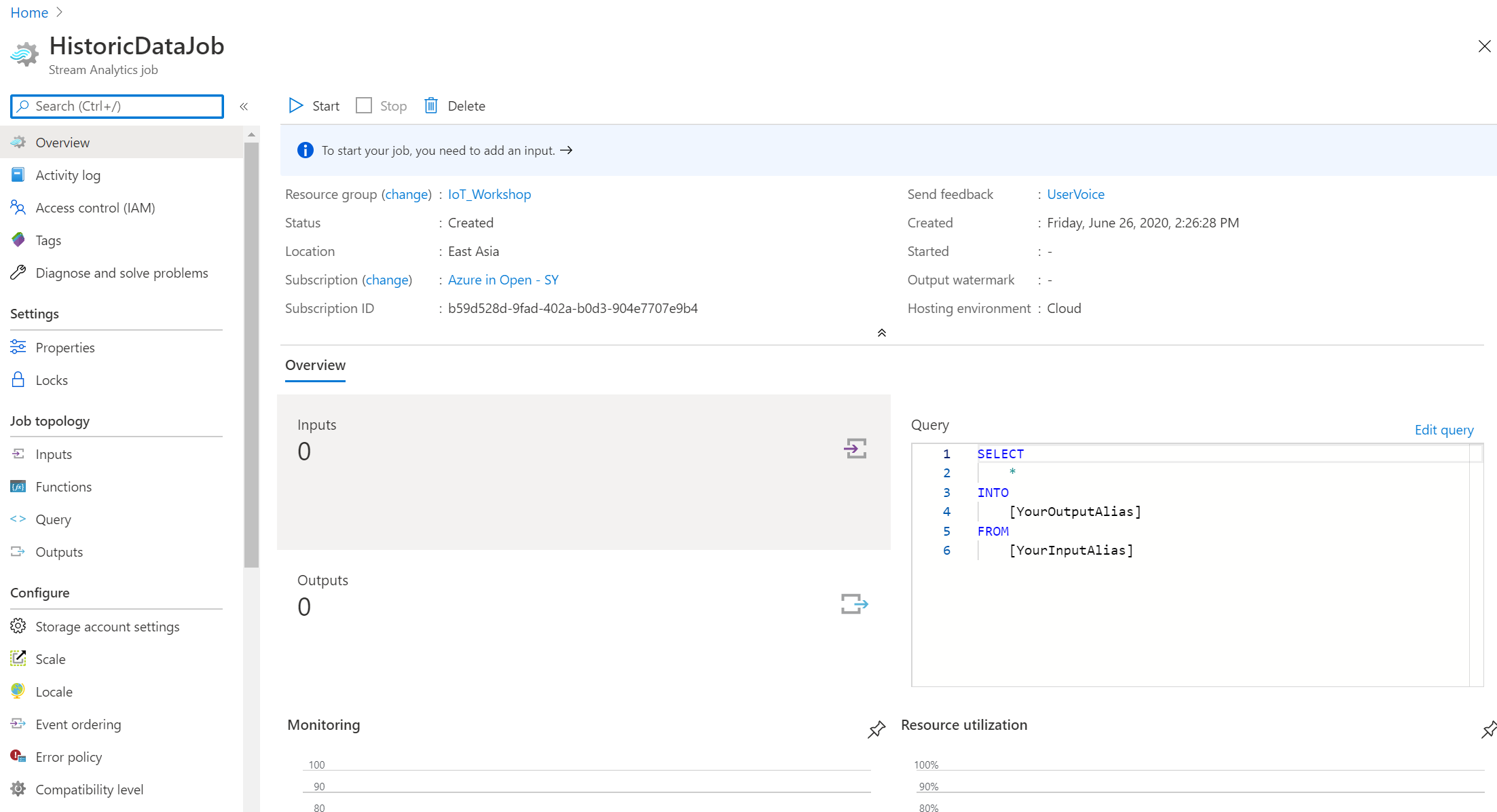
* Login Azure Portal <https://portal.azure.com>
* Create a Stream Analytics Job
  + Add and search **Stream Analytics job**



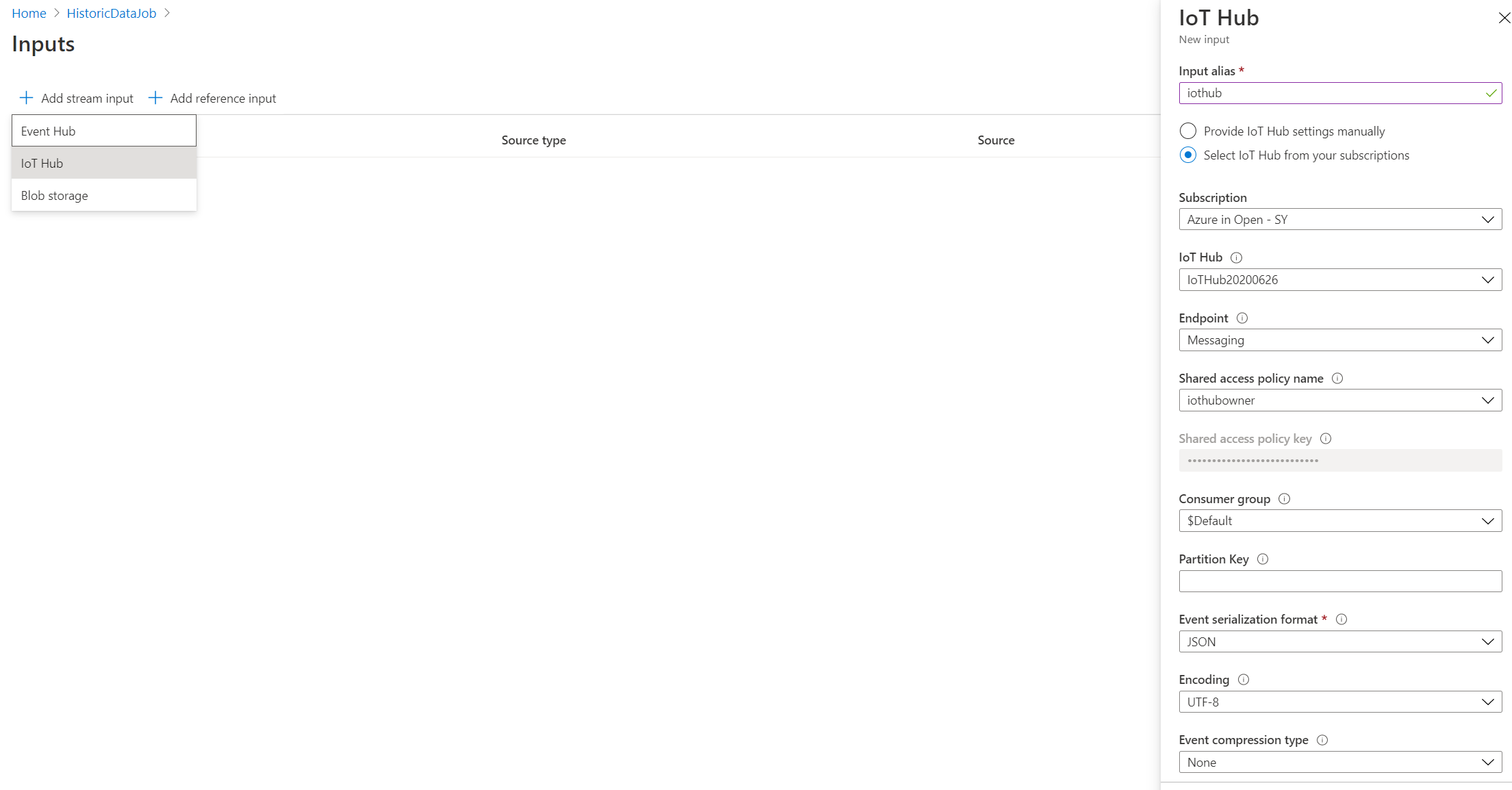
* + **Create** a Stream Analytics Job
  + **Create** a new Job
    - job name: **HistoricDataJob** (for example)
    - Choose a subscription
    - Choose a resource group (using the same resources group is preferred)



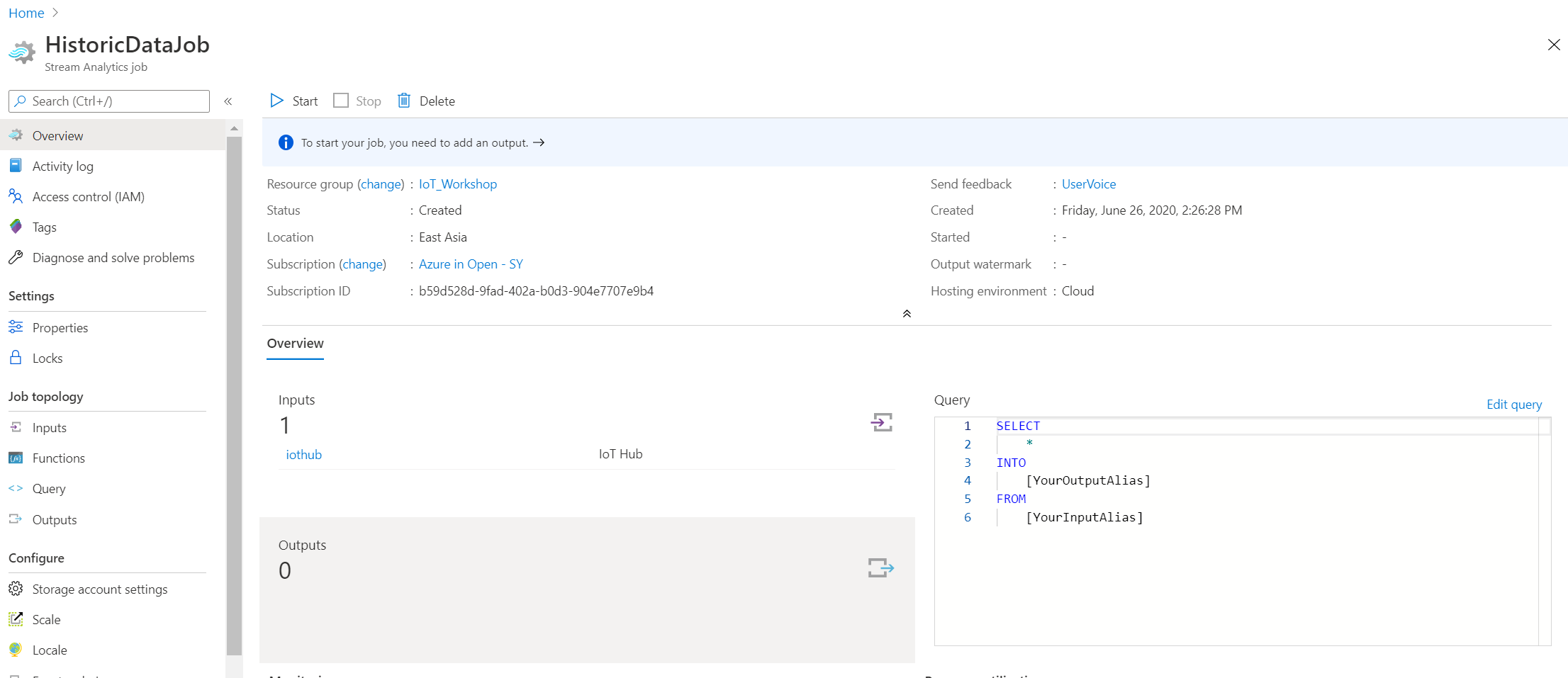
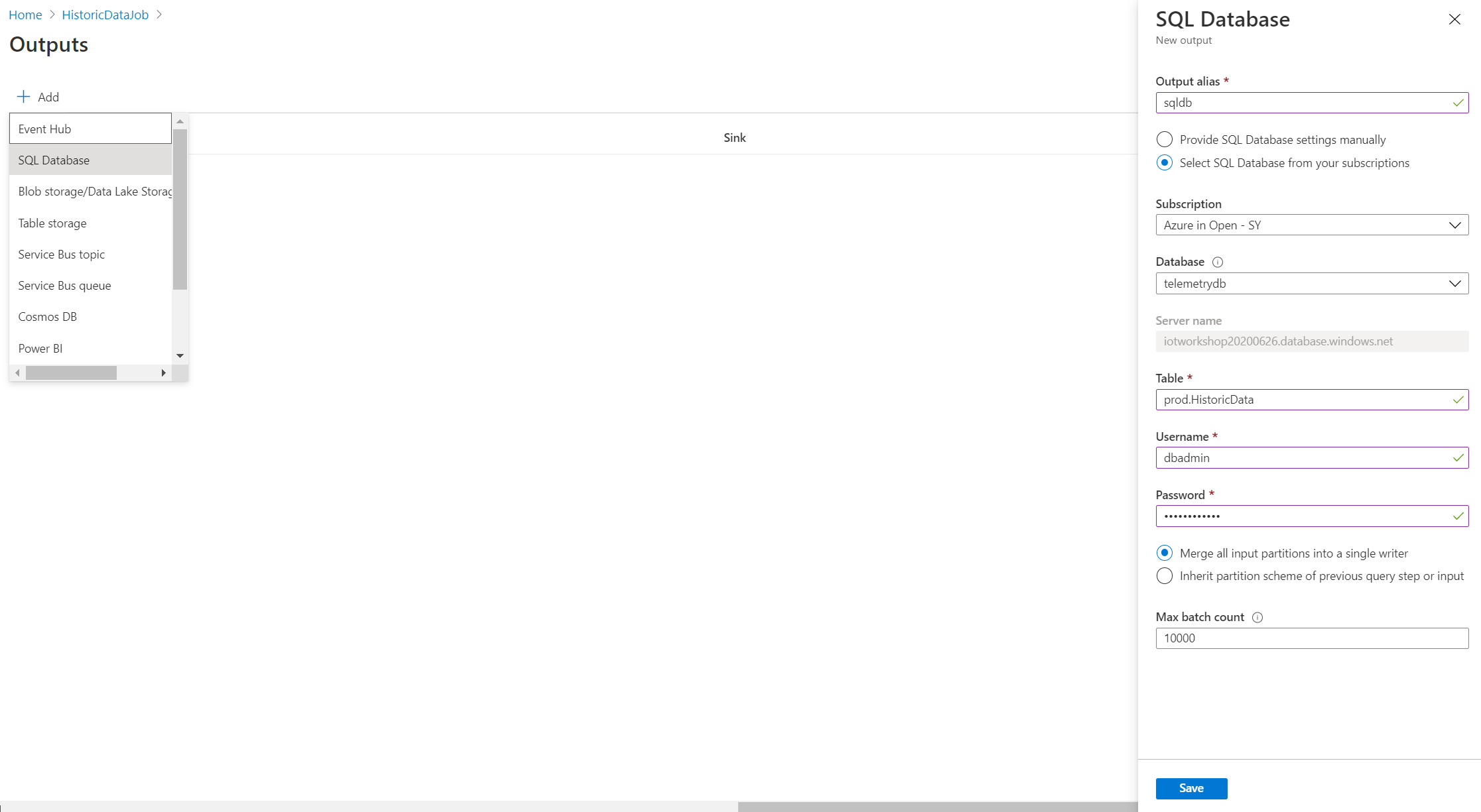
* + Add an **IoT Hub** as the **stream** **input**



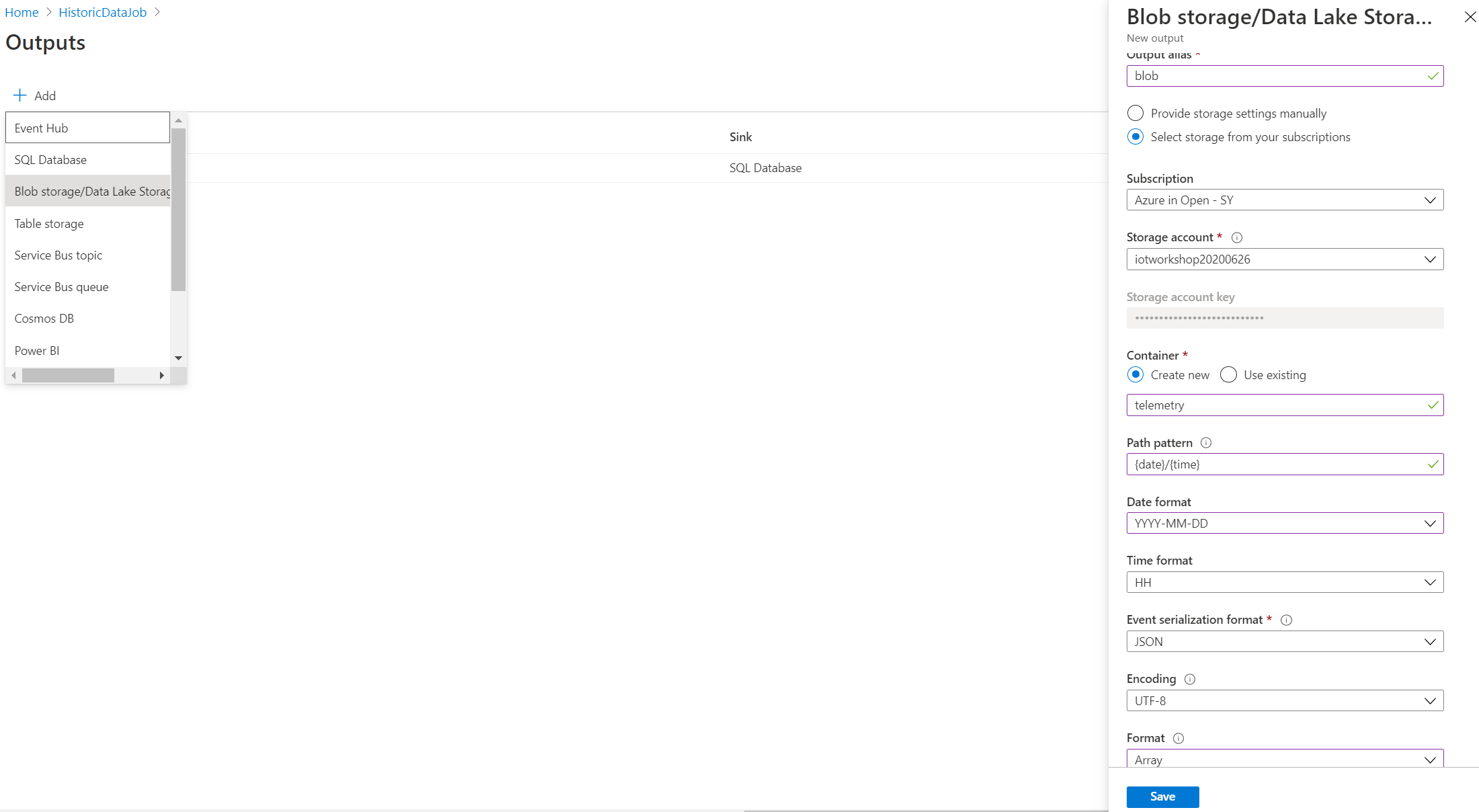
* + - Input alias: **iothub (must be fixed)**
    - The others should be set as below

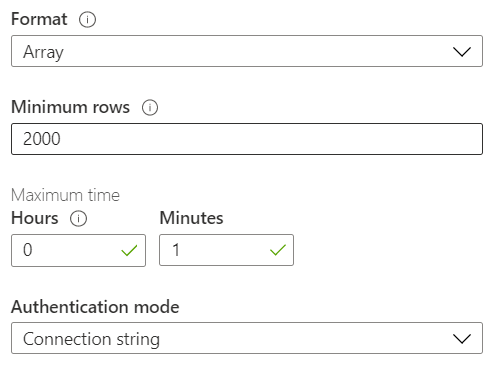


* + Add a **SQL database** as the **output**
    - Output alias: **sqldb (must be fixed)**
    - Database: **telemetrydb**
    - Username & password: please input your name and password of SQL database (for example, dbadmin/demo1234567!)
    - Table: **prod.HistoricData** **(must be fixed and please check the filled string without any space)**

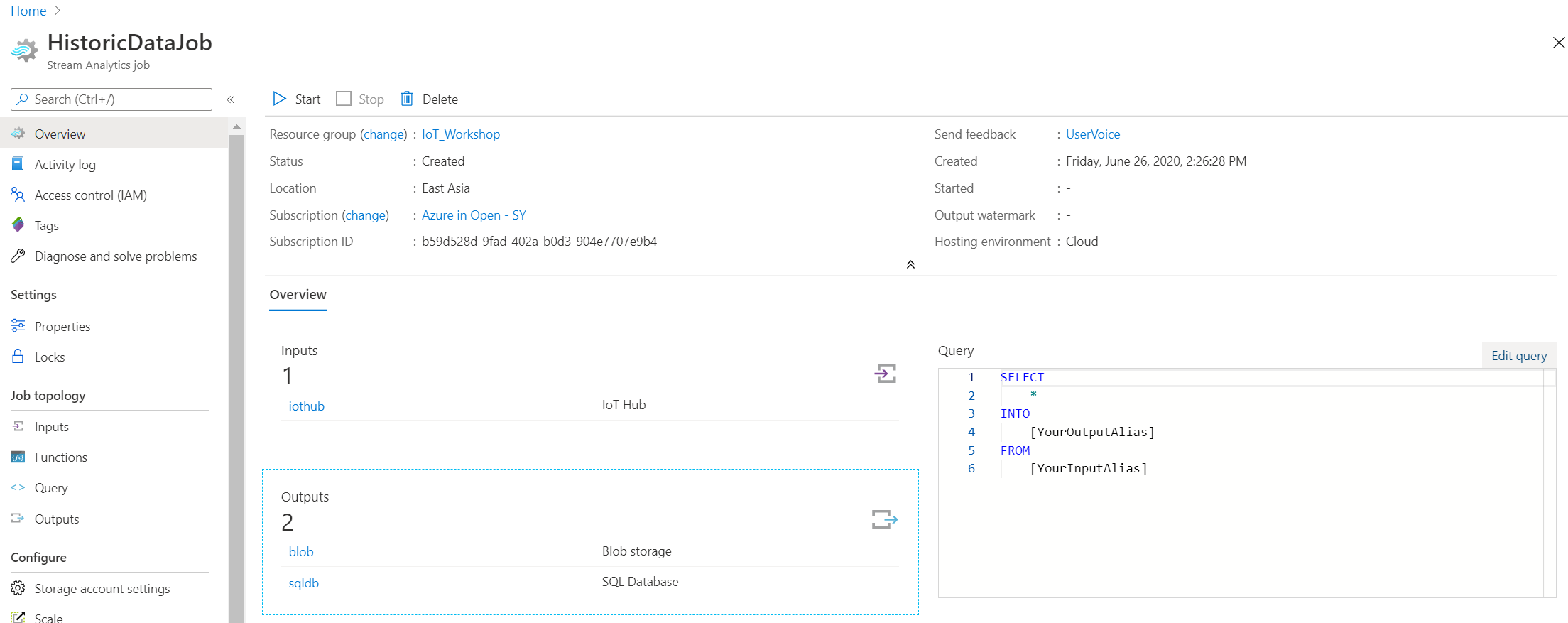
 

* + Add a **Blob Storage** as the **output**
    - Output alias: **blob (must be fixed)**
    - Storage account: the same as the previous storage account
    - Container: **telemetry (We need to create a new one for it)**
    - Path pattern: **{date}/{time} (must be fixed)**
    - Date format: **YYYY-MM-DD (must be fixed)**
    - Time format: **HH (must be fixed)**
    - Format: **Array** (it’s easy to read the JSON array)
    - The others should be set as below





* + Add a **Query** for the historic data



* + - Paste the following scripts into the query of Stream Analytics.

WITH HistoricData AS (

SELECT

Stream.[deviceId] AS [DeviceId],

Stream.[msgId] AS [MessageId],

Stream.[temperature] AS [Temperature],

Stream.[humidity] AS [Humidity],

Stream.[time] AS [LocalTime],

Stream.[EventEnqueuedUtcTime] AS [EventEnqueuedUtcTime]

FROM

[iothub] Stream

WHERE GetMetadataPropertyValue(Stream, '[User].[SensorType]') = 'thermometer'

)

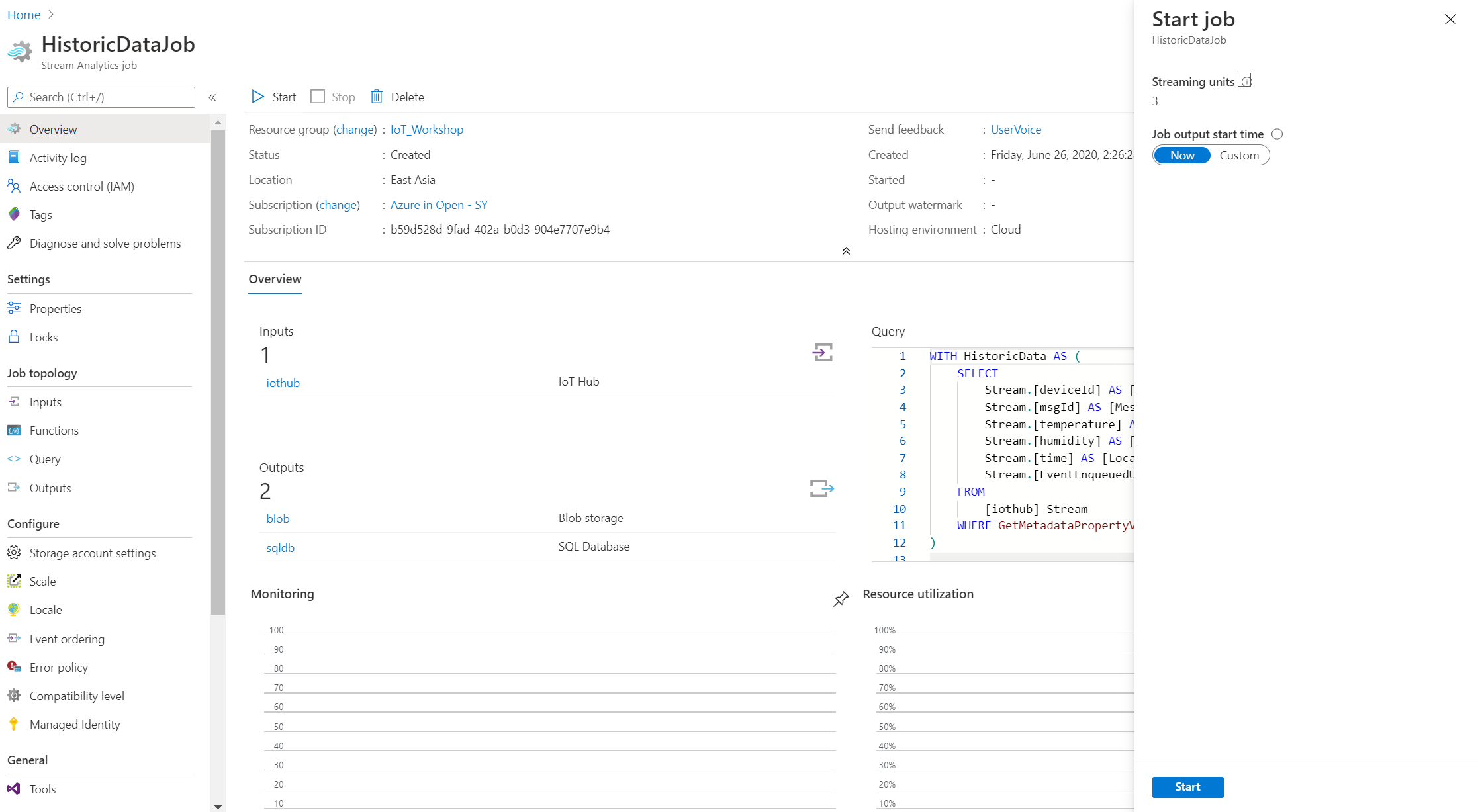
SELECT \* INTO [blob] FROM HistoricData

SELECT \* INTO [sqldb] FROM HistoricData

* + - And **Save**



* + - Start now

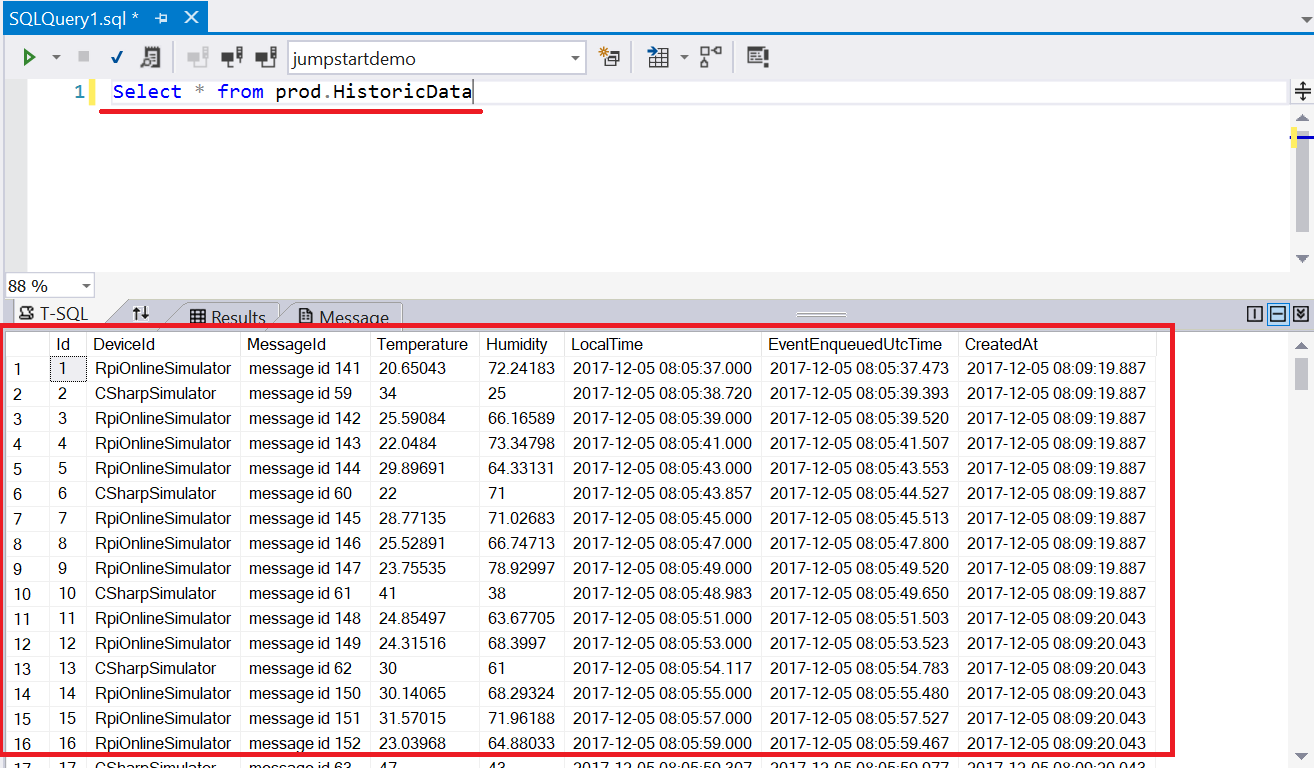


We need a few minutes to start Streaming Job…

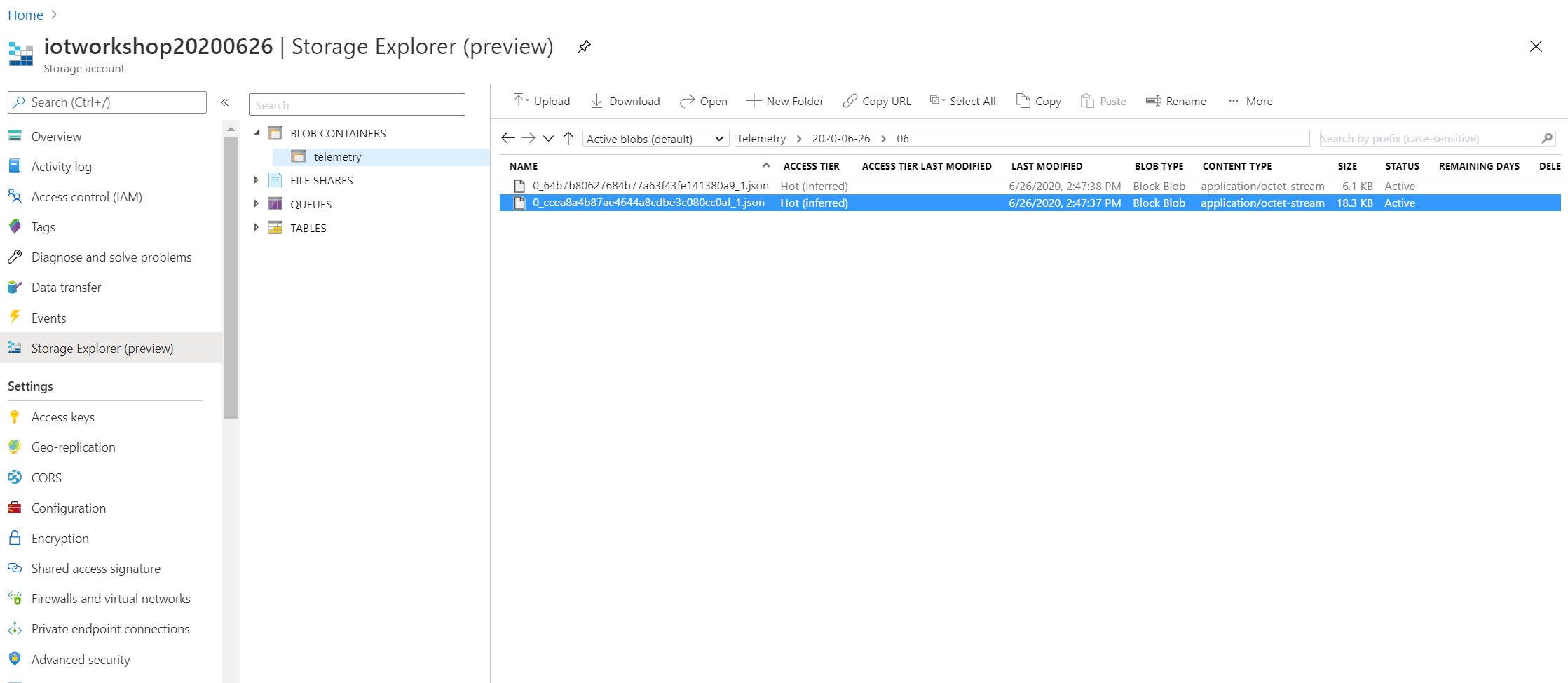
## Step 5: Watch the historic data in SQL DB and Blob Storage

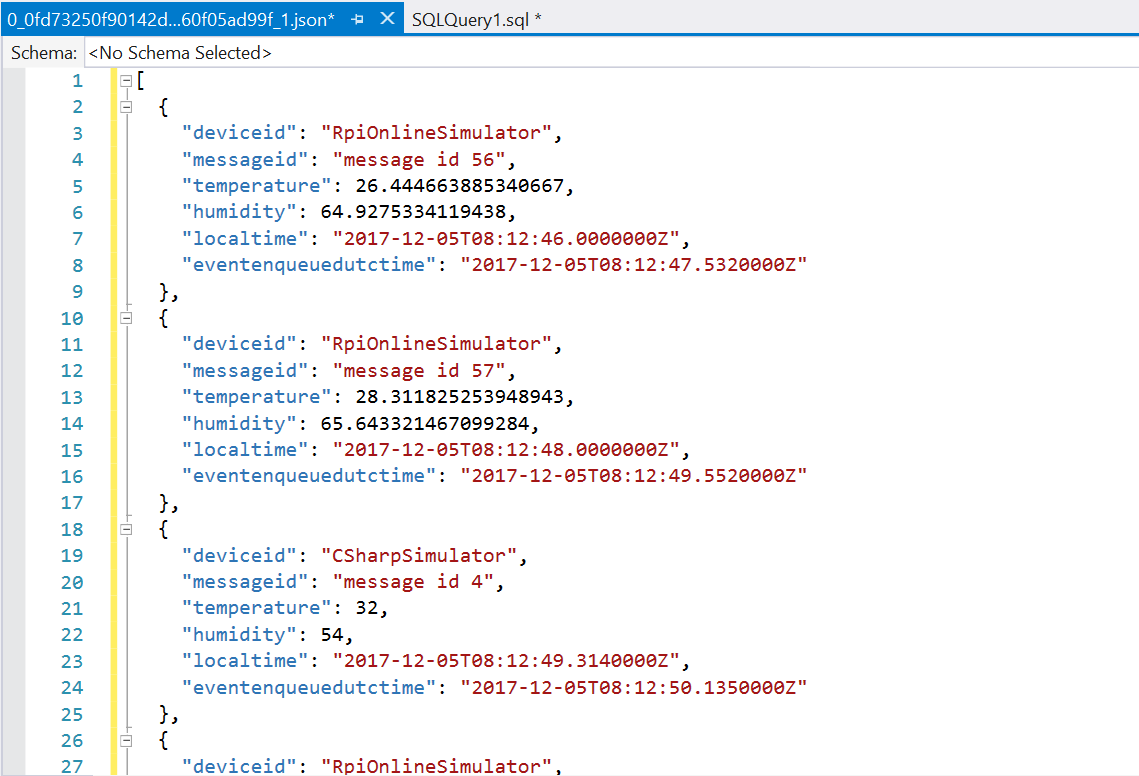
* Create a **New Query** from the **telemetrydb** database in Visual Studio.

Select \* from prod.HistoricData



* Navigate to Blobs of storage account.
* Select the Blob file of telemetry container.
* Download the blob
  + View the content of blob





* *The HOL 2 has been completed. You have already learned how to process the telemetry data from the devices, and store data in Azure SQL database and Azure Blob storage through Azure Stream Analytics job.*
* *The next hands-on lab, we will implement a rule alarm and use the Service Bus to send the cloud-to-device command to the device.*