

Simulating IoT data into Timestream

In 2022 the number of connected IoT device grew to [14.4 billion](#). This number is expected to grow exponentially alongside the jobs in this field. In 2022 global consulting firm McKinsey & Company found the biggest barrier to IoT adoption was skill shortages in the workforce. The number of jobs openings is outpacing the supply of IoT engineers. One of the main barriers to learning about IoT is the cost associated with purchasing IoT hardware.

This blog shows how you can simulate IoT devices and capture/filter that data for your own visualization tools. In 30 minutes you will

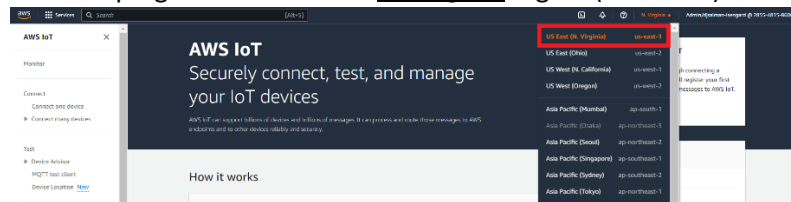
- Use a [CloudFormation](#) template to create simulator
- Capture time series data from the simulator into [AWS IoT Core](#)
- You will send that data into [Amazon Timestream](#) for your visualization

Prerequisites

- An AWS Account
- An understanding of the associated costs of this demo: [Here](#)

Instructions

1. Click the link below and download the [CloudFormation template](#)
2. [Link](#)
3. Open your AWS console (click [here](#))
4. At the top right make sure the **N. Virginia** region (us-east-1) is selected



5. At the top left of the console search for and click on Cloud Formation (or click [here](#))
6. On the top right click the orange **Create Stack** button.
7. In the section titled **Prerequisite – Prepare Template** select the **Template is ready** button
8. In the section below titled **Specify Template** select **Upload a template file**
9. Upload the file you downloaded earlier click **Next**.

Prerequisite - Prepare template

Prepare template
Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

☒ Template is ready ☐ Use a sample template

☐ Create template in Designer

Specify template
A template is a JSON or YAML file that describes your stack's resources and properties.

Template source
Selecting a template generates an Amazon S3 URL, where it will be stored.

☐ Amazon S3 URL ☒ Upload a template file

Upload a template file
Choose file **iot-device-simulator (1).template**
JSON or YAML formatted file

S3 URL: Will be generated when template file is uploaded [View in Designer](#)

Cancel **Next**

10. On the next page, under the section title **Stack name** enter **iot-device-simulator** (exclude the <>)

11. Under the section title **Parameters** enter your personal email address and hit **Next**

Specify stack details

Stack name

Stack name

Stack name can include letters (A-Z and a-z), numbers (0-9), and dashes (-).

Parameters
Parameters are defined in your template and allow you to input custom values when you create or update a stack.

Console access
* Console Administrator Email
The user E-Mail to access the UI

Cancel Previous **Next**

12. Hit **Next** then **Next** again

13. Check the box at the bottom of the page next to **I acknowledge that AWS CloudFormation might create IAM resources** and hit **Submit**

14. Wait about 5 minutes. You will receive an email from no-reply@verificationemail.com with login information.

15. Click the link and sign in using the credentials provided to you

Sign in to your account

Username *

Password *

Forgot your password? [Reset password](#)

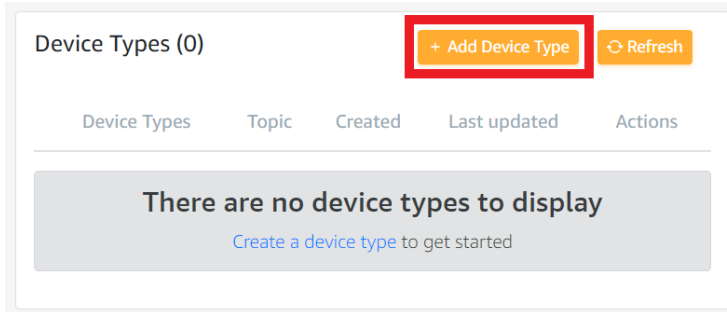
No account? [Create account](#)

SIGN IN

16. At the top of the site click the **Device Types** button

IoT Device Simulator Simulations **Device Types** [Sign Out](#)

17. Click the **+ Add Device Type** button



18. Under Device type name enter **Device type name**
19. Under **Topic** enter **TurbineMQQT**
20. Under the section title **Message payload** click the **+ Add attribute** button
21. Add an attribute by clicking the **+ Add attribute** button
22. Enter the following values

Attribute name: **id**

Attribute data type: **ID**

ID character set (optional): (leave blank)

ID length (optional): (leave blank)

Static: **False**

23. Add another attribute by clicking the **+ Add attribute** button

Attribute name: **rpm**

Attribute data type: **Integer**

Minimum Value: **20**

Maximum Value: **400**

Default Value: (leave blank)

24. Add one more attribute by clicking the **+ Add attribute** button

Attribute name: **voltage**

Attribute data type: **Integer**

Minimum Value: **600**

Maximum Value: **3000**

Default Value: (leave blank)

25. **(Optional)** Add one attribute of your choice (Feel free to copy the example below or make your own)

Attribute name: **humidity**

Attribute data type: **Integer**

Minimum Value: **23**

Maximum Value: **97**

Default Value: (leave blank)

Device Type Definition CT Report Automotive Demo
Create a device type with a customized payload

Device type name

The common name of the device type

Topic
 ✓
The topic where the individual sensor data will be sent

Message payload
Define the message payload that will be simulated for the device type

Message attribute	Data type	Static value	Actions
id	id	false	View Delete
rpm	int		View Delete
voltage	int		View Delete
humidity	int		View Delete

[+ Add attribute](#)

Sample message payload

```
{
  "id": "turbine002",
  "rpm": 480,
  "voltage": 3000,
  "humidity": 97
}
```

Save Cancel

26. Hit the **Save** button at the bottom of the page

27. At the top of the page click the **Simulations** button



28. Click the **+ Add Simulation** button

29. Under **Simulation name** enter **turbine-west**

30. Under Simulation type choose the **User created** option

31. Under **Select a device type** select **Turbine**

32. Under **Number of devices** enter your desired number. Remember the [associated costs](#)

33. Under **Data transmission interval** enter **1**

34. Under **Data transmission duration** enter your desired duration in seconds. I recommend **600-1200** but use your discretion based on the [associated costs](#)

35. Click **Save**

Create Simulation Devices Simulations
Home > Simulations > Create
0 running 0 running

Create A Simulation
Create a custom simulation to run

Simulation name

Simulation type
 ✓
The simulation type defines which device types may be used. User created simulations only allow the use of custom user created device types while the automotive demo simulations only allow the use of automotive demo device types.

Select a device type ✓ Number of devices ✓ Delete

[+ Add type](#)

Data transmission interval

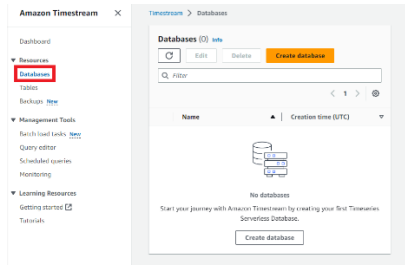
How often devices will send data during a simulation in seconds

Data transmission duration
 ✓
How long the device will simulate sending data to the defined data topic in seconds

Save Cancel

36. Go back to your AWS console and search for Amazon Timestream(or click [here](#))

37. In the left navigation bar click **Databases**



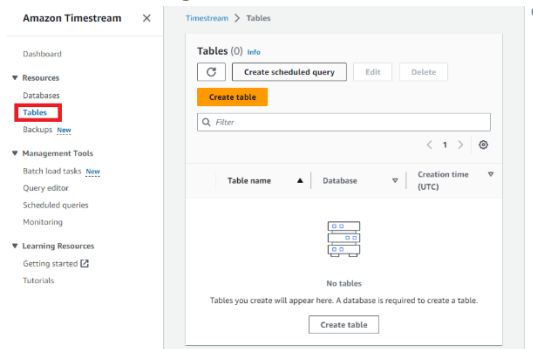
38. Click the orange **Create database** button

39. Under Choose a configuration select **Standard database**

40. Under Name enter **TurbineDB**

41. At the bottom click the **Create Database** button

42. In the left navigation bar click **Tables**



43. Click the **Create table** button

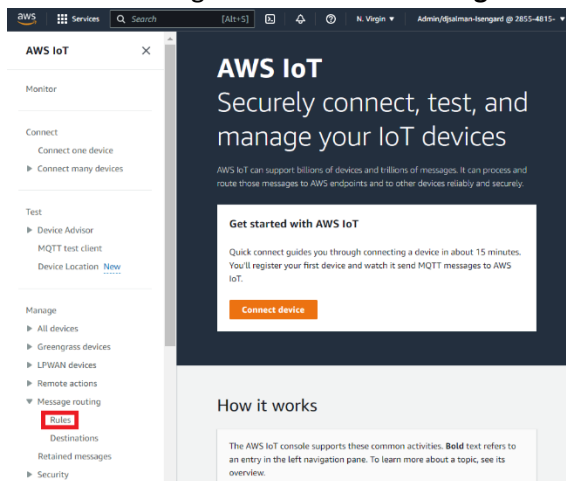
44. Under **Database name** select **TurbineDB**

45. Under **Table name** enter **TurbineTable**

46. At the bottom click **Create table**

47. In your AWS console and search for IOT Core (or click [here](#))

48. On the left navigation bar select **Message Routing** then select **Rules**



49. Click the orange **Create Rule** button

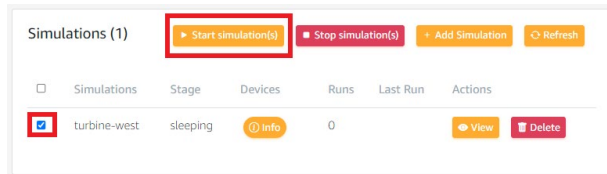
50. Under Rule name enter **allTurbineTelemetryToTimestream**

51. Add a description if you'd like and click **Next**

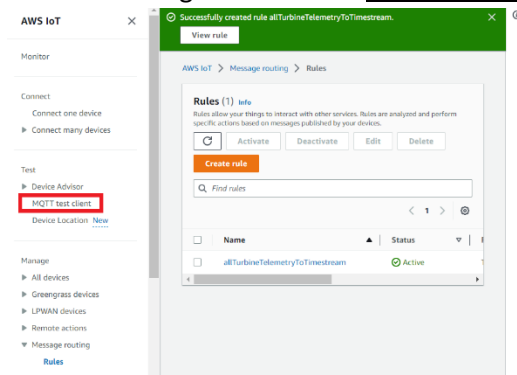
52. Under **SQL Statement** delete the existing text and enter **SELECT assetId AS id, rpm, voltage FROM 'TurbineMQQT'**
53. (Optional) if you added a custom attribute on step 25 you can include it after **voltage** (don't forget the comma). If you are unsure or unfamiliar with SQL just skip this step.
54. At the bottom click **Next**
55. Under **Action 1** search for and click on **Timestream table**
56. Under Database name select **TurbineDB**
57. Under **Table name** select **TurbineTable**
58. Under **Dimensions Name** enter **TelemetryAssetType**
59. Under **Dimension value** enter **Telemetry**
60. Click **Add new dimension**
61. Under the second **Dimensions name** enter **TelemetryAssetId**
62. Under the second **Dimension value** enter **\${topic(1)}**
63. Under **Timestamp value – optional** enter **\${timestamp()}**
64. Under **Timestamp unit** select **MILLISECONDS**
65. Under **IAM role** click **Create new role**
66. Enter **CoreToTimestream** and click **Create new role**
67. Click **Next** and then **Create**
68. Go back to the IoT Device Simulator URL you received via email
69. At the top of the page click the **Simulations** button



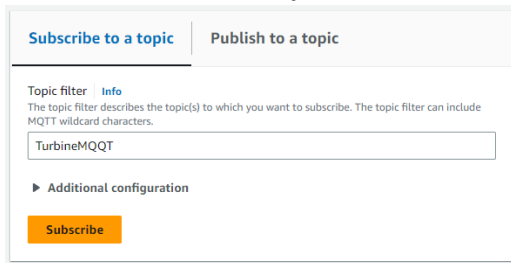
70. Click the check box next to **turbine-west** and click the yellow **Start Simulation(s)** button



71. Return to the AWS IoT in the AWS console([here](#)).
72. In the left navigation bar click **MQTT test client**



73. Under **Subscribe to a topic** enter **TurbineMQQT**

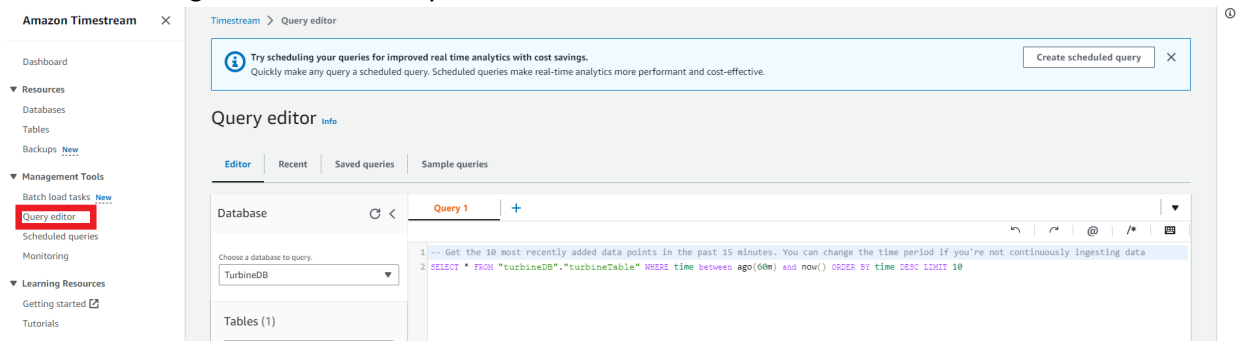


74. You should see your IoT data populating under **Subscriptions**. If you don't see data populating then something was spelled incorrectly. Retrace your steps.

75. Congratulations you are in the home stretch all that is left is to find your data in Amazon Timestream

76. At the top of the AWS Console search for and click on Amazon Timestream

77. On the left navigation click on Query editor



78. In the text box under **Query 1** enter **SELECT * FROM "TurbineDB"."TurbineTable" WHERE time between ago(60m) and now() ORDER BY time DESC LIMIT 10**

79. You should see data populating below.

80. Congratulations. You have completed this workshop.

- You have simulated MQTT data
- Sent that data into IoT Core
- Queried that data into Timestream

81. All that is left is connecting this to a visualization tool like Quicksight or Grafana. That out of scope for this workshop but you can learn about that [here](#).