

# IoT Device Simulation Demo

Venky Dahale (DS)  
Arpana Brahmbhatt (IE)  
Sridhar Kothalanka (CSA)

Mar 2020





## Connected Factory

By Microsoft

Accelerate your journey to Industrie 4.0 - connect, monitor and control industrial devices for insights using OPC UA to drive operational productivity and profitability.



## Remote Monitoring

By Microsoft

Connect and monitor your devices to analyze untapped data and improve business outcomes by automating processes.



## Device Simulation

By Microsoft

Streamline your IoT solution development by using simulated IoT devices to both build and test your solution throughout the software development lifecycle.



## Predictive Maintenance

By Microsoft

Anticipate maintenance needs and avoid unscheduled downtime by connecting and monitoring your devices for predictive maintenance.

# Microsoft IoT solution Accelerators

IoT solution accelerators are complete, ready-to-deploy IoT solutions that implement common IoT scenarios.



## Device Simulation

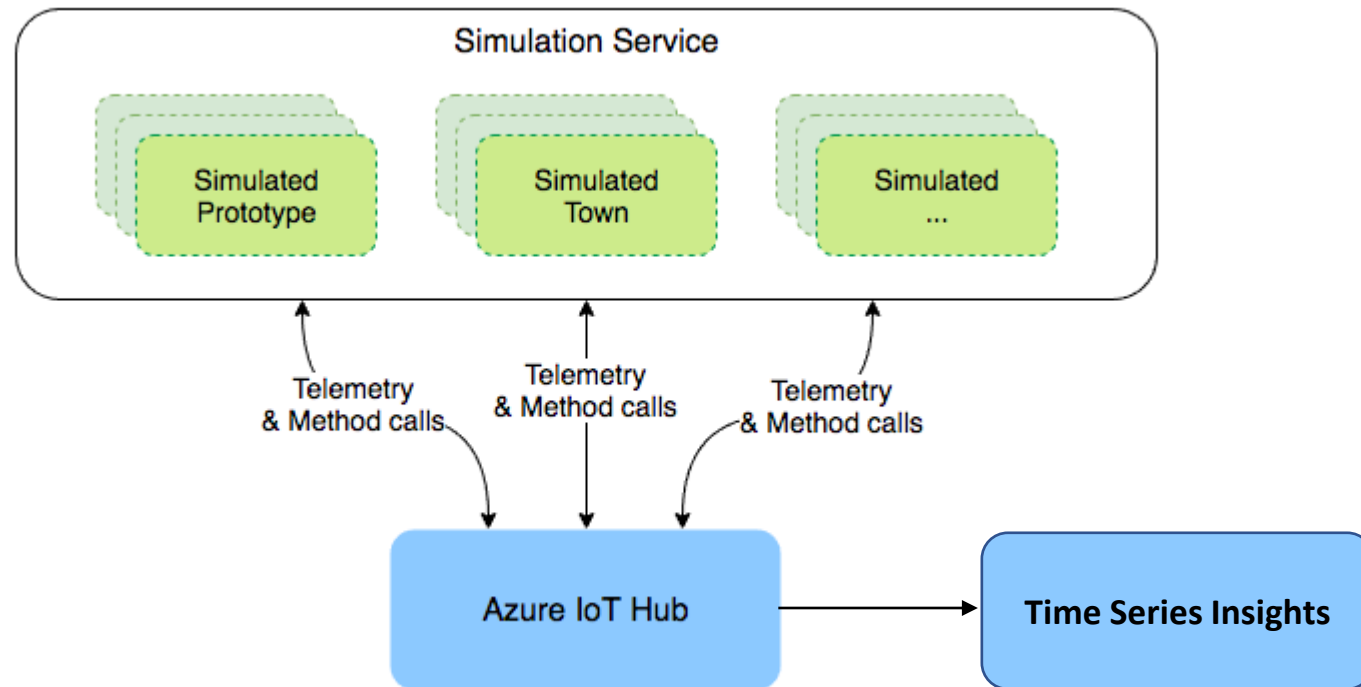
By Microsoft

Streamline your IoT solution development by using simulated IoT devices to both build and test your solution throughout the software development lifecycle.

# Device Simulation Benefits

- Quickly get a **prototype** up and running and iterate by adjusting simulated device behavior on the fly
- **Validate** the solution works as expected from device to solution by simulating real-world device behavior
- **Scale test** your solution by simulating normal, peak and beyond peak load conditions

# Overview



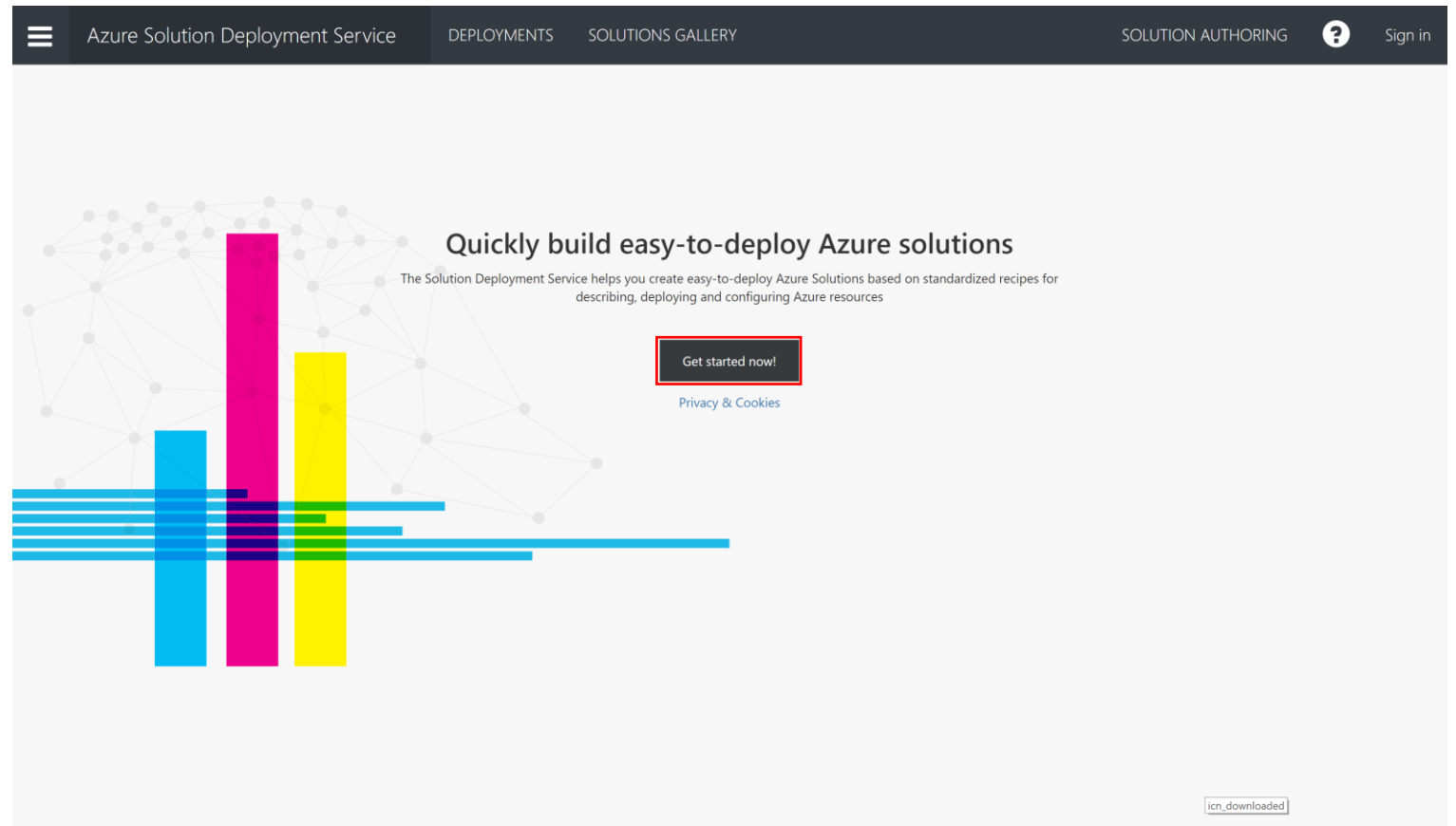
<https://github.com/Azure/device-simulation-dotnet>

# Demo

1. Login to Azure Solution Deployment Service
2. Select the “Device Simulation” accelerator option
3. Create device simulator
4. Automatic resources provisioning
5. Verify deployment of resources in Azure portal
6. Launch the solution
7. Note the default device models
8. Select the “Sample Simple Simulation”
9. Run the simulation



# Step 1



<https://sds.azureiotsolutions.com/>

## Step 2

The screenshot displays the Azure Solution Deployment Service interface. The top navigation bar includes 'Azure Solution Deployment Service', 'DEPLOYMENTS', 'SOLUTIONS GALLERY', and 'SOLUTION AUTHORIZING'. A red arrow points to the '+ New Deployment' button in the top right corner. Below the navigation bar, there is a dropdown menu for 'All Deployments' and a status indicator '0 deployment(s)'. The main content area features four solution templates: 'Connected Factory', 'Device Simulation' (highlighted with a red border and a red arrow), 'Intel Connected Logistics Platform', and 'Power BI'. The 'Device Simulation' template is described as a way to streamline IoT solution development by using simulated IoT devices.

Azure Solution Deployment Service DEPLOYMENTS SOLUTIONS GALLERY SOLUTION AUTHORIZING ?

All Deployments + New Deployment

0 deployment(s)

**Connected Factory**  
Accelerate your journey to Industrie 4.0 - connect, monitor and control industrial devices for insights using OPC UA to drive operational productivity and profitability.

**Device Simulation**  
Streamline your IoT solution development by using simulated IoT devices to both build and test your solution throughout the software development lifecycle.

**Intel Connected Logistics Platform**  
Intel Connected Logistics Platform

**Power BI**  
**Azure IoT Central Analytics (legacy)**  
Monitor and analyze the data your devices send to your IoT Central legacy application in this Power BI solution template

[More...](#)

# Step 3

☰

Azure Solution Deployment Service

DEPLOYMENTS

SOLUTIONS GALLERY

SOLUTION AUTHORIZING

?

1 | Solution details

2 | Resource provisioning (automated)

3 | Done

Device Simulation

Estimated Provisioning Time: 20 Minutes

\* Deployment name

deviceSimulation

✓

This will be used to name the resource group created for this deployment. Deployment name must be between 1 and 24 characters, start with a letter, end with a letter or digit and contain only letters, digits and hyphens.

Azure subscription

sridhar's internal subscription

▼

Azure subscription ID

Deployment options

Provision new IoT Hub

▼

Azure location

South Central US

▼

Resources will be deployed to this Azure location.

License

Disclaimer

↴

Create



# Step 4

☰

Azure Solution Deployment Service

DEPLOYMENTS

SOLUTIONS GALLERY

SOLUTION AUTHORIZING

?

1 | Solution details

2 | Resource provisioning (automated)

3 | Done

🔧 deviceSimulation

Solution: Device Simulation

Resource group: [deviceSimulation](#)

Status: **Provisioning** | [Cancel](#)

Activity	Status	
✔ Generating resource names	Succeeded	i
✔ Creating a Storage Account	Succeeded	i
🔄 <b>Bootstrapping Azure Function app</b>	<b>Running</b>	i
⌚ Configuring VM credentials	Pending	
⌚ Creating AAD application	Pending	
⌚ Creating service principal	Pending	
⌚ Creating role assignment	Pending	
⌚ Generating certificate	Pending	
⌚ Retrieving default tenant domain	Pending	
⌚ Creating resources in Azure	Pending	
⌚ Waiting for website to be operable	Pending	

Wait for deployment to complete

## Step 5

Microsoft Azure (Preview) Report a bug Search resources, services, and docs (G+)

Home > Resource groups > deviceSimulation

Resource groups

deviceSimulation

Subscription (change) : sridhar's internal subscription Deployments : 4 Succeeded

Subscription ID

Tags (change) : Application : SDS DeploymentId : UserEmailTag :

Filter by name... Type == all Location == all Add filter

Showing 1 to 13 of 13 records. Show hidden types

Name	Type
devic-fhe	Virtual machine scale set
devic-fhe-lb	Load balancer
devic-fhe-nsg	Network security group
devic-fhe-publicIP	Public IP address
devic-fhe-vnet	Virtual network
deviceSimulation-fherc	App Service
deviceSimulation-fherc-plan	App Service plan
documentdb-fherc	Azure Cosmos DB account
functions-xqf5pseprh2dw	App Service
hostingxqf5pseprh2dw	App Service plan
iotHub-fherc	IoT Hub
stgxf5pseprh2dw	Storage account
storagefherc	Storage account

Page 1 of 1

Note resources get deployed in your subscription

# Step 6

Azure Solution Deployment Service

DEPLOYMENTS

SOLUTIONS GALLERY

SOLUTION AUTHORIZING

?

1 | Solution details

2 | Resource provisioning (automated)

3 | Done

🔧 deviceSimulation

Solution: Device Simulation

Resource group: [deviceSimulation](#)

Status: **Ready**

Links

[Azure activity log](#)

[Metrics](#)

## Go to your solution accelerator

**Region**

South Central US

**Subscription ID**

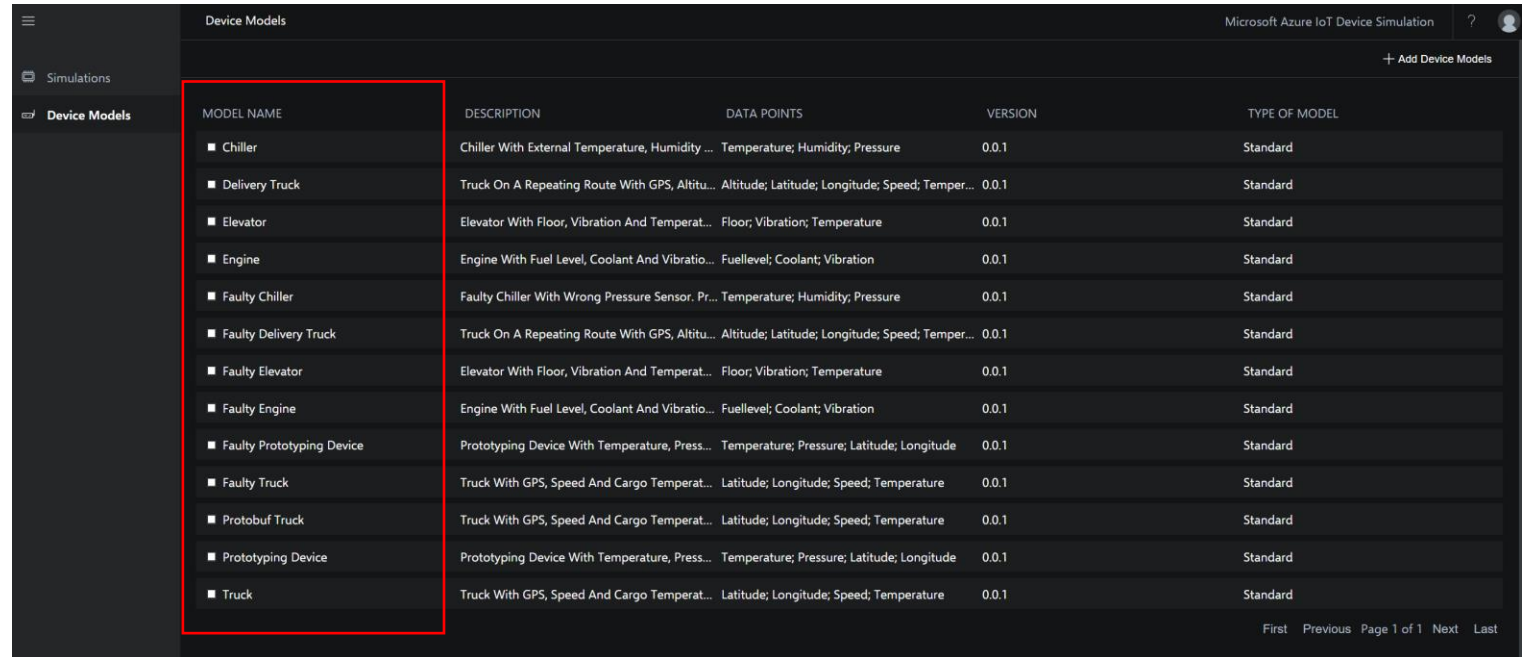
**Modify your solution**

View the source code for this solution accelerator on [GitHub](#)

**Resources**

[Developer Documentation](#)

## Step 7



The screenshot shows the 'Device Models' section of the Microsoft Azure IoT Device Simulation interface. A table lists various default device models, with the 'MODEL NAME' column highlighted by a red box. The table includes columns for MODEL NAME, DESCRIPTION, DATA POINTS, VERSION, and TYPE OF MODEL.

MODEL NAME	DESCRIPTION	DATA POINTS	VERSION	TYPE OF MODEL
■ Chiller	Chiller With External Temperature, Humidity ...	Temperature; Humidity; Pressure	0.0.1	Standard
■ Delivery Truck	Truck On A Repeating Route With GPS, Altitu...	Altitude; Latitude; Longitude; Speed; Temper...	0.0.1	Standard
■ Elevator	Elevator With Floor, Vibration And Temperat...	Floor; Vibration; Temperature	0.0.1	Standard
■ Engine	Engine With Fuel Level, Coolant And Vibratio...	Fuellevel; Coolant; Vibration	0.0.1	Standard
■ Faulty Chiller	Faulty Chiller With Wrong Pressure Sensor. Pr...	Temperature; Humidity; Pressure	0.0.1	Standard
■ Faulty Delivery Truck	Truck On A Repeating Route With GPS, Altitu...	Altitude; Latitude; Longitude; Speed; Temper...	0.0.1	Standard
■ Faulty Elevator	Elevator With Floor, Vibration And Temperat...	Floor; Vibration; Temperature	0.0.1	Standard
■ Faulty Engine	Engine With Fuel Level, Coolant And Vibratio...	Fuellevel; Coolant; Vibration	0.0.1	Standard
■ Faulty Prototyping Device	Prototyping Device With Temperature, Press...	Temperature; Pressure; Latitude; Longitude	0.0.1	Standard
■ Faulty Truck	Truck With GPS, Speed And Cargo Temperat...	Latitude; Longitude; Speed; Temperature	0.0.1	Standard
■ Protobuf Truck	Truck With GPS, Speed And Cargo Temperat...	Latitude; Longitude; Speed; Temperature	0.0.1	Standard
■ Prototyping Device	Prototyping Device With Temperature, Press...	Temperature; Pressure; Latitude; Longitude	0.0.1	Standard
■ Truck	Truck With GPS, Speed And Cargo Temperat...	Latitude; Longitude; Speed; Temperature	0.0.1	Standard

Default device models



Step 8

☰

Simulations

Device Models

Microsoft Azure IoT Device Simulation

?

+ New simulation

Simulations

Show all simulations

Sample Simple Simulation

Created 09/03/20 07:44:12 PM

Ended -

10 Truck

0

Average messages per second

Total messages sent 0

Sample Multi-Model Simulation

Created 09/03/20 07:44:12 PM

Ended -

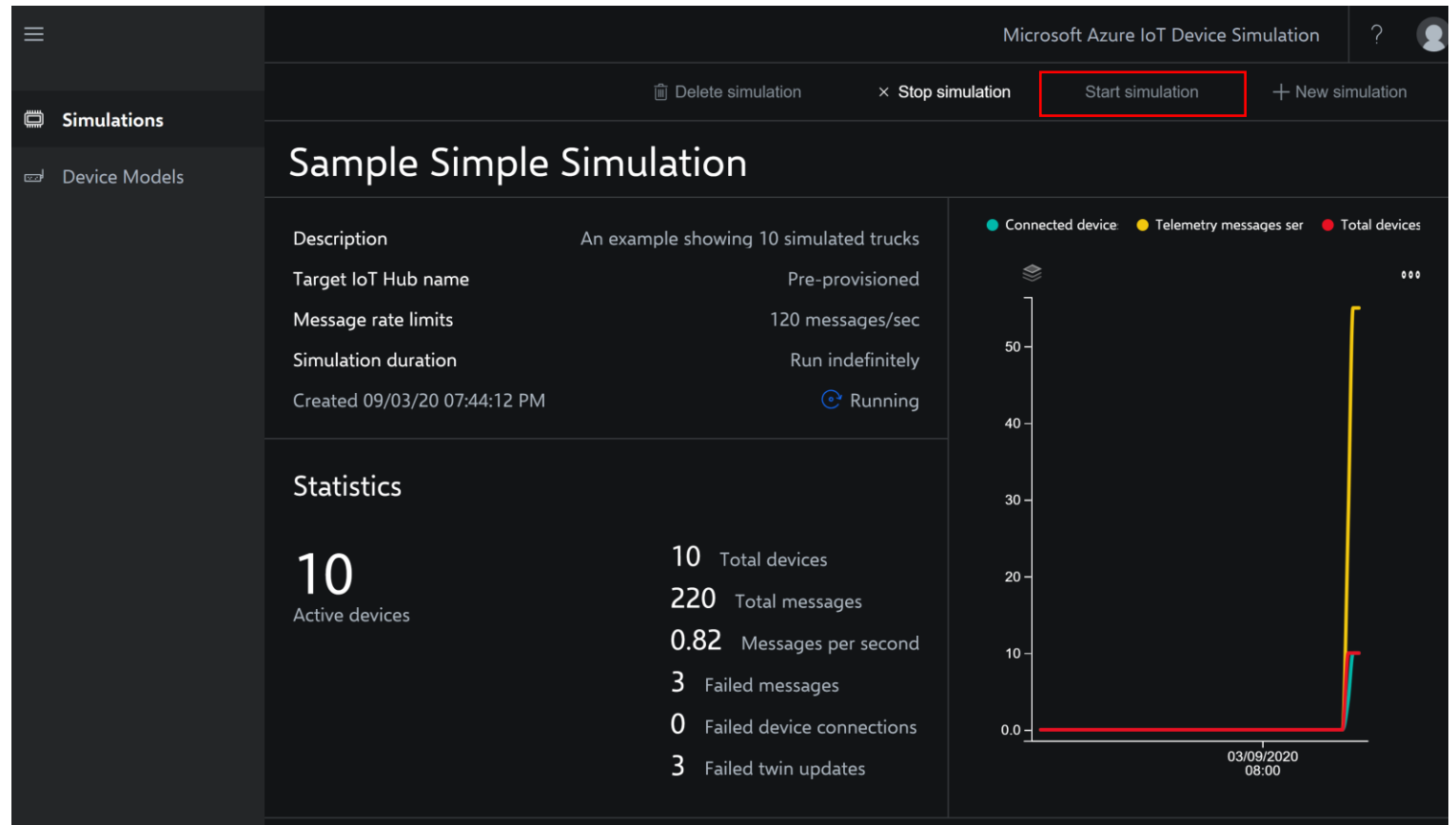
50 Chiller  
10 Elevator

0

Average messages per second

Total messages sent 0

Step 9





# Setup Time Series Insights

Add a Time Series Insights resource to the same resource group and configure it like below

[Home](#) > [Resource groups](#) > [deviceSimulation](#) > [New](#) > [Time Series Insights](#) > Create Time Series Insights environment

## Create Time Series Insights environment

Microsoft

[Basics](#) [Event Source](#) [Review + Create](#)

Create a Time Series Insights environment that you'll use to explore and query time series data. [Learn more](#)

**ENVIRONMENT DETAILS**

Choose the subscription that will house your new environment. Use resource groups to organize and manage resources in that subscription. Note that these details can't be edited after they're saved.

Environment name \* ⓘ

Subscription \* ⓘ

Resource group \* ⓘ  [Create new](#)

Location \* ⓘ

**PRICING**

Choose a pricing tier. If you aren't sure which tier to choose, [visit our pricing page](#) to learn more.

Tier \* ⓘ ☒ S1 ☐ S2 ☐ PAYG (Preview)

Capacity \* ⓘ

Ingress rate: 1 M events per day  
Storage capacity: 30 M events  
Estimated cost: **USD 150.00 / month**

[Review + create](#) [Next: Event Source »](#) [Download a template for automation](#)

[Home](#) > [Resource groups](#) > [deviceSimulation](#) > [New](#) > [Time Series Insights](#) > Create Time Series Insights environment

## Create Time Series Insights environment

Microsoft

[Basics](#) [Event Source](#) [Review + Create](#)

An event source is the IoT Hub or Event Hub that feeds data into your Time Series Insights environment. [Learn more](#).

**EVENT SOURCE DETAILS**

Create an event source? \* ⓘ ☒ Yes ☐ No

Name \* ⓘ

Source type \* ⓘ

Select a hub \* ⓘ

Subscription \* ⓘ

IoT Hub name \* ⓘ

IoT Hub access policy name \* ⓘ

**CONSUMER GROUP**

**i** This consumer group should be used exclusively for this event source as there can be only one active reader from a given consumer group at a time.

IoT Hub consumer group \* ⓘ  [New](#)

**TIMESTAMP**

Create an event source timestamp property name. If you don't enter a value, we'll use the message enqueued time from the event source. [Learn more](#).

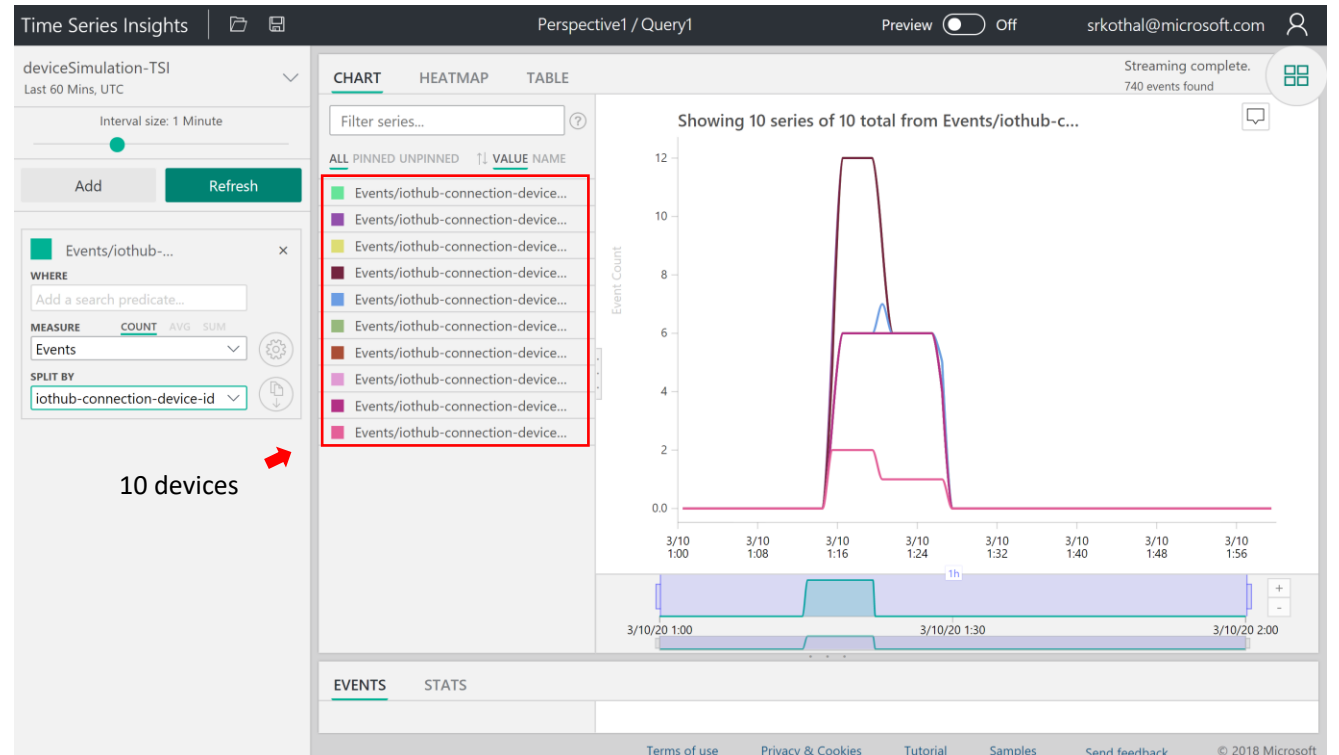
Property name ⓘ

[Review + create](#) [« Previous: Basics](#) [Download a template for automation](#)

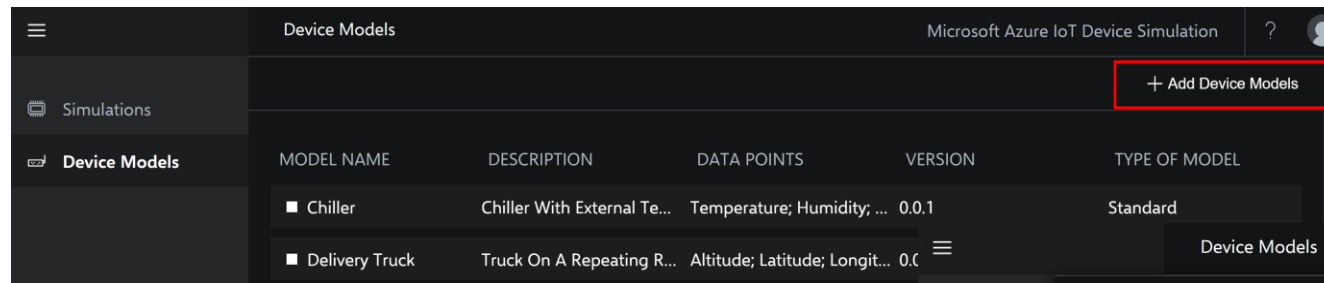
# Setup Time Series Insights


## Steps:

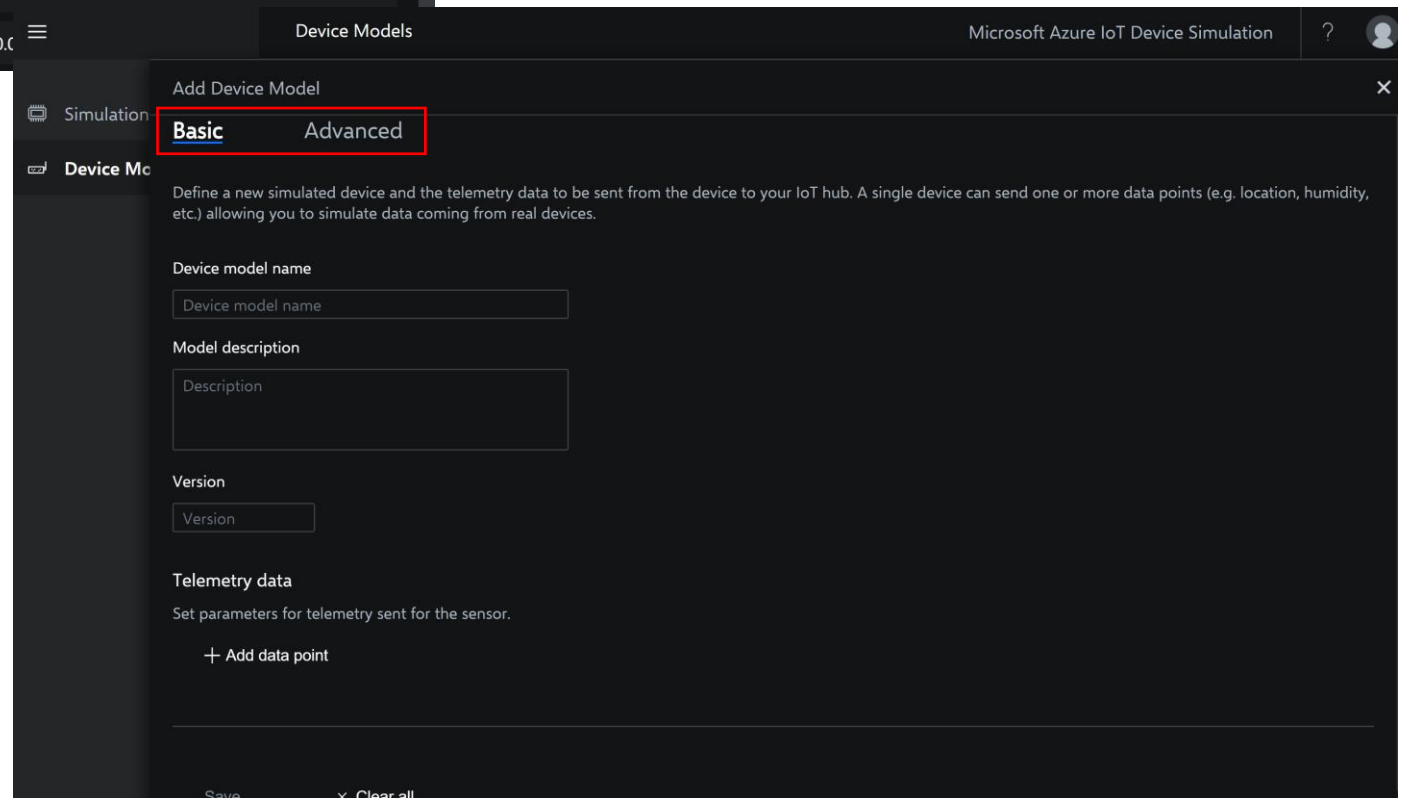
- Create an instance of Time Series Insights
- Point it to the IoT Hub
- View the events from the devices



# Add Device Models



Two options “Basic” and “Advanced” available 



# Add “Basic” Device Model

Device Models

Microsoft Azure IoT Device Simulation

Simulations

Device Model

Add Device Model

Basic

Advanced

Define a new simulated device and the telemetry data to be sent from the device to your IoT hub. A single device can send one or more data points (e.g. location, humidity, etc.) allowing you to simulate data coming from real devices.

Device model name

MyBasicDevice

Model description

My basic device

Version

1.0

Telemetry data

Set parameters for telemetry sent for the sensor.

DATA POINT	BEHAVIOR	MIN VALUE	MAX VALUE	UNIT
Random	Random	1	100	1

+ Add data point

Save

× Clear all

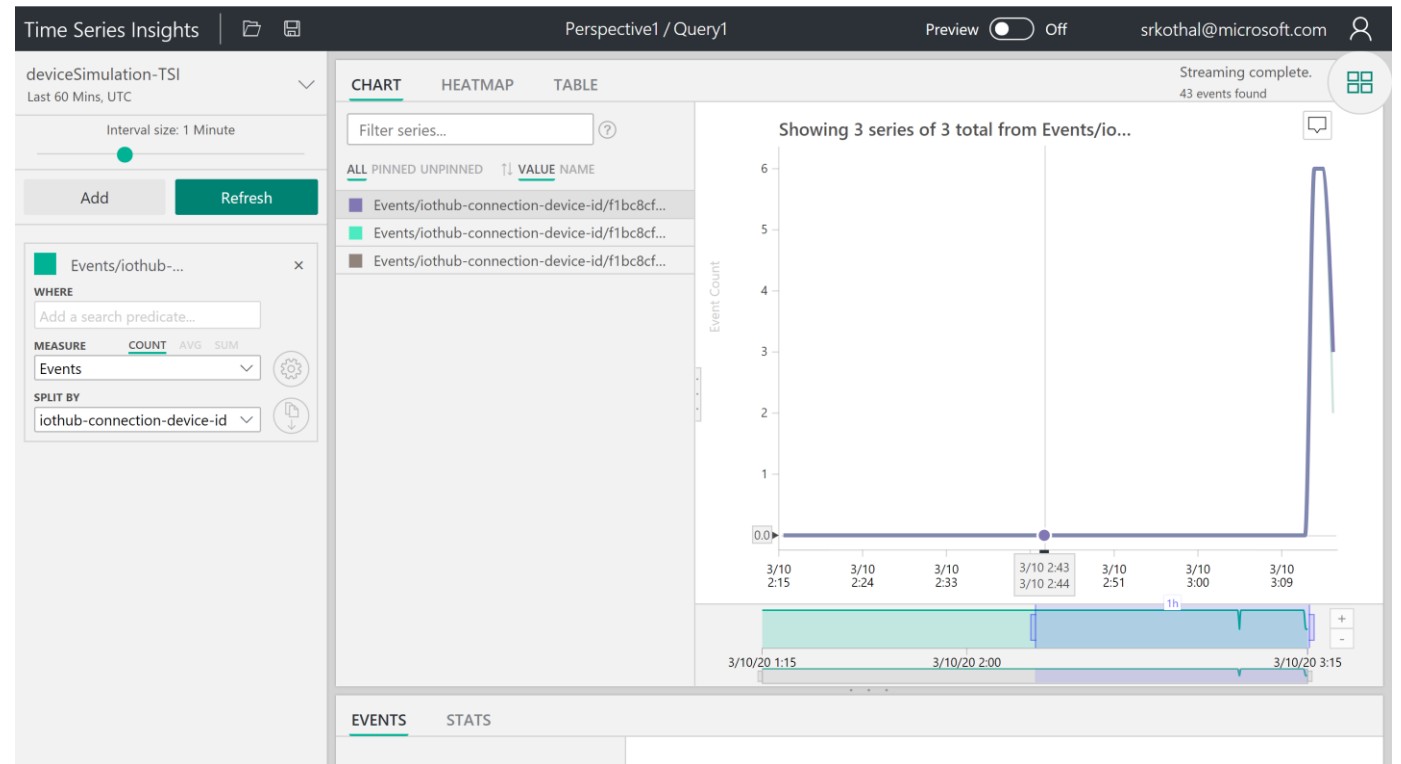


	Device Models
	MODEL NAME
Simulations	■ Chiller
Device Models	■ Delivery Truck
	■ Elevator
	■ Engine
	■ Faulty Chiller
	■ Faulty Delivery Truck
	■ Faulty Elevator
	■ Faulty Engine
	■ Faulty Prototyping ...
	■ Faulty Truck
	■ MyBasicDevice
	■ Protobuf Truck
	■ Prototyping Device
	■ Truck

# Setup Time Series Insights

## Steps:

- Refresh the instance of Time Series Insights
- Select Measure as “Events”
- Select Split By as “iothub-connection-device-id”



# New simulation with “Basic” device model

The screenshot displays the Microsoft Azure IoT Device Simulation interface. The main view shows a list of simulations under the heading "Simulations". Two sample simulations are visible: "Sample Simple Simulation" and "Sample Multi-Model Simulation". The "Sample Simple Simulation" shows a "10 Truck" device model with an average message rate of 0.92 and a total of 1256 messages sent. The "Sample Multi-Model Simulation" shows a "50 Chiller" and "10 Elevator" device models.

On the right side, the "Simulation setup" panel is open, showing the configuration for a new simulation. The "Name" field is set to "MyBasicDevice simulation". The "Description" field is also set to "MyBasicDevice simulation". The "Simulation duration" is set to "Run indefinitely". The "Device model" section shows a table with the following columns: NAME, AMOUNT, MESSAGE/SEC, and HH MM SS. The table contains one row with the device model "MyBasicDevice", an amount of 3, a message rate of 0.3, and a duration of 00:00:10. The "Target IoT Hub name" section is set to "Use pre-provisioned IoT Hub". The "Specify the IoT Hub throttling limits" section is set to "S2 Standard". The "Number of units" is set to 1. A warning message states: "Warning: This simulation will be throttled at 120 messages per second with these settings." The "Delete all devices when the simulation is complete" checkbox is unchecked.

Red boxes highlight the following elements:

- The "+ New simulation" button in the top right corner of the main view.
- The "Name" field in the "Simulation setup" panel.
- The "Run indefinitely" radio button in the "Simulation duration" section.
- The "Device model" table, specifically the "NAME", "AMOUNT", and "MESSAGE/SEC" columns.
- The "Start simulation" button at the bottom of the "Simulation setup" panel.



# Add “Advanced” device model

Microsoft Azure IoT Device Simulation

Device Models

Simulations

Device Model

Add Device Model

Basic **Advanced**

Each simulated device is derived from a specific device model. Device models define the device's capabilities and behavior including what messages to send, which methods are supported, etc.

Device models consist of one JSON configuration file, one JavaScript file defining the simulation behavior, and optionally one JavaScript file for each cloud to device method supported by the device. Advanced device models give you full control over these files. [Learn More](#)

Upload device model files **Browse**

Device model name  
Drone

Uploaded files:

drone.json	✓
drone-state.js	✓
droneRecall-method.js	✓

**Save** × Clear all



Device Models	
Simulations	
Device Models	MODEL NAME
	■ Chiller
	■ Delivery Truck
	<b>■ Drone</b>
	■ Elevator
	■ Engine
	■ Faulty Chiller
	■ Faulty Delivery Truck
	■ Faulty Elevator
	■ Faulty Engine
	■ Faulty Prototyping ...
	■ Faulty Truck
	■ MyBasicDevice
	■ Protobuf Truck
	■ Prototyping Device

Download the drone device model files from  
<https://github.com/dhanow/iot-solution-accelerators/tree/master/scripts/device-simulation>

# New simulation with “Advanced” device model

The image shows the Microsoft Azure IoT Device Simulation interface. The top navigation bar includes a hamburger menu, the title "Simulations", the text "Microsoft Azure IoT Device Simulation", and a user profile icon. A red box highlights the "+ New simulation" button in the top right.

The main content area is titled "Simulations" and displays two sample simulations:

- Sample Simple Simulation**: Created 09/03/20 07:44:12 PM, Ended 09/03/20 08:38:15 PM. It shows 10 Trucks with an average of 0.92 messages per second and a total of 1256 messages sent.
- Sample Multi-Model Simulation**: Created 09/03/20 07:44:12 PM. It shows 50 Chillers and 10 Elevators.

A sidebar on the left contains a hamburger menu and links to "Simulations" and "Device Models".

The right sidebar shows the "Simulation setup" form for a new simulation named "MyAdvancedModel Sim". The form includes the following sections:

- Name**: "MyAdvancedModel Sim" (highlighted with a red box).
- Description**: "MyAdvancedModel Simulation".
- Simulation duration**: Set to "Run indefinitely" (highlighted with a red box).
- Device model**: Choose type of device to simulate. A table lists the device types:

NAME	AMOUNT	MESSAGE/SEC	HH MM SS
Drone	5	1	00 00 05

A red box highlights the "Drone" row in the table. Below the table is a "+ Add a device type" button.

- Target IoT Hub name**: "Use pre-provisioned IoT Hub" (selected).
- Specify the IoT Hub throttling limits**: "S2 Standard" (selected).
- Number of units**: 1.
- Warning**: "This simulation will be throttled at 120 messages per second with these settings."
- Delete all devices when the simulation is complete**: Unchecked.

A red box highlights the "Start simulation" button at the bottom right.

Thank You