Creating Microsoft IoT Central app with MXChip

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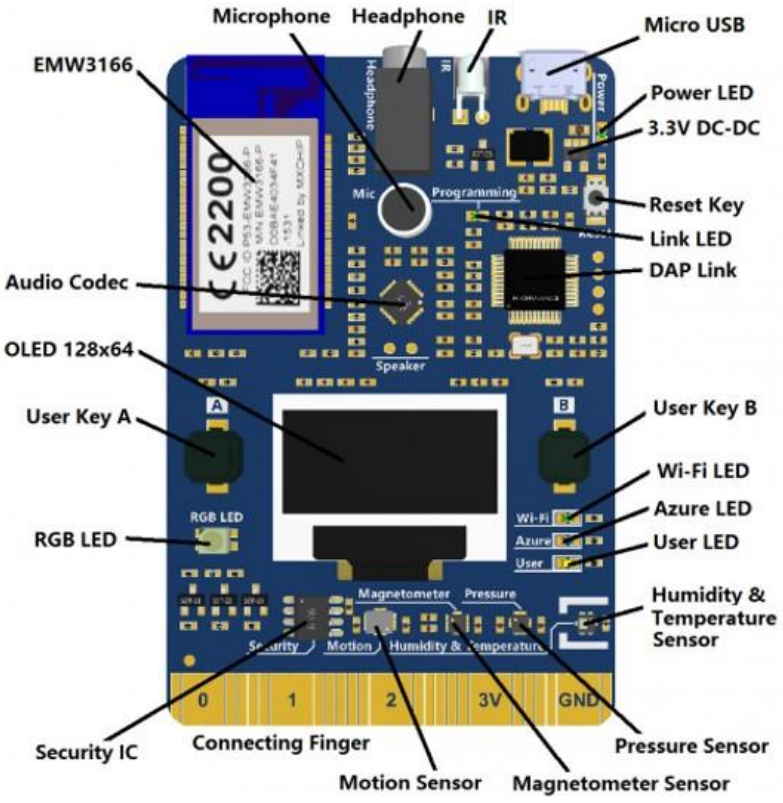

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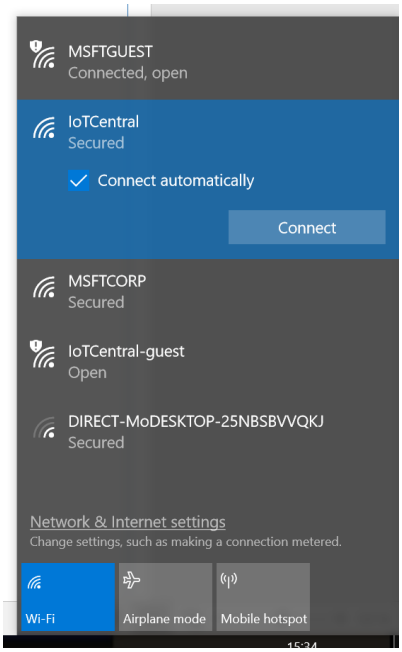
BEFORE YOU START

Wifi **SSID** : **IoTCentral**
Password: EasyNoCode!



This document describes how, as a device developer, you would connect an MXChip IoT DevKit (DevKit) device to your Microsoft IoT Central application. Before you start that journey, we would recommend:

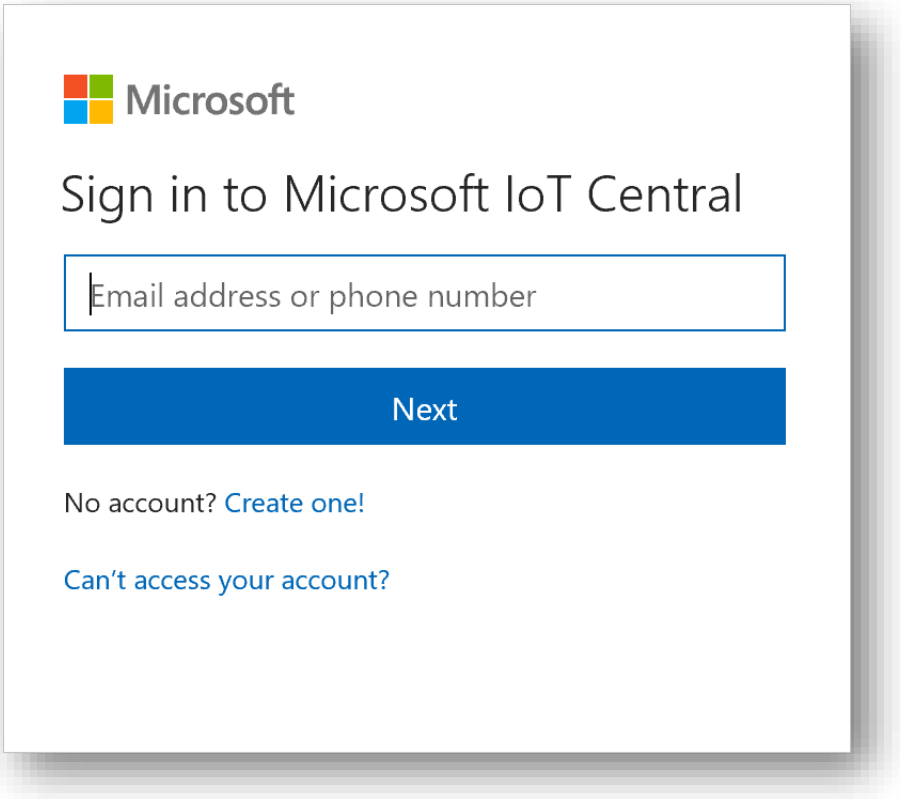
- Bookmark *the* ***tutorial*** on how to connect your DevKit to IoT central
- In your spare time, watch the **Channel 9 video** on creating an IoT Central Solution in minutes!
- If you need to order a DevKit device, please visit **MXChip IoT DevKit**.

CREATING A NEW MICROSOFT IOT CENTRAL APPLICATION

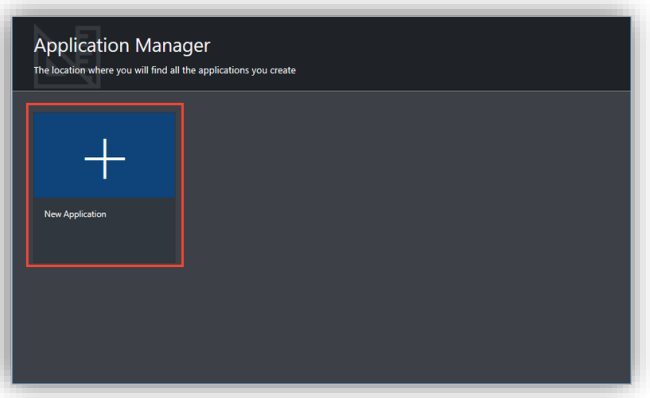
Pre-Requisites

If you don't have an Azure subscription, create a **Pay-As-You-Go subscription**. ***You will not be charged*** when you create a **Microsoft IoT Central free 30-day trial application**. To complete this section, you need to complete the following steps to create a new Microsoft IoT Central application:

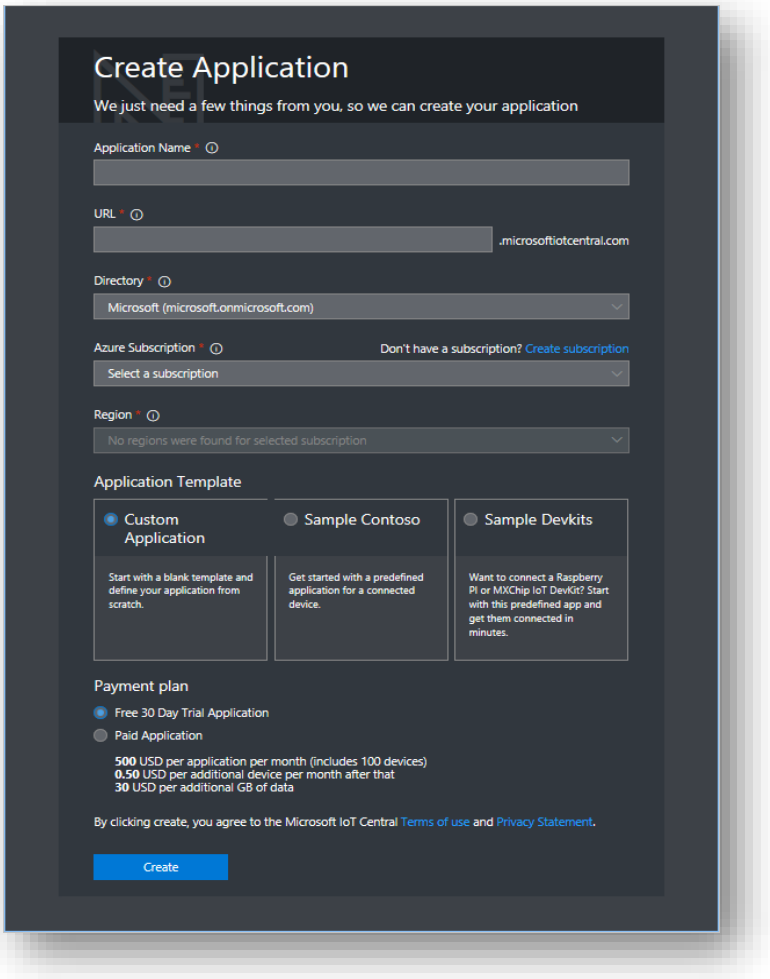
1. Navigate to the Microsoft IoT Central **Application Manager** page.
2. Enter the **email address & password** to access your Azure subscription:



3. To create a new Microsoft IoT Central application, click on **New Application**:



4. Fill in the details of the **Application** *(guidance provided on the next page)*



a. **Application Name:** The name of your application is displayed on the Application Manager page and within each Microsoft IoT Central application. You can choose any name for your Microsoft IoT Central application. Choose a name that makes sense to you and to others in your organization *e.g. Connected Refrigerator*
b. **URL:** The application URL is the link to your application. You can save a bookmark to it in your browser or share it with others. When you enter the name for your application, *your application URL is auto-generated*. If you prefer, you can choose a different URL for your application. Each Microsoft IoT Central URL must be unique. You see an error message if the URL you choose has already been taken.
c. **Directory:** Choose an Azure Active Directory tenant to create a Microsoft IoT Central application. An Azure Active Directory tenant contains user identities, credentials, and other organizational information. Multiple Azure subscriptions can be associated with a single Azure Active Directory tenant. If you don't have an Azure Active Directory tenant, one is created for you when you create an Azure subscription. To learn more, see Azure Active Directory
d. **Azure subscription:** An Azure subscription enables you to create instances of Azure services. Microsoft IoT Central automatically finds all the Azure Subscriptions you have access to and displays them in a dropdown on the Create Application page. Choose an Azure subscription to create a new Microsoft IoT Central Application. If you don't have an Azure subscription, you can

create one on this page. After you create the Azure subscription, navigate back to the Create Application page. Your new subscription appears in the Azure Subscription drop-down. To learn more, see Azure subscriptions.

e. **Resource group:** A resource group is a container that holds related resources for an Azure solution. You can choose either an existing resource group, or to create a new one for your Microsoft IoT Central Application. To learn more, see Azure resource groups.

f. **Region:** Choose the region where you'd like to create your Microsoft IoT Central Application. Typically, you should ***choose the region that is closest physically to your devices*** to get optimal performance. To learn more, see Azure regions. You can see the regions in which Microsoft IoT Central is available on the Products available by region page.

Note: Once you choose a region, you cannot later move your application to different region

g. **Application Template:** You can choose one of the available application templates for your new Microsoft IoT Central application. An application template can contain predefined items such as device templates and dashboards to help you get started ***(e.g. choose Custom for this lab):***

Application template	Description
Custom application	Creates an empty application for you to populate with your own device templates and devices.
Sample Contoso	Creates an application that includes a device template for a simple connected device. Use this template to get started exploring
Sample Devkits	Creates an application with device templates ready for you to connect an MXChip or Raspberry Pi device. Use this template if you

h. **Payment plan:** You can create either a free trial or a paid application. Learn more about Trials and Paid applications on this page. ***For our lab, we will choose Free 30-day trial***

i. Then click on **Create.**

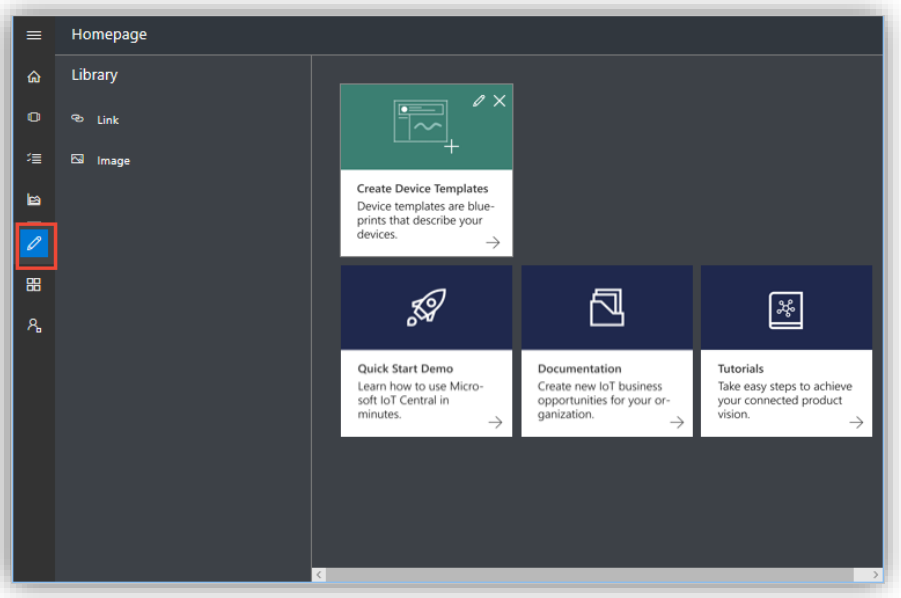
CONGRATULATIONS!

YOU'VE SUCCESSFULLY CREATED YOUR FIRST MICROSOFT IOT CENTRAL APPLICATION!

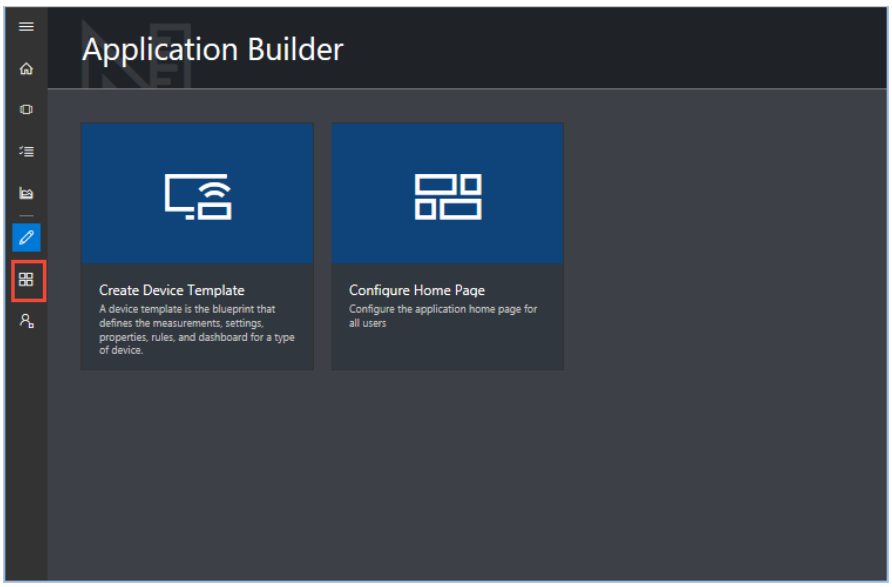
CREATING A NEW CUSTOM DEVICE TEMPLATE

As a builder, you use the *builder mode* to create and edit the device templates in your application. When you create a device template, Microsoft IoT Central generates a simulated device from the template. The simulated device generates telemetry that enables you to test the behavior of your application before you connect a physical device.

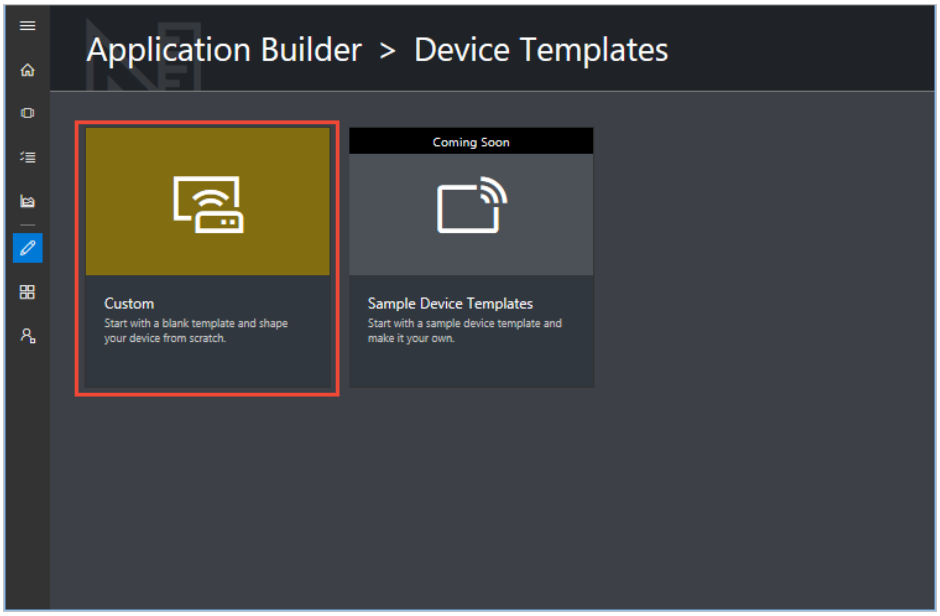
a) To add a new device template to your application, you need to switch builder mode on. To switch builder mode on, choose **Builder Mode** on the left navigation menu (gets highlighted):



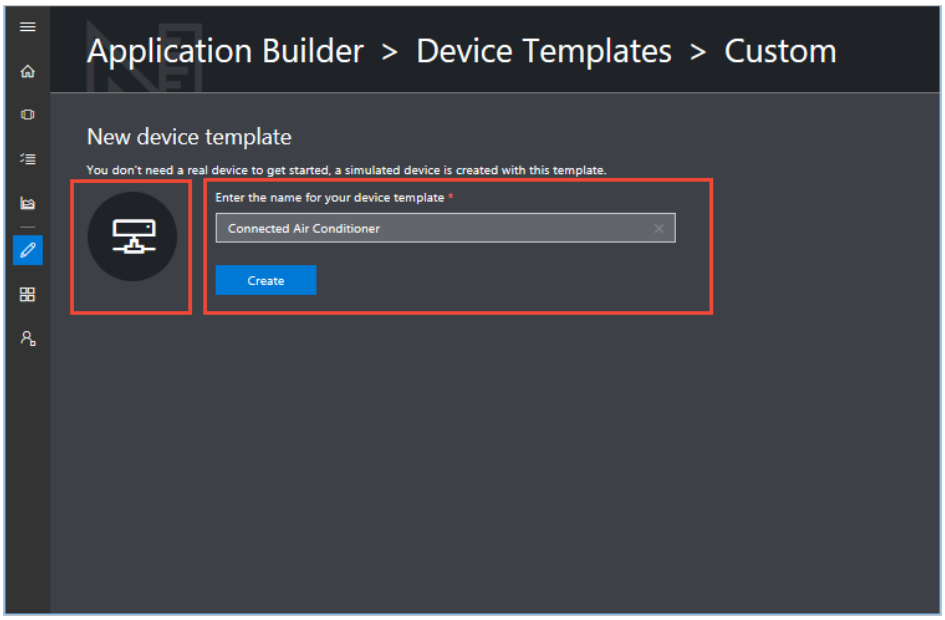
b) To display the **Application Builder** page, choose the **Application builder** on the left navigation menu just below the Builder Mode:



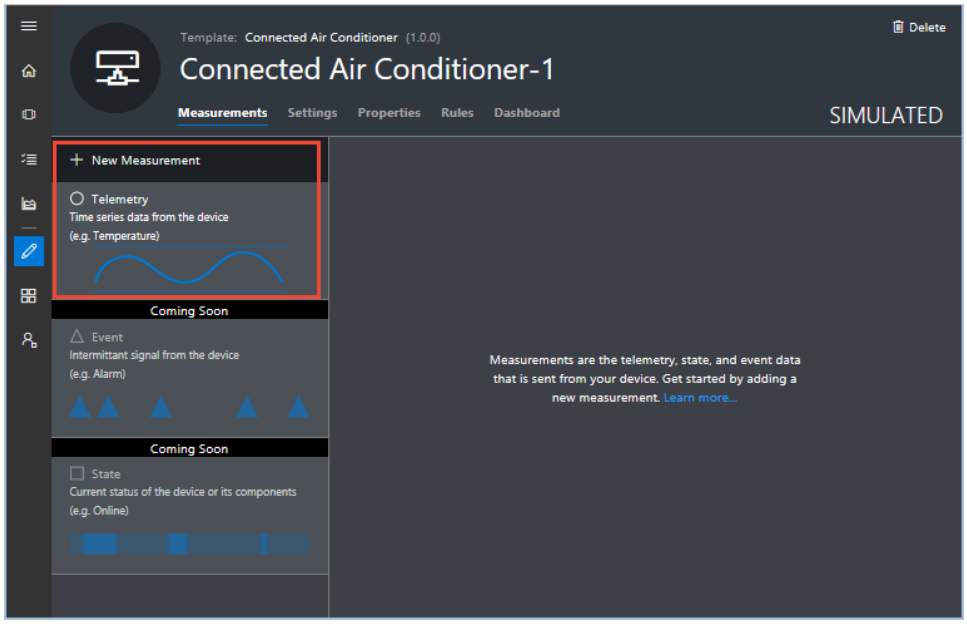
c) On the **Device Templates** page, choose **Custom**. **A Custom device template** enables you to define all the characteristics and behaviors of your connected product:



d) On the **New Device Template** page, enter Connected Product as the name of your device, and then choose **Create**. You can also upload an image of your device that's visible to operators in the device explorer:



e) Go to the **Measurement** tab and choose **New Measurement** and then **Telemetry:**



f) For each type of telemetry you define for a device template includes configuration options such as:
- Display options
- Details of the telemetry
- Simulation parameters

g) **Create the following Telemetry measurements**:

Measurements

Field name	Units	Minimum	Maximum	Decimals
humidity	%	0	100	0
temp	°C	-40	120	0
pressure	hPa	260	1260	0
magnetometerX	mgauss	-1000	1000	0
magnetometerY	mgauss	-1000	1000	0
magnetometerZ	Magus s	-1000	1000	0
accelerometerX	mg	-2000	2000	0
accelerometerY	mg	-2000	2000	0
accelerometerZ	mg	-2000	2000	0
gyroscopeX	mdps	-2000	2000	0
gyroscopeY	mdps	-2000	2000	0
gyroscopeZ	mdps	-2000	2000	0

Settings

You use settings to enable an operator to send configuration data to a device. In this section, you add a setting to your Connected Air Conditioner device template that enables an operator to set the target temperature of the connected air conditioner.

Display name	Field name	Units	Decimal places	Minimum	Maximum	Initial
Voltage	setVoltage	Volts	0	0	240	0
Current	setCurrent	Amps	0	0	100	0
Fan Speed	fanSpeed	RPM	0	0	1000	0

Toggle settings

Display name	Field name	On text	Off text	Initial
IR	activateIR	ON	OFF	Off

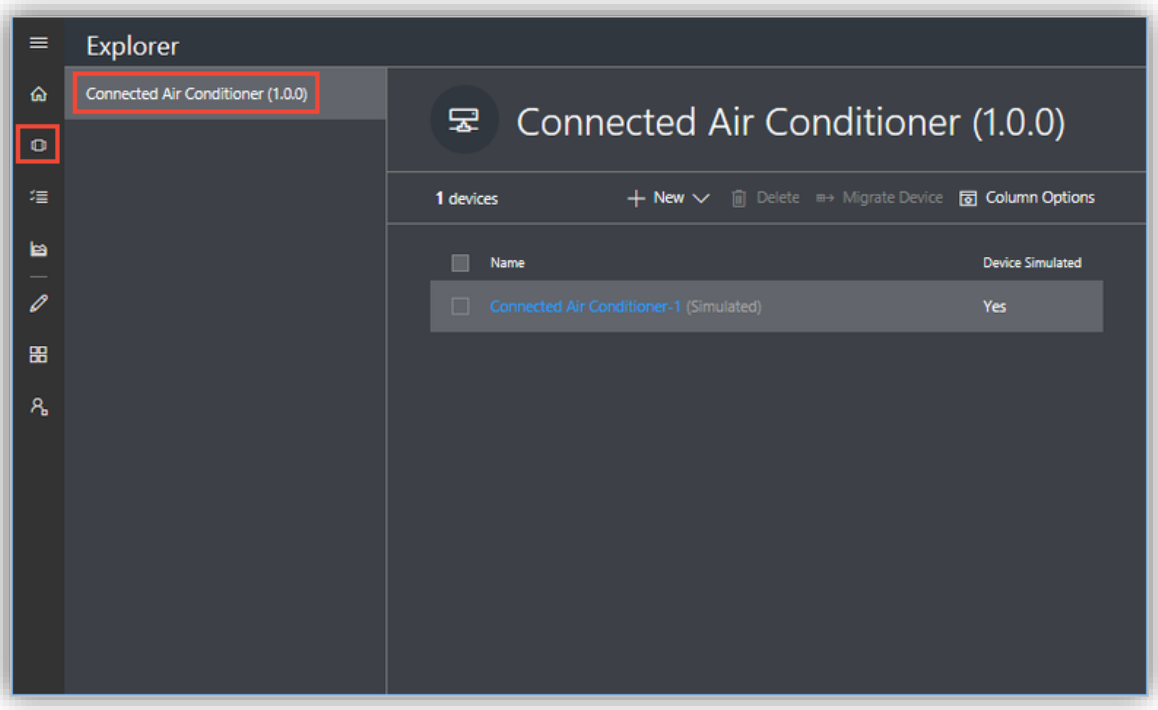
Properties

Type	Display name	Field name	Data type
Device property	Die number	dieNumber	number
Text	Location	location	N/A

GETTING THE CONNECTION STRING FOR REAL DEVICE

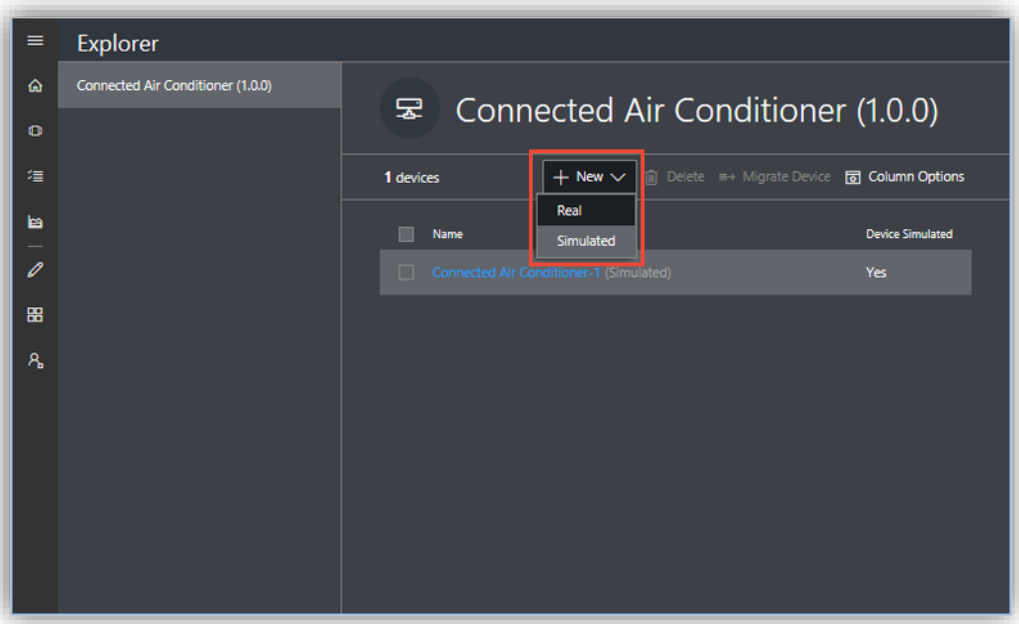
A device developer needs to embed the *connection string* for your real device in the code that runs on the device. The connection string enables the device to connect securely to your Microsoft IoT Central application. Every device instance has a unique connection string. The following steps show you how to find the connection string for a device instance in your application.

1. To connect a real device, we will need a connection string so go back and choose **Device Explorer** in the left navigation menu:

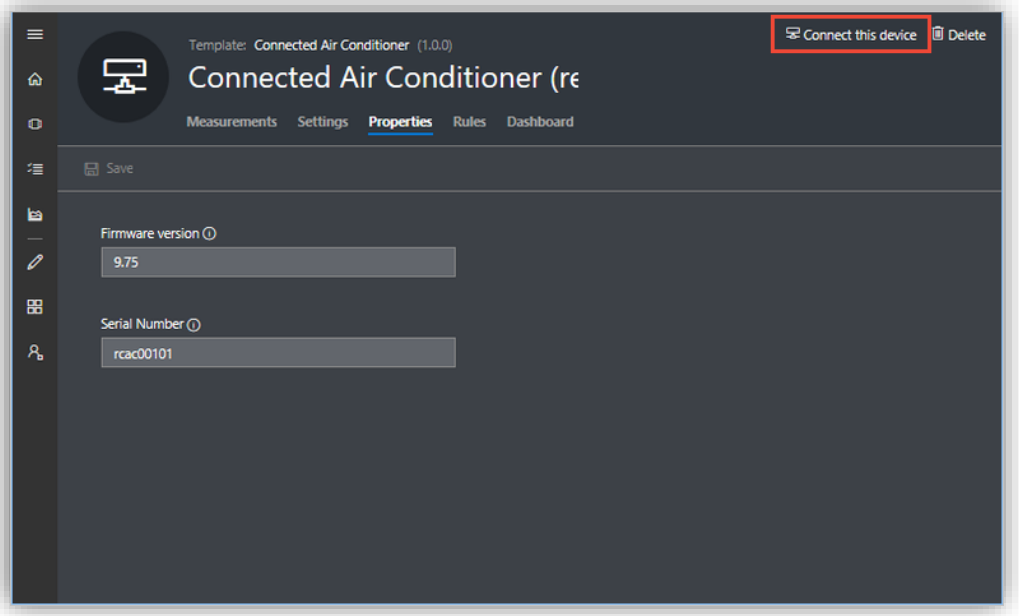


   The **Device Explorer** shows the **Connected Air Conditioner** device template and the simulated device that was automatically created when the builder created the device template.

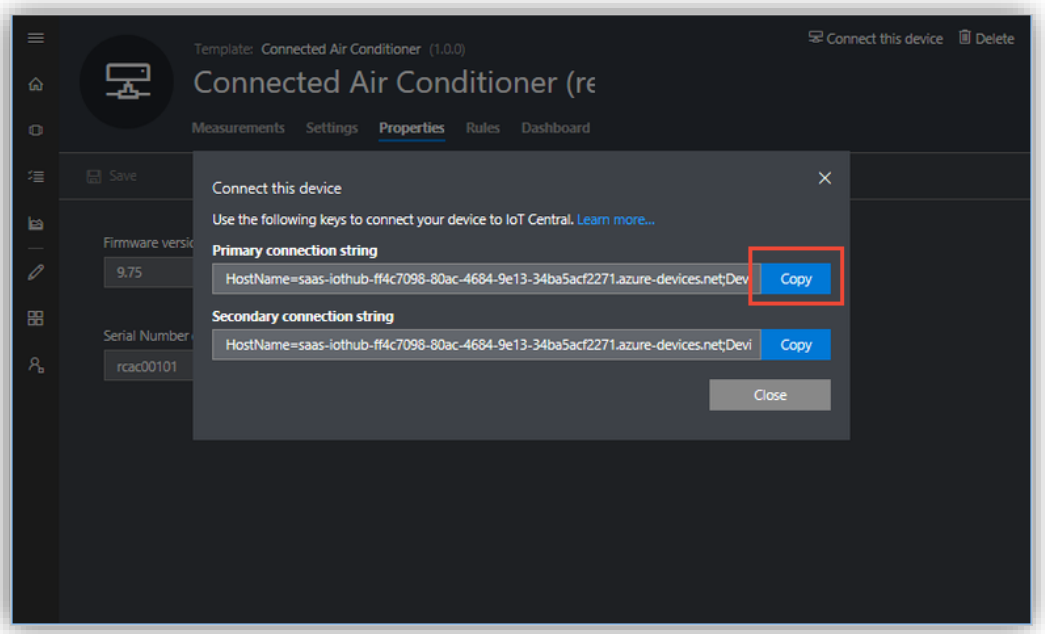
2. To start connecting a real connected air conditioner device, choose **New**, then **Real**



On the **Device** screen for your real connected air conditioner device, choose **Connect this device**

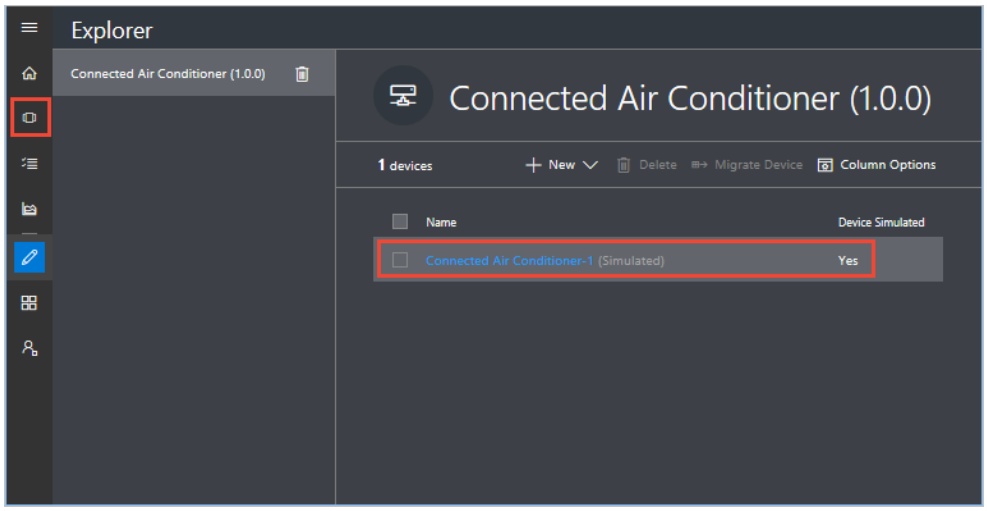


On the **Connect** page, copy the **Primary connection string**, and save it. You use this value in the next section of this tutorial. A device developer uses this value in the client application that runs on the device start connecting a real connected

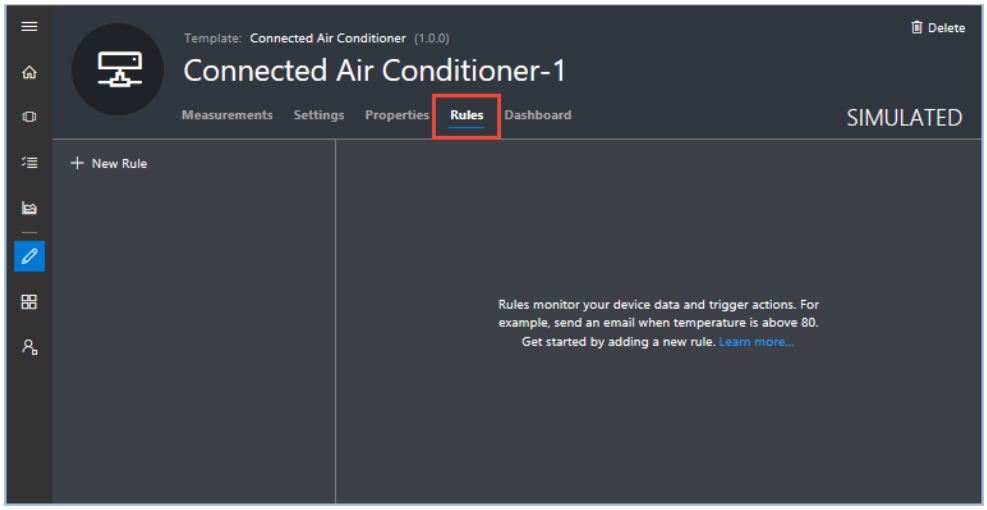


CREATING RULES AND ACTIONS

1. To add a new telemetry-based rule to your application, you need to be in *builder mode*. To switch builder mode on, choose **Builder Mode** on the left navigation menu.
2. In the left navigation menu, choose **Device Explorer**



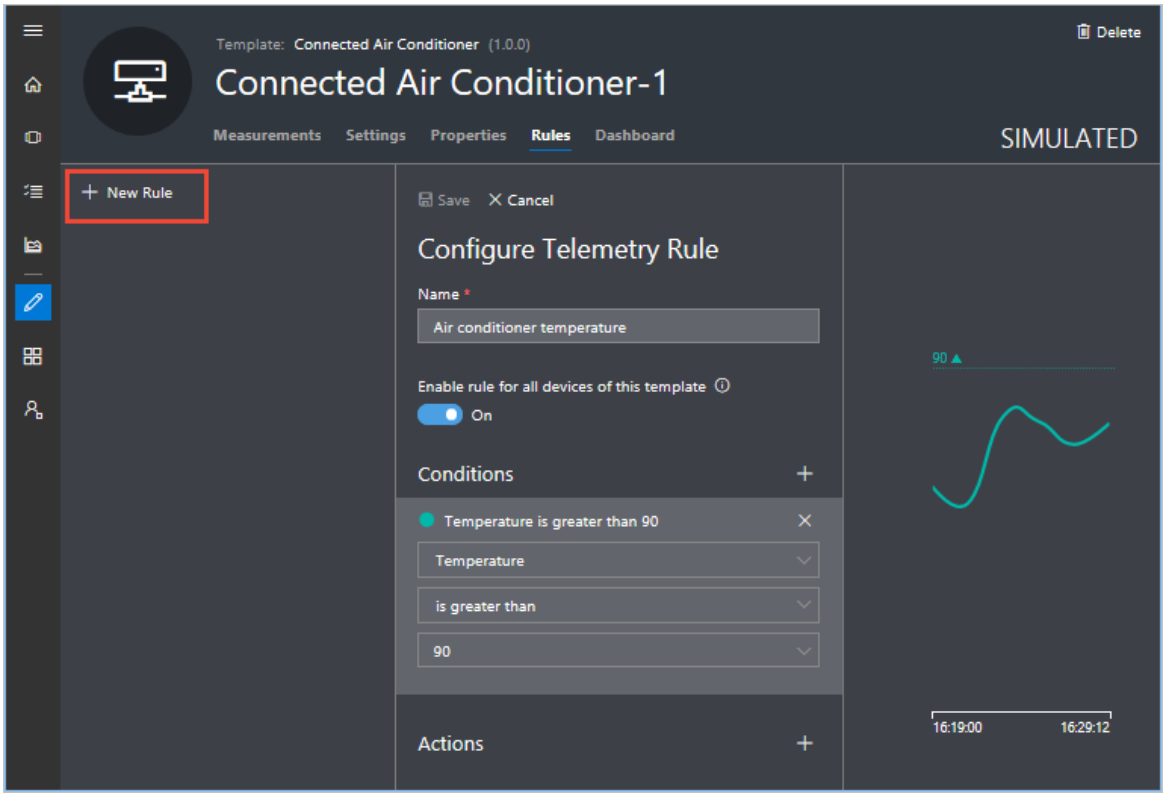
3. To start adding a rule in the **Rules** view, choose **Rules**:



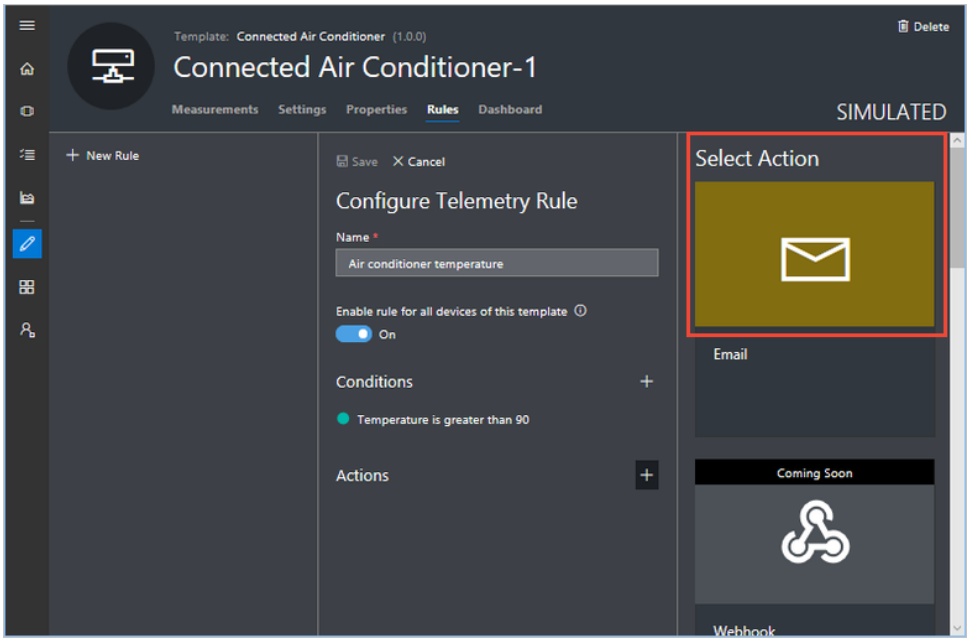
To define your rule, use the information in the following table:

Setting	Value
Name	Air conditioner temperature
Enable rule	On
Condition	Temperature is greater than 90

Set the temp:



Action, scroll down on the **Configure Telemetry Rule** panel and choose the **+** next to **Actions**,

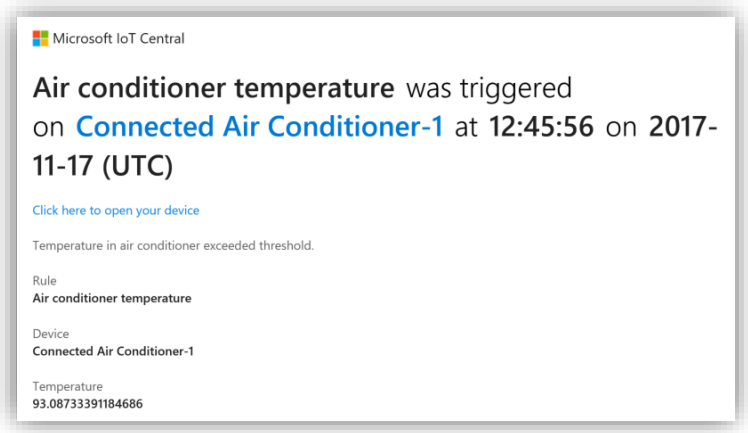


Define your action, use the information in the following table:

Setting	Value
To	Your email address
Notes	Temperature in air conditioner exceeded threshold.

> **Note**
> To receive an email notification, the email address must be a user ID in the application, and that user must have signed in to the application at least once.

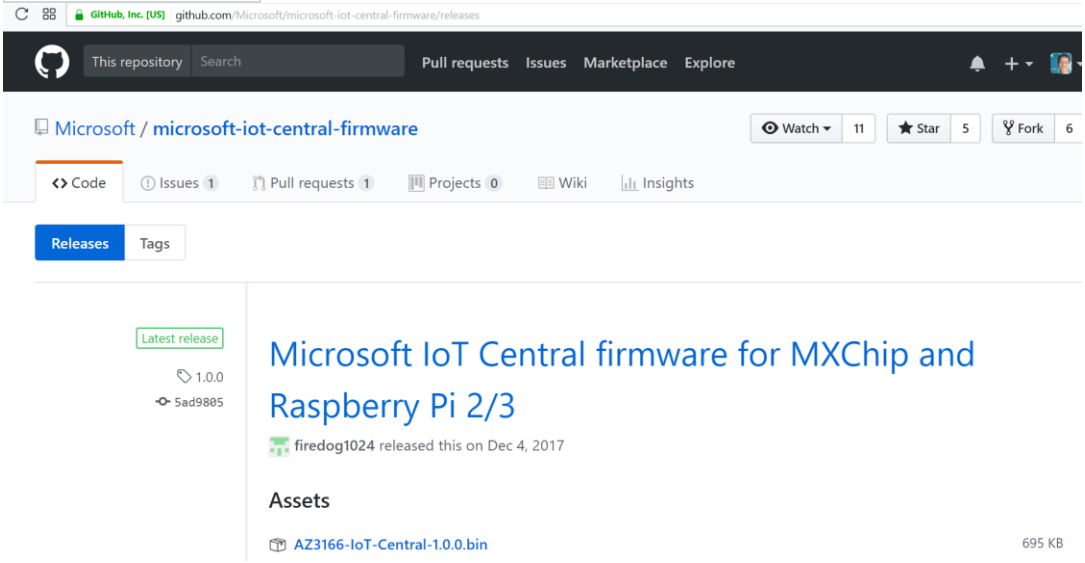
Test the Rules: After you save the rule, it may take up to 5 minutes to become active. When the conditions defined in the rule are met, your application sends a message to the email address you specified in the action.



CONNECTING THE REAL DEVICE (MXCHIP)

Note : Your device should have the latest 1.0.0.bin firmware already loaded with December 4th, 2017 release.

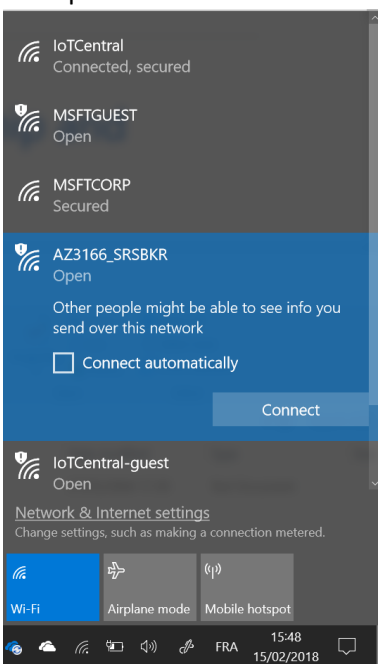
1. If not, please download the latest pre-built Microsoft IoT Central firmware for the MXChip from the releases page on GitHub. The download filename on the releases page looks like `AZ3166-IoT-Central-X.X.X.bin`. (ex. AZ3166-IoT-Central-1.0.0.bin)



2. Connect the DevKit device to your development machine using a USB cable. In Windows, a file explorer window opens on a drive mapped to the storage on the DevKit device. For example, the drive might be called **AZ3166 (D:)**.
3. Drag the **iotCentral.bin** file onto the drive window. When the copying is complete, the device reboots with the new firmware.
4. When the DevKit device restarts, the following screen:

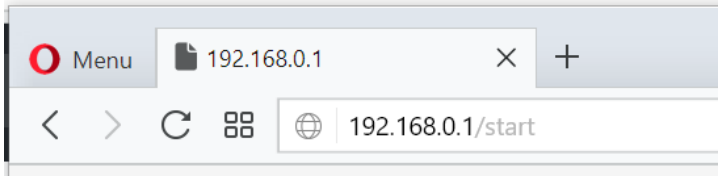
```
WiFi name:
AZ3166_??????
mac:????
Ready to connect
```

Example

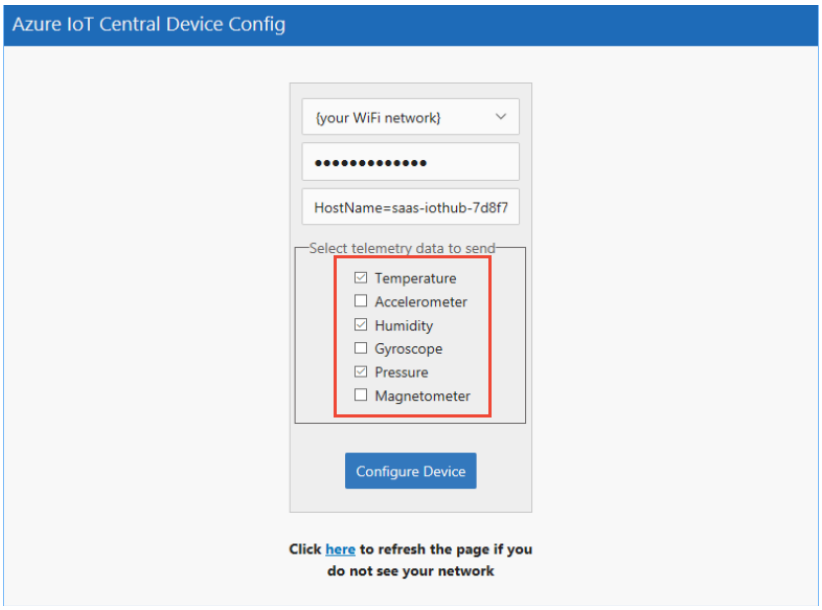


If the screen displays a MAC address consisting of only zeros, press the **Reset** button on the device.

5. Your DevKit is now updated with the latest firmware and ready to connect.
6. The device is now in access point (AP) mode. You can connect to this WiFi access point from your computer or mobile device.
7. On your computer, phone, or tablet connect to the WiFi network name shown on the screen of the device. When you connect to this network, you do not have internet access. This state is expected, and you are only connected to this network for a short time while you configure the device.
8. Open your web browser and navigate to http://192.168.0.1/start

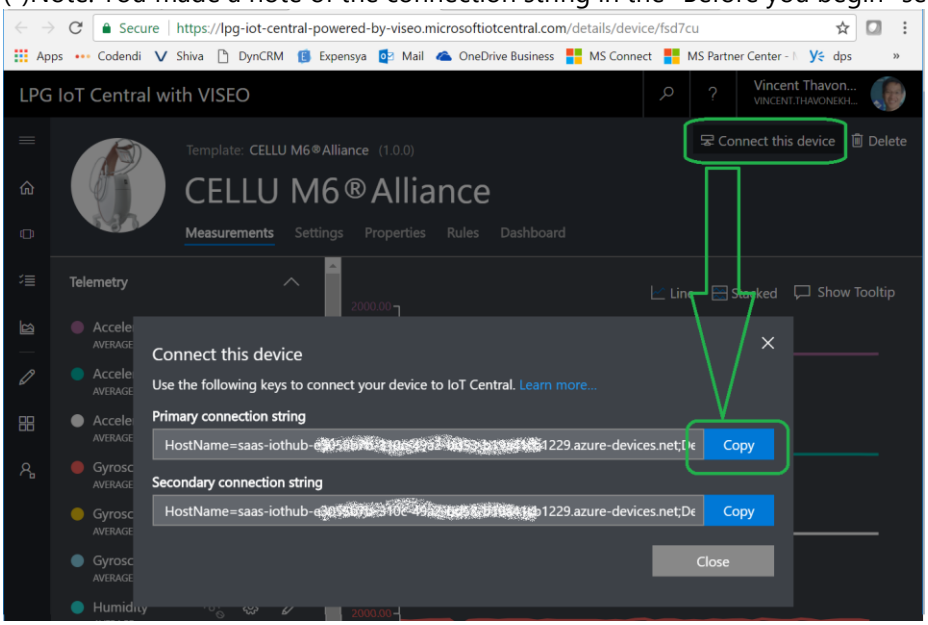


The following web page displays:



In the web page, add the name of your WiFi network, your WiFi network password, and the connection string of your device (*). Select all the available telemetry measurements.

(*)Note: You made a note of the connection string in the "Before you begin" section in this article.



After you choose **Configure Device**, you see this page:

Press the **Reset** button on your device.

Note: To reconfigure the device to use a **different WiFi network,** connection string, or telemetry measurement, press both the **A** and **B** buttons on the board simultaneously.

View the telemetry

When the DevKit device restarts, the screen on the device shows:

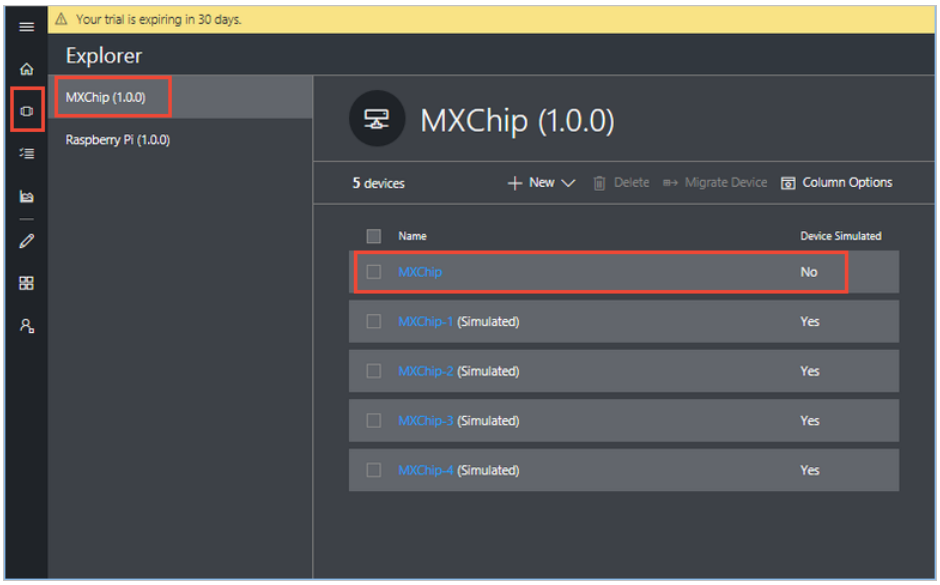
- The number of telemetry messages sent.
- The number of failures.
- The number of desired properties received, and the number of reported properties sent.

Shake the device increment the number of reported properties sent. The device sends a random number as the **Die number** device property.

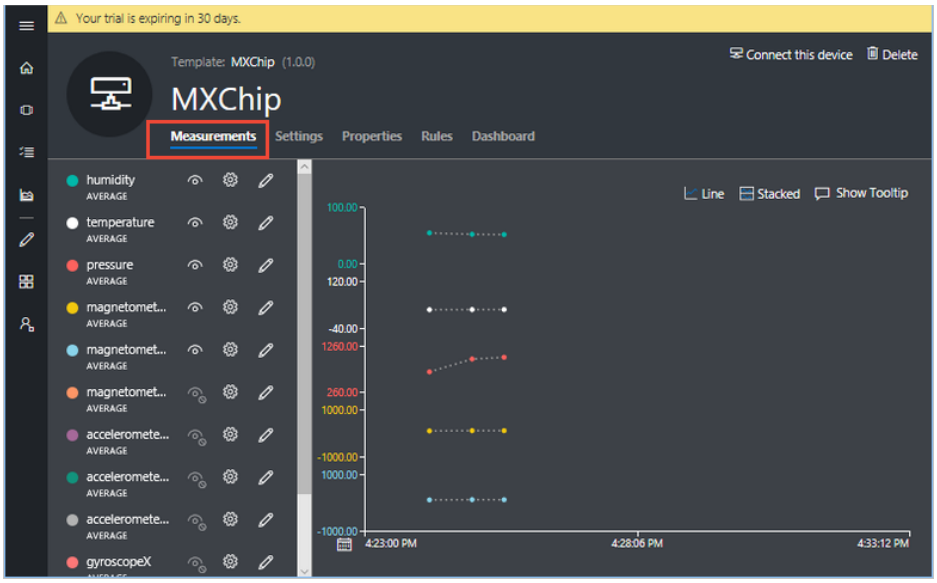
You can view the telemetry measurements and reported property values, and configure settings in Microsoft IoT Central:

Make sure that **Builder Mode** is off.

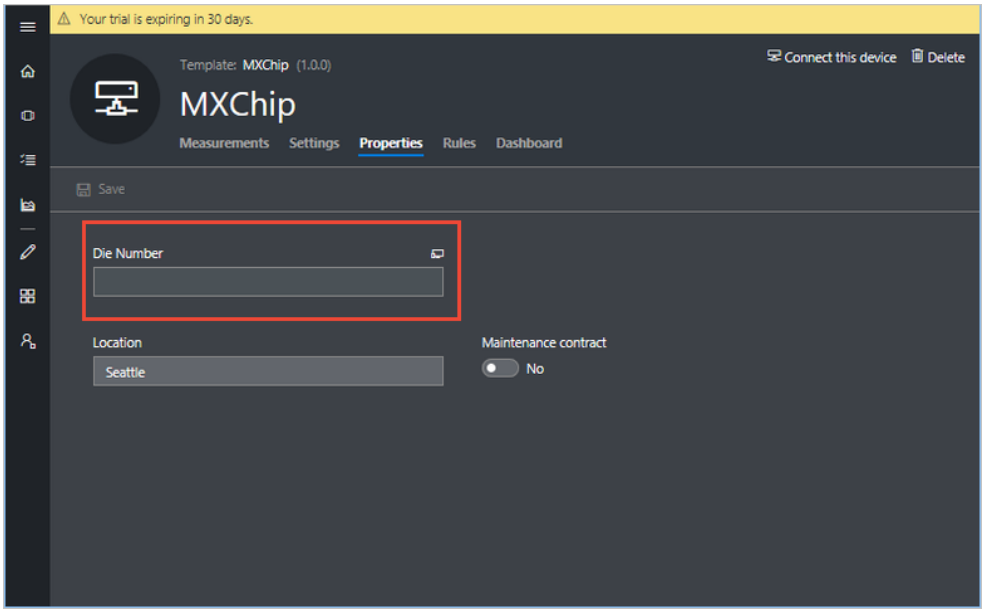
Use **Device Explorer** to navigate to the **Measurements** page for the real MXChip device you added:



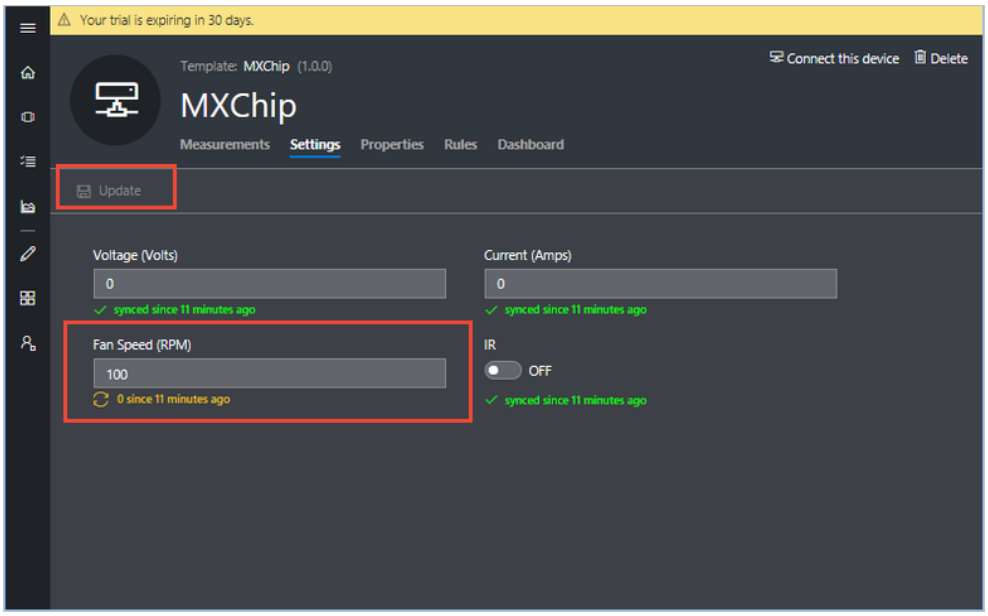
On the **Measurements** page, you can see the telemetry coming from the MXChip device:



On the **Properties** page, you can view the last die number reported by the device:



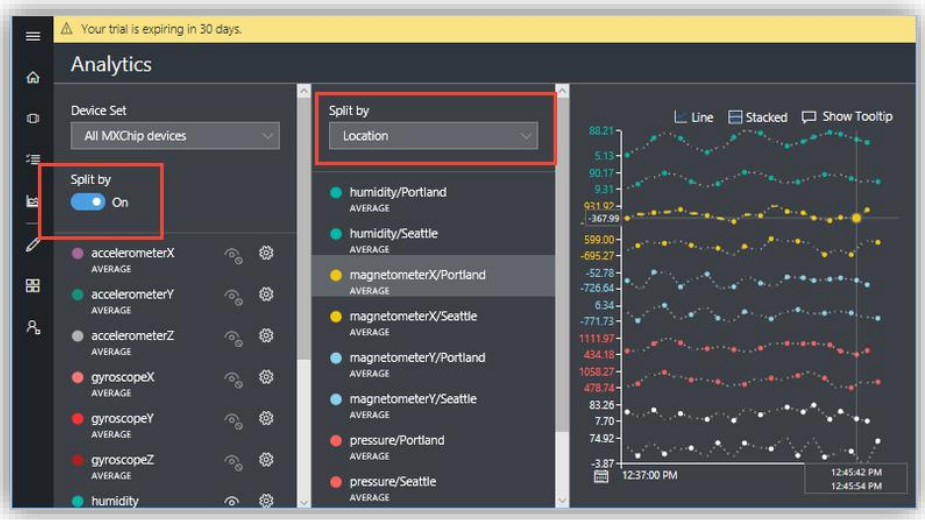
On the **Settings** page, you can update the settings on the MXChip device:



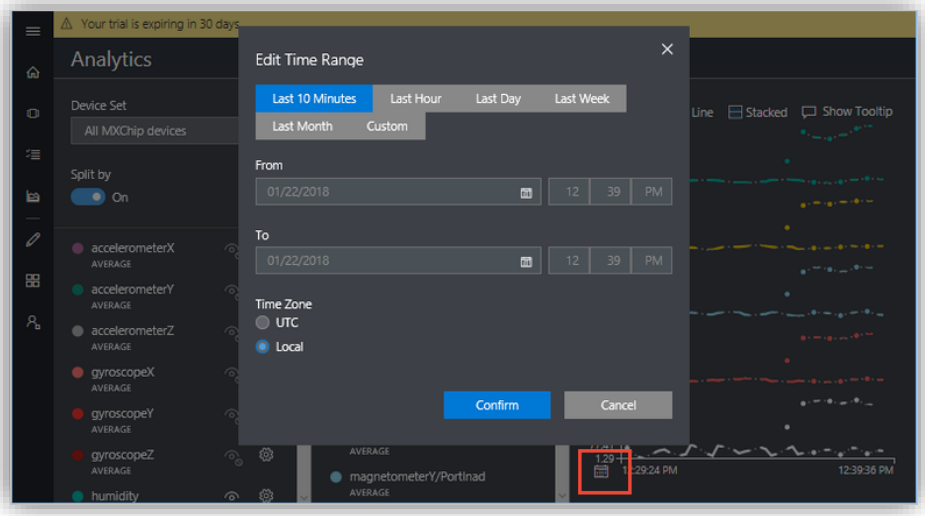
CREATING CUSTOM ANALYTICS

Use analytics to view and analyze data for a given **device set** in your application. A device set is a user-defined group of your devices. You can narrow down your analysis to a small set of devices or to a single device. As an operator, choose **Analytics** on the left navigation menu, choose a device set, and then choose the measurements to display on the graph.

- **Measurements:** E.g. Choose the measurements to display such as temperature and humidity.
- **Aggregation:** Choose the aggregation function for the measurements. For example, **Minimum** or **Average**.
- **Split-by:** Drill down by splitting the data by device properties or device name. For example, split by device location



Time-range: You can choose time range from one of the predefined time ranges or create a custom time



Change the visualizations

You can change the graphs to meet your visualization requirements by choosing from one of the three modes:

- **Stacked:** A graph for every measurement is stacked and each of the graphs have their own Y-axis. Stacked graphs are useful when you have multiple measurements selected and want to have distinct view of these measurements.
- **Unstacked:** A graph for every measure is plotted against one Y-axis, but the values for the Y-axis are changed based on the highlighted measure. Unstacked graphs are useful when you want to overlay multiple measures and want to see patterns across these measures for the same time range.
- **Shared Y-axis:** All the graphs share the same Y-axis and the values for the axis do not change. Shared Y-axis graphs are useful when you want to look at a single measure while slicing the data with split-by

ADMINISTERING YOUR APP

After you create a Microsoft IoT Central application, you can use the **Administration** section of the Microsoft IoT Central user interface to administer it. To navigate to the **Administration** section, choose **Administration** on the left navigation menu.

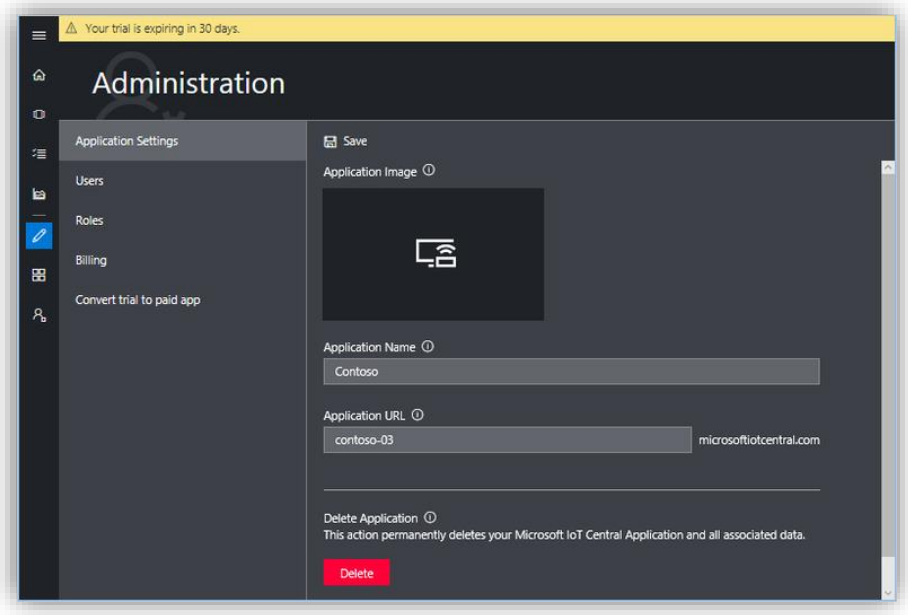
The **Administration** section enables you to: Manage users, Manage roles, View billing information, Manage application settings. In the **Administration** section, there is a secondary navigation menu with links to the various administration tasks.

To access and use the **Administration** section, you must be in the **Administrator** role in the Microsoft IoT Central application. If you create a Microsoft IoT Central application, you are automatically assigned to the **Administrator** role for that application. The *Managing Users* section in this article explains more about how to assign the **Administrator** role to other users.

CHANGING APP NAME AND URL

To change the name of your application, use the secondary navigation menu to navigate to the **Application Settings** page in the **Administration** section.

On the **Application Settings** page, enter a name of your choice in the **Application Name** field, and then choose **Save**. To change the **URL** for your application, use the secondary navigation menu to navigate to the **Application Settings** page in the **Administration** section.



On the **Application Settings** page, enter the URL of your choice in the **URL** field, and then choose **Save**. Your URL can be at most 200 characters in length. If the URL is not available, you see a validation error

Note

If you change your URL, your old URL can be taken by another Microsoft IoT Central customer. In that case, it is no longer available for you to use. When you change your URL, the old URL no longer works, and you must notify your users about the new URL to use.

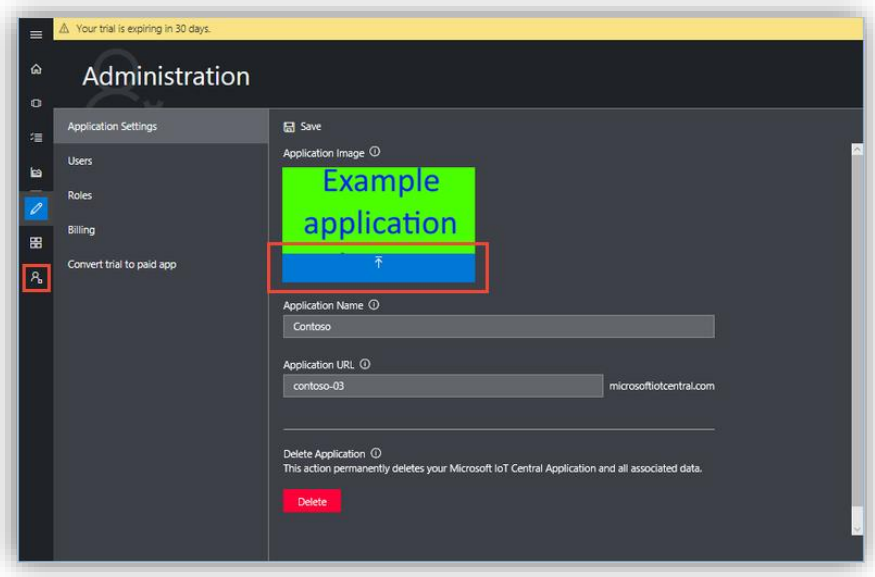
CHANGING APP IMAGE

You can add custom images to the **App Manager** page, the **Home page**, **Device template, Device Set Dashboard, Device Dashboard** . In all locations, you can use either PNG, GIF, or JPEG images. The following table summarizes the image sizes you can use:

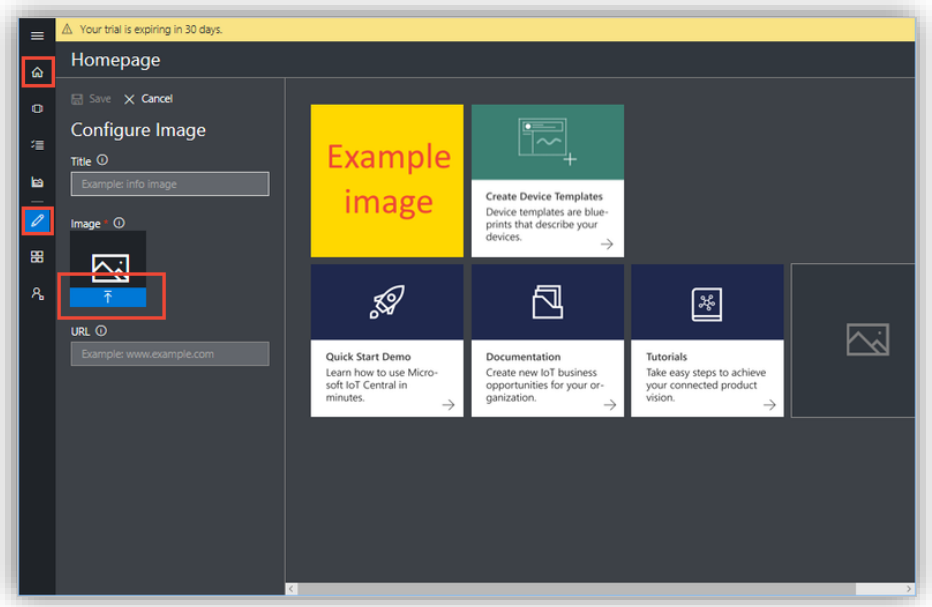
Location	Sizes
Application Manager	268x160 px
Device template	64x64 px
Home page and dashboard tiles	The smallest sized tile is 200x200 px, larger tiles can be either square or rectangular multiples of small tiles. E.g. 200x400 px, 400x200 px, or 400x400 px

For the best display in the application, you should create images that match the dimensions shown in the previous table.

Application Manager: To upload an image to use on the Application Manager, navigate to the Application Settings page in the Administration section. You must be an administrator to complete this task:

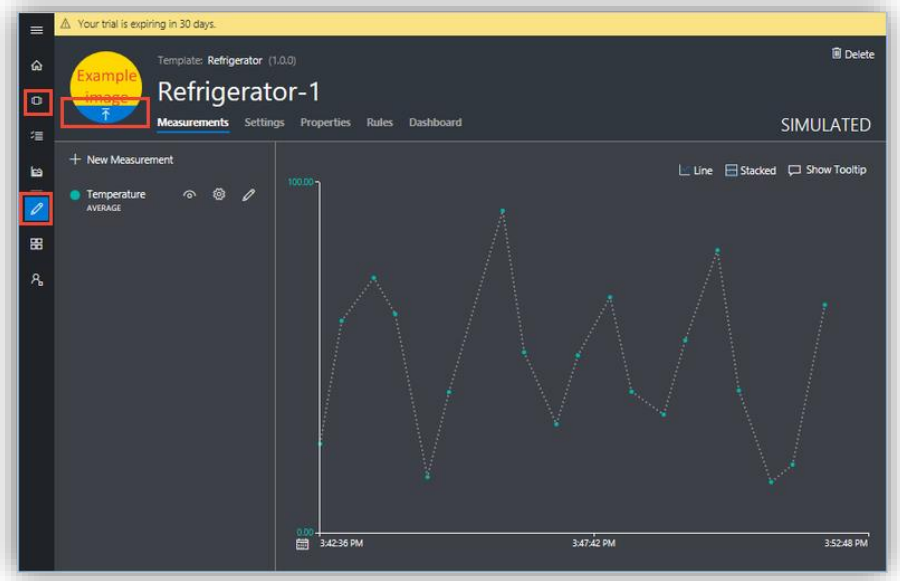


Home Page: To upload an image to use on the home page, navigate to the Homepage of your application and switch builder mode on. You must be a builder to complete this task, can resize:



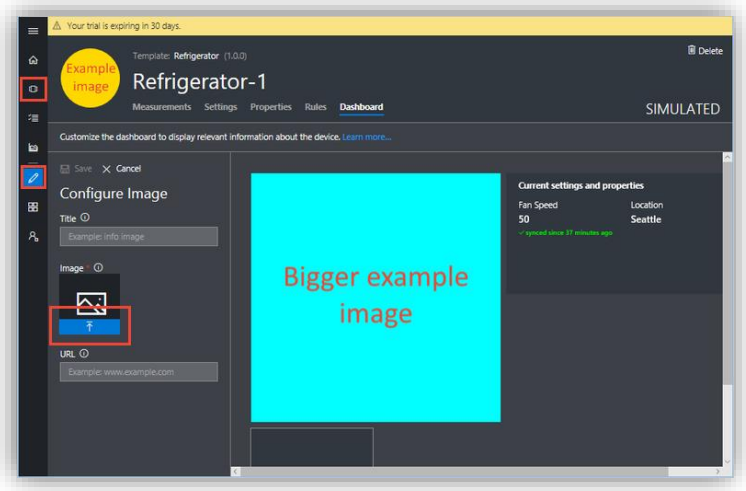
Device Template:

To upload an image to use on a device template, navigate to Device Explorer, choose the device template and then a device, and switch builder mode on. You must be a builder to complete this task, can resize:



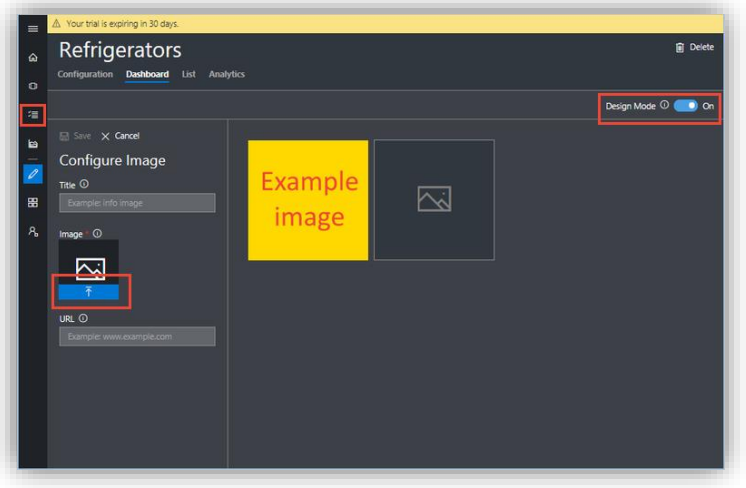
Device Dashboard:

To upload an image to use on a device dashboard, navigate to Device Explorer, choose the device template, and then a device. Then choose the Dashboard page and switch builder mode on. You must be a builder to complete this task, can resize:



Device Set Dashboard:

To upload an image to use on a device set dashboard, navigate to **Device Sets** and choose the device set, and then a device. Then choose the **Dashboard** page and switch **Design Mode** on. After the image uploads, you can resize and reposition it while design mode is switched on.



VIEWING YOUR BILL

To view your bill, navigate to the **Billing** page in the **Administration** section and choose **Billing**. The Azure billing page opens in a new tab and you can see the bill for each of your Microsoft IoT Central applications.

CONVERT TRIAL TO PAID

To convert your trial application to a paid application, contact the Microsoft IoT Central team through the **Convert trial to paid app** page.