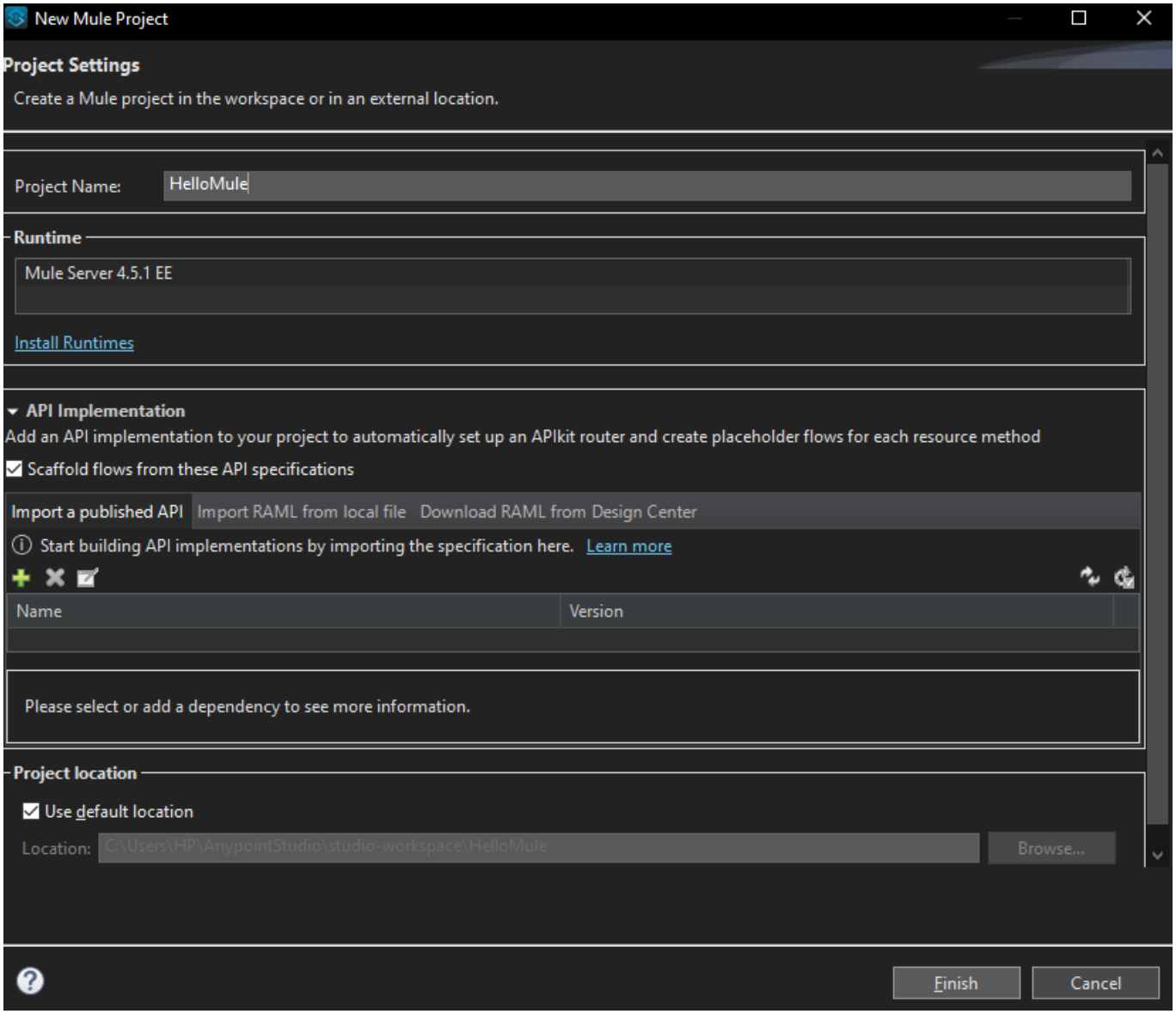
Ejercicio 1: Cree su primera aplicación Hello Mule.

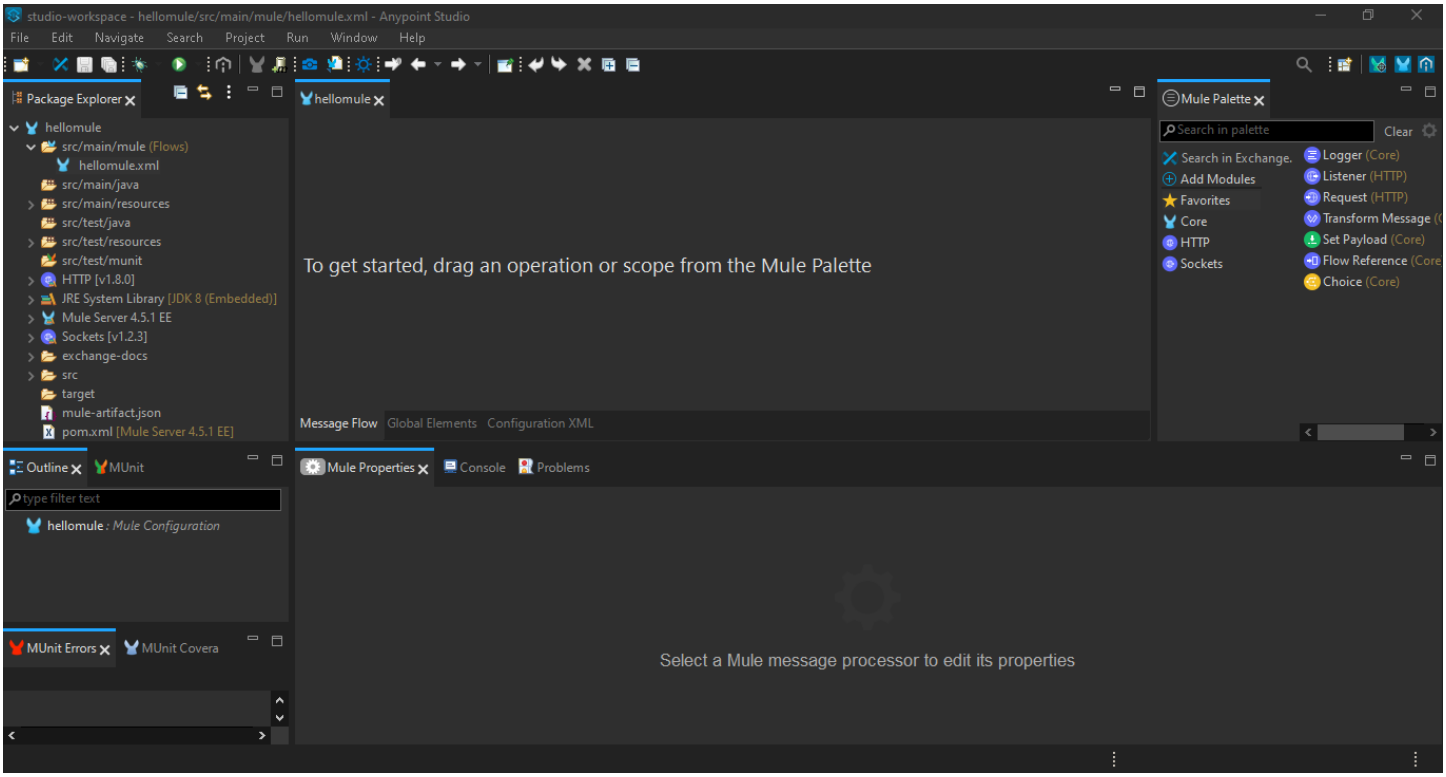
Crea, prueba y despliega tu primer aplicación mule.

1. Create a new project in Anypoint Studio

Anypoint Studio will open the **New Mule Project** wizard. In the **Project Name** field, enter the value , then click **Finish**. `HelloMule`



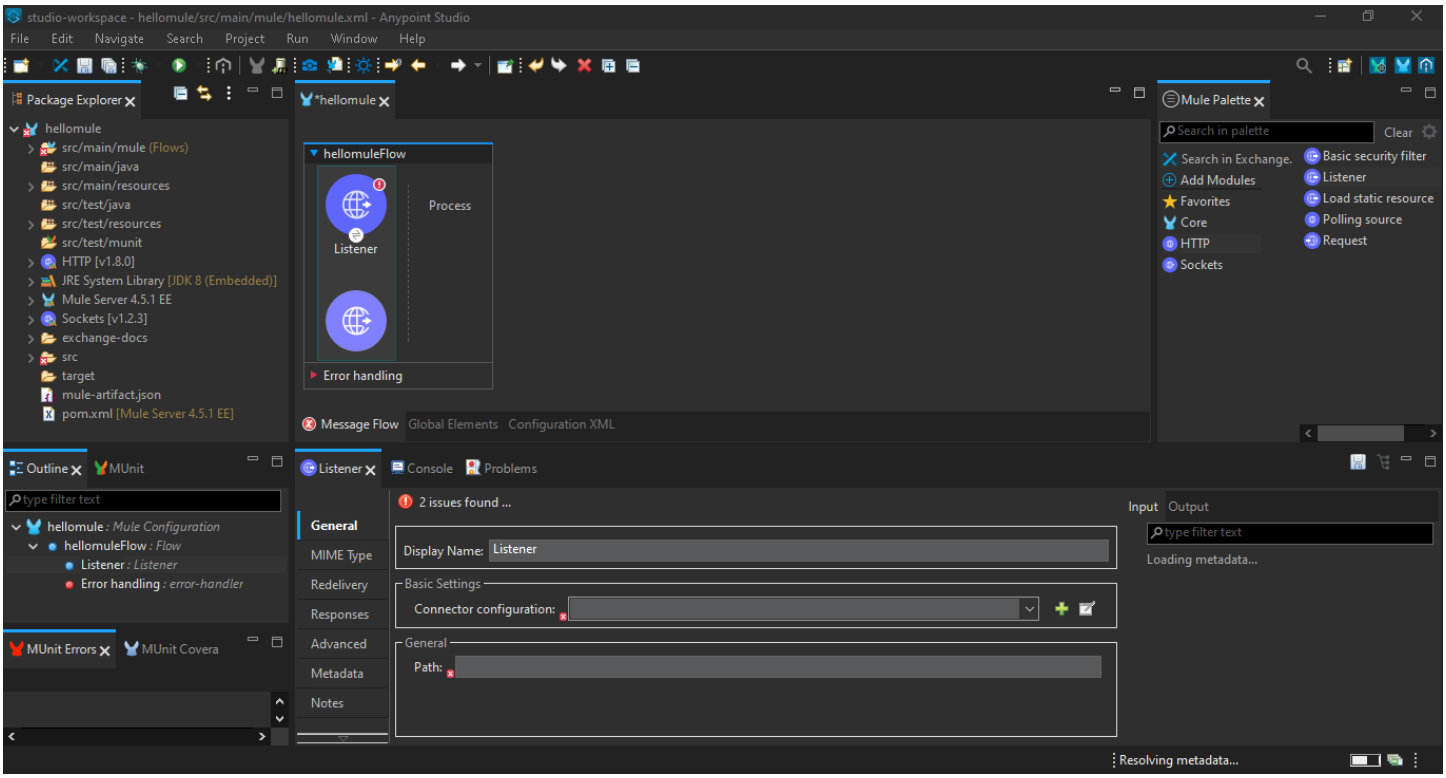
Anypoint Studio will open a new blank Project, for example.



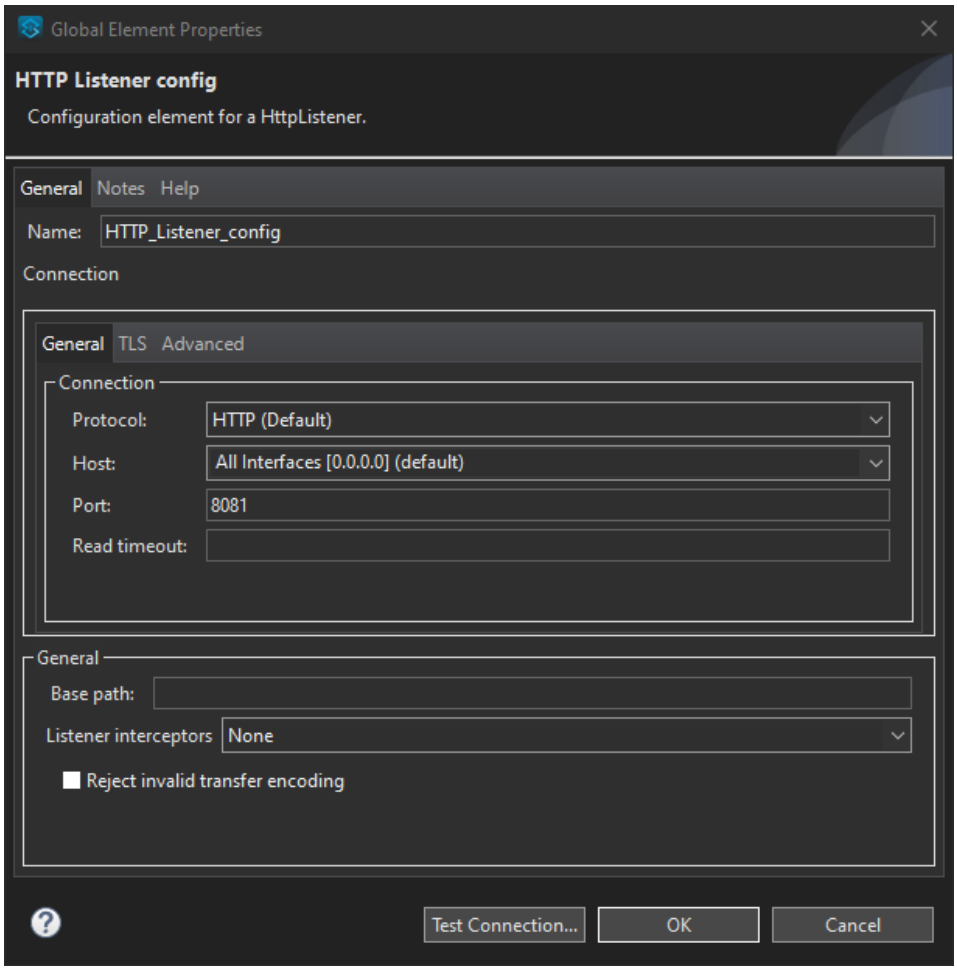
2. Add and configure the HTTP Listener connector

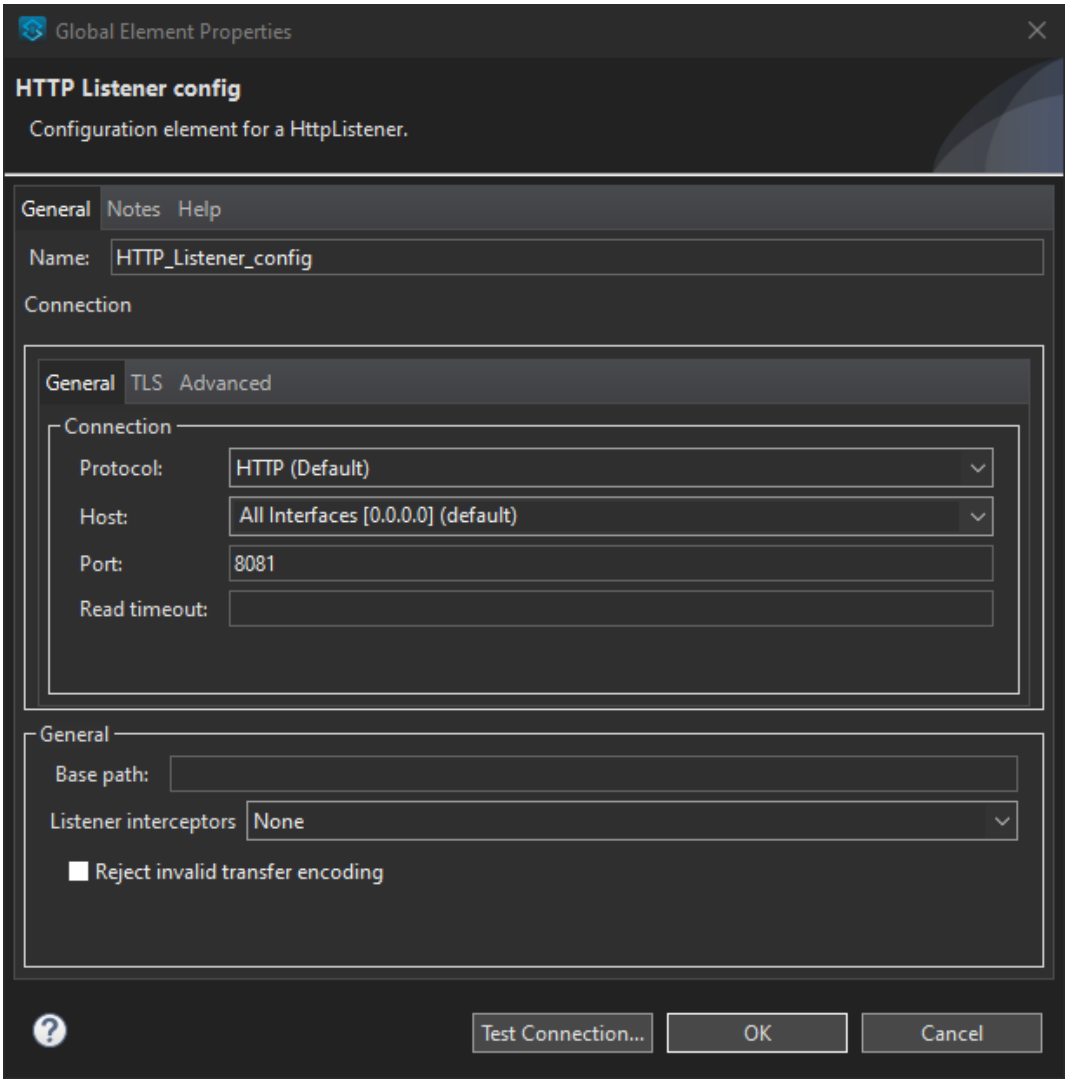
Drag and drop an **HTTP Listener** from the **Mule Palette** to the **canvas**. Anypoint Studio will automatically wrap the connector with a flow once you drag and drop it on the canvas.

An HTTP Listener is an HTTP endpoint that listens for an HTTP request to come to the URL you define. When the Listener receives an HTTP request, the contents inside of the flow will execute in the order that you define.

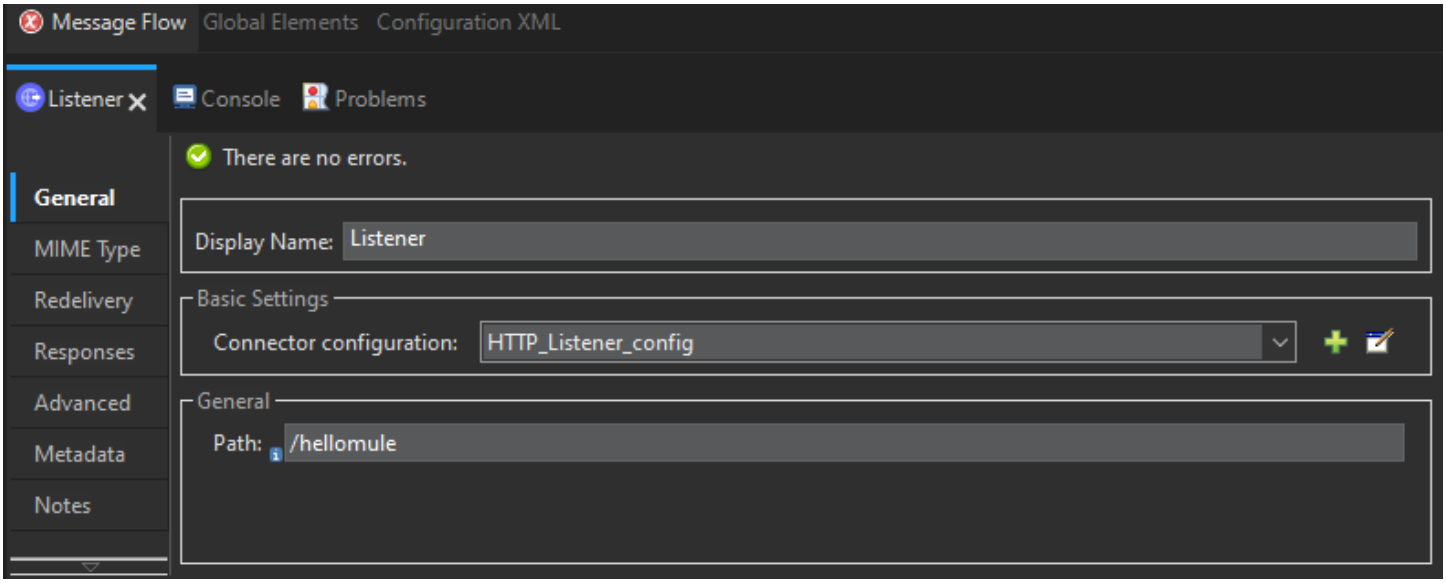


Next, click on the HTTP Listener connector, and in the Properties Editor below, click on the Green Plus (Add) button. The Green Plus button will create a configuration file under your Global Elements Configuration. Confirm the default values below and click the OK button.



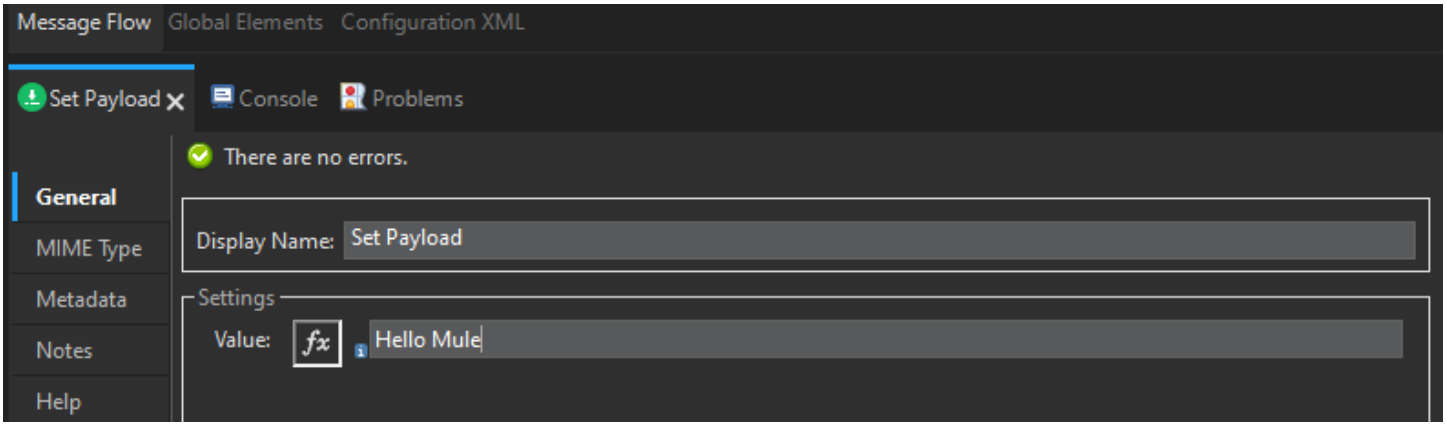


Then under **General > Path** type in: `/hellomule`



The Path you define is going to represent the endpoint that will execute your flow when an HTTP request is made to your HTTP Listener.

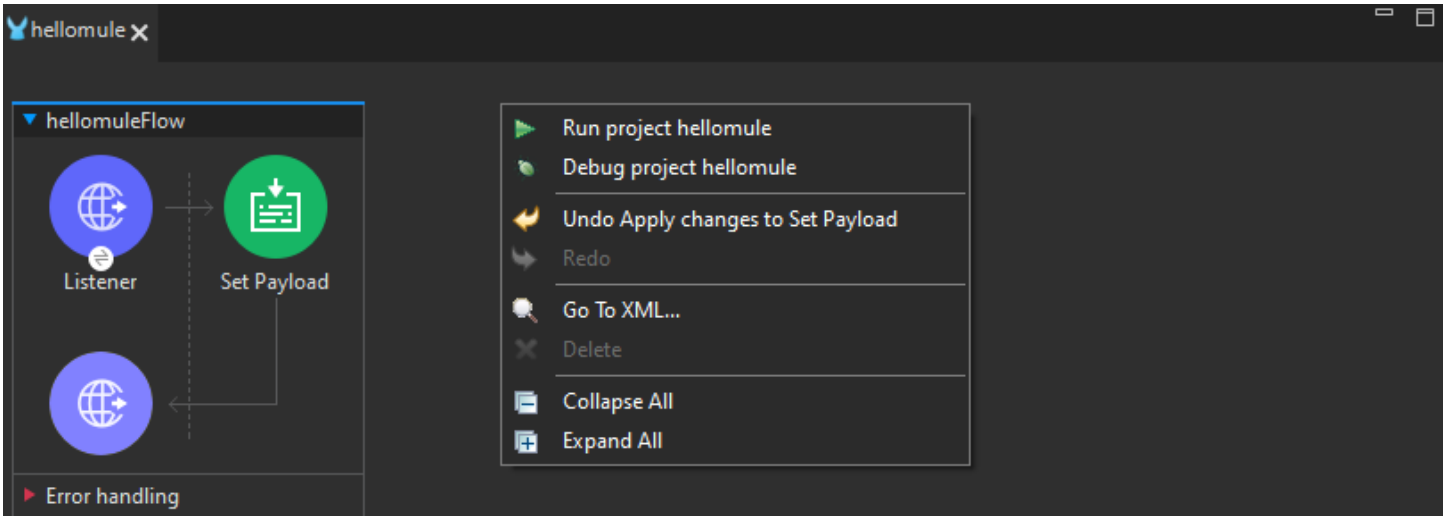
Now, drag the **Set Payload** connector into your flow, inside the **Process** section. You can find the Set Payload connector under the **Core** module in your Mule Palette. Uncheck the fx button and add the string: `Hello Mule`



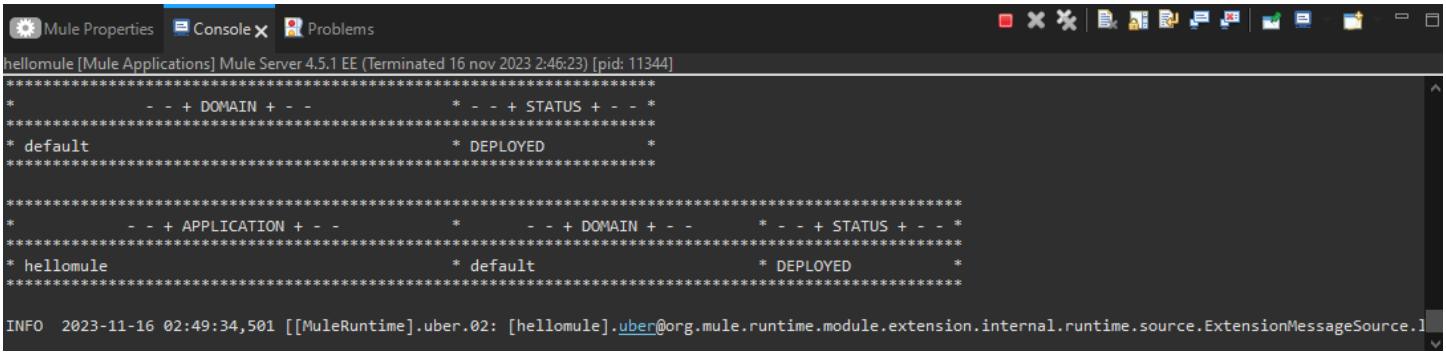
Now go to **File > Save** to save your project.

3. Run the Mule Application locally

After saving, right-click on your canvas and click **Run project hellomule** to test it live from your local computer!



If you go into your Console view, you can check to see whether your application has been successfully deployed. If it says DEPLOYED at the bottom right, then you are ready to use a REST Client to test your first Mule Application.

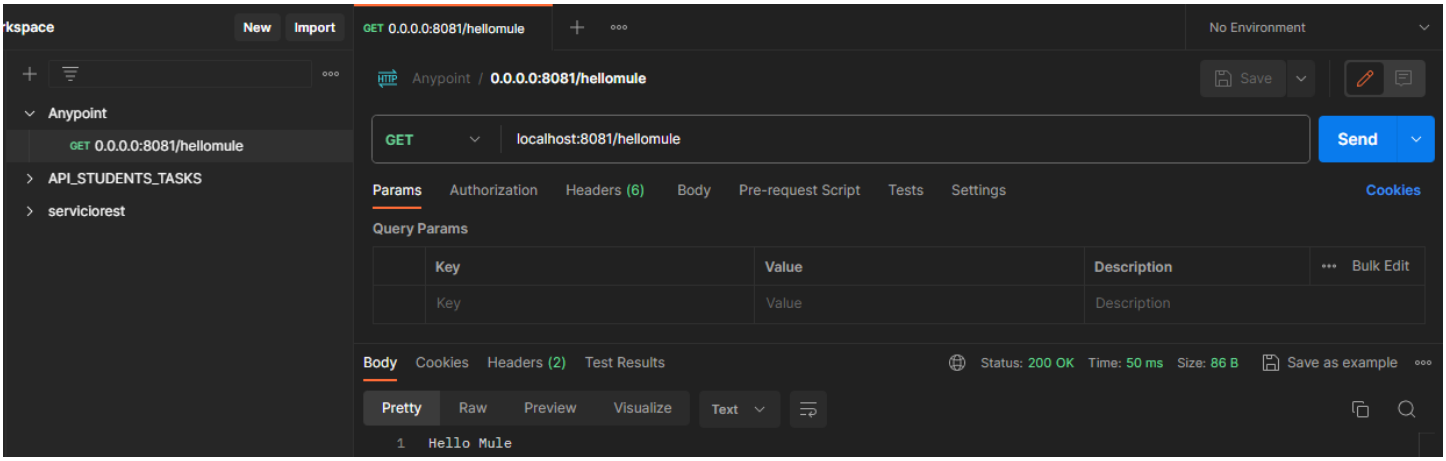


4. Testing tool with POSTMAN – ID Client

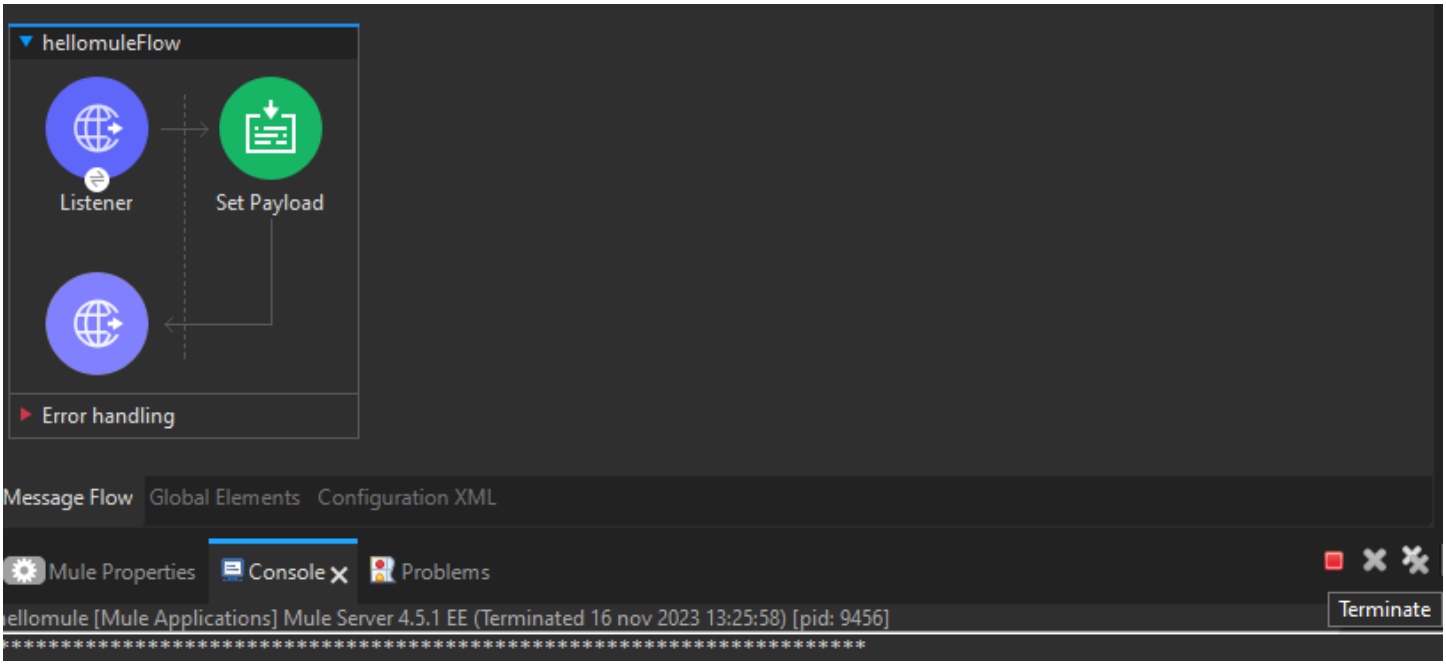
Open up your REST Client (POSTMAN) of choice. Type in the URL of your HTTP endpoint and path added after the URL. For this demo, you will use the address: `http://0.0.0.0:8081/hellomule`

You can replace `0.0.0.0` with `localhost`

Click the **Send** button and you should get `Hello Mule` as a **200 OK Response**

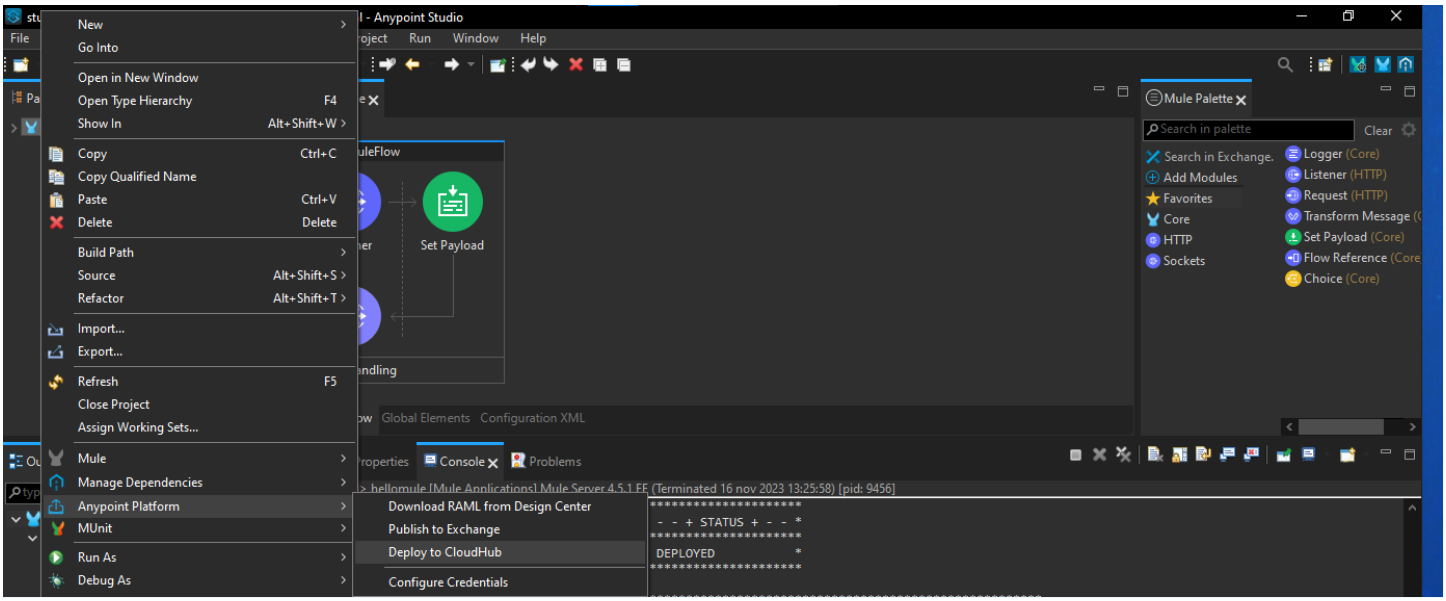


To stop the project from running locally, you can right-click again on the canvas and click **Stop project hellomule.**

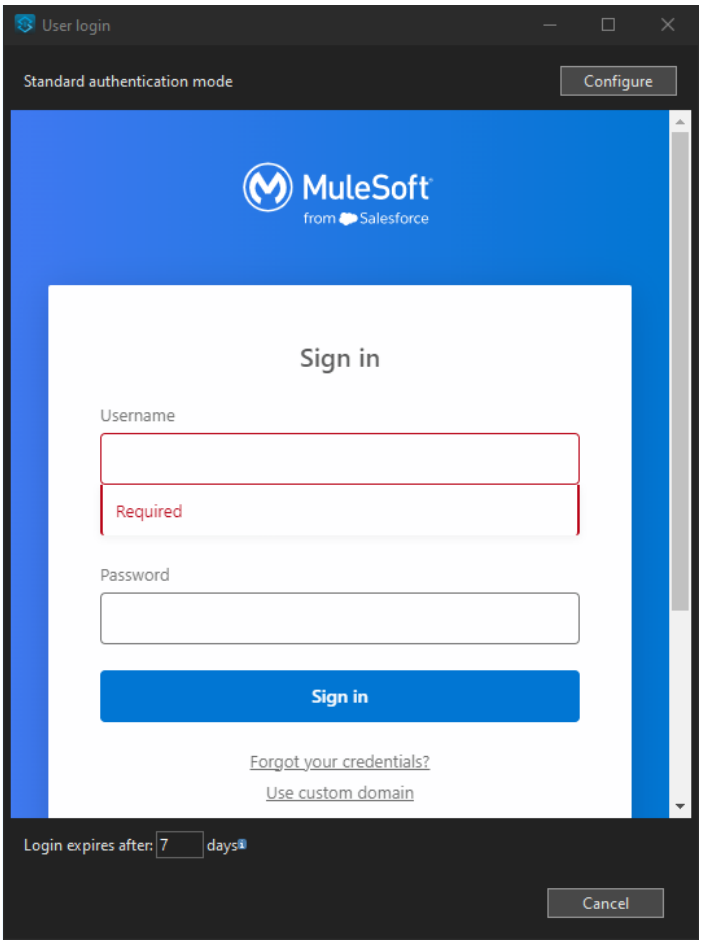


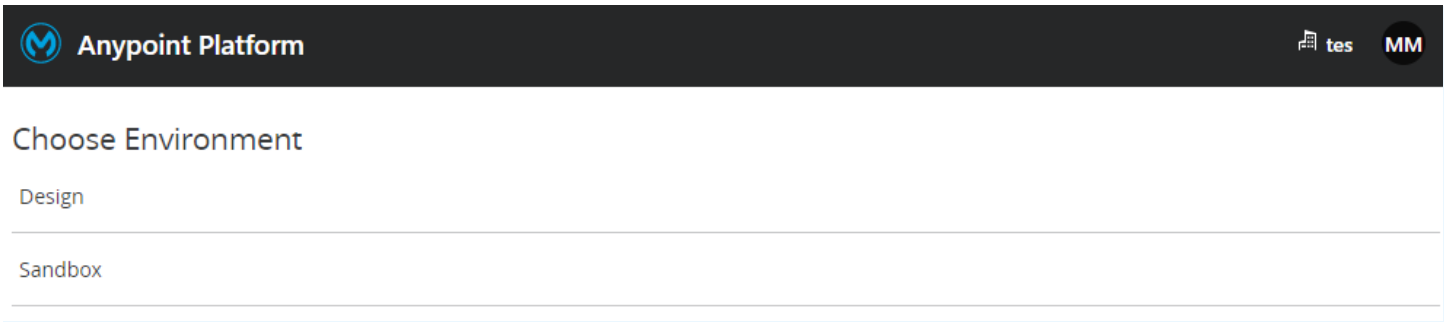
5. Deploy the Mule Application to CloudHub

Now that you have learned how to deploy and test locally, let's deploy our application to CloudHub. CloudHub will issue your application with a publicly accessible endpoint URL after you complete the deployment process. Right-click on your project in your Package Explorer, and click on **Anypoint Platform > Deploy to CloudHub**.

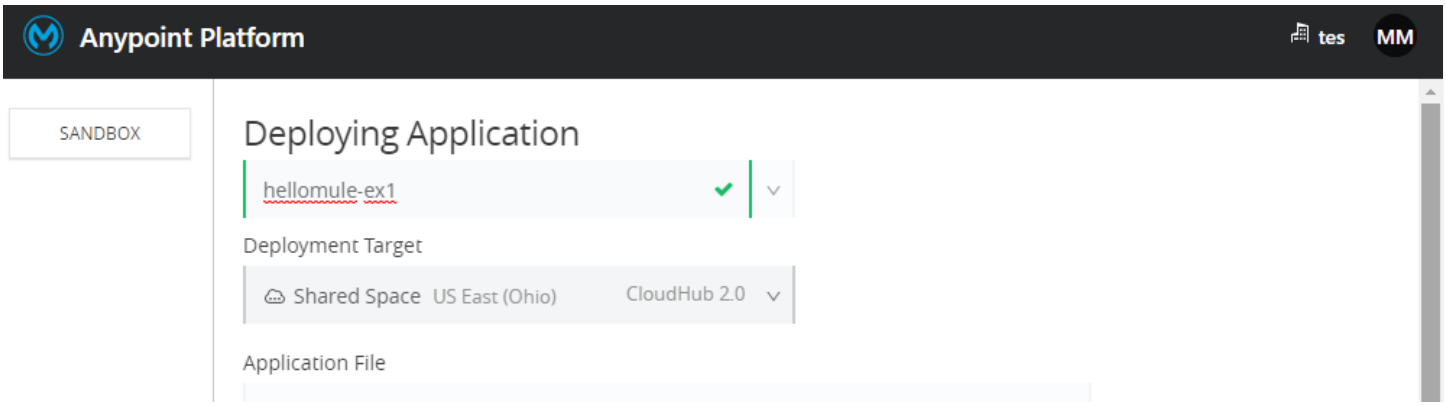


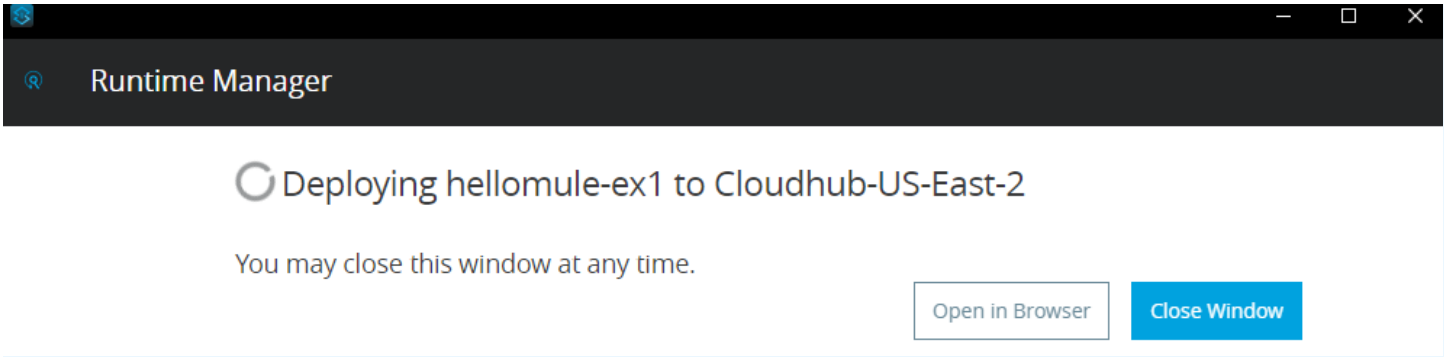
First, you will need to log in with your Anypoint Platform credentials. After that, choose the Sandbox environment then choose a unique name for your application. If your application has a red x next to it, it means someone else has deployed with that application name. You just have to give it a new unique name.

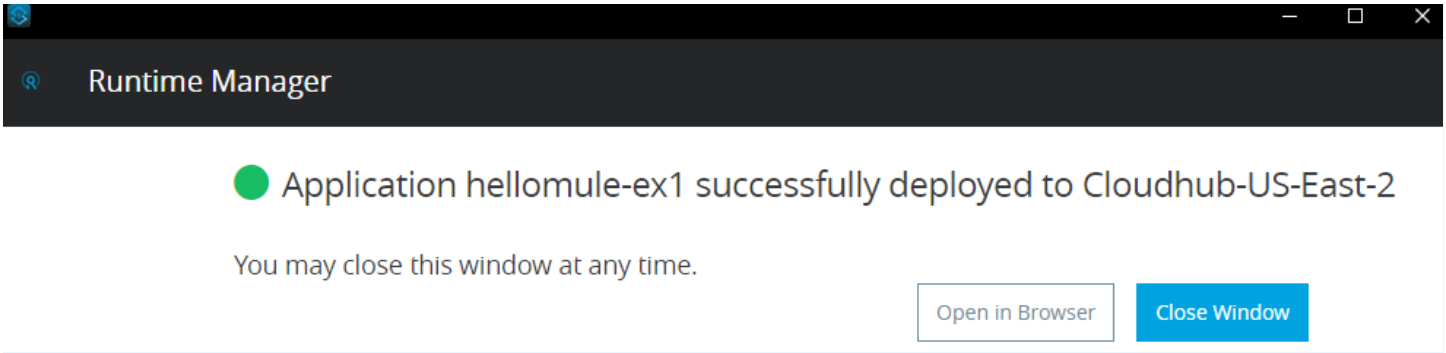




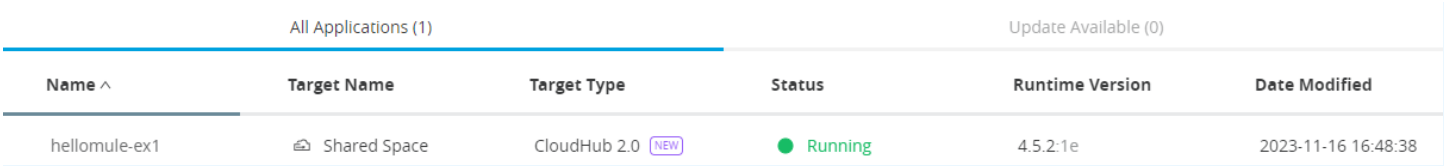
When your application name has a green check next to it, click the Deploy Application button. It may take a few minutes to fully deploy to CloudHub. After that, click on the following button to log in to Anypoint Platform.





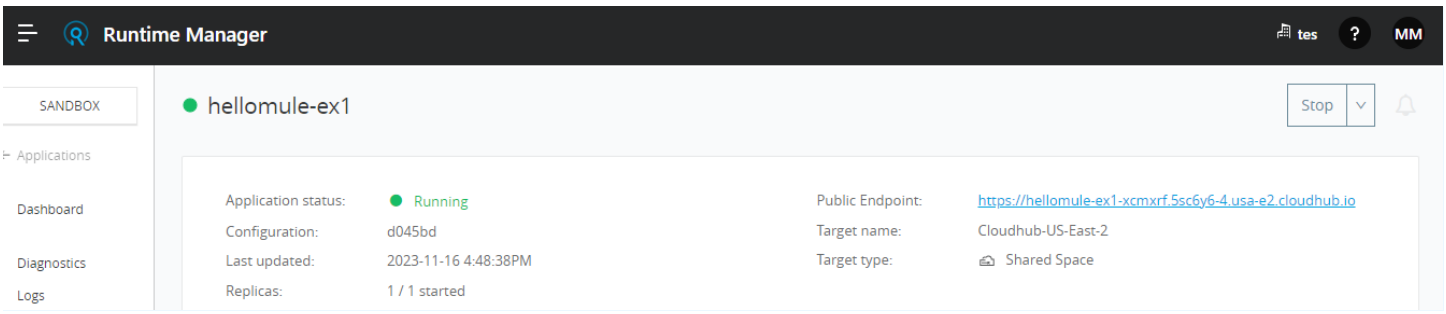


Navigate to Runtime Manager and find your application. Click on your application's name to open the Dashboard.



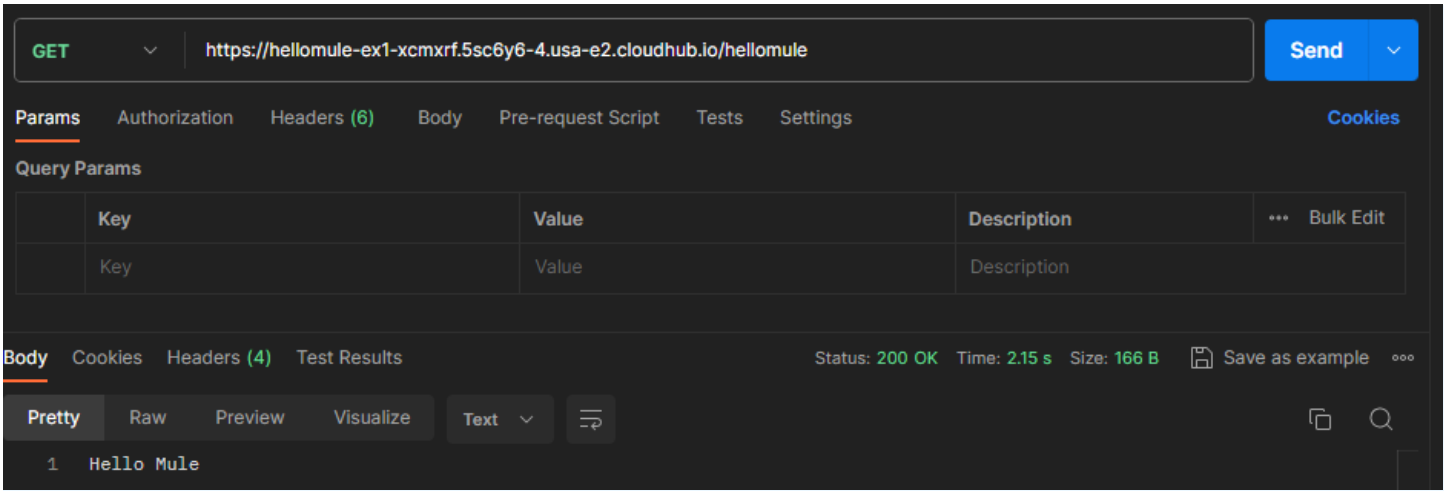
Once your application is fully deployed, copy and paste your application's URL highlighted in blue into your REST Client and add your Endpoint Path after the URL.

In this case, it would be `hellomule-ex1-xcmxrf.5sc6y6-4.usa-e2.cloudhub.io/hellomule`



6. Testing with POSTMAN in the desployed API

When you send a request to your CloudHub endpoint, you should get *Hello Mule* as a **200 OK Response**.



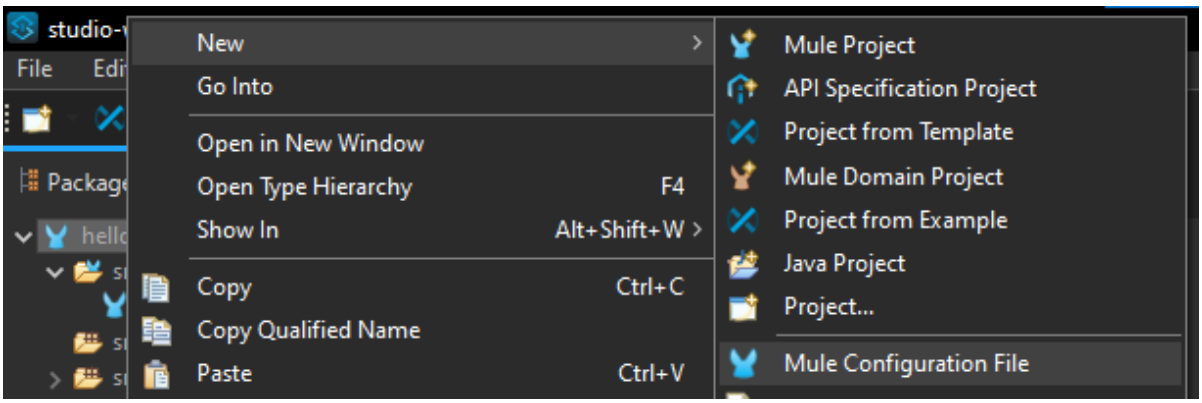
Ejercicio 2: Cómo configurar tus archivos globales de elementos y propiedades en Anypoint Studio.

Utiliza el archivo de propiedades para mantener y referenciar datos sensibles por separado al código generado.

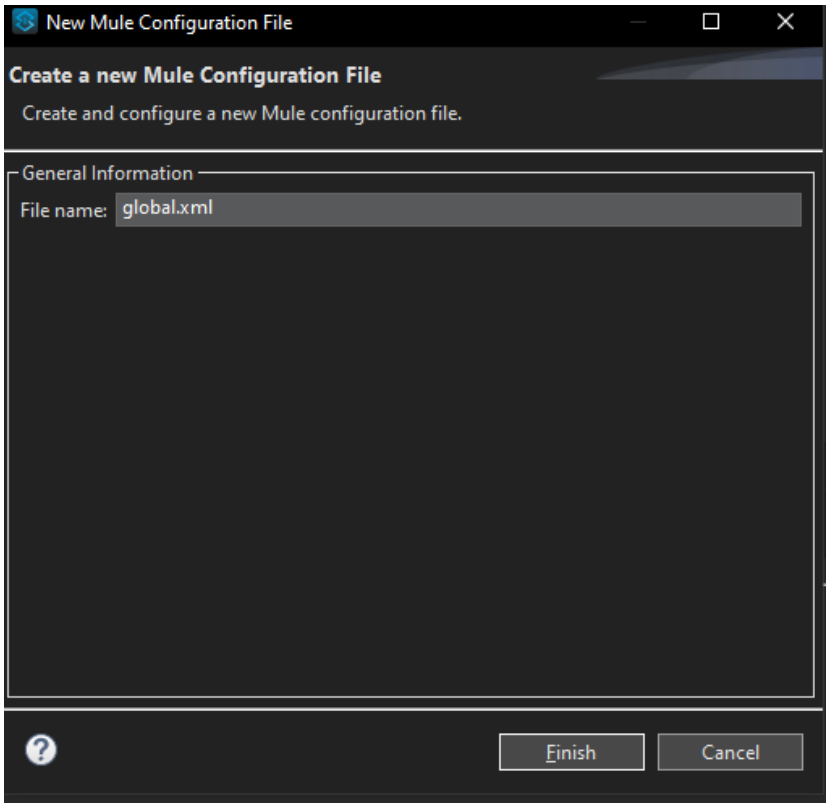
1. Create a global.xml file to keep the global elements

It is a best practice to create a new **global.xml** file to keep all our global elements stored there. This is useful when we have more XML files and we don't want to be looking for our global elements in each file.

Right-click on the **src/main/mule** folder. Select **New > Mule Configuration File**.



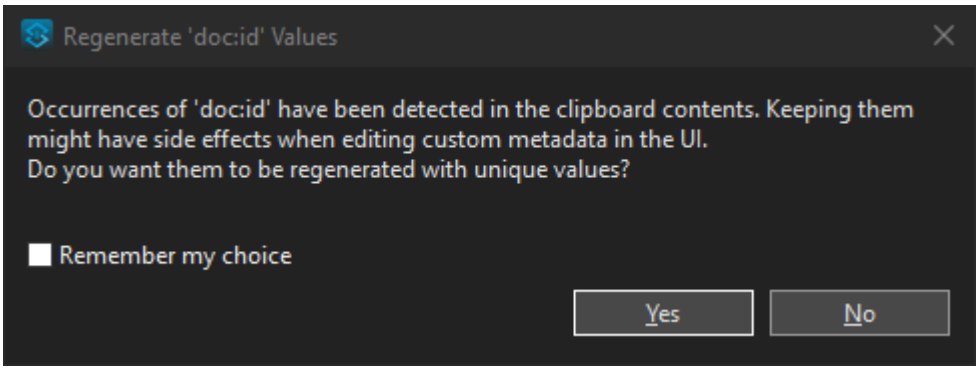
Add the name `global.xml` and click Finish.



Go back to the **hellomule.xml** file and switch to the Configuration XML view. Locate the code and cut everything between the tags. `http:listener-config`

```
hellomule  global

1  <?xml version="1.0" encoding="UTF-8"?>
2
3  <mule xmlns:http="http://www.mulesoft.org/schema/mule/http" xmlns="http://www.mulesoft.org/schema/mule/cor
4      xmlns:doc="http://www.mulesoft.org/schema/mule/documentation"
5      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.mulesoft.org/sche
6  http://www.mulesoft.org/schema/mule/http http://www.mulesoft.org/schema/mule/http/current/mule-http.xsd">
7      <http:listener-config name="HTTP_Listener_config" doc:name="HTTP Listener config" doc:id="2713aa22-80b
8          <http:listener-connection host="0.0.0.0" port="8081" />
9      </http:listener-config>
10     <flow name="hellomuleFlow" doc:id="51845599-2992-49b4-8296-f8e7f70086ce" >
11         <http:listener doc:name="Listener" doc:id="120cf796-a220-4862-bbcf-aec115565d52" config-ref="HTTP_
12         <set-payload value="Hello Mule" doc:name="Set Payload" doc:id="8ea48a58-1b8b-4779-b213-8c3f96451b5
13     </flow>
14 </mule>
15
```

Go to the **global.xml** file and switch to the Configuration XML view. Paste this code **inside the mule tags**. If you get an alert regarding the 'doc:id' values, you can select **Yes** to regenerate the IDs of each component. Unless you purposely want to paste the exact same components, it is recommended to regenerate the IDs when copy/pasting code. Don't select the checkbox in case you need to copy and paste the exact same IDs in the future.



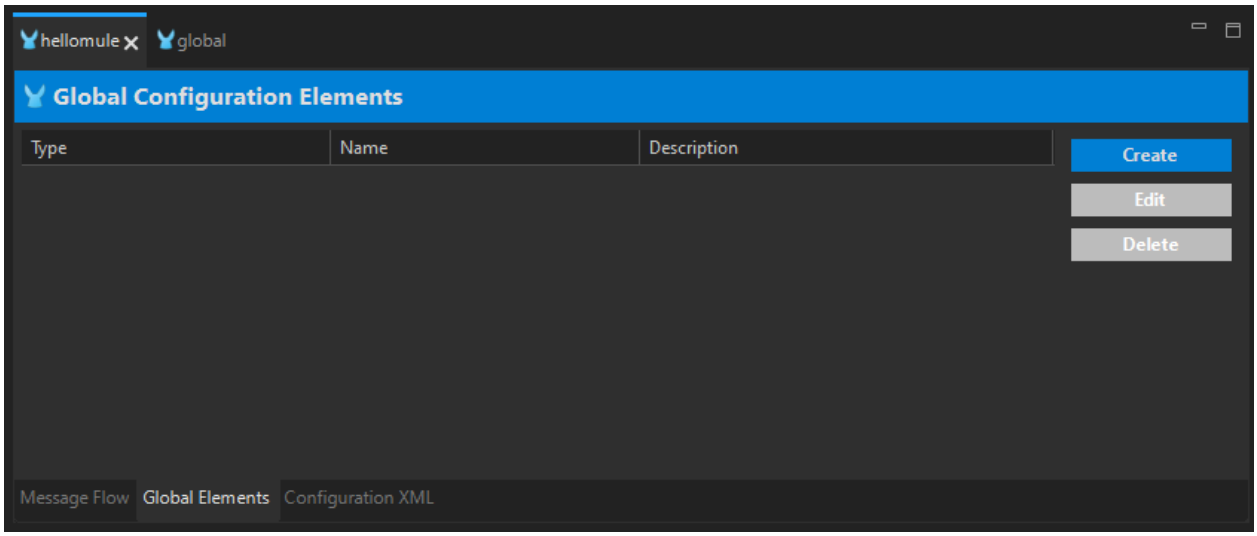
Notice how you may be getting an error at this point. This is because the **hellomule.xml** file has not been saved and Studio thinks you now have two global elements with the same name.

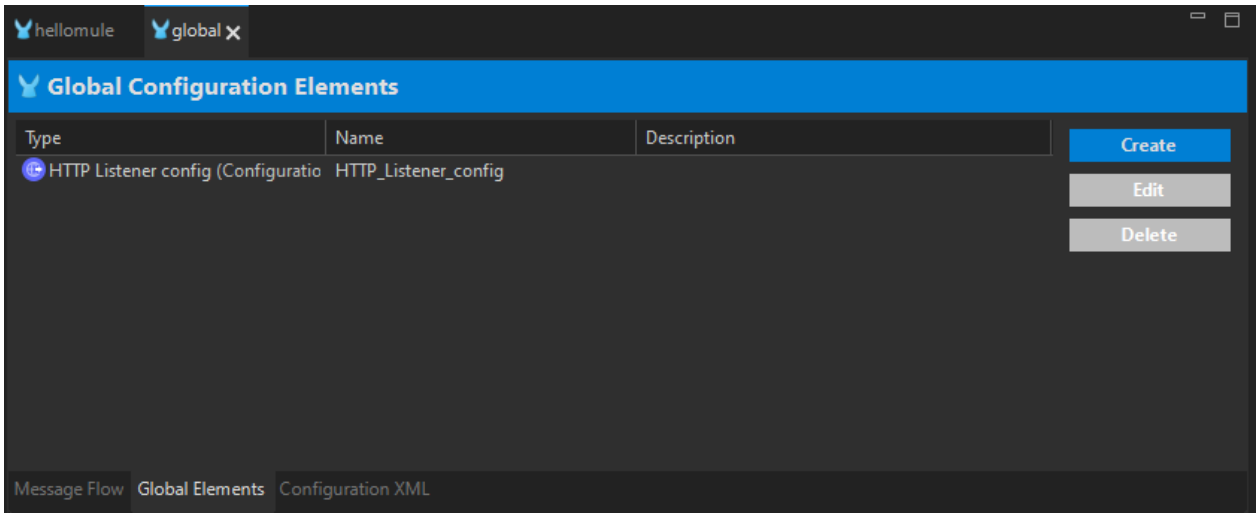
```
hellomule  global

1  <?xml version="1.0" encoding="UTF-8"?>
2
3  <mule xmlns:http="http://www.mulesoft.org/schema/mule/http"
4      xmlns="http://www.mulesoft.org/schema/mule/core" xmlns:doc="http://www.mulesoft.org/schema/mule/documenta
5      xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
6      xsi:schemaLocation="
7  http://www.mulesoft.org/schema/mule/http http://www.mulesoft.org/schema/mule/http/current/mule-http.xsd http:
8      <http:listener-config name="HTTP_Listener_config" doc:name="HTTP Listener config" doc:id="4139f364-6f90-4
9          <http:listener-connection host="0.0.0.0" port="8081" />
10     </http:listener-config>
11 </mule>
12
```

You can save each individual file separately, or you can click on the **Save All** button at the top left of the screen.

The error disappears after saving both files.

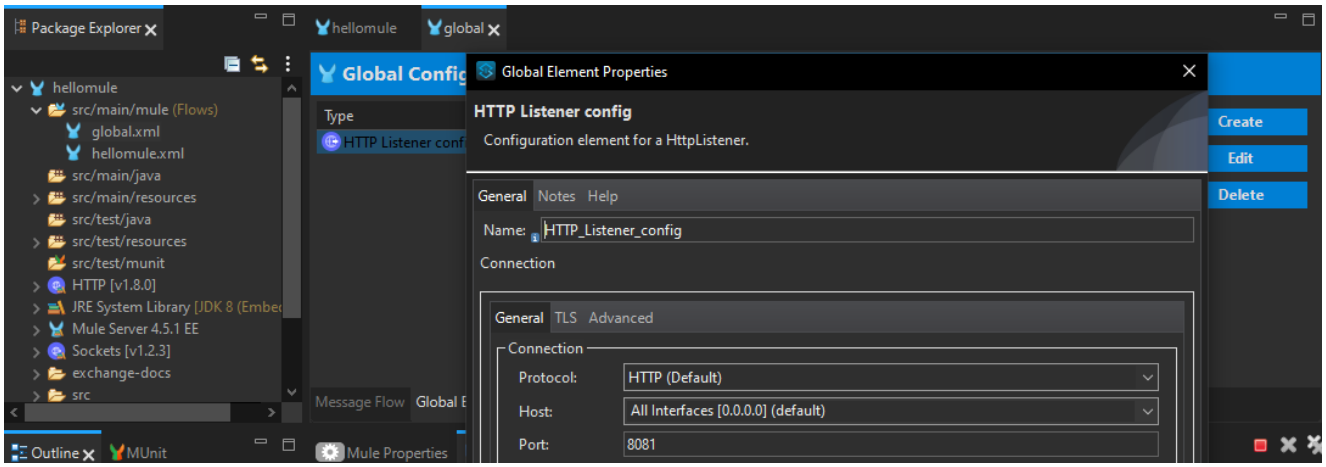
If you switch to the Global Elements tab for both files, you will now notice that the **HTTP_Listener_config** is no longer present in the **hellomule.xml** file and it was moved to the **global.xml** file.





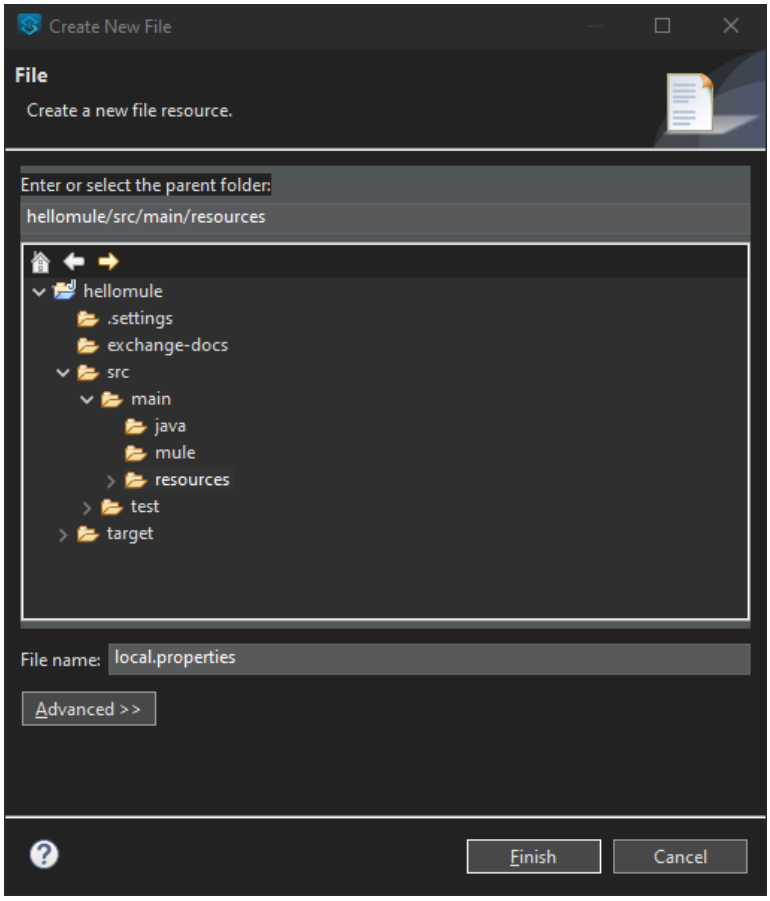
2. Externalize the hardcoded values into properties

In the **global.xml** file, switch to the Global Elements view. Select the **HTTP_Listener_config** element and click on the **Edit** button to the right or double-click it. Remember the default values for the Host and the Port? These are hardcoded values. This means that whenever we want to change them, we have to find the correct element and edit it. Maybe it's not hard to do right now because we only have one global element, but this becomes an issue in bigger projects.

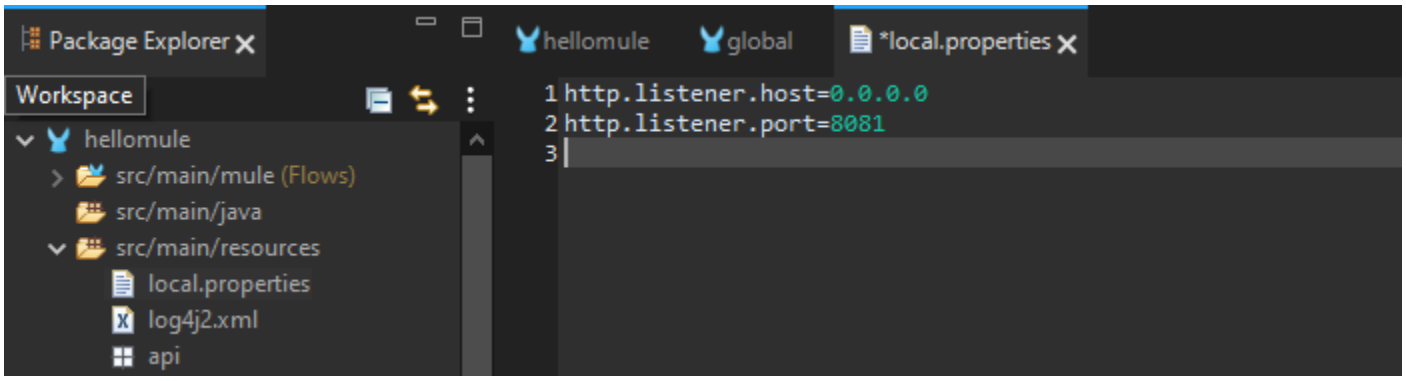


To avoid having hardcoded values in our code, it is a best practice to externalize them into properties files. Right-click on the **src/main/resources** folder and select **New > File**.

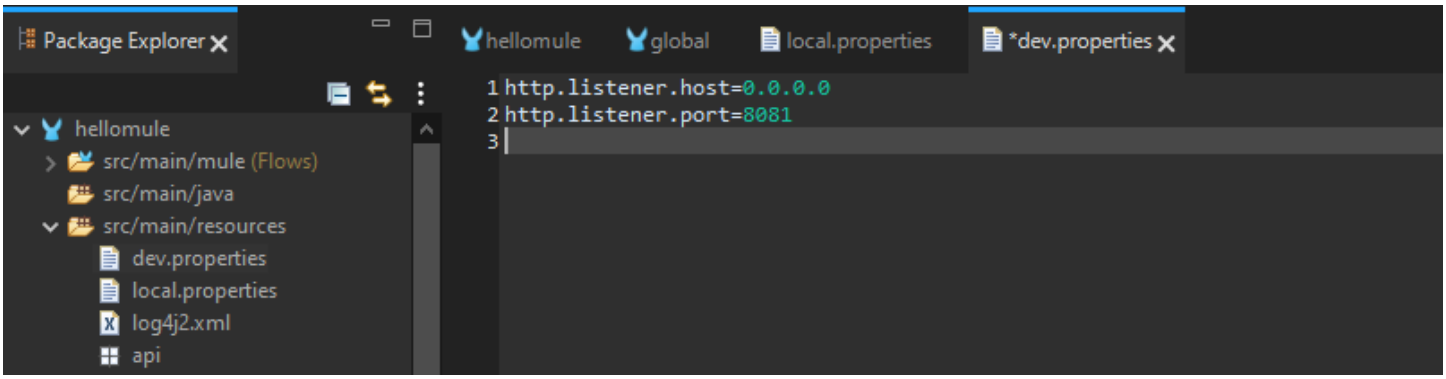
Create a **local.properties** file under src/main/resources.



Inside this new file, copy and paste the following properties and save the file:



Repeat the same steps for a **dev.properties** file. This helps us separate the properties per environment. When we run our Mule app on our local computer, we'll be using the local.properties file. When we deploy our application to CloudHub, we'll be using the dev.properties file. In this case, both properties have the same values. But it's a good practice to separate your properties files by environment.



Go back to the **global.xml** file and switch to the **Global Elements** view. Select the **HTTP_Listener_config** element and click on **Edit**. In order to refer to a property from any connector configuration, you need to use the following syntax: `${your.property.name}`

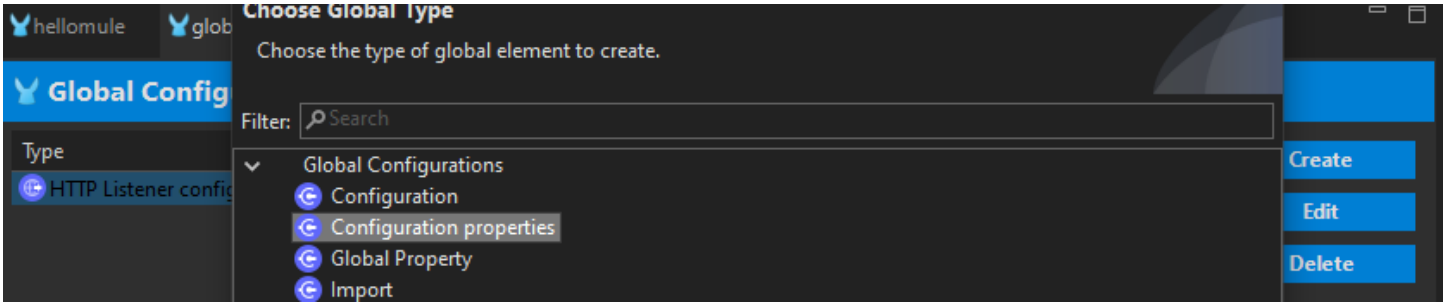
Replace each hardcoded value with the corresponding property, using the previous syntax. You should end up with something like this:

Click **OK** and save all files.

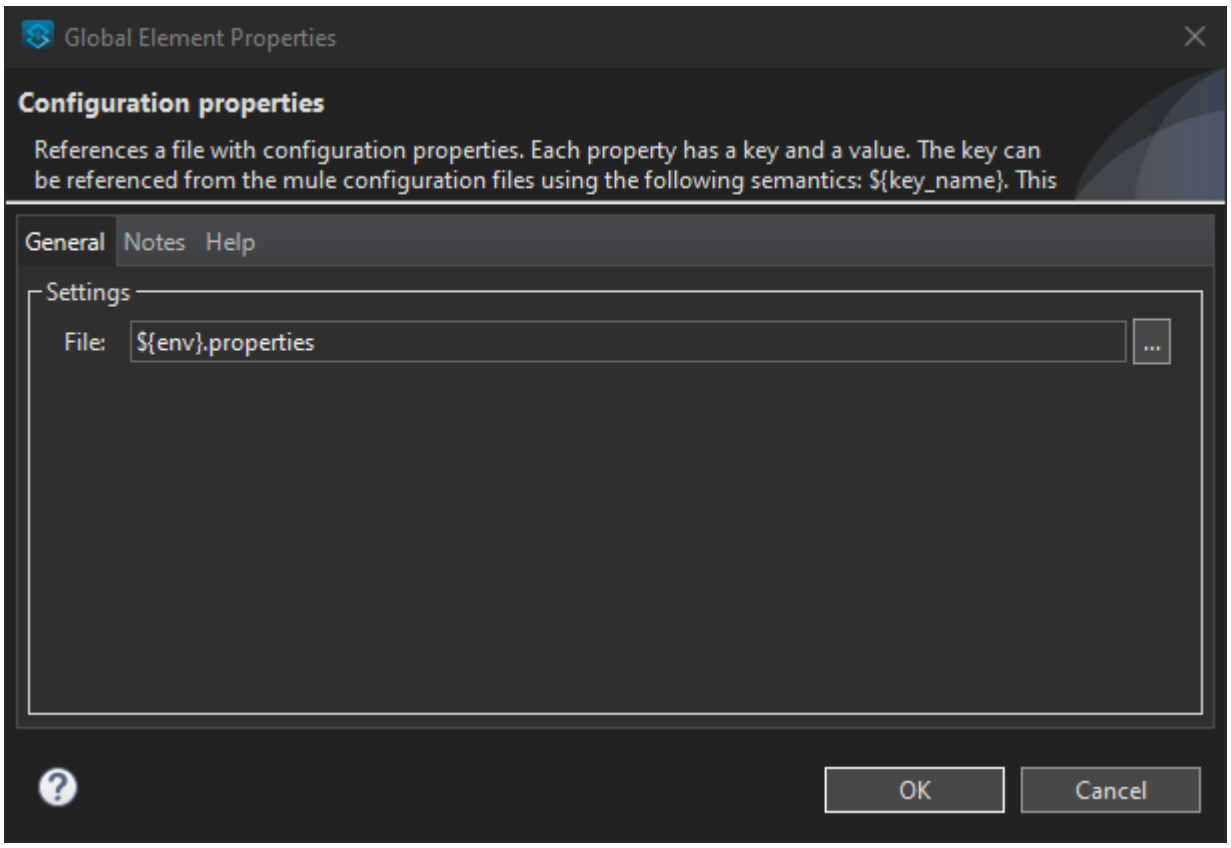
3. Set up the Configuration Properties global element

Adding the properties file is not enough to let the Mule Application know where to look for them. If you try to run the app without this configuration, it will throw an error stating that it wasn't able to find your properties.

In your **global.xml** file, switch to the **Global Elements** view. Click on **Create** to add a new global element. Search for **Configuration properties**. Select the element and click **OK**.

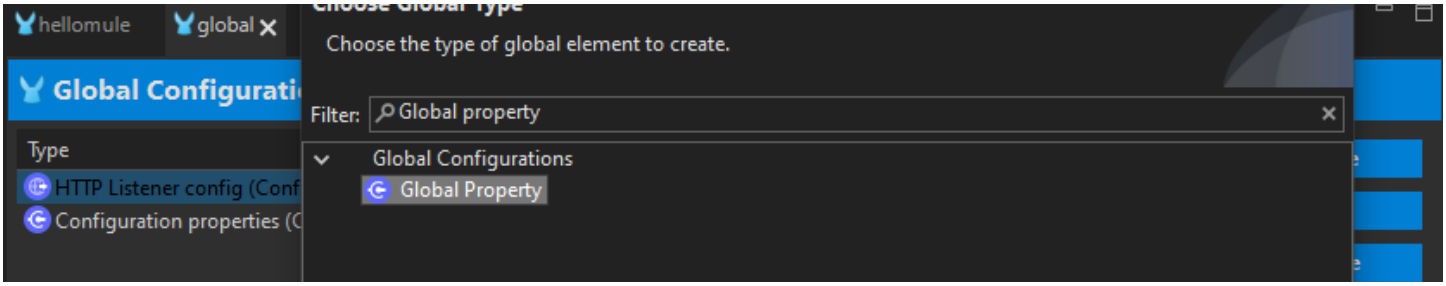


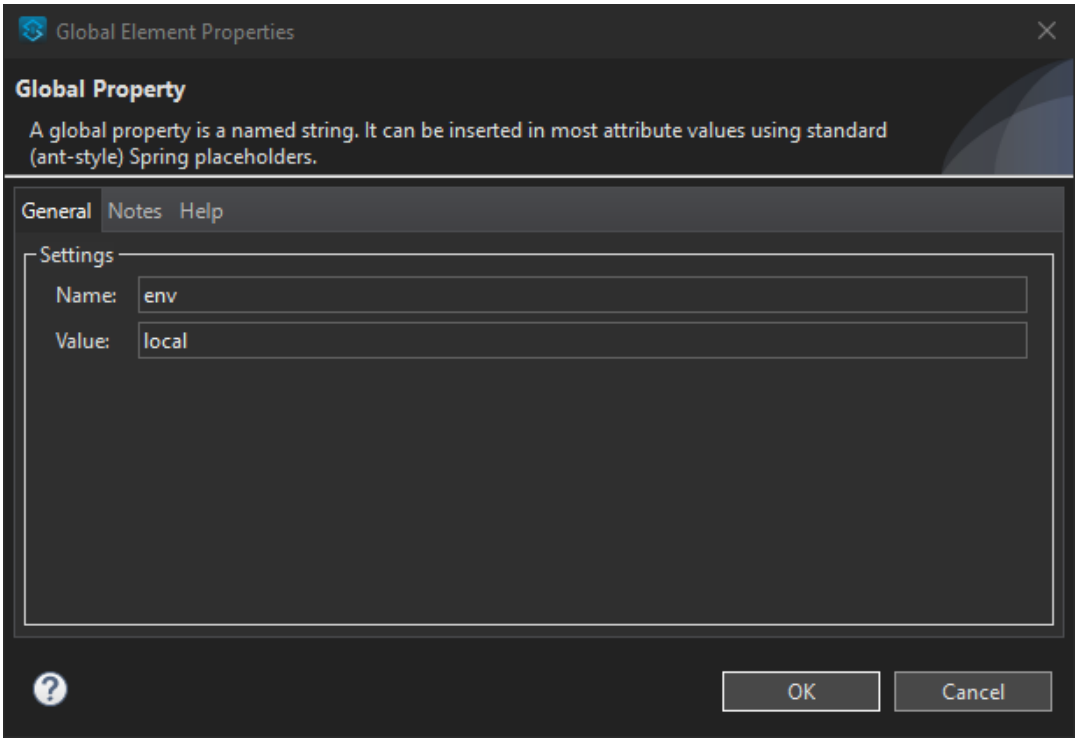
Because we're not using static properties files, we need to be able to switch between files depending on the environment. Remember that the `${}` syntax is used to reference properties. Let's add the following properties file: `${env}.properties`



You should now have two global elements in the **global.xml** file. We still need to add the **env** property that we just referenced in the previous step. There are two ways to do that: 1) adding it to the environment variables at runtime, or 2) creating a global property in the global configuration elements. The first way is preferred when you don't want to save the property in the source code. We'll see how to do this in the next tutorial for secure properties. Since this is not a secure property, we'll add it to the global configuration elements.

Click **Create** and select **Global Property**. The name should be **env** and the value **local**.

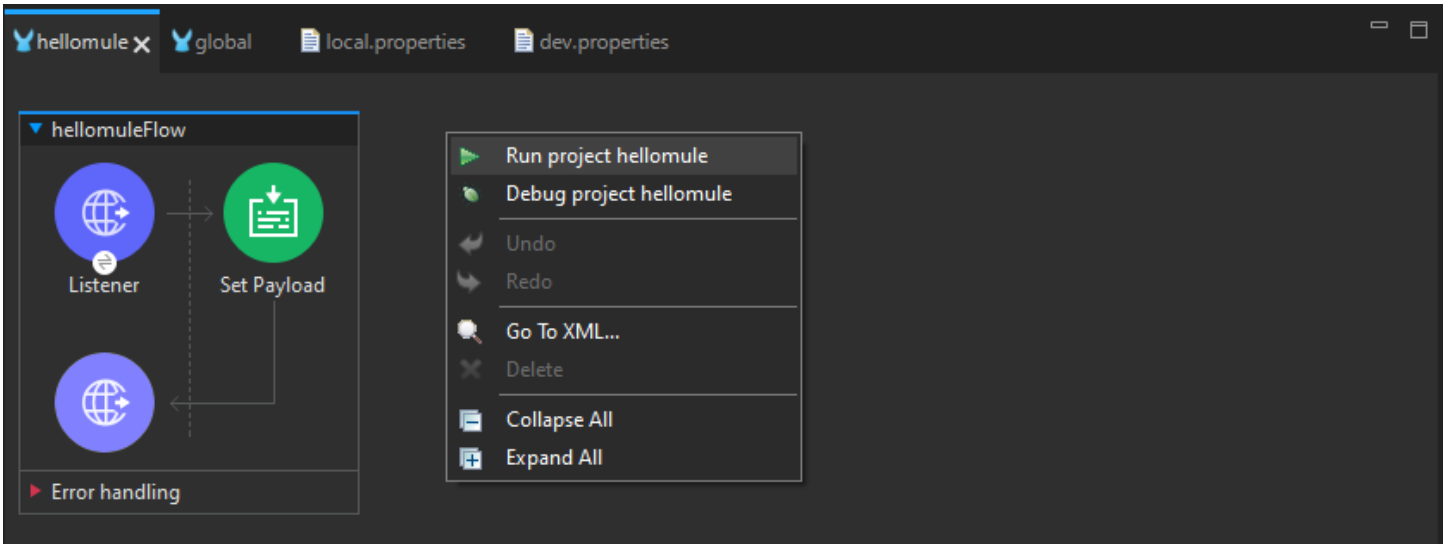




Click **OK** and save all files.

4. Verify the Mule project is still working as expected

Make sure you saved all the files. Go to any of the XML files and switch to the **Message Flow** view. Right-click inside the canvas and select **Run project hellomule**.

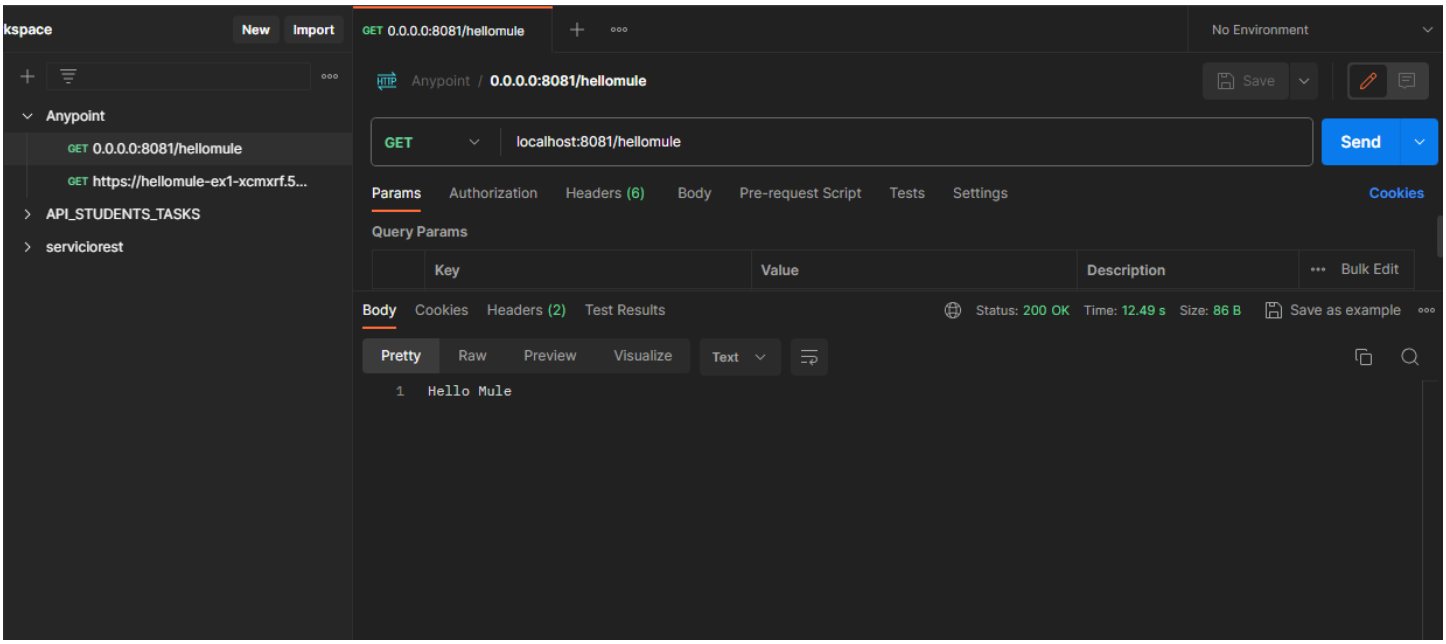


Verify that there are no errors in the Console and the Status of the application is **DEPLOYED**.

5. Testing with POSTMAN

In the REST Client and send a request to the local application: `localhost:8081/hellomule`

You should get back the `Hello Mule` response and a **200 OK** status.



To stop the project from running locally, you can right-click again on the canvas and click **Stop project hellomule**.

Ejercicio 3: Cómo proteger las propiedades antes de la implementación en Anypoint Studio.

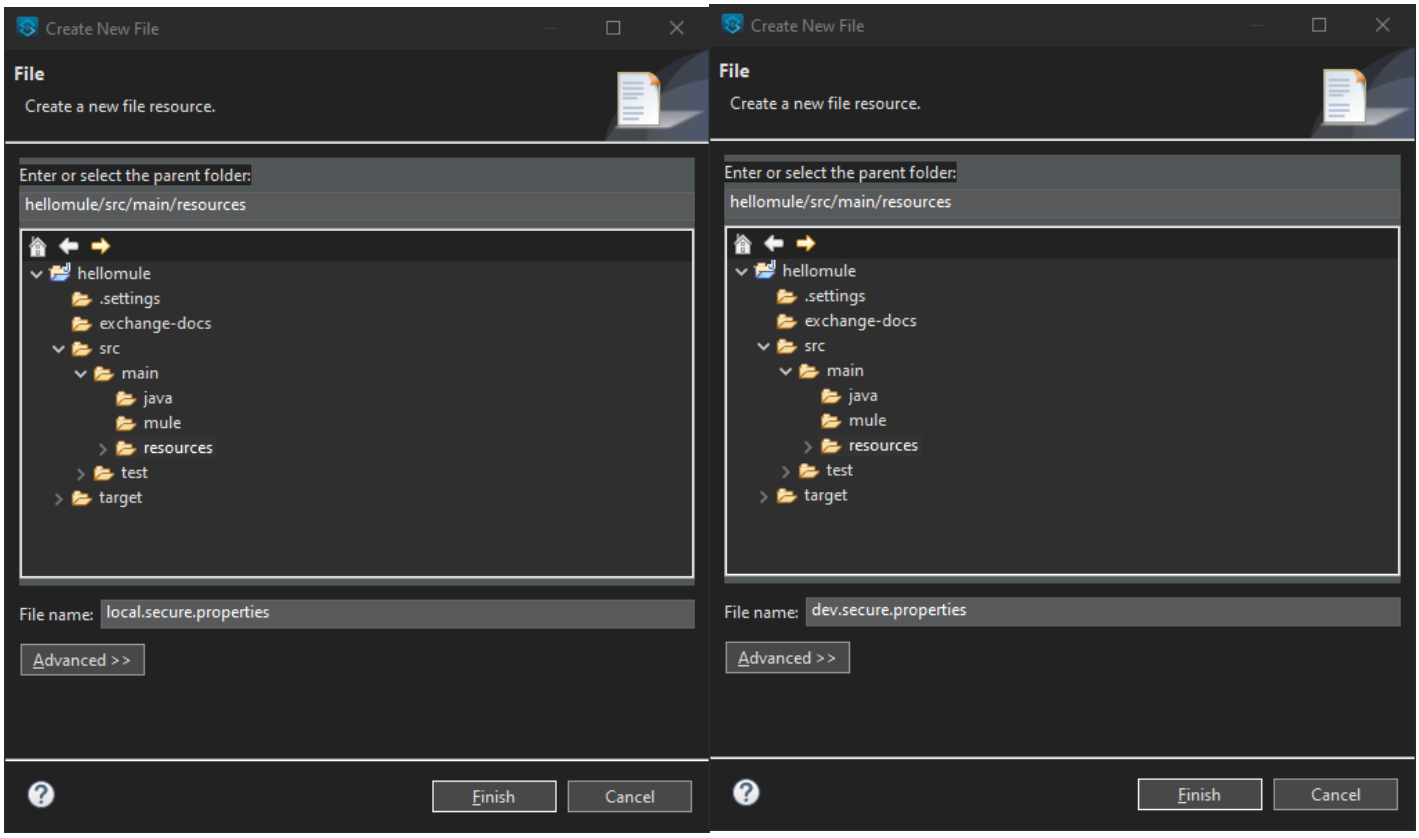
Crea un archivo de propiedades seguras para proteger datos sensibles que representan un riesgo mantenerlos en claro.

1. Create your environments' secure properties files

Whenever you are storing global variables, unique tokens or keys, or login credentials, you should always store them in a properties file. Storing all of your variables in a single file will help keep your project organized, and if you ever need to make a change to an existing system or migrate the integration, you won't have to make any manual modifications to your existing code.

In order to have a better organization of your properties, it is a best practice to separate your secure properties in files per environment. You can create a **local.secure.properties** file for your local settings, a **dev.secure.properties** for your dev environment, a **qa.secure.properties** for your testing environment, etc.

To create a local.secure.properties file, right-click on **src/main/resources** and click on **New > File** and name the file . `local.secure.properties`



Now that you have successfully created the file, double click on your **local.secure.properties** file to add a new entry.

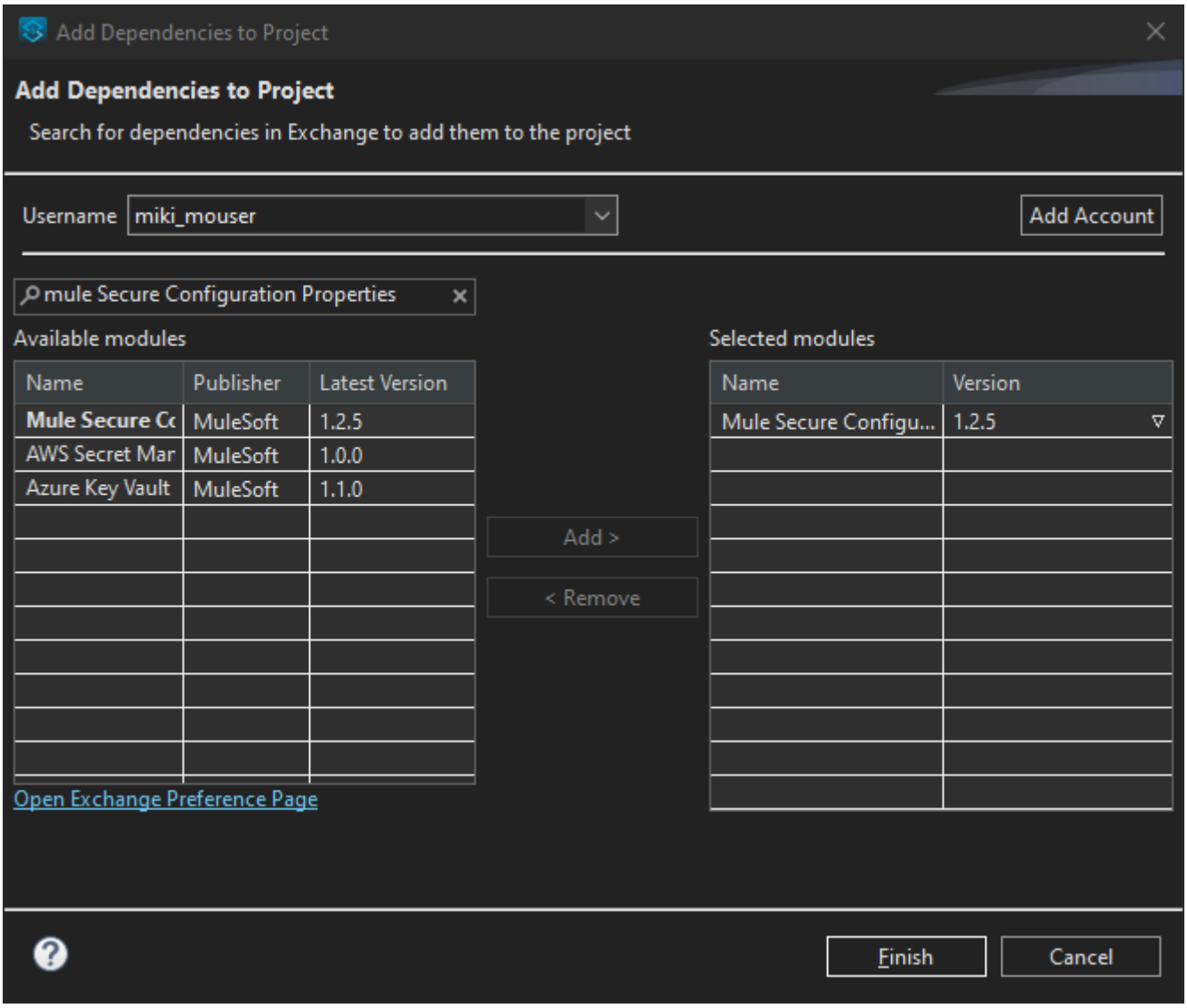
After you have entered your private credentials into the **local.secure.properties** file, repeat the same steps for a **dev.secure.properties** file.

Add the properties:

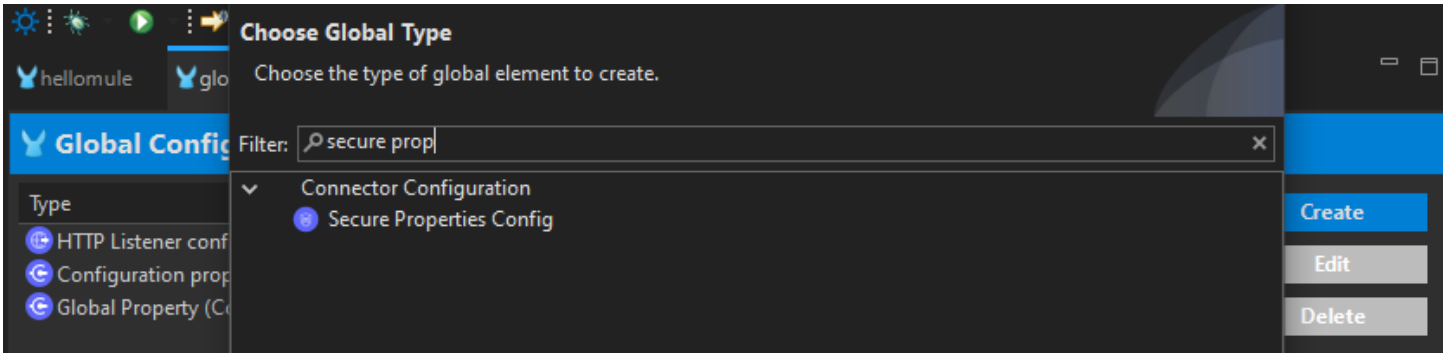
```
hellomule    *local.secure.properties
1 example.username=myUsernameLocal
2 example.password=myPasswordLocal
3
```

```
*dev.secure.properties
1 example.username=myUsernameDev
2 example.password=myPasswordDev
3
```

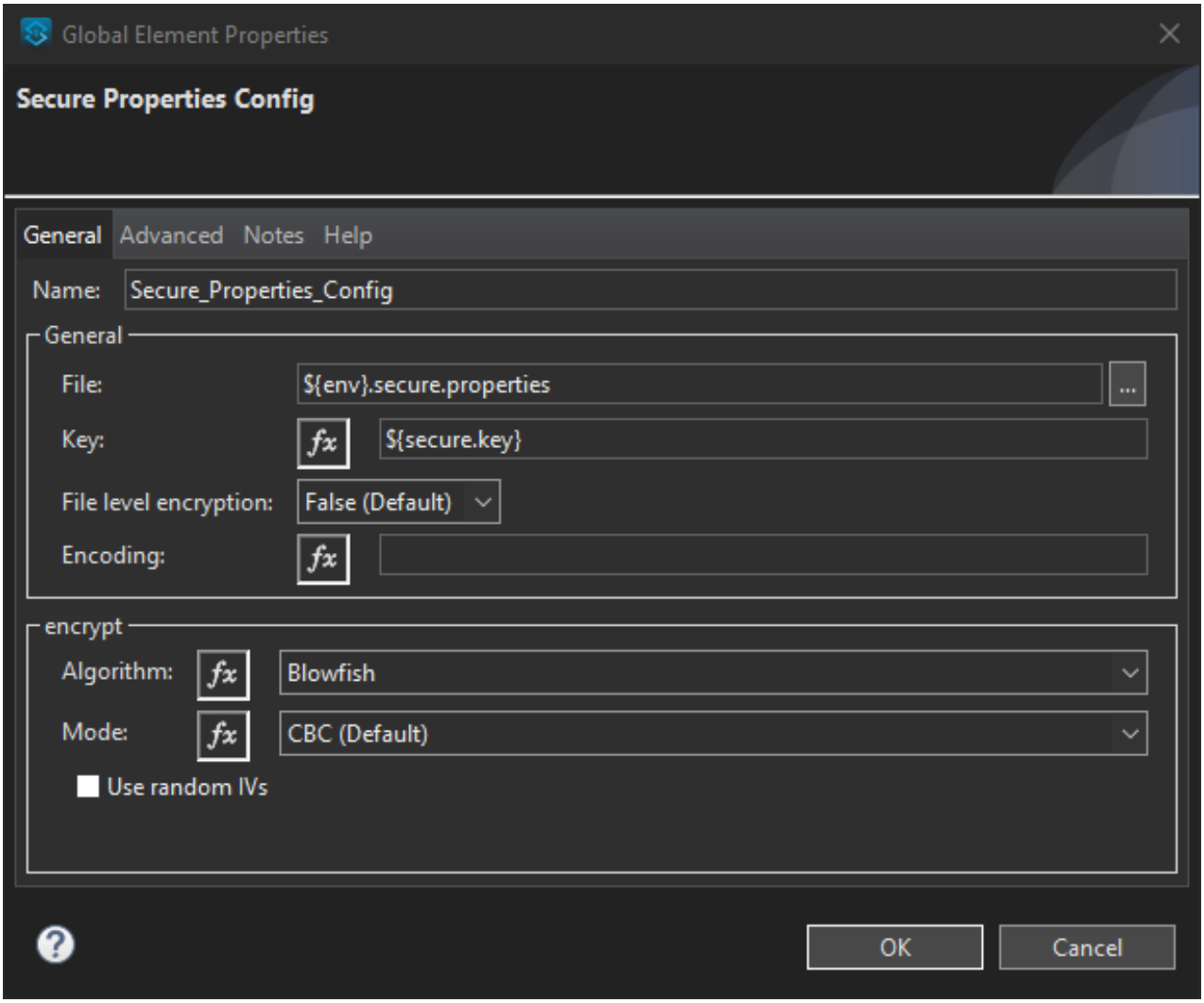
The next step is to search Exchange for the **Mule Secure Configuration Properties** module. In your **global.xml** file, select the **Search in Exchange** option from the Mule Palette. Search for the module and click on **Add >**.



Once you import your Secure Properties module, go to the **Global Elements** view. Click the **Create** button and create a **Secure Properties Config**. Under File, type `${env}.secure.properties`. This is a dynamic file. The Mule App will read the **env** property first and then the appropriate file based on it. In this case, **local.secure.properties**.



Under Key, type and select **Blowfish** as the Algorithm. The secure.key value will also be a property, but we don't want to add this property in our code directly because that is a possible security breach. We will be passing the key every time we start the application, either from our local computer or from CloudHub.

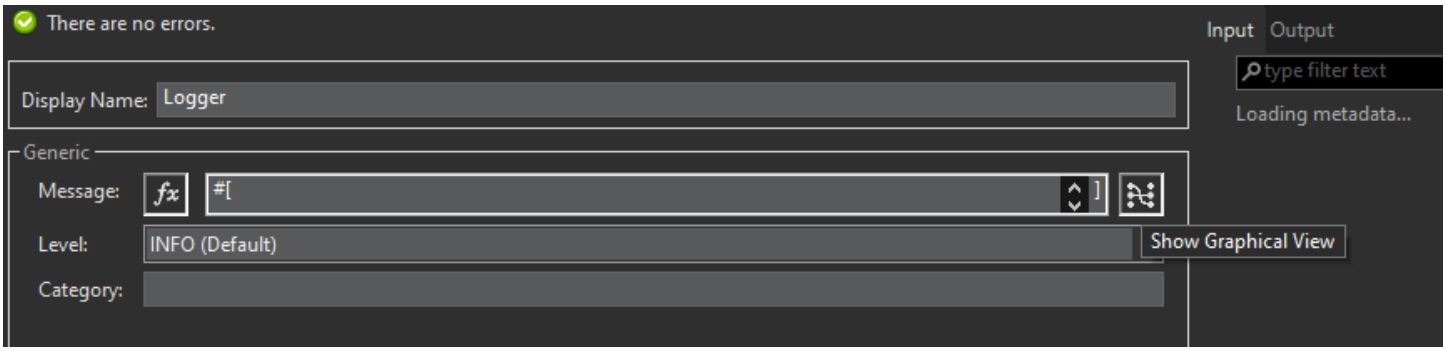


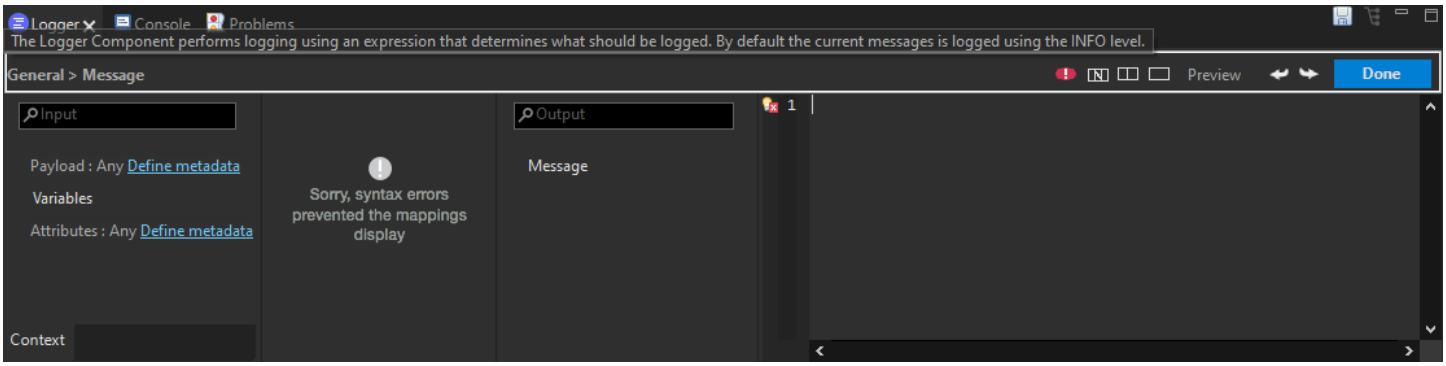
Save changes in all your files.

2. Set up a logger to read your secure credentials

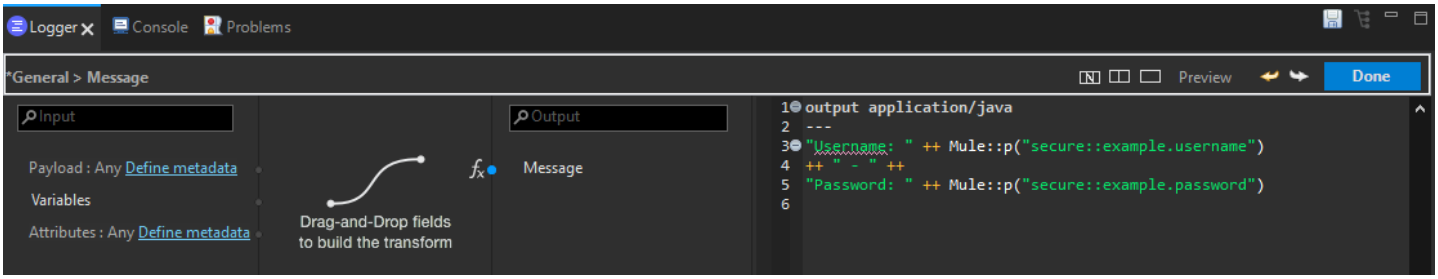
We'll set up a logger component to output the credentials into the console. Go to the **hellomule.xml** file and add a **Logger** component from the Mule Palette - you can find it under the **Core** module.

In the configuration, click on the **fx** button and then on the Show Graphical View button to the right. This will open a bigger view to add your DataWeave code. You can use the buttons next to the blue **Done** button to switch between the different views available.





Add this code to output a String with the two secured properties:



Note the `secure::` that we added before the property name. This tells the application it needs to decrypt these values before using them. Save all files.

3. Encrypt your properties files' values

Download the Secure Properties Tool Jar file from the official MuleSoft documentation. Open a terminal or command line prompt in the directory where this Jar file is located and run the following:

In Linux:

```
java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool \
string \
encrypt \
Blowfish \
CBC \
MyMuleSoftKey \
"myUsernameLocal"
```

In Windows:

```
java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool ^
string ^
encrypt ^
Blowfish ^
CBC ^
MyMuleSoftKey ^
"myUsernameLocal"
```

Or also in Windows you can only in one line:

```
java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool string encrypt Blowfish CBC MyMuleSoftKey "myUsernameLocal"
```

Command explanation:

- **string**: Indicates that the type of property to be encrypted is a string.
- **encrypt**: Specifies that an encryption operation is to be performed.
- **Blowfish**: Indicates the encryption algorithm to be used (in this case, Blowfish).
- **CBC**: Cipher Block Chaining mode of block cipher operation.
- **"MyMuleSoftKey"**: The value to be encrypted. In your case, this would be the value you want to protect, such as a password.
- **mulesoft**: The key used for encryption and decryption. Be sure to change this to a secure key and keep it secure.

This will return the encrypted value of **myUsernameLocal**, which is the property we are using as an example. Note that the key we're using to encrypt the property is **MyMuleSoftKey**. We will be using this value as the **secure.key** property to decrypt the values at runtime.

```
C:\Windows\System32\cmd.exe
(c) Microsoft Corporation. Todos los derechos reservados.

C:\Users\HP\Downloads>java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool
string encrypt Blowfish CBC MyMuleSoftKey "myUsernameLocal"
HbsuWJRjiubchmzQREGdsA==

C:\Users\HP\Downloads>
```

All:

```
C:\Windows\System32\cmd.exe
(c) Microsoft Corporation. Todos los derechos reservados.

C:\Users\HP\Downloads>java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool
string encrypt Blowfish CBC MyMuleSoftKey "myUsernameLocal"
HbsuWJRjiubchmzQREGdsA==

C:\Users\HP\Downloads>java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool
string encrypt Blowfish CBC MyMuleSoftKey "myPasswordLocal"
zhoritn2db6Ud+9QuhyViQ==

C:\Users\HP\Downloads>java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool
string encrypt Blowfish CBC MyMuleSoftKey "myUsernameDev"
HbsuWJRjiuZZis+2oogkdQ==

C:\Users\HP\Downloads>java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool
string encrypt Blowfish CBC MyMuleSoftKey "myPasswordDev"
zhoritn2db6oII22158LPQ==

C:\Users\HP\Downloads>
```

After you get the encrypted value, you need to add the following syntax in the properties files:

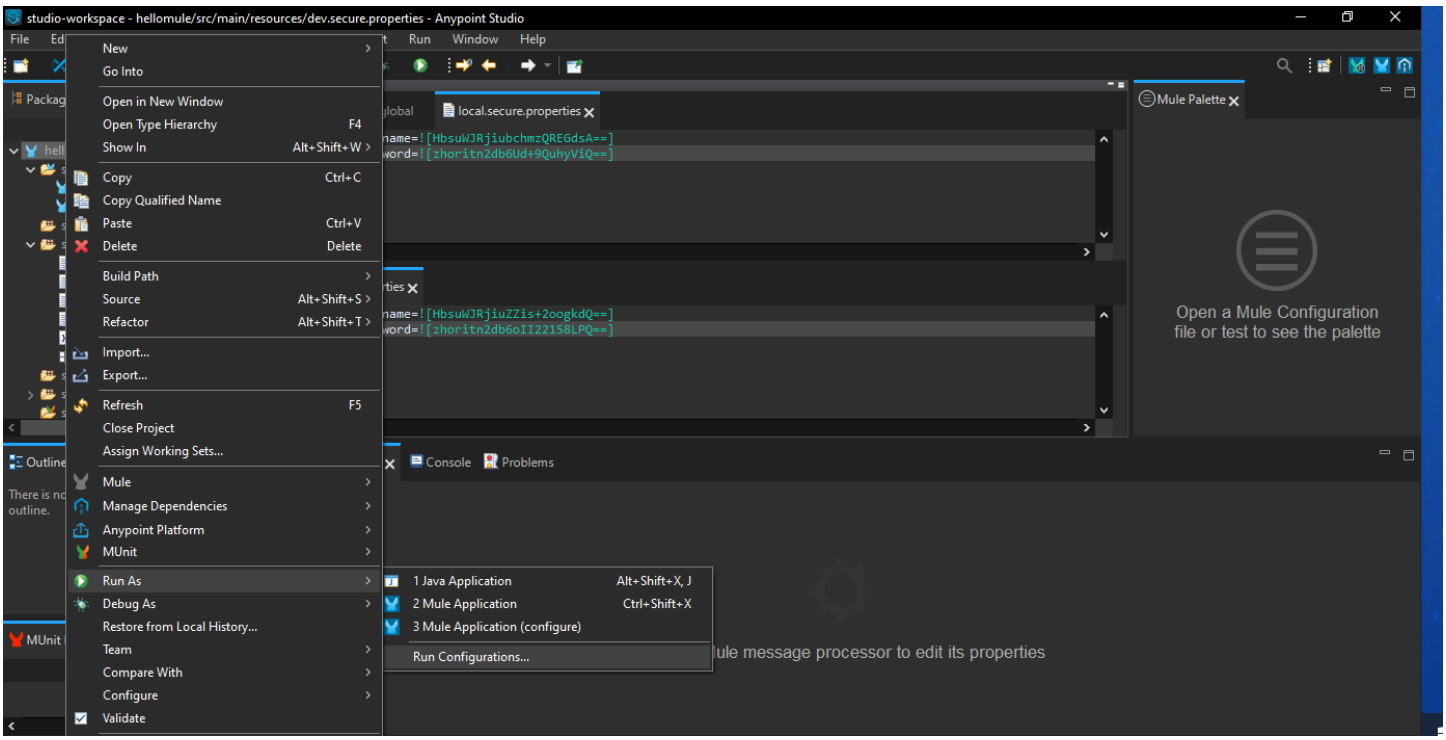
`![encryptedValue]`

If your encrypted value was `HbsuWJRjiubchmzQREGdsA==`, then your property should be `![HbsuWJRjiubchmzQREGdsA==]` . Repeat for each property in local.secure.properties and dev.secure.properties. You should end up with something like this:

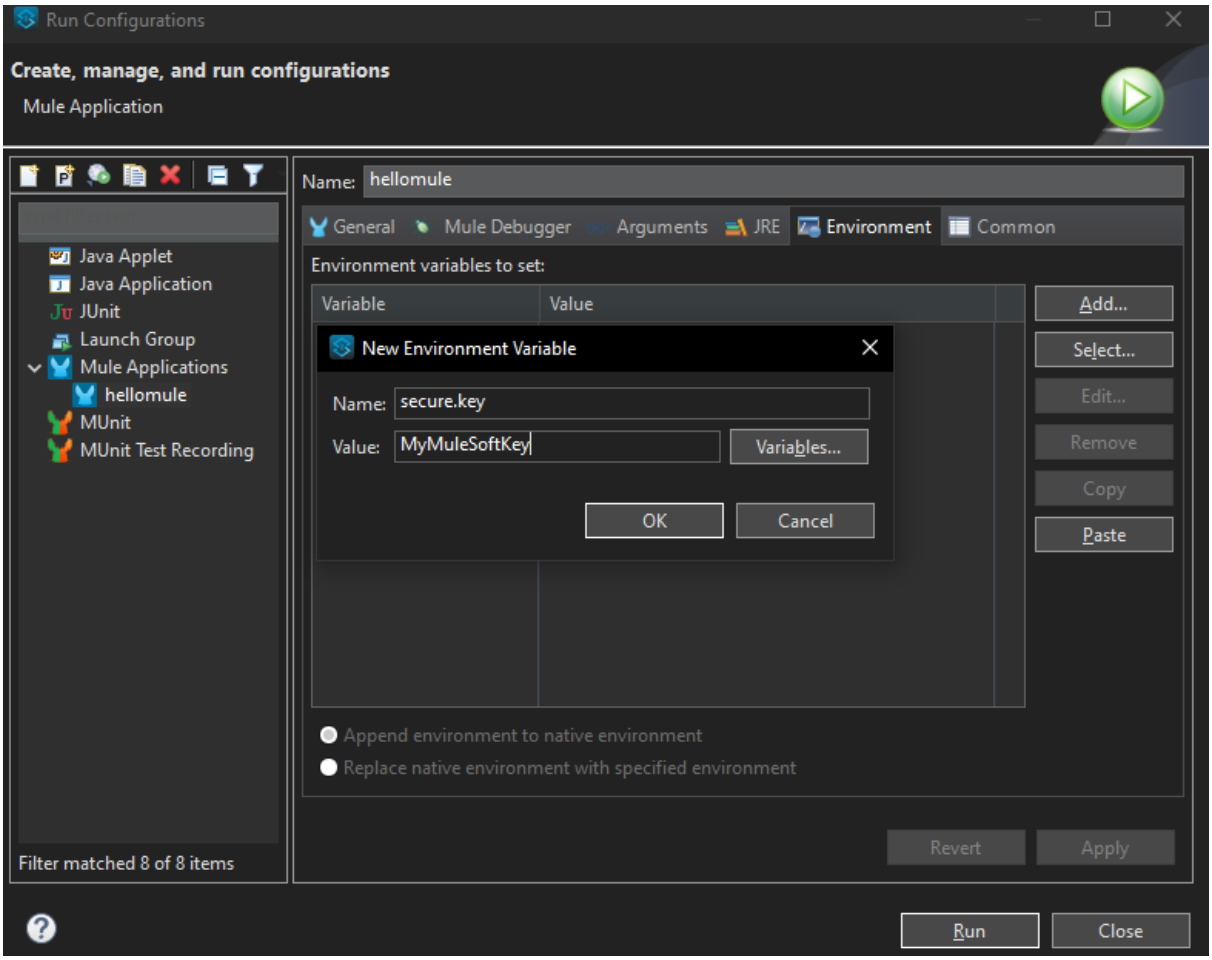
```
hellomule   global   *local.secure.properties
1 example.username=![HbsuWJRjiubchmzQREGdsA==]
2 example.password=![zhoritn2db6Ud+9QuhyViQ==]
3

*dev.secure.properties
1 example.username=![HbsuWJRjiuZZis+2oogkdQ==]
2 example.password=![zhoritn2db6oII22158LPQ==]
3
```

4. Test your application on your local computer

Right-click on your Mule project and select **Run As > Run Configurations**.



Go to the **Environment** tab and click on **Add**. Input the following and click **OK**:

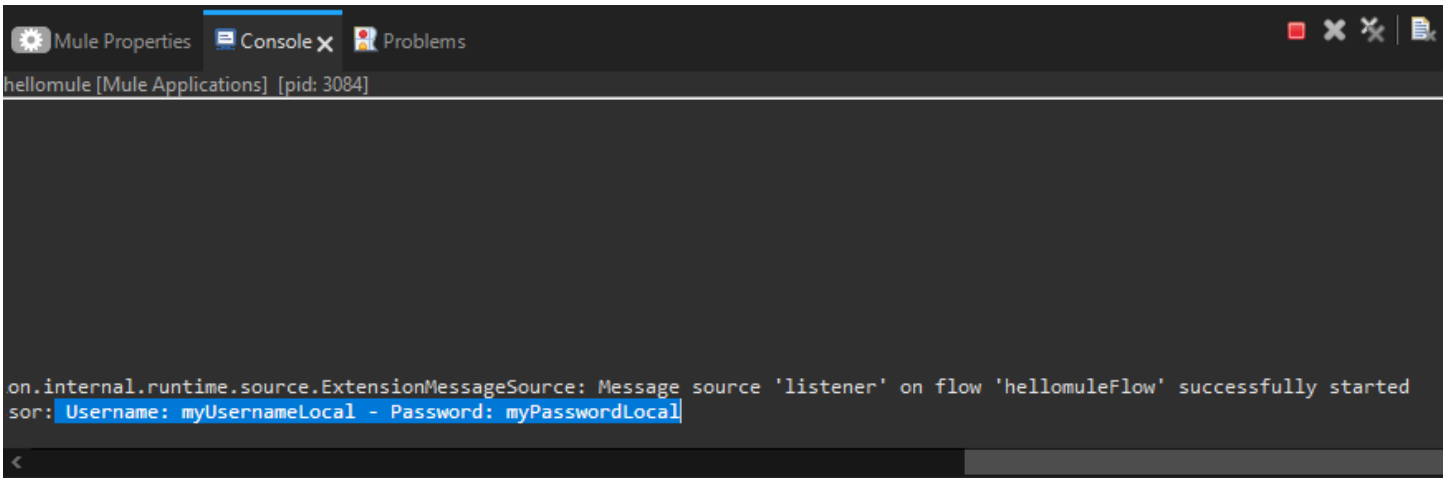


Once that's set, click on **Apply** and **Run**. This will send the **secure.key** property at runtime and it will not be saved in your code. We do this to prevent security breaches if someone has access to the source code of our application.

After you get the DEPLOYED status, go back to your REST client (in this case we'll be using Postman).

Send a request to **localhost:8081/hellomule**.

You should see the decrypted values in your Console.

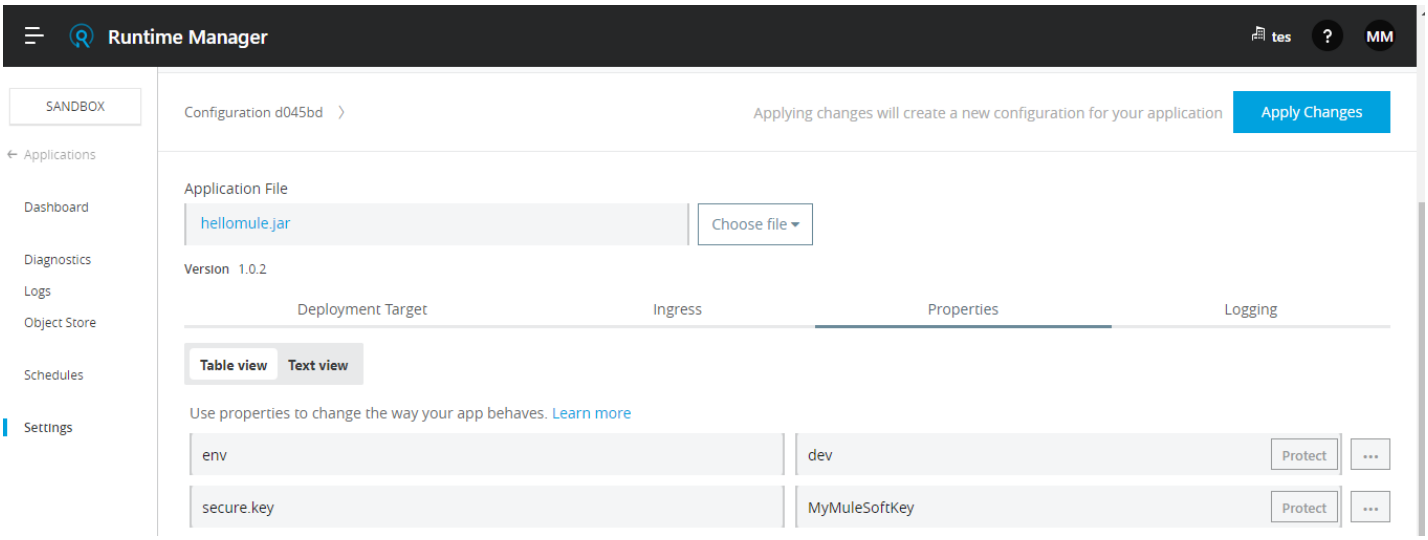


Stop your application.

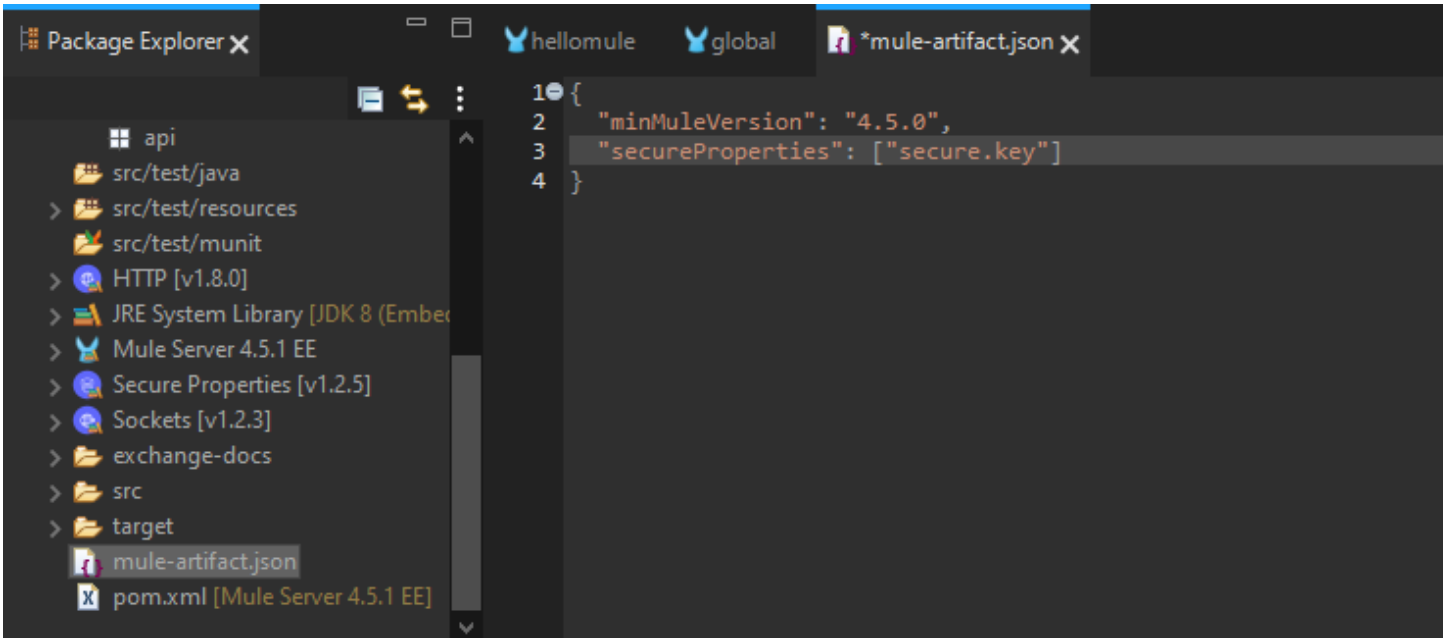
5. Deploy to CloudHub with your secure credentials

It's important that before you deploy your application to CloudHub, that you add your **secure.key** and your **env** values to your deployment properties. Sign in to [Anypoint Platform]() and go to **Runtime Manager**. Select your **Sandbox** environment and click on your previously deployed application.

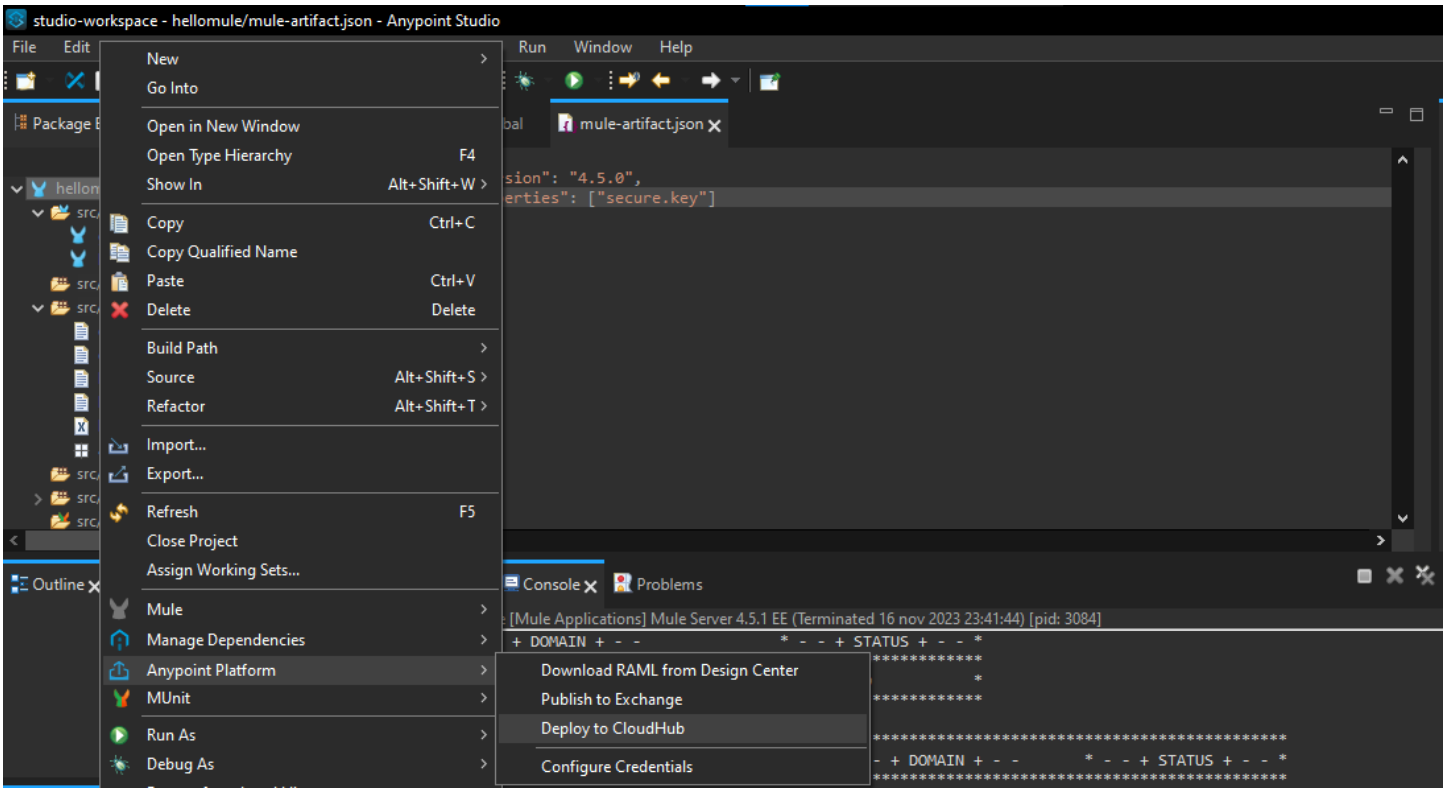
Now, go to the **Properties** tab and add the two properties. This time the **env** property should be set to **dev**. Click on Apply Changes.



Notice how the secure.key value is not currently hidden. To hide it, go to your **mule-artifact.json** file in Anypoint Studio and add this line before the closing brackets (don't forget to add a comma at the end of the minMuleVersion line): `"secureProperties": ["secure.key"]`

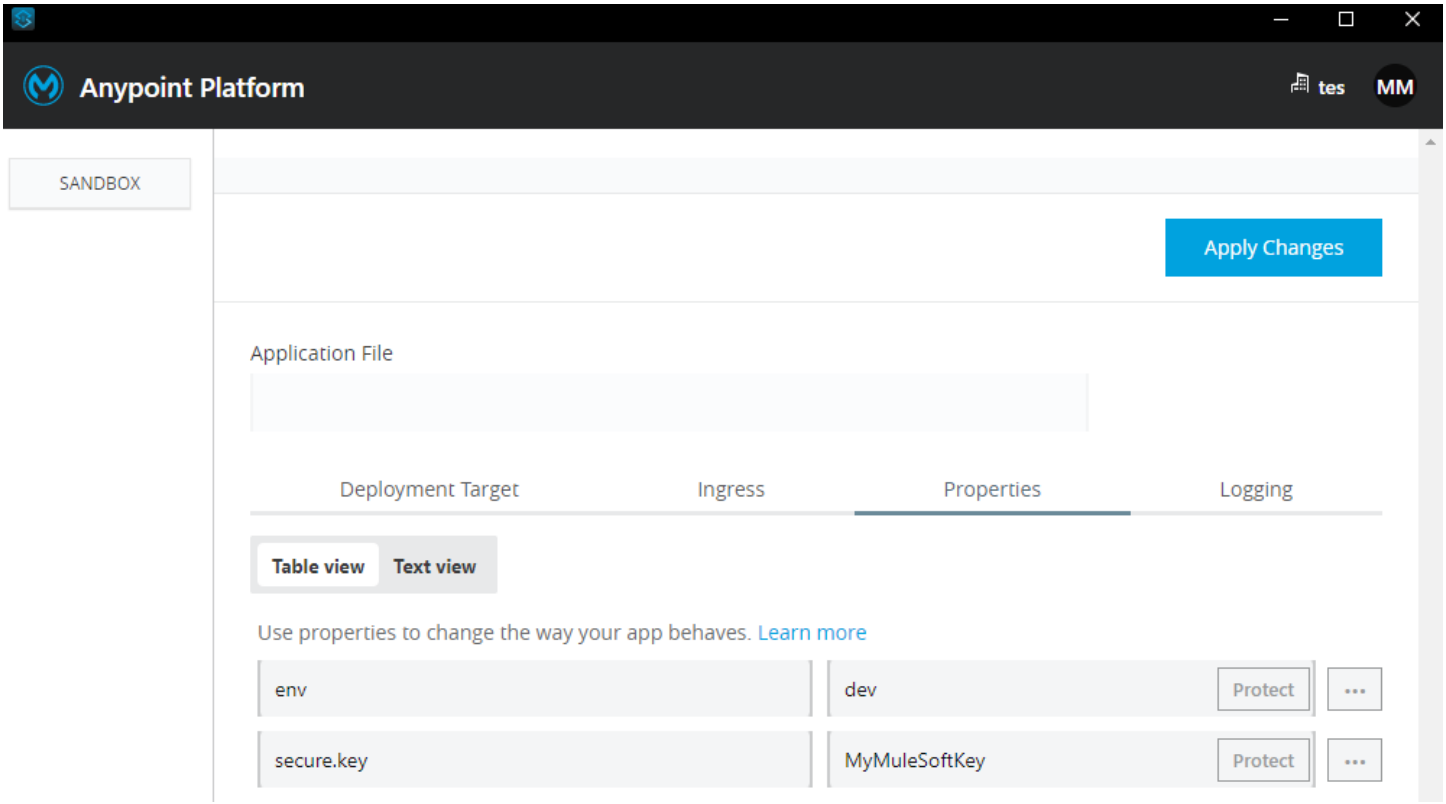


Save all your files and deploy your Mule App to CloudHub by selecting **Anypoint Platform > Deploy to CloudHub**.

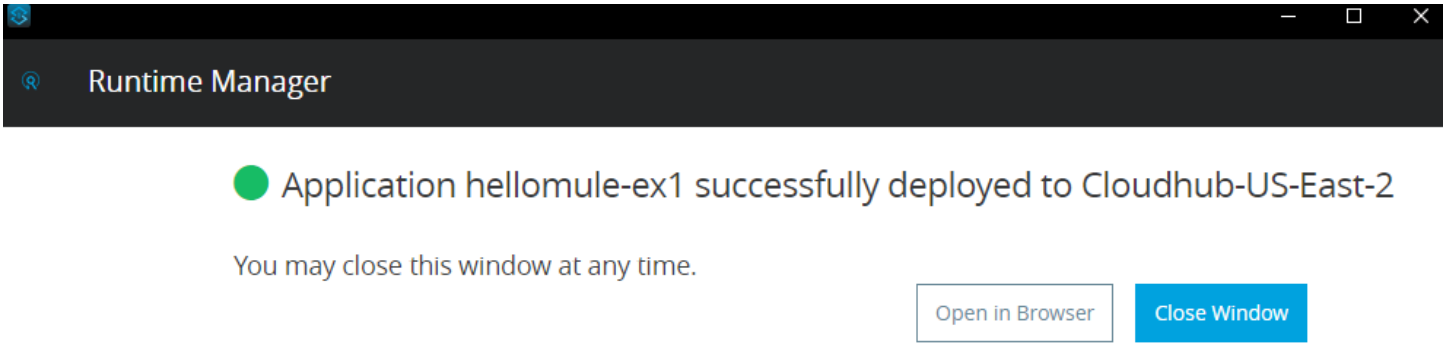


Make sure you select the previously deployed application as the **Deploying Application**. After it finishes deploying, refresh the page, and your secure.key property should now be hidden in Runtime Manager.

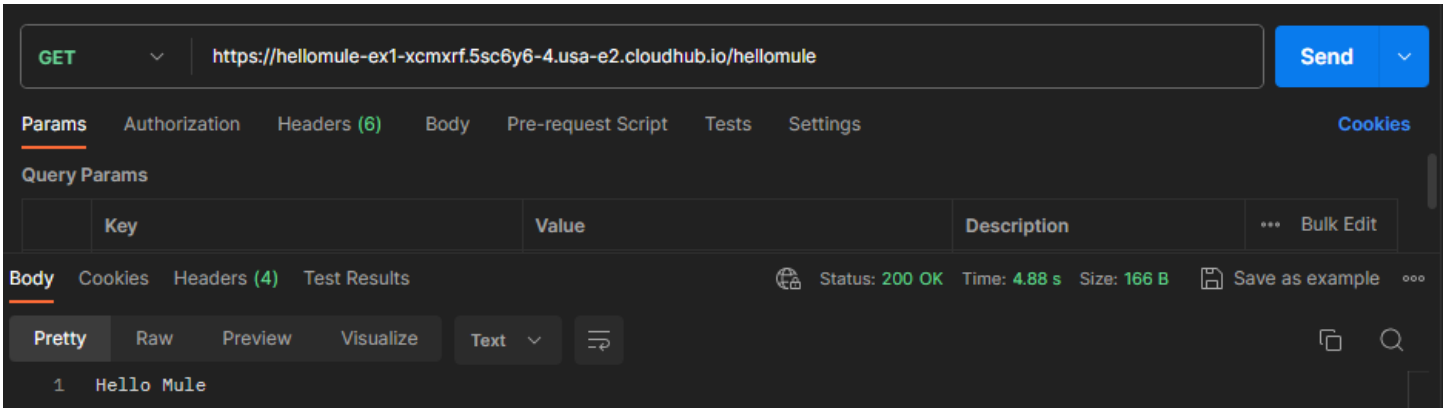
Aply Changes



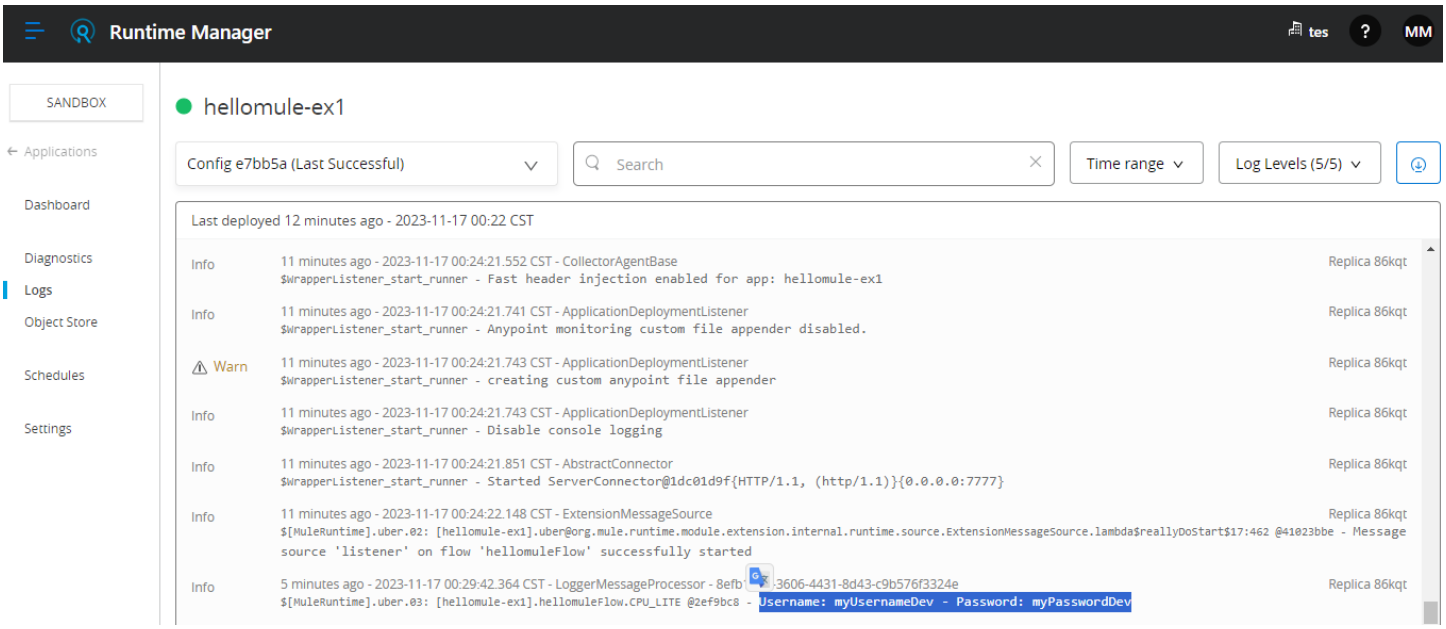
Verify:



Testing in POSTMAN:



You should see the decrypted values in the **Logs** tab after calling your CloudHub application. Remember you can call your CloudHub app by using the **App url** ending in **.cloudhub.io**.

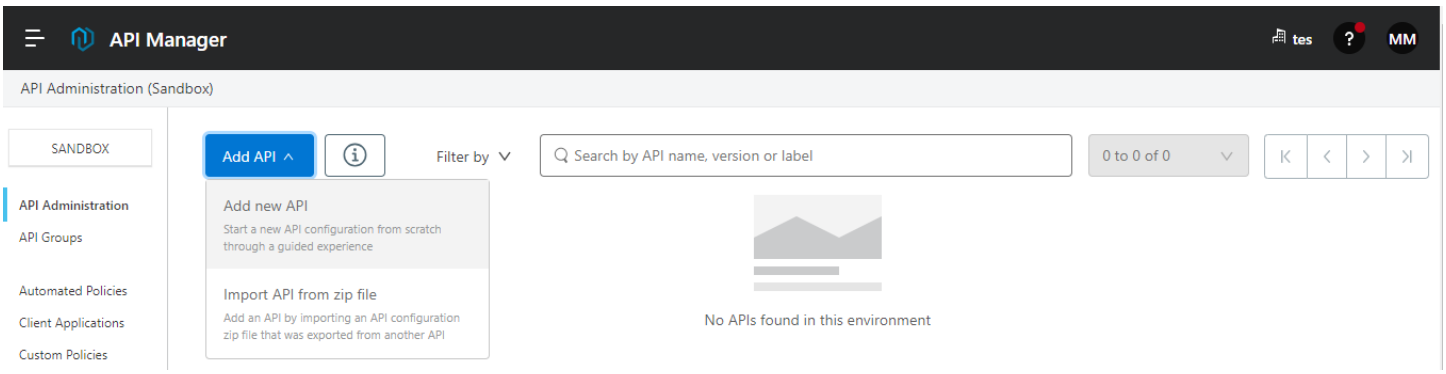


Ejercicio 4: Cómo configurar la detección automática de API en Anypoint Studio

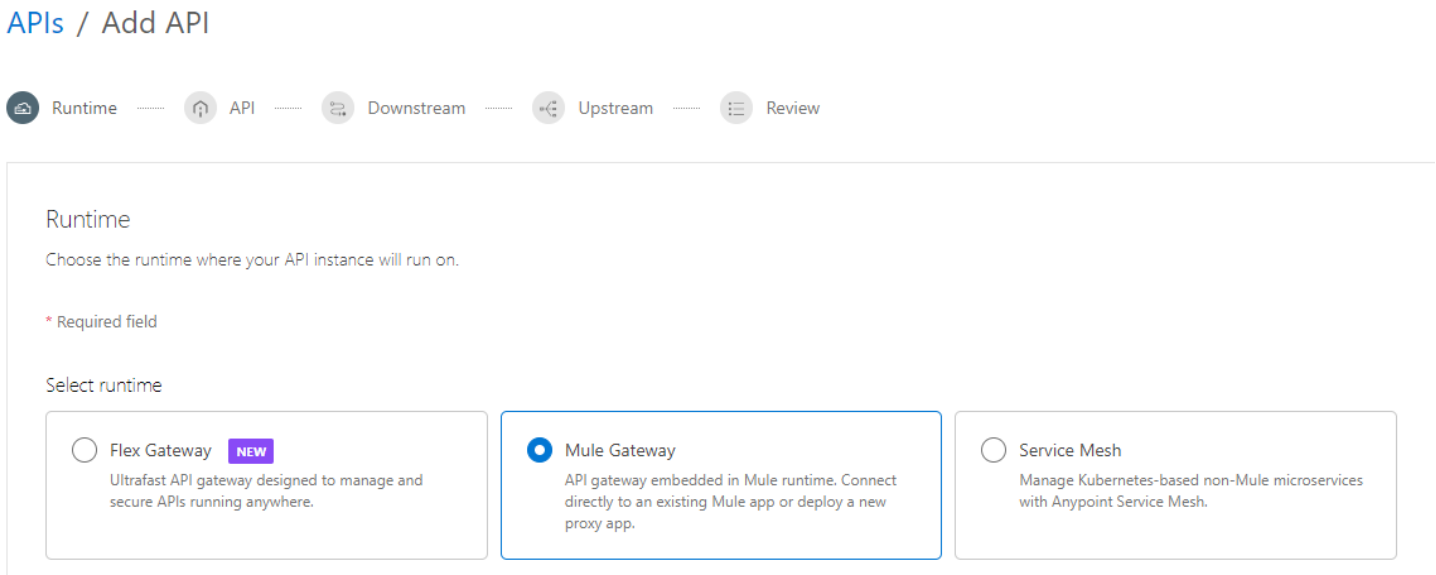
Crear una API en API Manager para permitir aplicar políticas.

1. Create a new API in API Manager

The first step to managing your API and enabling security policies is to create a new API in API Manager. To do this, log in or sign up for a free Anypoint Platform account and go to **API Manager**. Once you're there, select **Manage API > Create new API**.

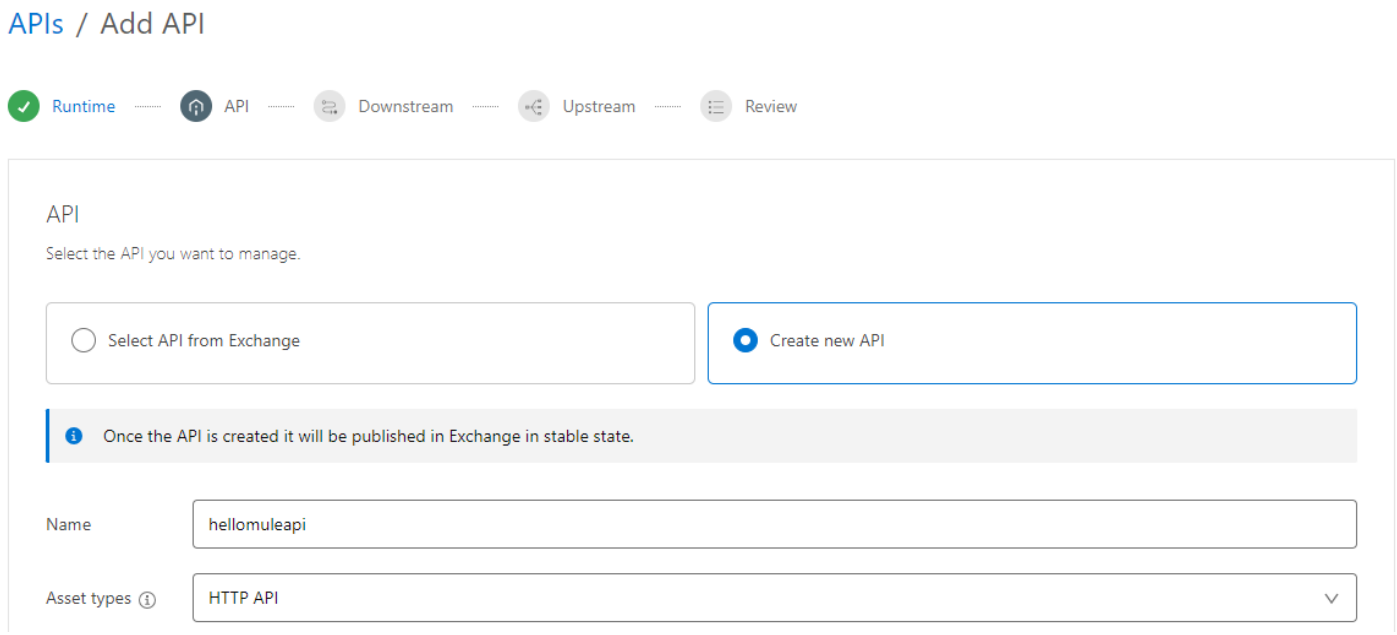


Select Option Mule Gateway



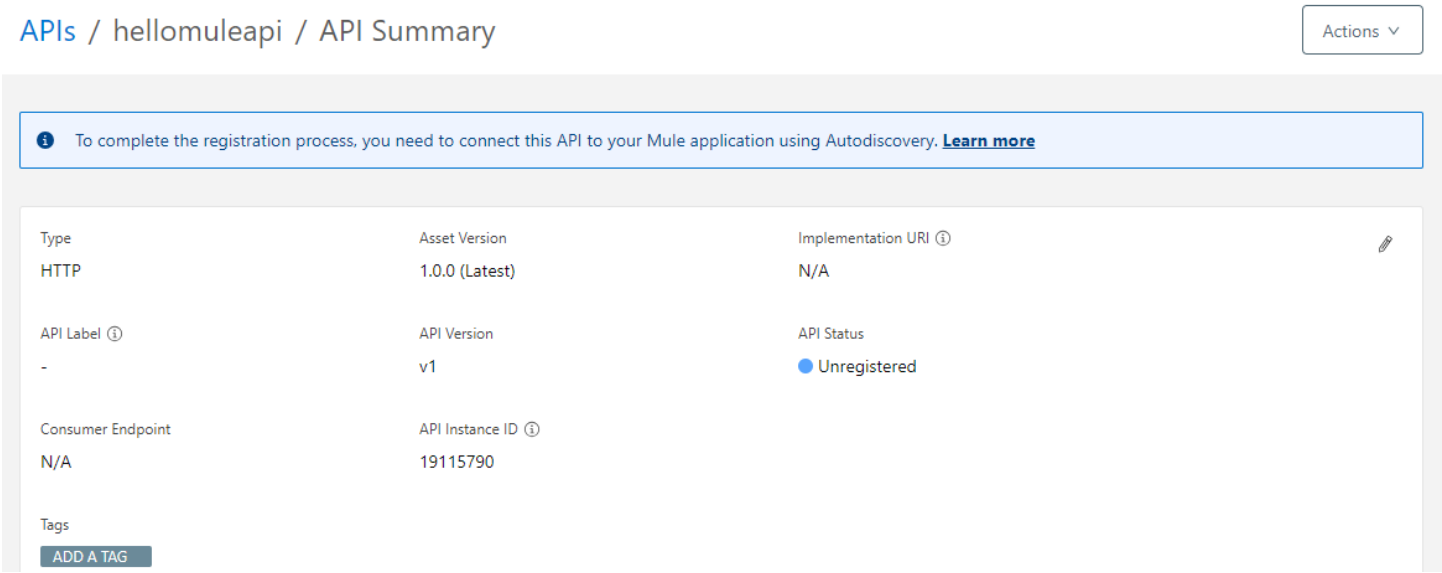
Click on **Next Button**.

Add a name for your API and select **HTTP API**. Note that this name doesn't need to be unique like the Runtime Manager one. Click on **Continue**.



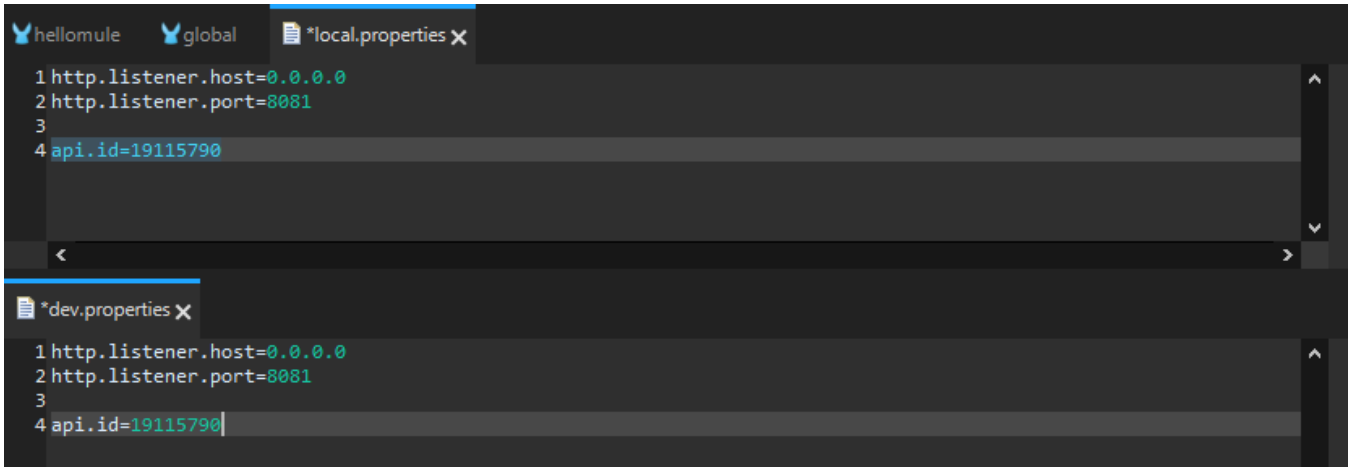
Click on **Next Button**.

When you create your new API, you will be granted an **API Autodiscory API ID**. You will need to input your Autodiscovery API ID in Anypoint Studio to link your mule application with your API in API Manager. For now, just make a note of your API ID.



2. Create a new api.id property per environment

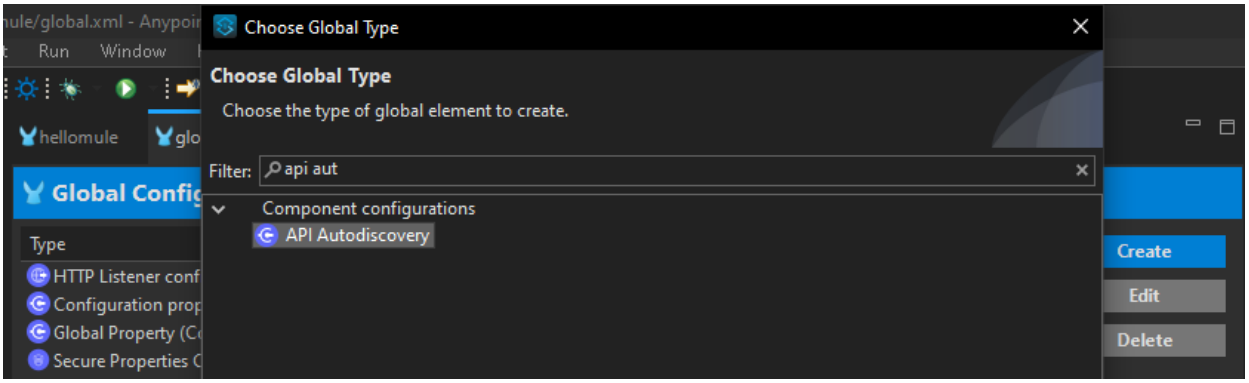
It's always a best practice to keep our properties in external files instead of hardcoding the values in our components. In your Anypoint Studio project, open the **local.properties** and **dev.properties** files under **src/main/resources**. Add a new `api.id` property in both files with the API ID value you got from API Manager.



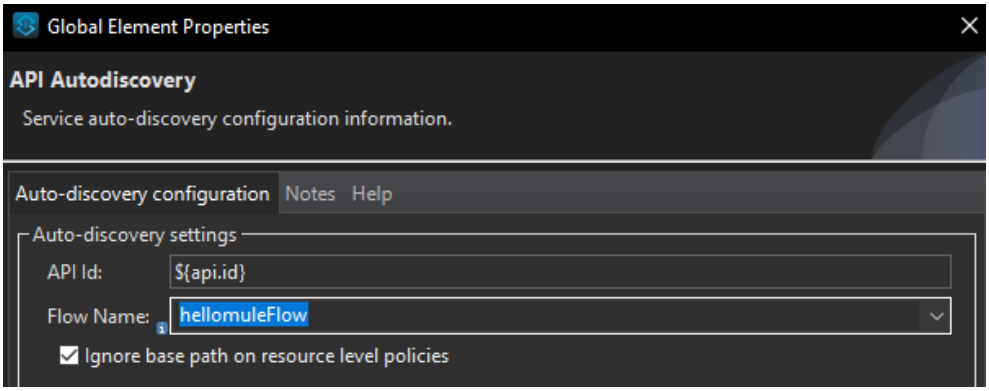
If you had more environments in API Manager like QA or PROD, your API ID would be different for each one and you would have to update your qa.properties or prod.properties files accordingly. In this case, we want to sync our API (from API Manager) to both our dev and local environments.

3. Configure Anypoint Studio with API Autodiscovery

Go to your **global.xml** file and switch to the **Global Elements** view. Click the **Create** button, then select **API Autodiscovery**.

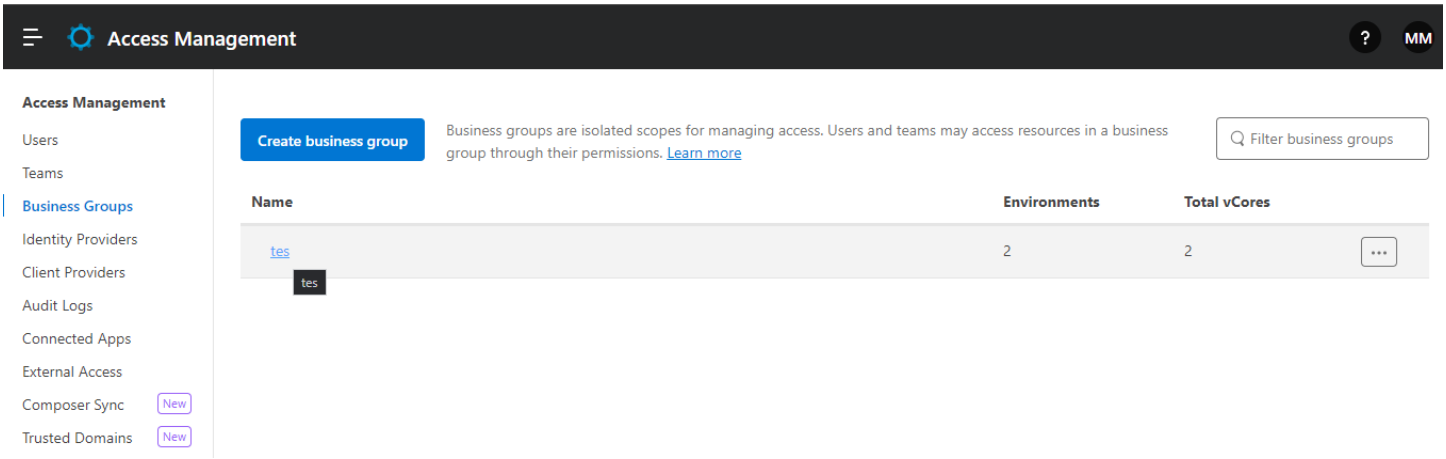


To link the API Id field to your new property, just reference to it using the following syntax: `${api.id}`. For the flow name, you can just select the **hellomuleFlow**. Learn more by [visiting the documentation](#).

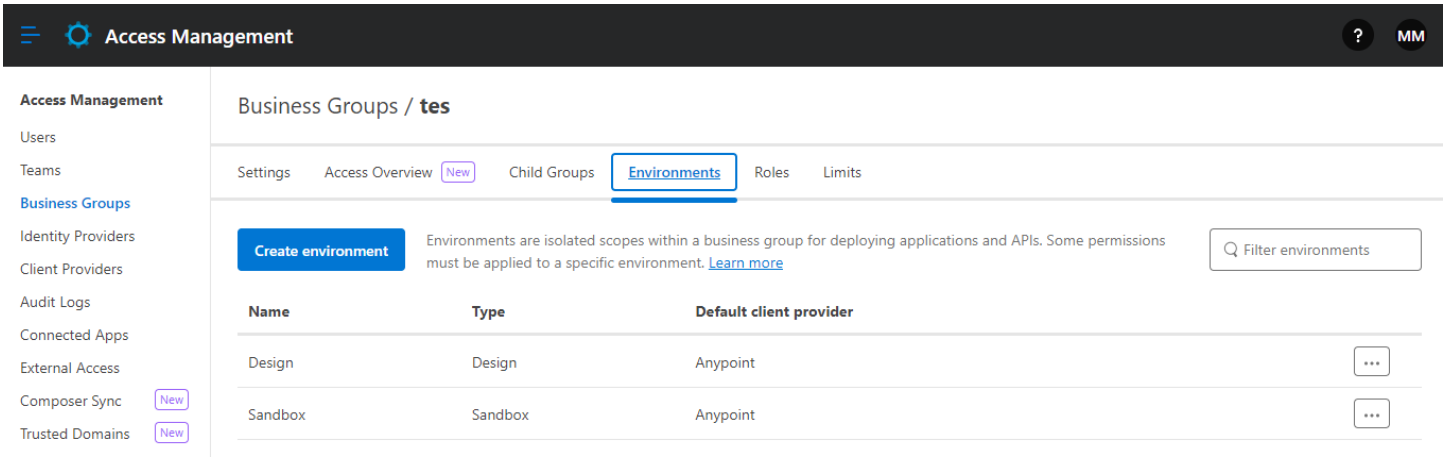


4. Test your application on your local computer

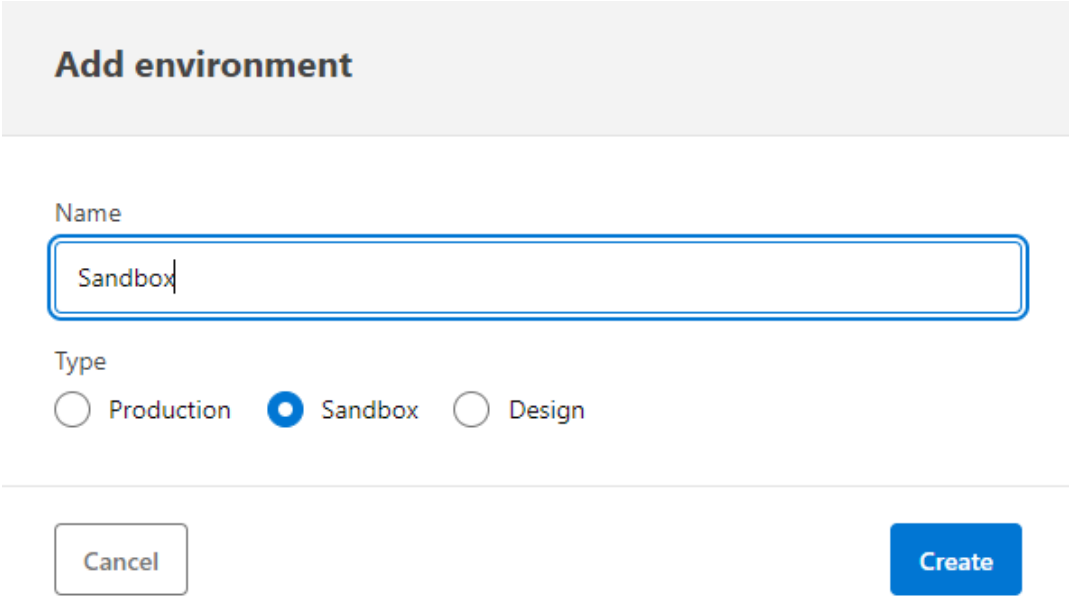
Solution to the fact that in the current version it is now shown directly to the environments: [To Create a New Environment]



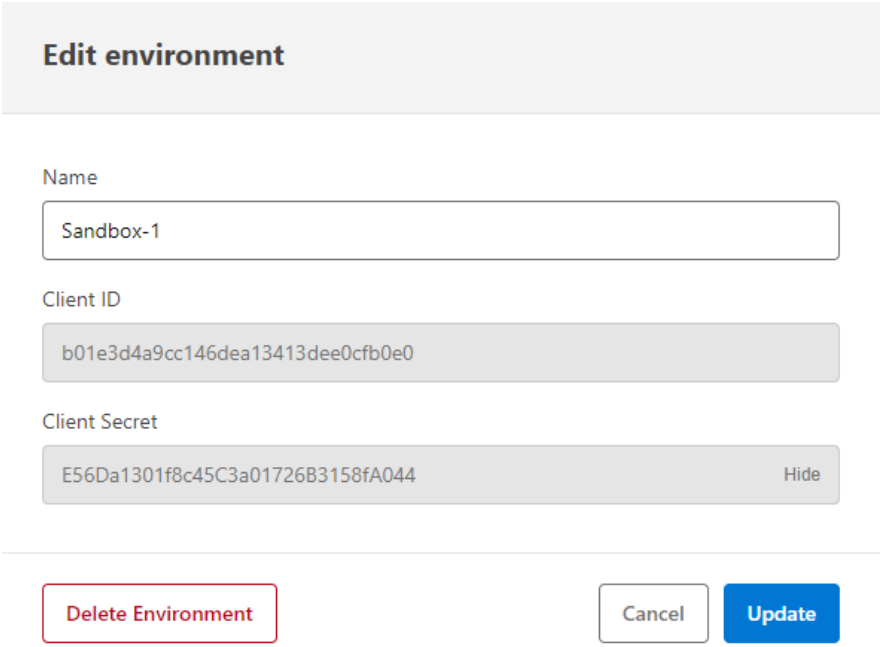
Click the name of your root organization.



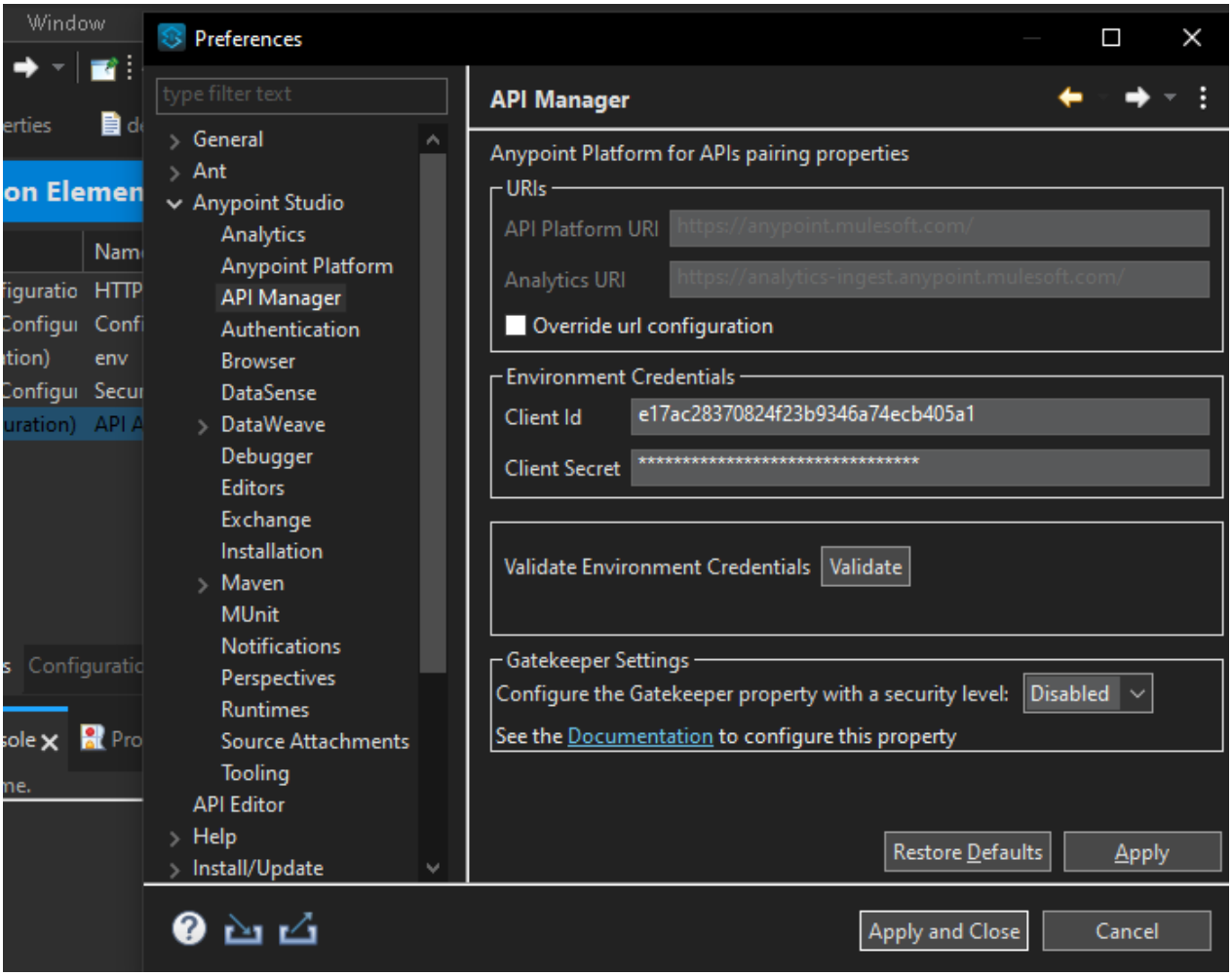
Click the Environments tab. Click Add Environment. Configuration Environment



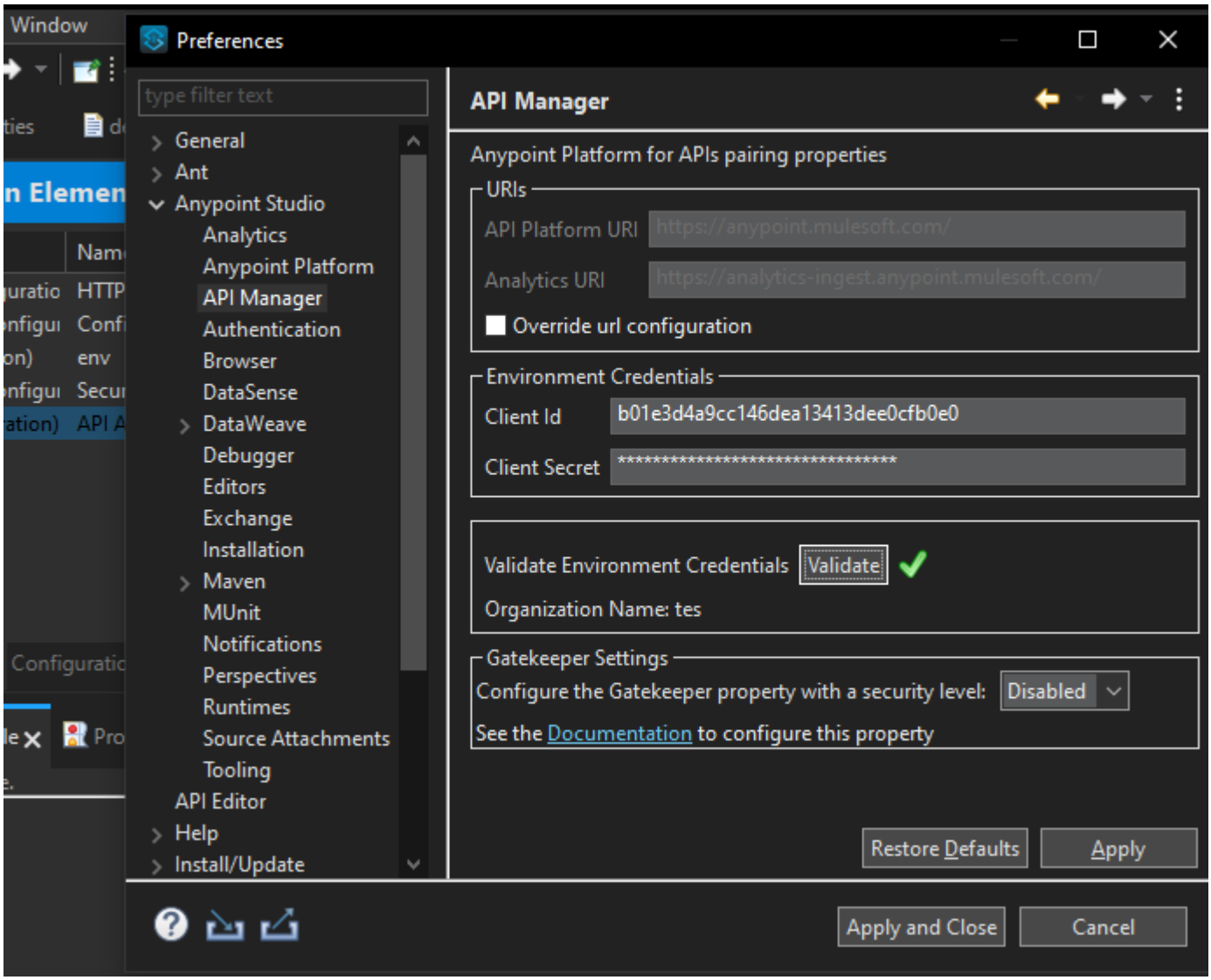
Before we run the application, we need to add two more values to be able to connect to our API Manager. Navigate back to Anypoint Platform and go to **Access Management**. Go to your Environments, and select the Environment you are going to deploy to (in this case, Sandbox). You will need to copy and paste your **Client ID** and **Client Secret** and include those properties in your Deployment Properties and in Anypoint Studio.



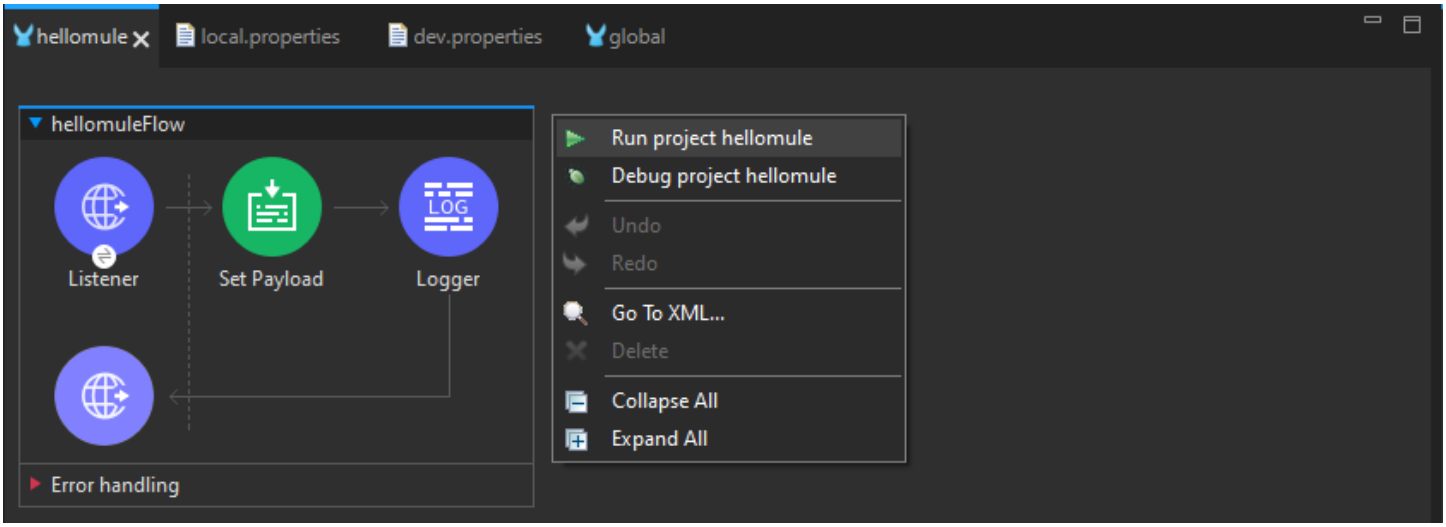
Go to your Anypoint Studio's (in this case **Window**) preferences or settings.



Navigate to **Anypoint Studio > API Manager**. Paste here the credentials you copied from Access Management (Client Id and Client Secret) and click **Validate**. The organization name should match what you have on the top-right corner of your Anypoint Platform account.

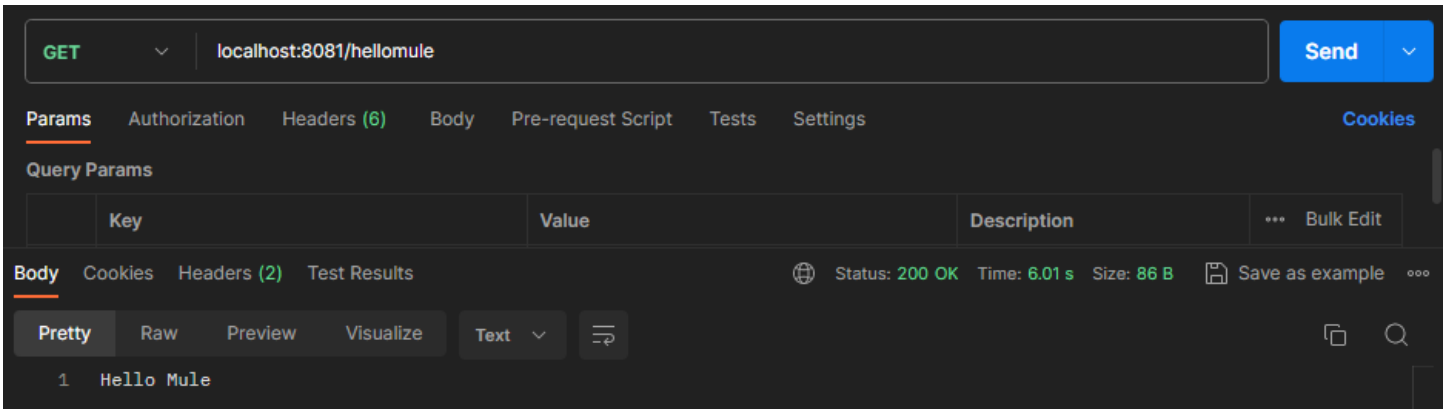


Once that's set, click on **Apply and Close** and run your Mule app. Verify that there are no errors in the Console and the Status of the application is **DEPLOYED**.



```
INFO  2023-11-17 11:19:37,453 [WrapperListener_start_runner] org.mule.runtime.core.internal.logging.LogUti
**********************************************************************
*              - - + DOMAIN + - -                * - - + STATUS + - - *
**********************************************************************
* default                                        * DEPLOYED           *
**********************************************************************

*************************************************************************************************************
*            - - + APPLICATION + - -             *       - - + DOMAIN + - -       * - - + STATUS + - - *
*************************************************************************************************************
* hellomule                                      * default                        * DEPLOYED           *
*************************************************************************************************************
```

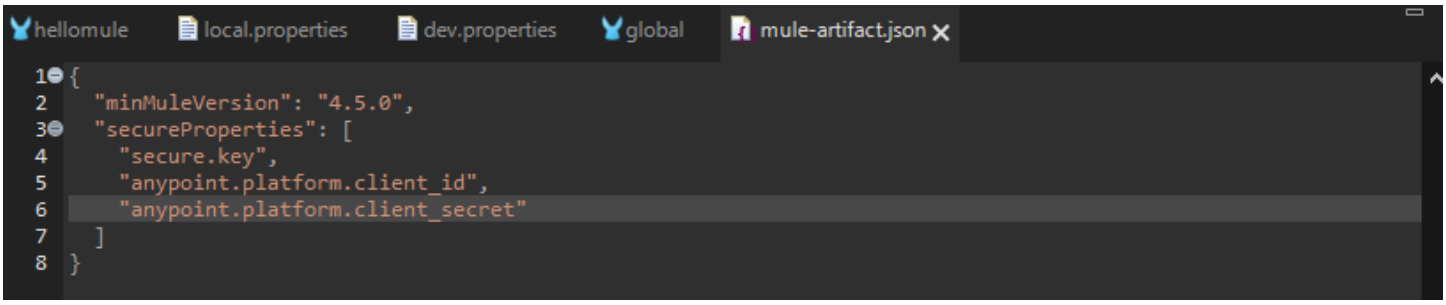
Go to your REST Client and send a request to the local application. You should get back the **Hello Mule** response and a **200 OK** status.



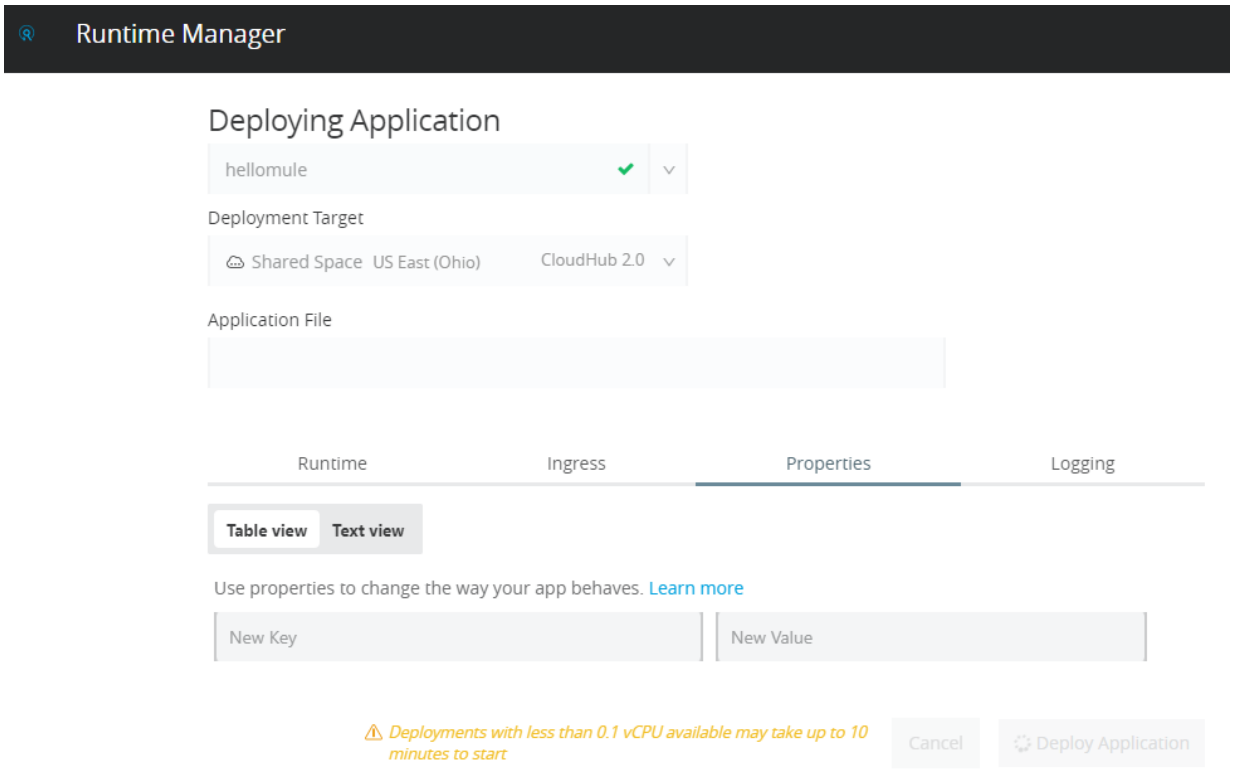
Stop the application.

5. Deploy to CloudHub with your environment credentials

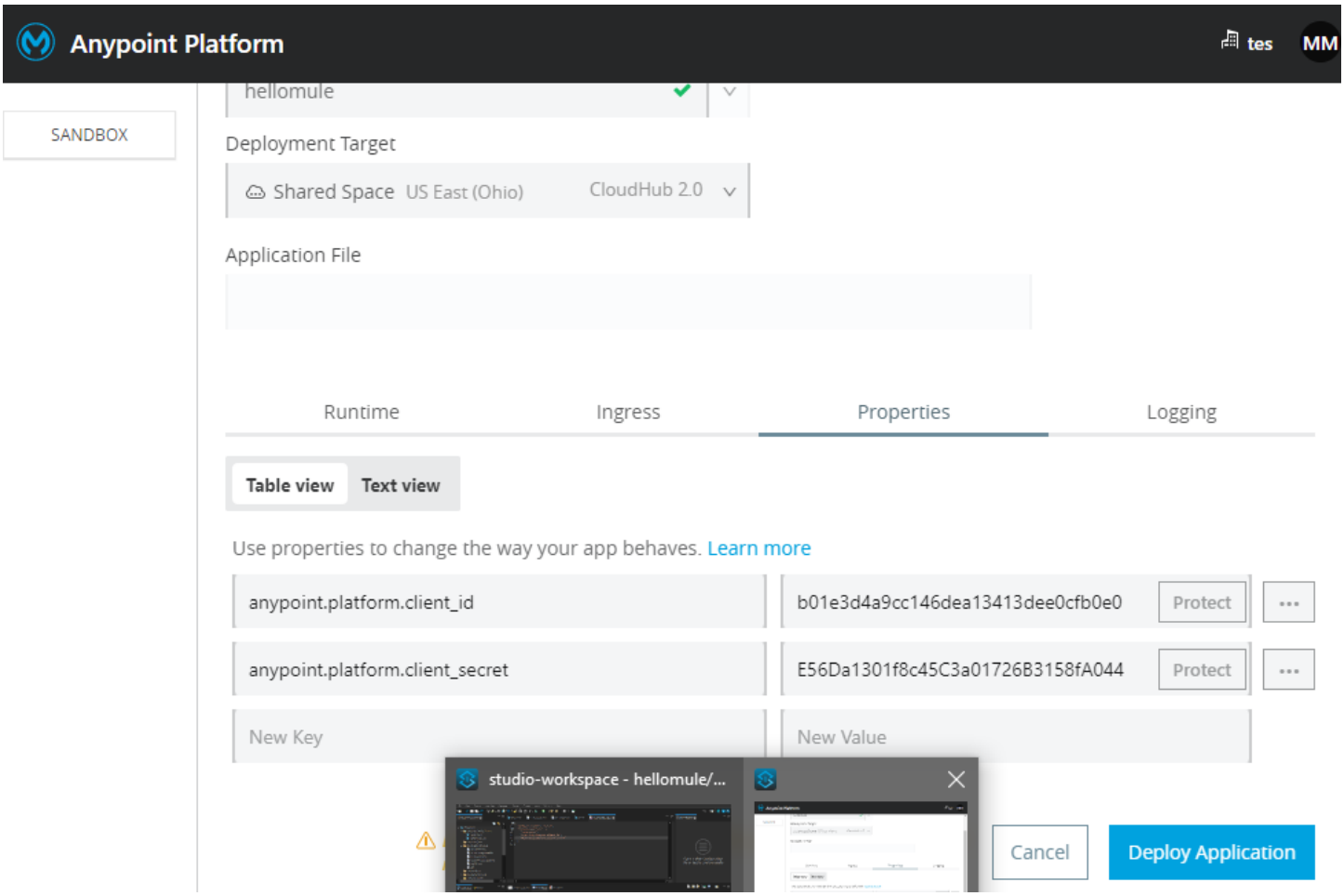
In your Anypoint Studio, open the **mule-artifact.json** file to add these two properties to the secure properties list. This will hide both properties in our Runtime Manager for security reasons.



Save this file and right-click on your project. Select **Anypoint Platform > Deploy to CloudHub**.



Make sure you select the previously deployed application and check the **Overwrite Existing Application** option. Go to the **Properties** tab. Enter your Client ID and Client Secret like this:



Click **Deploy Application**. After your application finishes deploying in Runtime Manager, you should see the status of your API set as Active in API Manager. Now you can enforce policies directly from API Manager without needing to redeploy your Mule application.

Ejercicio 5: Aplicar ID Client a una API en API Manager.

Ejercicio 6: Conoce sobre el enfoque de la primera API de Especificación.

Ejercicio 7: Construye una API de Especificación en API Designer.

Ejercicio 8: Habilitar el consumo de la aplicación Mule por medio de HTTPS.

Ejercicio 9: Desplegar la aplicación Mule en CloudHub utilizando Maven.