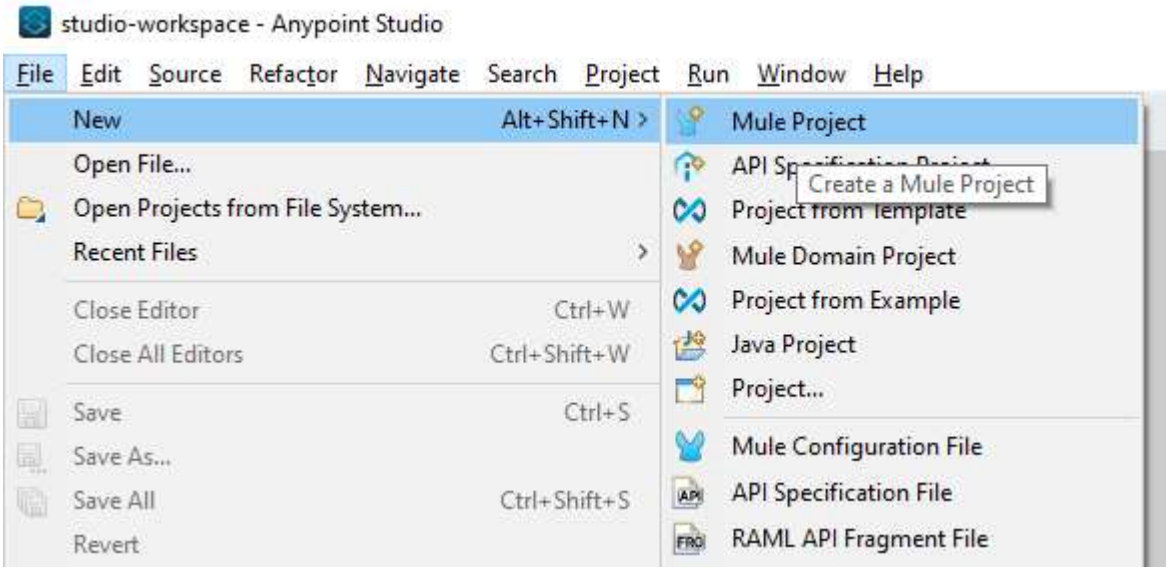
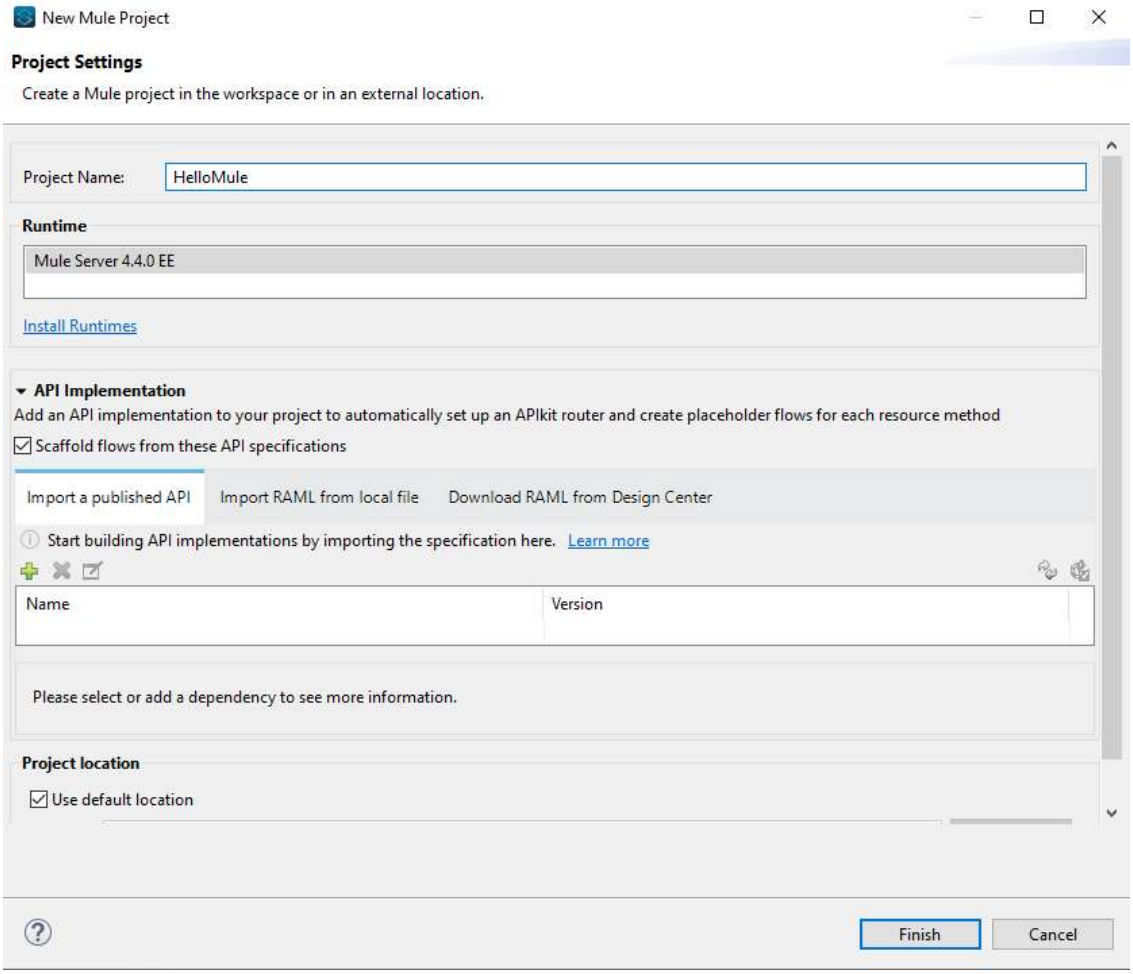
BUILD, TEST, AND DEPLOY YOUR FIRST MULE APP.

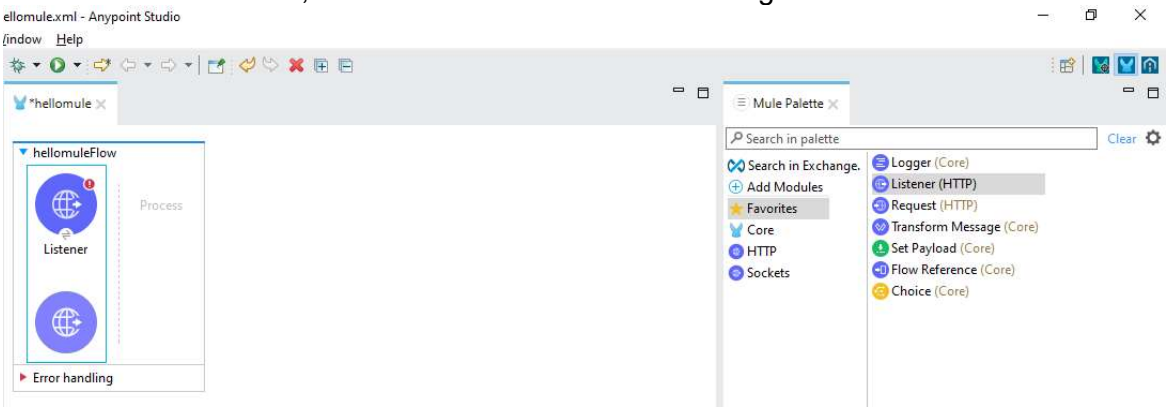
1. First, we are going to open Anypoint Studio and, from there, we are going to **File**, then select **New > Mule Project**.



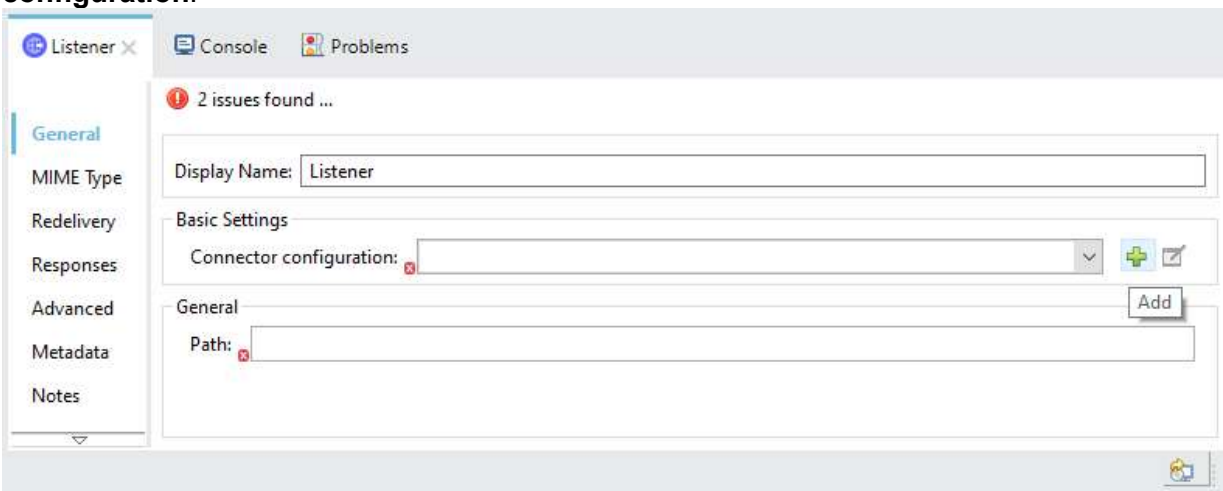
2. In the **Project Name** field is assigned as *Hello Mule*, and then click **on Finish**.



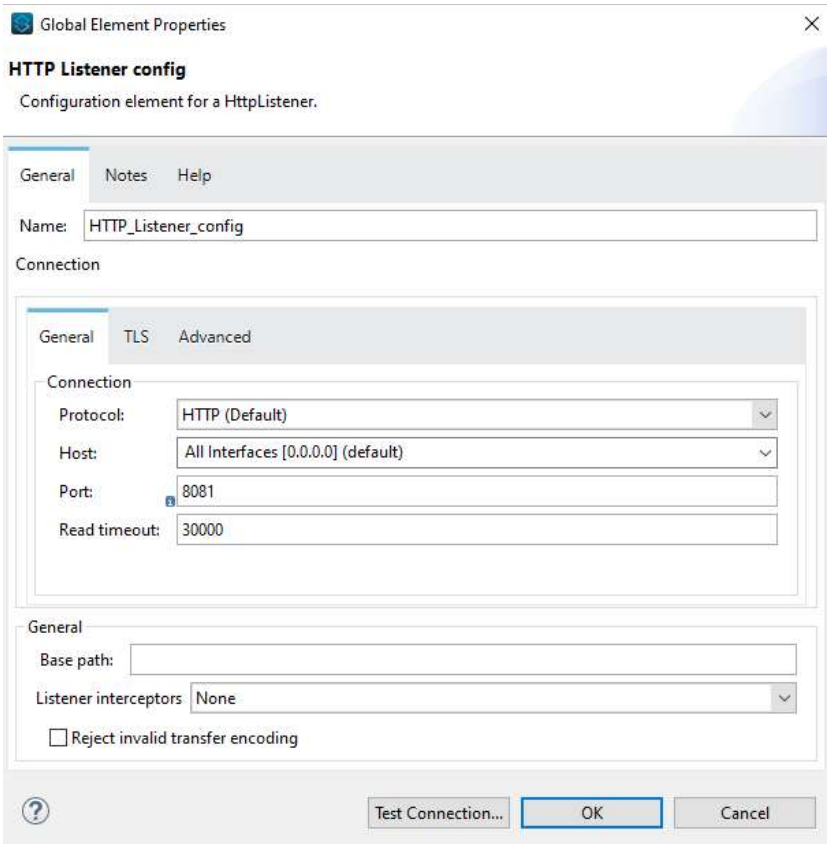
3. Inside the Mule Palette, select the **HTTP Listener** and drag it onto the canvas.



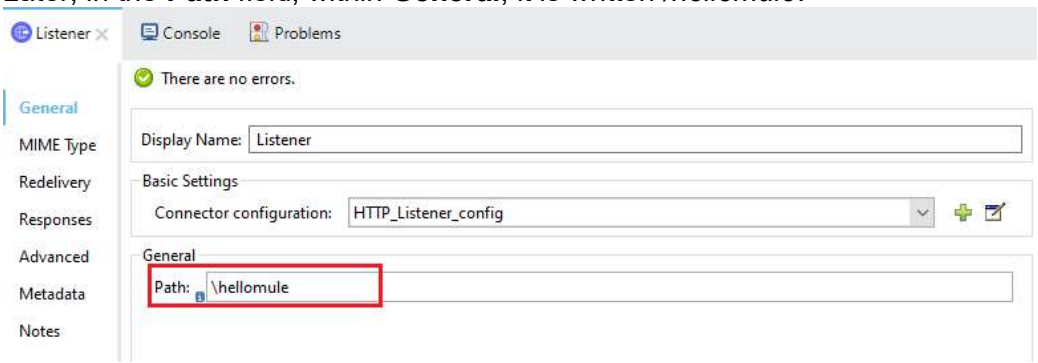
4. Now, within the *Propierties Editor*, click on the **+** symbol in green, which is located next to **Connector configuration**.



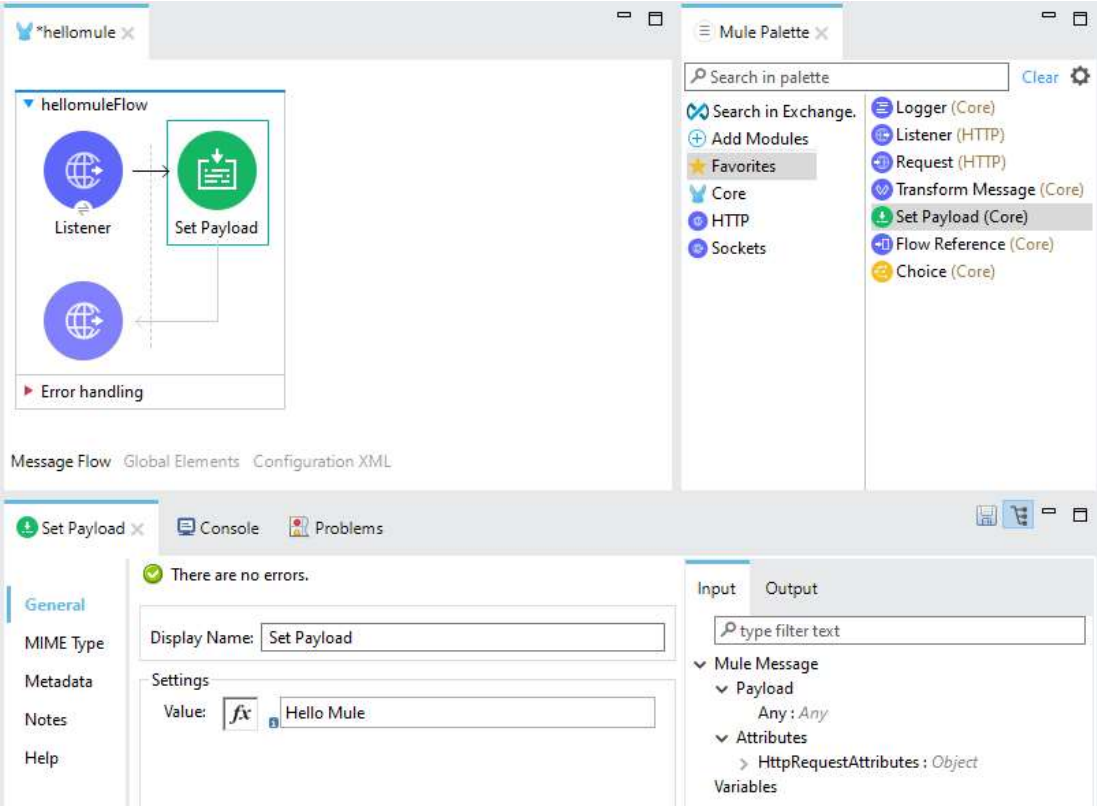
5. Inside the window, the values of **Host**, which should be *0.0.0.0*, and **Port**, which should be *8081*, are checked. Then click on **Ok**.



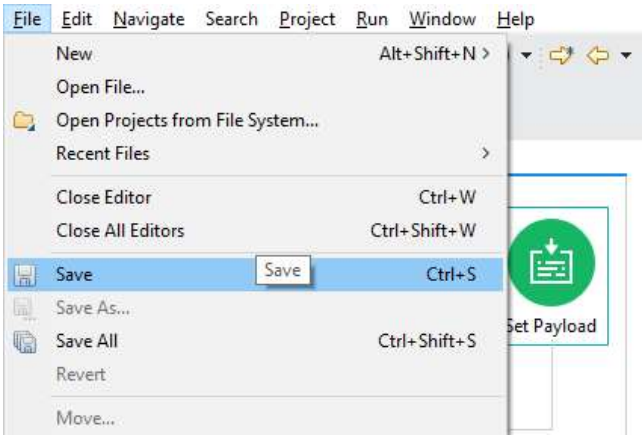
6. Later, in the **Path** field, within **General**, it is written */hellomule*.



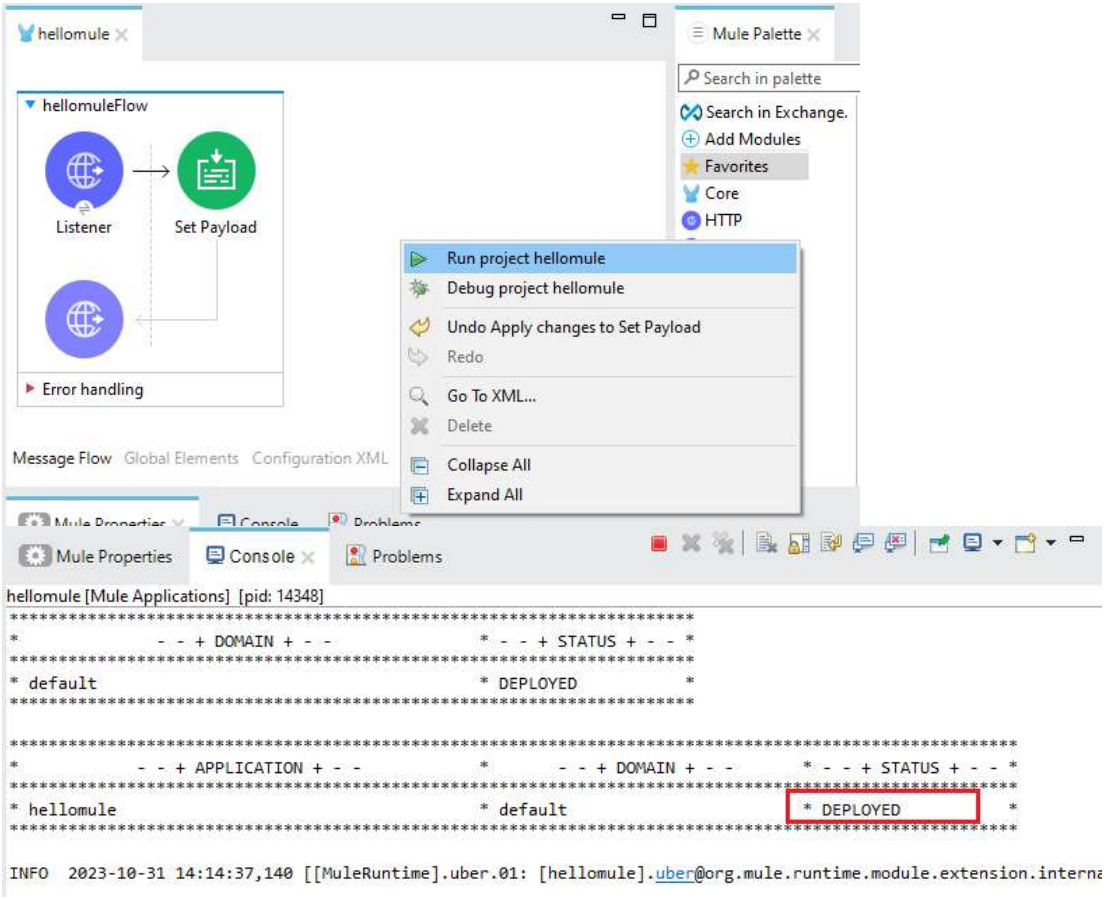
7. Within the *Mule Palette*, select **Set Payload**, and drag it onto the **canvas**. Then, in **Properties Editor**, click on the **fx** formula button and in the **value** field type *Hello Mule*.



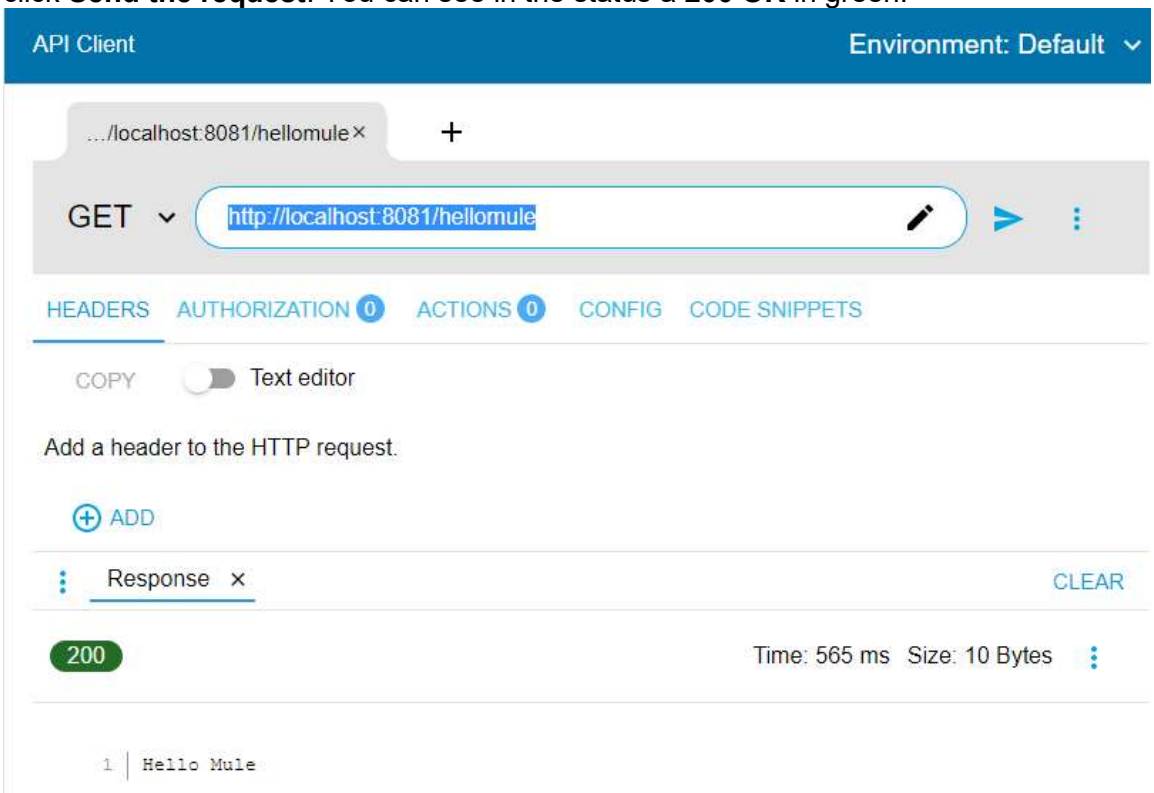
8. Then click on **file** and then on **save**.



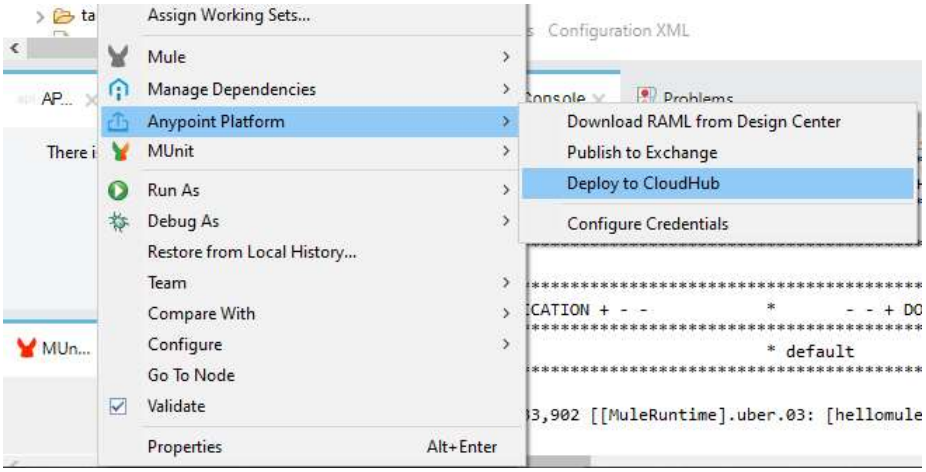
9. Inside canvas, set right-click and then click on **Run project hellomule**, then check in the part of the console that at the bottom right says **DEPLOYED**.



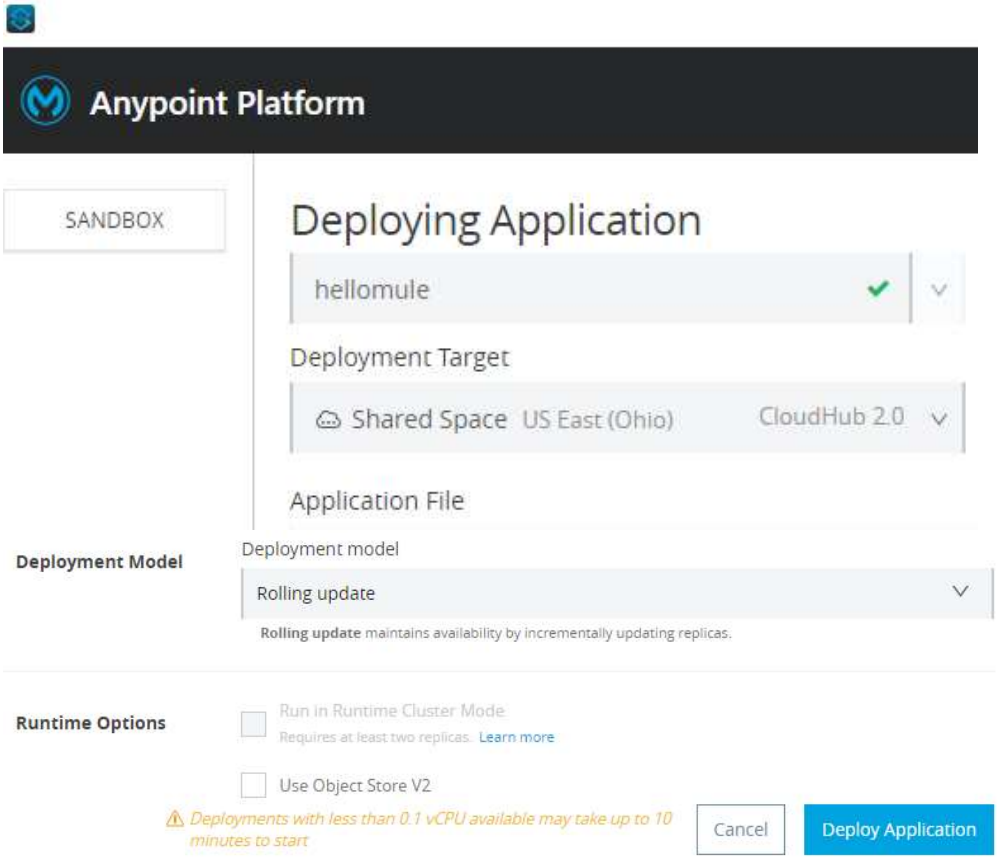
10. Now, we open the Advanced REST Client, and in the **search** field type *http://0.0.0.0:8081/hellomule* and click **Send the request**. You can see in the status a **200 OK** in green.



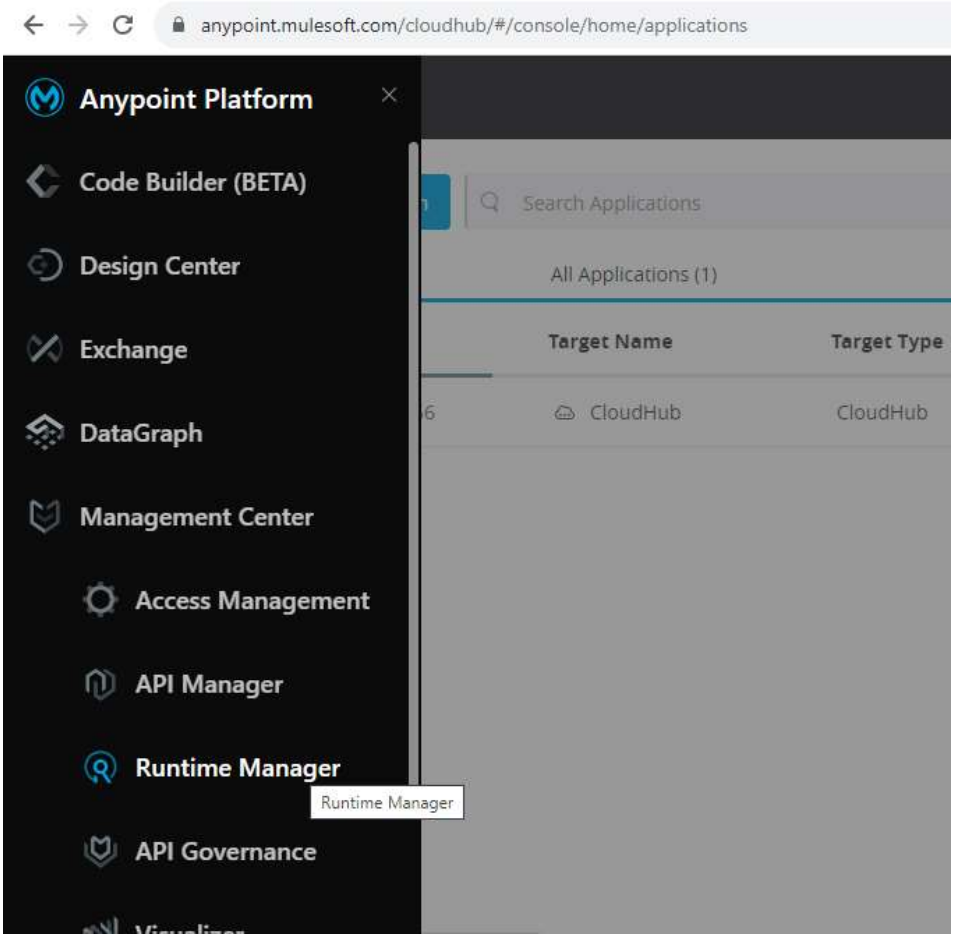
11. In Anypoint Studio**,** on the console side, click **Anypoint Platform > Deploy to CloudHub**. Then, it asks us for the access credentials, and then we choose **sandbox** environment.



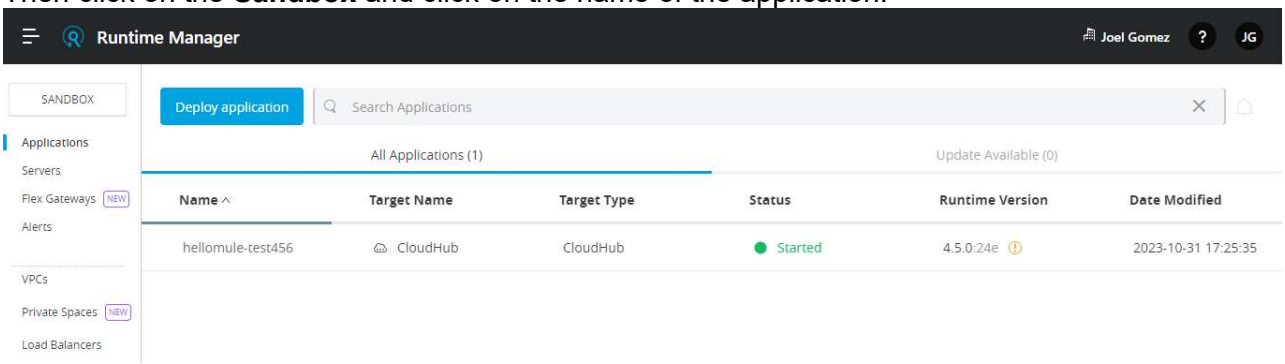
12. Once in the environment, we verify that the name of the application is with a green check. If so, click on **Deploy Application**.



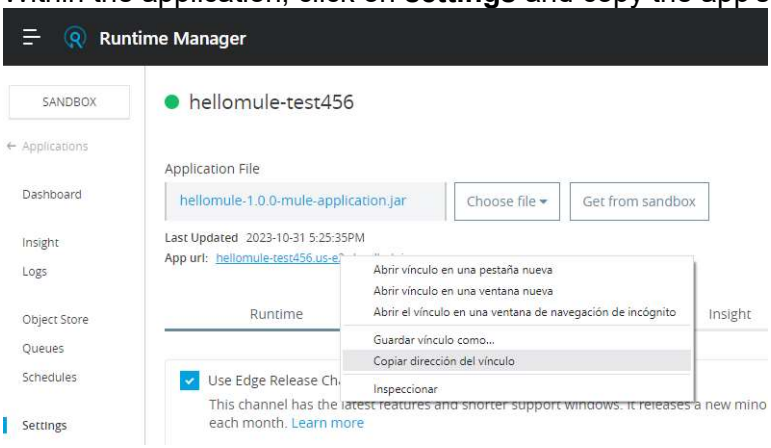
13. Now, through the browser, you can access the website of *https://anypoint.mulesoft.com/login/signin?*, then click on the three-bar menu, and then click on **Runtime Manager**.



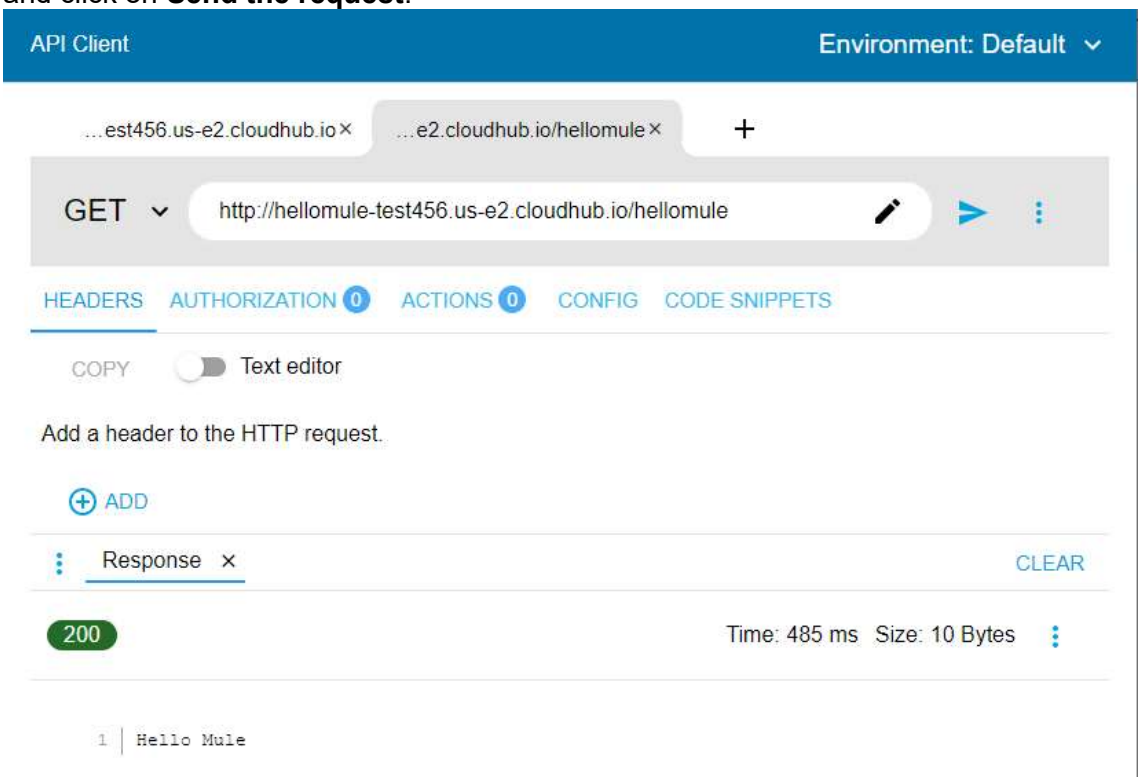
14. Then click on the **Sandbox** and click on the name of the application.



15. Within the application, click on **settings** and copy the app's url.

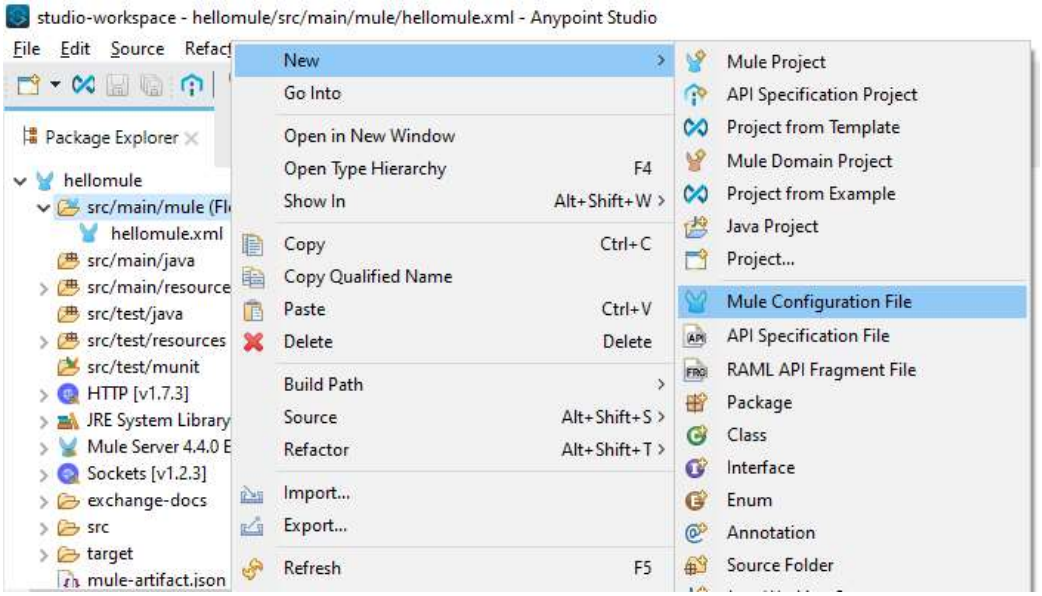


16. Now, within the *Advanced REST Client,* we add a new tab, in the search field the url copied is pasted and click on **Send the request**.

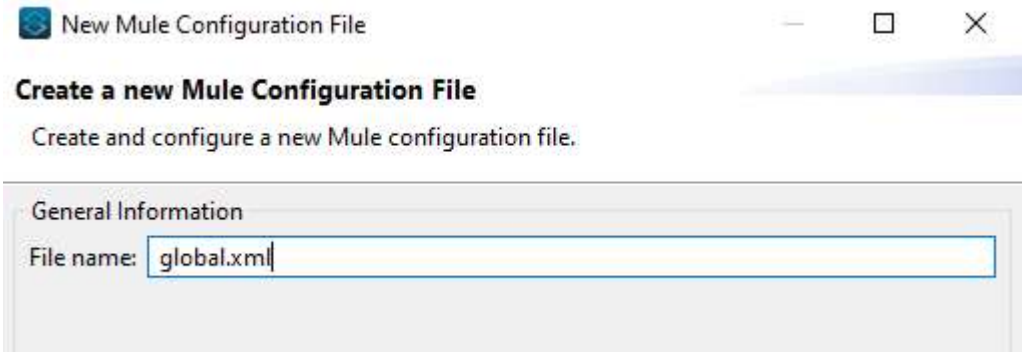


USE THE PROPERTY FILE TO MAINTAIN AND REFERENCE SENSITIVE DATA SEPARATELY FROM THE GENERATED CODE.

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



2. Add *global.xml* as a name inside the **File name** field, and then click on **Finish**.

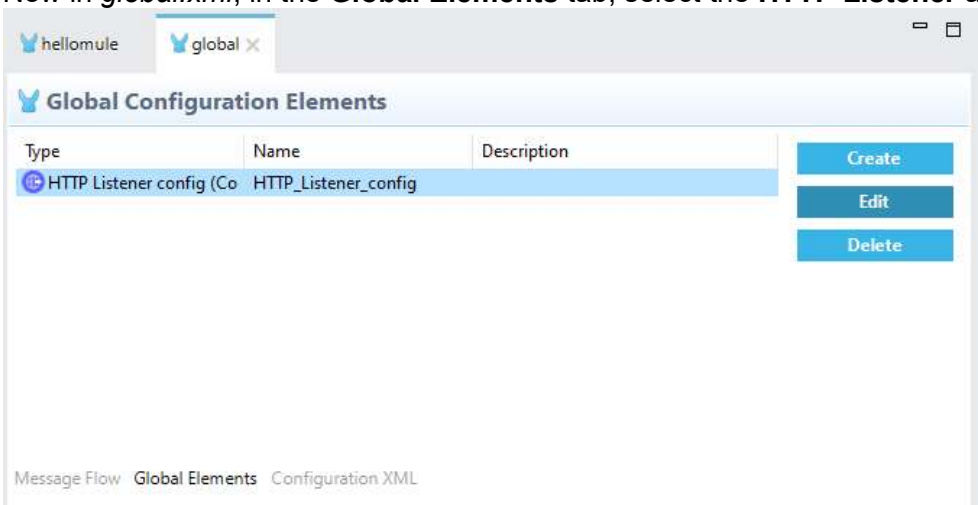


3. Now in *hellomule.xml* within the **Configuration XML** tab, we select everything that includes within *http:listener-config* and then it is cut.

4. Now in *global,* within the **Configuration XML** tab, paste *http:listener-config*. In case the "*doc:id" values* pop-up window appears, click on **Yes**.

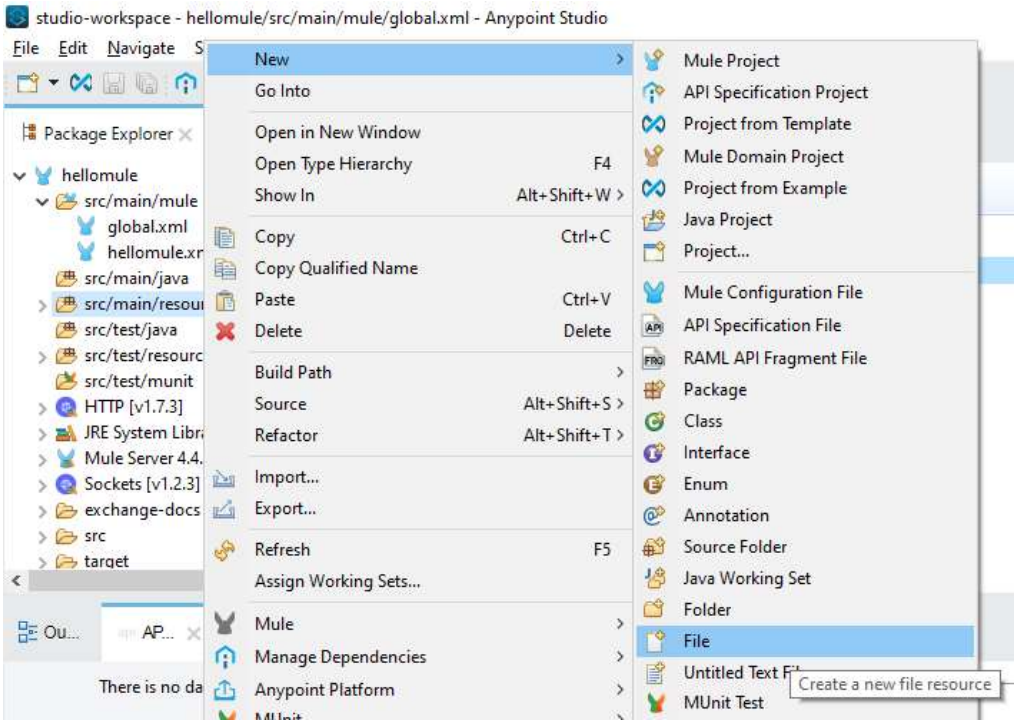
5. Then click on **Save all**. This is done to eliminate the "duplicate" error of global files.

6. Now in *global.xml*, in the **Global Elements** tab, select the **HTTP Listener** and from there click **Edit**.

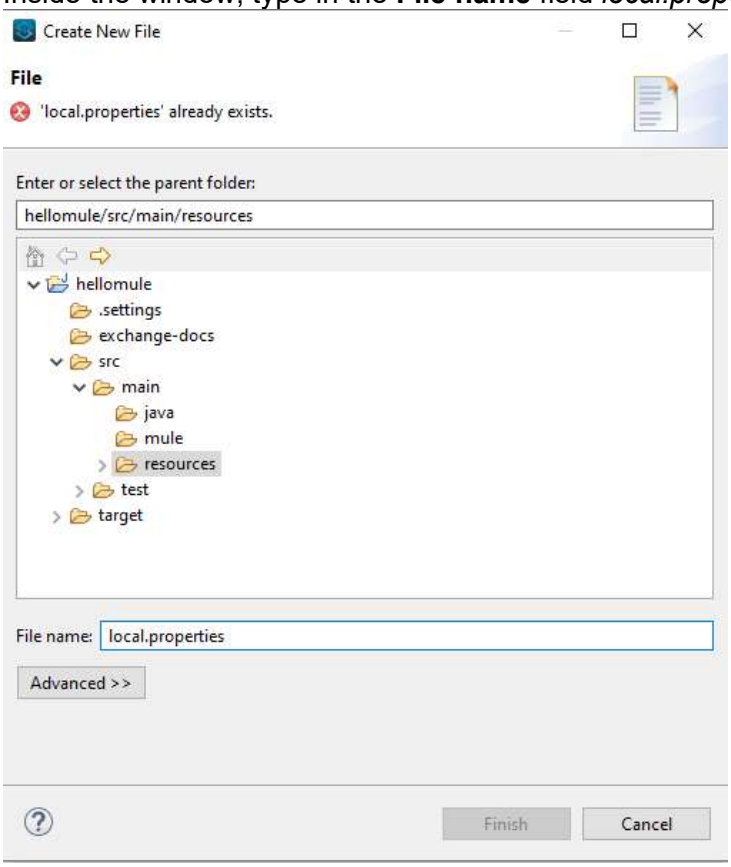


7. Now we check the *hardcoded values*, which are the global values that are related to the *host* and the *port*. This is done in order to validate whether the *Host* and *Port* values were maintained.

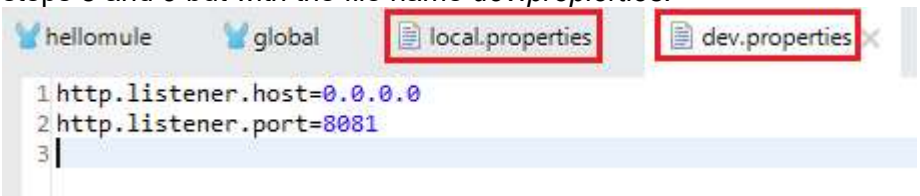
8. To avoid having *hardcoded values*, they are going to be outsourced. To do this, right-click on the **src/main/resources** folder and select **New > File**.



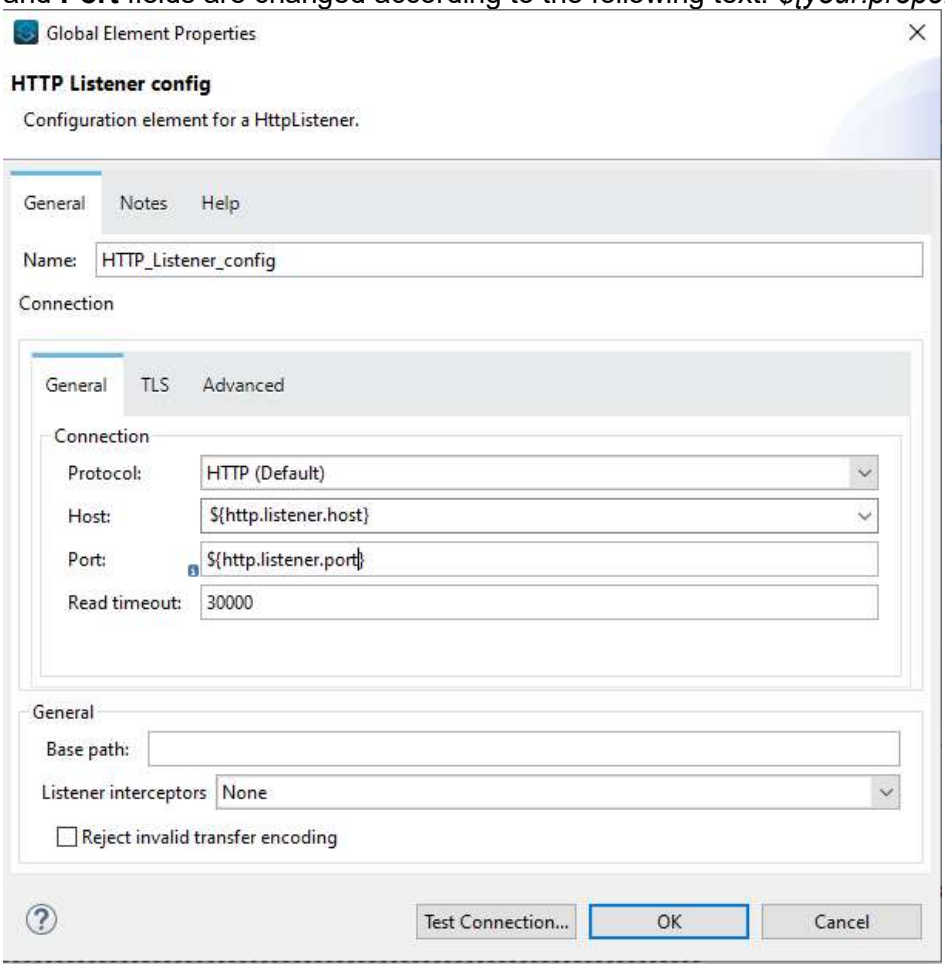
9. Inside the window, type in the **File name** field *local.properties.*



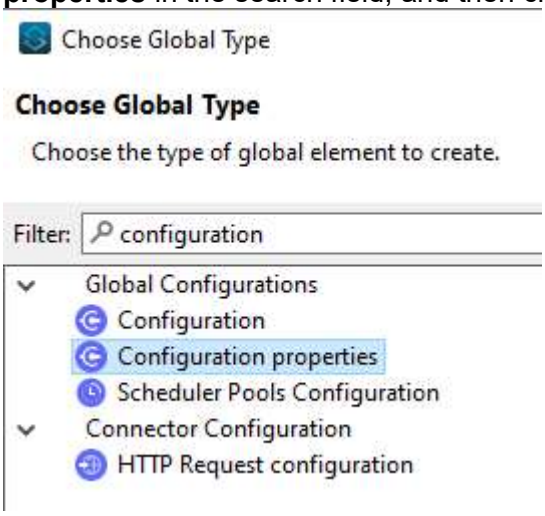
10. The code is written into the file (as shown in the image below) and saved. The same is repeated from steps 8 and 9 but with the file name *dev.propierties.*



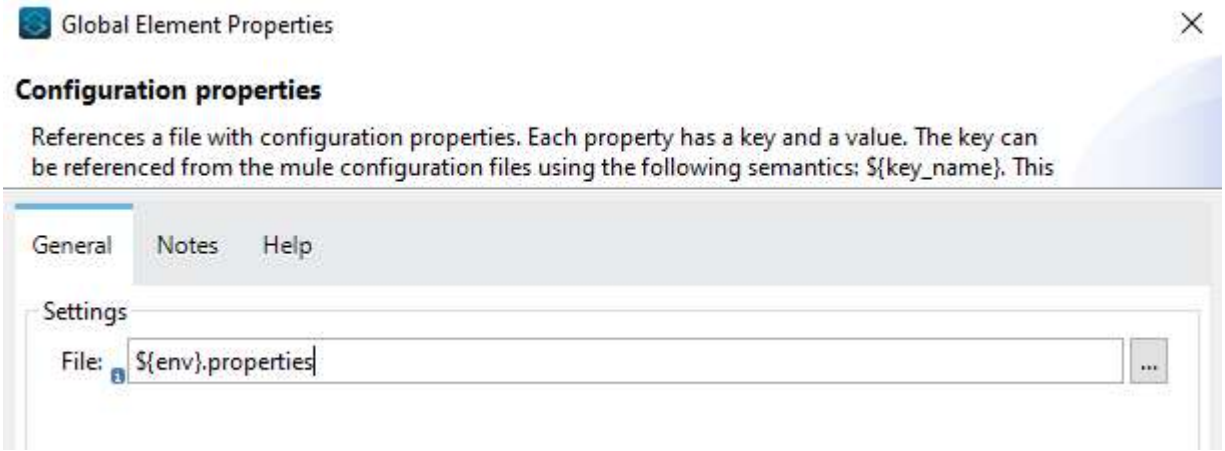
11. Then, in global.xml within global elements tab, click on **edit** from the **HTTP Listener** and there the **Host** and **Port** fields are changed according to the following text: *${your.property.name}*. Then click **Save all**.



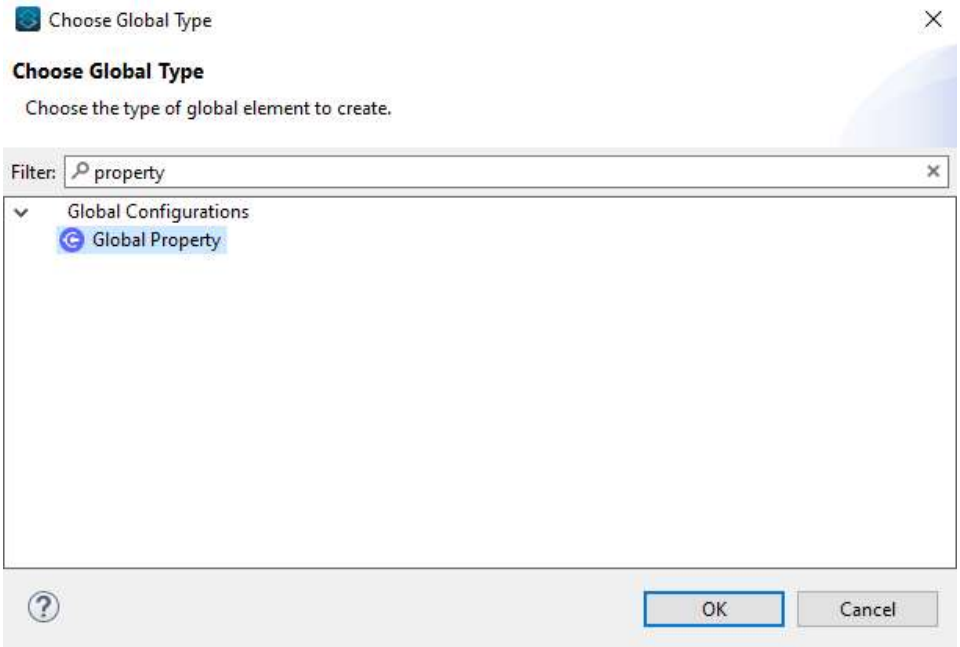
12. Now within global, in the **Global elements** tab, click on **create**. In the window, enter **configuration properties** in the search field, and then click on **Ok**.



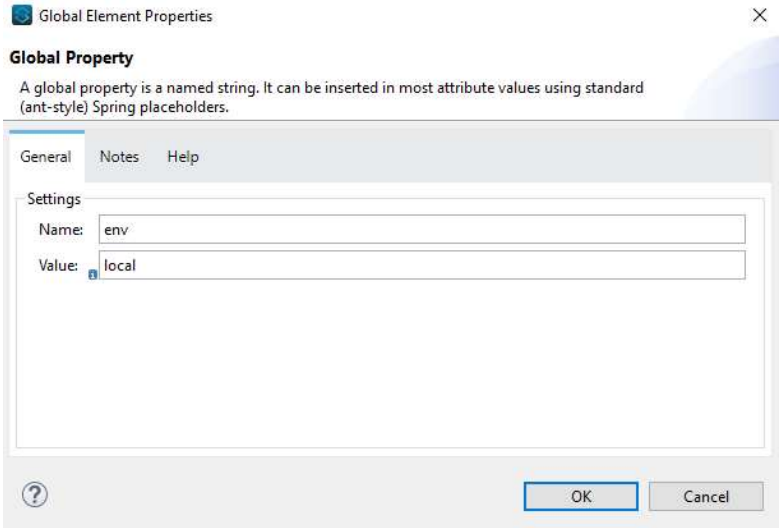
13. Now, in the window, type *${env}.properties* in the **File** field, and then click on **OK**. Then click on **Save all**.



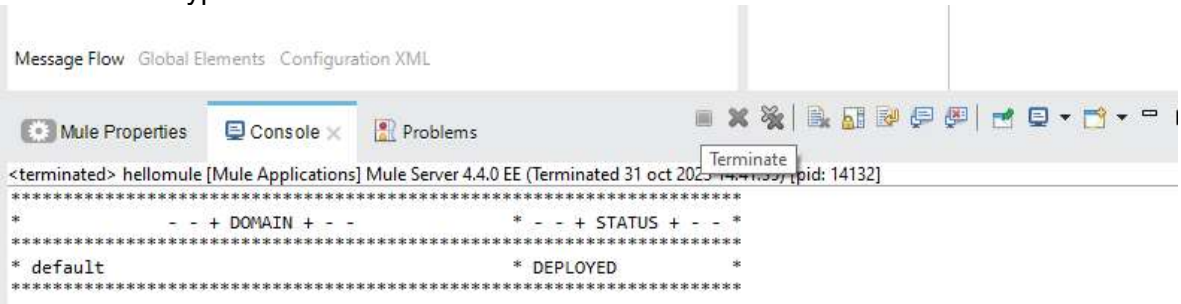
14. Now in global.xml, in the **Global elements** tab, click **create**. In the window, enter *Global Property* in search field and then click on **ok**.



15. Now, in the window, in the **Name** field, type *env* and also in the **Value** field we type **local**, and then click on **Ok**. Then click on **Save all**. Then it goes to the **hellomule.xml** tab, in the **Message flow** part there right-click inside the canvas and then click on **Run project hellomule.** And then, wait for the console to say **DEPLOYED**.

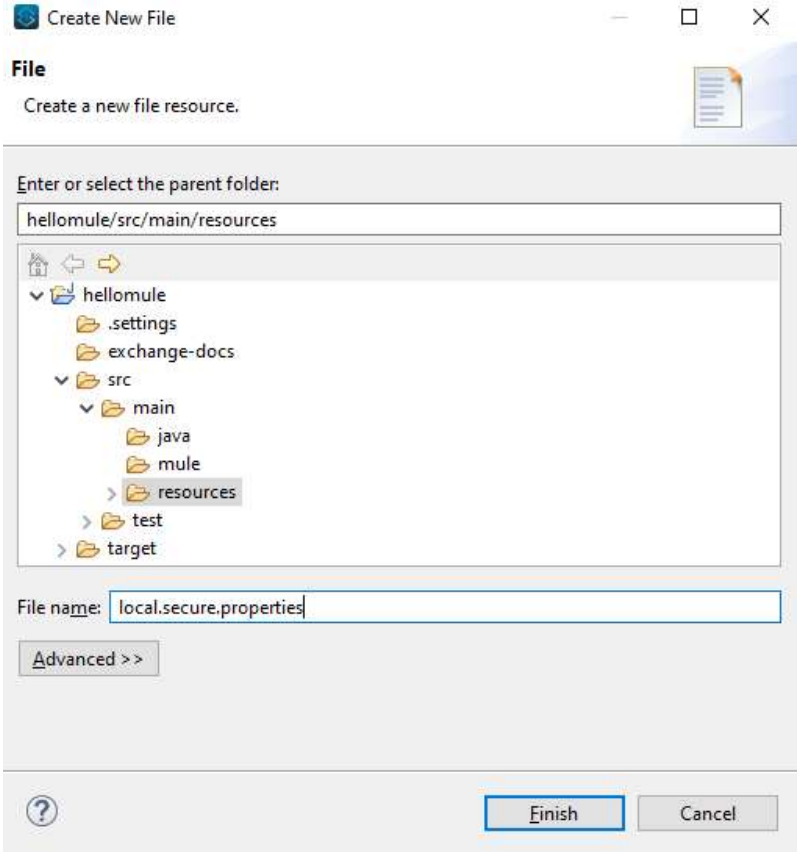


16. Within the Advanced REST Client, type *localhost:8081/hellomule* into the search field and click **send**. Always validating that the status comes out **OK 200**.
17. Go back to Anypoint Studio and click on **Terminate**.



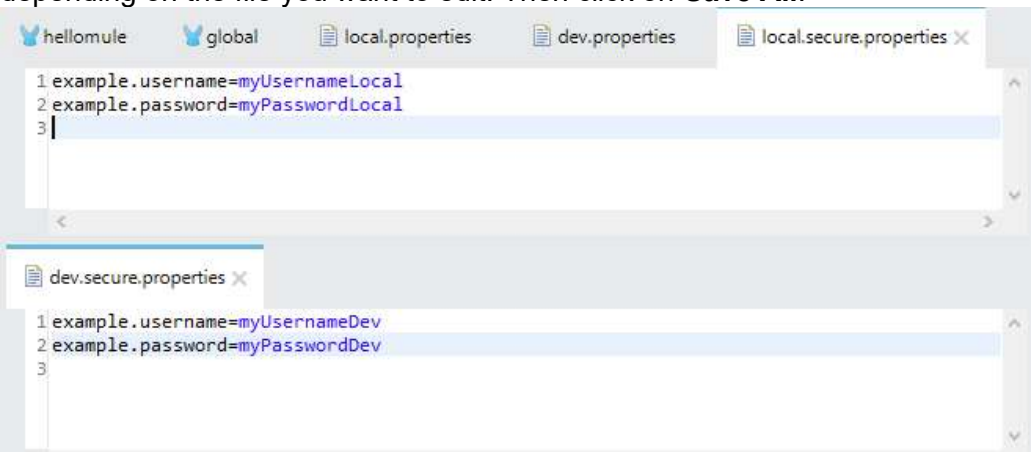
CREATE A SECURE PROPERTY FILE TO PROTECT SENSITIVE DATA THAT POSES A RISK TO KEEP IT CLEAR.

1. Right-click on the **src/main/resources** folder and click on **New > File**. And in that same window, in the **File** field, enter in the **name** field *local.secure.properties.*

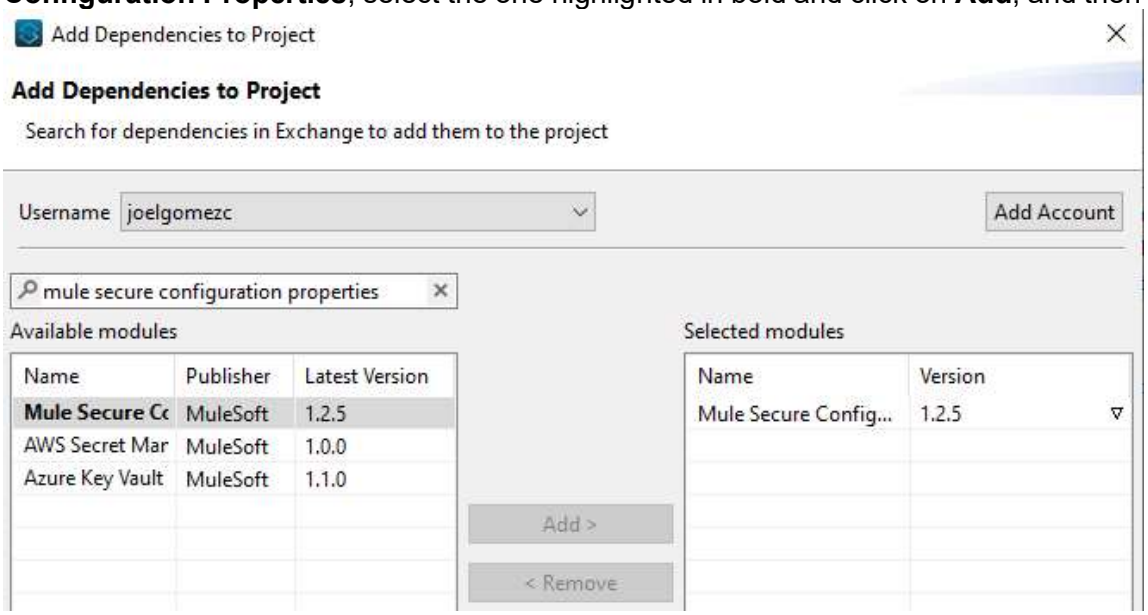


2. The previous step is repeated, but it is entered in the **File name** field *dev.secure.properties.*

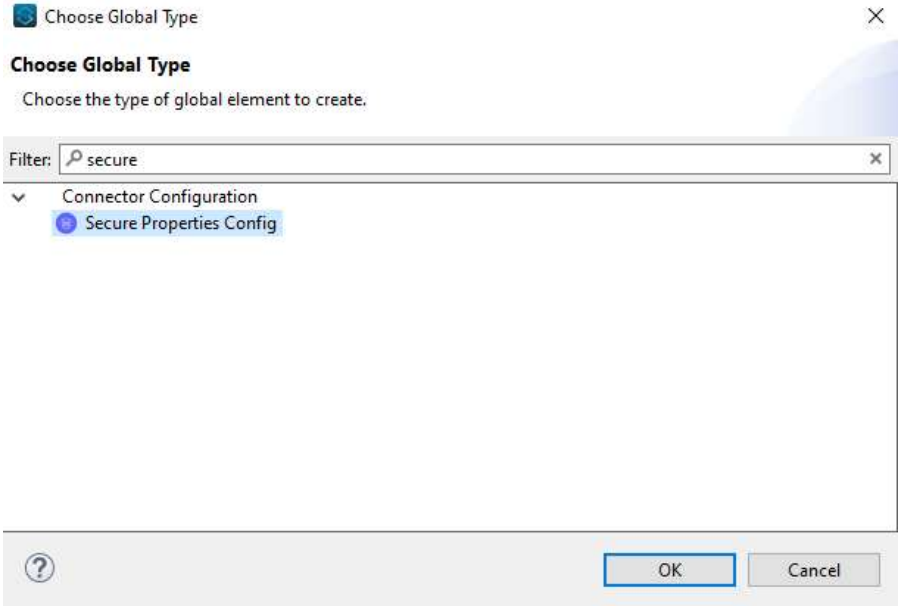
3. Now, in both created files, the following lines of code are entered:
```
example.username=myUsernameLocal
example.password=myPasswordLocal
```
depending on the file you want to edit. Then click on **Save All**.



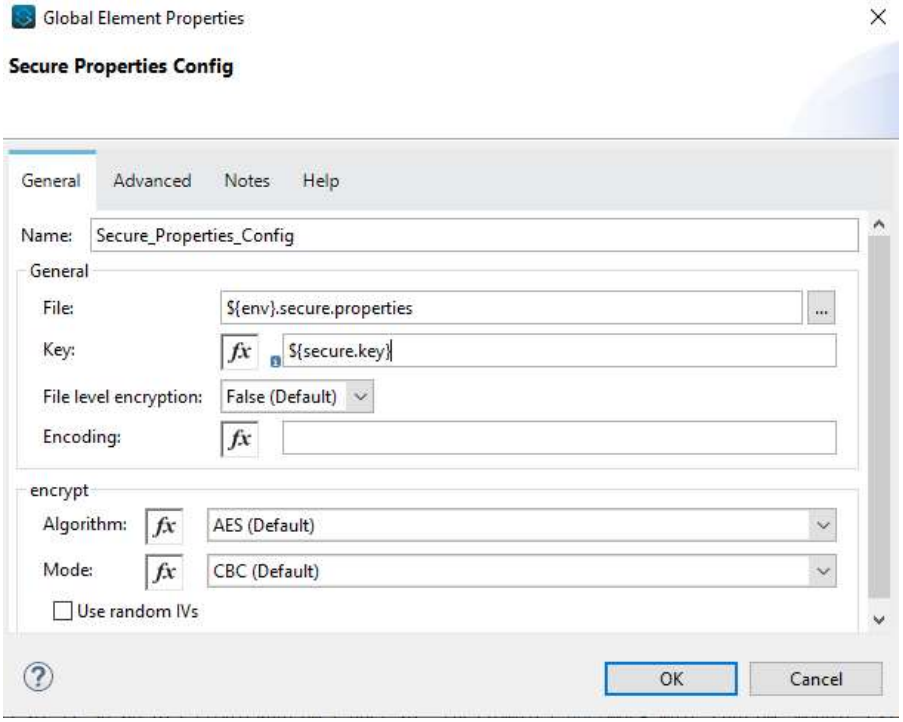
4. Within hellomule.xml, click on **Search in Exhange** and from there search for **Mule Secure Configuration Properties**, select the one highlighted in bold and click on **Add**, and then click on **Finish**.



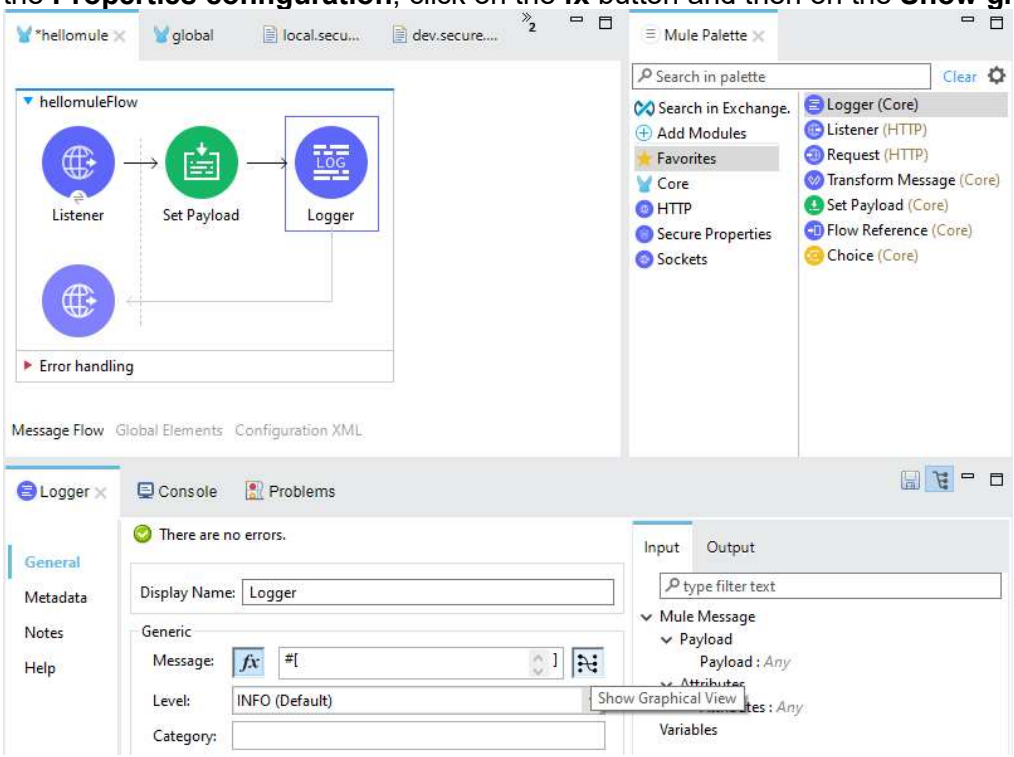
5. Now in global.xml, in the **Global elements** tab, click on **create,** in the window type in the search field **Secure properties config**, select it and click on **OK**.



6. Inside the window, enter in the **File** and **Key** fields, *${env}.secure.properties* and *${secure.key}.* It is put into **Algorithm** as *Blowfish*. It is confirmed by clicking **Ok**. Then click on **Save all**.



7. Returning to hellomule.xml, the **Mule Palette Logger (core)** is searched and dragged to the canvas. In the **Properties configuration**, click on the **fx** button and then on the **Show graphical view** button.



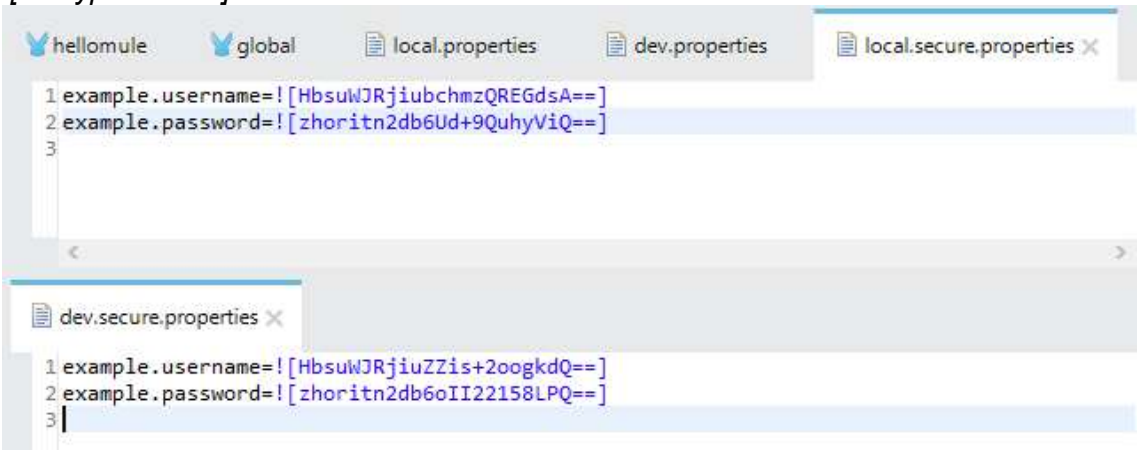
8. Then click on the **source only** view and enter the lines of code according to the image, and then click on **Done**.

```
output application/java
---
"Username: " ++ Mule::p("secure::example.username")
++ " - " ++
"Password: " ++ Mule::p("secure::example.password")
```

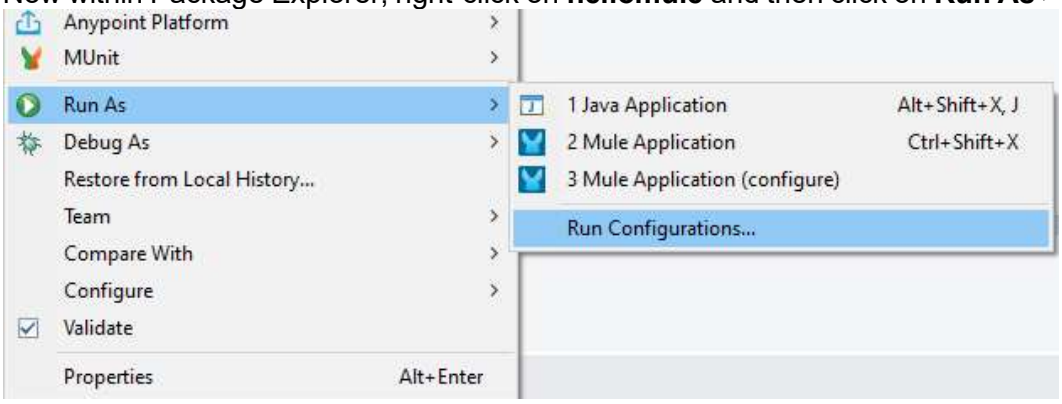
9. Now, from the Mulesoft documentation, we should download the **Secure properties Tools Jar** file.
10. Open Command Prompt, search for the folder where the file was downloaded, and then enter the next line of code.
    `java -cp secure-properties-tool.jar com.mulesoft.tools.SecurePropertiesTool string encrypt Blowfish CBC MyMuleSoftKey "myUsernameLocal"`
    Do the same thing, but instead of *"myUsernameLocal",* switch to *"myPasswordLocal", "myUsernameDev"* and *"myPasswordDev".*

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

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

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

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

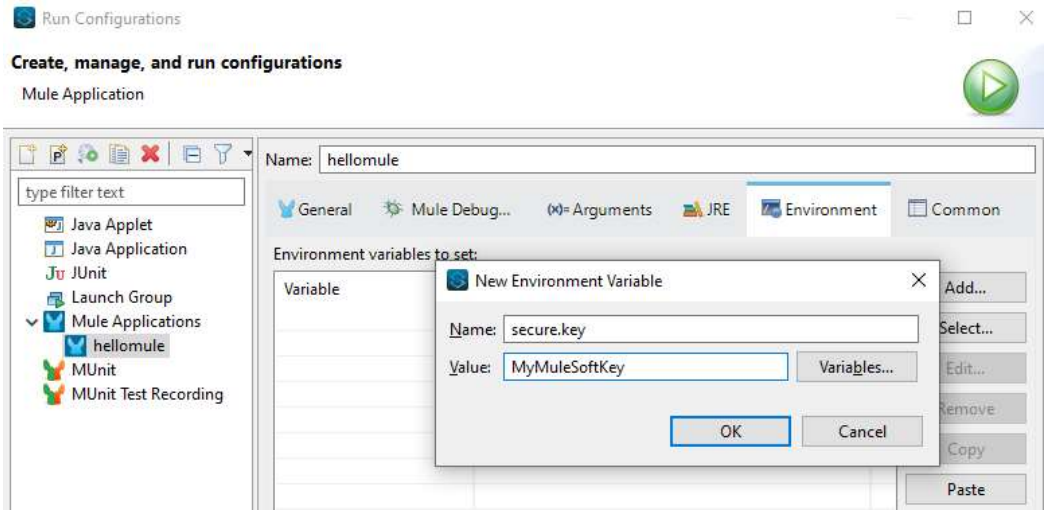
11. Now, in Anypoint Studio, we're going to add the values generated from each command prompt execution, inside the **local.secure.properties** files and also **dev.secure.properties.** They are changed as follows: *![encryptedValue]*.



12. Now within Package Explorer, right-click on **hellomule** and then click on **Run As > Run Configurations**.



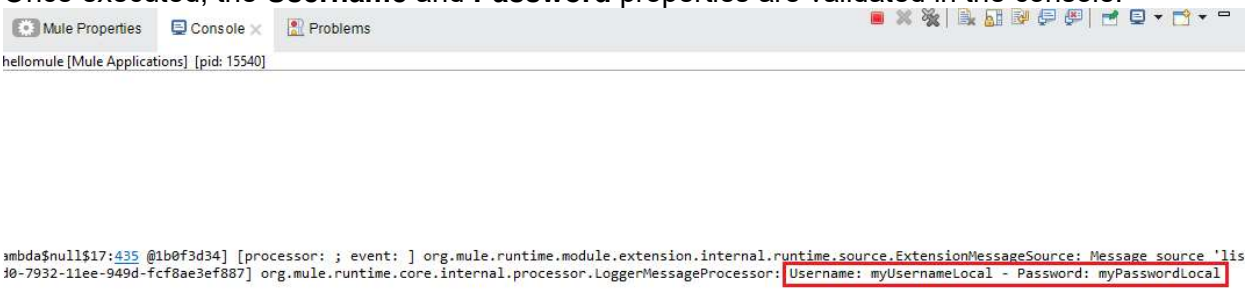
13. Now in the window, the **Environment tab** opens, click on **Add** and enter in the **Name** and **value** fields these values: *secure.key* and *MyMuleSoftKey*. Click on **OK**.



14. Then click on **Apply** and then on **Run**. Proceed to wait for it to say **DEPLOYED**.

15. Within the Advanced REST Client, type *localhost:8081/hellomule* into the search field and click on **send**. Always validating that the status comes out **200**.

16. Once executed, the **Username** and **Password** properties are validated in the console.

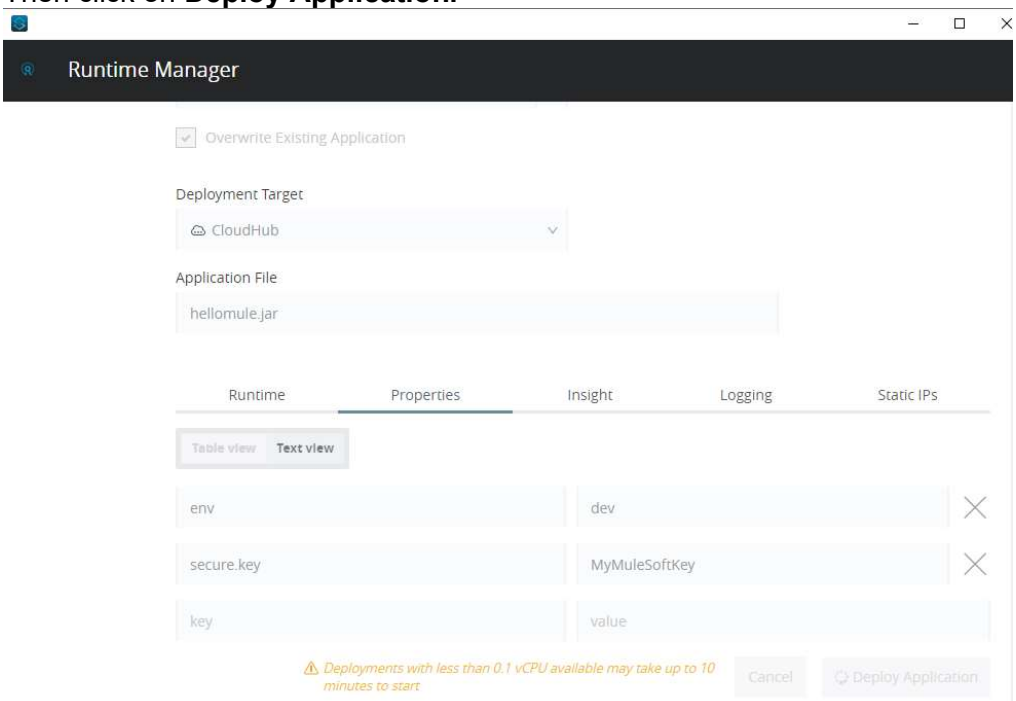


17. Go back to Anypoint Studio and click on **Terminate**.

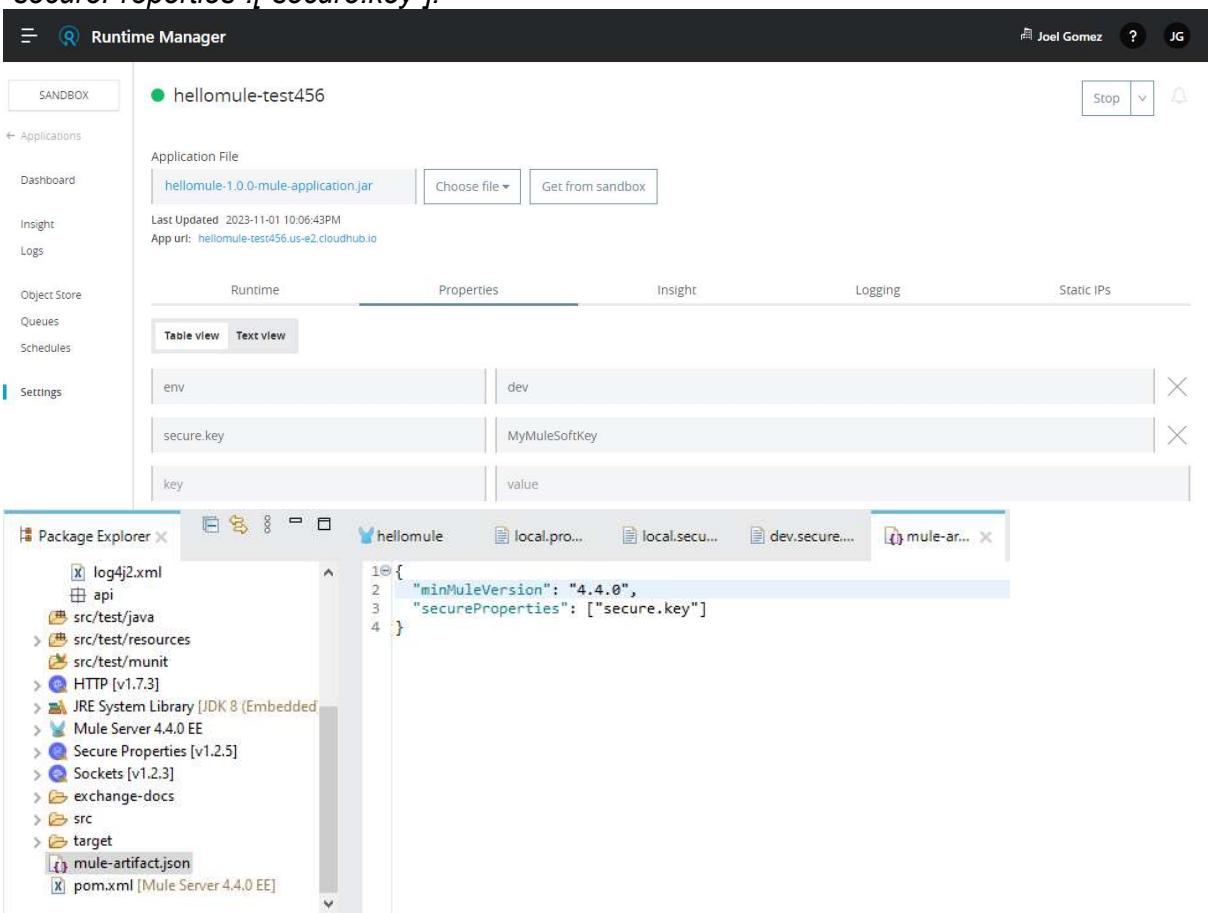
18. Right-click on the project name, then click on **Anypoint Platform > Deploy to CloudHub**.

19. Inside that window, click on properties, and enter the following values:
    - env = dev
    - secure.key = MyMuleSoftKey

    Then click on **Deploy Application.**

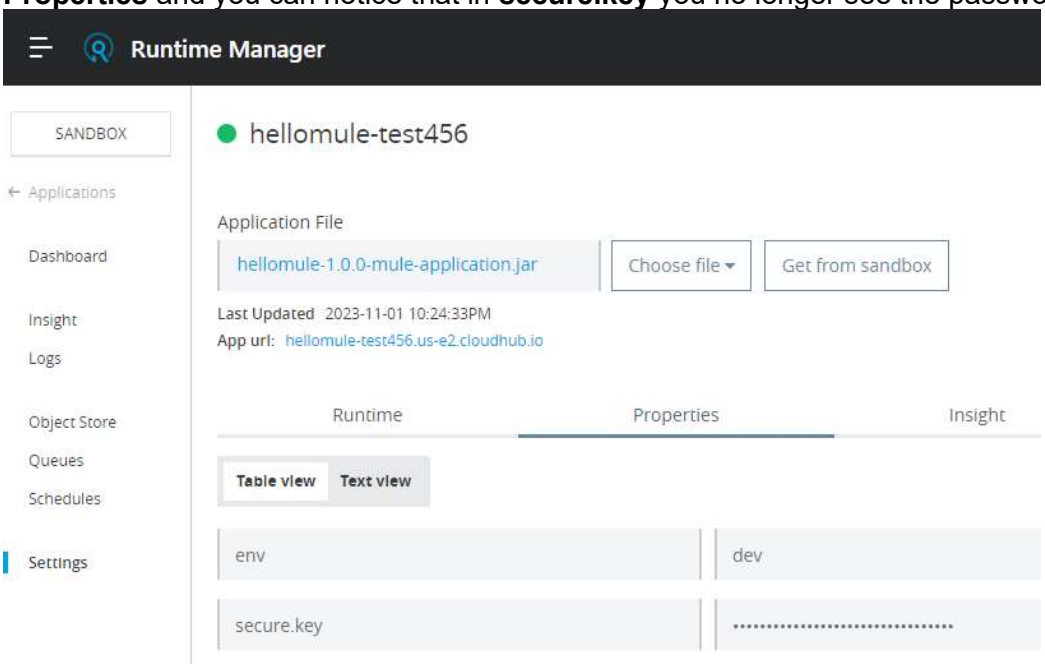


20. Now, entering the CloudHub site, inside **Runtime Manager**, click on the **Settings** tab and then on **Properties** tab and you can notice that in **secure.key** you see the password. To do this, we go to **Anypoint Studio**, open the **mule-artifact.json** file and add the following line of code: "*secureProperties":["secure.key"].*



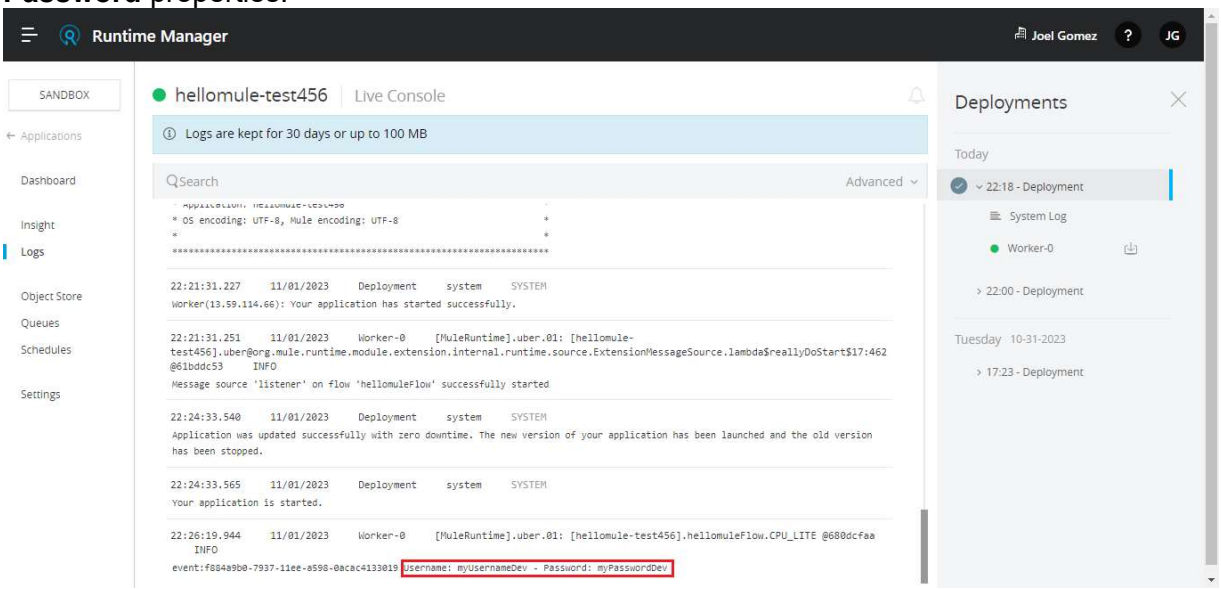
21. Then click on **Save all**. Then, click on **Anypoint Platform > Deploy to CloudHub** and click on **Deploy Application** again.

22. Now, entering the CloudHub site, within Runtime Manager, click on the **Settings** tab and then on **Properties** and you can notice that in **secure.key** you no longer see the password.



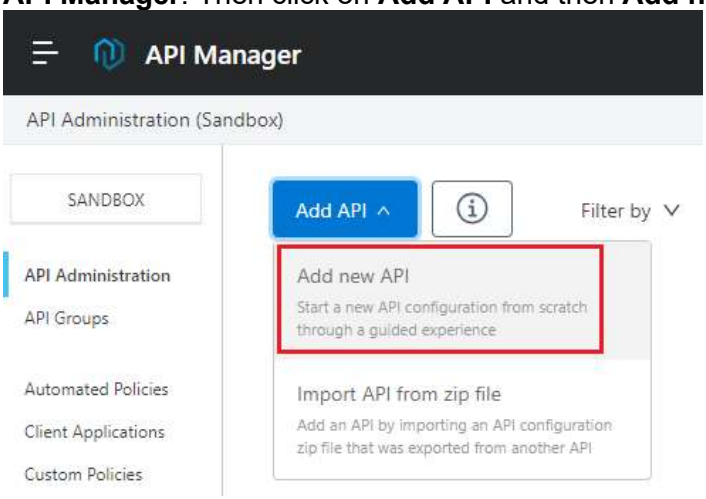
23. Now, within the *Advanced REST Client* we add a new tab, in the search field paste the url copied and click on **Send the request**.

24. Once executed, we should go to logs (within the runtime manager) and check for the **Username** and **Password** properties.

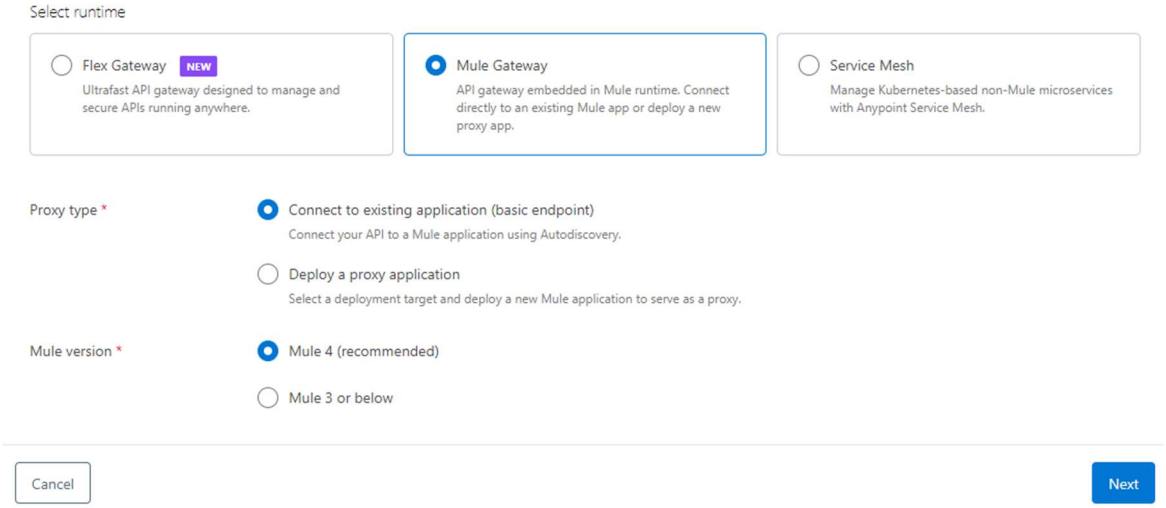


CREATE AN API IN API MANAGER TO ALLOW APPLY POLICY.

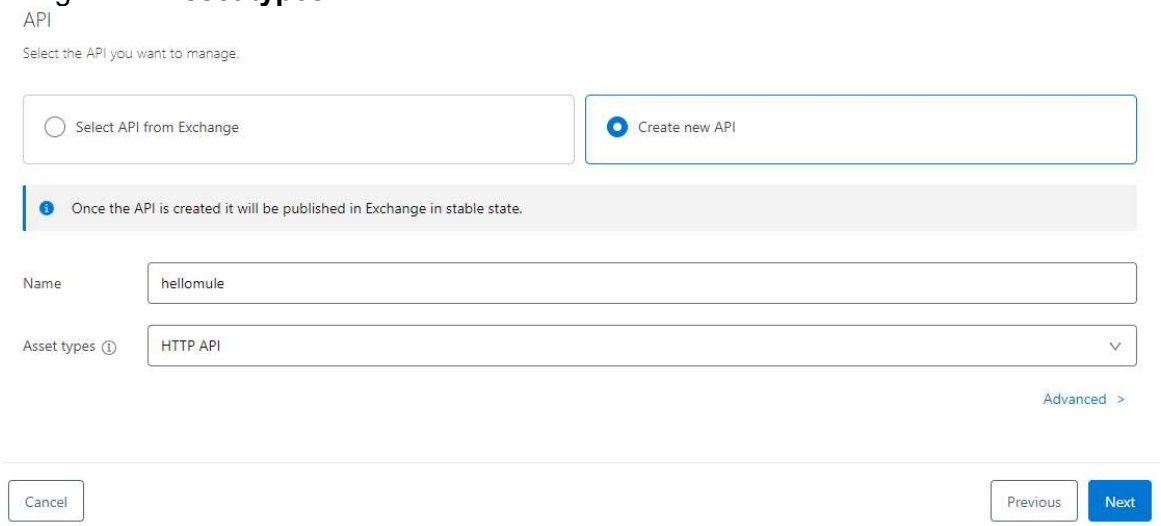
1. On the Anypoint Platform platform, click on the menu, and from there click on **Management Center > API Manager**. Then click on **Add API** and then **Add new API.**



2. We select **Mule Gateway**, as well as **Connect to existing application** and **Mule 4** checks.

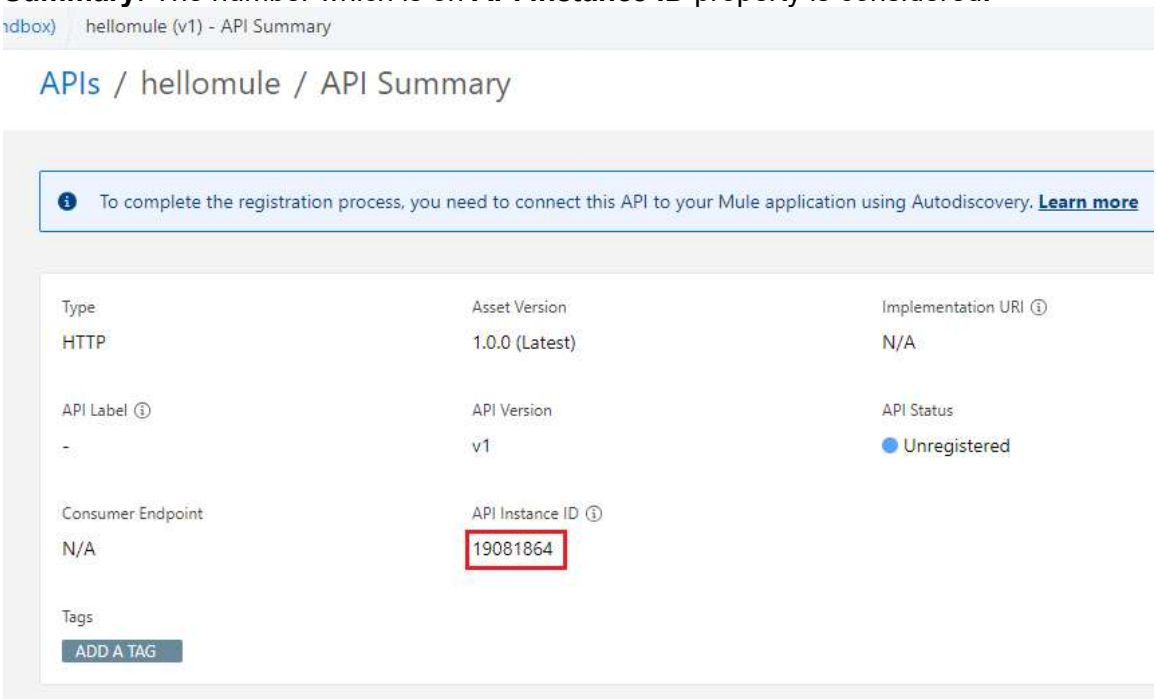


3. Then select the **Create New API** check, and *hellomule* is assigned to the **Name** field and *HTTP API* is assigned to **Asset types**.

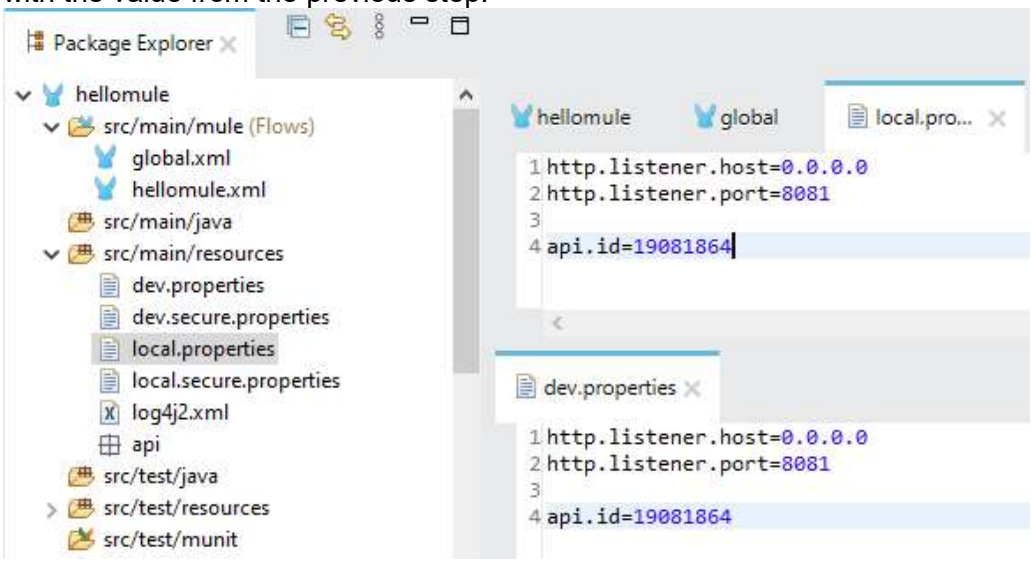


4. Click on **next** in the next downstream, upstream and review windows and click on **Save**.

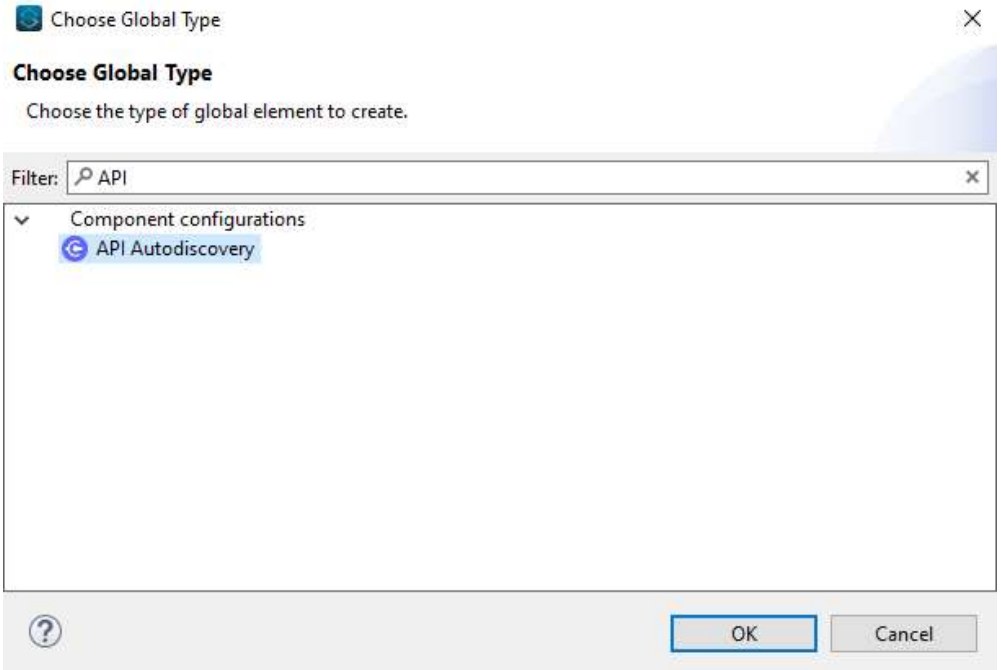
5. Within the API manager, click on the name of the API, and then click (in the right-side panel) on **API Summary**. The number which is on **API Instance ID** property is considered**.**



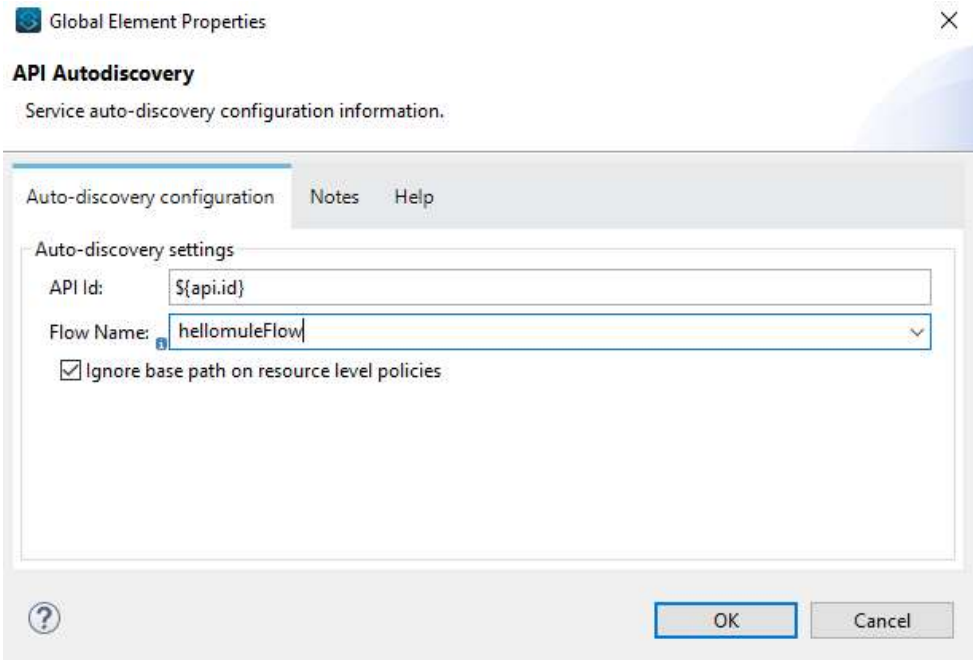
6. Within Anypoint Studio, in the **local.properties** and **dev.properties** files, we add the line of code *api.id* with the value from the previous step.



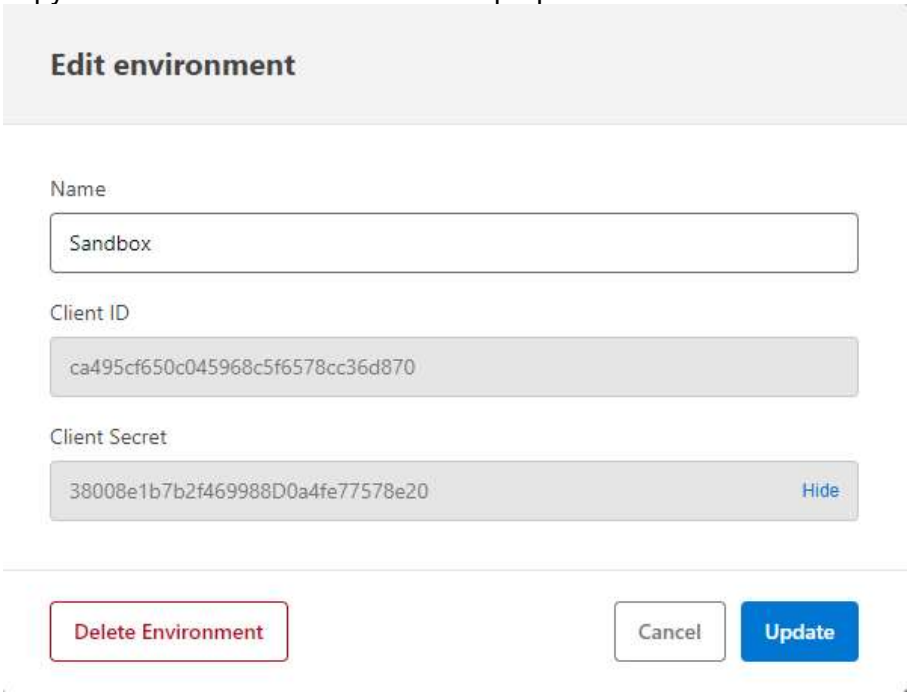
7. Now we go to **global.xml** and from there in **Global Elements**, click on **create**. And look in the **API Autodiscovery** field and click on **OK**.



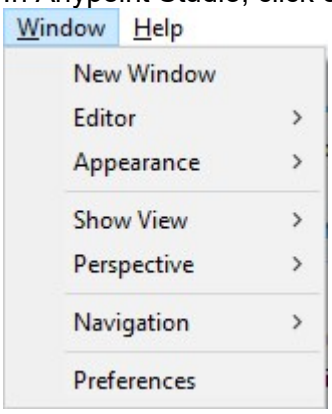
8. In the next window, enter the *${api.id}* and *hellomuleFlow* values in the **API Id** and **Flow Name** fields. Then click on **OK**.



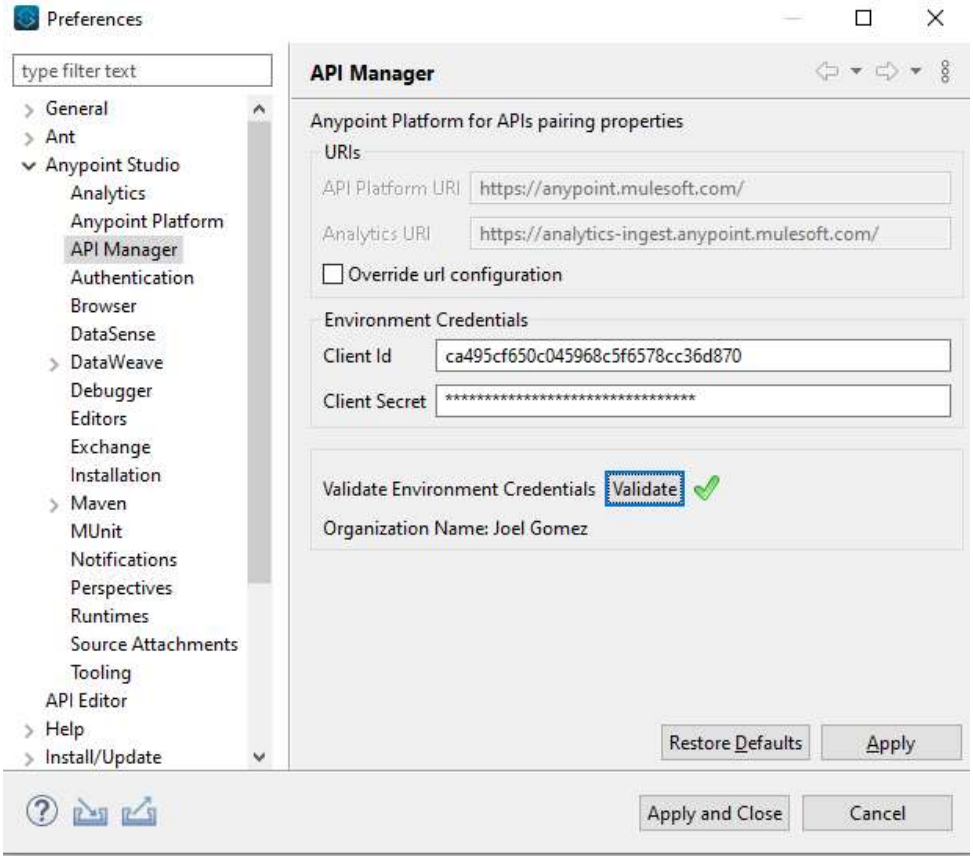
9. Now, click on the menu (of Anypoint Platform) and then click on **Management Center > Access Management**. And inside the window click on **Enviorenments** and then to **Business Groups > Username > Environments > Sandbox**. And the window is shown as shown in the following image. We copy the **Client ID** and **Client Secret** properties.



10. In Anypoint Studio, click on **Window > Preferences**.

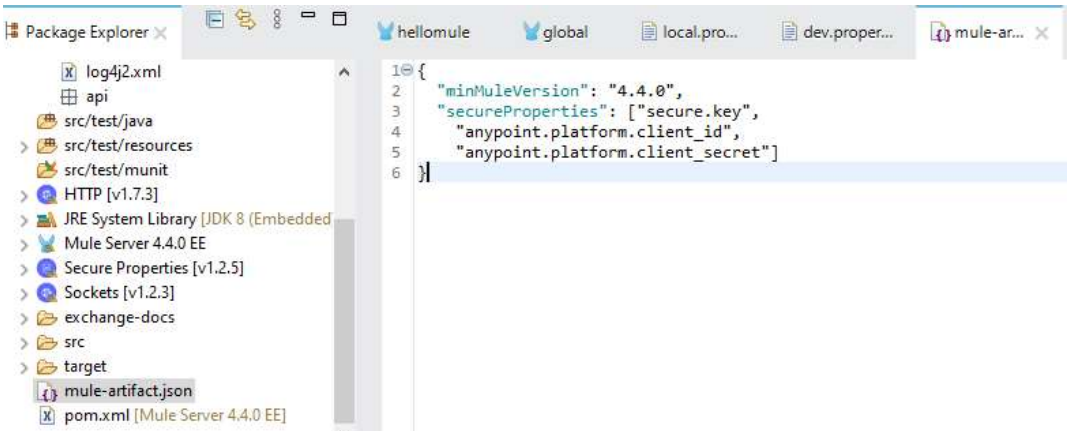


11. Now click on **Anypoint Studio > API Manager** and paste the copied credentials. Then click on **validate** and click on **Apply and close**.



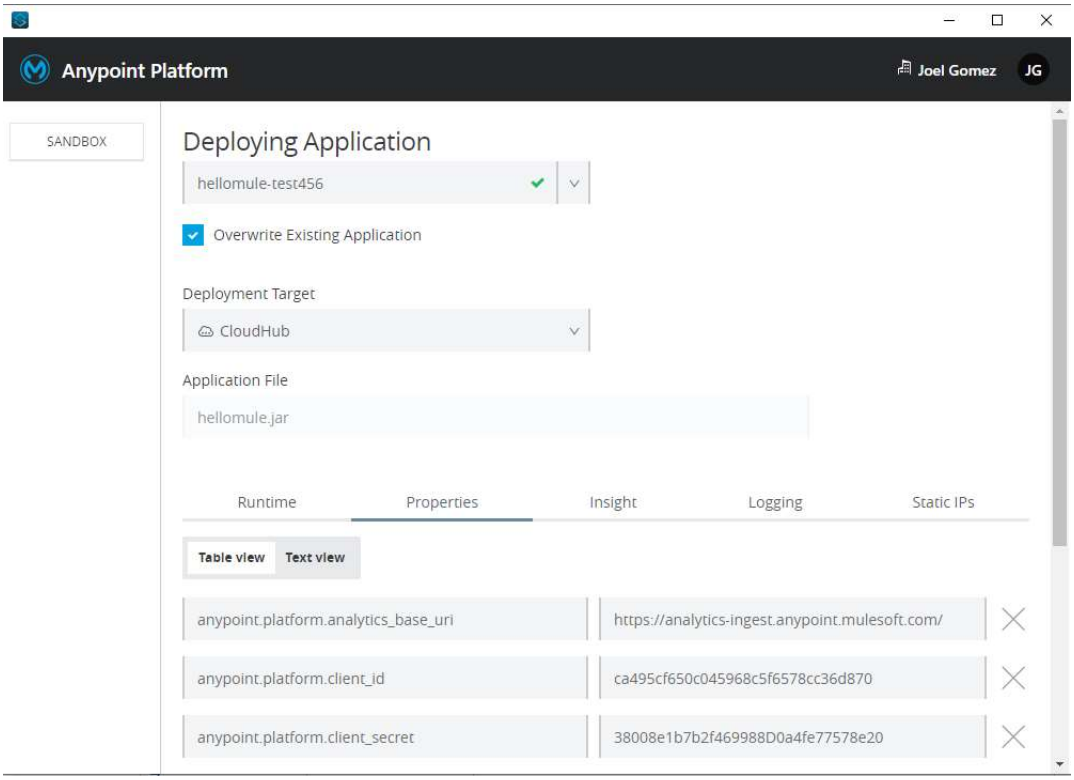
12. Then we have to execute the application, inside the canvas, always verifying that at the end it says in the console **DEPLOYED**.
13. Now, we have to go to the Advanced REST Client, and in the **search** field, you type *http://0.0.0.0:8081/hellomule* and click on **Send the request**. You can see in the status a **200 OK** in green.
14. Now, we should open the **mule-artifact.json** file and we should add the following two properties

```
"anypoint.platform.client_id",
"anypoint.platform.client_secret"
```

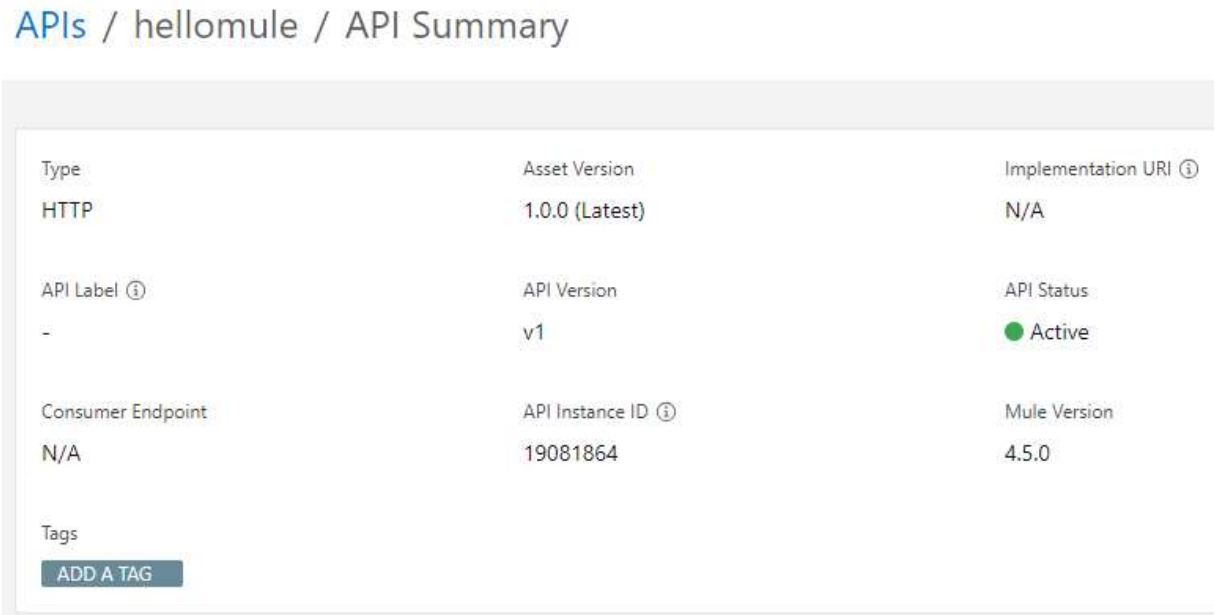


15. Then click on **Save all** and right-click on **hellomule** and from there click on **Anypoint Platform > Deploy to CloudHub**.

16. Now, we verify that the **Overwrite Existing application** box is checked, as well as the data mentioned in 9 are included and match. Then click **Deploy Application**.

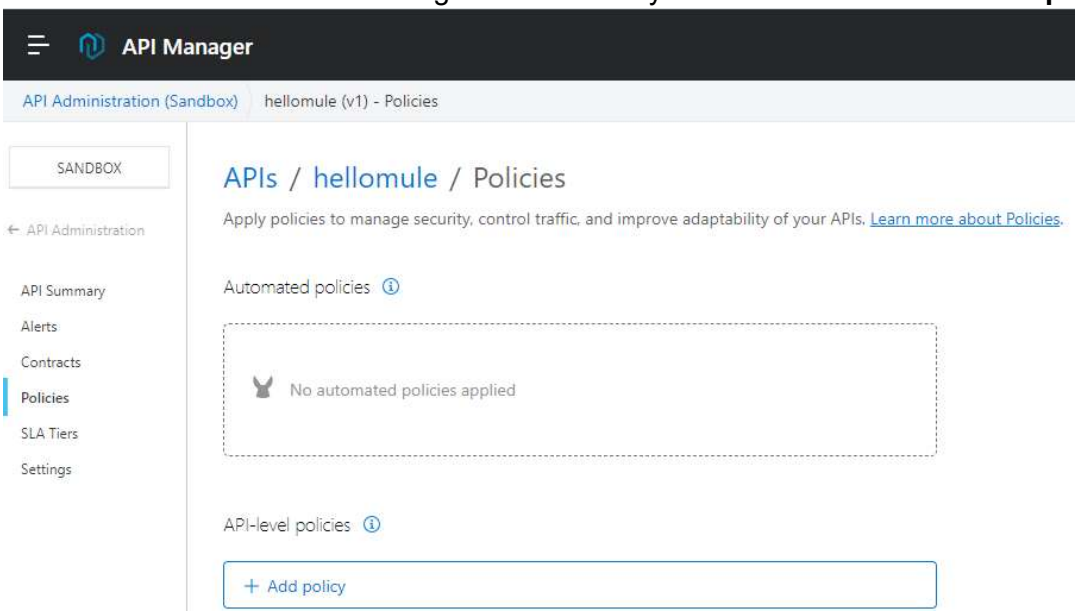


17. Now, within the Advanced REST Client a new tab is added, in the search field the url copied is pasted and click on **Send the request**.
18. Now, click on the **Anypoint Platform menu** and then click on **Management Center > API Manager** and then click on **hellomule**. And we validate that the API status be active.

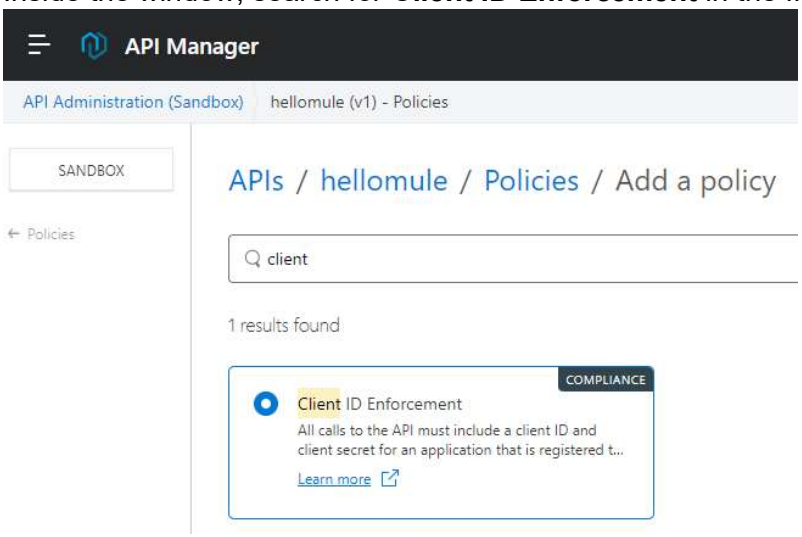


APPLY CLIENT ID ENFORCEMENT POLICY TO API IN API MANAGER

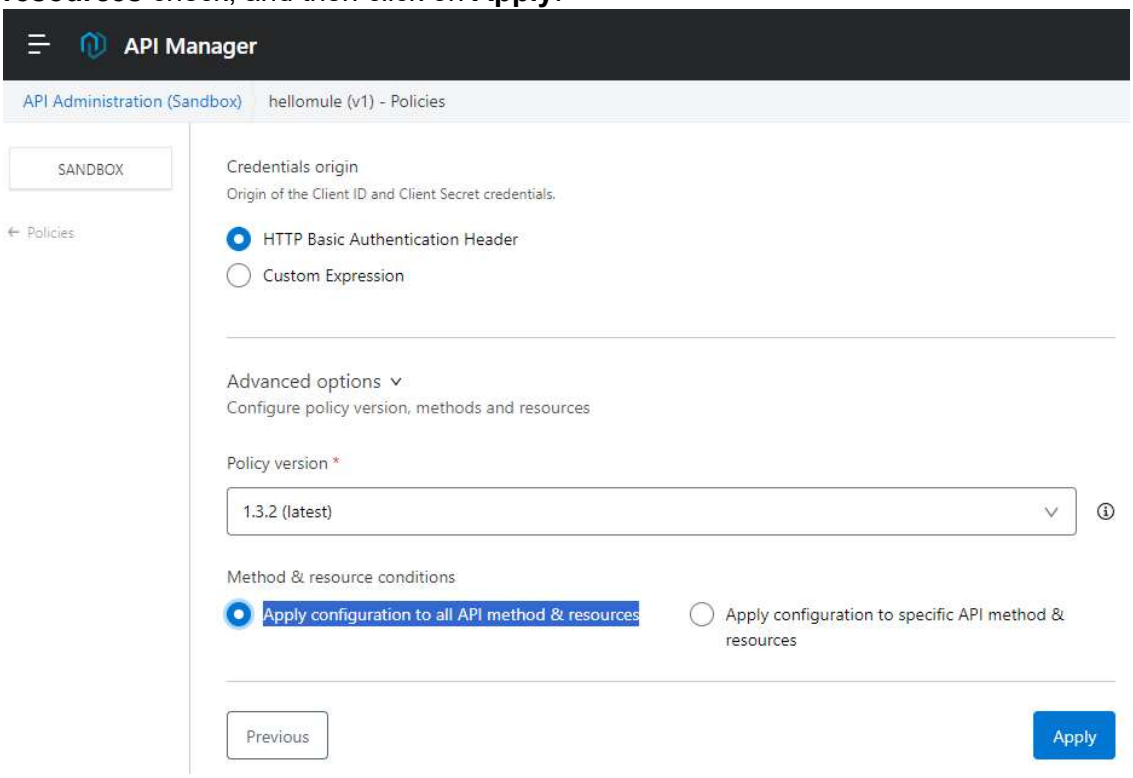
1. Now, click on the **Anypoint Platform** menu and click on **Management Center > API Manager** and then click on **hellomule**. And then we go to where it says **Policies**. And click on **Add policy**.



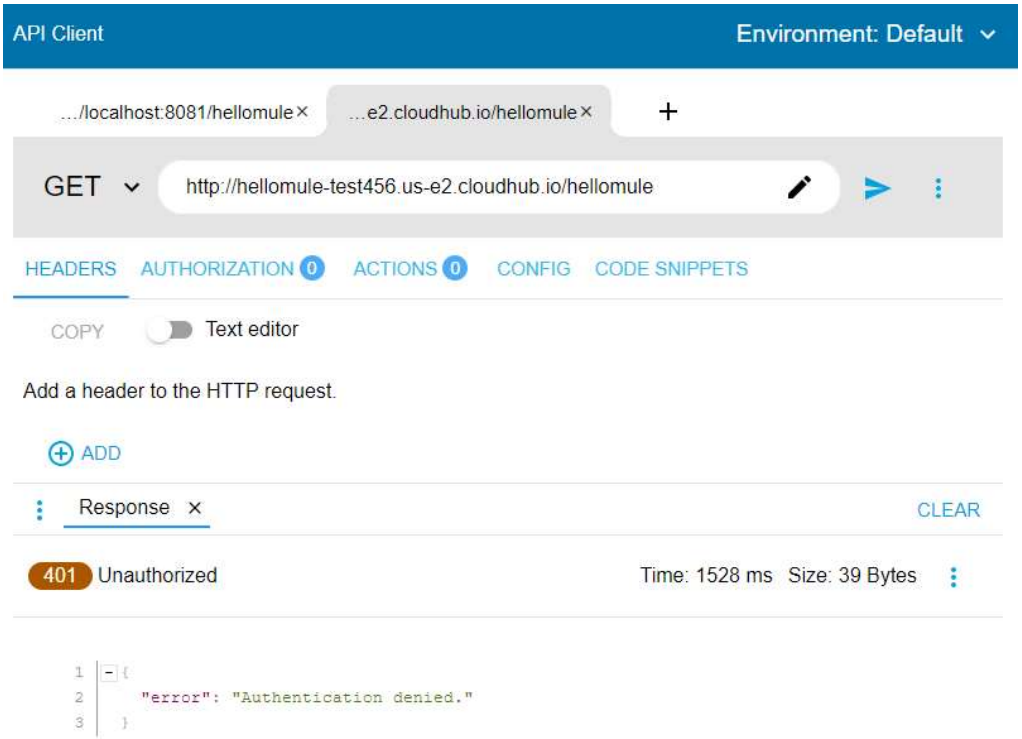
2. Inside the window, search for **Client ID Enforcement** in the field. And then you click on **Next.**



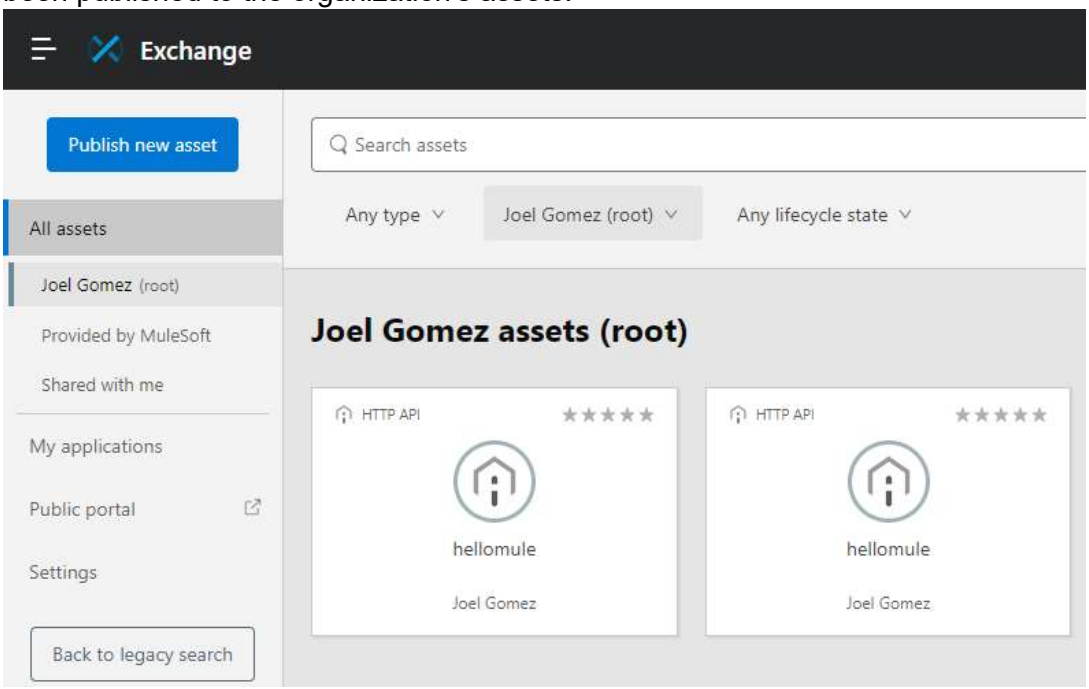
3. Now within this window, click on the **HTTP Basic Authentication Header** check, expand **Advanced options** and select the latest version, and also click on the **Apply configuration to all API method & resources** check, and then click on **Apply**.



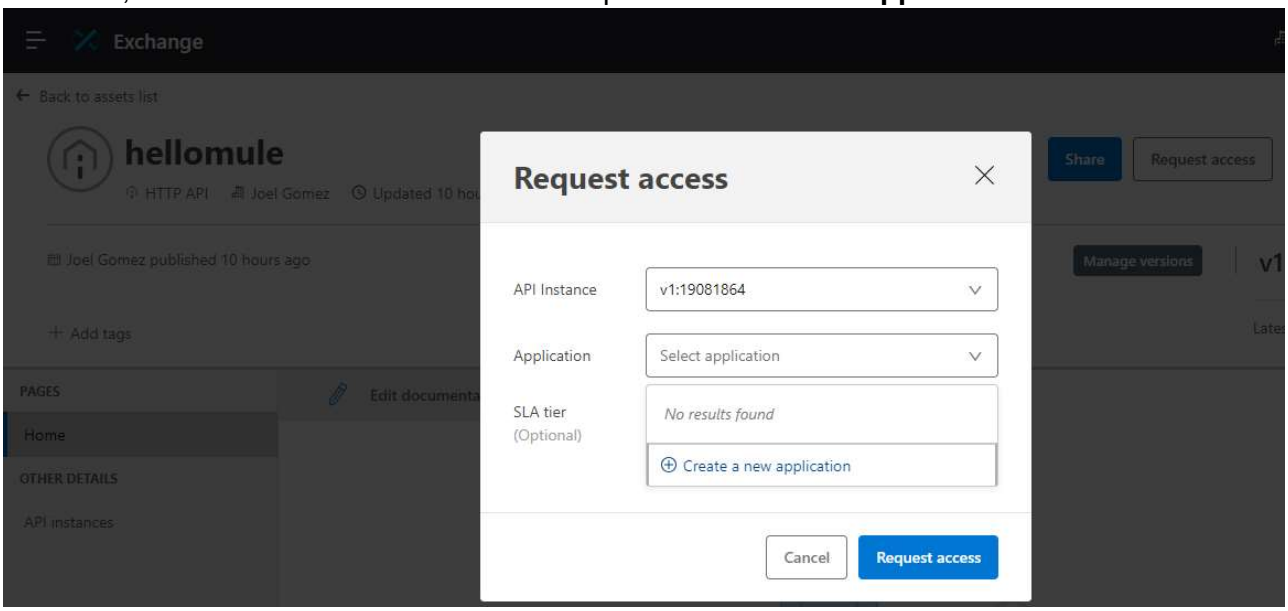
4. Now, within **Advanced REST Client,** we add a new tab, we paste in the search field the url copied and click on **Send the request**. As you can see in the image below, the status result is **401 Unauthorized** and the error is **"Authentication denied".**



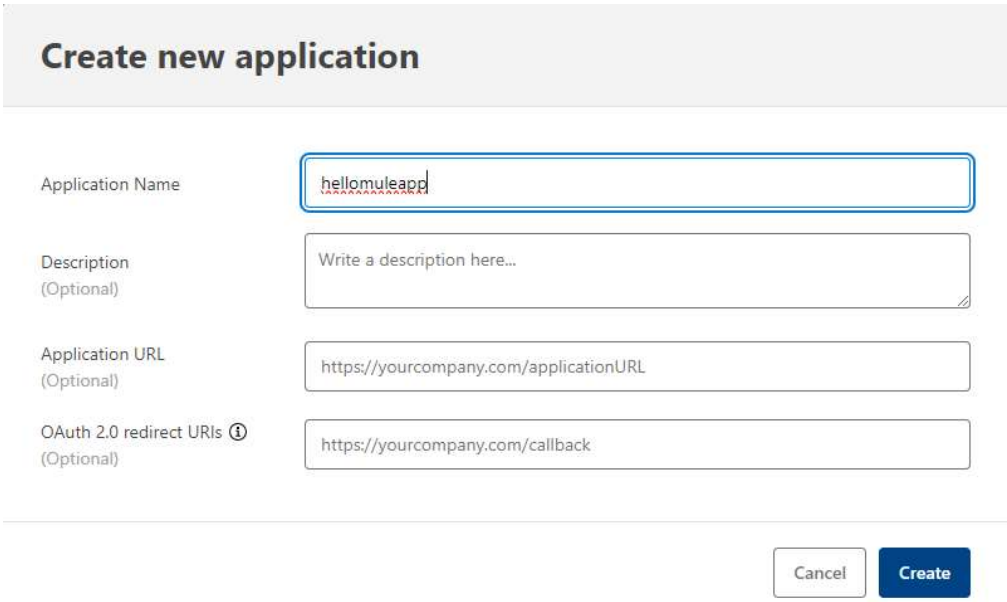
5. Now, on Anypoint Platform, we are heading to **Exchange.** We can see that the HTTP API has already been published to the organization's assets.

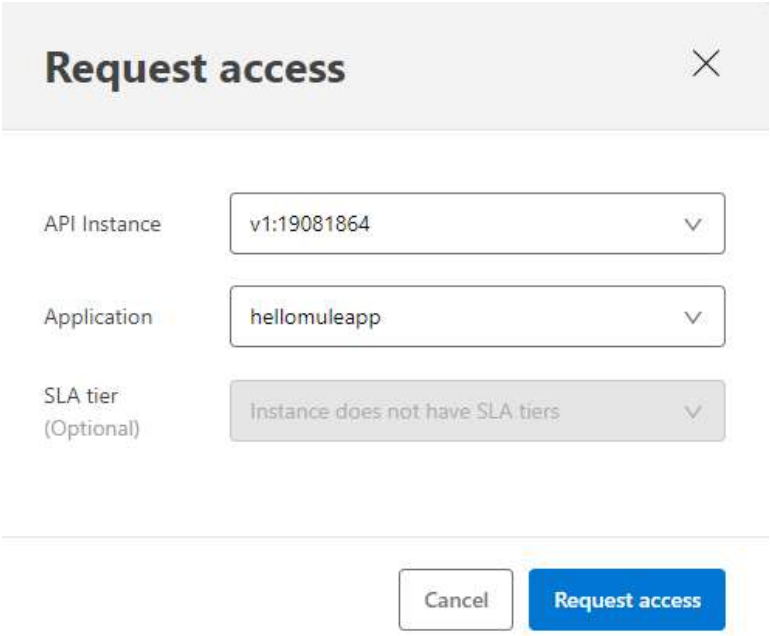


6. We select the corresponding API, within that window click on **Request Access**, it is selected within **API Instance**, and within **SLA Tier** we select the option **Create a new application**.

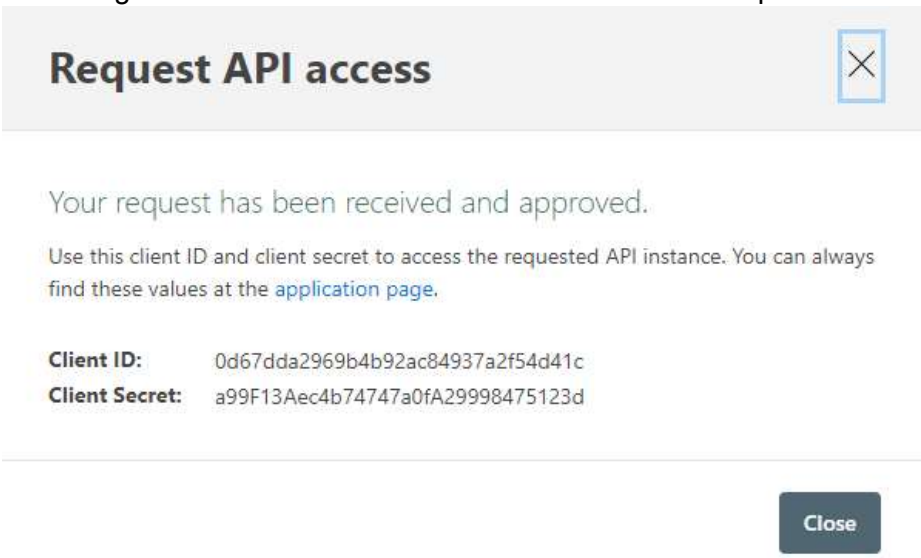


7. In the **Application Name** field, we enter *hellomuleapp*, click on **Create**, and then click on **Request Access**.

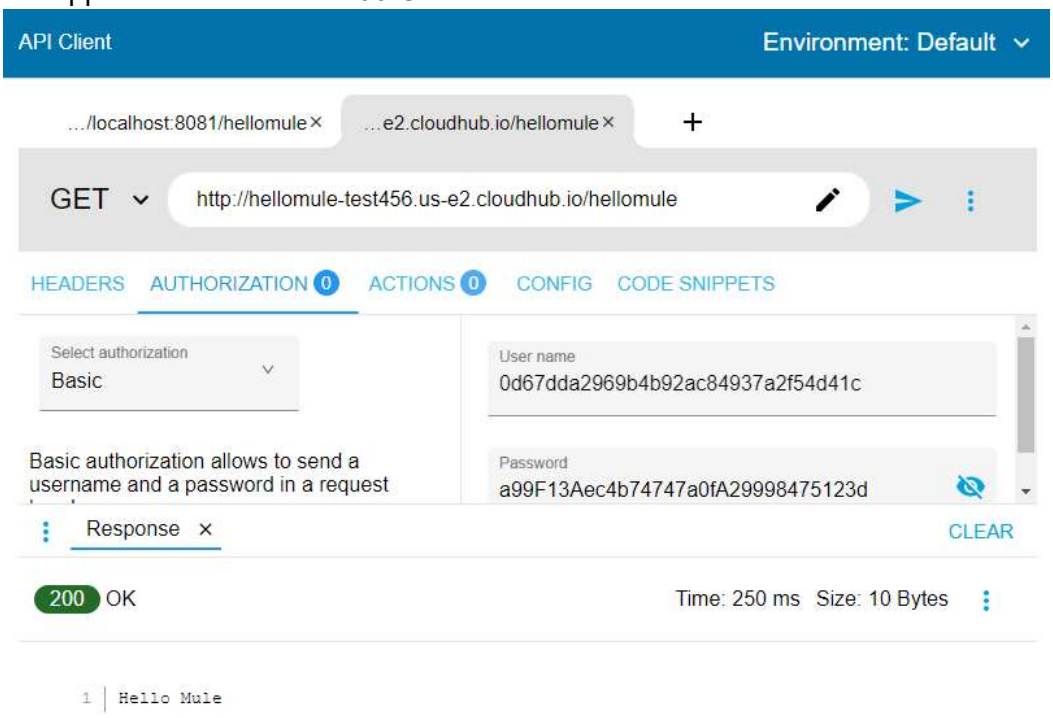




8. Those login credentials are considered when these are requested in the REST client.

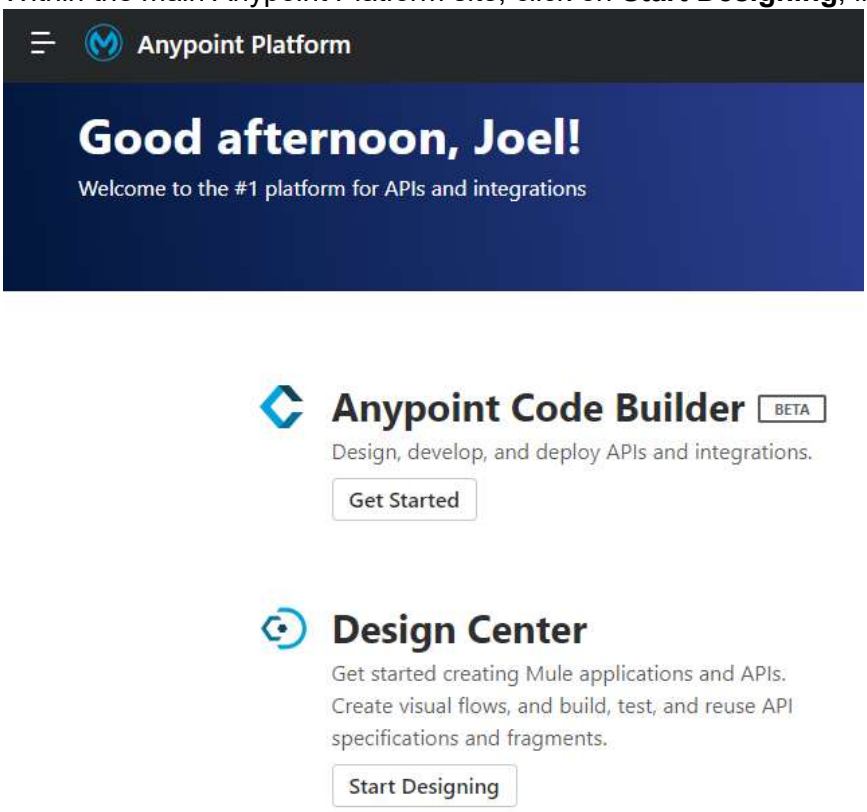


9. Now in Advanced REST Client, go to the **AUTHORIZATION** tab and paste the username and password from the previous step, click on **send the request** again where the link is requested, and you see that the application is run with **200 OK** as status.

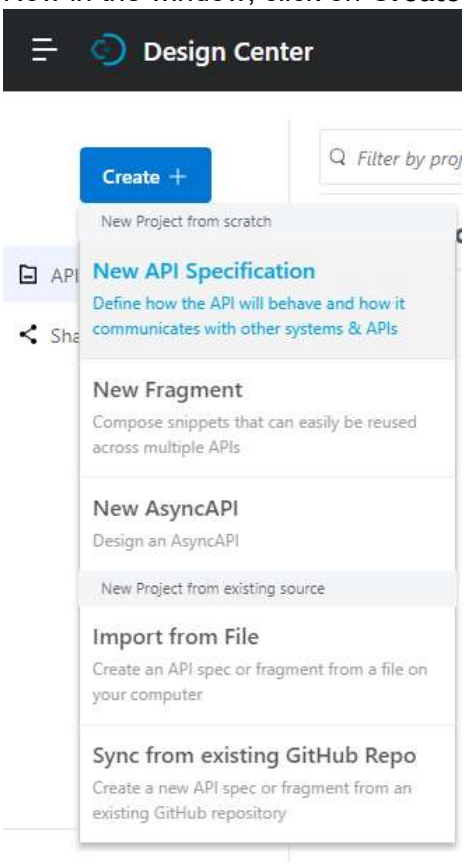


LEARN ABOUT THE FIRST API SPECIFICATION AND BUILD AN API SPECIFICATION IN API DESIGNER.

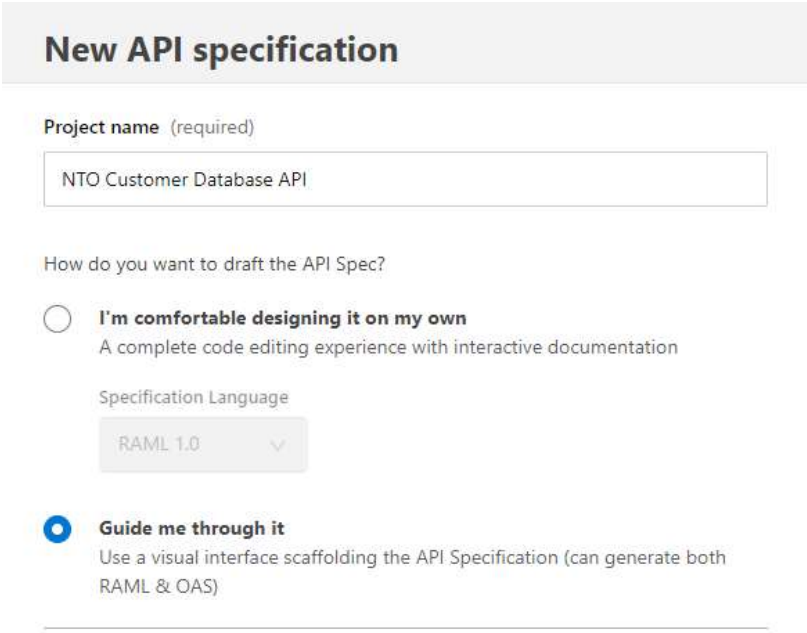
1. Within the main Anypoint Platform site, click on **Start Designing**, in the **Design Center section**.



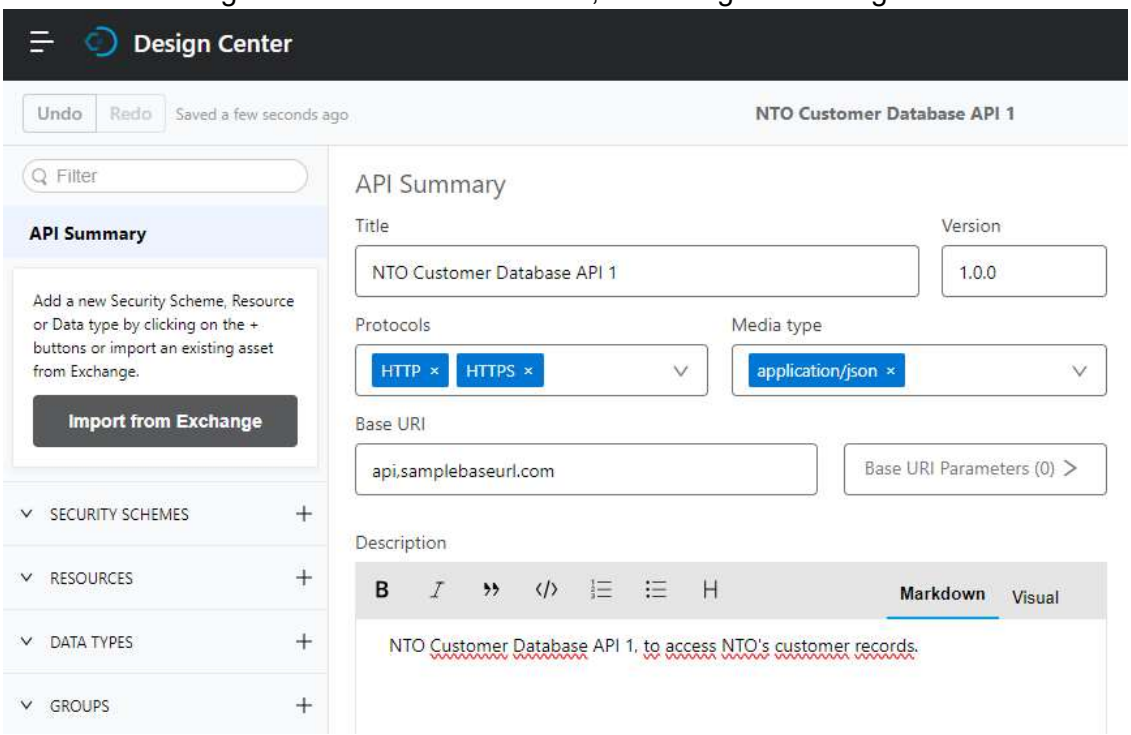
2. Now in the window, click on **Create** and from there click on **New API Specification**.



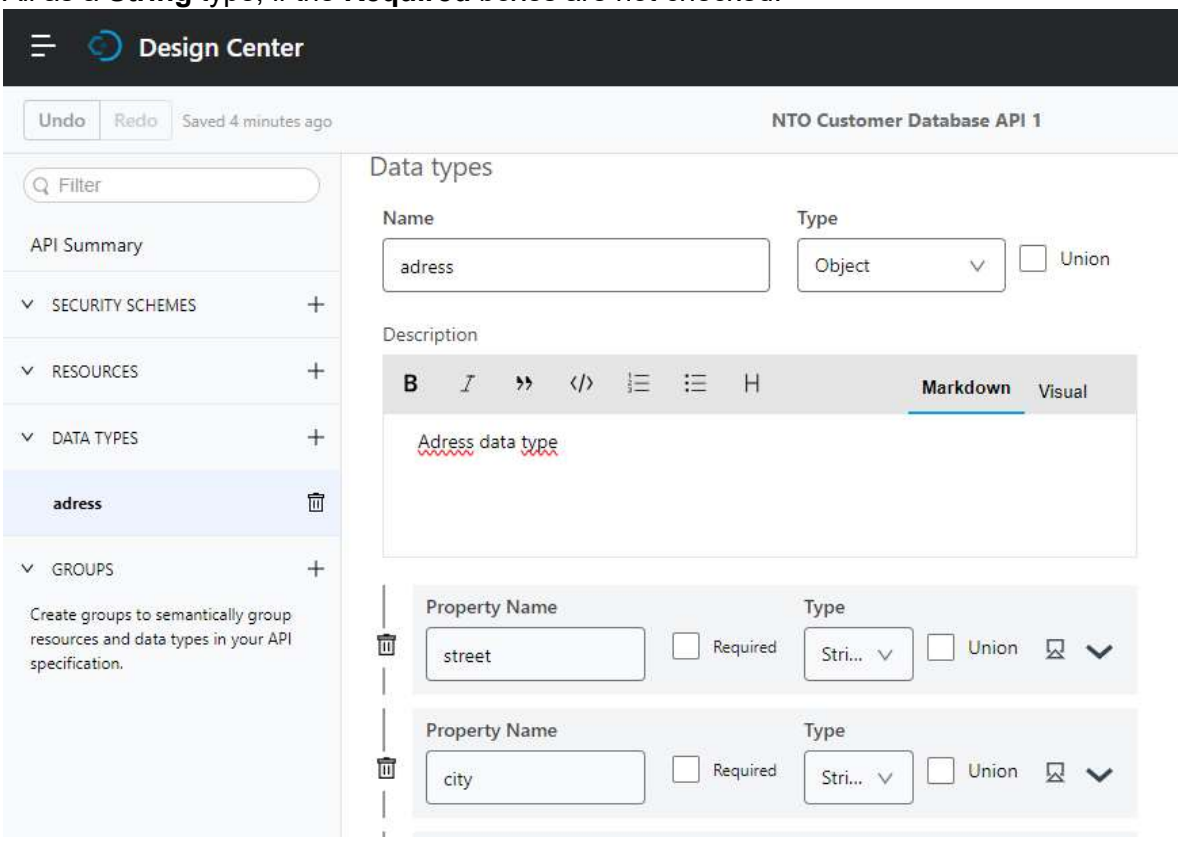
3. In the **Project Name** field, we enter *NTO Customer Database API 1* and check the **Guide me through it** box, then click on **Create API**.



4. We have to configure the fields in the window, according to the image.

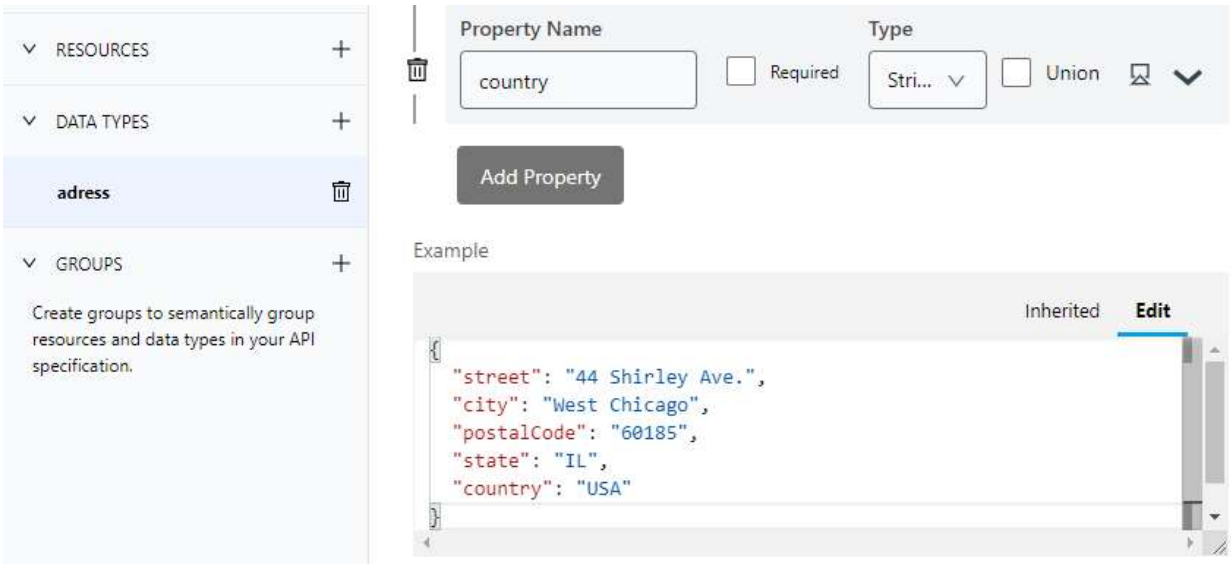


5. Then, click on **+** next to **Data Types**. Then, we type *adress* in the **Name** field, and now in **Description** field we type *Adress data type*. They are added as properties: *Street*, *city*, *postalCode*, *state*, and *country*. All as a **String** type, if the **Required** boxes are not checked.

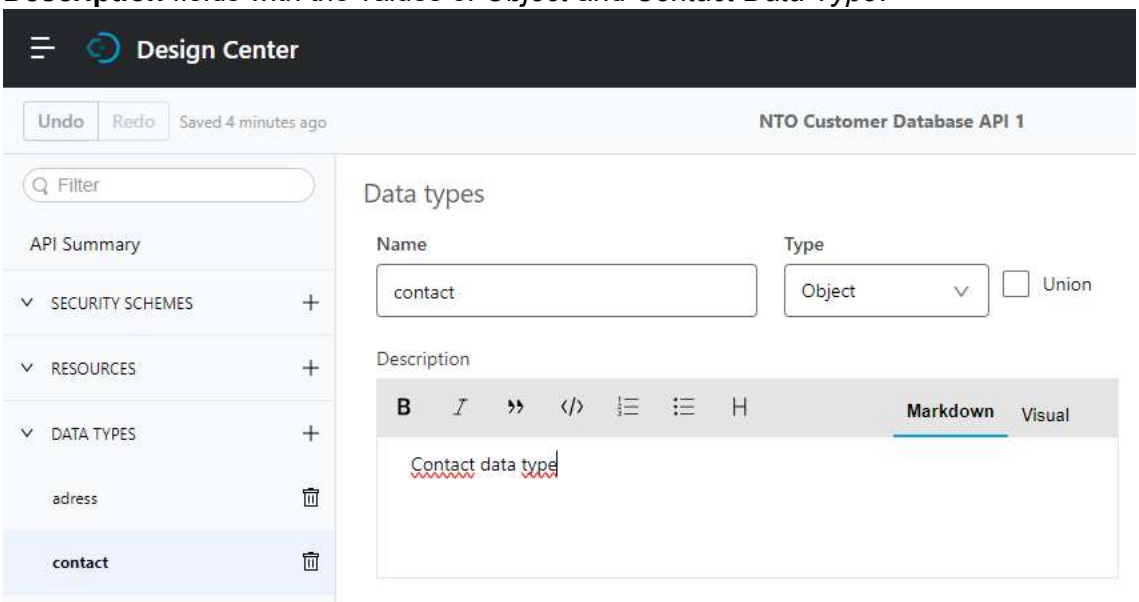


6. We write the following lines of code into the **Example** field, as long as we click on **Edit.**

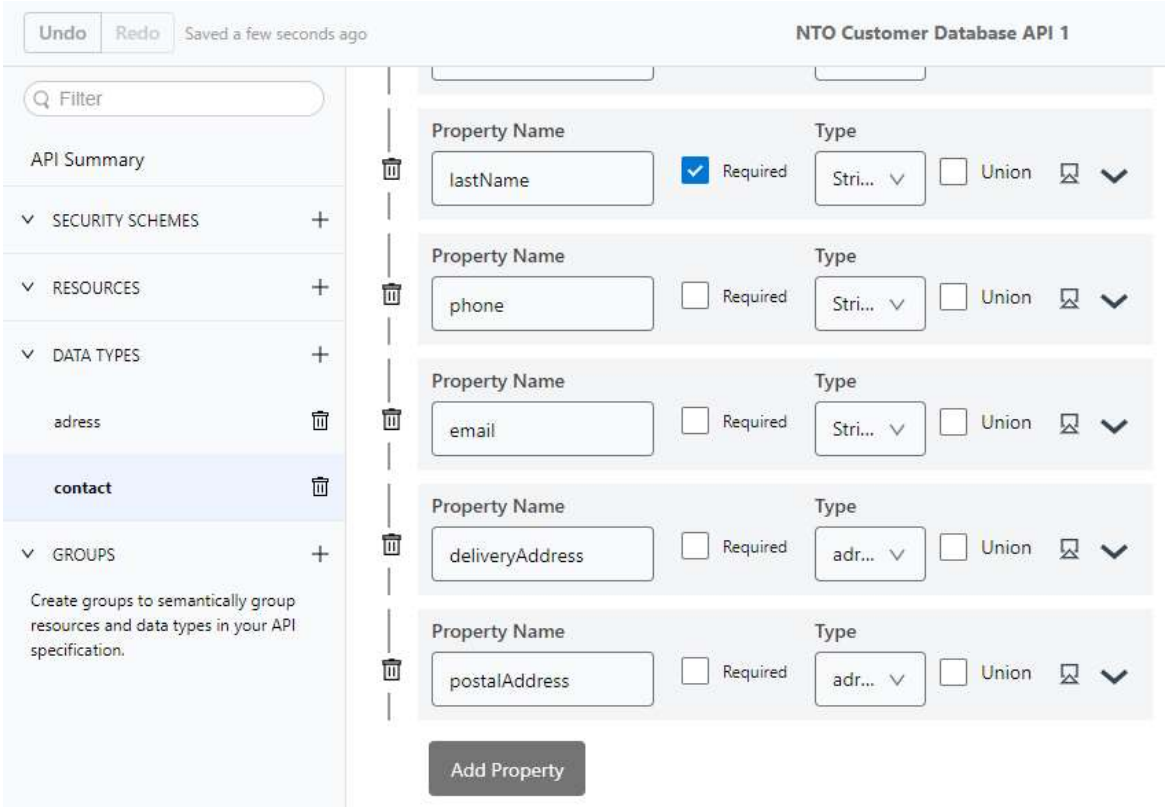
```
{
  "street": "44 Shirley Ave.",
  "city": "West Chicago",
  "postalCode": "60185",
  "state": "IL",
  "country": "USA"
}
```



7. Step 5 is repeated, but now in the **Name** field we type *Contact,* and we modify on the **Type** and **Description** fields with the values of *Object* and *Contact Data Type*.

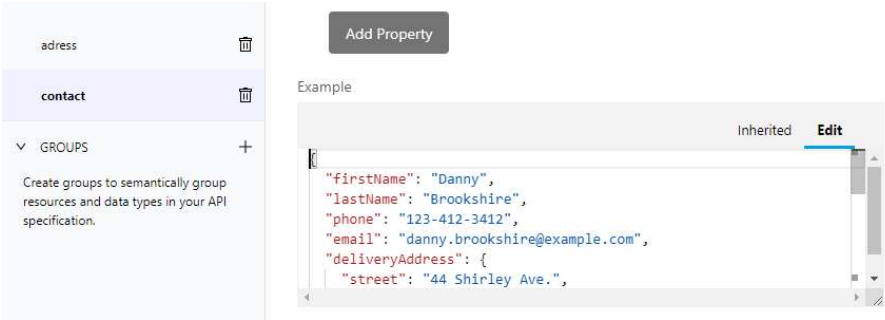


8. We should add as properties *FirstName, lastName, phone, email, deliveryAddress,* and *postalAddress*. The only ones that are of type **Adress** are *deliveryAddress* and *postalAddress*, and the only one that is marked in **Required** is *lastName*.

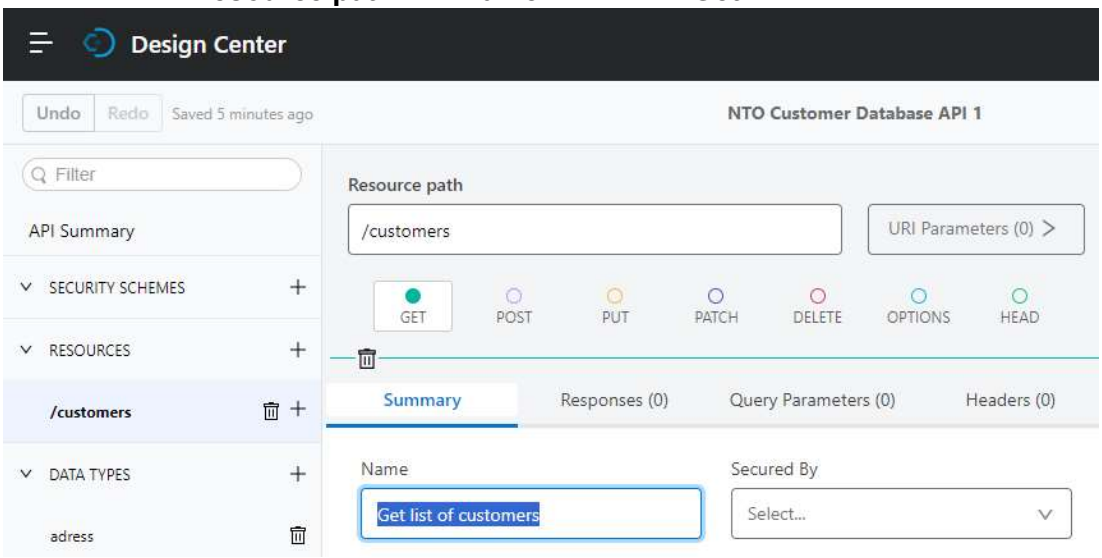


9. Now, we type the following lines of code into the **Example** field, if we click on **Edit.**

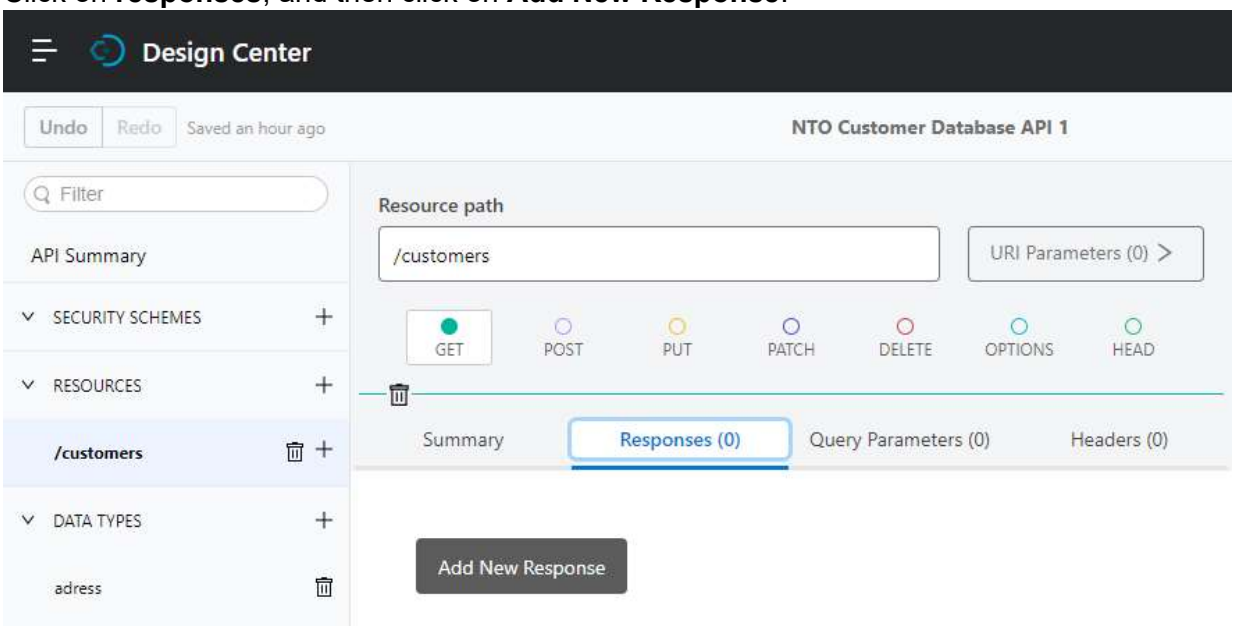
```
{
  "firstName": "Danny",
  "lastName": "Brookshire",
  phone: "123-412-3412",
  "email": "danny.brookshire@example.com",
  "deliveryAddress": {
    "street": "44 Shirley Ave.",
    "city": "West Chicago",
    "postalCode": "60185",
    "state": "IL",
    "country": "USA"
  },
  "postalAddress": {
    "street": "44 Shirley Ave.",
    "city": "West Chicago",
    "postalCode": "60185",
    "state": "IL",
    "country": "USA"
  }
}
```



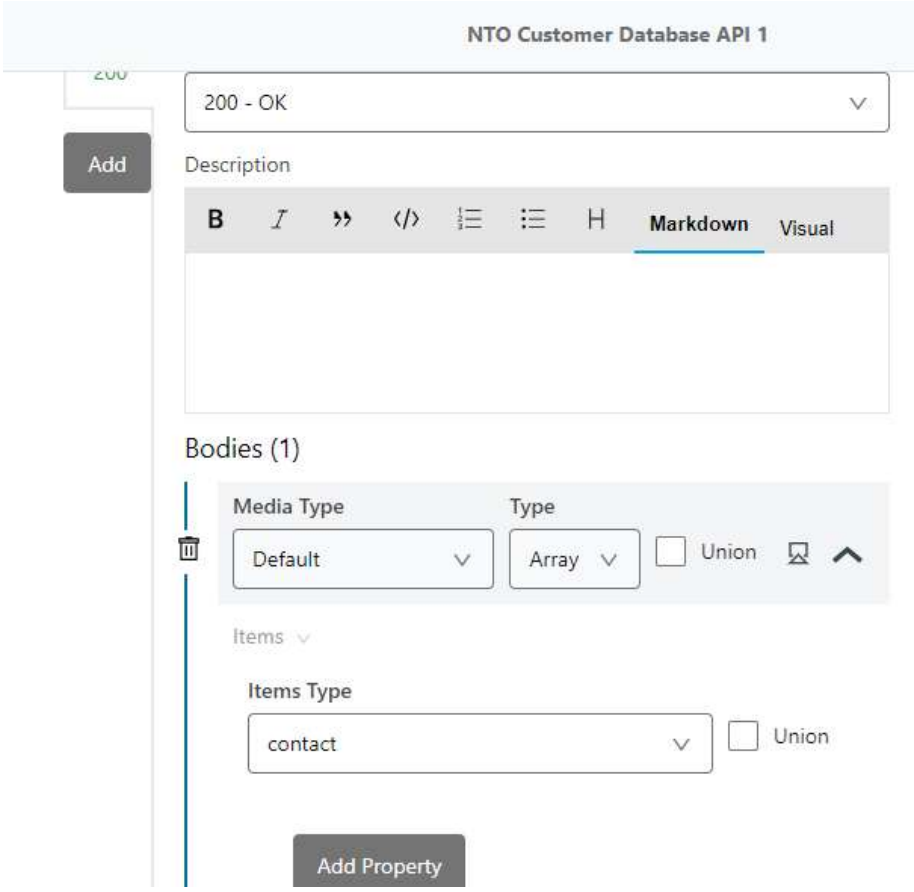
10. On the **Resources** tab, click on **+**. Subsequently, the values of */customers* and *Get list of customers* are entered in the **Resource path** and **Name** fields. The **Get** box is checked**.**



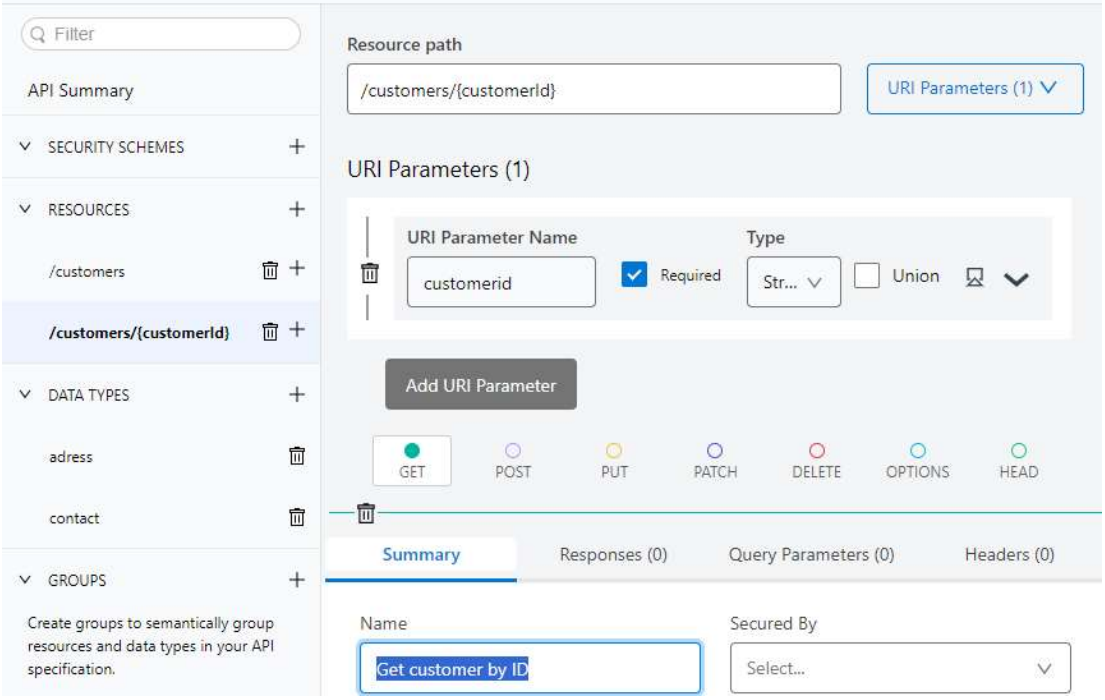
11. Click on **responses**, and then click on **Add New Response**.



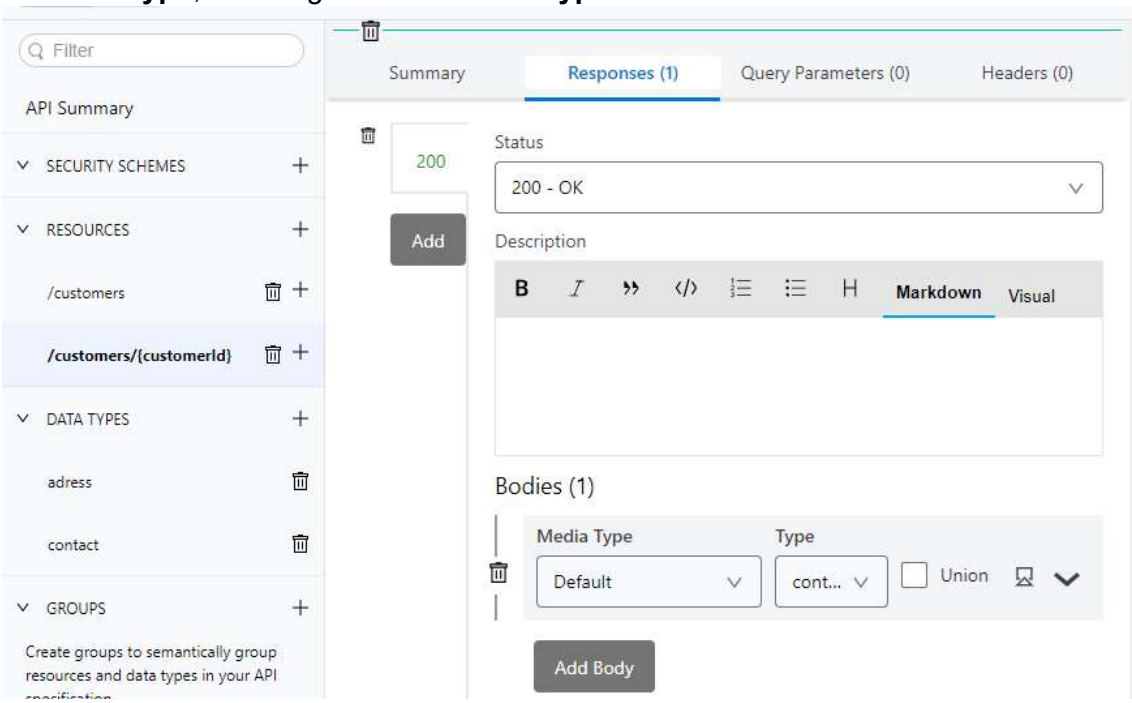
12. Inside the window, we check that the status is 200 OK, click on **Add Body**. **Media Type** is set to **Default (application/json)**, and **Type** to **Array**. Click on the downward-pointing arrow on the right, and the **contact** type is assigned to **Type**.



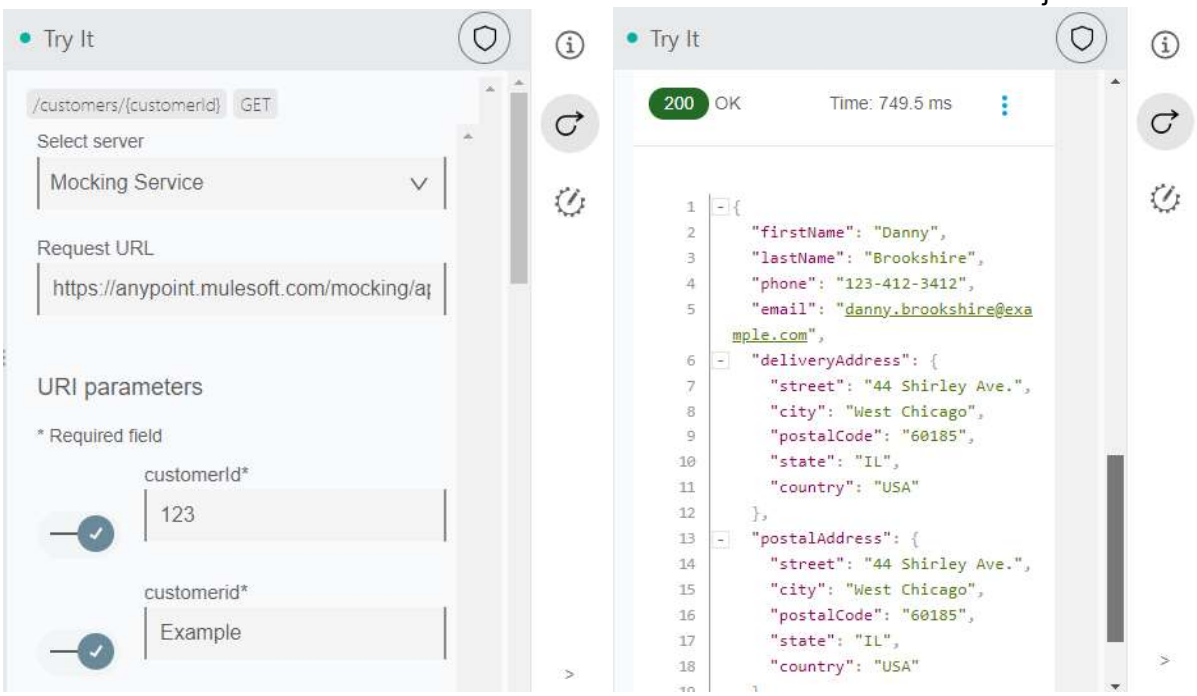
13. Then click on **+** next to **RESOURCES**. And in the window we set the properties of the **Resource path** as */customers/{customerId}*, and in **name** we assign the value of *Get customer by ID* and check the **Get** box. And click on URI Parameters, and click on **URI Parameters** and we assign the values of *customerid* and *String* on the **URI Parameter Name** and **Type** fields. The **Required** box is checked.



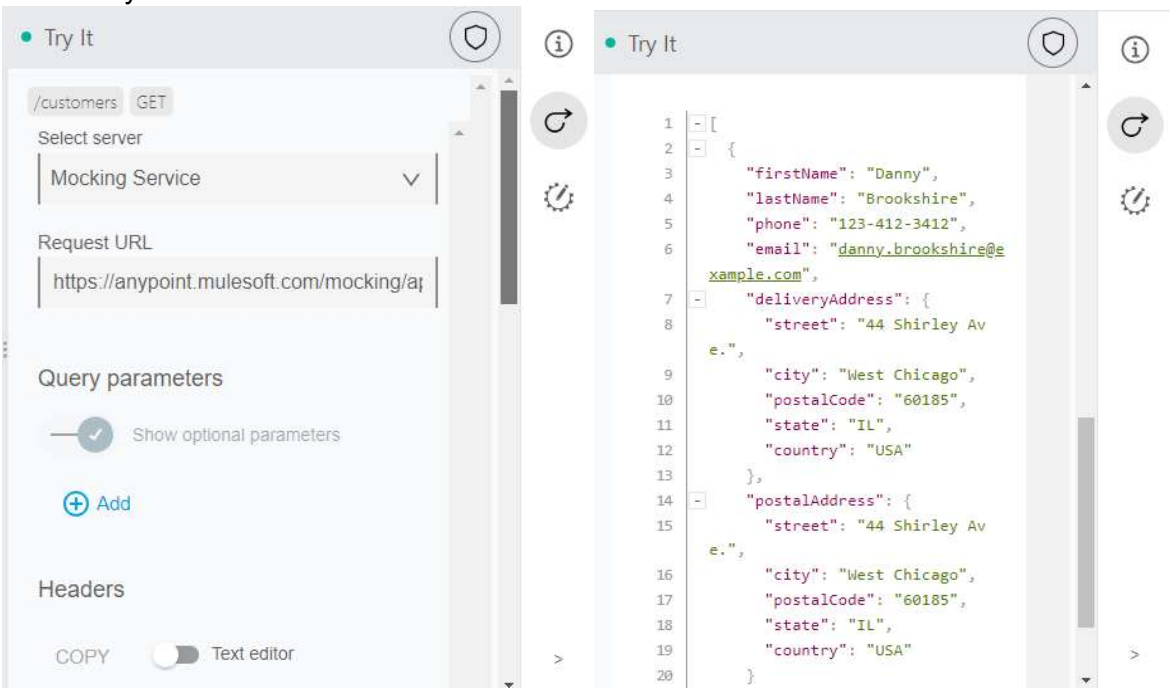
14. On the **Responses** tab, click on **Add new response** and then click on **Add body**, and we assign *Default* in **Media Type**, we assign **contact** in the **Type** field.



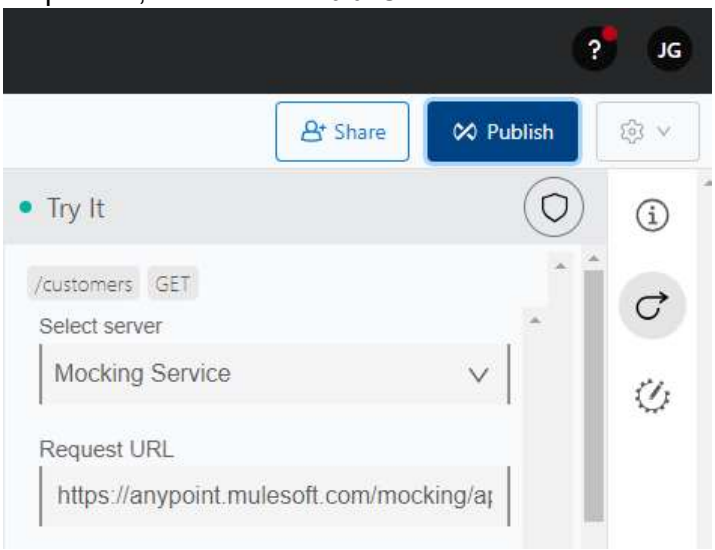
15. Now, we have to test. To do this, click on **/customers/{customerId}**, then click on **Try It** (from the bar to the right of the interface), once in the window, configure **Select server** as **Mocking service**, and enter *123* in **URI Parameters**. Then click on **send**. We can see that the result is an object.



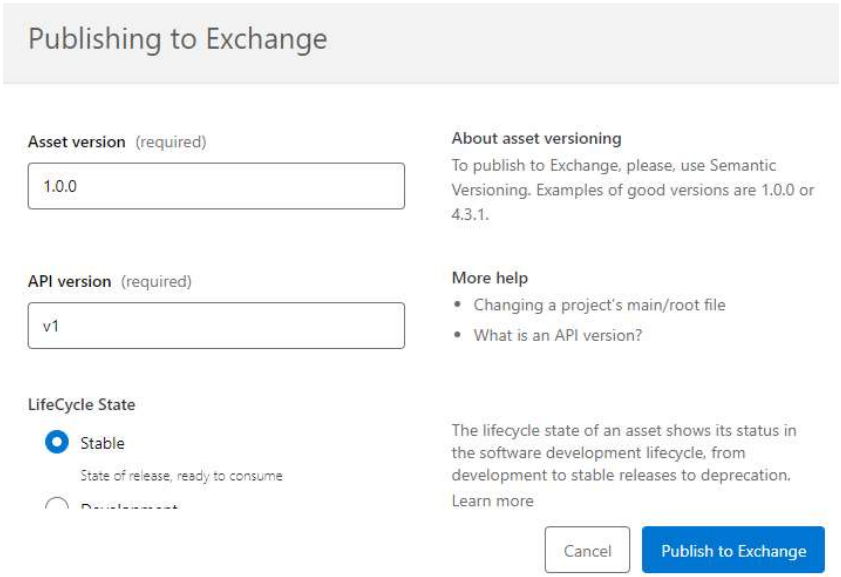
16. Then click on **/customers**, then click on **Try It** (from the bar to the right of the interface), once in the window, we configure **Select server** as *Mocking service*. Then click on **send**. We can see that the result is an array.



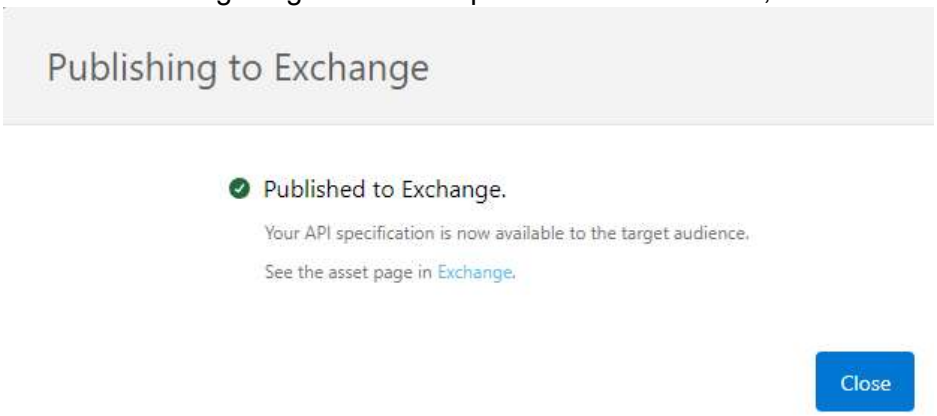
17. To publish, click on the **Publish** button.



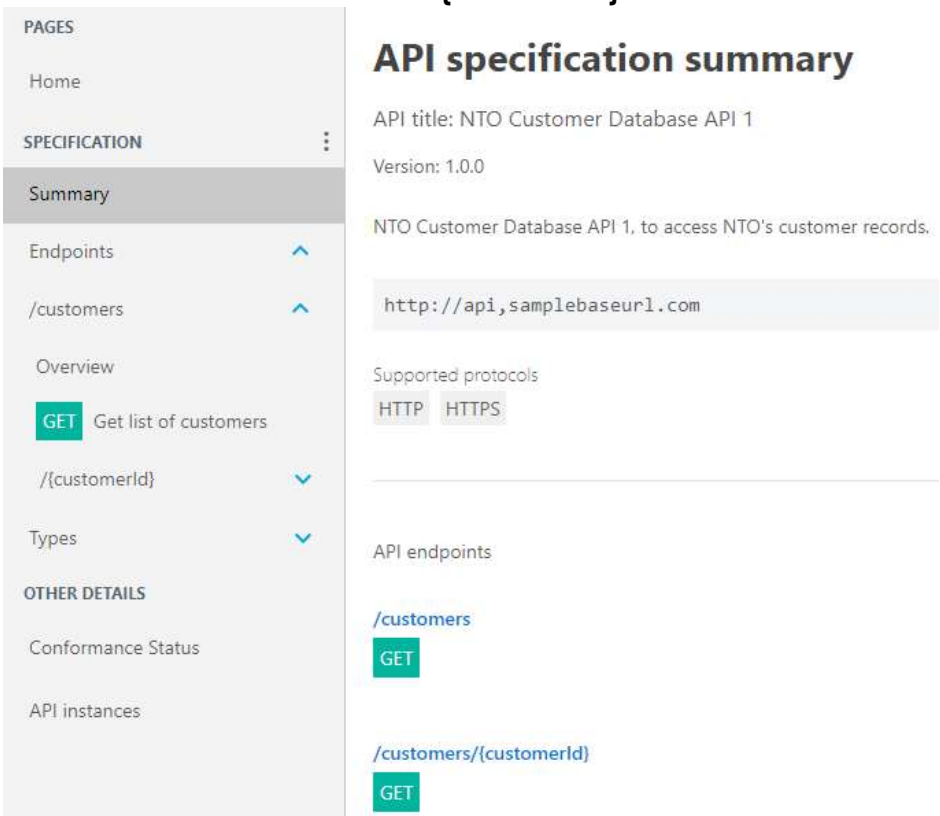
18. Then, we make sure that in **Asset Version** is *1.0.0.* Then, click on **Publish to Exchange**.



19. Once the message is given that the publication is available, click on **Exchange**.

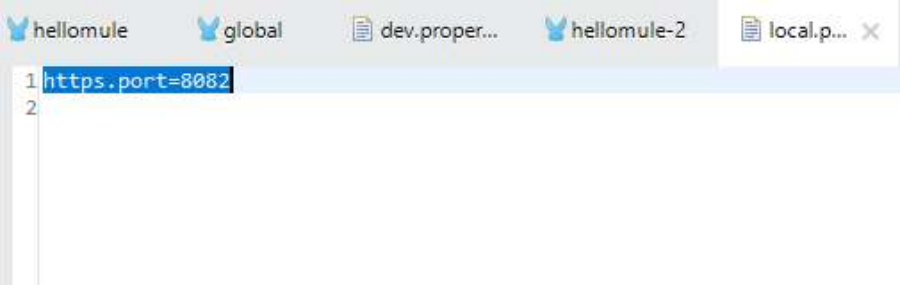


20. There in the window, click on **Summary** of the right panel. And we can see that inside of **API Endpoints** are **/customers** and **/customers/{customerId}**.

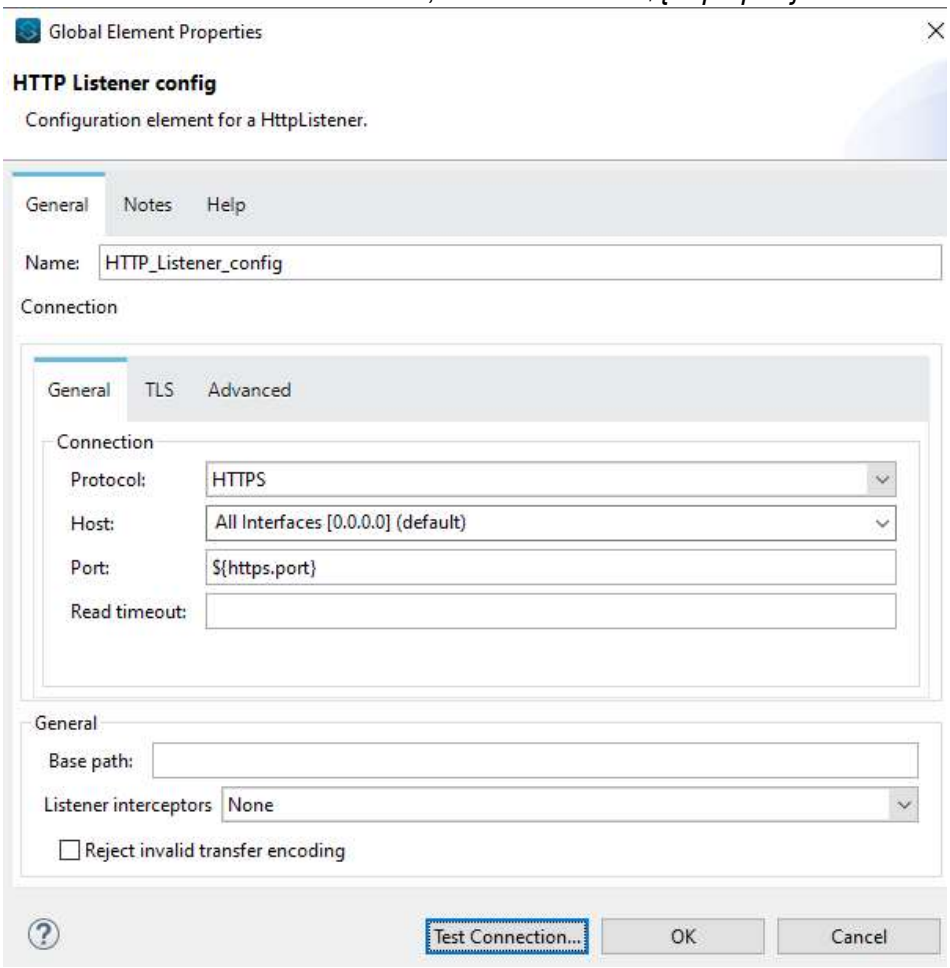


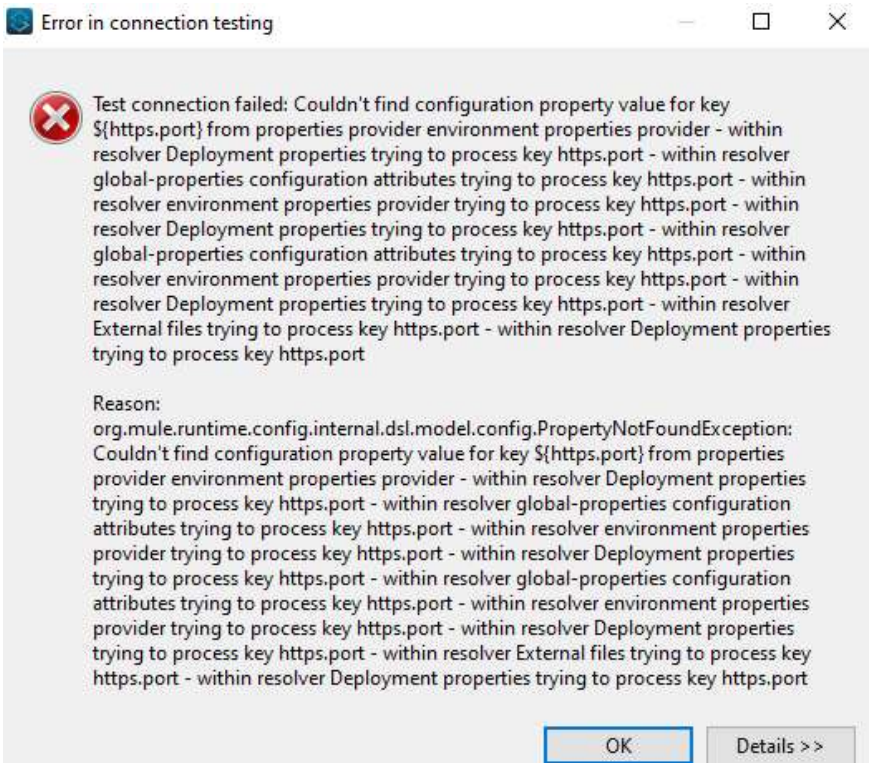
ENABLE MULE APPLICATION CONSUMPTION THROUGH HTTPS.

1. Repeat the first exercise, but with the difference that the project will be named *hellomule-2*.
2. From the left panel of Anypoint Studio, right click on **src/main/resources**, and then **New > File.**
3. Then we assign on the **File name** field as *local.properties*.
4. Inside the file, we write the following: `https.port=8082`.



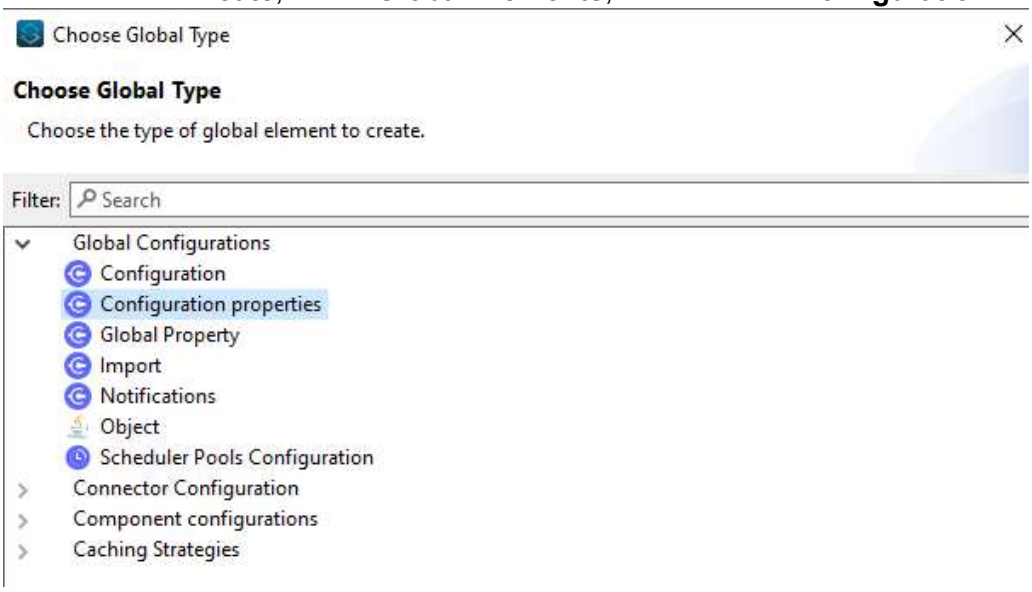
5. Now in hellomule-2.xml we will go to the **Global Elements** tab, and from there click on **Edit**. Later, we edit the **Protocol** and **Port** fields, as *HTTPS* and *${https.port}*. Then click on **Test connection**.



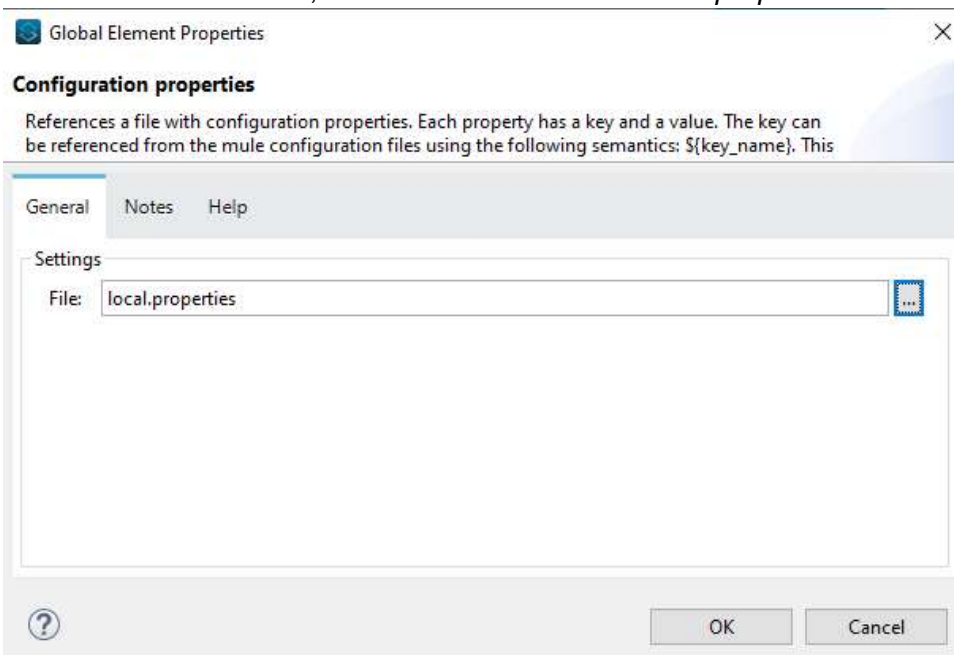


Then click **OK**.

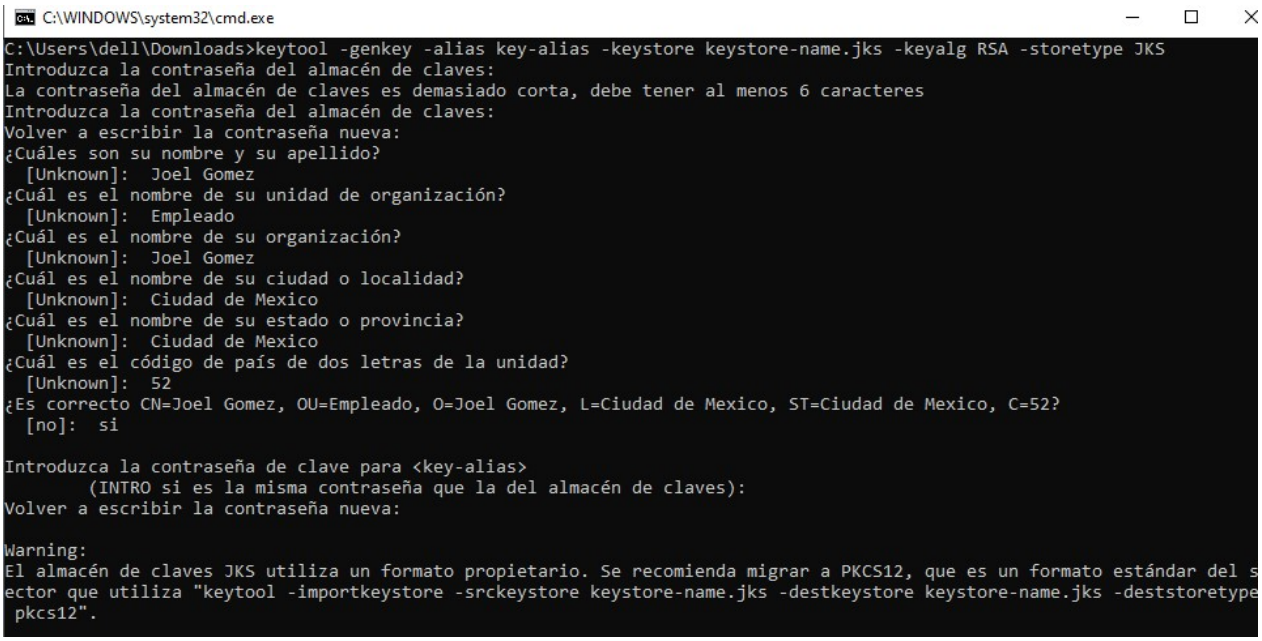
6. Then click on **Create**, within **Global Elements**, and consider **Configuration Properties**.



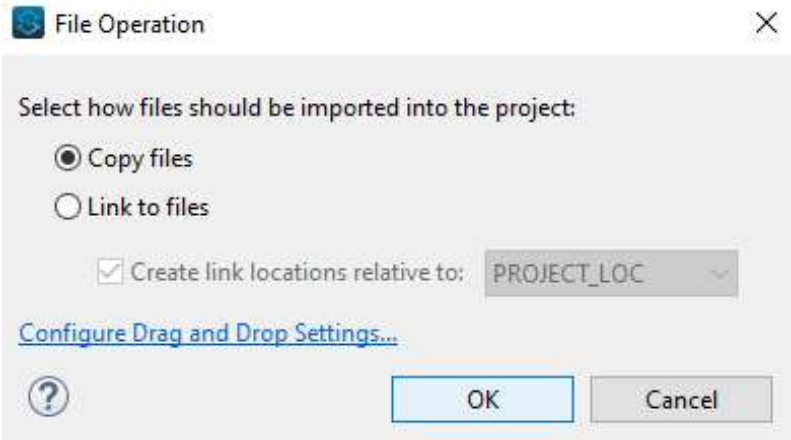
7. Once we clicked on **OK**, in the **File** field we enter *local.properties.* And click on **OK**.



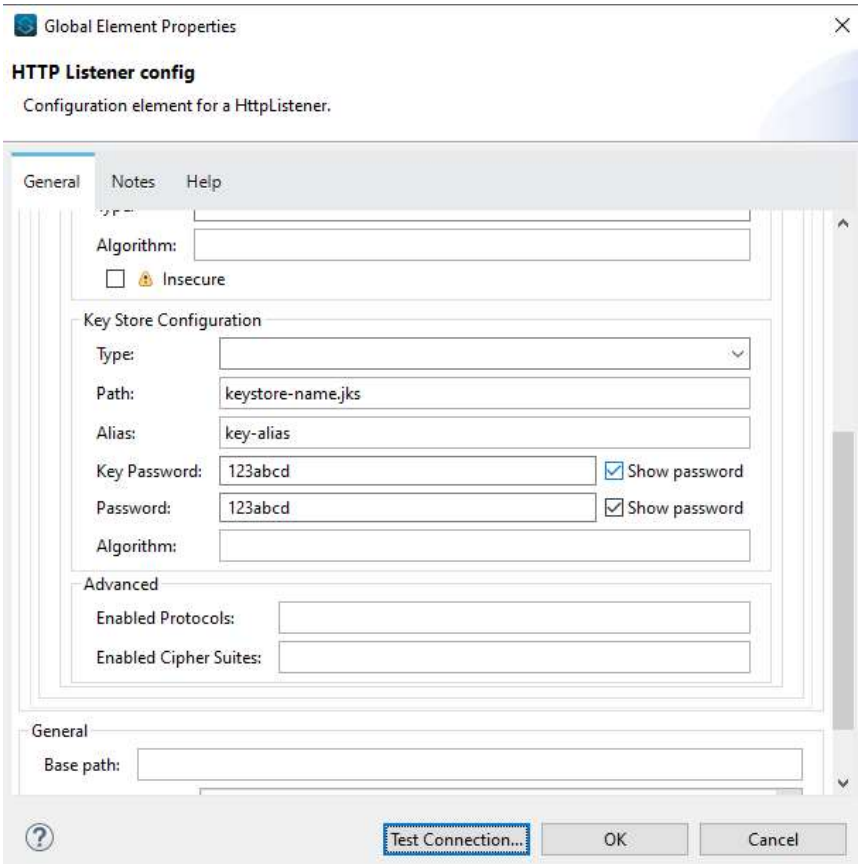
8. Now at Command Prompt, the following line of code is typed. Fill in the corresponding fields and consider that we have saved the password typed.
   `keytool -genkey -alias key-alias -keystore keystore-name.jks -keyalg RSA -storetype JKS`



9. Now, the **keystore-name.jks** file is copied to Anypoint Studio, in the **src/test/resources** folder. Then click on **OK**.



10. Now you go back to **HTTP Listener Config**, and from there we click on **Edit**. We change to the **TLS** tab and within **TLS Configuration** we assign **Edit Inline**. Scroll down to the **Key Store Configuration** section, and edit the **Path, Alias, Key Password,** and **Password** fields. And then click on **Test Connection**.



11. When the **Connection successful** pop-up appears, click on **OK**.
12. Then, click on **save all**, and from there we go to **Message Flow**, right-click on the canvas and click on **Run Project**. Wait until the console says **DEPLOYED.**
13. Now in the REST client, we click on add new tab, and we type *https://0.0.0.0:8082/hellomule* in the **search field**, and at the end we click **on send**.