

# Restaurant OS + AWS

<b>CLI Commands</b>	<b>2</b>
<b>Prerequisites</b>	<b>3</b>
AWS	3
AWS CLI	3
Windows:	3
Mac:	3
OutSystems environment	4
<b>Demo</b>	<b>5</b>
Summary	5
Demo Steps	5
Starting with the AWS CLI	5
Showing the data in Service Studio	8
Creating a detail Screen	10
Adding UI to take pictures	22
Rekognition + S3	25
Finishing up	31

# CLI Commands

Installing AWS CLI Windows:

1 - Run in the CMD the following command:

**msiexec.exe /i <https://awscli.amazonaws.com/AWSCLIV2.msi>**

Follow the wizard to install, then close and open the CMD

2 - Run CLi Commands for DynamoDB:

Scan the **Restaurant** db

`aws dynamodb scan --table-name Restaurant`

Get Specific Item (windows version with escaped “)

`aws dynamodb get-item --table-name Restaurant --key  
{\"Id\":{\"S\": \"638f3b19c2b0fb839b3652b8\"}}`

Get Specific Item

`aws dynamodb get-item --table-name Restaurant --key  
{\"Id\":{\"S\":\"638f3b19c2b0fb839b3652b8\"}}`

3- Run Commands for S3:

List content of os.restaurant-images

`aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize`

Copy file “**testkey**” from the bucket “**os-restaurant-images**” to disk:

`aws s3 cp s3://os-restaurant-images/testkey .`

List buckets

`aws s3api list-buckets --output json`

# Prerequisites

## AWS

You need to have created:

- ☐ One bucket on S3 with the name **os-restaurant-images**
- ☐ One DynamoDB Table with the name **Restaurant** populated with the data from [this JSON](#)
- ☐ Access to Rekognition
- ☐ An IAM user configured with access to these 3 services
- ☐ Make sure that the S3 and the DynamoDB table are set in the same region

## AWS CLI

You need to install the AWS CLI on your machine and configure the user to your IAM one

Windows:

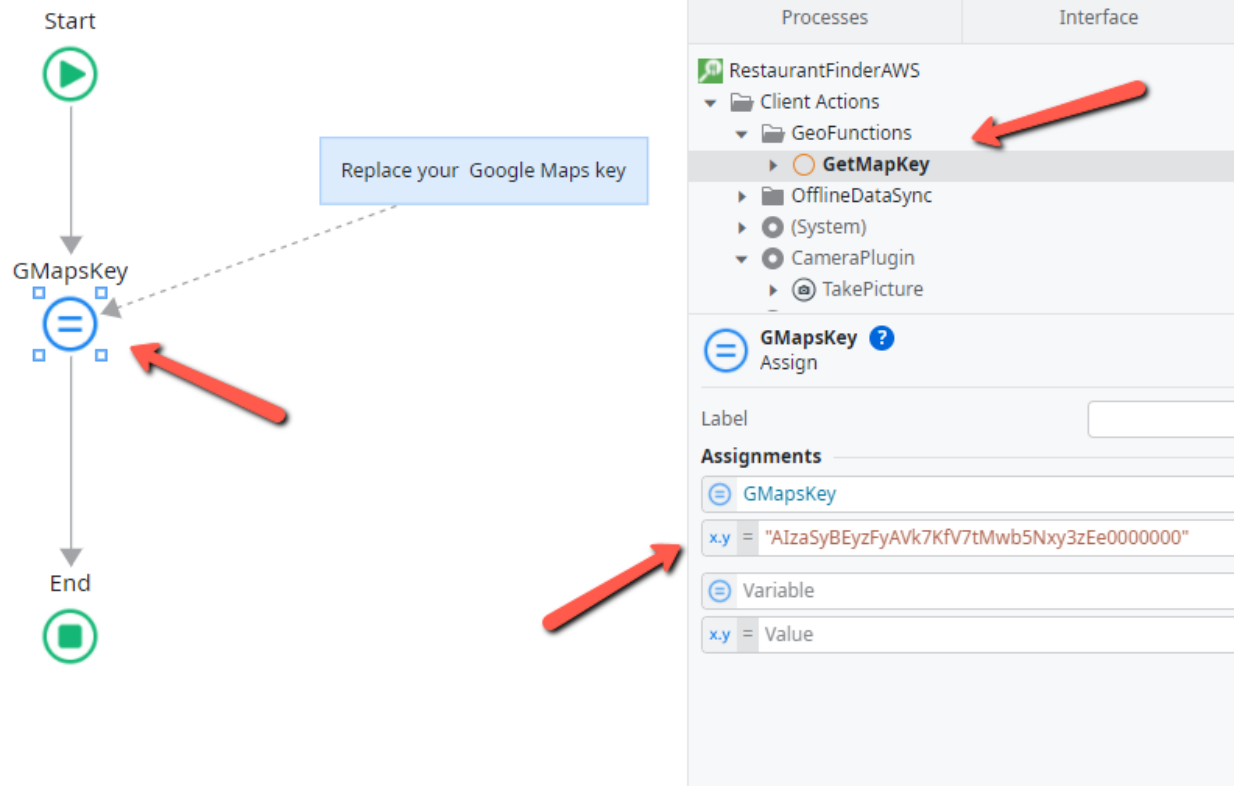
- 1 - Open a CMD and run the command **msiexec.exe /i <https://awscli.amazonaws.com/AWSCLIV2.msi>** (run installer)
- 2 - Follow the instructions on the installer until is finished
- 3 - Close the CMD and open a new one (so it refreshes and has the aws cli installed)
- 4 - Run the command **aws configure**. Set the Access Key Id, the Access Key and the Region
- 5 - You are all set to use the CLI

Mac:

- 1 - Download and install <https://awscli.amazonaws.com/AWSCLIV2.pkg>
- 2 - Open the Terminal and check if it's working using the command **aws --version**
- 3 - Run the command **aws configure**. Set the Access Key Id, the Access Key and the Region
- 4 - You are all set to use the CLI

# OutSystems environment

1. You need to install from forge the following:
  - [Camera Plugin](#)
  - [Common Plugin](#)
2. You need to install [this custom version](#) of Amazon Rekognition (The .NET code had to be updated to use the AWSSDK.Core updated version)
3. You need to install [this custom version](#) of Amazon S3 (The .NET code had to be updated to use the AWSSDK.Core updated version)
4. You need to install [this custom version](#) of Amazon DynamoDB (The .NET code had to be updated to use the AWSSDK.Core updated version)
5. Install the starter version of the [Restaurant Finder \(AWS\) app](#)
6. Configure the site properties of the application (this keys are an example and not real):
  - AWS\_AccessKeyId** - AKIA6HMOSDKE3LAO39D
  - AWS\_Region** - EUWest1
  - AWS\_SecretAccessKey** - ShnHFsTln8LD5Wi9sXPqksdiGD6849Lkfje73K2
  - DynamoDB\_Table** - Restaurant
  - S3\_ImageBucketName** - os-restaurant-images
7. Open the **RestaurantFinderAWS** module on service studio, go to the client action **GetMapKey** and in the assign put in your Google Maps Key. This google maps key needs to have the **Maps Static API** active:



# Demo

## Summary

In this demo we are going to show how you can use OutSystems and AWS together.

First we are going to show the data that exists already in the DynamoDB using the AWS CLI in the command line.

Then we will open the Restaurant Finder AWS application in the service studio. We will go through the existing screen and explain how we are consuming the AWS services through a .Net extension.

We will get an item in the AWS CLI, copy the JSON and import it to a structure in Service Studio to show how easy it is to map structures and how the pre existing mapping was done. We will not use this structure since it is already done.

We are going to create a new screen for the Restaurant Detail. We are going to use the template for location detail. We are going to fetch the data using a “get-item” pre build action. We will replace the data.

We will create a server action that receives a binary, checks using the Amazon Rekognition for labels of “Restaurant” or “Food”, and if they exist will send them to the S3 bucket. If not, it will give a warning.

We will create a client action that takes a picture and calls this server action. Then we will test it out taking a picture of nothing (and giving the warning that this picture is not of a restaurant or food) and another picture of food (you can take a picture of an image of food)

Then using the CLI we will see that picture in the bucket and copy it to the desktop to show.

We are using OS to create a quick mobile app that integrates in the AWS Ecosystem. We are quickly showing the list of restaurants and can easily create a screen to show detail. We can easily create a feature for the user to share pictures of the restaurants. And we are pre approving those pictures (using Amazon Rekognition) and sending them to S3. At the end of the demo we can say as an example, that from the S3 bucket, a Lambda function can be triggered that processes the image, creates thumbnails and adds it to our DynamoDB database closing the cycle.

## Demo Steps

These steps assume that all prerequisites are installed and configured correctly. The names being used in the commands are the ones given as examples in the site properties. All the AWS CLI commands are expressed for Windows CMD.

### Starting with the AWS CLI

- 1) Open your console and show which S3 buckets exist using the command **aws s3api list-buckets --output json**

```
C:\Users\ama>aws s3api list-buckets --output json
{
  "Buckets": [
    {
      "Name": "os-restaurant-images",
      "CreationDate": "2023-02-01T09:28:15+00:00"
    }
  ],
  "Owner": {
    "DisplayName": "aws_osacc02520",
    "ID": "a7ccf6de7418f25058dec33be35bce327d359cd9edc81d521699760b6f66a6d7"
  }
}
```

- 2) Then list the content of your bucket using the command **aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize** . This will show that the image that you're going to upload in the future is not there.

```
C:\Users\ama>aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize
2023-02-02 11:41:55    18.4 KiB restaurants_Dynamo.json
2023-02-07 18:52:18    48.1 KiB testkey

Total Objects: 2
Total Size: 66.6 KiB
```

- 3) Open your console and show the DynamoDB Restaurant DB using the command **aws dynamodb scan --table-name Restaurant**

```
C:\Users\ama>aws dynamodb scan --table-name Restaurant
{
  "Items": [
    {
      "cost": {
        "S": "Expensive"
      },
      "score": {
        "N": "5"
      },
      "images": {
        "L": [
          {
            "S": "https://media-cdn.tripadvisor.com/media/photo-o/17/e1/c0/c1/one-atria-cafe.jpg"
          },
          {
            "S": "https://media-cdn.tripadvisor.com/media/photo-s/26/cb/ca/fd/one-atria-cafe.jpg"
          }
        ]
      },
      "latest_comments": {
        "L": [

```

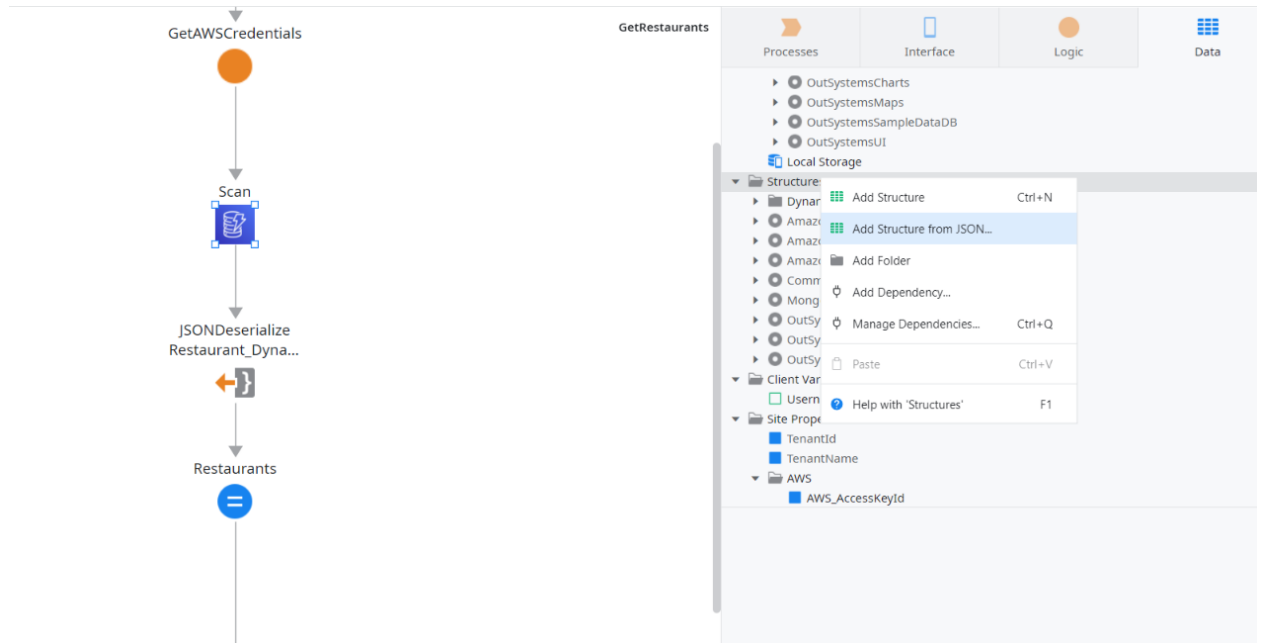
- 4) You can press enter a bit to show more information. Then let's show only one item so you can copy the JSON. Using the id from the first record do a "get-item" using the command **aws dynamodb get-item --table-name Restaurant --key**

`{"Id":{"S":"638f3b19c2b0fb839b3652b8"}}`

```
C:\Users\ama>aws dynamodb get-item --table-name Restaurant --key {"Id":{"S":"638f3b19c2b0fb839b3652b8"}}
{
  "Item": {
    "cost": {
      "S": "Expensive"
    },
    "score": {
      "N": "5"
    },
    "images": {
      "L": [
        {
          "S": "https://media-cdn.tripadvisor.com/media/photo-o/17/e1/c0/c1/one-atria-cafe.jpg"
        },
        {
          "S": "https://media-cdn.tripadvisor.com/media/photo-s/26/cb/ca/fd/one-atria-cafe.jpg"
        }
      ]
    },
    "latest_comments": {
      "L": [
        {
          "S": "Excellent breakfast"
        },
        {
          "S": "Excellent breakfast"
        }
      ]
    },
    "reviews": {
      "N": "799"
    },
    "address": {
      "S": "1 Palace Rd Lobby level, Bengaluru 560001 India"
    },
    "Id": {
      "S": "638f3b19c2b0fb839b3652b8"
    },
    "name": {
      "S": "One Atria Cafe"
    },
    "Category": {
      "L": [
        {
          "S": "Indian"
        },
        {
          "S": "International"
        }
      ]
    }
  }
}
```

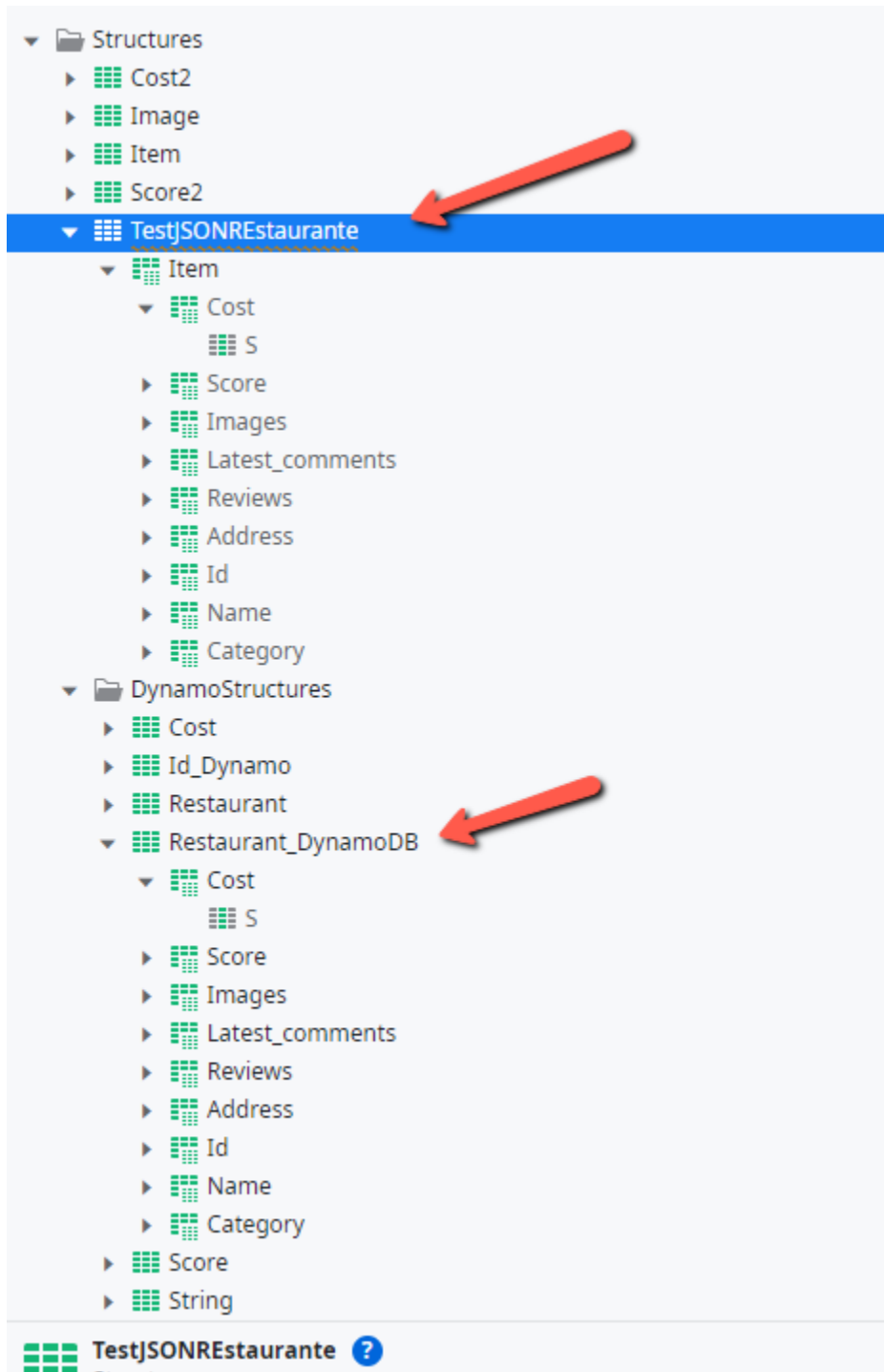
## Showing the data in Service Studio

- 5) Select the JSON and copy it. Go to **Service Studio** and open the **RestaurantFinderAWS** module. Drill down on the existing screen showing how the data is fetched. Show the **Scan** action, explaining that it is an extension done in .Net code. While explaining how we get the data and deserialize it show how to create a structure from JSON. Go to Data, right click in “structures” and select **Add Structure from JSON**:



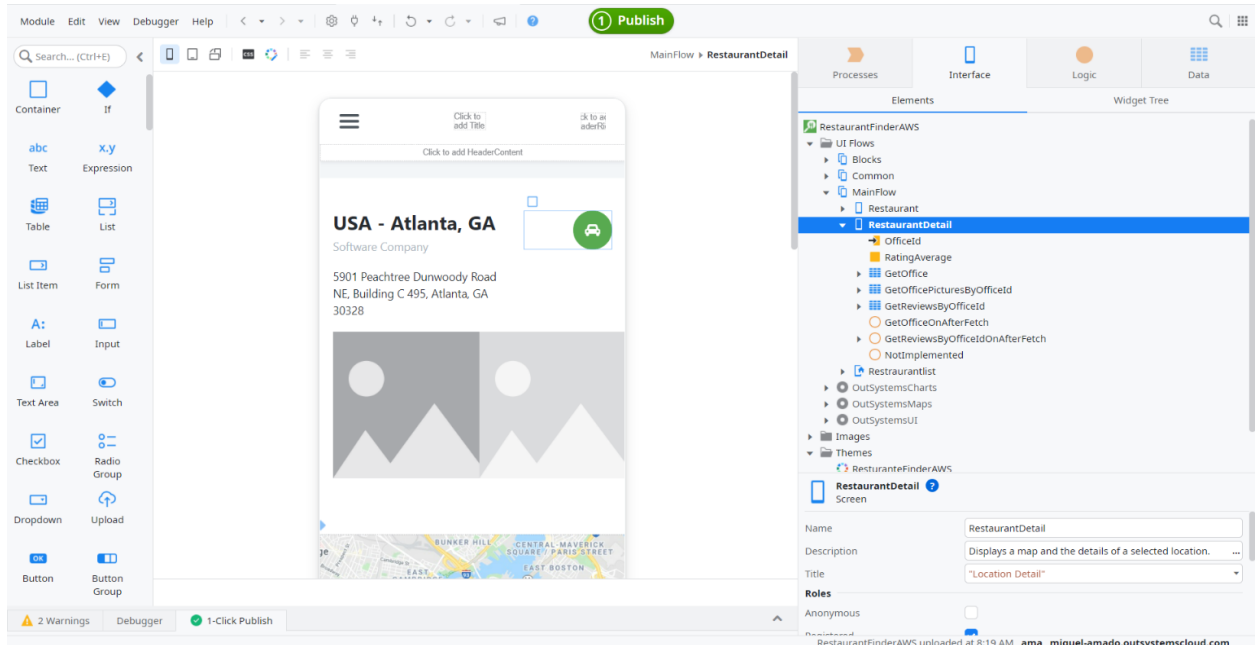


- 6) Paste the copied JSON and give it a name. Show how the created structures are equal to the ones already existing

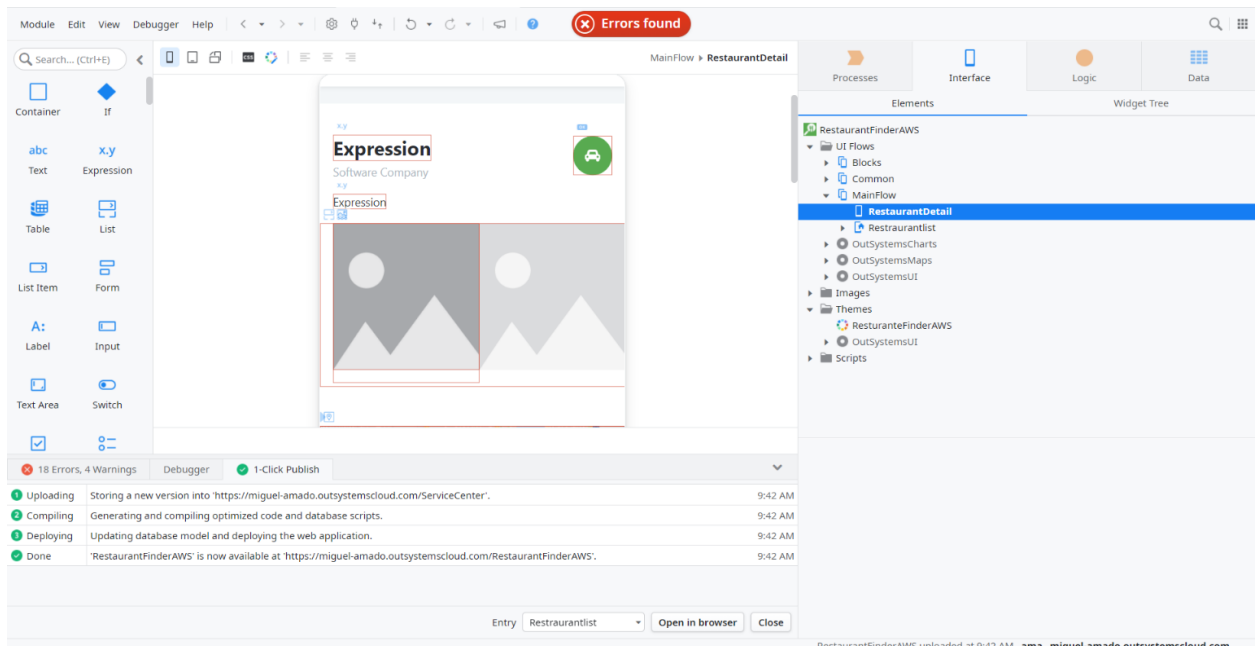


## Creating a detail Screen

- 7) Now that how we get the data is explained, let's move onto creating the new screen. Go to the **main flow** in the interface and click on the right mouse button. Add a screen. From the templates select the **"Location Detail"**. Give it the name **"RestaurantDetail"** and create it.

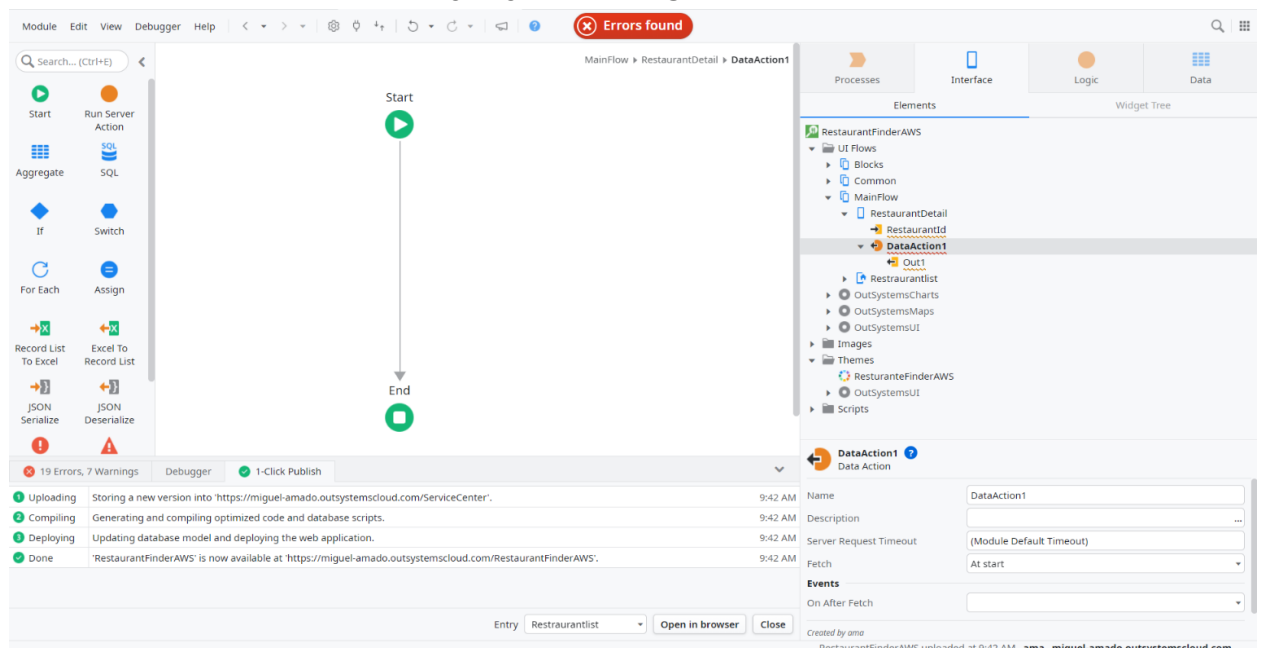


- 8) Select variables, aggregates and client actions from that newly created screen and delete them all (since we are going to fetch our own data)

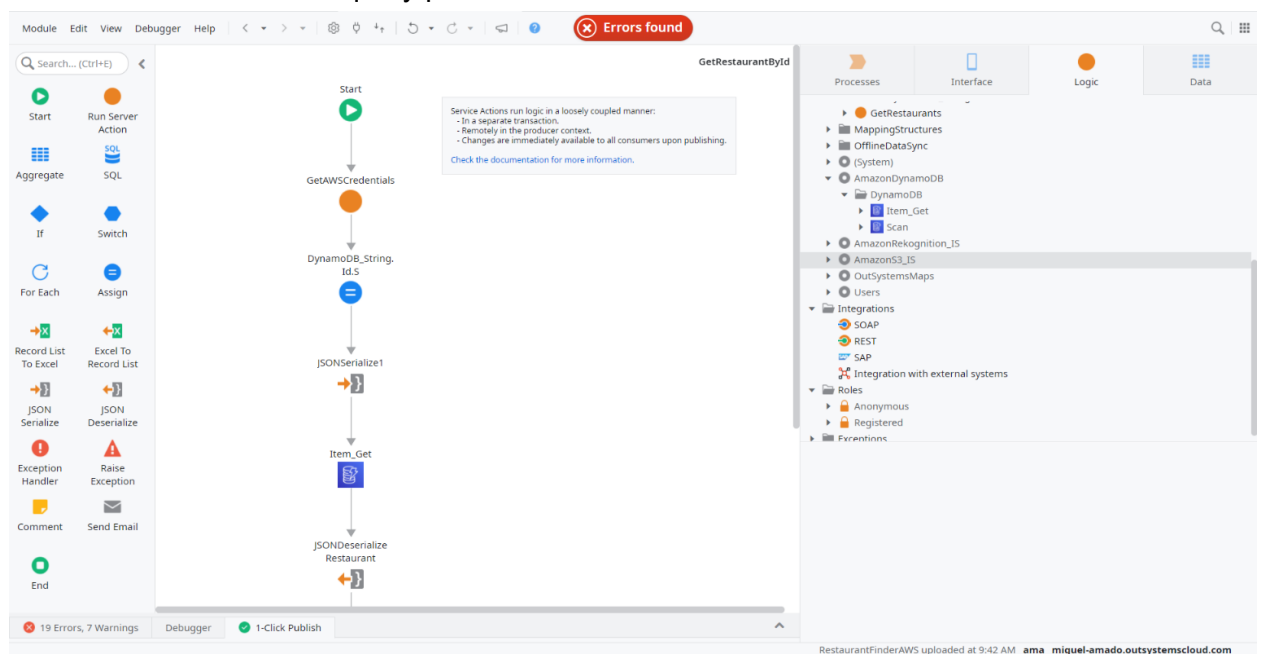


- 9) Click on the right button on top of the RestaurantDetail page and add an **input parameter** called **"RestaurantId"** of the text type. This will have the id of the restaurant

so we can query the DynamoDB to get the information. Also click on the right mouse button on top of the RestaurantDetail and add a “**Fetch Data from other Sources**”. In this server action is where we are going to use the **get-item** action



- 10) Open the Logic tab and check the **GetRestaurantById** action with the **Item\_Get** extension. **Show** how the query parameter “Id” is serialized and sent to the extension.



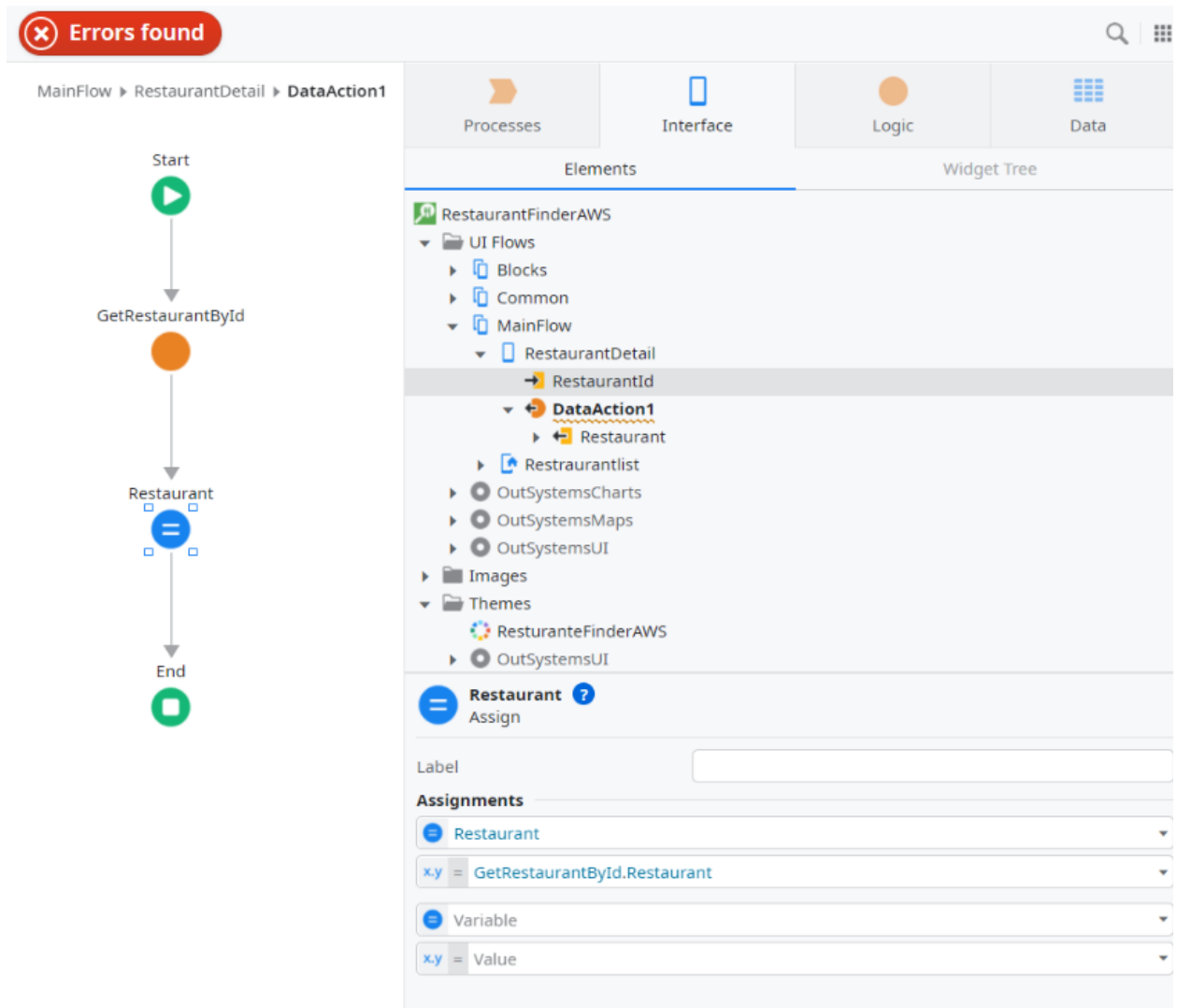
- 11) Drag the **GetRestaurantById** to the **DataAction1** of the **RestaurantDetail** screen. Pass the RestaurantId input to the input attribute of the **GetRestaurantById** action. Now copy the output of the first action (**GetRestaurantById**) to the **DataAction1** and delete the

## “Out1” output

The screenshot displays the OutSystems Studio interface. The top menu bar includes Module, Edit, View, Debugger, and Help. A red notification bar at the top right indicates "Errors found". The main workspace shows a flow diagram with the following steps: Start (green circle), GetRestaurantById (orange circle), and End (green circle). The left sidebar contains a search bar and a list of actions: Start, Run Server Action, Aggregate, SQL, If, Switch, For Each, Assign, Record List To Excel, Excel To Record List, JSON Serialize, JSON Deserialize, Exception Handler, Raise Exception, Comment, and End. The right sidebar features tabs for Processes, Interface, Logic, and Data. Below these tabs are sections for Elements and Widget Tree. The Widget Tree shows a hierarchy: RestaurantFinderAWS > UI Flows > Common > MainFlow > RestaurantDetail > RestaurantId > DataAction1 > Restaurant. The bottom status bar shows "19 Errors, 6 Warnings", "Debugger", and "1-Click Publish".

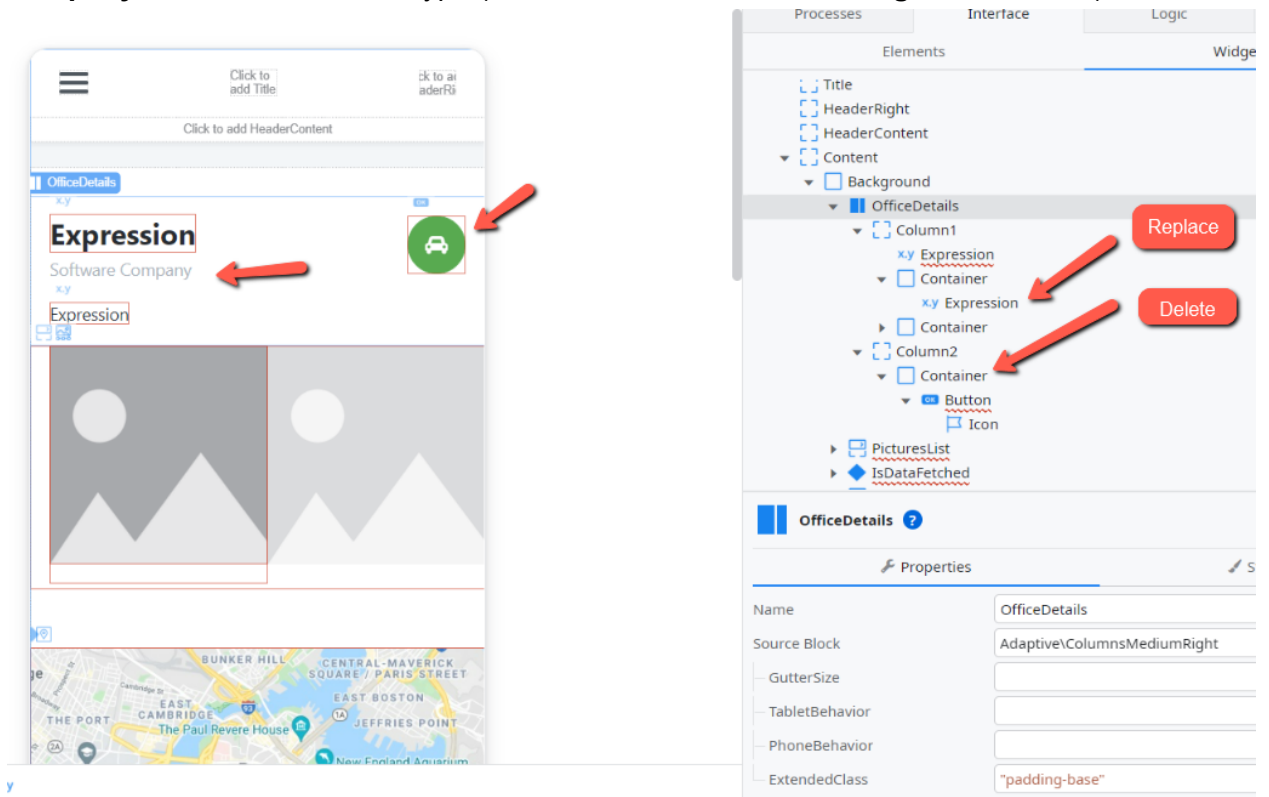
RestaurantFinderAWS uploaded on February 16 at 9:42 AM [ama.miguel-amado.outsystemscloud.com](mailto:ama.miguel-amado.outsystemscloud.com)

- 12) Drag an assign and assign the **output** of the **GetRestaurantById** action to the **Restaurant** output structure

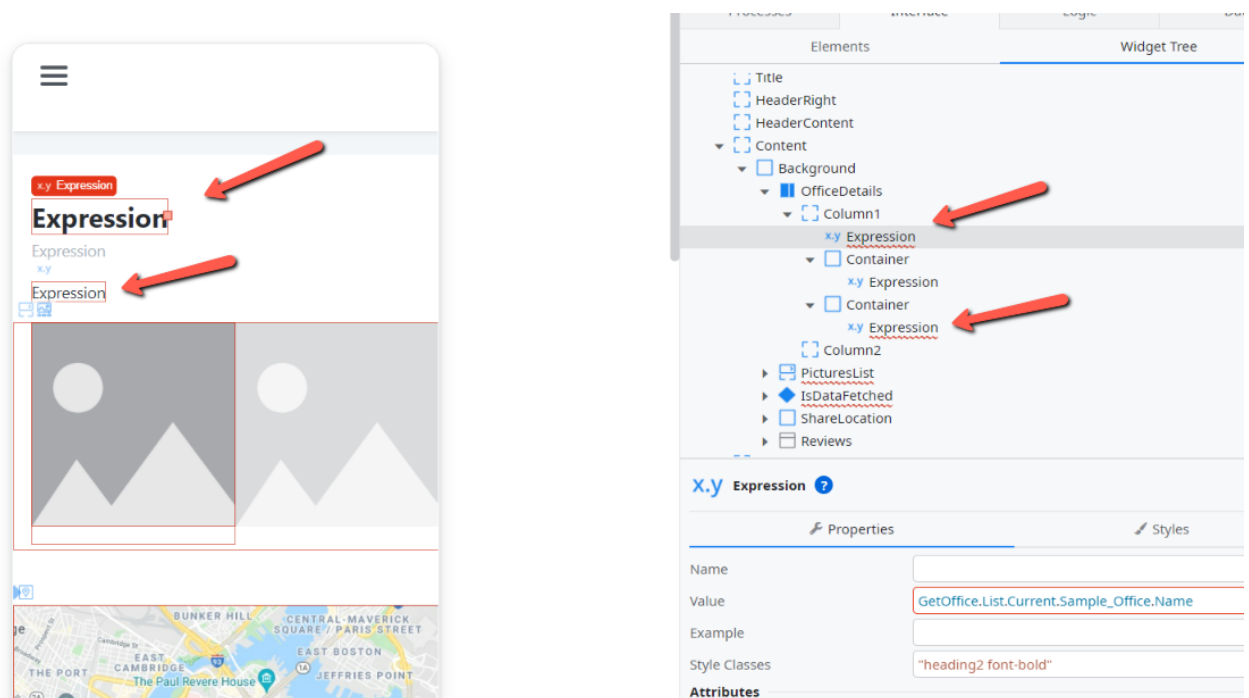


- 13) Now start replacing the different components of the UI with the outcomes from the DataAction1. Start by deleting the button with the car and replacing the “**Software**

Company” with the Restaurant type (**DataAction1.Restaurant.Categories.Current**)

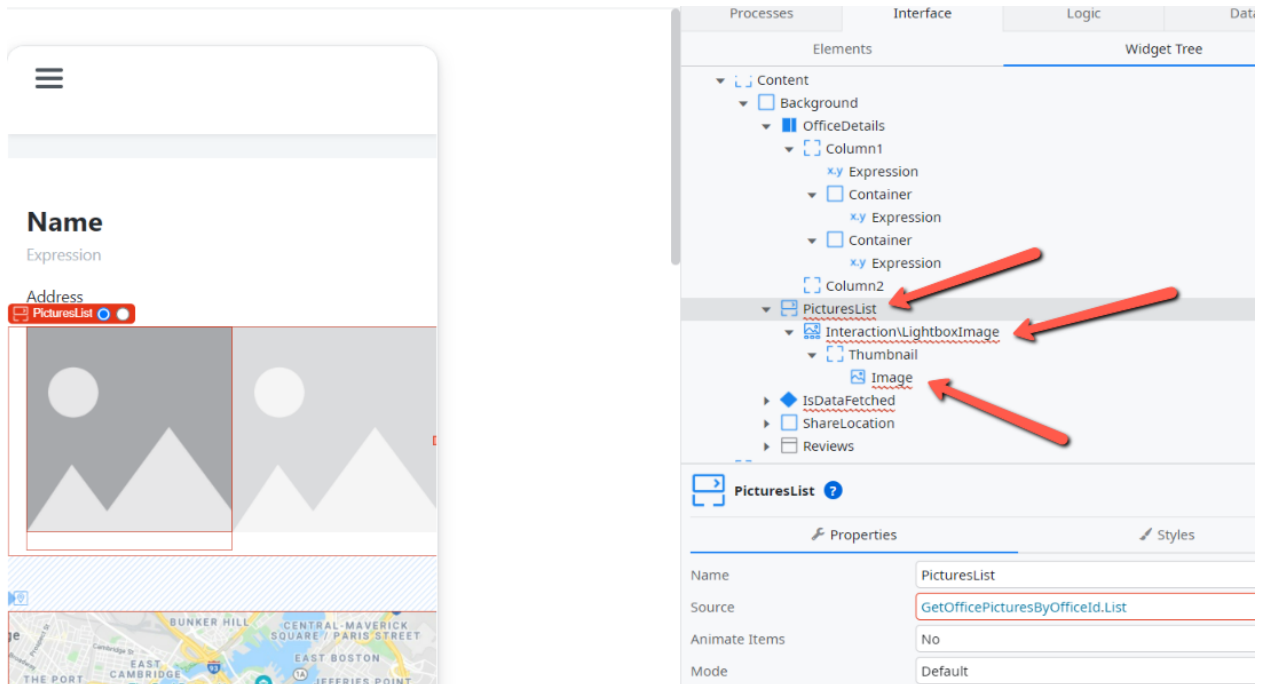


14) Replace the Title for the “**DataAction1.Restaurant.Name**” and the Address for the “**DataAction1.Restaurant.Address**”

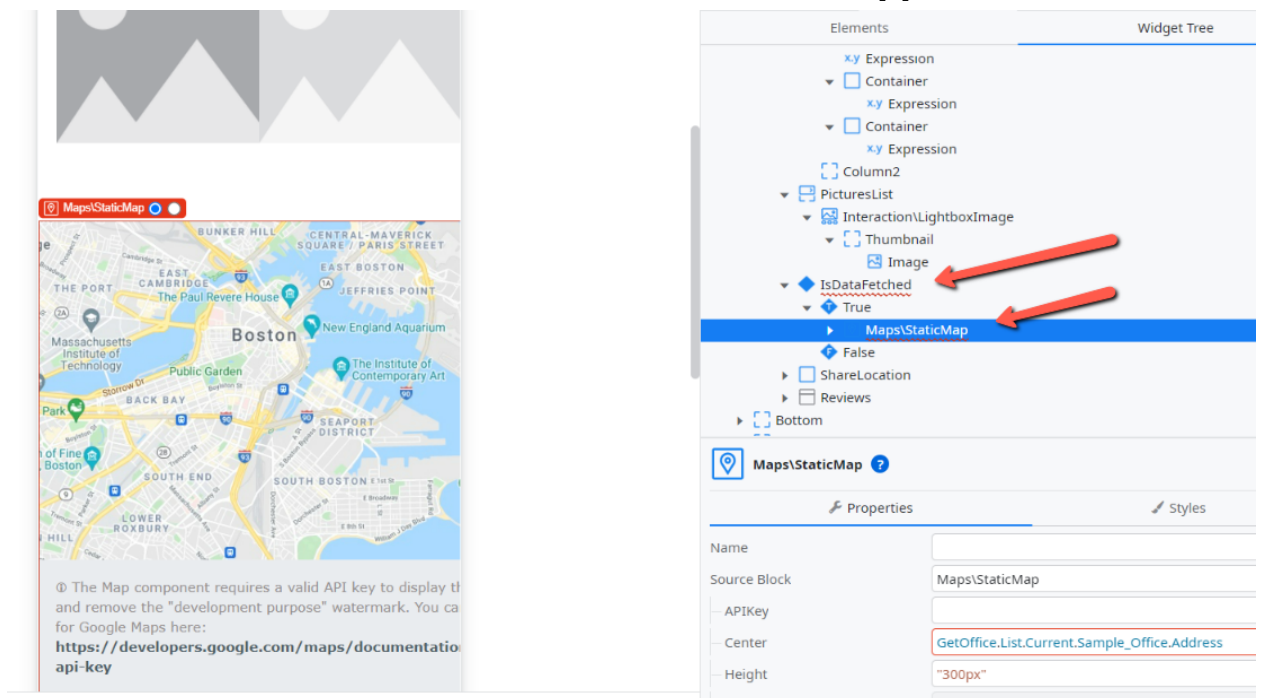


15) In the “**PictureList**” Replace the Source for the “**DataAction1.Restaurant.Images**”, the **LightboxImage** replace the **Group** attribute with the “**DataAction1.Restaurant.Name**”

and in the **Image** of the Thumbnail, change the Type to “**External URL**” and the URL to “**DataAction1.Restaurant.Images.Current**”

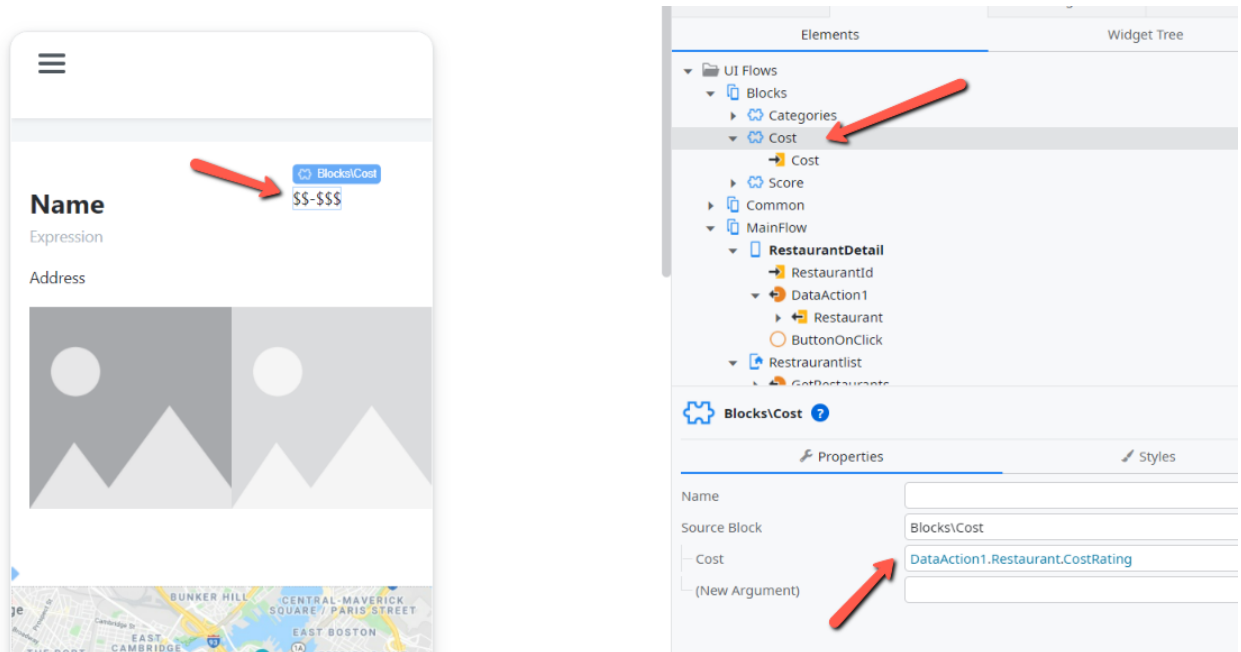


- 16) Now let's take care of the **staticmap**. Go to the “**IsDataFetched**” if statement and change the condition to “**DataAction1.IsDataFetched**”. Then on the StaticMap, for the APIKey use the already built function “**GetMapKey()**” and for the “**Center**” select the “**DataAction1.Restaurant.Address**”. Same for the StaticMarkers - [0] - **Location**

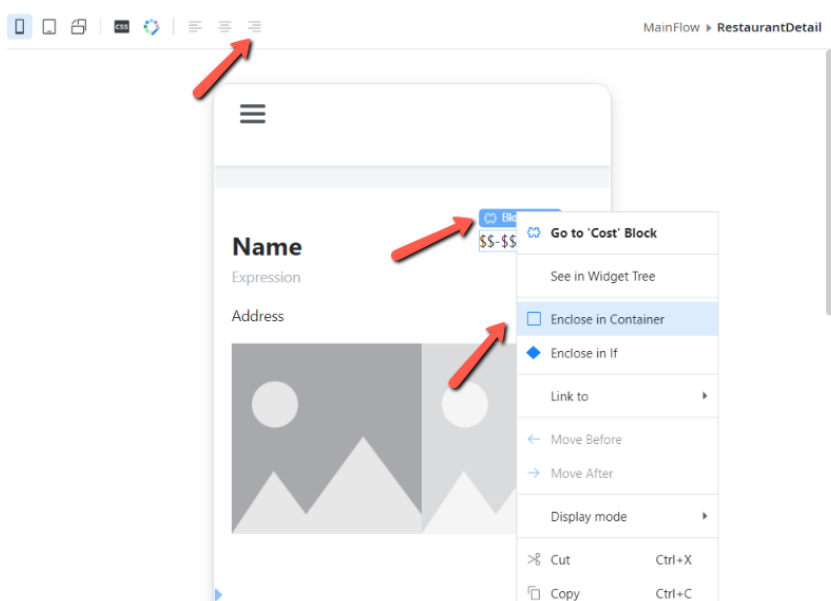


- 17) Now let's add on the top right a block to show the price range of the Restaurant. Open the **Interface tab**. On the UI Flows you have a **Blocks flow**. Open it and you'll see a

block called **“Cost”**. This is a block created by a colleague that translates the word that comes on the **“CostRating”** attribute from DynamoDB into dollar signs. We are going to reuse it on our screen. Drag the block to the right side of the Restaurant Name. On the Cost attribute of the block select **“DataAction1.Restaurant.CostRating”**



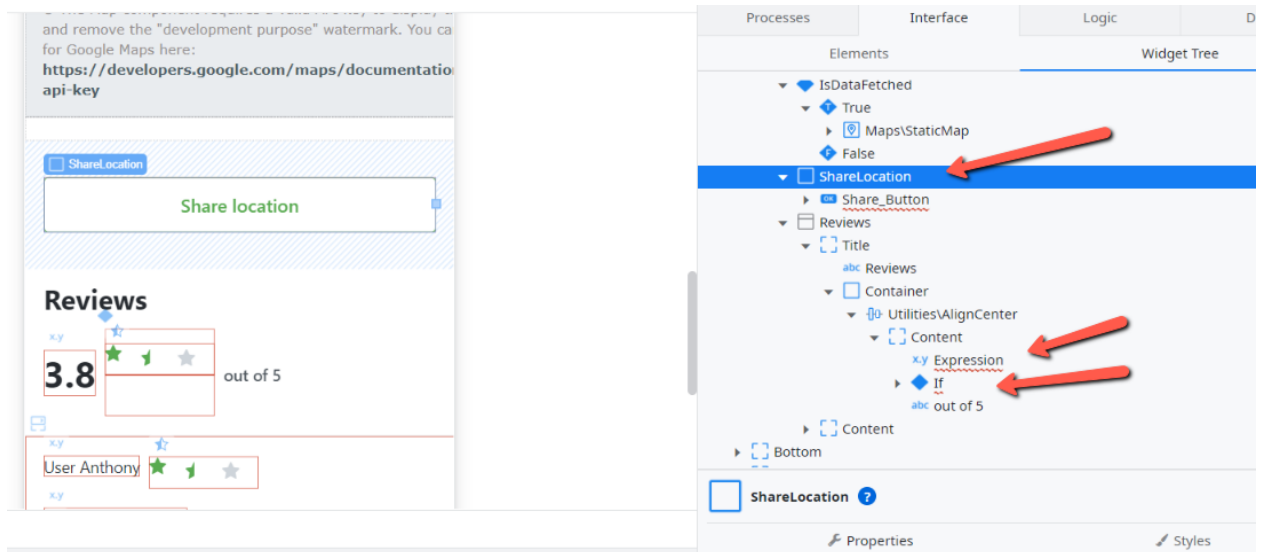
- 18) To align the component in the page you can right click on top of the block and select the **“Enclose in Container”** option. This will create a container enclosing the block. Afterwards, on the top left of the Service Studio you have the text alignment options. Choose the align right option



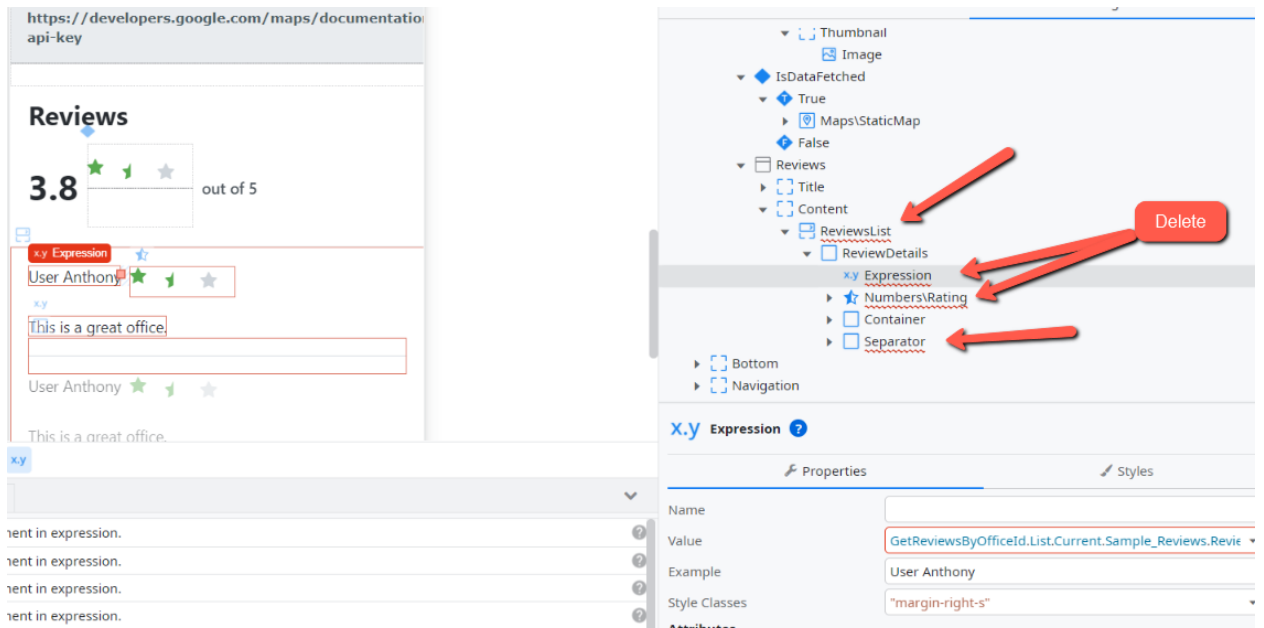
- 19) Continuing, Select the **“ShareLocation”** div and delete it. For the Reviews part, go to the first **Expression** (the big 3.8) and replace its value for the



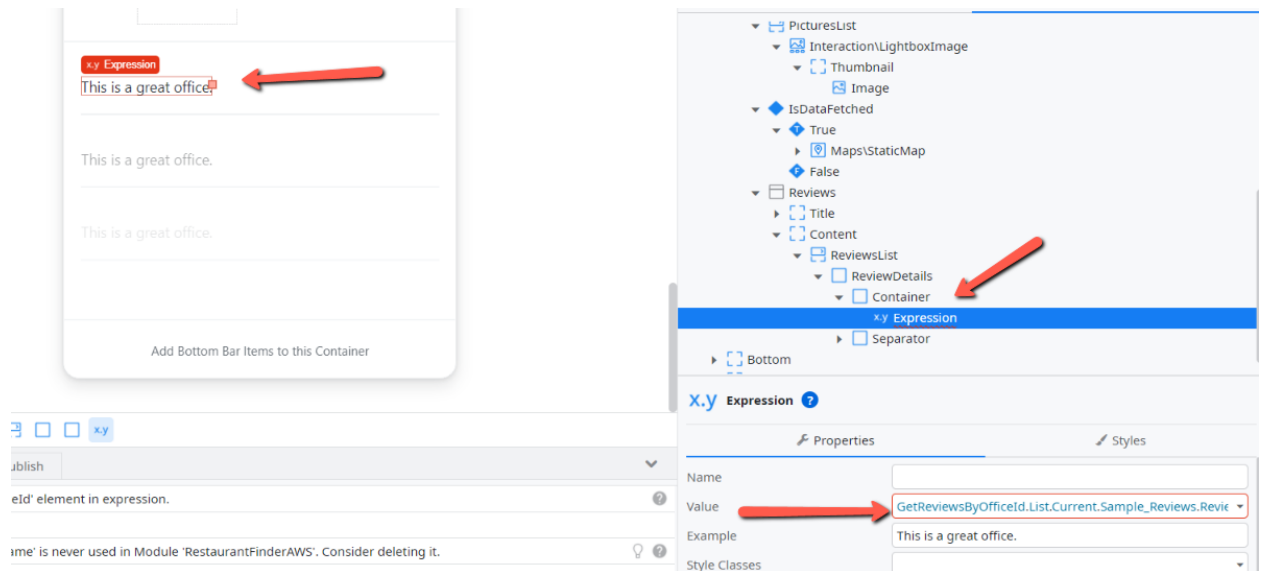
**"DataAction1.Restaurant.Score"**. Open the next **"If"**, change it's condition to be **"DataAction1.IsDataFetched"**, and change the Rating's **"RatingValue"** attribute to **"DataAction1.Restaurant.Score"**



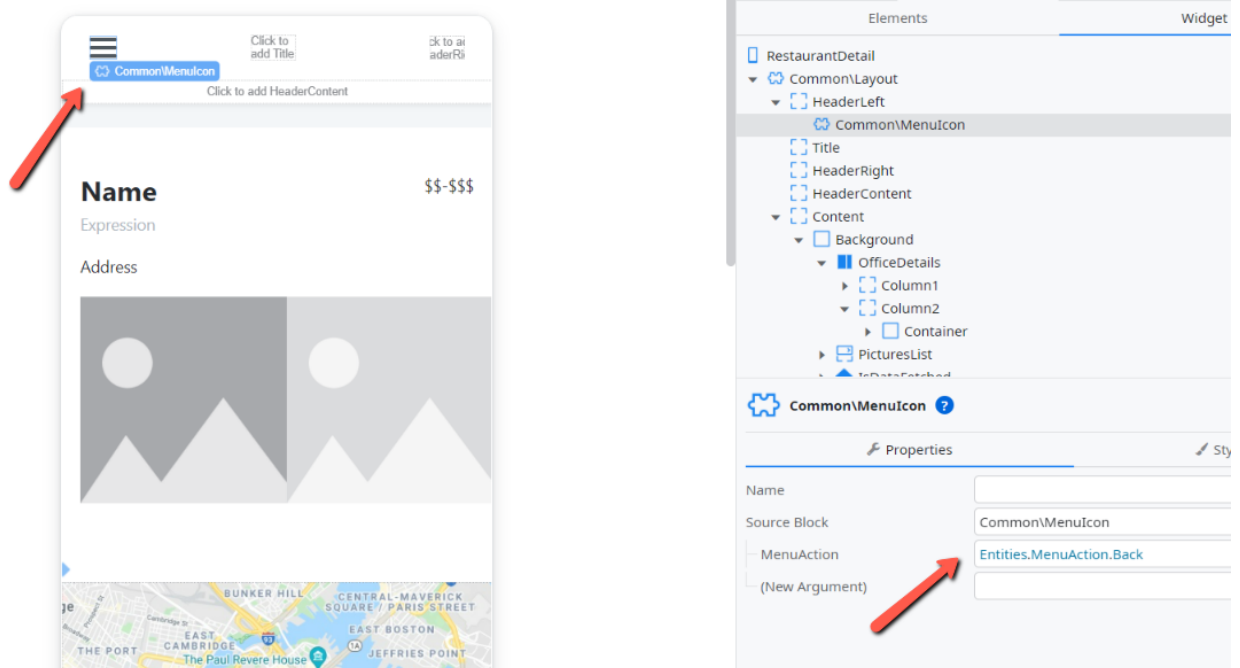
20) Now let's go to the ReviewList. Change the list's source to **"DataAction1.Restaurant.LatestComments"**. Delete the first expression and the rating (since for the review we only have the latest comments). Change the "Separator" div visible attribute from **"GetReviewsByOfficeId.List.CurrentRowNumber <> GetReviewsByOfficeId.List.Length - 1"** to **"DataAction1.Restaurant.LatestComments.CurrentRowNumber <> DataAction1.Restaurant.LatestComments.Length - 1"**. Here we are putting the logic of only having a separator if there is another comment following the current.



21) Finally, change the Expression on the Container before the separator for the **"DataAction1.Restaurant.LatestComments.Current"**



22) To finish this screen, go to the top left corner of the screen and select the menu widget. On the **"MenuAction"** attribute select **"Entities.MenuAction.Back"**. This way, the widget will have the "back" functionality



23) Now you should have the environment free of errors and ready to publish. We just need to create a connection between the Landing **Restaurantlist** page to this detail. Open the **Restaurantlist** page, select the **TextContainer**, and on the Events option select the

“onclick” event and on the Handler choose on the Suggestions “New Client Action”.

The screenshot displays the Axure RP software interface. The top toolbar includes icons for settings, zoom, and navigation, along with a red "Errors found" button. The main canvas shows a mobile app prototype for a restaurant listing. A red arrow points to a "TextContainer" element on the screen. The right-hand sidebar is divided into "Elements" and "Properties" sections. The "Elements" section shows a hierarchical tree of the app's structure, with "Restaurantlist" selected. The "Properties" section shows the configuration for the selected "TextContainer" element. The "Events" tab is active, showing an "onclick" event with a red arrow pointing to the "Handler" field, which is currently empty. Below the canvas, a console area displays error messages, including one stating "name" is never used in Module "RestaurantFinderAWS".

Errors found

MainFlow ▶ Restaurantlist

TextContainer

1. Name  
4.3 (234 reviews)  
Indian • \$\$\$\$  
Taking safety measures  
"Amazing pasta."  
"Amazing pasta."  
"Amazing pasta."

UI Flows  
Blocks  
Common  
MainFlow  
RestaurantDetail  
RestaurantId  
DataAction1  
Restaurant  
Restaurantlist  
OutSystemsCharts  
OutSystemsMaps  
OutSystemsUI  
Images  
TextContainer

Properties

Name: TextContainer  
Visible: True  
Animate: No  
Style Classes: "rest-wrapper"

Attributes

Property: Value

Events

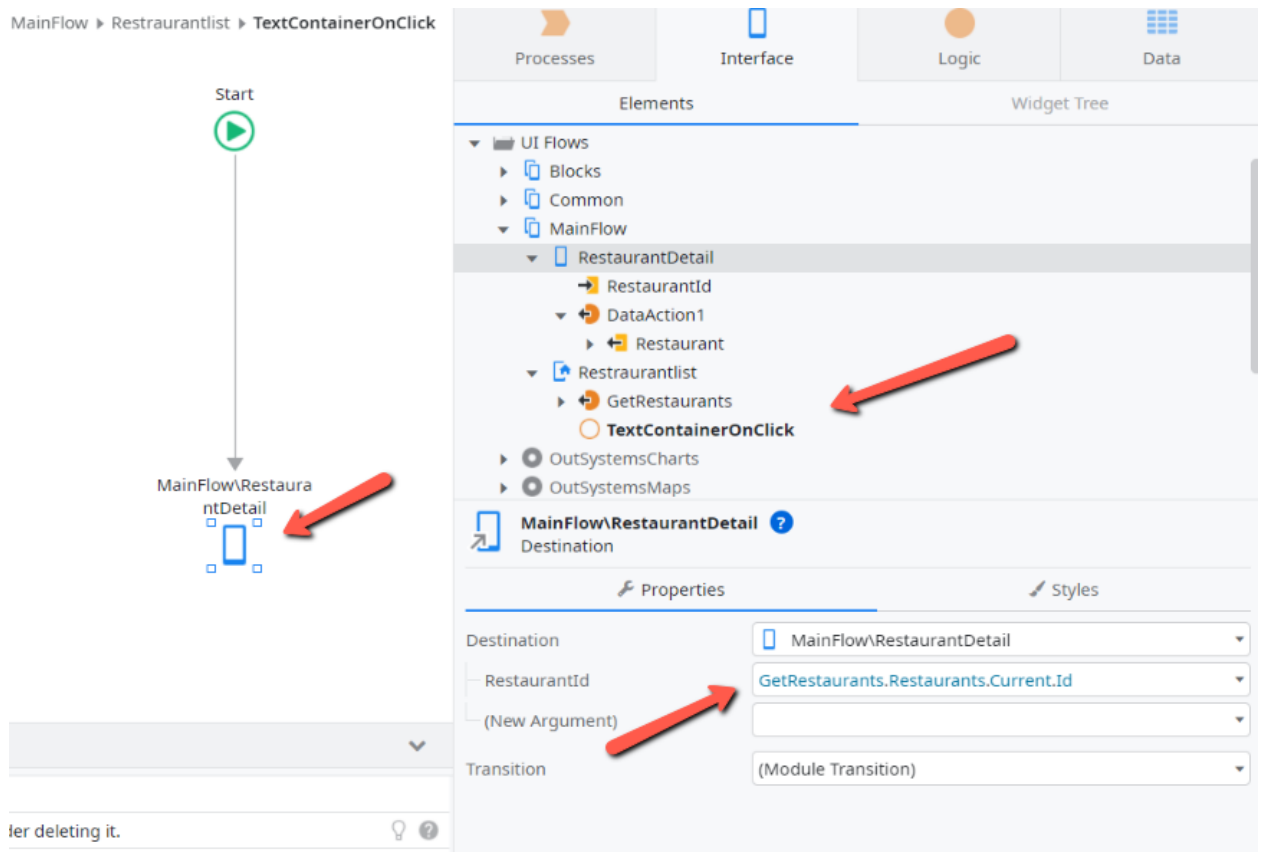
Event: onclick  
Handler:

et.

ame' is never used in Module 'RestaurantFinderAWS'. Consider deleting it.

warning. Double-click the above messages to highlight the issue or right-click for more options.

24) On the new created client action drag the **RestaurantDetail** screen to replace the end node and for the RestaurantId define the “**GetRestaurants.Restaurants.Current.Id**”




25) Publish and watch the results. You can turn the app into a PWA application for people to scan the qr code with their phone and try out. You can go to Service Studio, find the Restaurant Finder (AWS) application and on the Distribute tab, click on the toggle for

# “Distribute as PWA” application

EnvironmentEditHelp<>⚙️🗨️📄📦

[Back to applications](#)




Restaurant Finder (AWS)


[Edit](#)[Delete](#)[Download](#)[Test In Browser](#)


DevelopDistribute

### Native Platforms

Generate a mobile app that can be distributed through app stores and can use native capabilities.


 [Generate Android app](#)

 [Generate iOS app](#)

 [Generating and testing mobile apps](#)


### Progressive Web App (PWA)

Mobile-optimized apps that work on any device and can be installed from the browser.



Scan the code to access your app and add it to your device's home screen.  
You can also [click here to open in the browser](#)

☒ **Distribute as PWA**  
No configurations or developer account needed.

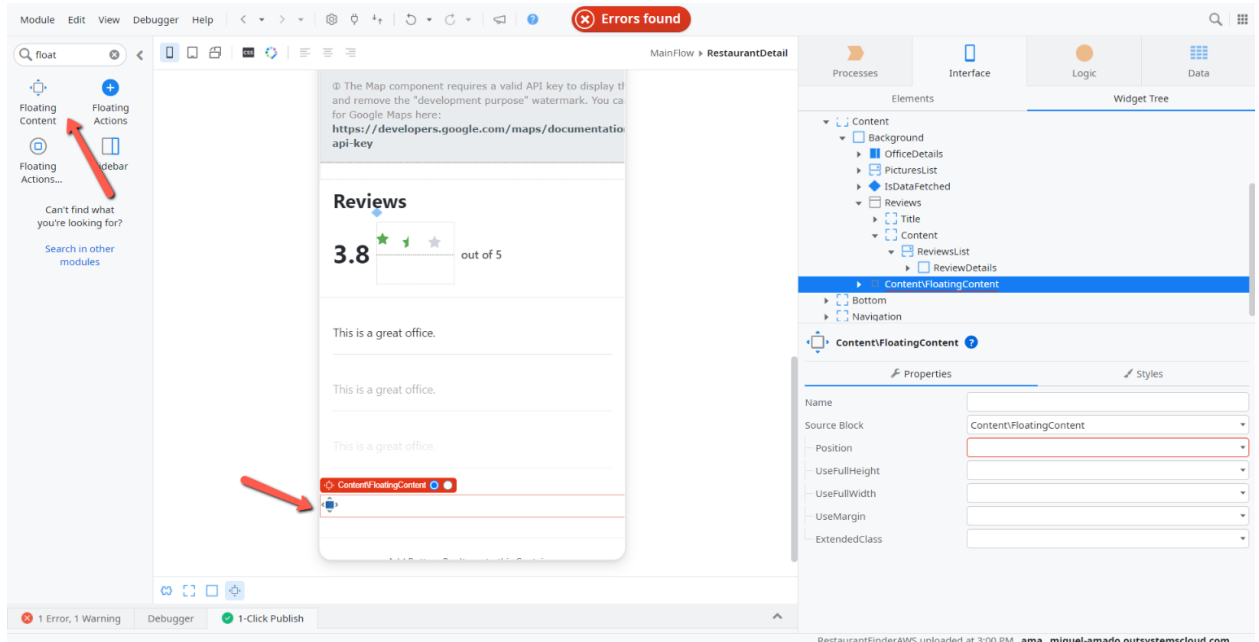
 [Distributing and customizing PWAs](#)

Service Studio 11.53.39

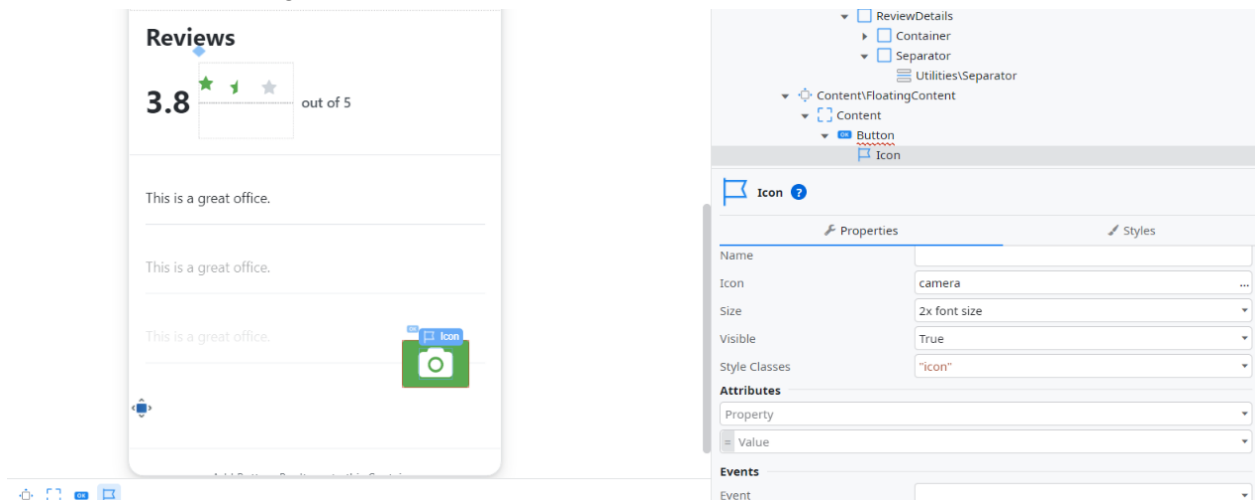
ama miguel-amado.outsystemscloud.com

## Adding UI to take pictures

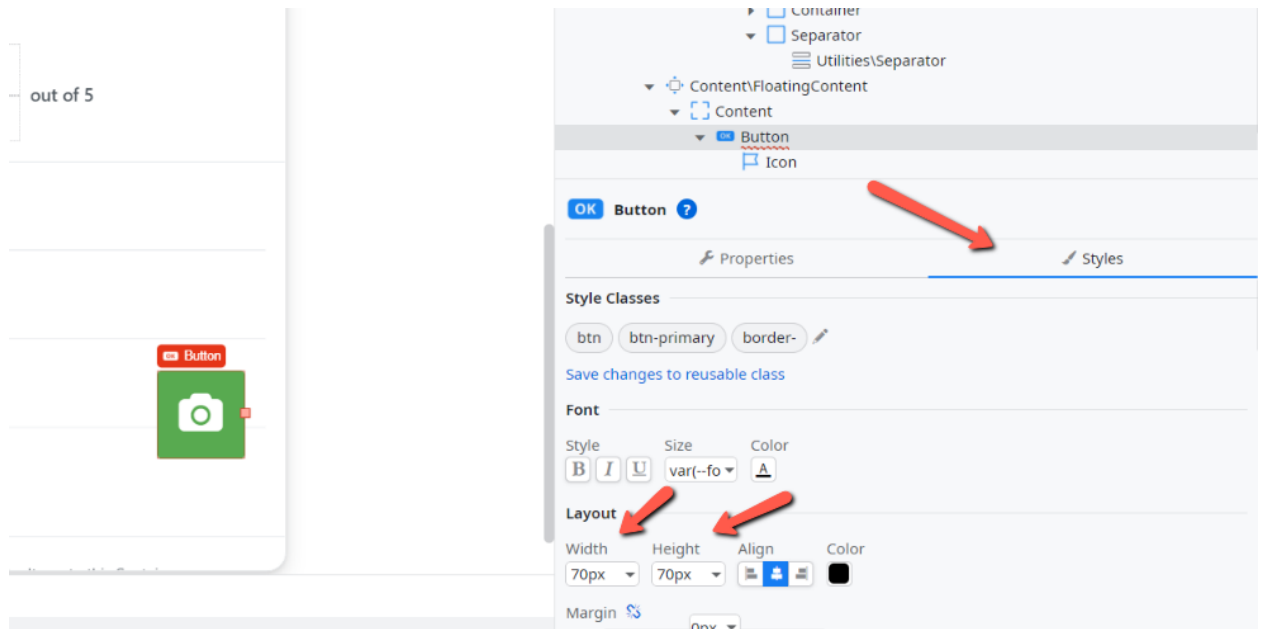
26) Let's add an action to take pictures and send them to S3. Go to the **RestaurantDetail** Screen and add a **"Floating Content"** widget to the bottom of the page



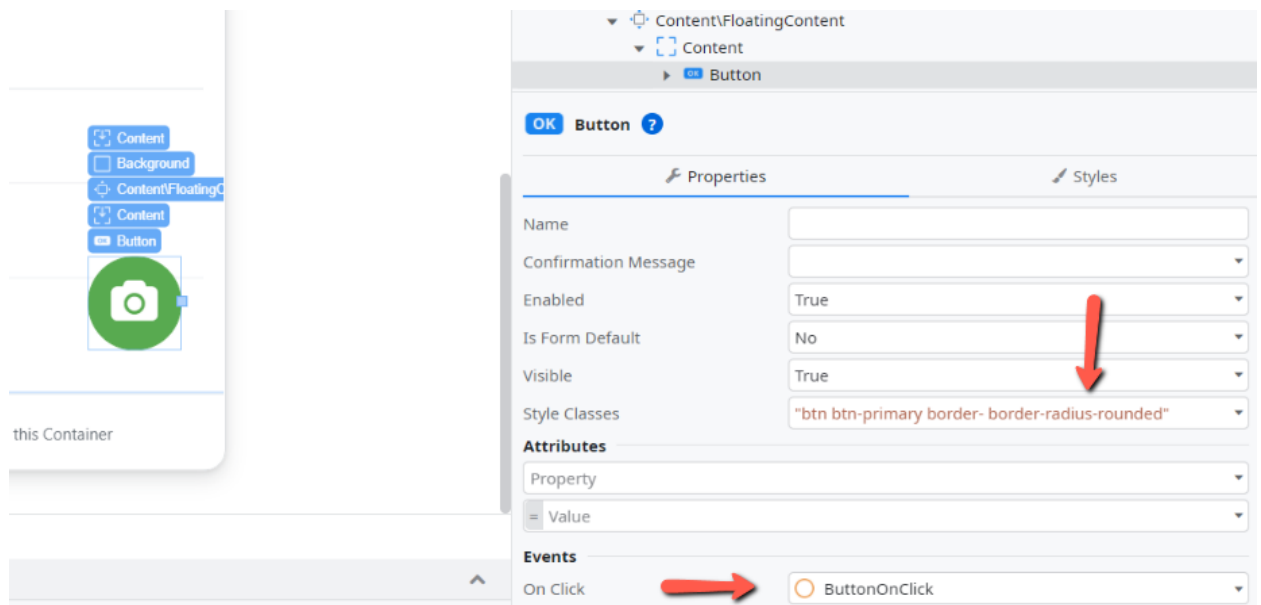
27) Define the Position to be on the bottom right (**Entities.Position.BottomRight**). Then drag a button to the content of the **"FloatingContent"**. Replace the expression of the button for an icon widget with the camera icon.



28) Select the button, change from the “**Properties**” tab to the “**Styles**” tab on the bottom right, select the width to be 70px and the height to be 70px

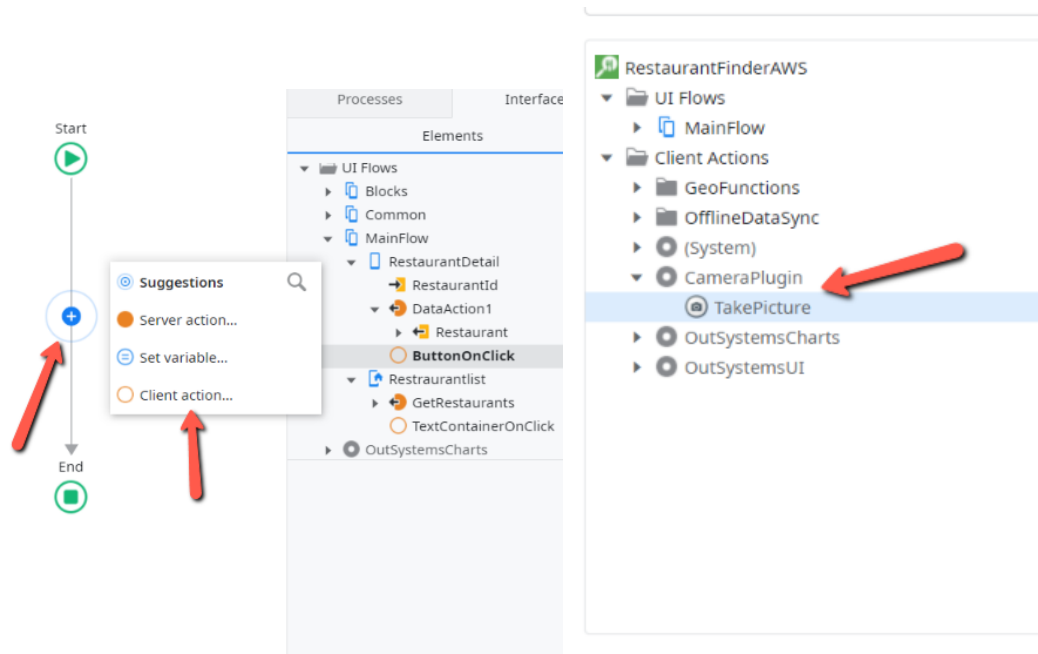


29) Switch back to the “**Properties**” Tab, and on the “**Style Classes**” at the class “**border-radius-rounded**”. On the Event’s “**onClick**”, select to create a “**New Client Action**”

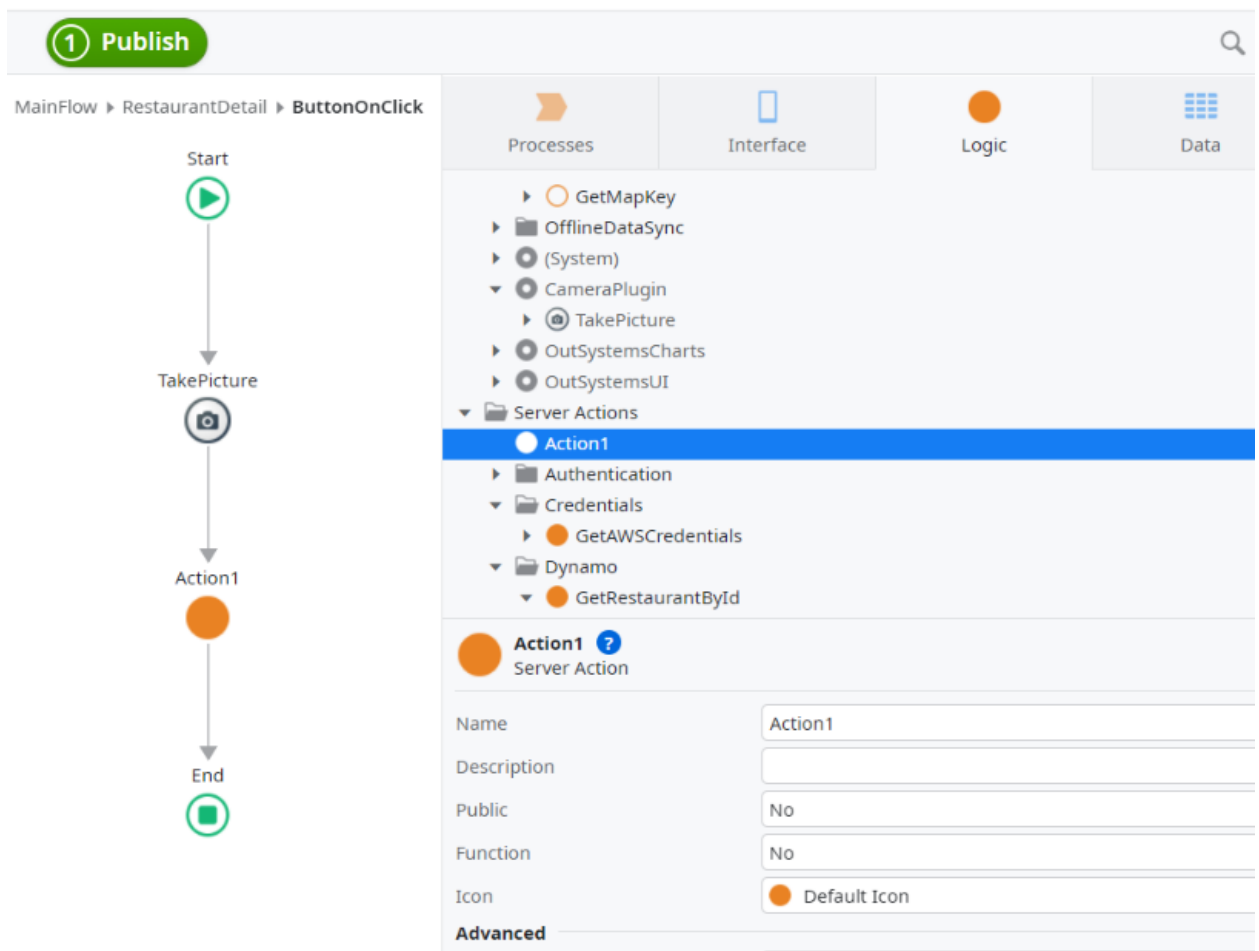


30) On this new action click on the “**plus button**” in the middle of the flow and select a “**Client Action**”. Then select the “**CameraPlugin**” dependency, and select the

“TakePicture” action.



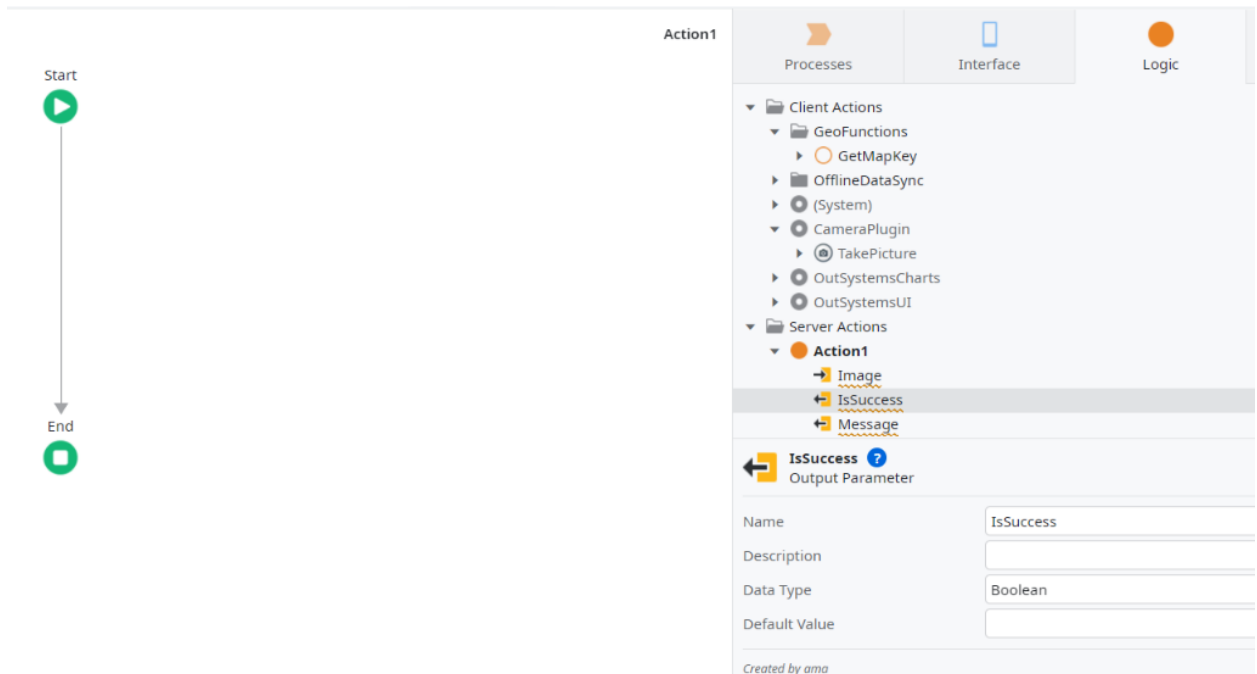
31) Now do the same but to create a new Server Action



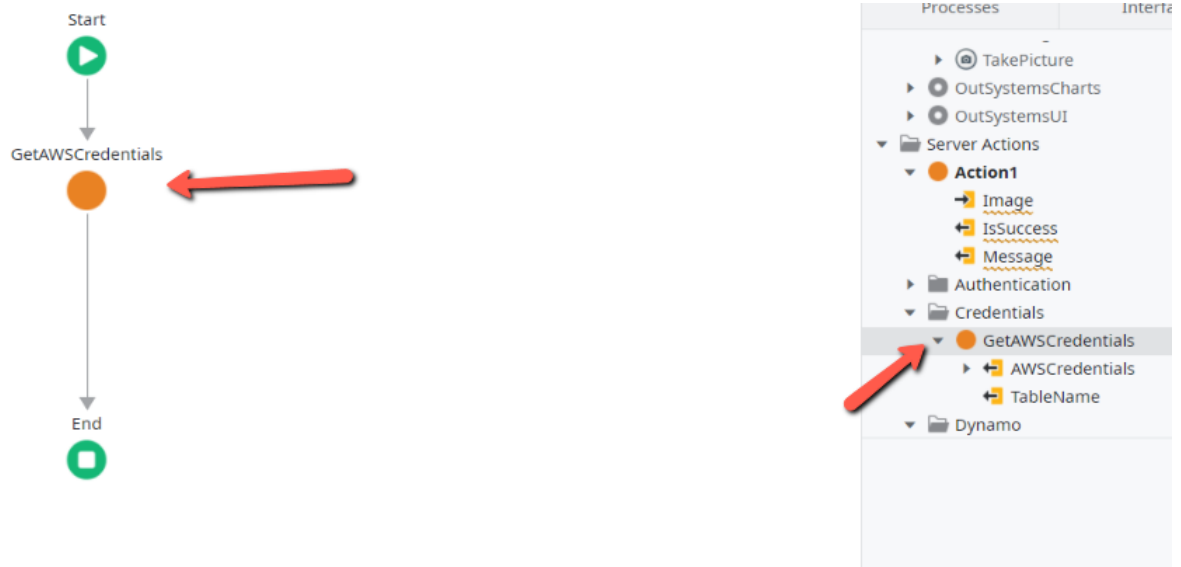


## Rekognition + S3

- 32) Let's build the server action to check if the pictures are from restaurants or food, before uploading them to S3. Open the Action1 from the logic tab and add an input parameter called Image with the type Binary. Add an output parameter called IsSuccess with the type boolean, and another output Text variable called Message

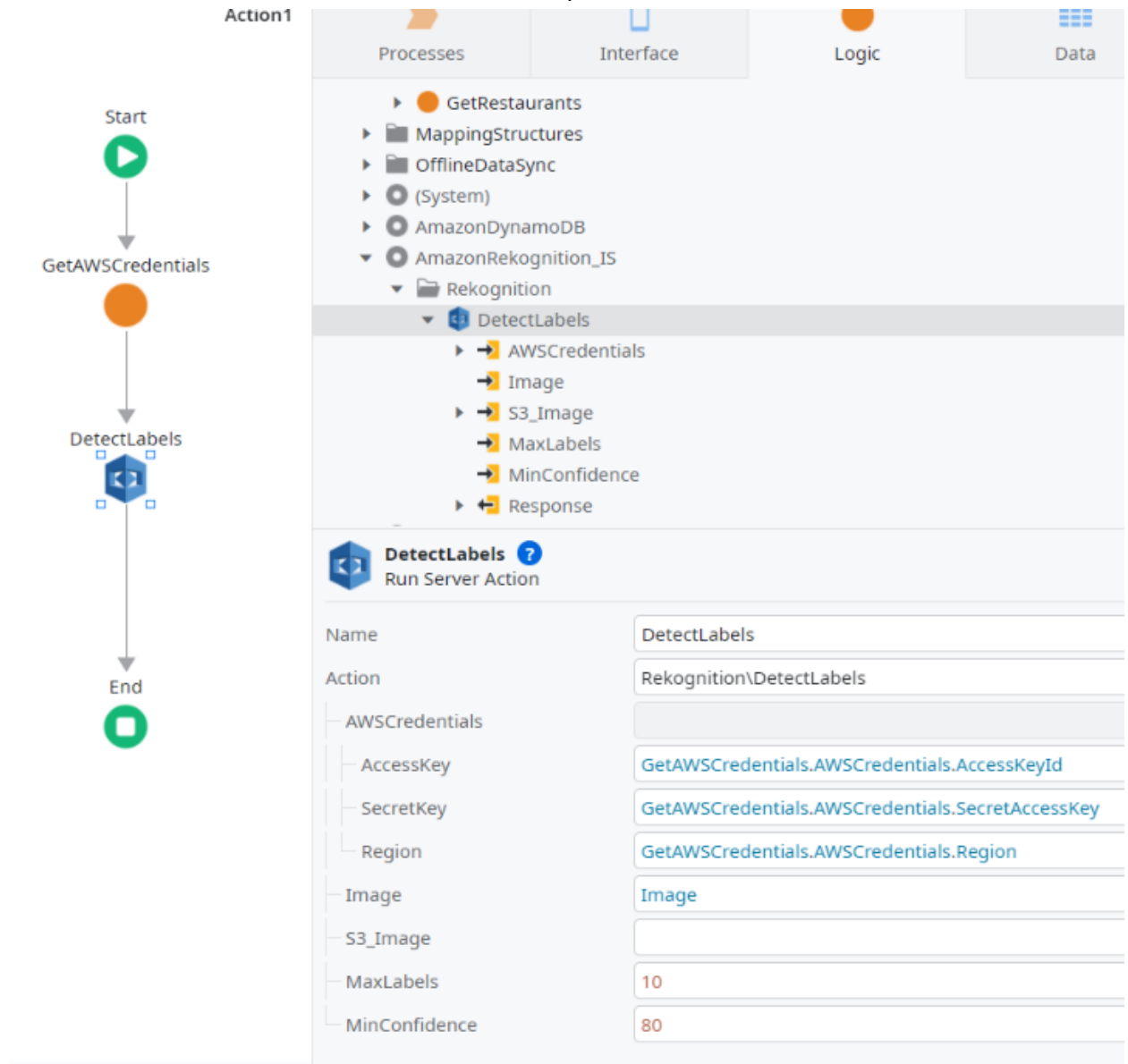


- 33) In the Logic tab, from the Credentials folder, drag the GetAWSCredentials action. This action returns the keys needed to use the AWS IAM user with access to the necessary APIs

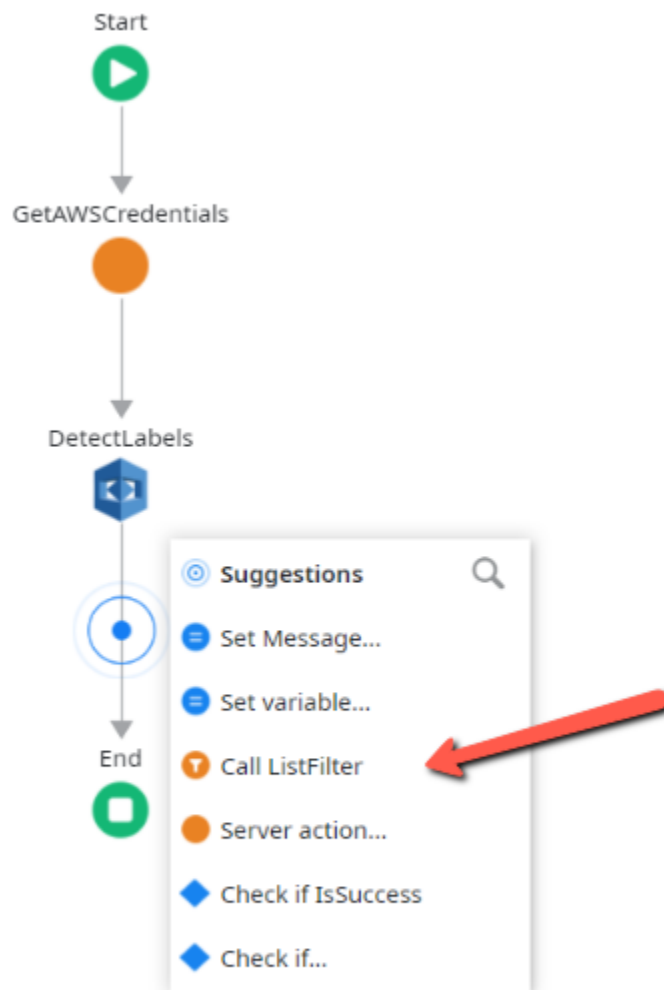


- 34) From the AmazonRekognition\_IS, drag the DetectLabels action. If you hover with the mouse on the left of the AWSCredentials attribute you'll be able to click on a plus sign.

Map the outputs from the **GetAWSCredentials** action to the **AccessKey**, the **Secret Key** and the **Region**. Also pass to the Image attribute the **input image**. The **max labels** define 10 and the **MinConfidence** define 80. This way the **DetectLabels** will return a list of a maximum of 10 labels all with confidence superior to 80%

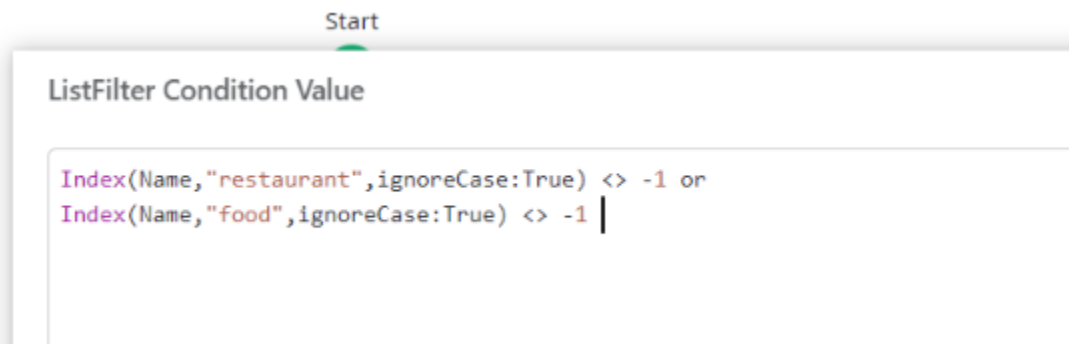


35) Click on the blue dot after that action to get some AI suggestions and put a list filter. It will have pre-selected the SourceList.

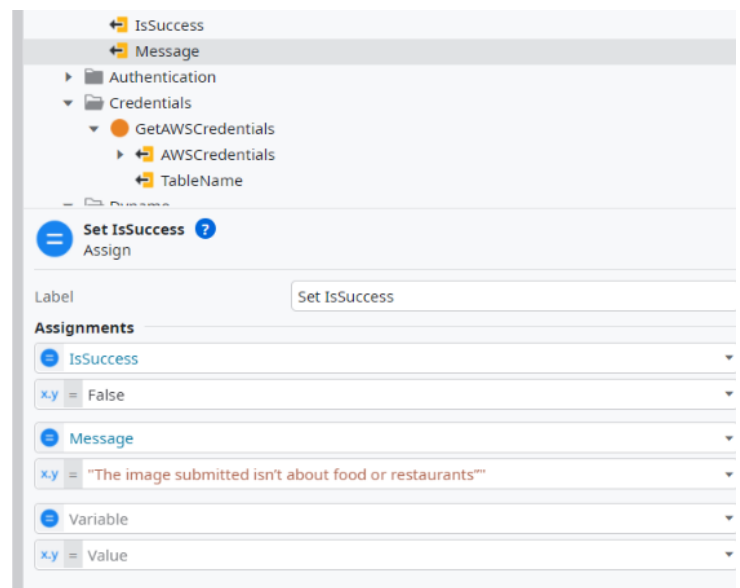
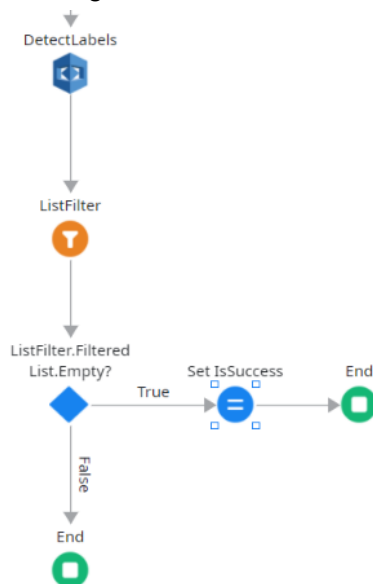


36) For the condition we are going to check if any of the Labels are for **“Restaurant”** or for **“food”** to make sure that the uploaded image is indeed useful to add to the restaurant. To compare the text we are going to use the Index function that returns **“-1”** if the text passed is not found: On the condition attribute put **“Index(Name,“restaurant”,ignoreCase:True) <> -1 or**

**Index(Name,"food",ignoreCase:True) <> -1"**

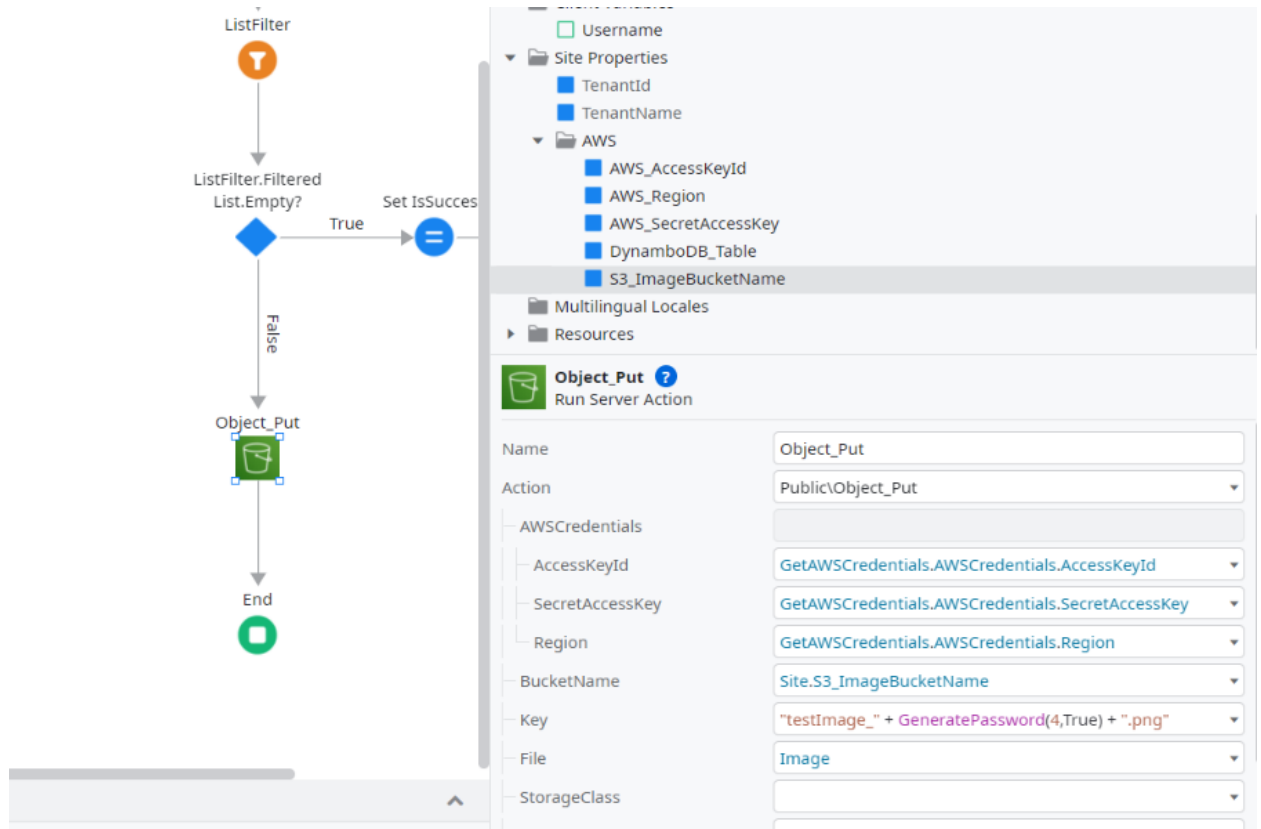


- 37) To check if Rekognition was able to identify a label of food or restaurant with enough confidence we just need to check if the list filtered is not empty. Put an if statement, where you check for **"ListFilter.FilteredList.Empty"** and pull a True branch from the if, that connects to an Assign that defines the IsSuccess as false and defines the message as "The image submitted isn't about food or restaurants"

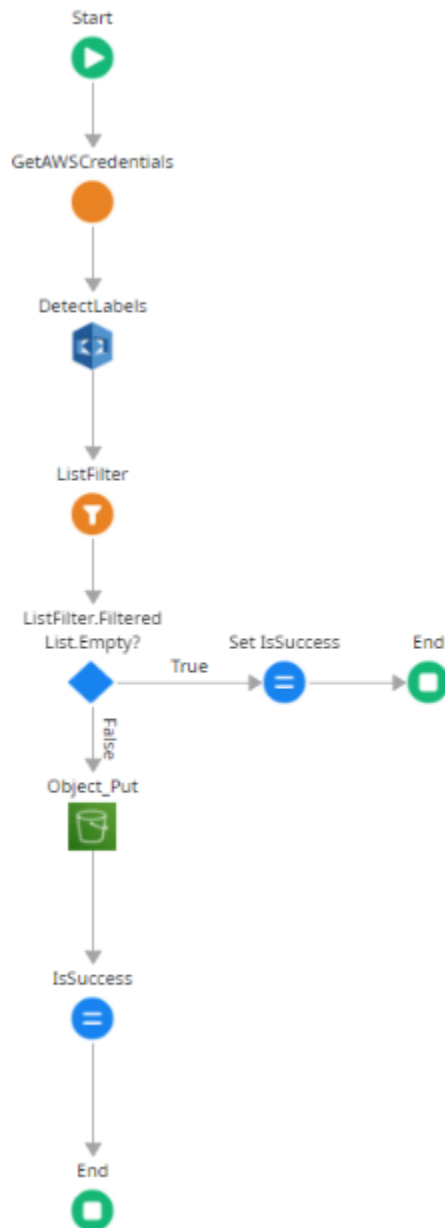


- 38) On the false branch, you can now drag the **"Object\_Put"** action from the **AmazonS3\_IS** dependency. Map the **AWSCredentials** as you already have done for the **"DetectLabel"**. Get the bucket name by putting the site property **Site.S3\_ImageBucketName**. For the key generate a name for the imagefile in the bucket and you can use the **"GeneratePassword()"** function to generate a random text for the images to have different identifiers. You can give the key **"testImage\_" + GeneratePassword(4,True) + ".png"** to get a file name like "testImage\_2f43.png". Fine assign the input image to the

“file” attribute

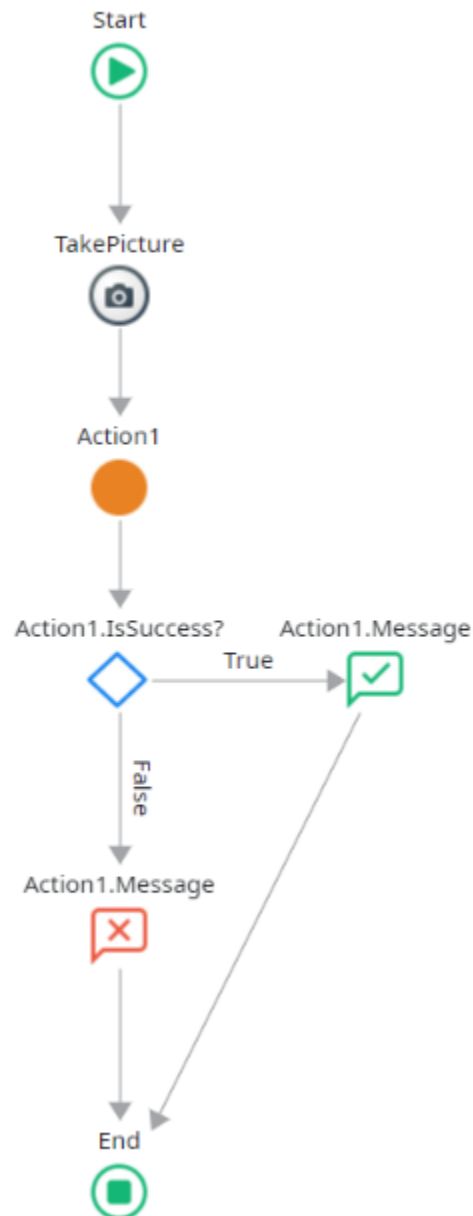


39) To finish the action, get an **Assign**, put the **IsSuccess** as true and the server action is finished. Assign the Message “Upload successful” to the **Message** output



## Finishing up

- 40) Now go to the “**ButtonOnClick**” client action on the **RestaurantDetail** screen and in the image attribute of this created action, put the image captured of the “**TakePicture**” action. No add an **IF** checking the **IsSuccess** boolean from **Action1**. In the true branch give a positive Message with the **message** output of the server action. In the false branch do the same but with a red message.



- 41) To test it out use the application, try to take a picture of a blend background and see if we get the negative message. Then try to take a picture of food or a restaurant setting and it should give the positive message of a successful upload.

- 42) Get back to the AWS CLI. You can run a command to check the content of the bucket **aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize** Run before and after you take a successful picture.

```
Command Prompt
Microsoft Windows [Version 10.0.19044.2486]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ama>aws s3api list-buckets --output json
{
  "Buckets": [
    {
      "Name": "os-restaurant-images",
      "CreationDate": "2023-02-01T09:28:15+00:00"
    }
  ],
  "Owner": {
    "DisplayName": "aws_osacc02520",
    "ID": "a7ccf6de7418f25058dec33be35bce327d359cd9edc81d521699760b6f66a6d7"
  }
}

C:\Users\ama>aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize
2023-02-02 11:41:55    18.4 KiB restaurants_Dynamo.json
2023-02-19 18:19:55    11.8 KiB testImage_OaNN.png
2023-02-07 18:52:18    48.1 KiB testkey

Total Objects: 3
Total Size: 78.4 KiB

C:\Users\ama>
```

- 43) You can copy the file to your desktop using the following command as an example: **aws s3 cp s3://os-restaurant-images/testImage\_OaNN.png .**

```
Command Prompt
'clear' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\ama>aws s3api list-buckets --output json
{
  "Buckets": [
    {
      "Name": "os-restaurant-images",
      "CreationDate": "2023-02-01T09:28:15+00:00"
    }
  ],
  "Owner": {
    "DisplayName": "aws_osacc02520",
    "ID": "a7ccf6de7418f25058dec33be35bce327d359cd9edc81d521699760b6f66a6d7"
  }
}

C:\Users\ama>aws s3 ls s3://os-restaurant-images --recursive --human-readable --summarize
2023-02-02 11:41:55    18.4 KiB restaurants_Dynamo.json
2023-02-19 18:19:55    11.8 KiB testImage_OaNN.png
2023-02-07 18:52:18    48.1 KiB testkey

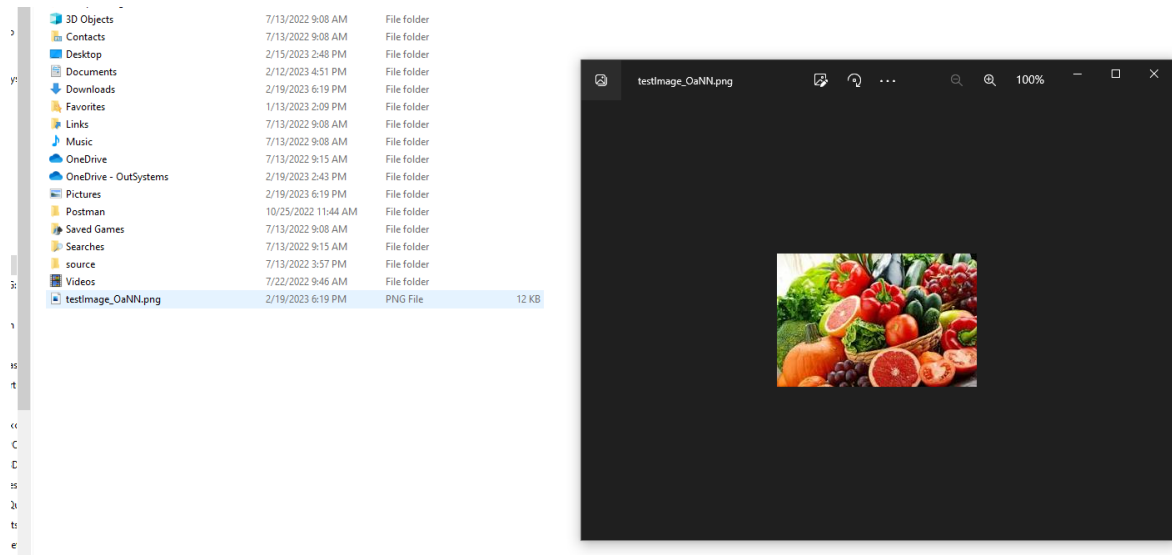
Total Objects: 3
Total Size: 78.4 KiB

C:\Users\ama>aws s3 cp s3://os-restaurant-images/testImage_OaNN.png .
download: s3://os-restaurant-images/testImage_OaNN.png to .\testImage_OaNN.png

C:\Users\ama>
```



44) Then you can open your file browser in the desktop and show the copied image



45) You are finished with the Demo. But from the upload of the image to S3 you can extend your solution in AWS. You could trigger a Lambda function from the S3 that could process the upload image, creating a thumbnail image and normalizing it and that could change it to a repository where all user uploaded pictures are. Then the lambda could add it to the DynamoDB database