CLOUD APPLICATION DEVELOPMENT

List of Practical:		**sign**
1.	Develop an ASP.NET Core MVC based Stateless Web App.	
2.	Develop a Spring Boot API.	
3.	Create an ASP.NET Core Web API and configure monitoring.	
4.	a. Create an Azure Kubernetes Service Cluster	
	b. Enable Azure Dev Spaces on an AKS Cluster	
	c. Configure Visual Studio to Work with an Azure Kubernetes Service Cluster	
	d. Configure Visual Studio Code to Work with an Azure Kubernetes Service Cluster	
	e. Deploy Application on AKS i.CoreWeb API ii.Node.jsAPI	
5.	Create an AKS cluster a. from the portal b. with Azure CLI	
6.	Create an Application Gateway Using Ocelot and Securing APIs with Azure AD.	
7.	Create a database design for Microservices an application using the database.	
8.	a. Create an API management service b. Create an API gateway service	
9.	Demonstrate a. Securing APIs with Azure Active Directory. b. Issuing a custom JWT token using a symmetric signing key c. Pre-Authentication in Azure API Management d. AWS API Gateway Authorizer	
10.	Create a serverless API using Azure functions	
11.	Create an AWS Lambda function	
12.	Build AWS Lambda with AWS API gateway	

PRACTICAL 01
Develop an ASP.NET Core MVC based Stateful Web App

What Is Service Fabric?
Azure Service Fabric is a distributed systems platform that allows you to run, manage, and scale applications in a cluster of nodes, using any OS and any cloud.
What is Service Fabric Clusters?
Service Fabric helps you deploy your microservices on a cluster, which is a set of virtual or physical machines that are interconnected through a network. Each machine inside the cluster is called a node. A cluster can consist of thousands of nodes, depending on resource needs of your application. Each node in a cluster has a Windows service called FabricHost.exe, which makes sure that the other two executables (Fabric.exe and FabricGateway.exe) are always running on the cluster nodes
What is Model-View-Controller (MVC)?

The Model-View-Controller (MVC) architectural pattern separates an app into three main components: Model, View, and Controller. The MVC pattern helps you create apps that are more testable and easier to update.

Models: Classes that represent the data of the app. The model classes use validation logic to enforce business rules for that data. Typically, model objects retrieve and store model state in a database. In this practical, a Movie model retrieves movie data from a database, provides it to the view or updates it. Updated data is written to a database.
Views: Views are the components that display the app's user interface (UI). Generally, this UI displays the model data.
Controllers: Classes that handle browser requests. They retrieve model data and call view templates that return a response. In an MVC app, the view only displays information; the controller handles and responds to user input and interaction. For example, the controller handles route data and query-string values, and passes these values to the model. The model might use these values to query the database.

Step 1: Create Project

Launch Visual Studio as an administrator.
Create a project with File >New >Project.
In the New Project dialog, choose Cloud > Service Fabric Application.
Name the application Voting and click OK.
On the New Service Fabric Service page, choose Stateless ASP.NET Core, name your service VotingWeb, then click OK.
The next page provides a set of ASP.NET Core project templates. For this practical, choose Web

Application (Model-View-Controller), then click OK.
Visual Studio creates an application and a service project and displays them in Solution Explorer.

Step 2: Create and update the files

In this step we will create and will update file in the VotingWeb project

2.1 Update the site.js file

Open wwwroot/js/site.js. Replace its contents with the following JavaScript used by the Home views, then save your changes.

```
var app = angular.module('VotingApp', ['ui.bootstrap']);
```

```
app.run(function () { });

app.controller('VotingAppController', ['$rootScope', '$scope', '$http', '$timeout', function ($rootScope,
$scope, $http, $timeout) {

    $scope.refresh = function () {
        $http.get('api/Votes?c=' + new Date().getTime())
            .then(function (data, status) {
                $scope.votes = data;
            }, function (data, status) {
                $scope.votes = undefined;
            });
    };

    $scope.remove = function (item) {
        $http.delete('api/Votes/' + item)
            .then(function (data, status) {
                $scope.refresh();
            })
    };

    $scope.add = function (item) {
        var fd = new FormData();
        fd.append('item', item);
        $http.put('api/Votes/' + item, fd, {
            transformRequest: angular.identity,
            headers: { 'Content-Type': undefined }
        })
            .then(function (data, status) {
                $scope.refresh();
                $scope.item = undefined;
            })
    };
}]);
```

2.2 Update the Index.cshtml file

Open Views/Home/Index.cshtml, the view specific to the Home controller. Replace its contents with the following, then save your changes.

```
@{
    ViewData["Title"] = "Service Fabric Voting Sample";
}

<div ng-controller="VotingAppController" ng-init="refresh()">
    <div class="container-fluid">
        <div class="row">
            <div class="col-xs-8 col-xs-offset-2 text-center">
                <h2>Service Fabric Voting Sample</h2>
            </div>
        </div>

        <div class="row">
            <div class="col-xs-8 col-xs-offset-2">
                <form class="col-xs-12 center-block">
                    <div class="col-xs-6 form-group">
                        <input id="txtAdd" type="text" class="form-control" placeholder="Add voting option" ng-
model="item"/>
                    </div>
                    <button id="btnAdd" class="btn btn-default" ng-click="add(item)">
                        <span class="glyphicon glyphicon-plus" aria-hidden="true"></span>
                        Add
                    </button>
                </form>
            </div>
        </div>

        <hr/>

        <div class="row">
            <div class="col-xs-8 col-xs-offset-2">
                <div class="row">
                    <div class="col-xs-4">
```

```
                Click to vote
            </div>
        </div>
        <div class="row top-buffer" ng-repeat="vote in votes.data">
            <div class="col-xs-8">
                <button class="btn btn-success text-left btn-block" ng-click="add(vote.key)">
                    <span class="pull-left">
                        {{vote.key}}
                    </span>
                    <span class="badge pull-right">
                        {{vote.value}} Votes
                    </span>
                </button>
            </div>
            <div class="col-xs-4">
                <button class="btn btn-danger pull-right btn-block" ng-click="remove(vote.key)">
                    <span class="glyphicon glyphicon-remove" aria-hidden="true"></span>
                    Remove
                </button>
            </div>
        </div>
    </div>
  </div>
</div>
```

2.3 Update the _Layout.cshtml file

Open Views/Shared/_Layout.cshtml, the default layout for the ASP.NET app. Replace its contents with the following, then save your changes.

```
<!DOCTYPE html>
<html ng-app="VotingApp" xmlns:ng="http://angularjs.org">
<head>
    <meta charset="utf-8"/>
    <meta name="viewport" content="width=device-width, initial-scale=1.0"/>
    <title>@ViewData["Title"]</title>

    <link href="~/lib/bootstrap/dist/css/bootstrap.min.css" rel="stylesheet"/>
    <link href="~/css/site.css" rel="stylesheet"/>

</head>
<body>
<div class="container body-content">
    @RenderBody()
</div>

<script src="~/lib/jquery/dist/jquery.js"></script>
<script src="~/lib/bootstrap/dist/js/bootstrap.js"></script>
<script src="~/lib/angular/angular.js"></script>
<script src="~/lib/angular-bootstrap/ui-bootstrap-tpls.js"></script>
<script src="~/js/site.js"></script>

@RenderSection("Scripts", required: false)
</body>
</html>
```

2.4 Update the VotingWeb.cs file

Open the VotingWeb.cs file, which creates the ASP.NET Core WebHost inside the stateless service using the WebListener web server.

Replace the content with the following code, then save your changes.

```
namespace VotingWeb
{
    using System;
    using System.Collections.Generic;
    using System.Fabric;
    using System.IO;
    using System.Net.Http;
    using Microsoft.AspNetCore.Hosting;
    using Microsoft.Extensions.Logging;
    using Microsoft.Extensions.DependencyInjection;
    using Microsoft.ServiceFabric.Services.Communication.AspNetCore;
    using Microsoft.ServiceFabric.Services.Communication.Runtime;
```

```
    using Microsoft.ServiceFabric.Services.Runtime;

    internal sealed class VotingWeb : StatelessService
    {
        public VotingWeb(StatelessServiceContext context)
            : base(context)
        {
        }

        protected override IEnumerable<ServiceInstanceListener> CreateServiceInstanceListeners()
        {
            return new ServiceInstanceListener[]
            {
        new ServiceInstanceListener(
            serviceContext =>
                new KestrelCommunicationListener(
                    serviceContext,
                    "ServiceEndpoint",
                    (url, listener) =>
                    {
                        ServiceEventSource.Current.ServiceMessage(serviceContext, $"Starting Kestrel on {url}");

                        return new WebHostBuilder()
                            .UseKestrel()
                            .ConfigureServices(
                                services => services
                                    .AddSingleton<HttpClient>(new HttpClient())
                                    .AddSingleton<FabricClient>(new FabricClient())
                                    .AddSingleton<StatelessServiceContext>(serviceContext))
                            .UseContentRoot(Directory.GetCurrentDirectory())
                            .UseStartup<Startup>()
                            .UseServiceFabricIntegration(listener, ServiceFabricIntegrationOptions.None)
                            .UseUrls(url)
                            .Build();
                    }))
            };
        }

        internal static Uri GetVotingDataServiceName(ServiceContext context)
        {
            return new Uri($"{context.CodePackageActivationContext.ApplicationName}/VotingData");
        }
    }
}
```

2.5 Add the VotesController.cs file

a. Add a controller, which defines voting actions. Right-click on the Controllers folder, then select Add->New item->Visual C#->ASP.NET Core->Class. Name the file VotesController.cs, then click Add.
b. Replace the VotesController.cs file contents with the following, then save your changes this file is modified to read and write voting data from the back-end service.

```
namespace VotingWeb.Controllers
{
    using System;
    using System.Collections.Generic;
    using System.Fabric;
    using System.Fabric.Query;
    using System.Linq;
    using System.Net.Http;
    using System.Net.Http.Headers;
    using System.Text;
    using System.Threading.Tasks;
    using Microsoft.AspNetCore.Mvc;
    using Newtonsoft.Json;

    [Produces("application/json")]
    [Route("api/[controller]")]
    public class VotesController : Controller
    {
        private readonly HttpClient httpClient;
        private readonly FabricClient fabricClient;
```

```
        private readonly string reverseProxyBaseUri;
        private readonly StatelessServiceContext serviceContext;

        public VotesController(HttpClient httpClient, StatelessServiceContext context, FabricClient
fabricClient)
        {
            this.fabricClient = fabricClient;
            this.httpClient = httpClient;
            this.serviceContext = context;
            this.reverseProxyBaseUri = Environment.GetEnvironmentVariable("ReverseProxyBaseUri");
        }

        // GET: api/Votes
        [HttpGet("")]
        public async Task<IActionResult> Get()
        {
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);

            ServicePartitionList partitions = await
this.fabricClient.QueryManager.GetPartitionListAsync(serviceName);

            List<KeyValuePair<string, int>> result = new List<KeyValuePair<string, int>>();

            foreach (Partition partition in partitions)
            {
                string proxyUrl =
                    $"{proxyAddress}/api/VoteData?PartitionKey={((Int64RangePartitionInformation)
partition.PartitionInformation).LowKey}&PartitionKind=Int64Range";

                using (HttpResponseMessage response = await this.httpClient.GetAsync(proxyUrl))
                {
                    if (response.StatusCode != System.Net.HttpStatusCode.OK)
                    {
                        continue;
                    }

                    result.AddRange(JsonConvert.DeserializeObject<List<KeyValuePair<string, int>>>(await
response.Content.ReadAsStringAsync()));
                }
            }

            return this.Json(result);
        }

        // PUT: api/Votes/name
        [HttpPut("{name}")]
        public async Task<IActionResult> Put(string name)
        {
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);
            long partitionKey = this.GetPartitionKey(name);
            string proxyUrl =
$"{proxyAddress}/api/VoteData/{name}?PartitionKey={partitionKey}&PartitionKind=Int64Range";

            StringContent putContent = new StringContent($"{{ 'name' : '{name}' }}", Encoding.UTF8,
"application/json");
            putContent.Headers.ContentType = new MediaTypeHeaderValue("application/json");

            using (HttpResponseMessage response = await this.httpClient.PutAsync(proxyUrl, putContent))
            {
                return new ContentResult()
                {
                    StatusCode = (int) response.StatusCode,
                    Content = await response.Content.ReadAsStringAsync()
                };
            }
        }

        // DELETE: api/Votes/name
        [HttpDelete("{name}")]
        public async Task<IActionResult> Delete(string name)
        {
```

```
            Uri serviceName = VotingWeb.GetVotingDataServiceName(this.serviceContext);
            Uri proxyAddress = this.GetProxyAddress(serviceName);
            long partitionKey = this.GetPartitionKey(name);
            string proxyUrl =
$"{proxyAddress}/api/VoteData/{name}?PartitionKey={partitionKey}&PartitionKind=Int64Range";

            using (HttpResponseMessage response = await this.httpClient.DeleteAsync(proxyUrl))
            {
                if (response.StatusCode != System.Net.HttpStatusCode.OK)
                {
                    return this.StatusCode((int) response.StatusCode);
                }
            }

            return new OkResult();
        }


        /// <summary>
        /// Constructs a reverse proxy URL for a given service.
        /// Example: http://localhost:19081/VotingApplication/VotingData/
        /// </summary>
        /// <param name="serviceName"></param>
        /// <returns></returns>
        private Uri GetProxyAddress(Uri serviceName)
        {
            return new Uri($"{this.reverseProxyBaseUri}{serviceName.AbsolutePath}");
        }

        /// <summary>
        /// Creates a partition key from the given name.
        /// Uses the zero-based numeric position in the alphabet of the first letter of the name (0-25).
        /// </summary>
        /// <param name="name"></param>
        /// <returns></returns>
        private long GetPartitionKey(string name)
        {
            return Char.ToUpper(name.First()) - 'A';
        }
    }
}
```

Step 3: Add a stateful back-end service to your application

a. In Solution Explorer, right-click Services within the Voting application project and choose Add -> New Service Fabric Service....
b. In the New Service Fabric Service dialog, choose Stateful ASP.NET Core, name the service VotingData, then press Create.

Once your service project is created, you have two services in your application. As you continue to build your application, you can add more services in the same way. Each can be independently versioned and upgraded.
The next page provides a set of ASP.NET Core project templates. choose API.
Visual Studio creates the VotingData service project and displays it in Solution Explorer.

3.1 Add the VoteDataController.cs file

a. In the VotingData project, right-click on the Controllers folder, then select Add->New item->Class. Name the file VoteDataController.cs and click Add.
b. Replace the file contents with the following, then save your changes.

```
namespace VotingData.Controllers
{
    using System.Collections.Generic;
    using System.Threading;
    using System.Threading.Tasks;
    using Microsoft.AspNetCore.Mvc;
    using Microsoft.ServiceFabric.Data;
```

```
using Microsoft.ServiceFabric.Data.Collections;

[Route("api/[controller]")]
public class VoteDataController : Controller
{
    private readonly IReliableStateManager stateManager;

    public VoteDataController(IReliableStateManager stateManager)
    {
        this.stateManager = stateManager;
    }

    // GET api/VoteData
    [HttpGet]
    public async Task<IActionResult> Get()
    {
        CancellationToken ct = new CancellationToken();

        IReliableDictionary<string, int> votesDictionary =
            await this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            var list = await votesDictionary.CreateEnumerableAsync(tx);

            var enumerator = list.GetAsyncEnumerator();

            List<KeyValuePair<string, int>> result = new List<KeyValuePair<string, int>>();

            while (await enumerator.MoveNextAsync(ct))
            {
                result.Add(enumerator.Current);
            }

            return this.Json(result);
        }
    }

    // PUT api/VoteData/name
    [HttpPut("{name}")]
    public async Task<IActionResult> Put(string name)
    {
        IReliableDictionary<string, int> votesDictionary = await
this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            await votesDictionary.AddOrUpdateAsync(tx, name, 1, (key, oldvalue) => oldvalue + 1);
            await tx.CommitAsync();
        }

        return new OkResult();
    }

    // DELETE api/VoteData/name
    [HttpDelete("{name}")]
    public async Task<IActionResult> Delete(string name)
    {
        IReliableDictionary<string, int> votesDictionary = await
this.stateManager.GetOrAddAsync<IReliableDictionary<string, int>>("counts");

        using (ITransaction tx = this.stateManager.CreateTransaction())
        {
            if (await votesDictionary.ContainsKeyAsync(tx, name))
            {
                await votesDictionary.TryRemoveAsync(tx, name);
                await tx.CommitAsync();
                return new OkResult();
            }
            else
            {
                return new NotFoundResult();
            }
```

```
        }
      }
    }
}
```

Step 4: Publish Service Fabric application

a. In the solution Explorer Right click on the Voting and select Publish. The Publish dialog box appears.
b. To open the service fabric explorer, open the Browser and paste the following IP address http://localhost:19080/
c. Go to cluster >Application >Voting Type >fabric:/Voting >fabric:/VotingWeb > 8482ef73-476d-45a6-aca9-b33d75575855(partition) >_Node_0 Instance
d. You will see the endpoint in the address section click on that address to run your app

PRACTICAL 2

Develop Spring Boot API

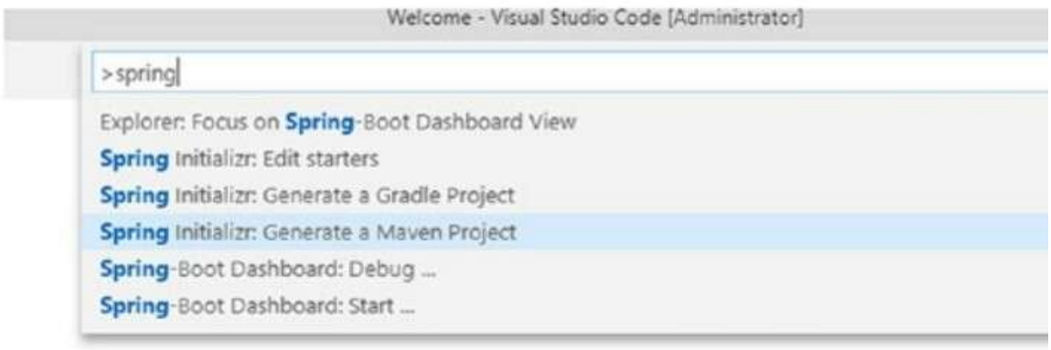
Introduction:-

Spring Boot provides a good platform for Java developers to develop a stand-alone and production-grade spring application that you can just run. You can get started with minimum configurations without the need for an entire Spring configuration setup.

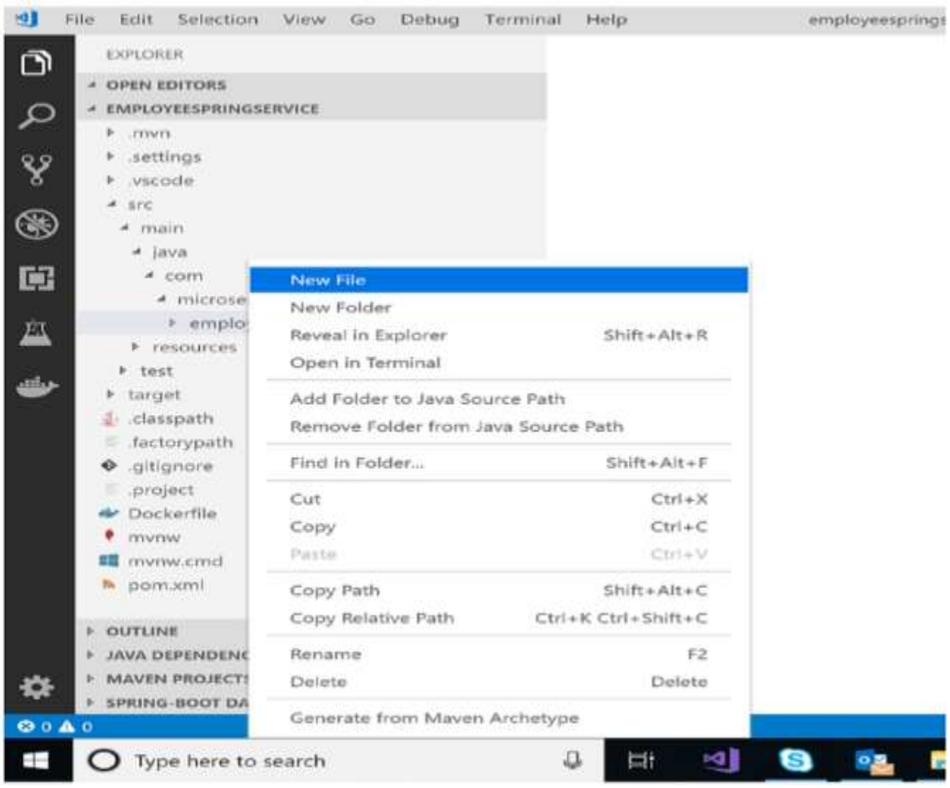
In this example, we showcase that it is possible to host a non-Microsoft stack application to a Service Fabric cluster. We will not create a reliable service; instead, we will host a Java Spring Boot–based API as a guest executable and as a container. We will use VS Code to develop a simple Spring Boot application.

Setting up the Development Environment
Let's set up the development environment.
1. Install Visual Studio 2017.
2. Install the Microsoft Azure Service Fabric SDK.
3. Install Visual Studio Code.
   a. Install Spring Boot Extensions Pack.
   b. Install Java Extensions Pack.
   c. Install Maven for Java.
4. Make sure that the Service Fabric Local cluster is in a running state.
5. Install Docker Desktop.
6. Access the Azure container registry.

Develop a Spring Boot API
Now it's time to get started on the application.
1. Launch Visual Studio Code as an administrator.
2. Press Ctrl+Shift+P to open the command palette.
3. Enter spring in the command palette, and choose Spring Initializr: Generate a maven project



4. Choose Java for Specify Project Language.
5. Enter com.microservices in the input group ID for your project.
6. Enter employeespringservice in the input artifact ID for your project.
7. Choose the latest Spring boot version.
8. Choose the following dependencies.
a. DevTools
b. Lombok
c. Web
d. Actuator
9. Choose the path where you want to save the solution.
10. Right-click the EMPLOYEESPRINGSERVICE folder under src ➤ main ➤ java ➤ com ➤ microservices, as shown in Figure 3-15, and click Add File.



11. Name the file Employee.Java and add the following code. (This is the definition of the employee object; we kept it simple by having only three properties to represent an employee.)

```
package com.microservices.employeespringservice;
import lombok.AllArgsConstructor;
import lombok.EqualsAndHashCode;
import lombok.Getter;
import lombok.Setter;
/*** Employee ***/
@Getter
@Setter
@EqualsAndHashCode
@AllArgsConstructor
public class Employee {
 private String firstName;
 private String lastName;
private String ipAddress; }
```

12. Now let's create an employee service that returns an employee's information. Right-click the employeespringservice folder and add a file named EmployeeService.java. Add the following code to it.

```
package com.microservices.employeespringservice;
import java.net.InetAddress;
import java.net.UnknownHostException;
import org.springframework.stereotype.Service;
/**
 * EmployeeService

*/

@Service

public class EmployeeService {

 public Employee GetEmployee(String firstName, String

lastName){

 String ipAddress;

try {

getHostAddress().toString();

 } catch (UnknownHostException e) {

 ipAddress = e.getMessage();

 }
```

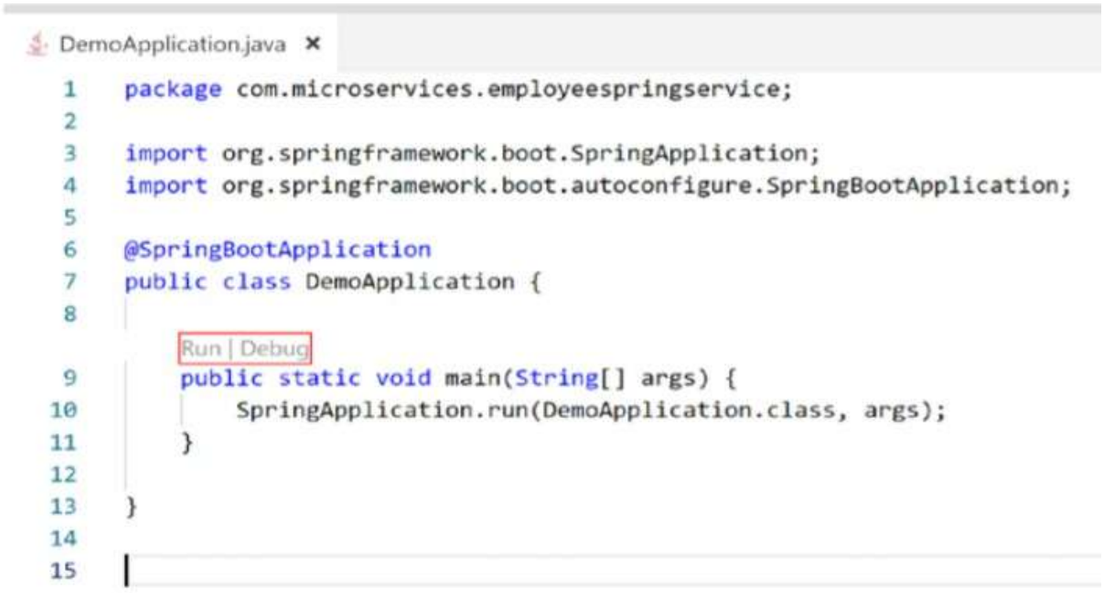
```
 Employee employee = new Employee(firstName,

lastName,ipAddress);

 return employee;

 }

}
```

13. Now let’s create an employee controller that invokes the employee service to return the details of an employee. Right-click the employeespringservice folder and add a file named EmployeeController.

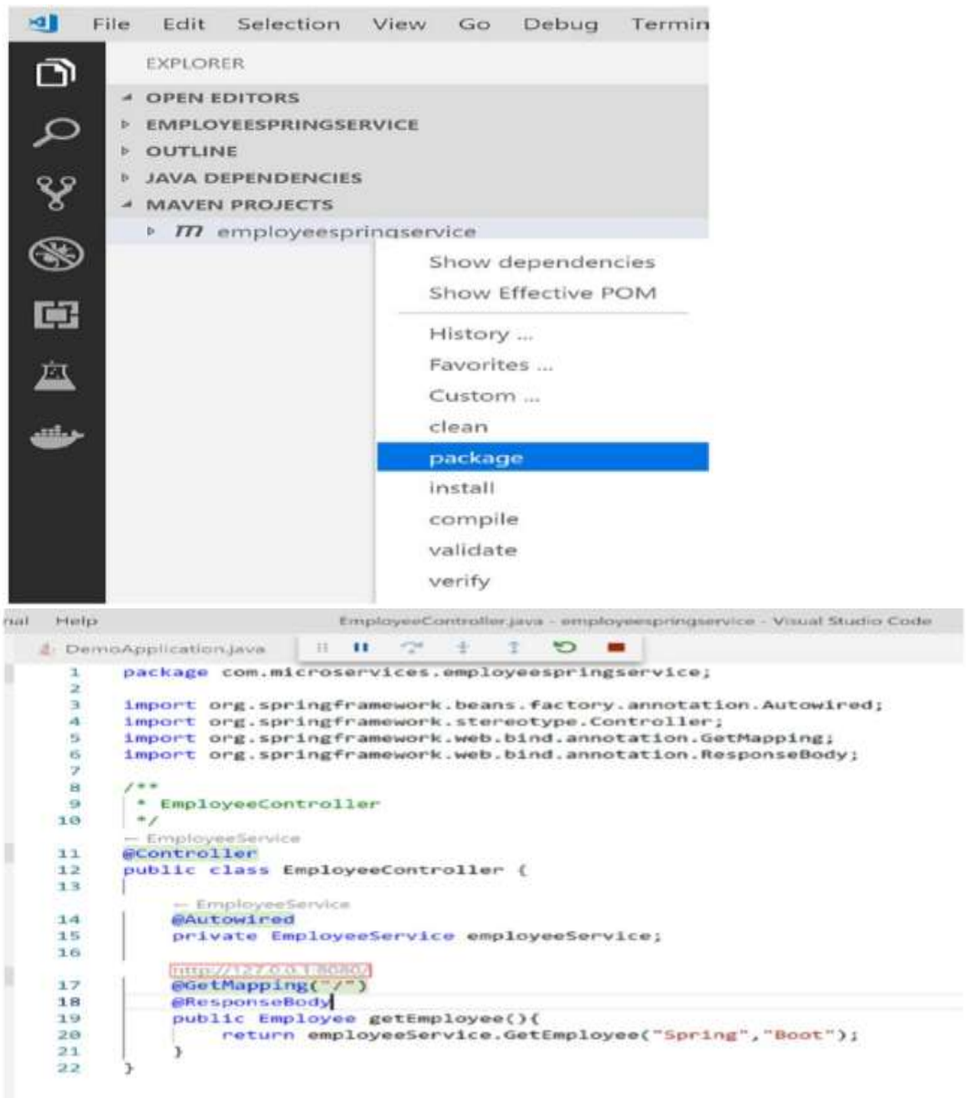
```
package com.microservices.employeespringservice;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.ResponseBody;


/**
 * EmployeeController
 */
@Controller
public class EmployeeController {
 @Autowired
private EmployeeService employeeService;
@GetMapping("/")
 @ResponseBody
 public Employee getEmployee(){
return employeeService.GetEmployee("Spring","Boot");
 }
}
```

Now you are ready for a simple REST-based service that returns employee information. Visual Studio Code has some cool features to run Spring Boot applications, and we are going to use the same.

1. Open DemoApplication.java and once you open the file, you see the option to run or debug the application,Please note that this may take time as Visual Studio automatically downloads the dependencies.



2. Click Run and open the Controller class. You see the URL where your controller service is hosted.



3. Click the URL and you see the output show in your default browser.

4. Right-click employeespringservice under Maven Projects. Click package,This generates the JAR file.

Now you have a simple Spring Boot-based REST API, and you have generated a JAR file. We will now deploy it to Service Fabric as a guest executable. To deploy, we will use Visual Studio 2017.

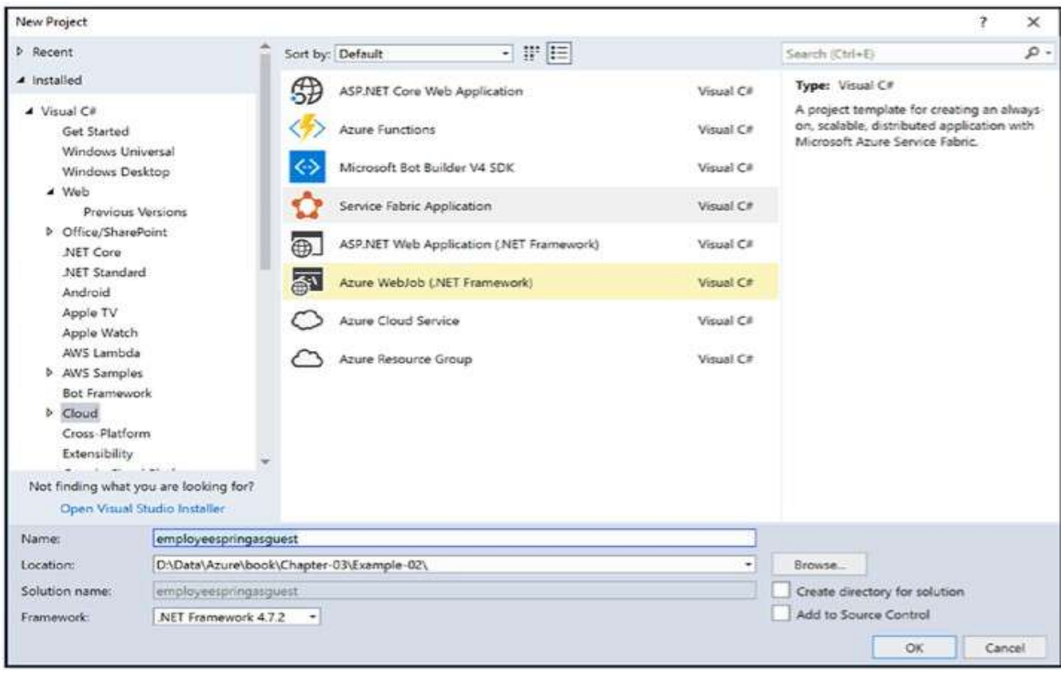
Deploy a Spring Boot Service as a Guest Executable

After executing all the steps in the previous section, your development is complete. Please follow

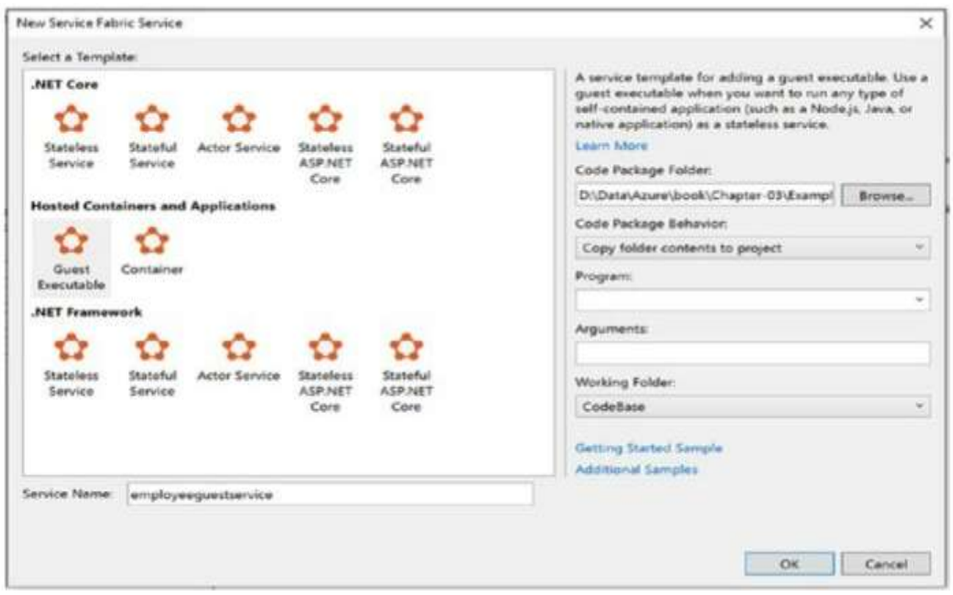
the steps in this section to deploy the developed Spring Boot application as a guest executable. This shows that it is possible to host a non-Microsoft stack application on a Service Fabric cluster by using a guest executable programming model. Service Fabric considers guest executables a stateless service.

1. Launch Visual Studio 2017 as an administrator.

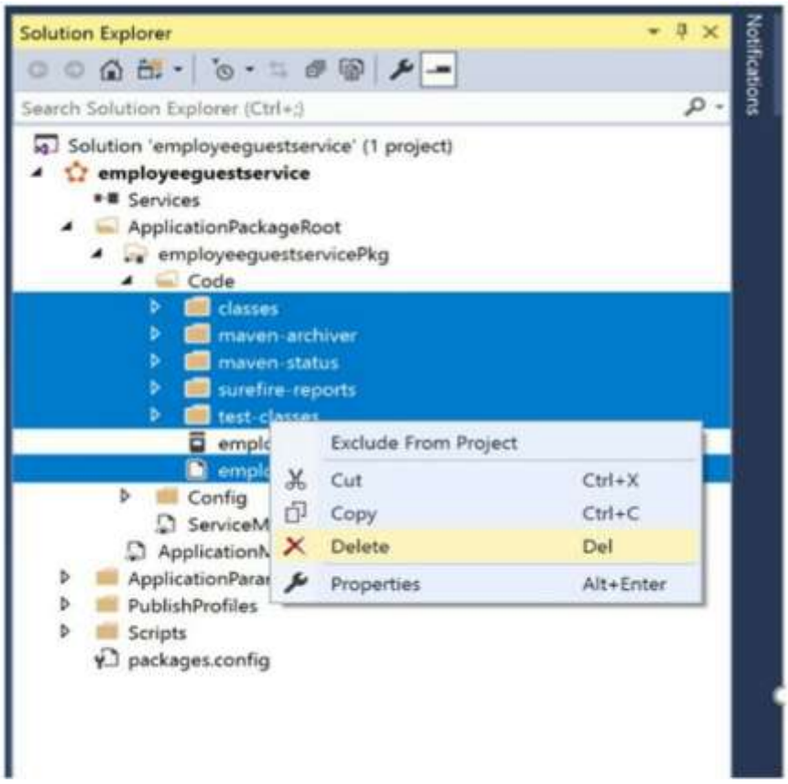
1. Click File ➤ New Project ➤ Select Cloud ➤ Service Fabric Application.
2. Name the application employeespringasguest



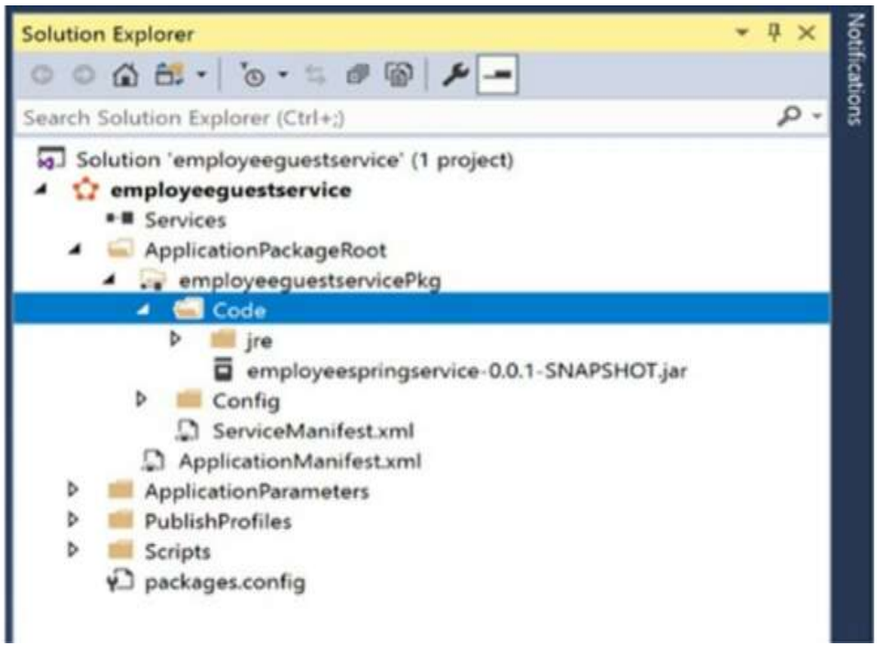
3. In New Service Fabric Service, select the following
a. Service Name: employeeguestservice
b. Code Package Folder: Point to the target folder in which Visual Studio Code generated the JAR file for the Spring Boot service.
c. Code Package Behavior: Copy folder contents to folder
d. Working Folder: CodeBase



4. Delete the selected files from the Code folder.



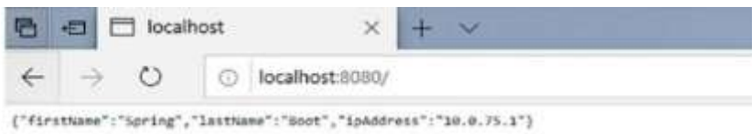
5. We also need to upload the runtime to run the JAR. Generally, it resides in the JDK installation folder (C:\ java-1.8.0-openjdk-1.8.0.191-1.b12.redhat.windows.x86_64). Paste it in the Code folder.

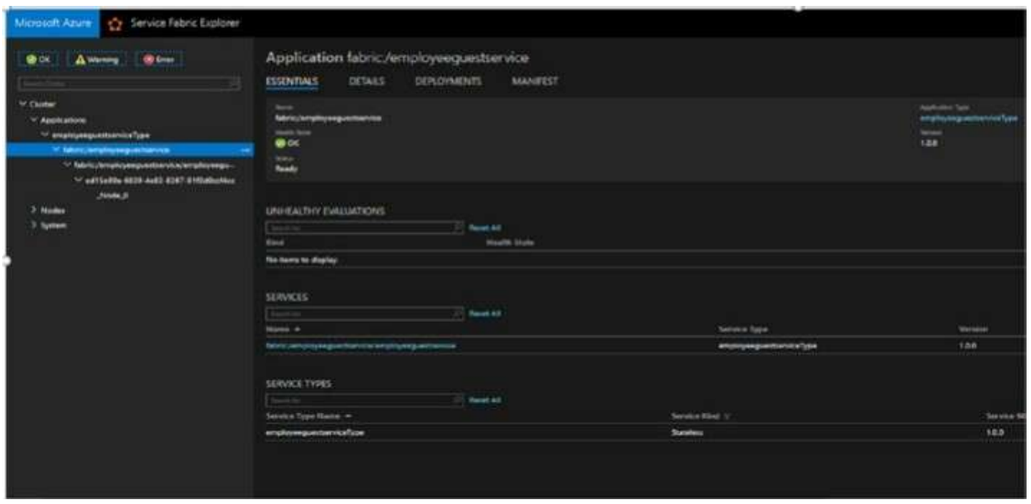


6. Open ServiceManisfest.xml and set the following values.

```
<EntryPoint>
<ExeHost>
 <Program>jre\bin\java.exe</Program>
<Arguments>-jar ..\..\employeespringservice-0.0.1-
SNAPSHOT.jar</Arguments>
<WorkingFolder>CodeBase</WorkingFolder>
 <!-- Uncomment to log console output (both stdout and stderr) to one of the
        service's working directories. -->
 <!-- <ConsoleRedirection FileRetentionCount="5"
FileMaxSizeInKb="2048"/> -->
       </ExeHost>
    </EntryPoint>
 </CodePackage>
<Resources>
 <Endpoints>
<!-- This endpoint is used by the communication listener to obtain the port on which to
 listen. Please note that if your service is partitioned, this port is shared withreplicas of different partitions
```

that are placed in
your code. -->
<Endpoint Name="employeeguestserviceTypeEndpoint"
Protocol="http" Port="8080" Type="Input" />
</Endpoints>
</Resources>
7. Make sure that the local Service Fabric cluster is up and running. Click F5. Browse the Service Fabric dashboard. The default URL is http://localhost:19080/Explorer/index.html. You see that your service is deployed.



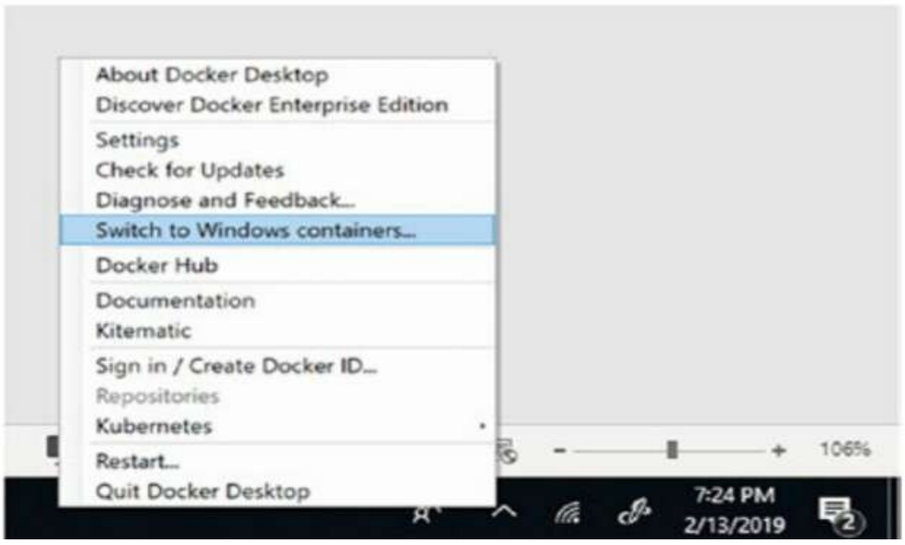


8. Browse http://localhost:8080 to access your service. In
servicemanifest.xml, we specified the service port as 8080; you can browse the same on 8080.

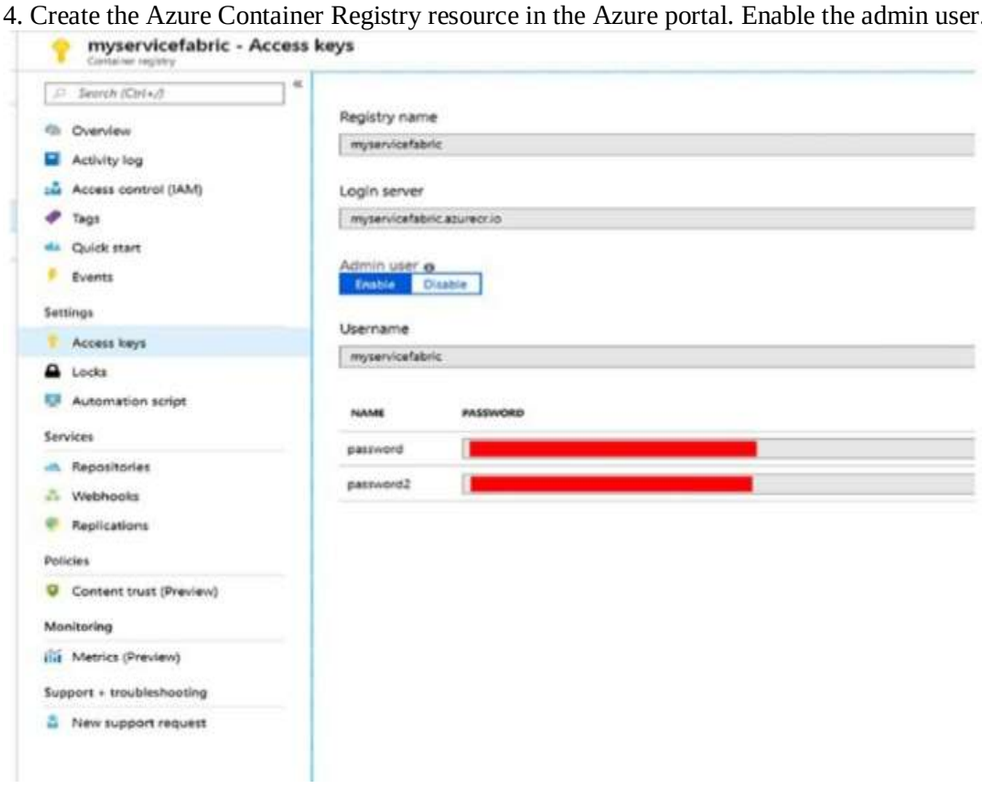
Deploy a Spring Boot Service as a Container

So far, we have deployed the service as a guest executable in Service Fabric. Now we will follow the steps to deploy the Spring service as a container in Service Fabric. This explains that in addition to creating stateful and stateless services, Service Fabric also orchestrates containers like any other orchestrator, even if the application wasn't developed on a Microsoft stack.

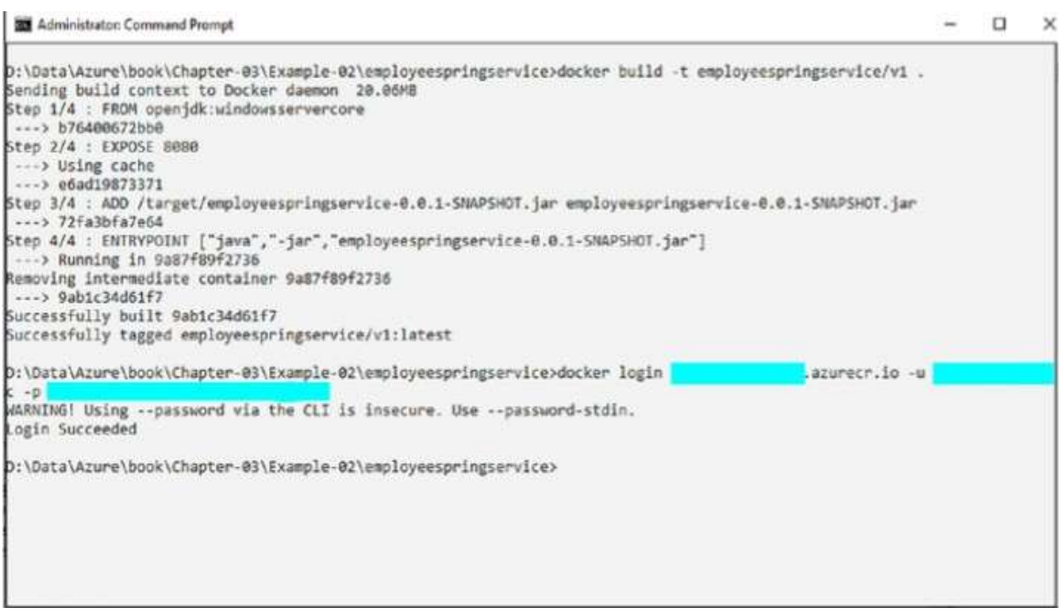
1. Open Visual Studio Code. Open the folder where employeespringservice exists. Open the Docker file.
2. Make sure that the name of the JAR file is correct.
3. Select Switch to Windows container… in Docker Desktop.



4. Create the Azure Container Registry resource in the Azure portal. Enable the admin user.



5. Open the command prompt in Administrative Mode and browse to the directory where the Docker file exists.
6. Fire the following command, including the period at the end. (This may take time because it downloads the Window Server core image from the Docker hub)
docker build -t employeespringservice/v1 .



now the container image is available locally. You have to push the image to Azure Container

Registry.

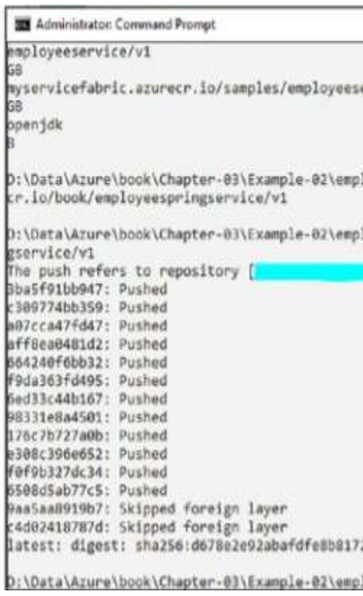
1. Log in to Azure Container Registry using the admin username and password. Use the following command
.

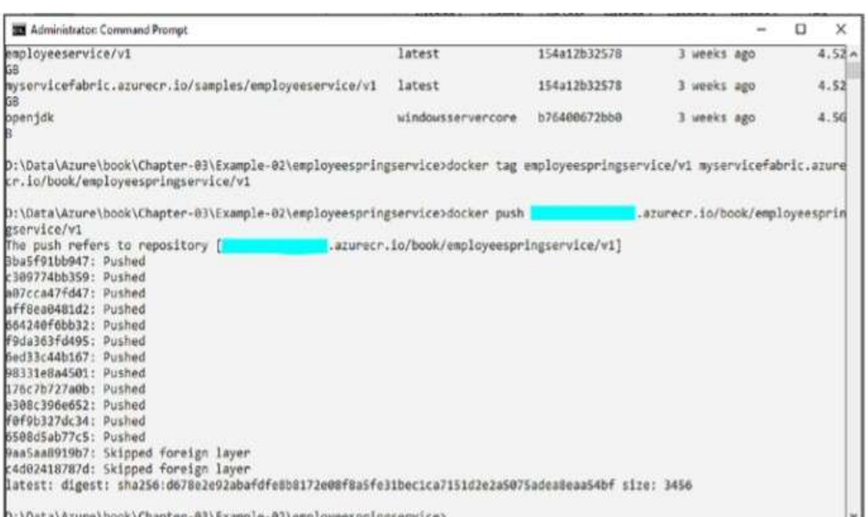
docker login youracr.azurecr.io -u yourusername -p yourpassword

2. Fire the following commands to upload the image to ACR.

docker tag employeespringservice/v1 youracr.azurecr.io/book/
employeespringservice/v1

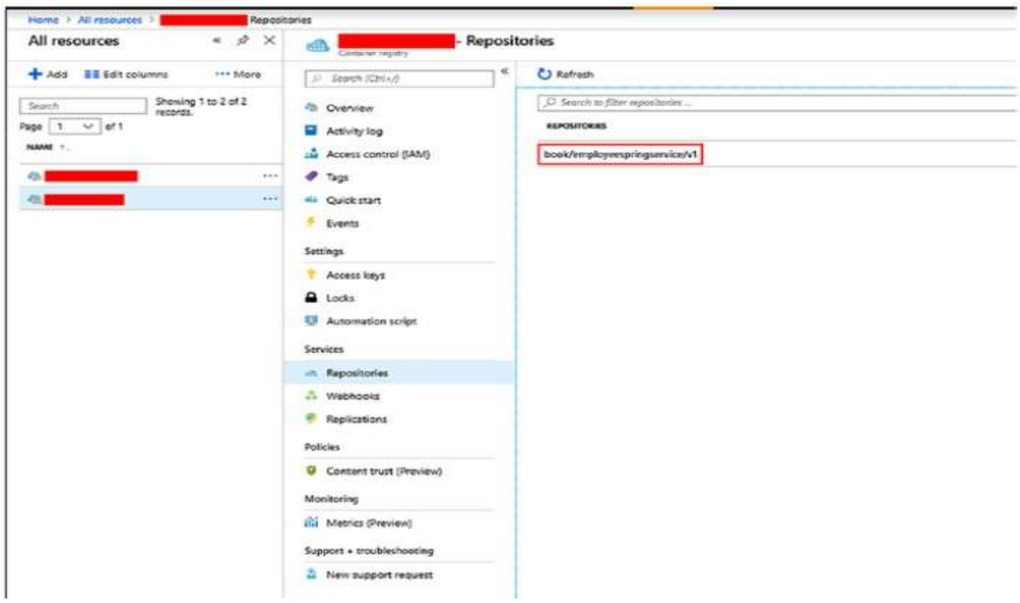
docker push myservicefabric.azurecr.io/book/
employeespringservice/v1



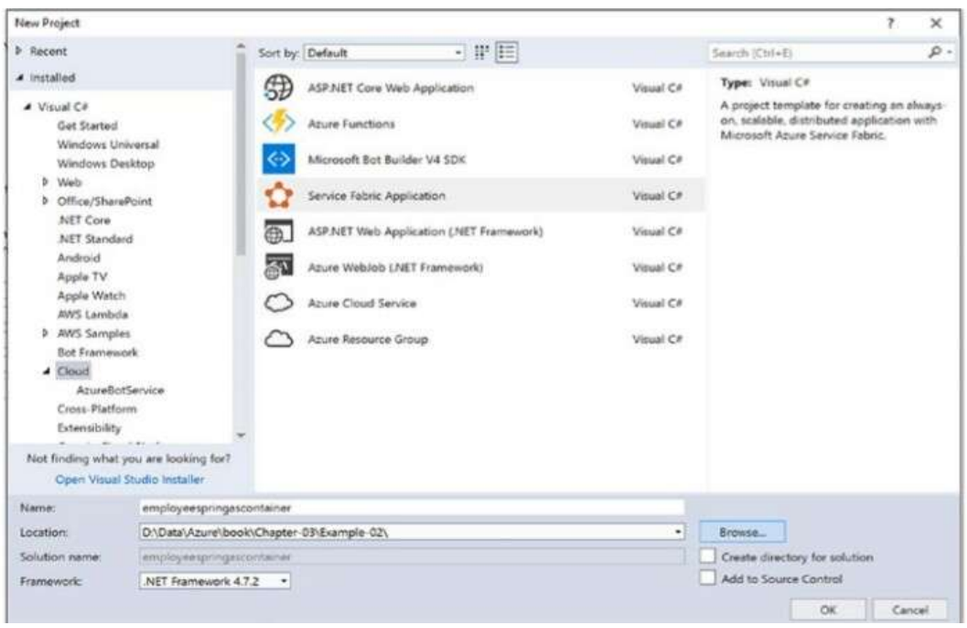


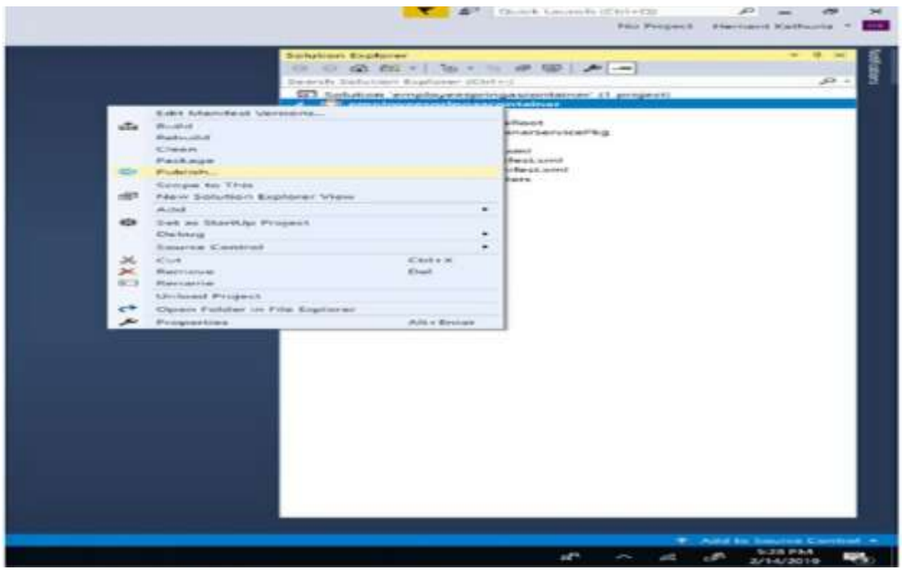
3. Log in to the
Azure portal and check if you can see your image in Repositories.Since the container image is ready and uploaded in Azure Container Registry, let's create a Service Fabric project to deploy the container to the local Service Fabric cluster.

1. Launch Visual Studio 2017 as an administrator.
2. Click File ➤ New Project ➤ Select Cloud ➤ Service Fabric Application.
3. Name the application employeespringascontainer.



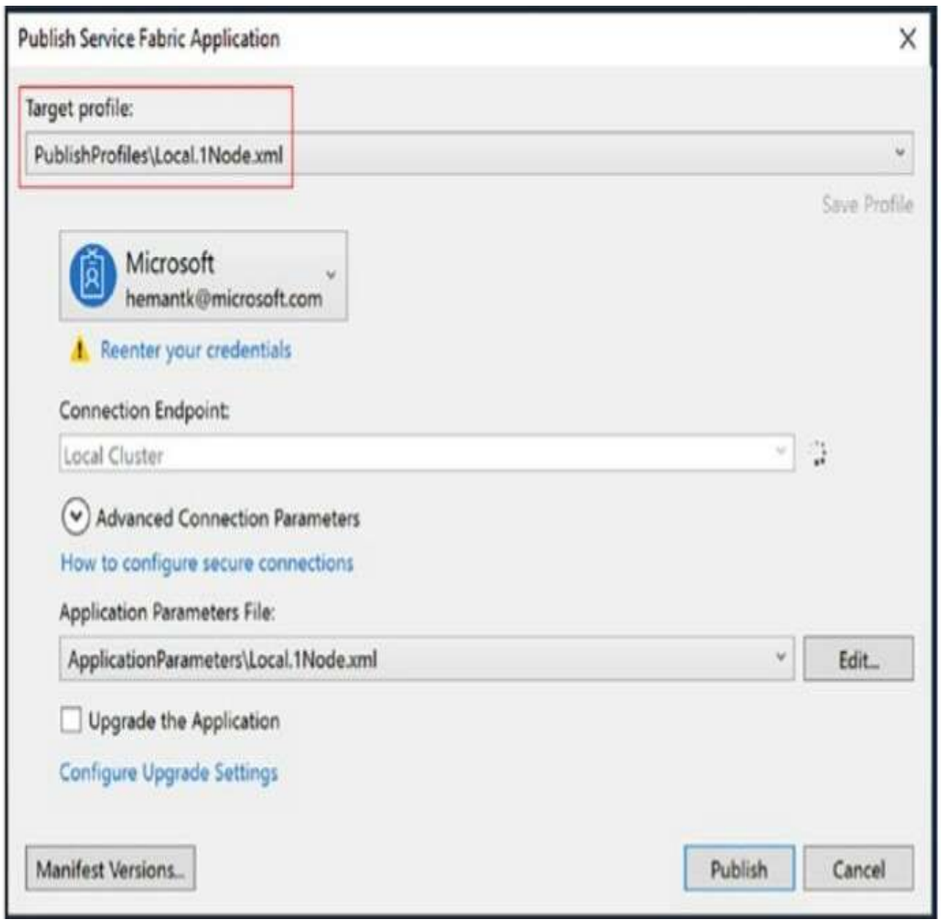
4. In New Service Fabric Service, select the following.
   a. Service Name: employeecontainerservice
   b. Image Name: youracr.azurecr.io/book/employeespringservice/v1
      c. User Name: Your username in the Azure Container Registry
      d. Host Port: 8090
      e. Container Port: 8080
5. Once the solution is created, open the ApplicationManifest.xml. Specify the right password for the admin user. (Since this is a sample, we kept the password unencrypted; for real-word applications you have to encrypt the password



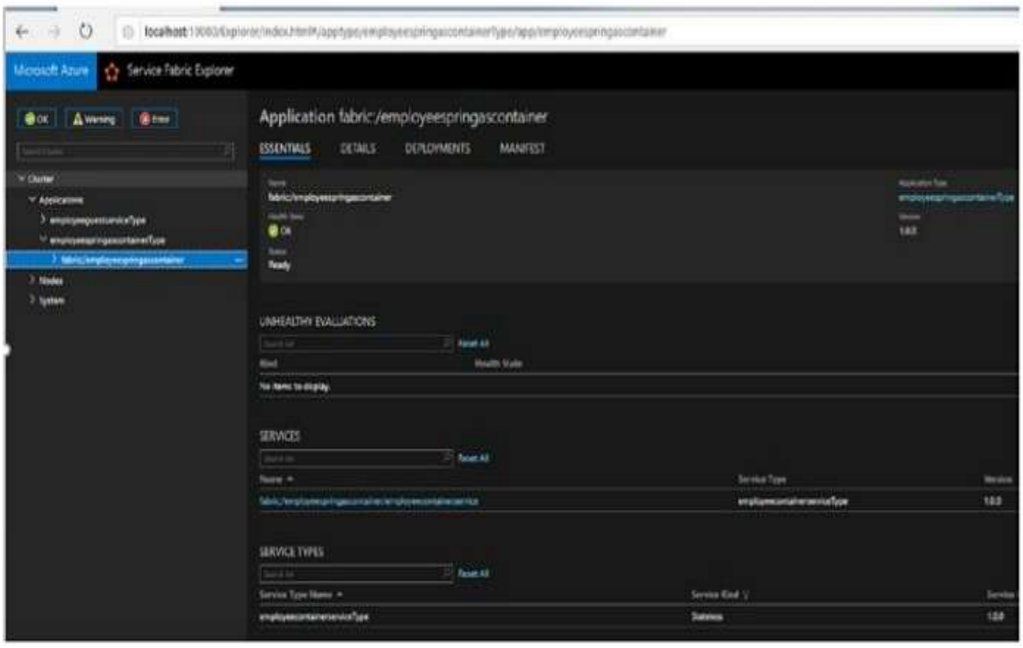


Now we are ready to build and deploy the container to the local Service Fabric cluster. Since we have given the user information to download the image from Azure Container Registry, Visual Studio downloads and deploy the container to the local services fabric cluster.
1. Right-click the Service Fabric project and publish.

2. Select the local cluster profile to publish to the local Service Fabric cluster. To deploy to Azure, select the cloud profile. Make sure that the Service Fabric cluster is up and ready in your subscription



3. Browse the Service Fabric dashboard. The default URL is http://localhost:19080/Explorer/index.html. Your service is deployed.



4. Browse to http://localhost:8090/ to access your service. You get the response which is served from the container run by Service Fabric.

PRACTICAL NO:3

Create an Asp.Net Web Core Api and Configure Monitoring.

Setting up the Development Environment
Let's set up.

1. Install Visual Studio 2017.

2. Install the Microsoft Azure Service Fabric SDK.

3. Create the Translator Text API in your Azure subscription and make a note of the access key.

4. Create an empty Azure SQL Database and keep the connection string with SQL Authentication handy.

5. Make sure that the Service Fabric local cluster on Windows is in a running state.

6. Make sure that the Service Fabric Azure cluster on Windows is in a running state.

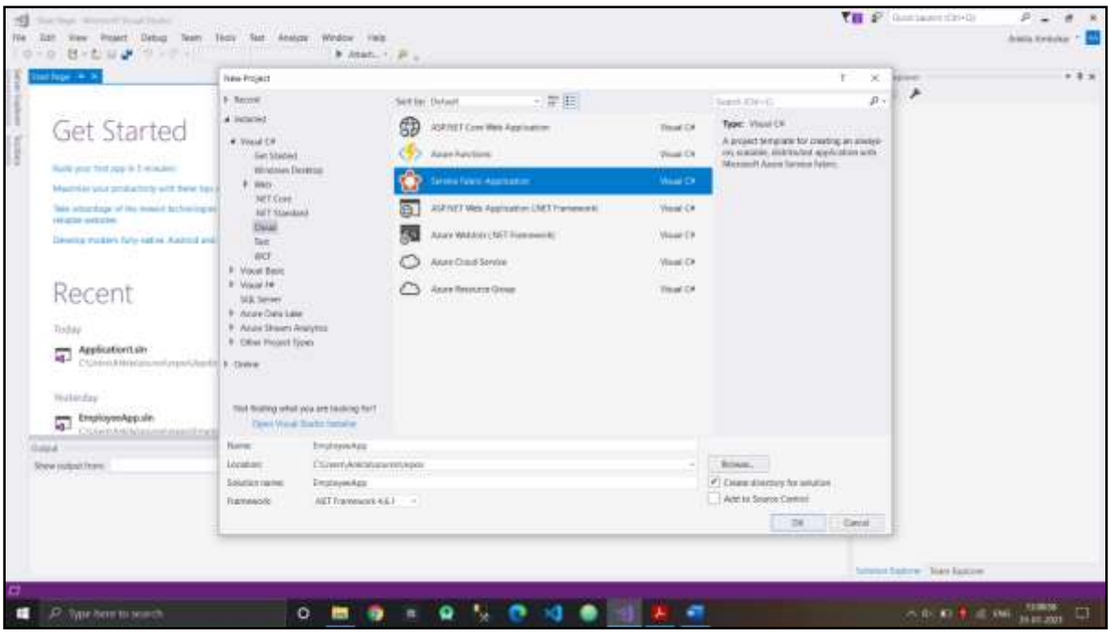
Create an ASP.NET Core Web API
Now let's start the API.

1. Launch Visual Studio 2017 as an administrator.

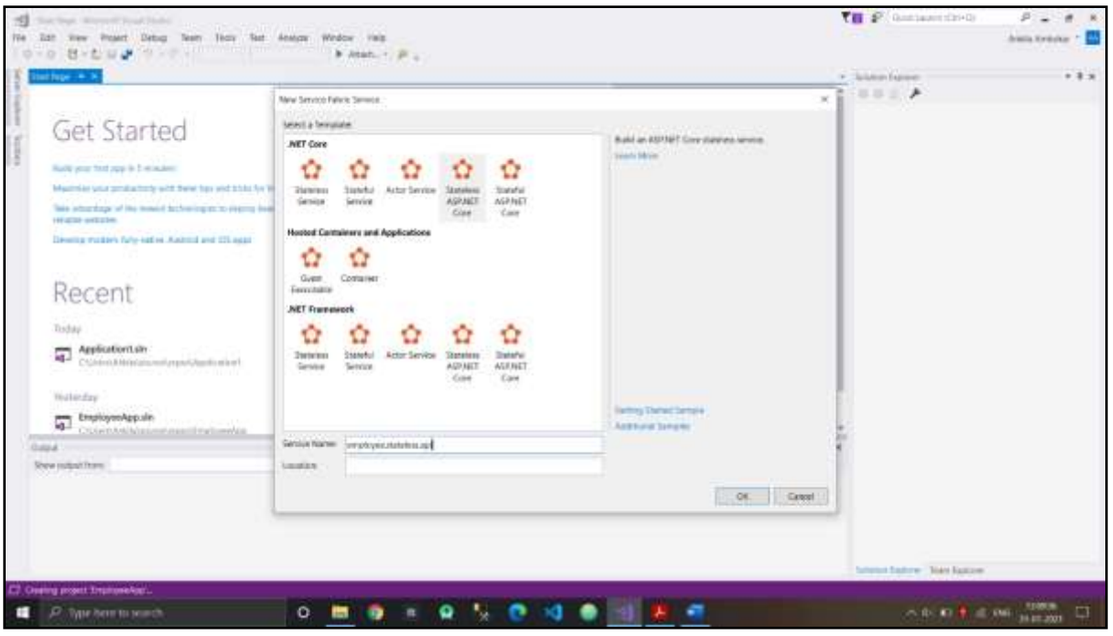
2. Create a project by selecting File → New → Project.

3. In the New Project dialog, choose Cloud →Service Fabric Application.

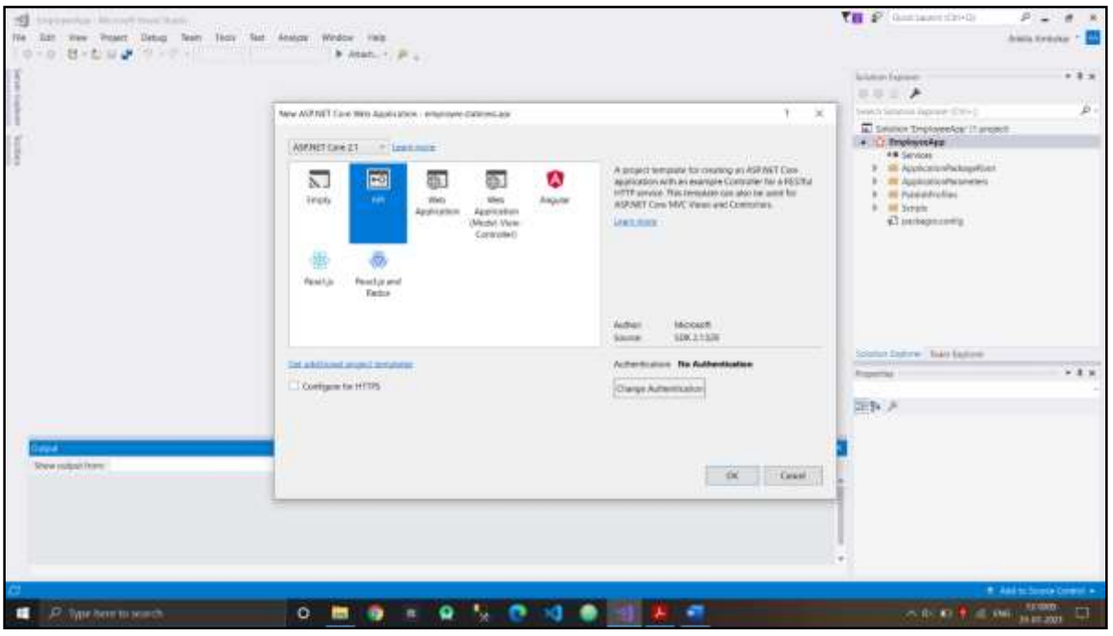
4. Name the Service Fabric application EmployeeApp and click OK.



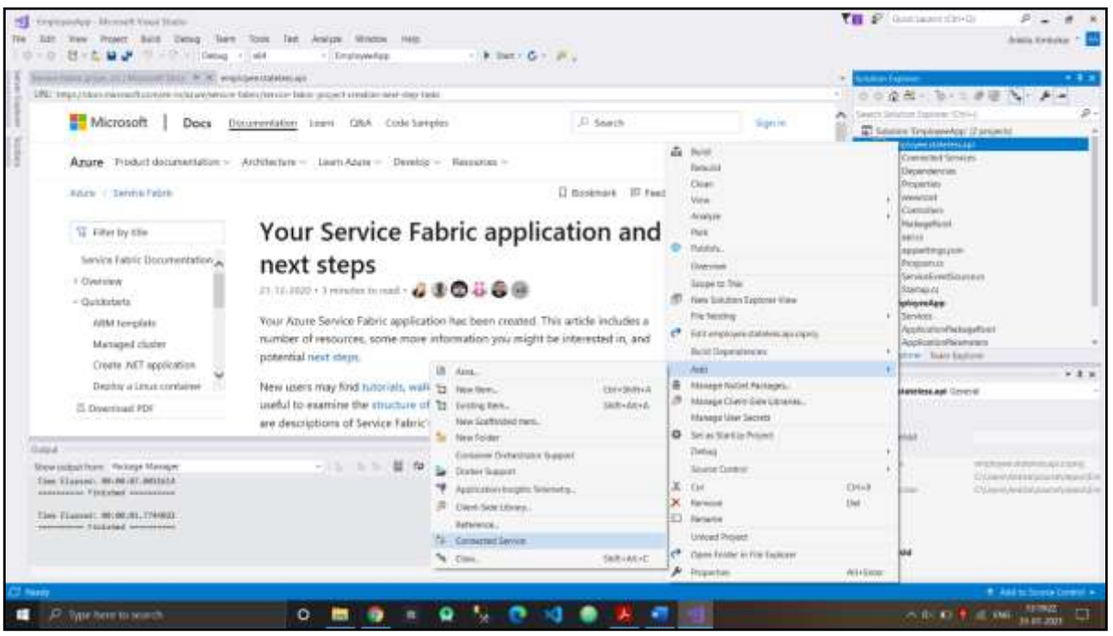
5. Name the stateless ASP.NET Core service Employee.Stateless.Api (as seen in Figure) and click OK.



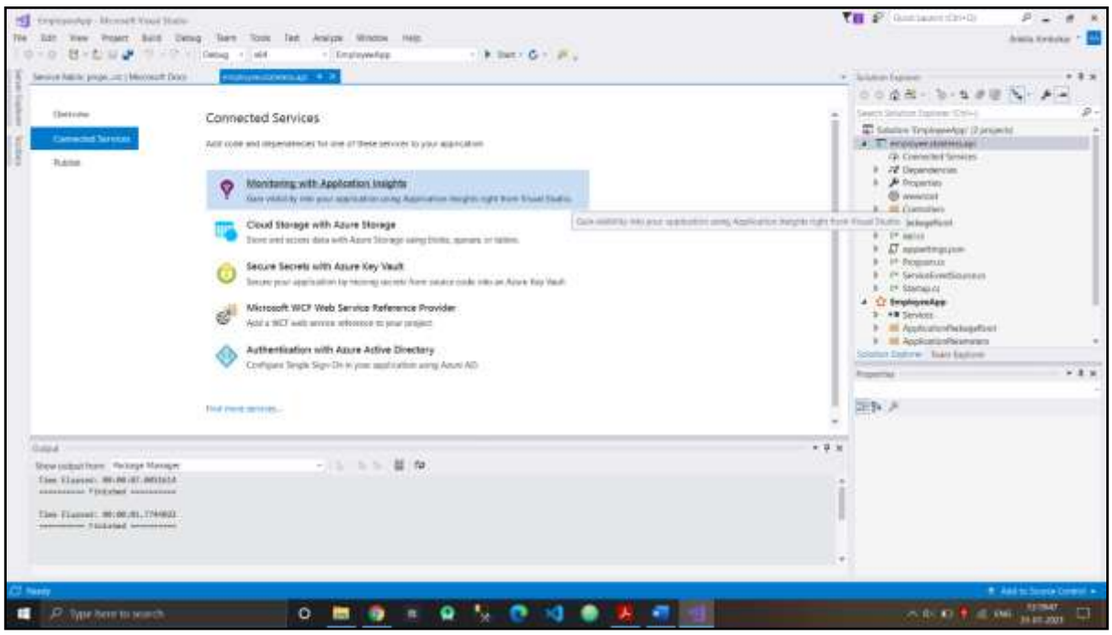
6. Choose the API and click OK. Make sure that ASP.NET Core 2.2 is selected, as shown in Figure.



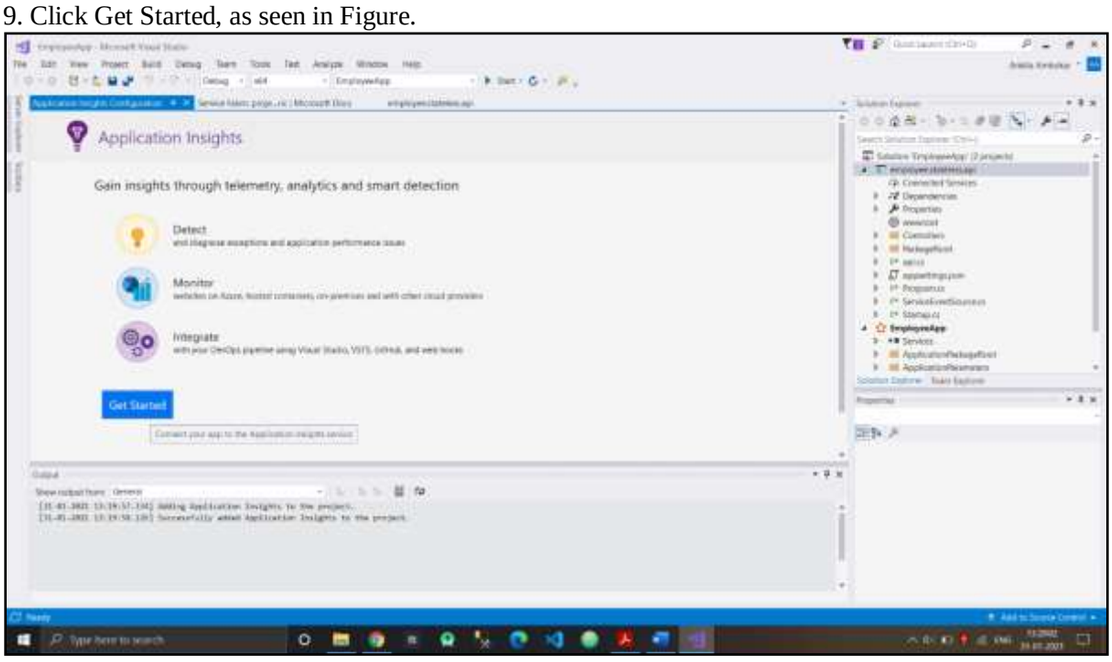
7. Right-click the employee.stateless.api project and select Add → Connected Service.



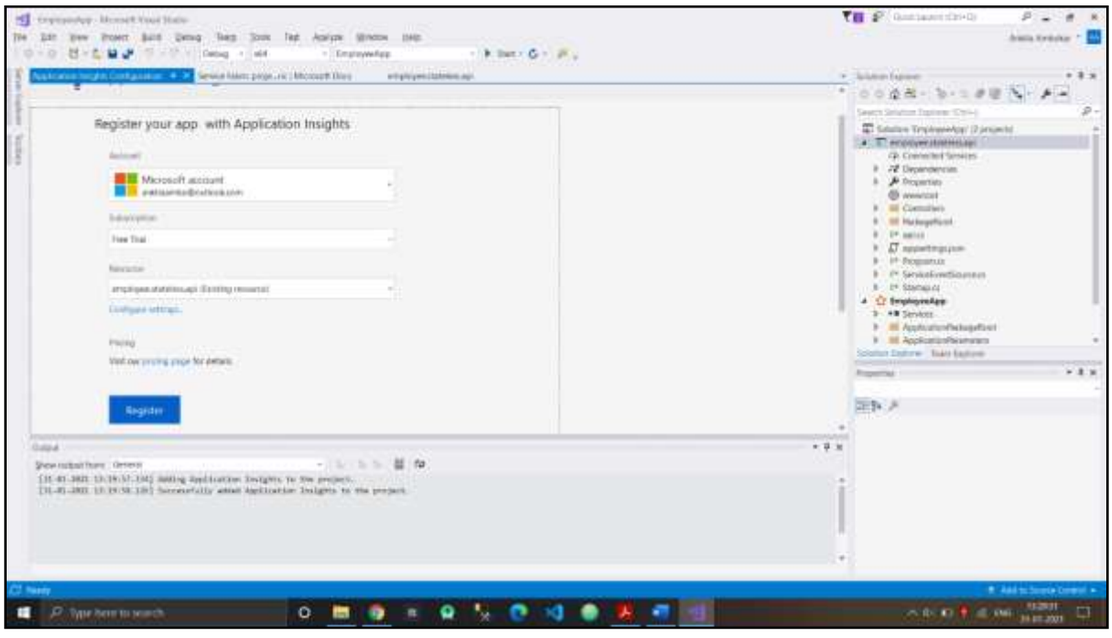
8. Choose Monitoring with Application Insights, as seen in Figure.



9. Click Get Started, as seen in Figure.

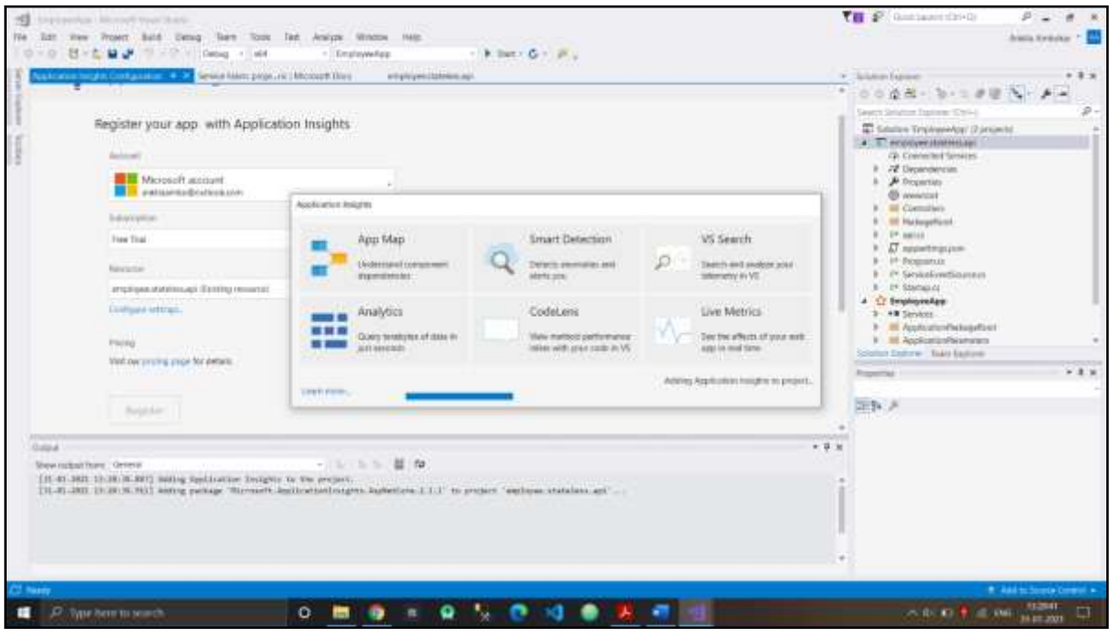


Choose the right Azure subscription and Application Insights resource. Once done, click Register, as seen in Figure.

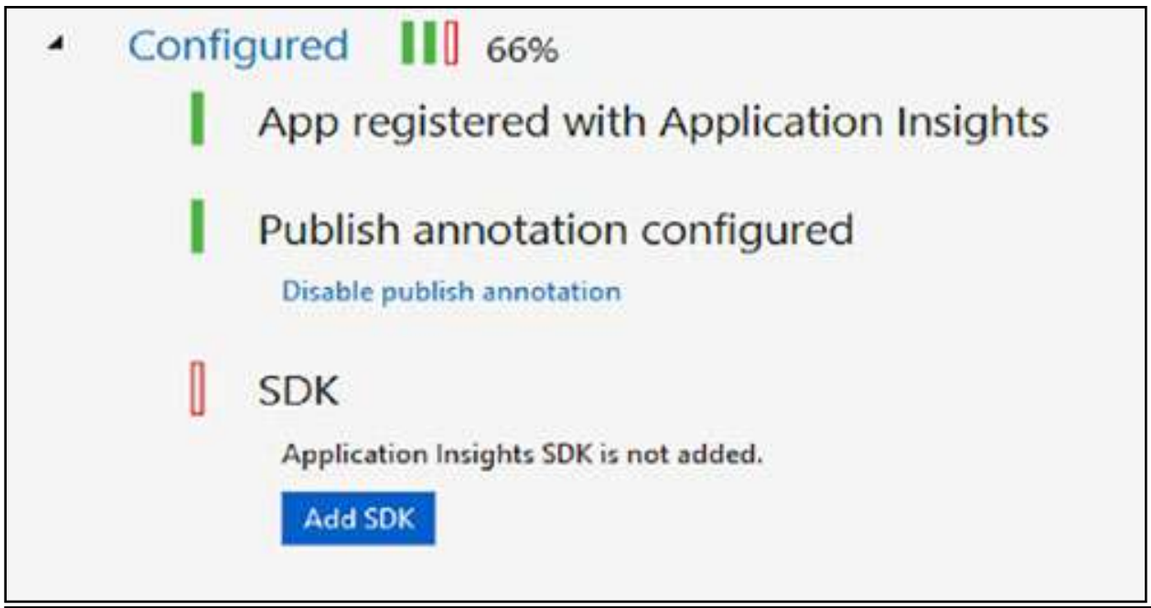


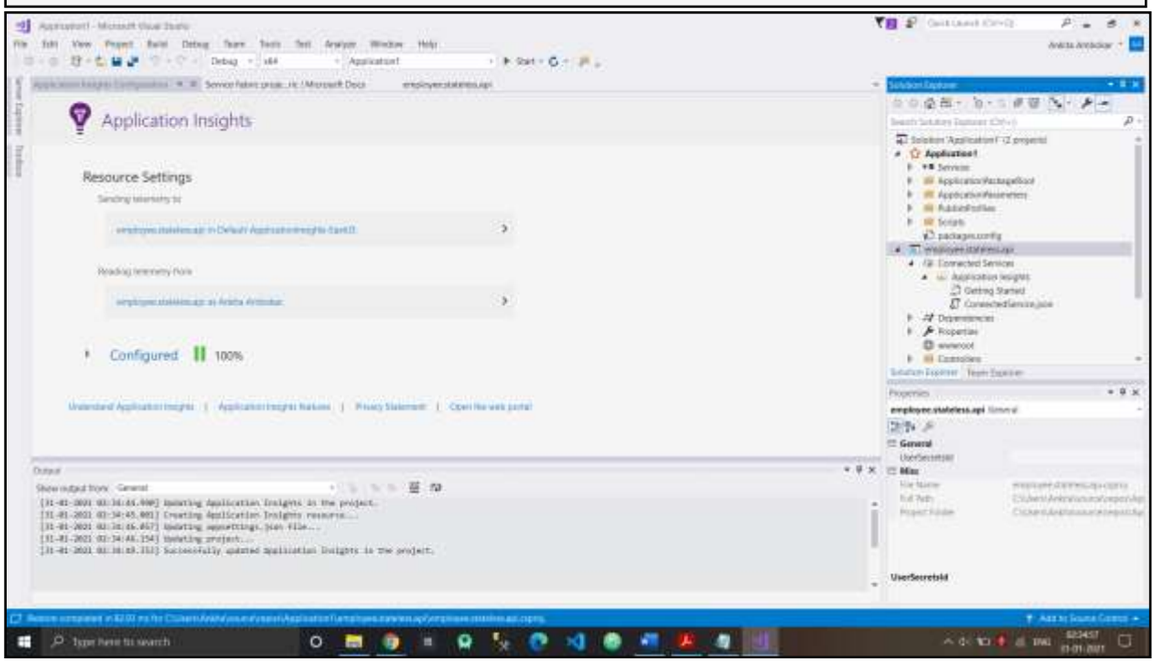
It takes a few minutes to create the Application Insights resource in your Azure subscription. During the registration process, you see the

screen shown in Figure.



11. Once the Application Insights configuration is complete, you see the status as 100%. If you see the Add SDK button (as shown in Figure), click it to achieve 100% status, as seen in Figure.





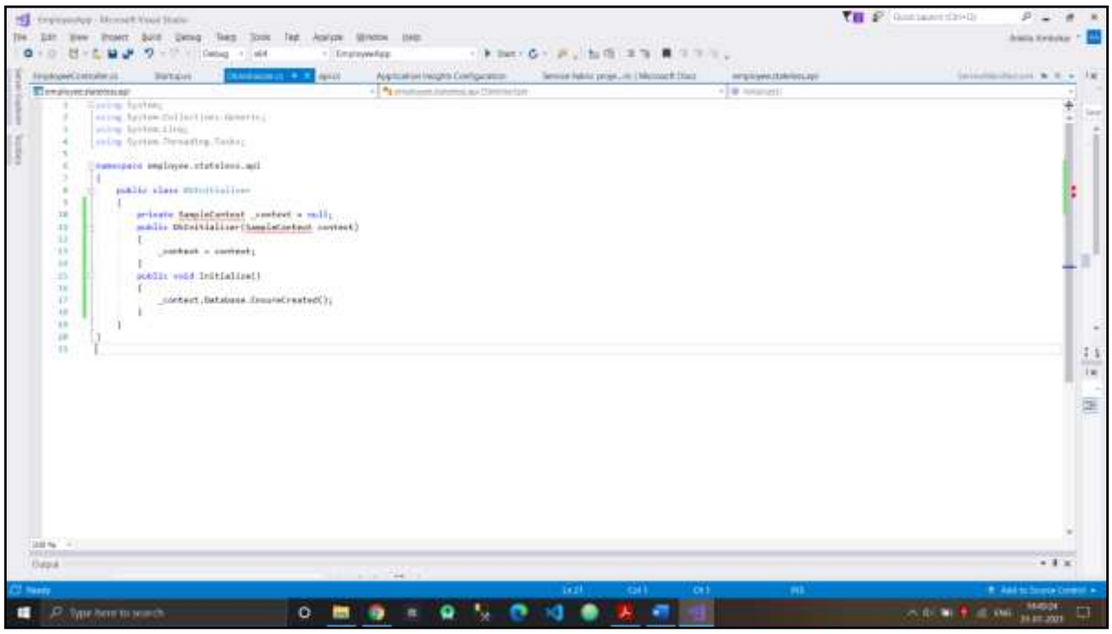
12. To confirm the Application Insights configuration, check the instrumentation key in appsettings.json.

13. Right-click the employee.stateless.api project to add dependencies for the following NuGet packages.
    a. Microsoft.EntityFrameworkCore.SqlServer

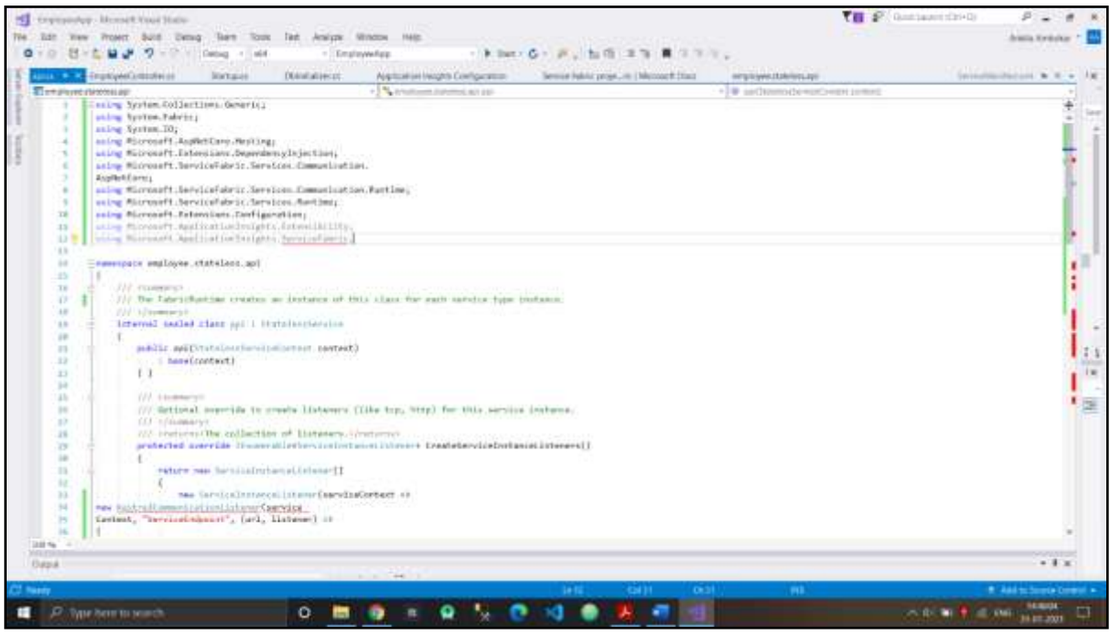
b. Microsoft.ApplicationInsights.ServiceFabric.Native
c. Microsoft.ApplicationInsights.AspNetCore

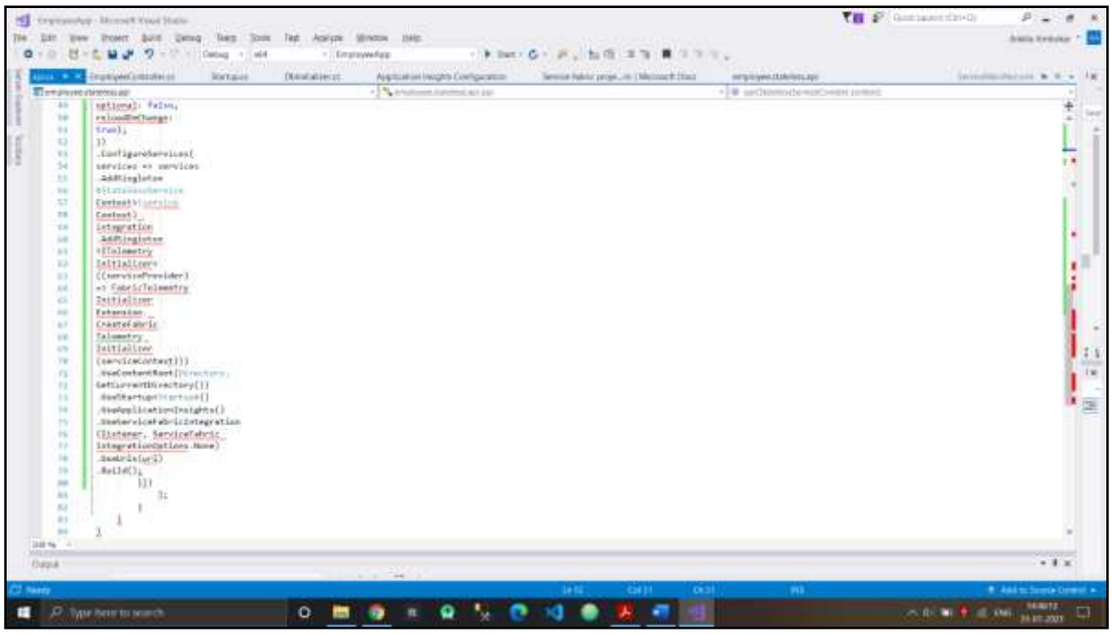
We are done with the configuration. Now let's add EmployeeController.

1. Right-click the employee.stateless.api project and a folder called Models. Add the following classes from the sources folder.
   a. AppSettings.cs
   b. Employee.cs
   c. SampleContext.cs
   d. TranslationResponse.cs
2. Right-click the employee.stateless.api project and add a file named DbInitializer.cs. Replace that content with the following content.

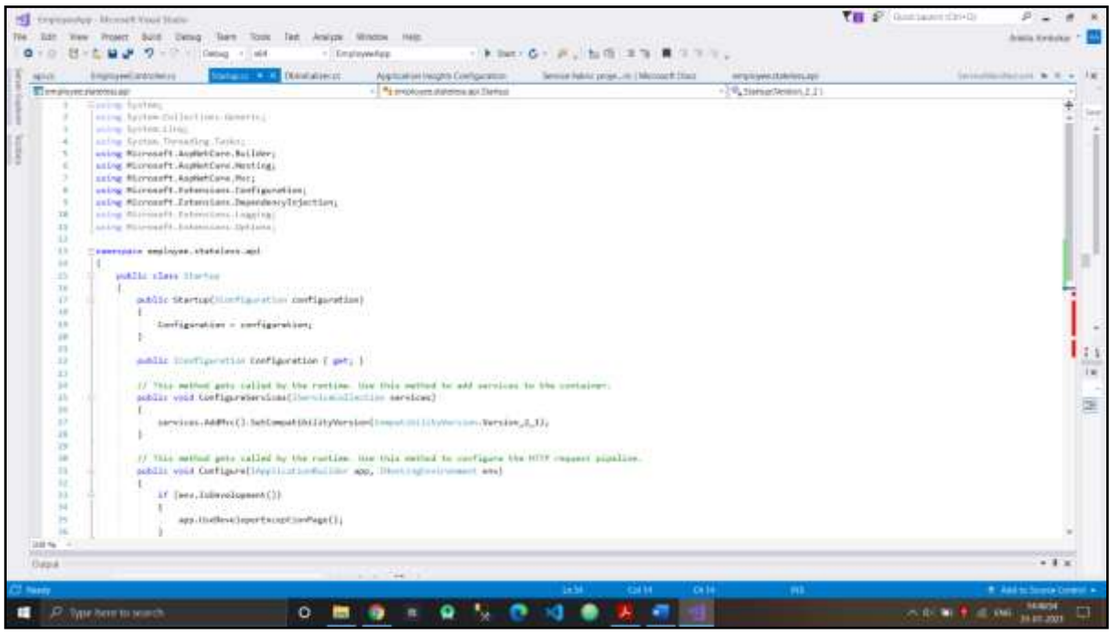


3. Open Api.cs and replace the contents of the CreateServiceInstanceListeners method with the following content.

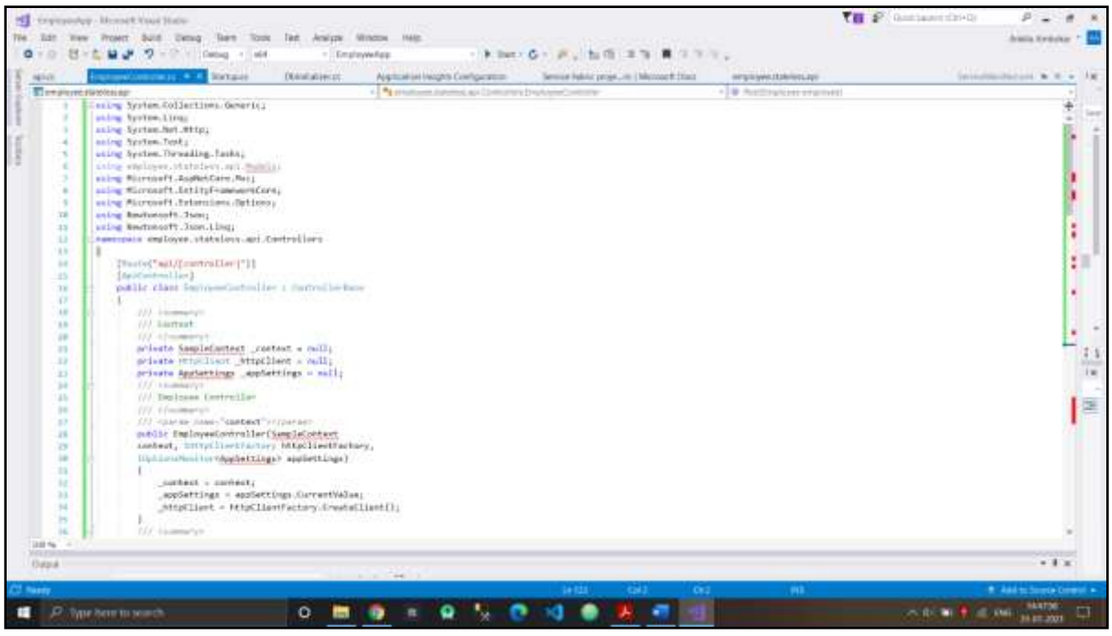


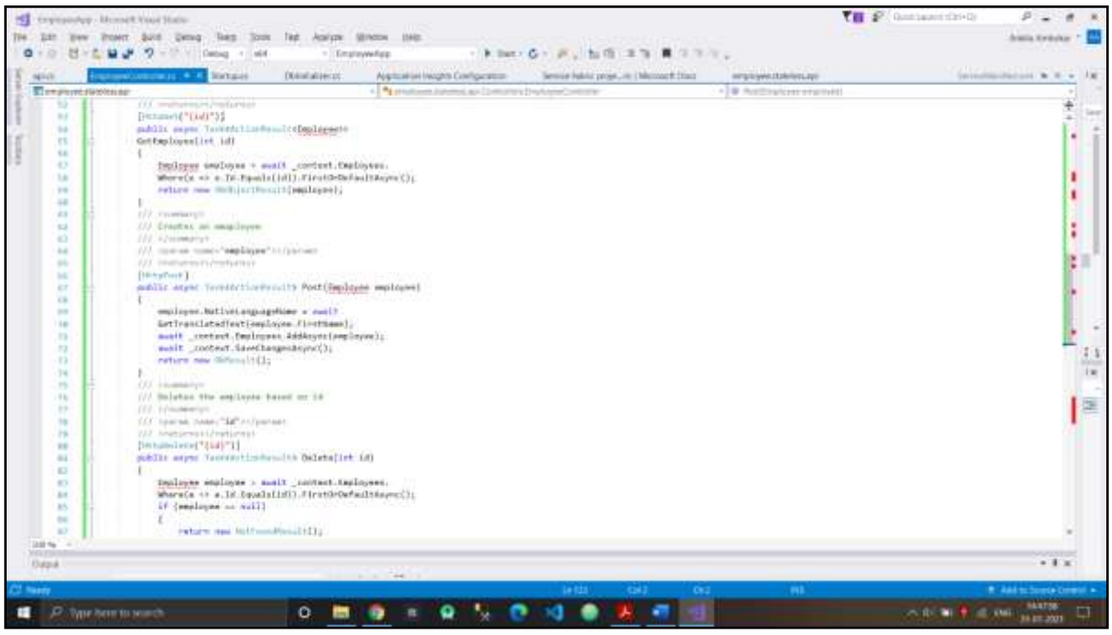


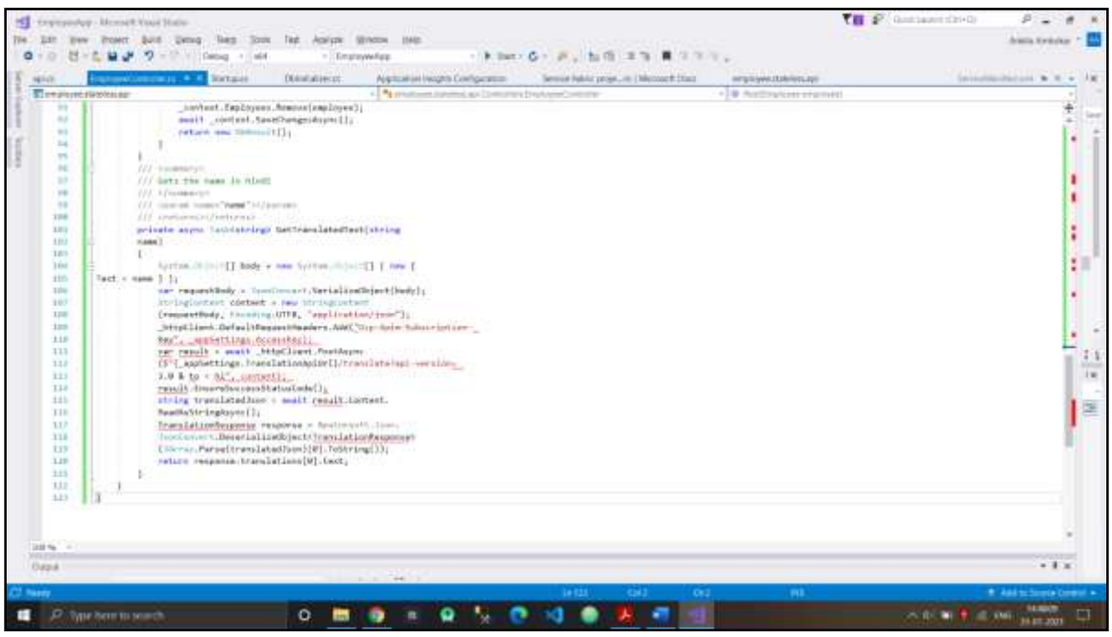
4. Open Startup.cs and replace the contents of the ConfigureServices method with the following content.



5. Right-click the controller folder in the employee.stateless.api project and add a controller called EmployeeController.cs. Replace that content with the following content.







6. Open AppSettings.json and make sure that the content looks similar to your connection strings.

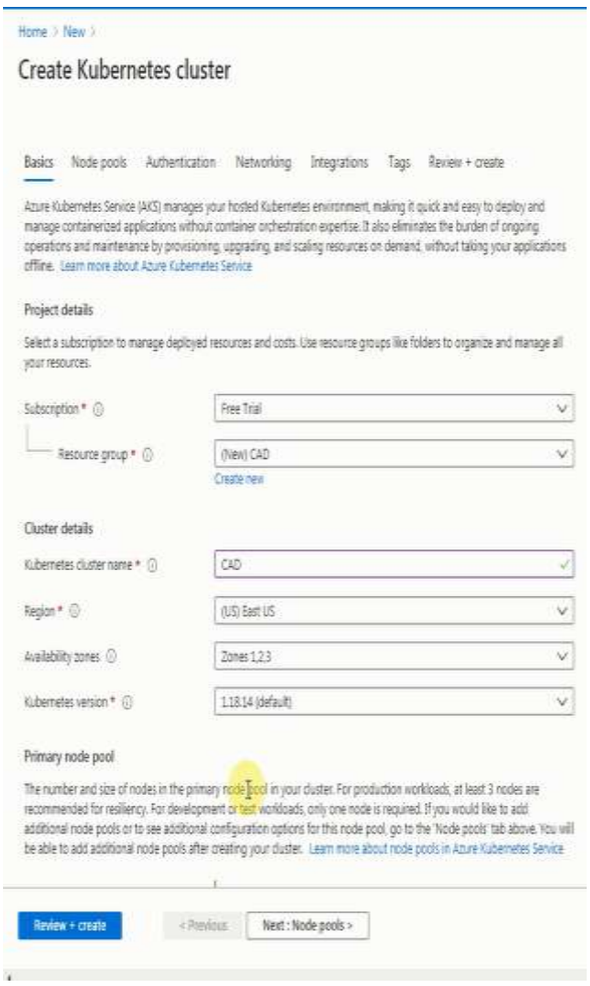
```
{
"ConnectionStrings": {
"DefaultConnection": "Server=<<YOUR_SERVER>>;Database=
<<YOUR_DATABASE>>;User ID=<<USER_ID>>;Password=<<PASSWORD>>
;Trusted_Connection=False;Encrypt=True;MultipleActiveResult
Sets=True;"
},
"AppSettings": {
"TranslationApiUrl": "https://api.cognitive.
microsofttranslator.com",
"AccessKey": "<<YOUR ACCESS KEY TO TRANSLATION API>>"
},
"Logging": {
"LogLevel": {
"Default": "Warning"
}
},
"AllowedHosts": "*",
"ApplicationInsights": {
"InstrumentationKey": "<<YOUR INSTRUMENTATION KEY OF YOUR
APP INSIGHTS RESOURCE>>"
}
```

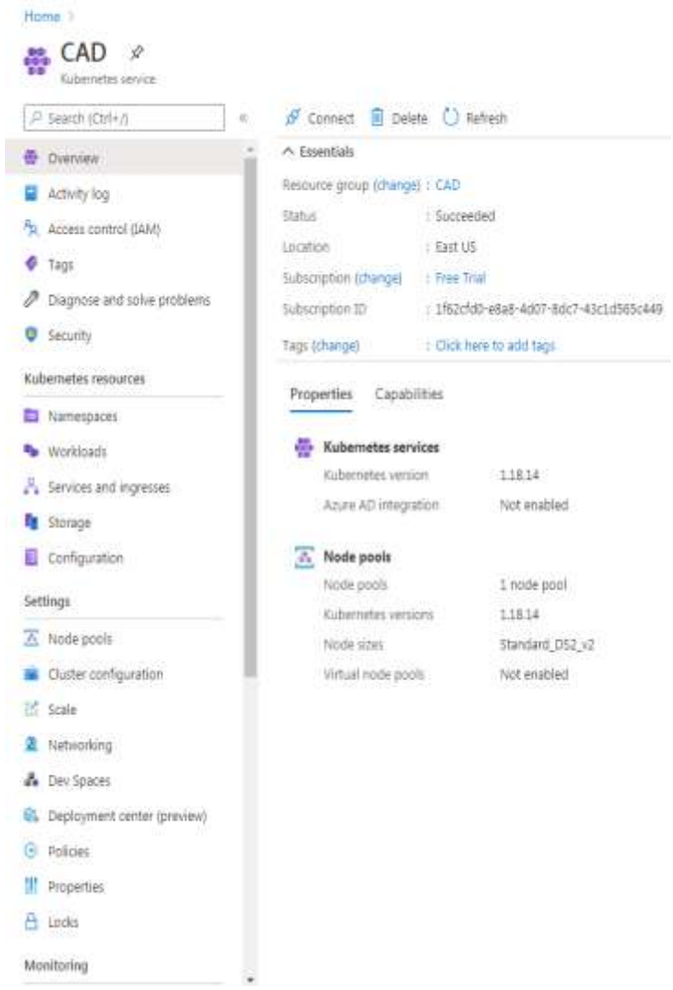
Practical No: 4

Practical No.4A
Create an Azure Kubernetes Service Cluster

Steps –

1. Sign in Azure Portal (https://portal.azure.com/)
2. Create Resource by clicking on Create Resource option.
3. Select Kubernetes Services
4. Enter the subscription, resource group, kubernetes, Cluster name, Region, Kubernetes version,& DNS Name prefix
5. Click on Review + Create Button
6. Click on Create Button





Practical No.4B - Enable Azure Dev Space on an AKS Cluster

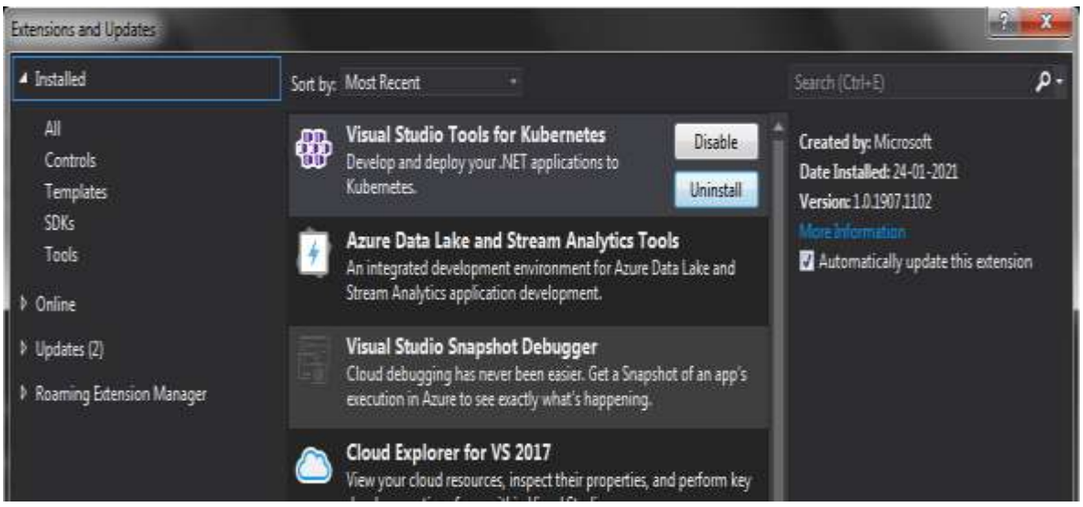
Steps –

1. Open Kubernetes Services
2. Click on Dev Space
3. Install Azure CLI
4. Open CMD
5. Enter command AZ LOGIN
6. Enter command
   az aks use-dev-spaces –n CAD–g CAD
7. Install Azure Dev Space

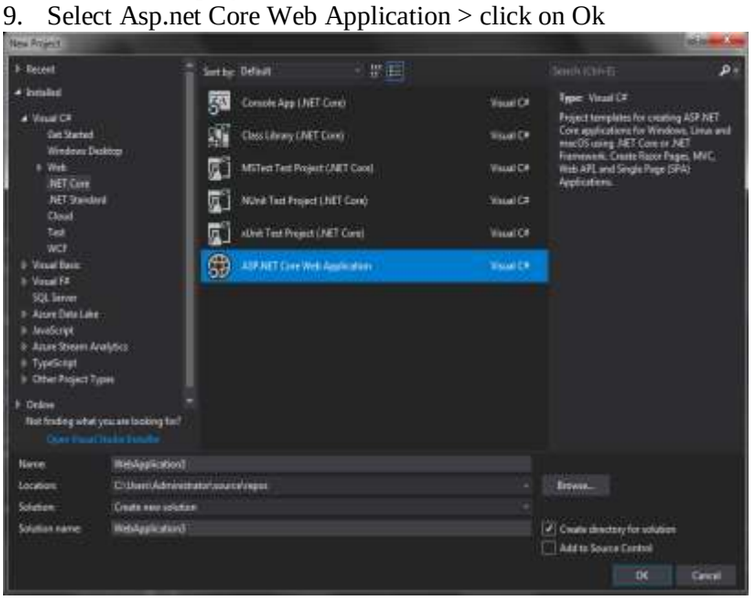
Practical No.4C - Configure Visual Studio to work with an azure kubernetes services Cluster

Steps –

1. Install Visual Studio Enterprise 2017
2. Open Visual Studio 2017 >Tool > Extensions & Update
3. Search for Kubernetes Services tool
4. Click on Download
5. Close visual studio
6. click on Modify(install kubernetes tool extension)

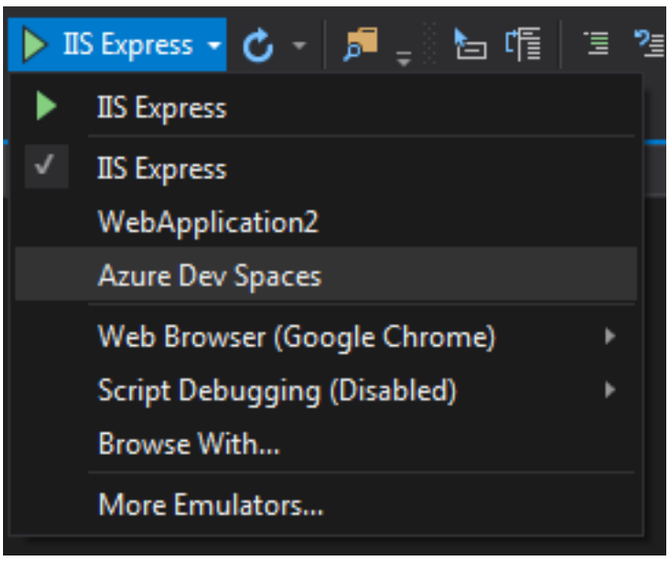


7. Open Visual studio
8. Click on new project
9. Select Asp.net Core Web Application > click on Ok



10. Select Model View Control > Click on OK

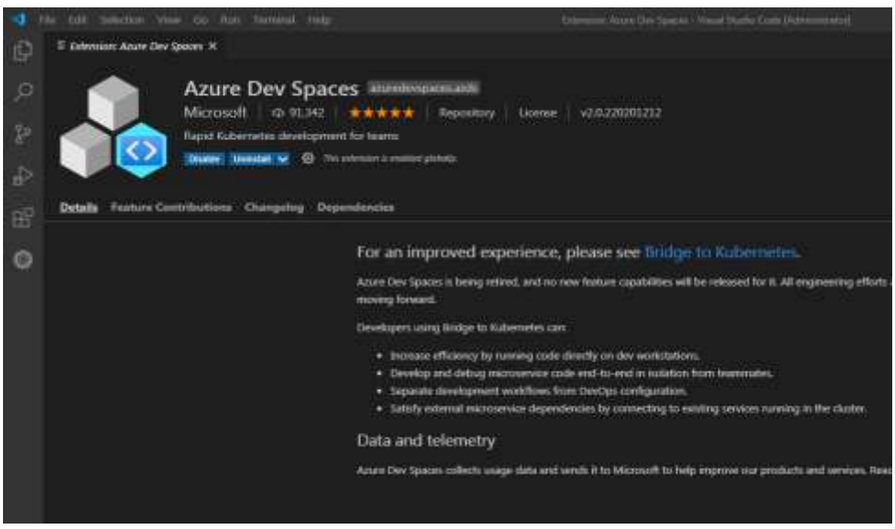
11. Click On Down Arrow of IIS Express
12. We can see option of Azure Dev Space



Practical No.4D - Configure Visual Studio Code to work with an azure Kubernetes services Cluster.

Steps –

1. Install visual studio code
2. Open extension window
3. Search for Azure Dev Space
4. Click Install



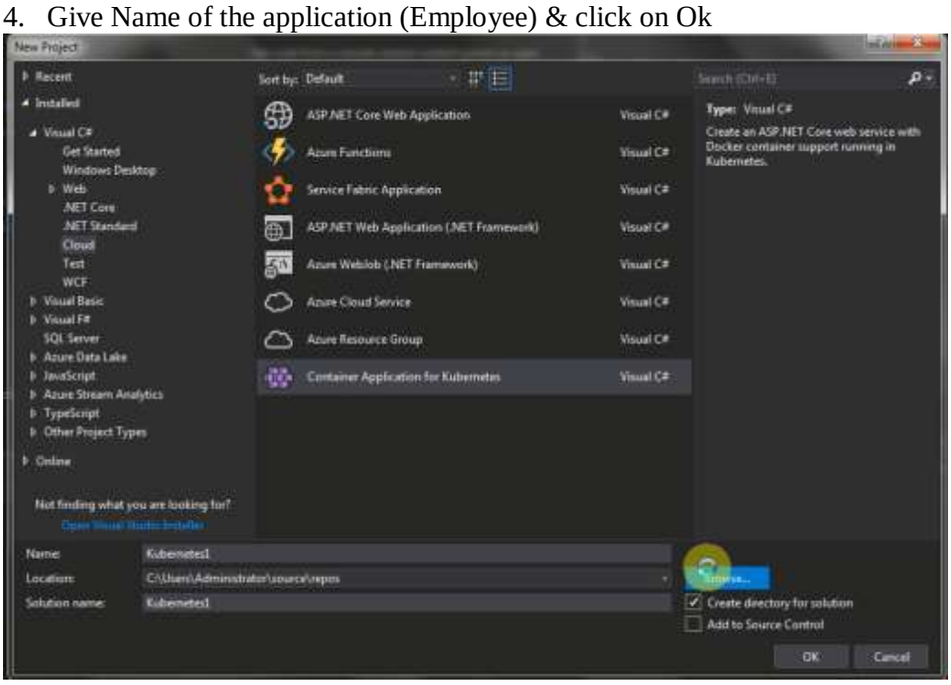
5. Install Azure CLI (https://docs.microsoft.com/en-us/cli/azure/install-azure-cli?view=azure-cli-latest)
6. Open cmd
7. Enter command az Login
8. Enter Command to install AZDS utility
   az aks use-dev-spaces –n CAD –g CAD

Practical No.4E - Deploy Application on AKS

1. Core web API

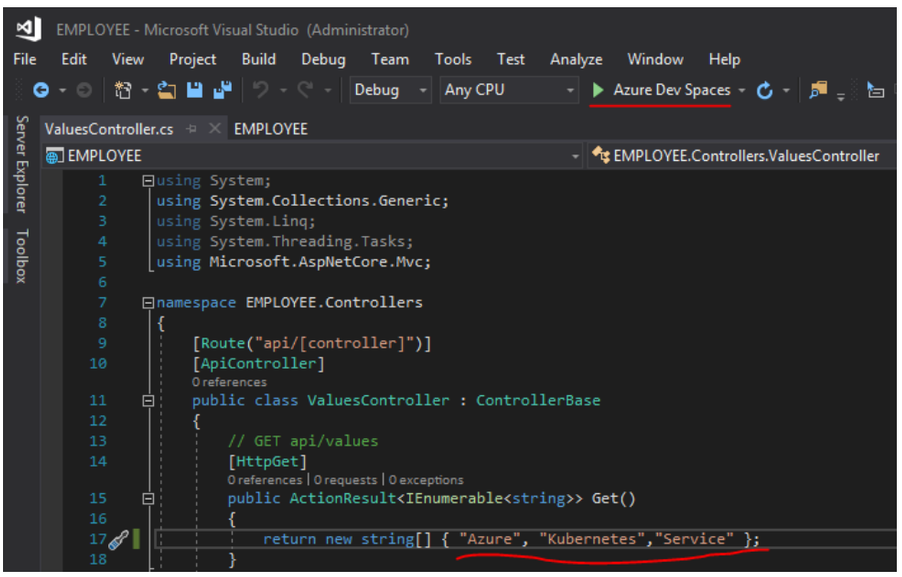
Steps –

1. Open Visual Studio
2. Click on New project
3. Select Cloud Container Application for Kubernetes
4. Give Name of the application (Employee) & click on Ok

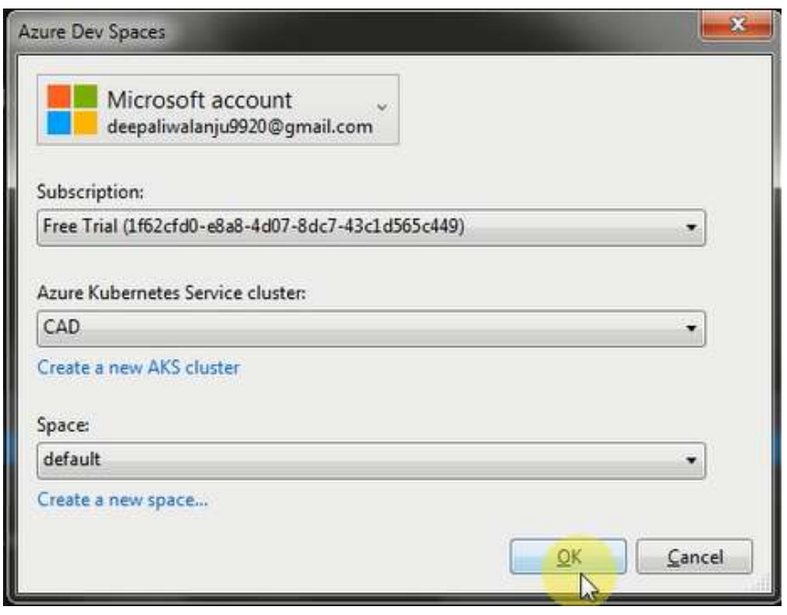


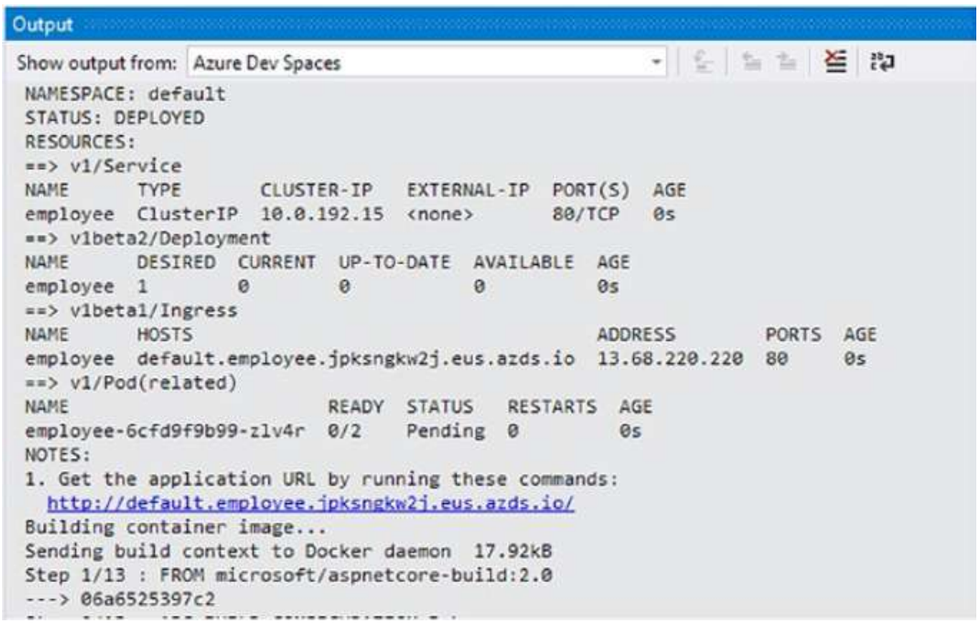
5. Select API option & click on OK button

6. Make sure Azure Dev Space is selected in menu.
7. Open ValuesController.cs file
8. Edit line number 16 as shown in the screen shot.



9. Save changes & press F5 button to run the application
10. Select cluster name & space > click on OK button





2.Node.js API

Steps –

1. Create MYAPP folder
2. Open visual studio code
3. Open folder MYAPP in visual studio code
4. Create new file server.js & pacakge.json
5. From windows explorer create PUBLIC folder in MYAPP folder
6. Now create new file using public folder by using visual studio code
7. Create file index.html & app.css
8. Open command palette from view menu (ctrl+shif+p)
9. Enter azure dev space & click on it
10. Click on configure
11. Click DEBUG icon on left & then click on LAUNCH SERVER(AZDS)
12. OUTPUT will display in Output window

Server.js

```
var express = require('express');
var app = express();
app.use(express.static(__dirname + '/public'));
app.get('/', function (req, res) {
res.sendFile(__dirname + '/public/index.html');
});
app.get('/api', function (req, res) {
res.send('Hello from webfrontend');
});
var port = process.env.PORT || 80;
var server = app.listen(port, function () {
console.log('Listening on port ' + port);
});
process.on("SIGINT", () => {
process.exit(130 /* 128 + SIGINT */);
});
process.on("SIGTERM", () => {
console.log("Terminating...");
server.close();
});
```

Package.json

```
{
"name": "webfrontend",
"version": "0.1.0",
"devDependencies": {
"nodemon": "^1.18.10"
},
"dependencies": {
"express": "^4.16.2",
```

```
"request": "2.83.0"
},
"main": "server.js",
"scripts": {
"start": "node server.js"
}
}
```

Index.html

```
<!doctype html>
<html ng-app="myApp">
<head>
<script src="https://ajax.googleapis.com/ajax/libs/
angularjs/1.5.3/angular.min.js"></script>
<script src="https://cdnjs.cloudflare.com/ajax/
libs/angular.js/1.5.3/angular-route.js"></script>
<script src="app.js"></script>
<link rel="stylesheet" href="app.css">
<link href="https://maxcdn.bootstrapcdn.
com/bootstrap/3.3.6/css/bootstrap.min.css"
rel="stylesheet" integrity="sha384-1q8mTJOASx8j1Au
+a5WDVnPi2lkFfwwEAa8hDDdjZlpLegxhjVME1fgjWPGmkzs7"
crossorigin="anonymous">
<!-- Uncomment the next line -->
<!-- <meta name="viewport" content="width=devicewidth,
initial-scale=1"> -->
</head>
<body style="margin-left:10px; margin-right:10px;">
<div ng-controller="MainController">
<h2>Server Says</h2>
<div class="row">
<div class="col-xs-8 col-md-10">
<div ng-repeat="message in messages
track by $index">
<span class="message">{{message}}</
span>
</div>
</div>
<div class="col-xs-4 col-md-2">
<button class="btn btn-primary"
ng-click="
sayHelloToServer()">Say It
Again</button>
</div>
</div>
</div>
</body>
</html>
```

APP.css

```
.message {
font-family: Courier New, Courier, monospace;
font-weight: bold;
}
```

OUTPUT

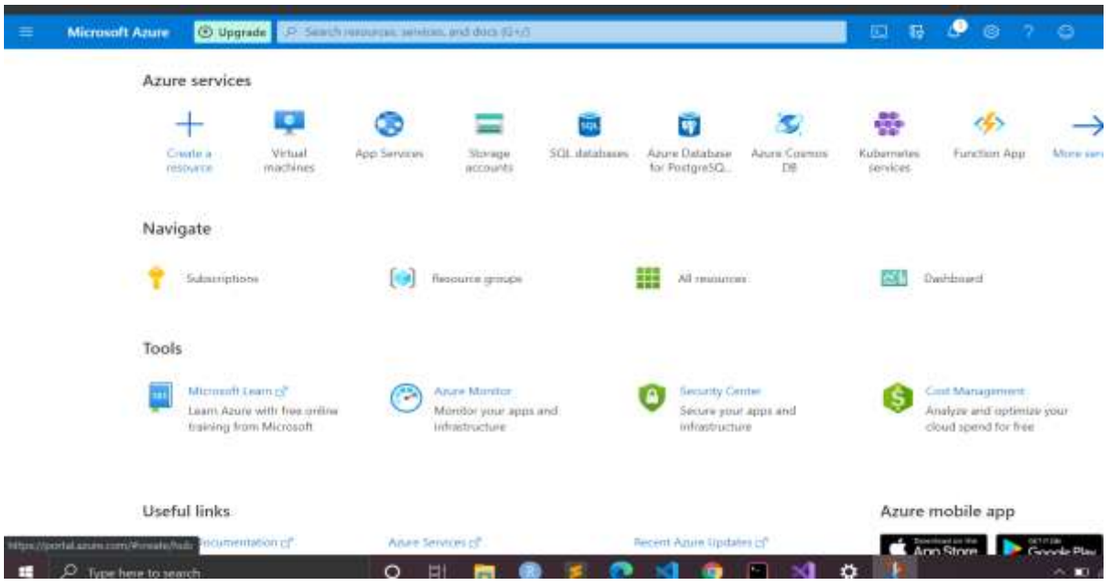
The Debug console shows the log output.

```
> Executing task: C:\Program Files\Microsoft SDKs\Azure\Azure
Dev Spaces CLI (Preview)\azds.exe up --port=50521:9229 --await-exec
--keep-alive <
Synchronizing files...4s
Using dev space 'new01' with target 'kuber01'
Installing Helm chart...2s
Waiting for container image build...29s
Building container image...
Step 1/8 : FROM node:lts
Step 2/8 : ENV PORT 80
Step 3/8 : EXPOSE 80
Step 4/8 : WORKDIR /app
Step 5/8 : COPY package.json .
Step 6/8 : RUN npm install
Step 7/8 : COPY . .
Step 8/8 : CMD ["npm", "start"]
Built container image in 45s
Waiting for container...52s
Service 'myapp' port 80 (http) is available via port forwarding
at http://localhost:50764
Terminal will be reused by tasks, press any key to close it.
```

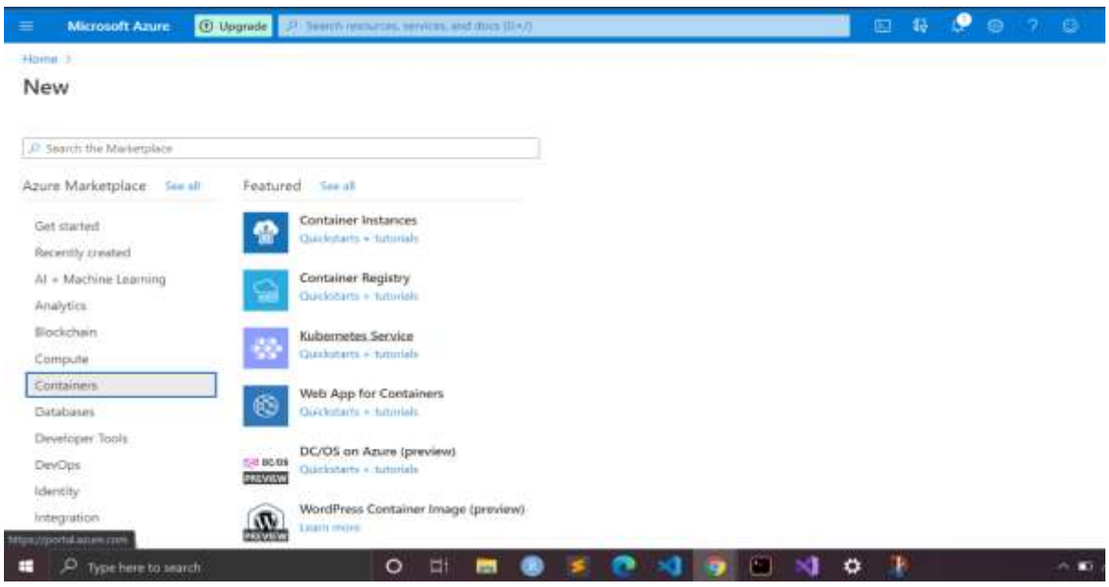
PRACTICAL 5
Create an AKS cluster

a. From the portal

Step 1: Sign in to the Azure portal at https://portal.azure.com.
Step 2: On the Azure portal menu or from the Home page, select Create a resource.



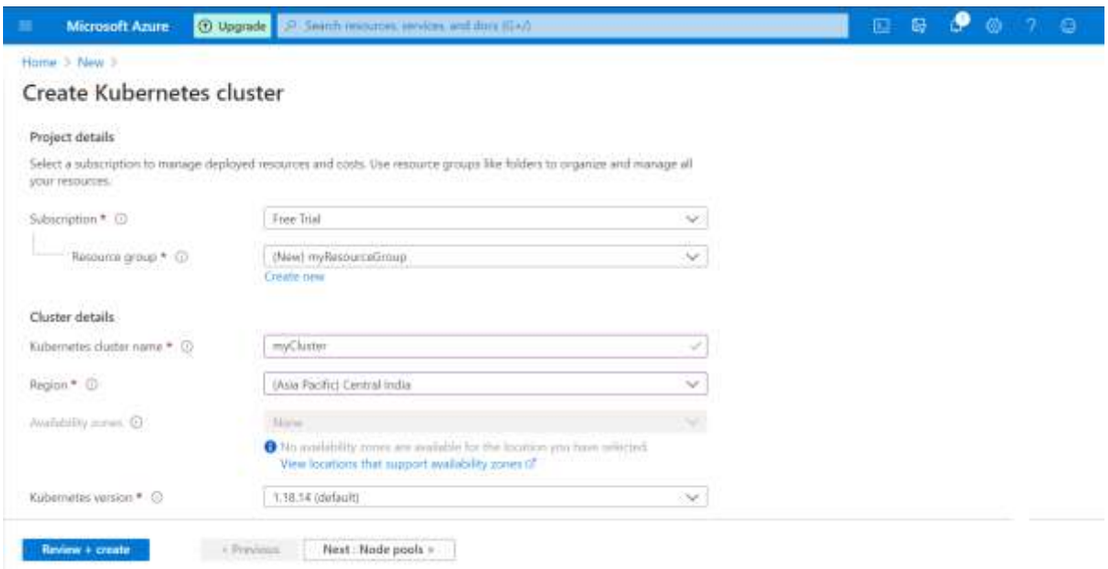
Step 3: Select Containers > Kubernetes Service.



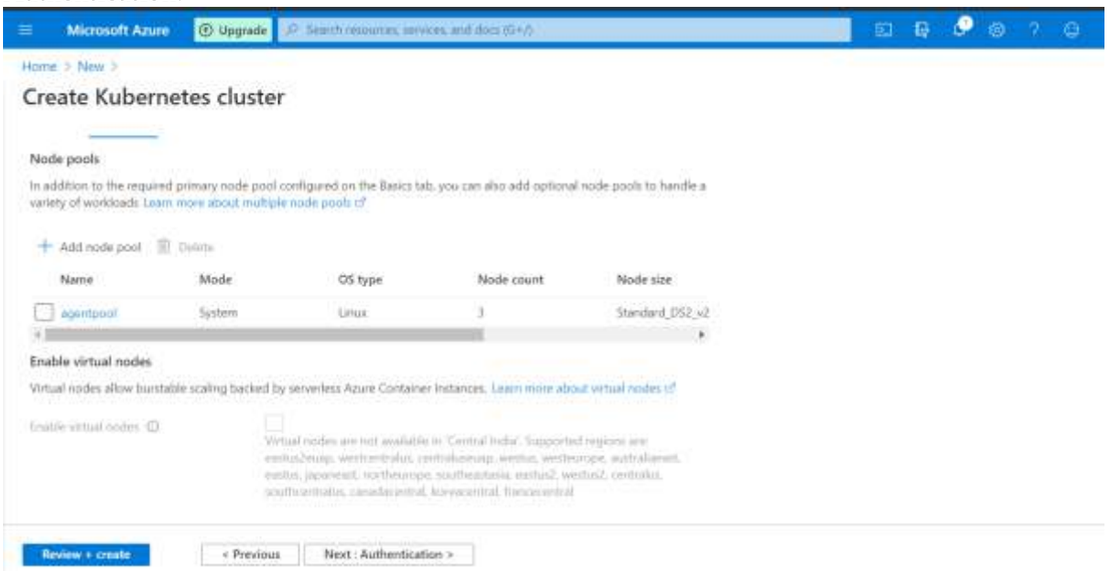
Step 4: On the Basics page, configure the following options:

- Project details: Select an Azure Subscription, then select or create an Azure Resource group, such as myResourceGroup.
- Cluster details: Enter a Kubernetes cluster name, such as myCluster. Select a Region and Kubernetes version for the AKS cluster.
- Primary node pool: Select a VM Node size for the AKS nodes. The VM size can't be changed once an AKS cluster has been deployed. - Select the number of nodes to deploy into the cluster. Set Node count to 1. Node count can be adjusted after the cluster has been deployed.

Select Next: Node pools when complete.

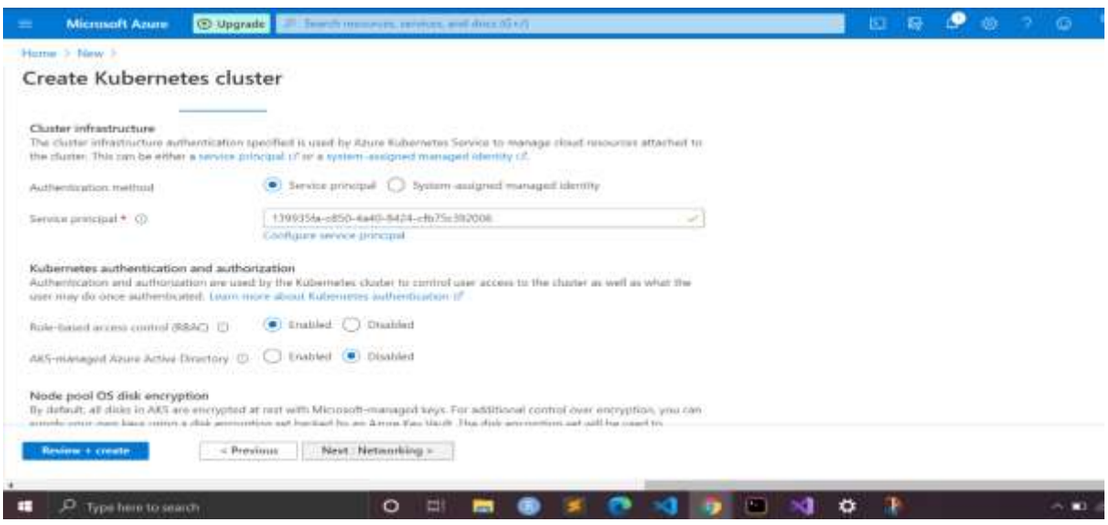


Step 5: On the Node pools page, keep the default options. At the bottom of the screen, click Next: Authentication.

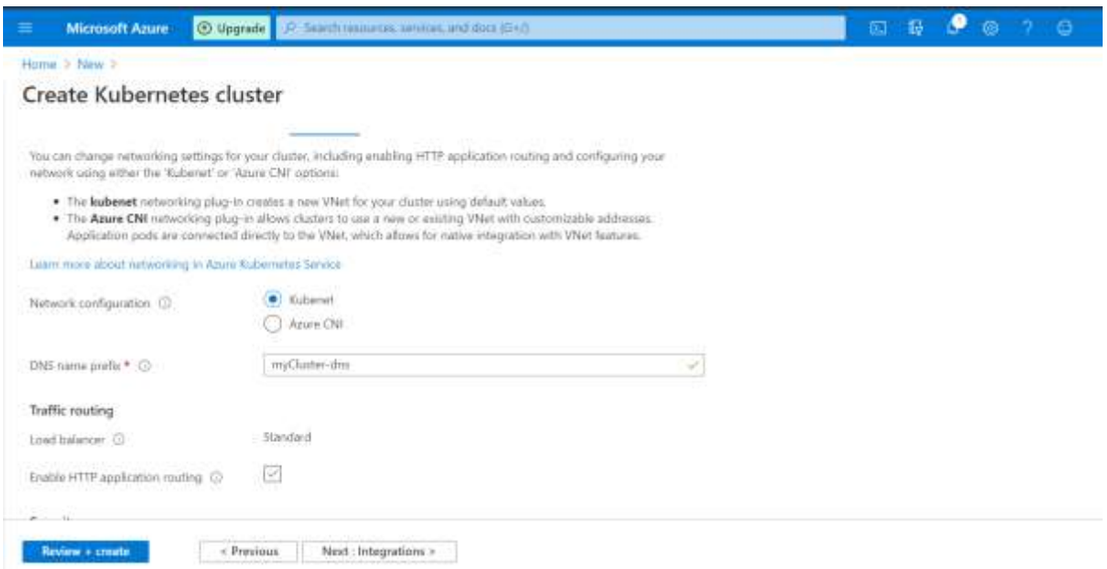


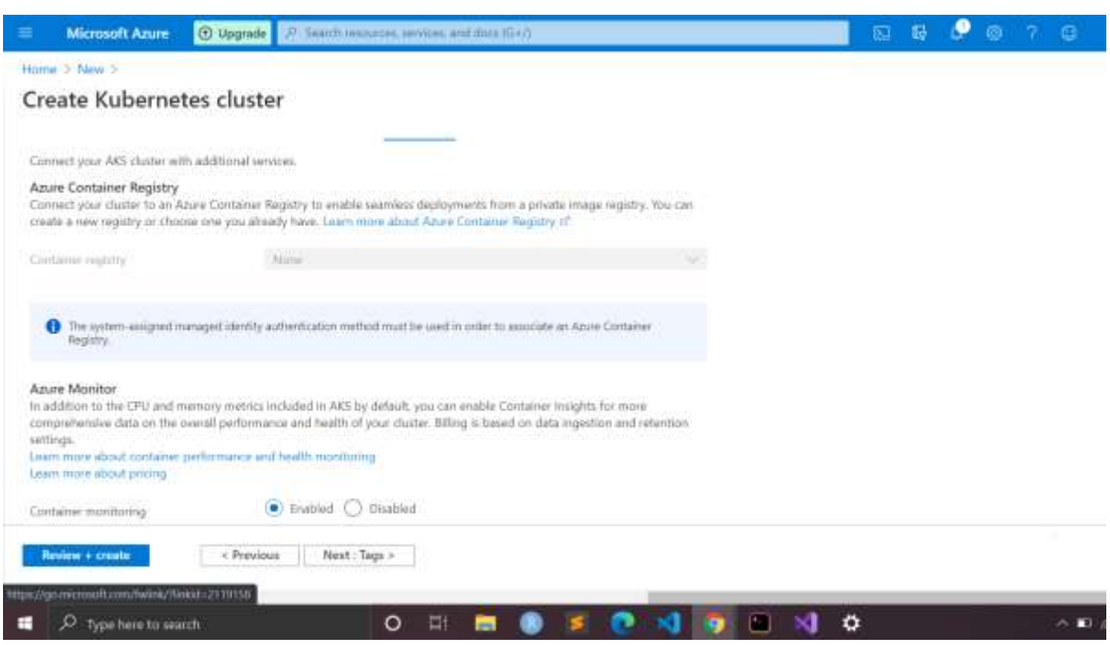
Step 6: On the Authentication page, configure the following options:

- Create a new service principal by leaving the Service Principal field with (new) default service principal. Or you can choose Configure service principal to use an existing one. If you use an existing one, you will need to provide the SPN client ID and secret.
- Enable the option for Kubernetes role-based access control (Kubernetes RBAC). This will provide more fine-grained control over access to the Kubernetes resources deployed in your AKS cluster

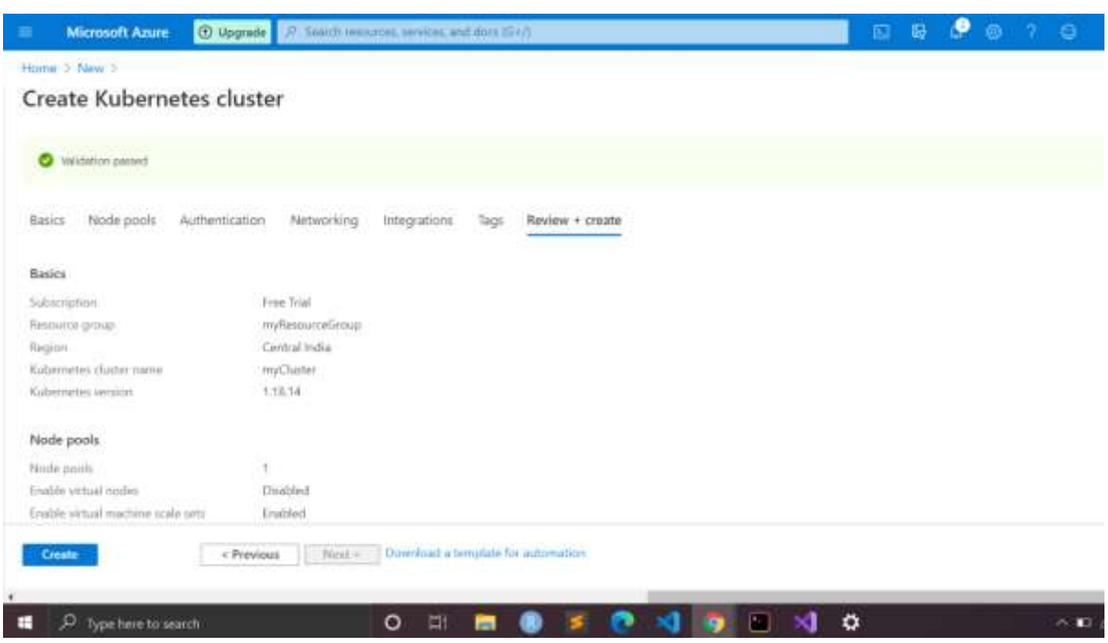


Step 7: By default, Basic networking, Integrations and tags is used, and Azure Monitor for containers is enabled.

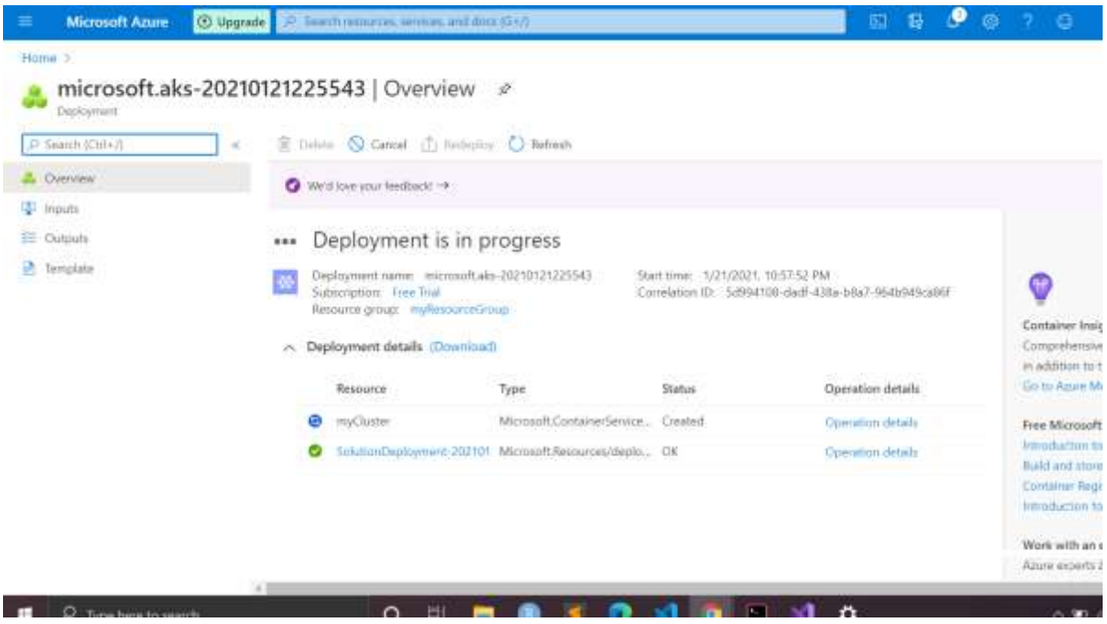


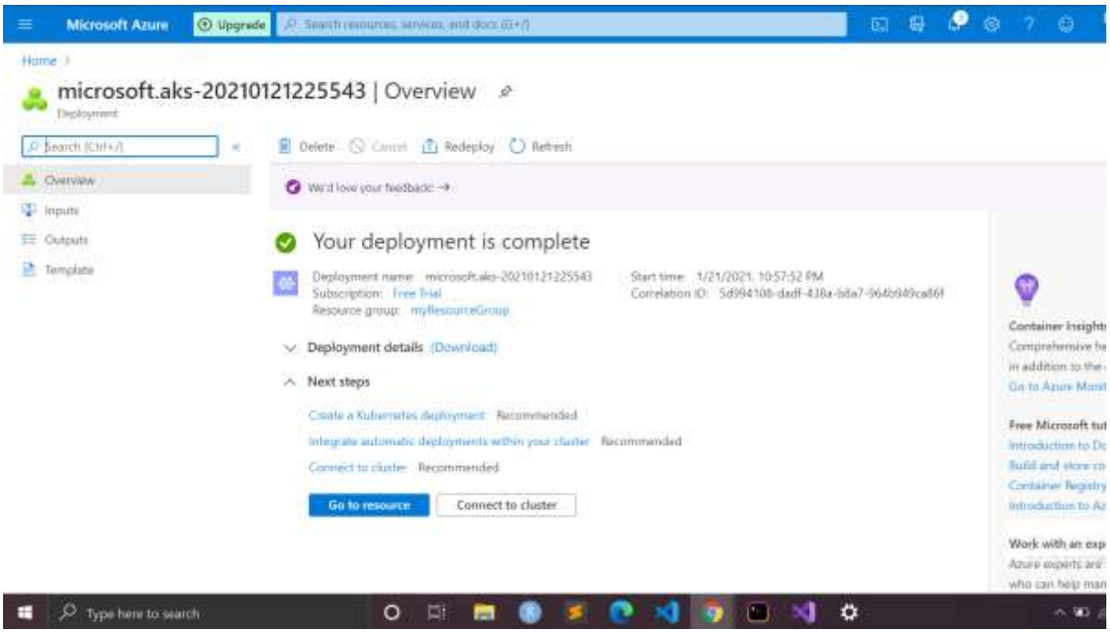


Click Review + create and then Create when validation completes.



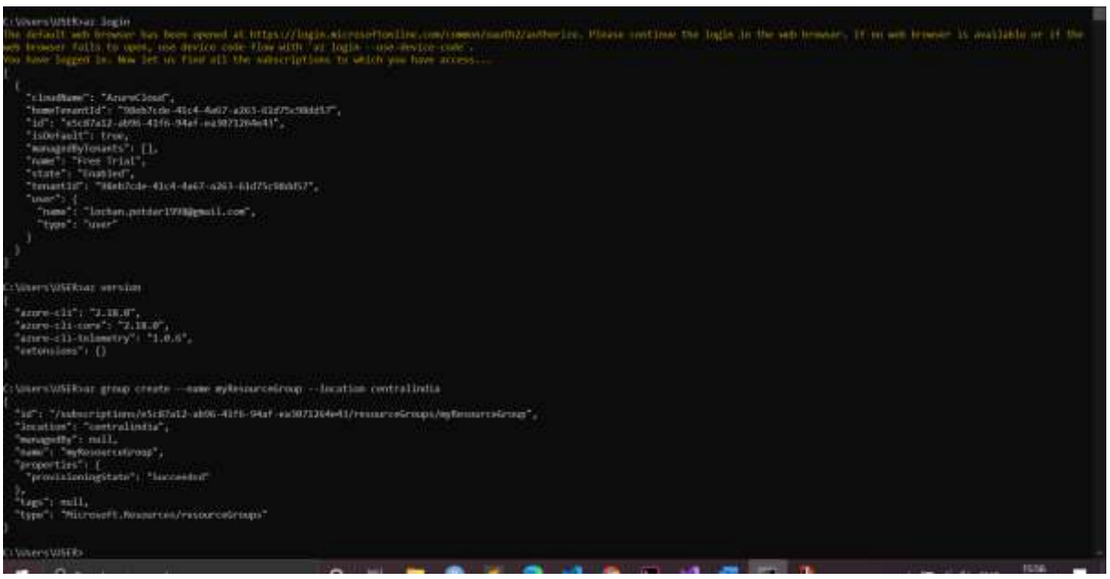
Step 8: It takes a few minutes to create the AKS cluster. When your deployment is complete, click Go to resource, or browse to the AKS cluster resource group, such as myResourceGroup, and select the AKS resource, such as myCluster. The AKS cluster dashboard is shown below:





b. From azure CLI

Step 1: Install the Azure CLI to run CLI reference commands.
Step 2: Sign in to the Azure CLI by using the az login command. To finish the authentication process, follow the steps displayed in your terminal.
Step 3: Run az version to find the version and dependent libraries that are installed. To upgrade to the latest version, run az upgrade.



Step 4: An Azure resource group is a logical group in which Azure resources are deployed and managed. When you create a resource group, you are asked to specify a location. This location is where resource group metadata is stored, it is also where your resources run in Azure if you don't specify another region during resource creation. Create a resource group using the az group create command.

Step 5: The following example creates a resource group named myResourceGroup in the centralindia location.

az group create --name myResourceGroup --location centralindia

Output similar to the following example indicates the resource group has been created successfully:

Step 6: Use the az aks create command to create an AKS cluster. The following example creates a cluster named myAKSCluster with one node. This will take several minutes to complete.

az aks create --resource-group myResourceGroup --name myAKSCluster --node-count 1 --enable-addons monitoring --generate-ssh-keys

After a few minutes, the command completes and returns JSON-formatted information about the cluster.

Practical no 6

Create an Application Gateway Using Ocelot and Securing APIs with Azure AD

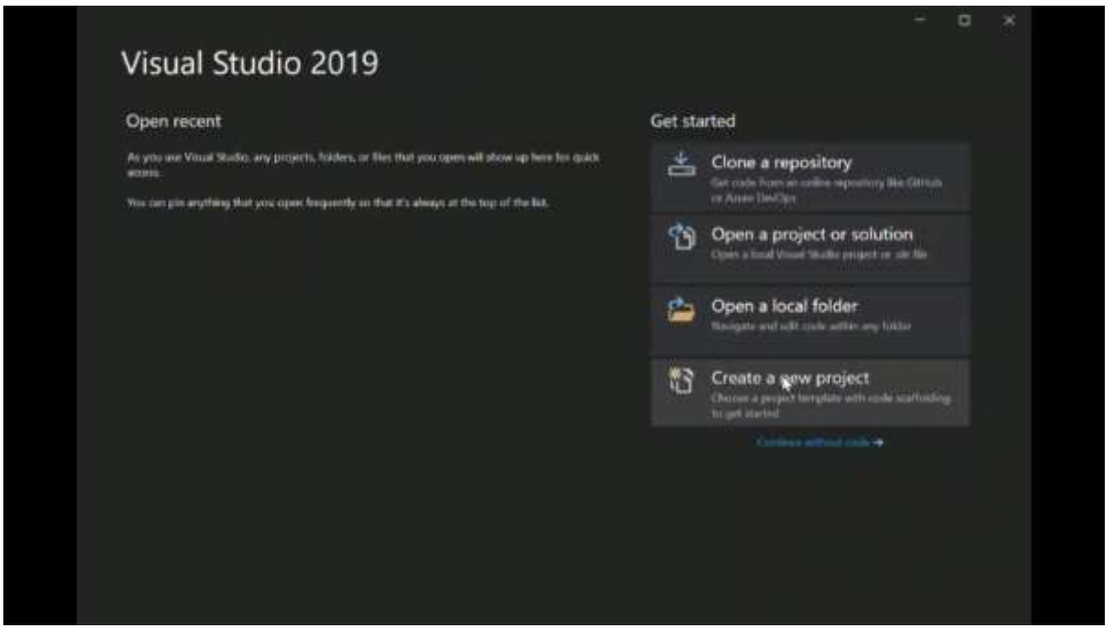
Q6: Create an Application Gateway Using Ocelot and Securing APIs with Azure AD.
API Gateway is an API management tool that usually sits between the external caller (Web or Mobile) and the internal services.
The API Gateway can provide multiple features like:

1. Routing Request
2. Aggregations
3. Authentication
4. Authorization
5. Rate Limiting
6. Caching
7. Load Balancing ETC.

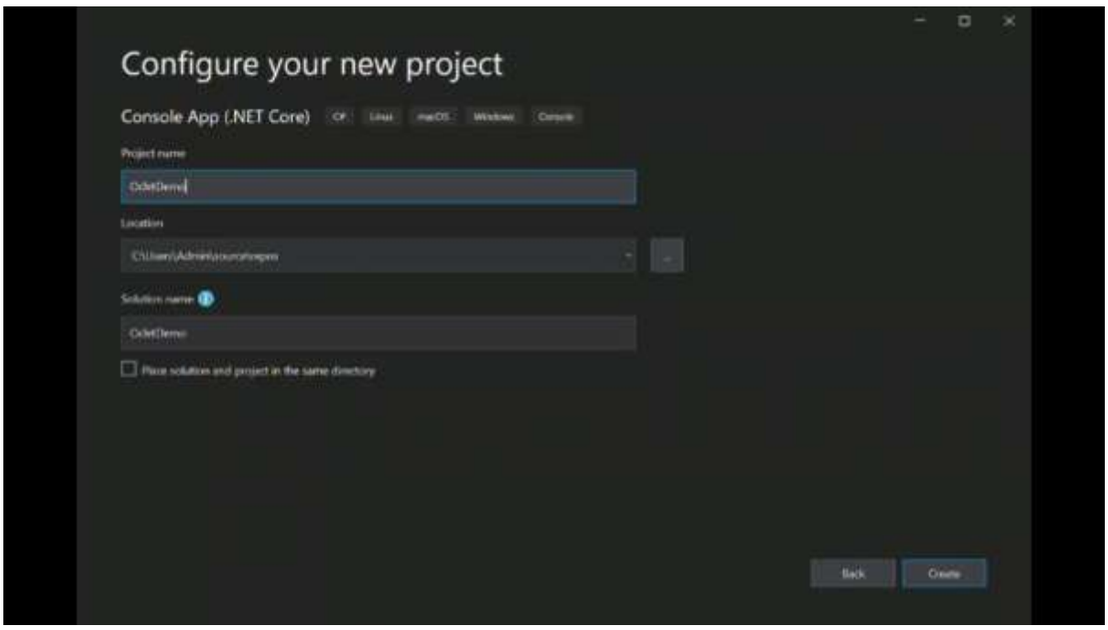
Ocelot is an ASP.Net Core (Supports .Net Core 3.1) API Gateway. It's a NuGet package, which can be added to any ASP.Net Core application to make it an API Gateway. Ocelot API Gateway supports all the features that any standard API Gateway does.

Steps:

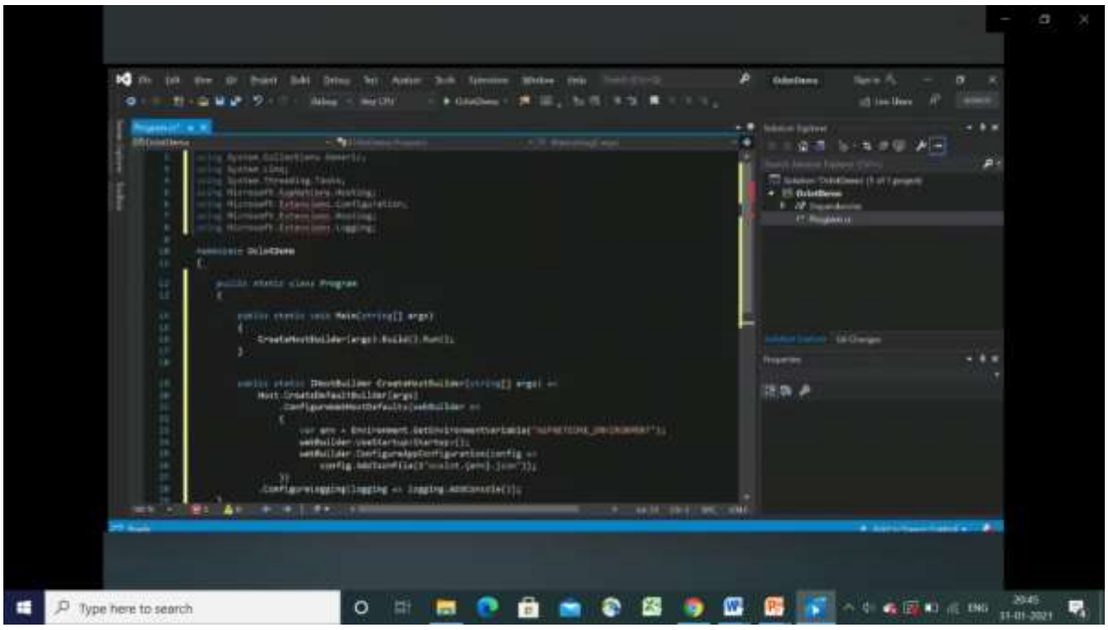
1. Create an ASP.NET Core Web Application Project.



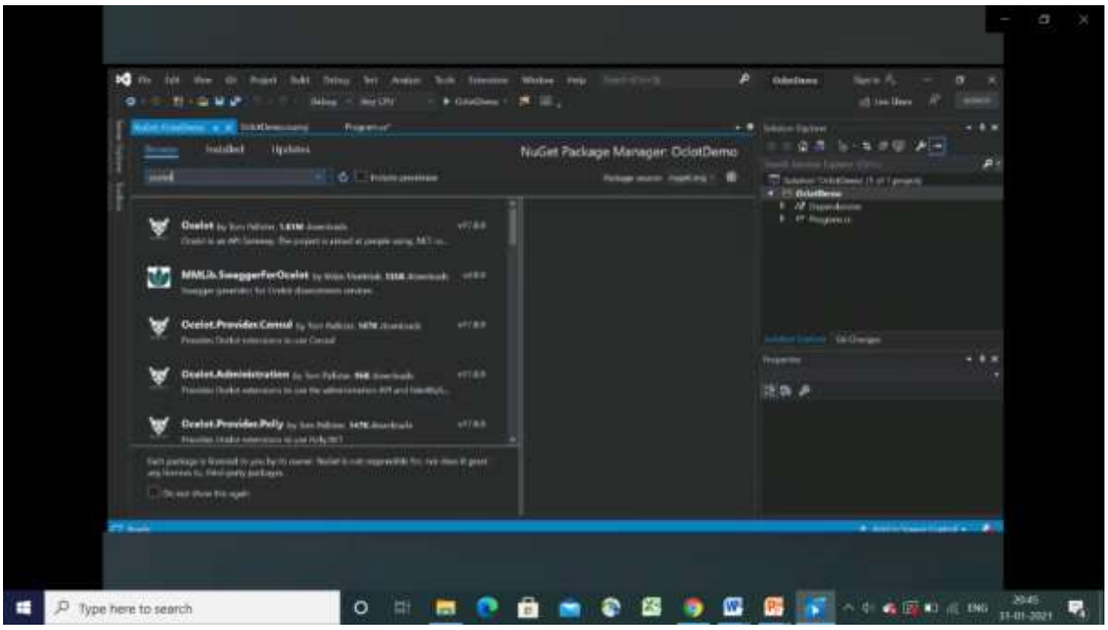
2. Create an empty ASP.NET Core 3.1 and and give a name of the Project.



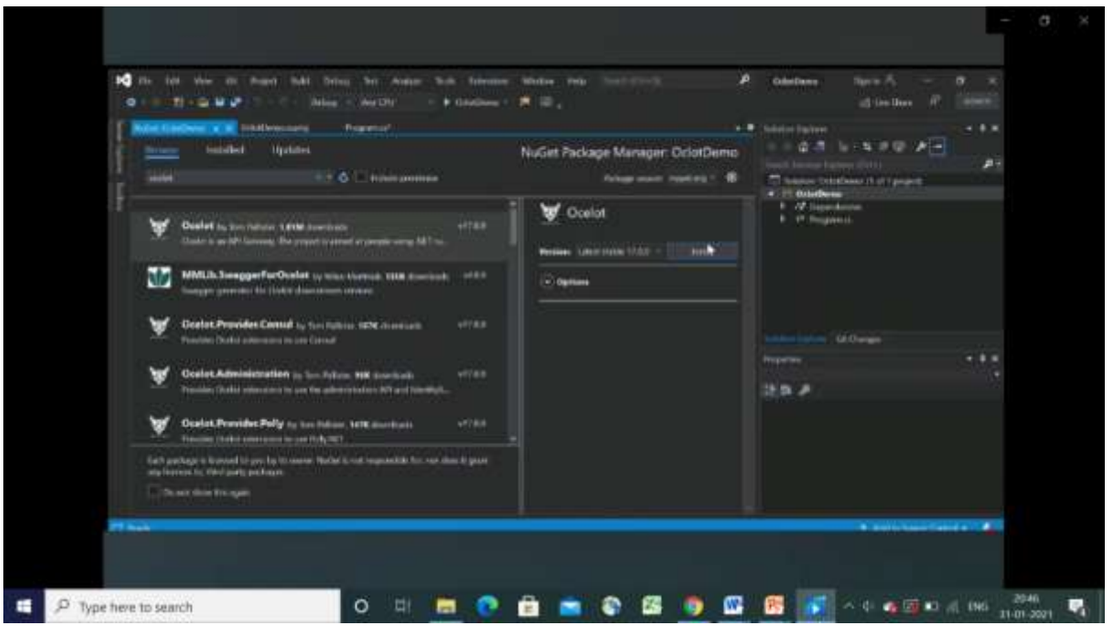
3. Go to Program.cs file and add logging code.



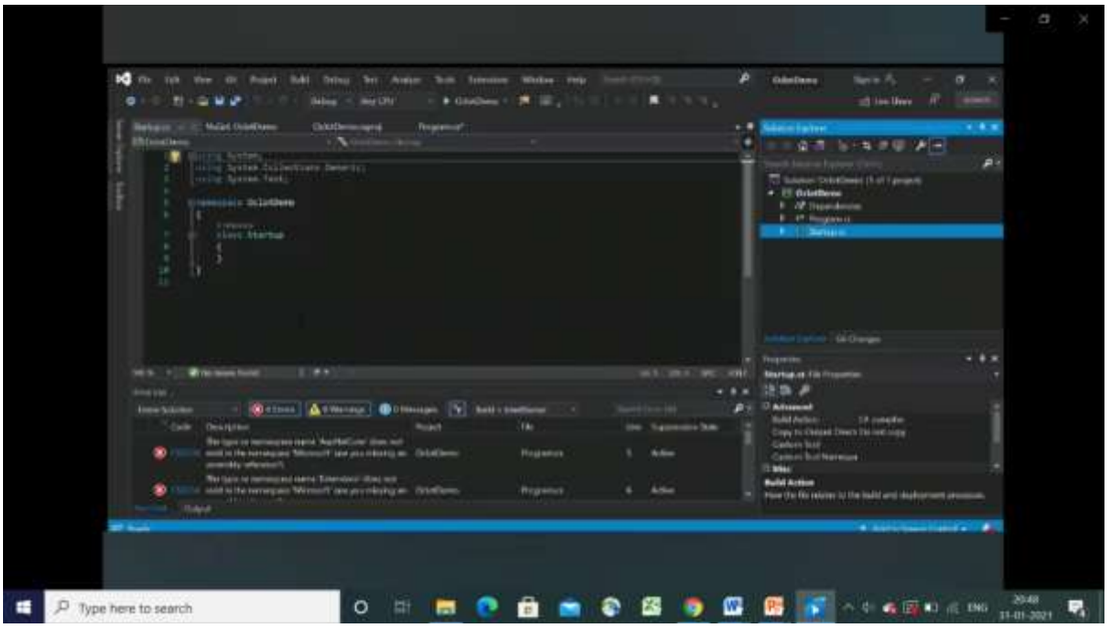
4. Now add new NuGet package for Ocelot



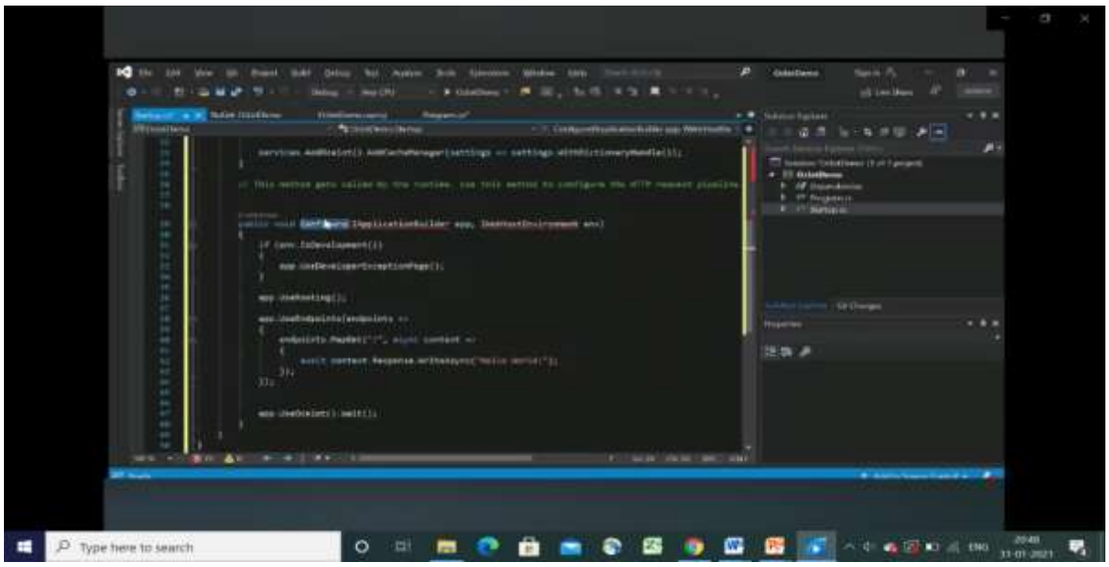
5. Click on Project -> Manage NuGet Package -> Click on Browse -> Search for ocelot package -> install.



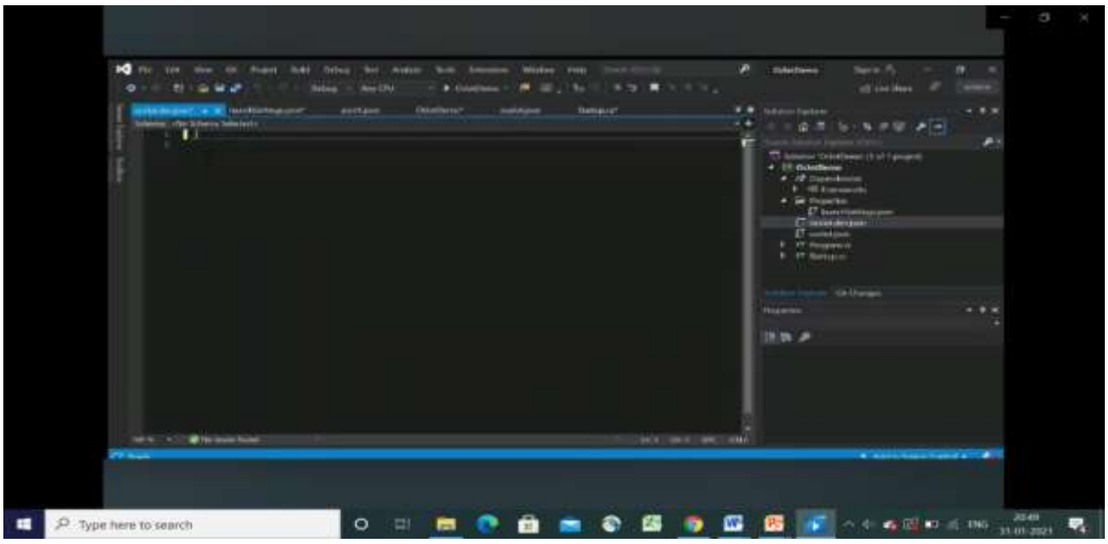
6. Once Ocelot Package is installed Go to Startup.cs



7. Now to Configure Ocelot add services.Addocelot() and app.UseOcelot().Wait() code.

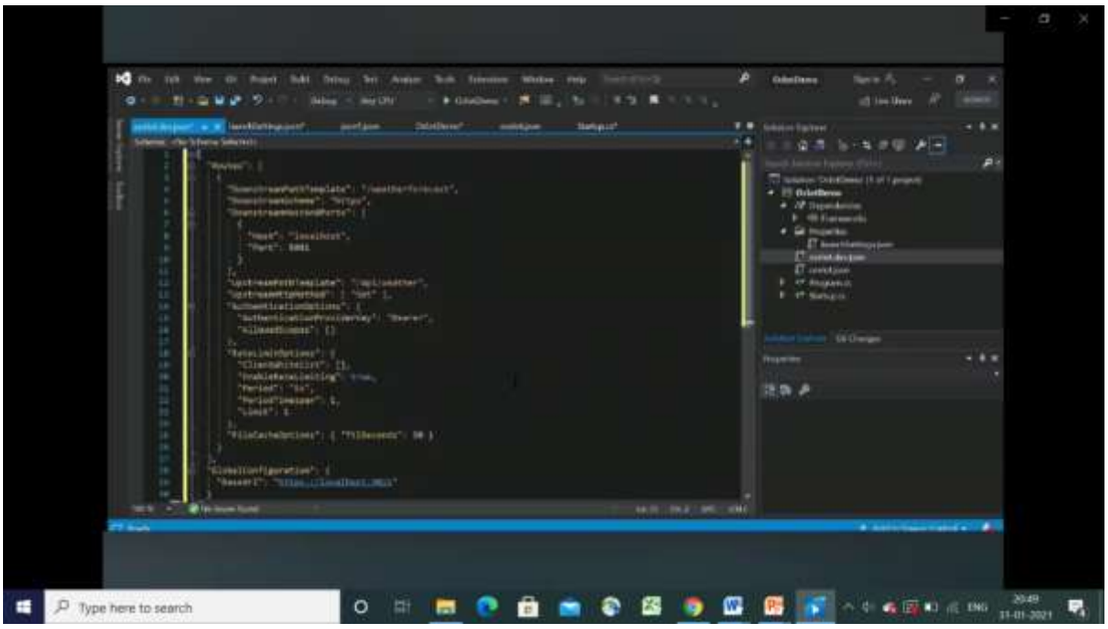


8. Now add the Ocelot JSON file.

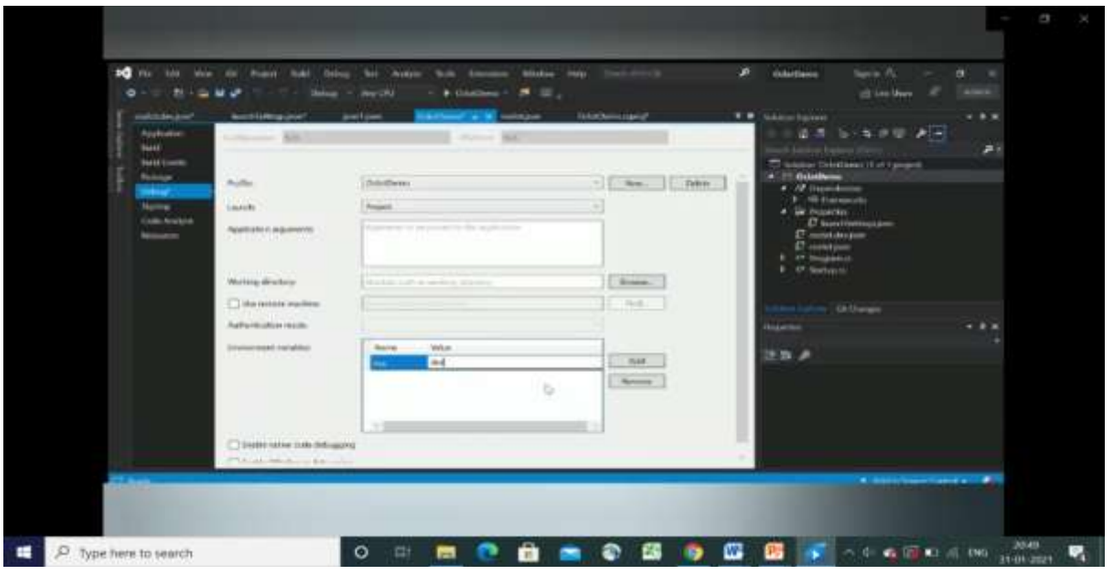


9. Click on Project name -> Add -> New Item -> JSON File ->(Give name)

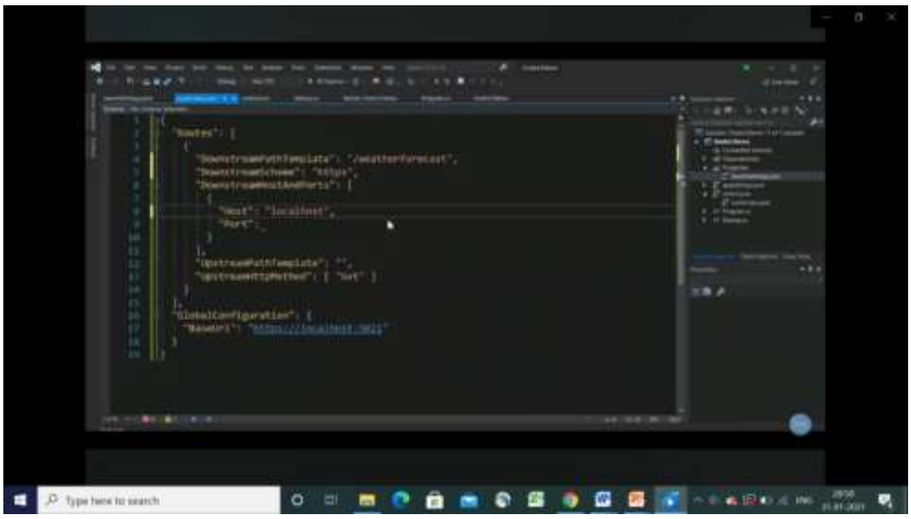
10. Add JSON Code.



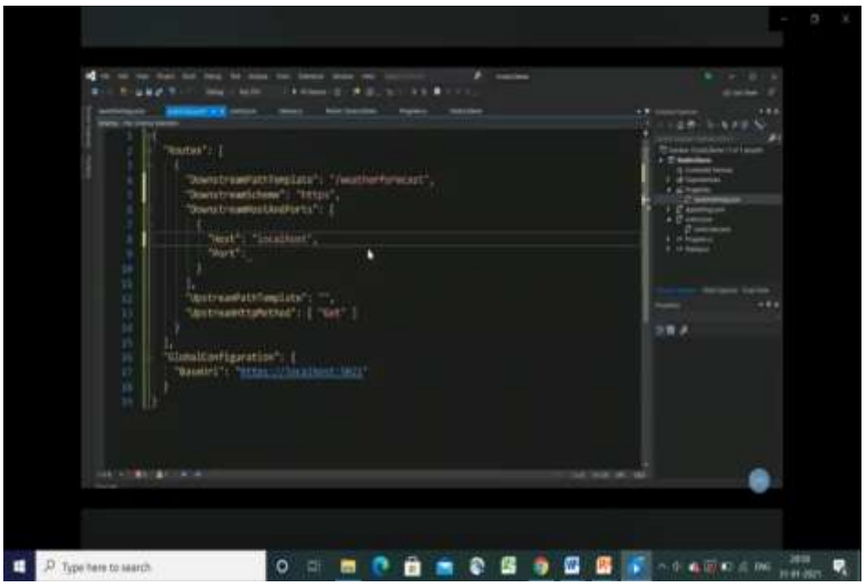
11. Create an Environmental Variable



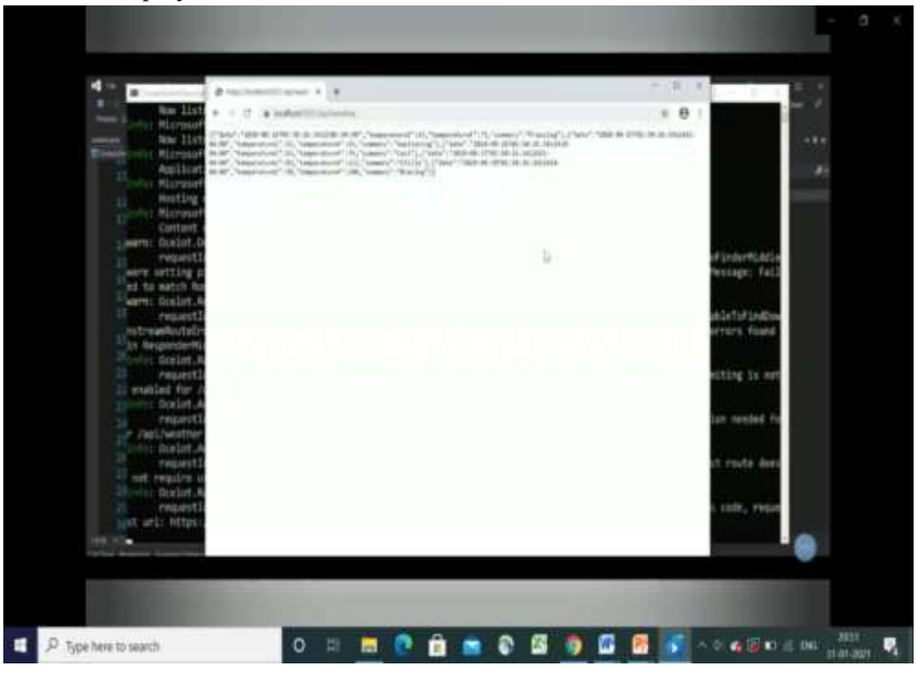
12. Change localhost to 5020 and 5021.



13. Add Configuration to the system.



14. Run the project.



Code:
Program.cs file

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;
using Microsoft.AspNetCore.Hosting;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.Hosting;
using Microsoft.Extensions.Logging;
namespace Oclot.Demo
{
    public static class Program
    {
        public static void Main(string[] args)
        {
            CreateHostBuilder(args).Build().Run();    }
        public static IHostBuilder CreateHostBuilder(string[] args) =>
            Host.CreateDefaultBuilder(args)
                .ConfigureWebHostDefaults(webBuilder =>
                {
                    var env =
Environment.GetEnvironmentVariable("ASPNETCORE_ENVIRONMENT");
                    webBuilder.UseStartup<Startup>();
                    webBuilder.ConfigureAppConfiguration(config =>
config.AddJsonFile($"ocelot.{env}.json"));
                })
            .ConfigureLogging(logging => logging.AddConsole());
    }
}
```

Startup.cs file

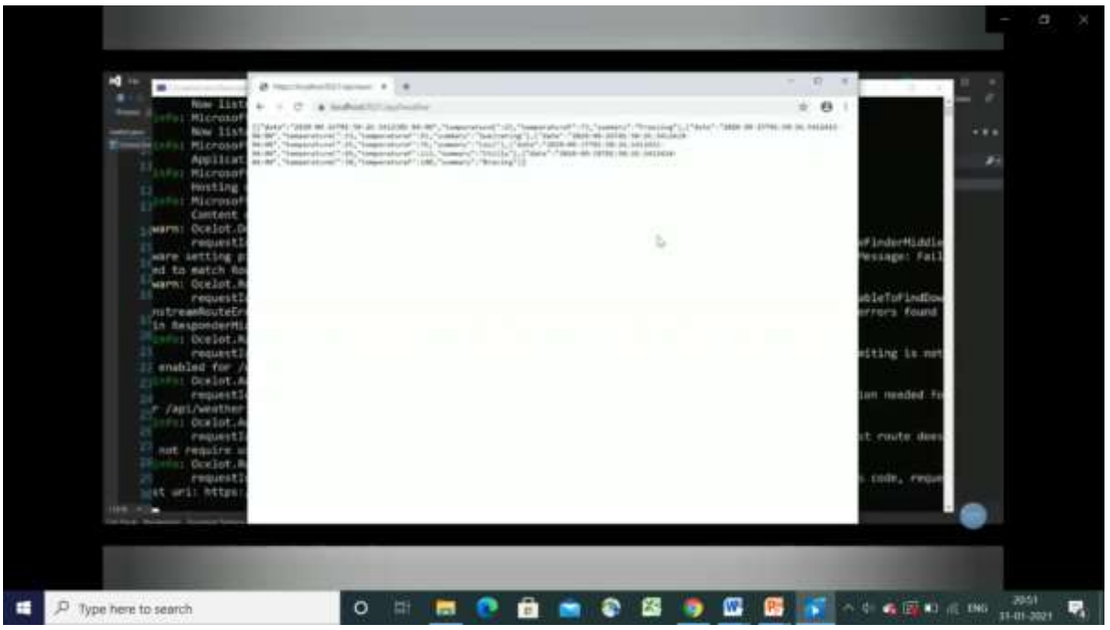
```
namespace Oclot.Demo
{
    public class Startup
    {
        public void ConfigureServices(IServiceCollection services)
        {
            services.AddOcelot().AddCacheManager(settings => settings.WithDictionaryHandle());
        }
        public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
        {
            if (env.IsDevelopment())
            {
                app.UseDeveloperExceptionPage();
            }
            app.UseRouting();
            app.UseEndpoints(endpoints =>
            {
                endpoints.MapGet("/", async context =>
                {
                    await context.Response.WriteAsync("Hello World!");
                });
            });
            app.UseOcelot().Wait();
        }
    }
}
```

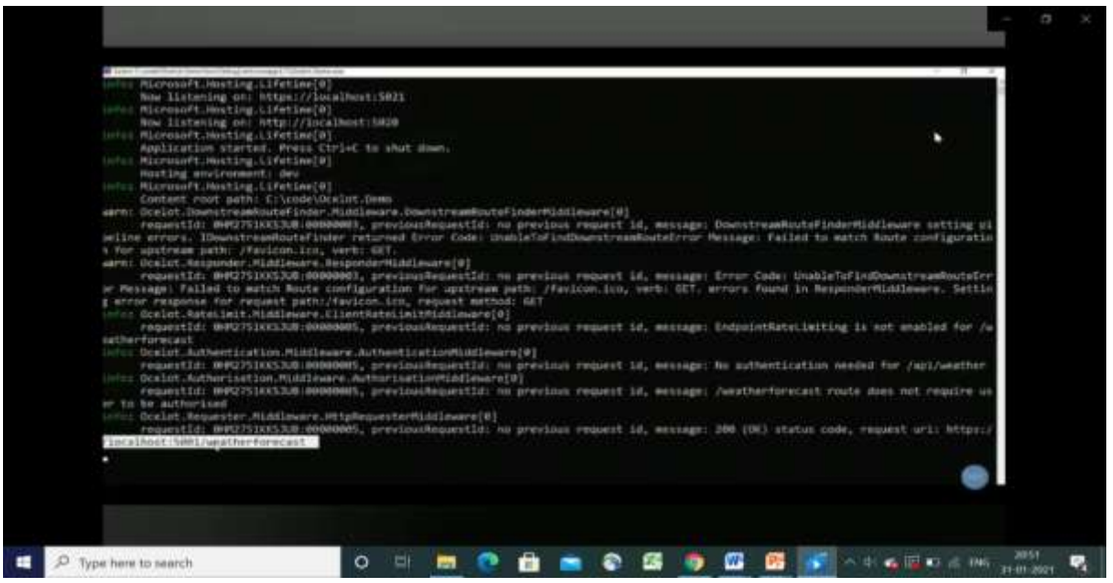
JSON file

```
{
  "Routes": [
    {
      "DownstreamPathTemplate": "/weatherforecast",
      "DownstreamScheme": "https",
      "DownstreamHostAndPorts": [
        {
          "Host": "localhost",
          "Port": 5001
        } ],
      "UpstreamPathTemplate": "/api/weather",
```

```
    "UpstreamHttpMethod": [ "Get" ],
    "AuthenticationOptions": {
      "AuthenticationProviderKey": "Bearer",
      "AllowedScopes": []  },
    "RateLimitOptions": {
      "ClientWhitelist": [],
      "EnableRateLimiting": true,
      "Period": "5s",
      "PeriodTimespan": 1,
      "Limit": 1 },
    "FileCacheOptions": { "TtlSeconds": 30 }
   }],
  "GlobalConfiguration": {
    "BaseUrl": "https://localhost:5021"
  }
}
```

OUTPUT





Practical no 7

Create a database design for Microservices an application using the database.

Choosing a Data Store

There are many risks associated with embracing a 1.0-level technology. The ecosystem is generally immature, so support for your favorite things may be lacking or missing entirely. Tooling and integration and overall developer experience are often high-friction. Despite the long and storied history of

.NET, .NET Core (and especially the associated tooling) should still be treated like a brand new 1.0 product.

One of things we might run into when trying to pick a data store that is compatible with EF Core is a lack of available providers. While this list will likely have grown by the time you read this, at the time this chapter was written, the following providers were available for EF Core:

- SQL Server
- SQLite
- Postgres
- IBM databases
- MySQL
- SQL Server Lite
- In-memory provider for testing
- Oracle

For databases that aren't inherently compatible with the Entity Framework relational model, like MongoDB, Neo4j, Cassandra, etc., you should be able to find client libraries available that will work with .NET Core. Since most of these databases expose simple RESTful APIs, you should still be able to use them even if you have to write your own client.

Because of my desire to keep everything as cross-platform as possible throughout this book, I decided to use Postgres instead of SQL Server to accommodate readers working on Linux or Mac workstations. Postgres is also easily installed on Windows

Building a Postgres Repository

In order to get something running and focus solely on the discipline and code required to stand up a simple service, we used an in-memory repository that didn't amount to much more than a fake that aided us in writing tests.

In this section we're going upgrade our location service to work with Postgres. To do this we're going to create a new repository implementation that encapsulates the PostgreSQL client communication. Before we get to the implementation code, let's revisit the interface for our location repository.

Example 1. ILocationRecordRepository.cs

```
using System;
using System.Collections.Generic;

namespace StatlerWaldorfCorp.LocationService.Models { public interface

    ILocationRecordRepository {
        LocationRecord Add(LocationRecord locationRecord); LocationRecord
        Update(LocationRecord locationRecord); LocationRecord Get(Guid
        memberId, Guid recordId); LocationRecord Delete(Guid memberId, Guid
        recordId);

        LocationRecord GetLatestForMember(Guid memberId);

        ICollection<LocationRecord> AllForMember(Guid memberId);
    }
}
```

The location repository exposes standard CRUD functions like Add, Update, Get, and Delete. In addition, this repository exposes methods to obtain the latest location entry for a member as well as the entire location history for a member.

The purpose of the location service is solely to track location data, so you'll notice that there is no reference to team membership at all in this interface.

Creating a Database Context

The next thing we're going to do is create a database context. This class will serve as a wrapper around the base DbContext class we get from Entity Framework Core. Since we're dealing with locations, we'll call our context class LocationDbContext.

If you're not familiar with Entity Framework or EF Core, the database context acts as the gateway between your database-agnostic model class (POCOs, or Plain-Old C# Objects) and the real database. For more information on EF Core, check out Microsoft's documentation. We could probably spend another several chapters doing nothing but exploring its details, but since we're trying to stay focused on cloud-native applications and services, we'll use just enough EF Core to build our services.

The pattern for using a database context is to create a class that inherits from it that is specific to your model. In our case, since we're dealing with locations, we'll create a LocationDbContext class.

Example 2. LocationDbContext.cs

```
using Microsoft.EntityFrameworkCore;
using StatlerWaldorfCorp.LocationService.Models; using
Npgsql.EntityFrameworkCore.PostgreSQL;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
      public class LocationDbContext : DbContext
      {
         public LocationDbContext(
            DbContextOptions<LocationDbContext> options) :
                base(options)
         {
         }

         protected override void OnModelCreating( ModelBuilder
            modelBuilder)
         {
               base.OnModelCreating(modelBuilder);
               modelBuilder.HasPostgresExtension("uuid-ossp");
         }


         public DbSet<LocationRecord> LocationRecords {get; set;}
      }
}
```

Here we can use the ModelBuilder and DbContextOptions classes to perform any additional setup we need on the context. In our case, we're ensuring that our model has the uuid-ossp Postgres extension to support the member ID field.

Implementing the Location Record Repository Interface

Now that we have a context through which other classes can use to communicate with the database, we can create a real implementation of the ILocationRecordRepository interface. This real implementation will take an instance of LocationDbContext as a constructor parameter. This sets us up nicely to configure this context with environment-supplied connection strings when deploying for real and with mocks or in-memory providers when testing.

Example 3 contains the code for the LocationRecordRepository class

Example 3. LocationRecordRepository.cs

```
using System; using
System.Linq;
using System.Collections.Generic;
using StatlerWaldorfCorp.LocationService.Models;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
   public class LocationRecordRepository :
      ILocationRecordRepository
   {
         private LocationDbContext context;

         public LocationRecordRepository(LocationDbContext context)
         {
               this.context = context;
         }

         public LocationRecord Add(LocationRecord locationRecord)
         {
               this.context.Add(locationRecord);
               this.context.SaveChanges(); return
               locationRecord;
         }

         public LocationRecord Update(LocationRecord locationRecord)
         {
               this.context.Entry(locationRecord).State =
                     EntityState.Modified;
               this.context.SaveChanges(); return
               locationRecord;
         }

         public LocationRecord Get(Guid memberId, Guid recordId)
         {
               return this.context.LocationRecords
                 .Single(lr => lr.MemberID == memberId &&
                                    lr.ID == recordId);
         }

         public LocationRecord Delete(Guid memberId, Guid recordId)
         {
               LocationRecord locationRecord =
                  this.Get(memberId, recordId);
               this.context.Remove(locationRecord);
               this.context.SaveChanges();
               return locationRecord;
```

```
        }

        public LocationRecord GetLatestForMember(Guid memberId)
        {
            LocationRecord locationRecord =
               this.context.LocationRecords.
                  Where(lr => lr.MemberID == memberId).
                  OrderBy(lr => lr.Timestamp).
                  Last();
            return locationRecord;
        }

        public ICollection<LocationRecord> AllForMember(Guid memberId)
        {
            return this.context.LocationRecords.
                  Where(lr => lr.MemberID == memberId).
                  OrderBy(lr => lr.Timestamp).
                  ToList();
        }
    }
}
```

The code here is pretty straightforward. Any time we make a change to the database, we call SaveChanges on the context. If we need to query, we use the LINQ expression syntax where we can combine Where and OrderBy to filter and sort the results.

When we do an update, we need to flag the entity we're updating as a modified entry so that Entity Framework Core knows how to generate an appropriate SQL UPDATE statement for that record. If we don't modify this entry state, EF Core won't know anything has changed and so a call
to SaveChanges will do nothing.

The next big trick in this repository is injecting the Postgres-specific database context. To make this happen, we need to add this repository to the dependency injection system in the ConfigureServices method of our Startup class.

Example 4. ConfigureServices method in Startup.cs

```
public void ConfigureServices(IServiceCollection services)
{
        services.AddEntityFrameworkNpgsql()
            .AddDbContext<LocationDbContext>(options =>
                    options.UseNpgsql(Configuration));
        services.AddScoped<ILocationRecordRepository, LocationRecordRepository>();
        services.AddMvc();
}
```

First we want to use the AddEntityFrameworkNpgsql extension method exposed by the Postgres EF Core provider. Next, we add our location repository as a scoped service. When we use the AddScoped method, we're indicating that every new request made to our service gets a newly create instance of this repository.

Configuring a Postgres Database Context

The repository we built earlier requires some kind of database context in order to function. The database context is the core primitive of Entity Framework Core. To create a database context for the location model, we just need to create a class that inherits from DbContext. I've also included a DbContextFactory because that can sometimes make running the Entity Framework Core command-line tools simpler:

```
using Microsoft.EntityFrameworkCore;
using Microsoft.EntityFrameworkCore.Infrastructure; using
StatlerWaldorfCorp.LocationService.Models; using
Npgsql.EntityFrameworkCore.PostgreSQL;

namespace StatlerWaldorfCorp.LocationService.Persistence
{
    public class LocationDbContext : DbContext
    {
        public LocationDbContext(
            DbContextOptions<LocationDbContext> options) :base(options)
        {
        }

        protected override void OnModelCreating( ModelBuilder
            modelBuilder)
        {
            base.OnModelCreating(modelBuilder);
            modelBuilder.HasPostgresExtension("uuid-ossp");
        }


        public DbSet<LocationRecord> LocationRecords {get; set;}
    }


        public class LocationDbContextFactory : IDbContextFactory<LocationDbContext>
    {
        public LocationDbContext Create(DbContextFactoryOptions
            options)
        {
            var optionsBuilder =
                new DbContextOptionsBuilder<LocationDbContext>(); var
            connectionString =
                Startup.Configuration
                  .GetSection("postgres:cstr").Value;
            optionsBuilder.UseNpgsql(connectionString);


            return new LocationDbContext(optionsBuilder.Options);
        }
    }
```

```
}
```

With a new database context, we need to make it available for dependency injection so that the location repository can utilize it:

```
public void ConfigureServices(IServiceCollection services)
{
    var transient = true;
    if (Configuration.GetSection("transient") != null) { transient =
        Boolean.Parse(Configuration
            .GetSection("transient").Value);
    }
    if (transient) { logger.LogInformation(
            "Using transient location record repository.");
        services.AddScoped<ILocationRecordRepository,
                                InMemoryLocationRecordRepository>();
    } else {
        var connectionString = Configuration.GetSection("postgres:cstr").Value;

        services.AddEntityFrameworkNpgsql()
                .AddDbContext<LocationDbContext>(options =>
                                options.UseNpgsql(connectionString));
        logger.LogInformation(
            "Using '{0}' for DB connection string.", connectionString);
        services.AddScoped<ILocationRecordRepository, LocationRecordRepository>();
    }

    services.AddMvc();
}
```

The calls to AddEntityFrameworkNpgsql and AddDbContext are the magic that makes everything happen here.

With a context configured for DI, our service should be ready to run, test, and accept EF Core command-line parameters like the ones we need to execute migrations. When building your own database-backed services, you can also use the EF Core command-line tools to reverse-engineer migrations from existing database schemas.

Exercising the Data Service

Running the data service should be relatively easy. The first thing we're going to need to do is spin up a running instance of Postgres. If you were paying attention to the wercker.yml file for the location service that sets up the integration tests, then you might be able to guess at the docker run command to start Postgres with our preferred parameters:

```
$ docker run -p 5432:5432 --name some-postgres \
  -e POSTGRES_PASSWORD=inteword -e POSTGRES_USER=integrator \
  -e POSTGRES_DB=locationservice -d postgres
```

This starts the Postgres Docker image with the name some-postgres (this will be important shortly). To verify that we can connect to Postgres, we can run the following Docker command to launch psql:

```
$ docker run -it --rm --link some-postgres:postgres postgres \
  psql -h postgres -U integrator -d locationservice
```

With the database up and running, we need a schema. The tables in which we expect to store the migration metadata and our location records don't yet exist. To put them in the database, we just need to run an EF Core command from the location service's project directory. Note that we're also setting environment variables that we'll need soon:

```
$ export TRANSIENT=false
$ export POSTGRES__CSTR="Host=localhost;Username=integrator; \
  Password=inteword;Database=locationservice;Port=5432"
$ dotnet ef database update
```

At this point Postgres is running with a valid schema and it's ready to start accepting commands from the location service. Here's where it gets a little tricky. If we're going to run the location service from inside a Docker image, then referring to the Postgres server's host as localhost won't work —because that's the host inside the Docker image. What we need is for the location service to reach out of its container and then into the Postgres container. We can do this with a container link that creates a virtual hostname (we'll call it postgres), but we'll need to change our environment variable before launching the Docker image:

```
$ export POSTGRES__CSTR="Host=postgres;Username=integrator; \
Password=inteword;Database=locationservice;Port=5432"
$ docker run -p 5000:5000 --link some-postgres:postgres \
  -e TRANSIENT=false -e PORT=5000 \
  -e POSTGRES__CSTR dotnetcoreservices/locationservice:latest
```

Now that we've linked the service's container to the Postgres container via the postgres hostname, the location service should have no trouble connecting to the database. To see this all in action, let's submit a location record (as usual, take the line feeds out of this command when you type it):

```
$ curl -H "Content-Type:application/json" -X POST -d \
  '{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f","latitude":12.0, \
    "longitude":10.0,"altitude":5.0,"timestamp":0, \
    "memberId":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}' \
  http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-3c8593ac8292
```

Take a look at the trace output from your running Docker image for the location service. You should see some very useful Entity Framework trace data explaining what happened. The service performed a SQL INSERT, so things are looking promising:

```
info: Microsoft.EntityFrameworkCore.Storage.
```

```
IRelationalCommandBuilderFactory[1]
      Executed DbCommand (23ms)
[Parameters=[@p0='?', @p1='?', @p2='?', @p3='?', @p4='?', @p5='?'],
 CommandType='Text', CommandTimeout='30']
      INSERT INTO "LocationRecords" ("ID", "Altitude", "Latitude",
"Longitude", "MemberID", "Timestamp")
      VALUES (@p0, @p1, @p2, @p3, @p4, @p5);
info: Microsoft.AspNetCore.Mvc.Internal.ObjectResultExecutor[1]
      Executing ObjectResult, writing value Microsoft.AspNetCore
.Mvc.ControllerContext.
info: Microsoft.AspNetCore.Mvc.Internal.ControllerActionInvoker[2]
      Executed action StatlerWaldorfCorp.LocationService.
Controllers.LocationRecordController.AddLocation
(StatlerWaldorfCorp.LocationService) in 2253.7616ms
info: Microsoft.AspNetCore.Hosting.Internal.WebHost[2]
      Request finished in 2602.7855ms 201 application/json;
charset=utf-8
```

Let's ask the service for this fictitious member's location history:

```
$ curl http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-
3c8593ac8292

[{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f",
  "latitude":12.0,"longitude":10.0,"altitude":5.0,
  "timestamp":0,"memberID":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}]
```

The corresponding Entity Framework trace looks like this:

```
info: Microsoft.EntityFrameworkCore.Storage.
IRelationalCommandBuilderFactory[1]
      Executed DbCommand (23ms) [Parameters=[@__memberId_0='?'],
 CommandType='Text', CommandTimeout='30']
      SELECT "lr"."ID", "lr"."Altitude", "lr"."Latitude",
 "lr"."Longitude", "lr"."MemberID", "lr"."Timestamp"
      FROM "LocationRecords" AS "lr"
      WHERE "lr"."MemberID" = @__memberId_0
      ORDER BY "lr"."Timestamp"
```

Just to be double sure, let's query the latest endpoint to make sure we still get what we expect to see:

```
$ curl http://localhost:5000/locations/63e7acf8-8fae-42ce-9349-
3c8593ac8292 \
/latest

{"id":"64c3e69f-1580-4b2f-a9ff-2c5f3b8f0e1f",
  "latitude":12.0,"longitude":10.0,"altitude":5.0,
  "timestamp":0,"memberID":"63e7acf8-8fae-42ce-9349-3c8593ac8292"}
```

Finally, to prove that we really are using real database persistence and that this isn't just a random fluke, use docker ps and docker kill to locate the Docker process for the location service and kill it. Restart it

using the exact same command you used before. You should now be able to query the location service and get the exact same data you had before. Of course, once you stop the Postgres container you'll permanently lose that data.

PRACTICAL 8

Create an API gateway service

a) Create an API Management Service.

Steps for creating an API management service are mentioned below-

Step 1- Sign-in to your Azure Subscription Portal

Step 2- Search for “API Management”, then select API Management in order to create a service instance.

Step 3- As shown in Image 1 Select “API Management service”

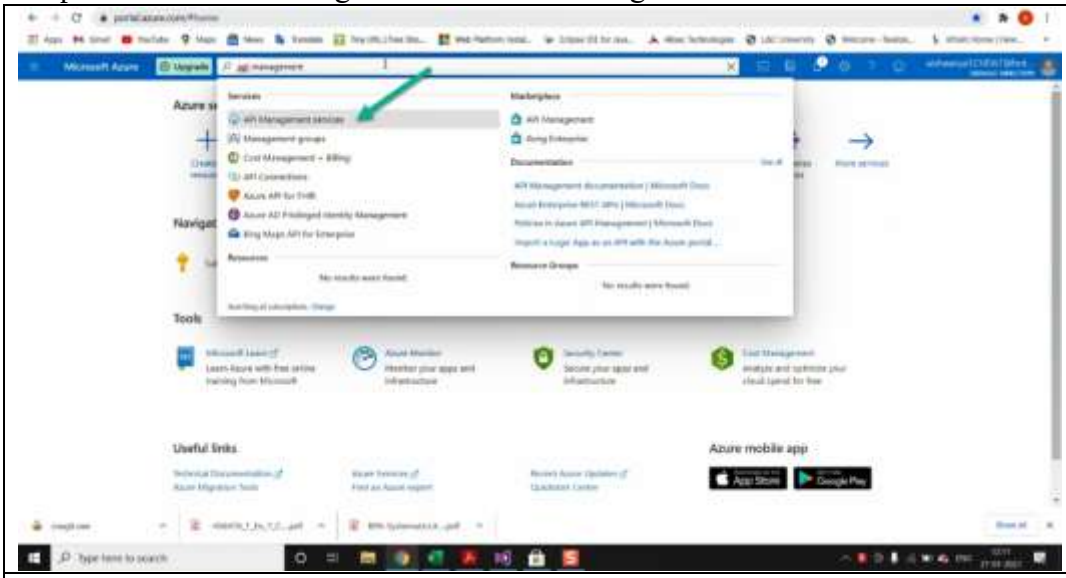


Image 1

Step 4- As API management service page is loaded, select “Create API management service” button. As shown in the image 2.

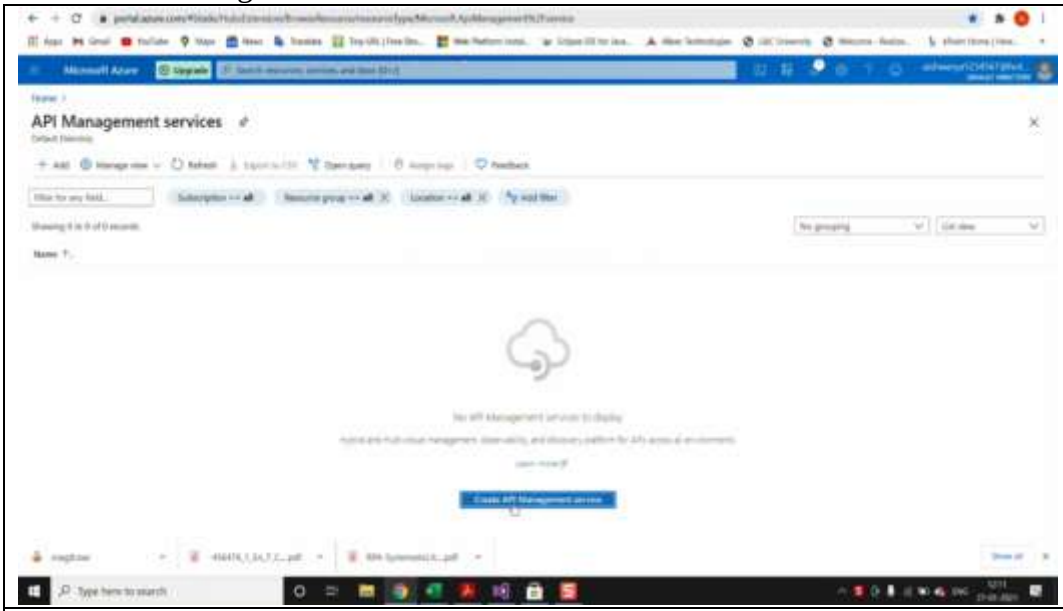


Image 2

Step 5- We will be able to see the Azure API Management service creation blade as shown in Image after clicking on the “Create API management service” button

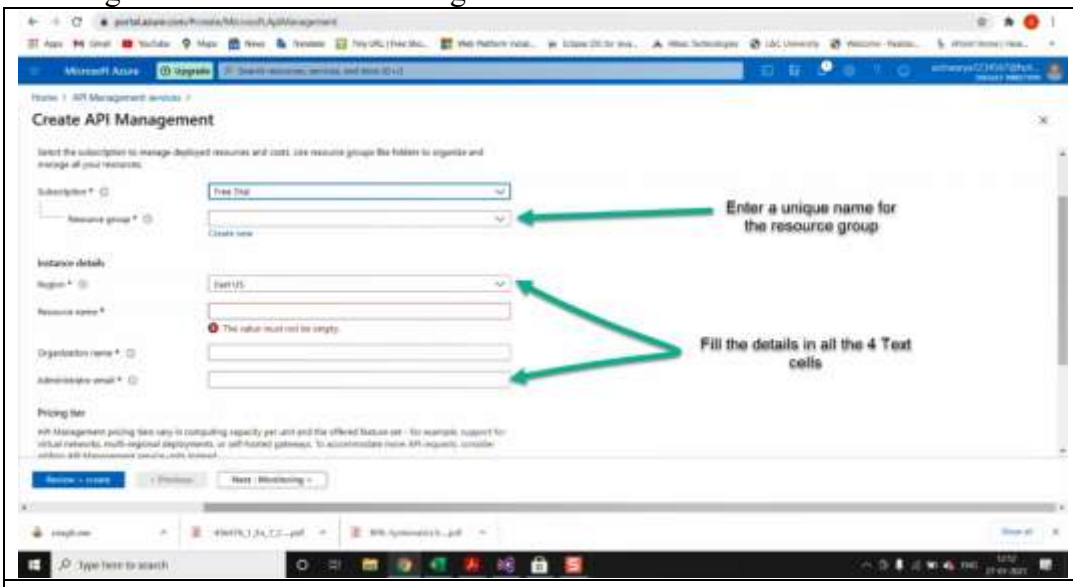


Image 3

Step 6- Provide a name. This name sets the URL of the API gateway and portal [Name- AzureManagementService]

Step 7-Select the subscription and resource group (or create a new resource group), and select the location. [Resource Name- AzureManagementService, Location- SouthEast Asia]

Step 8-Specify the organization name. This name will appear in the developer portal as the organization that publishes the API. [Name- CloudApplicationPratical]

Step 9- Specify the email address of the administrator. The user who creates the service instance will be the default administrator, so it's best to provide the email address of this user until you want someone else to serve as administrator. [Email ID- aishwarya1234567@hotmail.com]

Step 10 -Select the pricing tier. The Developer tier is the most comprehensive offering, with sufficient request/response limitations in dev/test scenarios.

Step 11-After Completing the form click on review + create button to create “Azure API Management service instance”. As shown in image 4

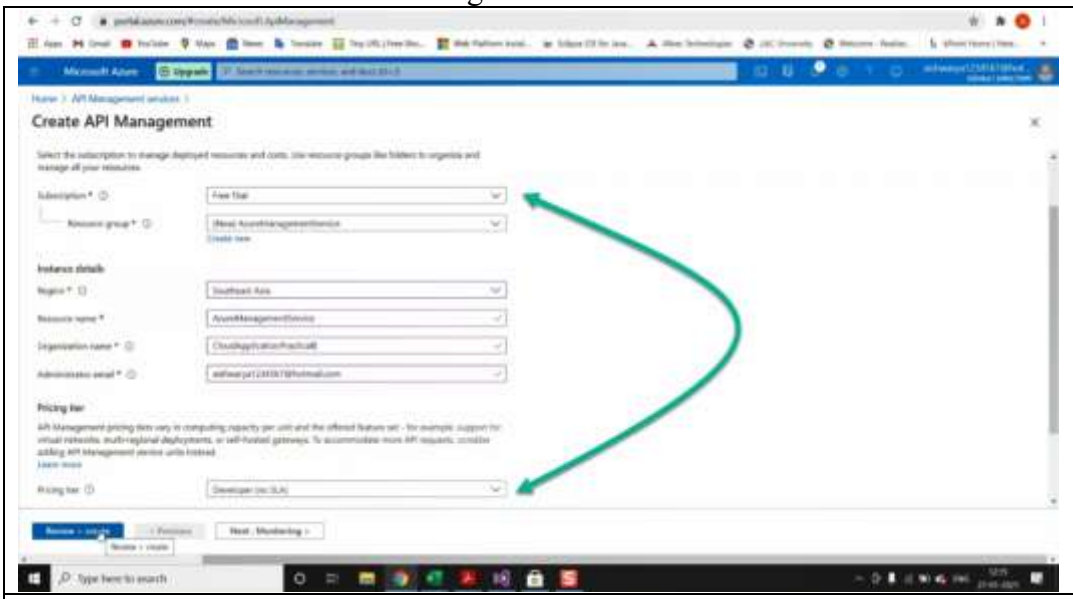


Image 4

Step 12-As shown in the image 5 the status is “Running Final Validation”. Wait for it to be in “Validation Passed” Stage

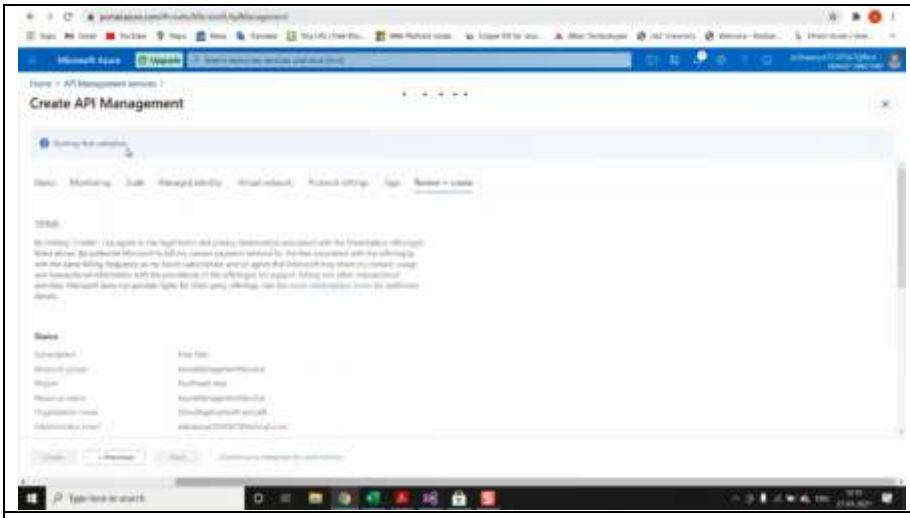


Image 5

Step 13-Once the Validation is done and the label displays “Validation Passed”, Click on create button to create the instance of the service.

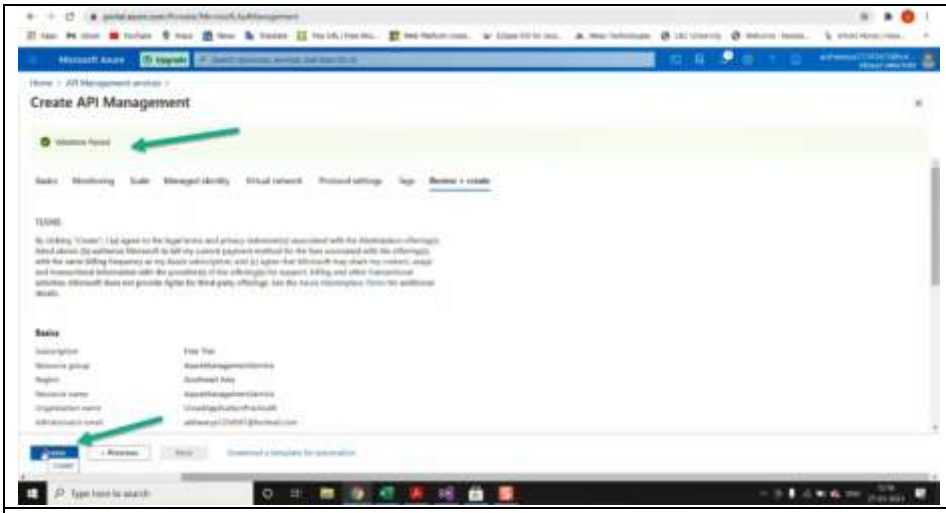


Image 6

Step 14- After clicking on the create button the API management service instance will go to deployment stage as shown in image 7. After the deployment is complete the instance will be shown as in image 8

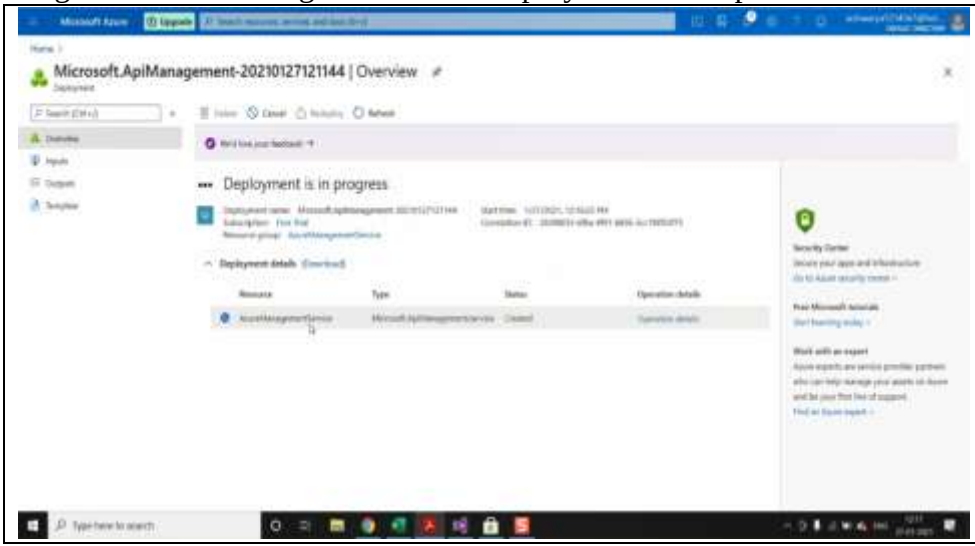


Image 7

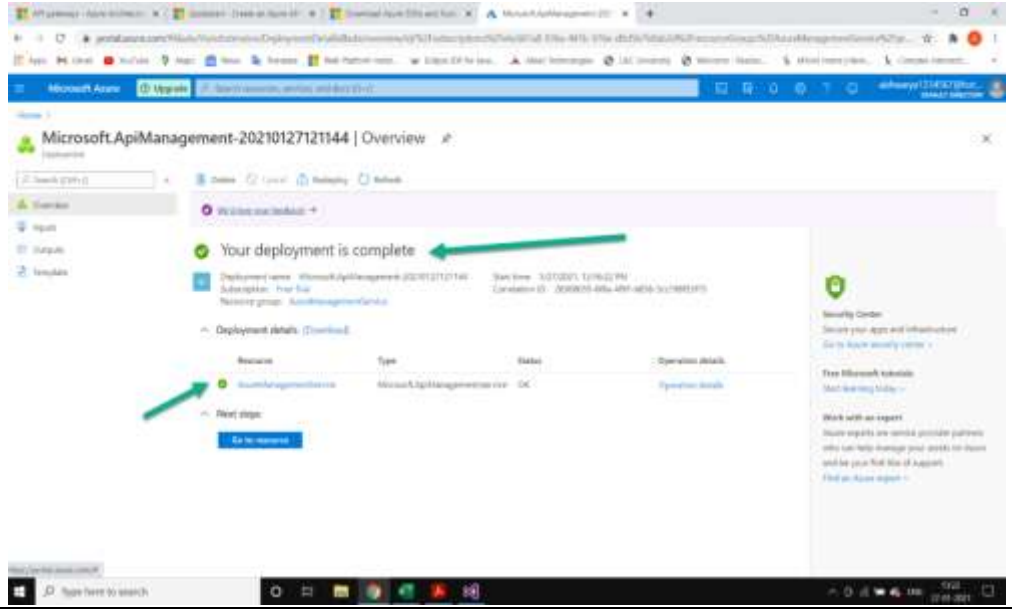


Image 8

Next step is Import an API into API Management and test the API in the Azure portal
Step 15- In the Azure portal, search for and select API Management services.
Step 16- On the API Management services page, select your API Management instance as in image 9.

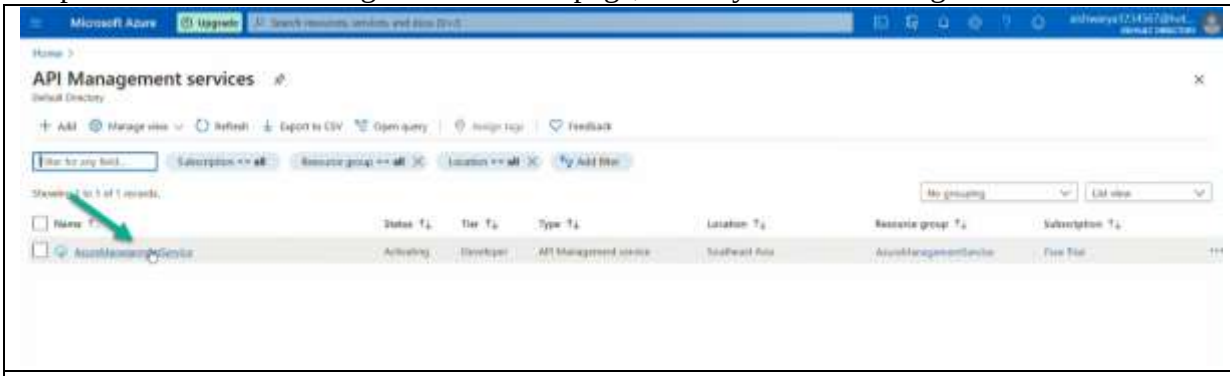


Image 9

Step 17- In the left navigation of API Management instance, select APIs.
Step 18- Select the OpenAPI tile as shown in image 10.

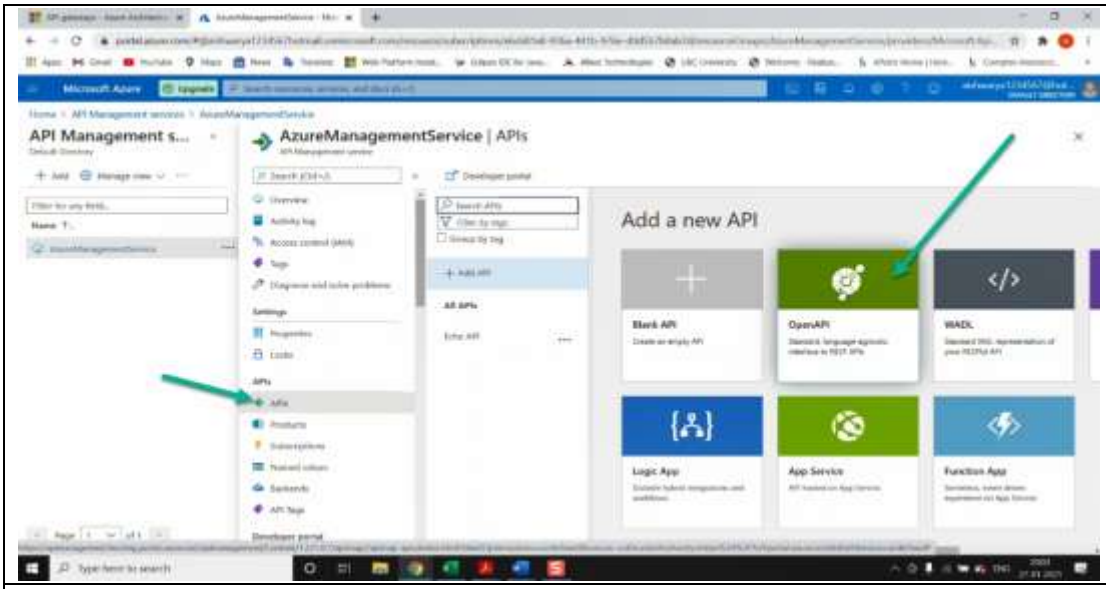


Image 10

Step 19- In the Create from OpenAPI specification window, select Full.
Step 20- Enter the values as mentioned below in the form shown in image 11

Setting	Value
OpenAPI specification	https://conferenceapi.azurewebsites.net?format=json
Display name	After you enter the preceding service URL, API Management fills out this field based on the JSON. .(automatic)
Name	After you enter the preceding service URL, API Management fills out this field based on the JSON. .(automatic)
Description	After you enter the preceding service URL, API Management fills out this field based on the JSON.(automatic)
URL scheme	HTTPS
API URL suffix	conference
Tags	-leave it as blank
Products	Unlimited
Gateways	Managed

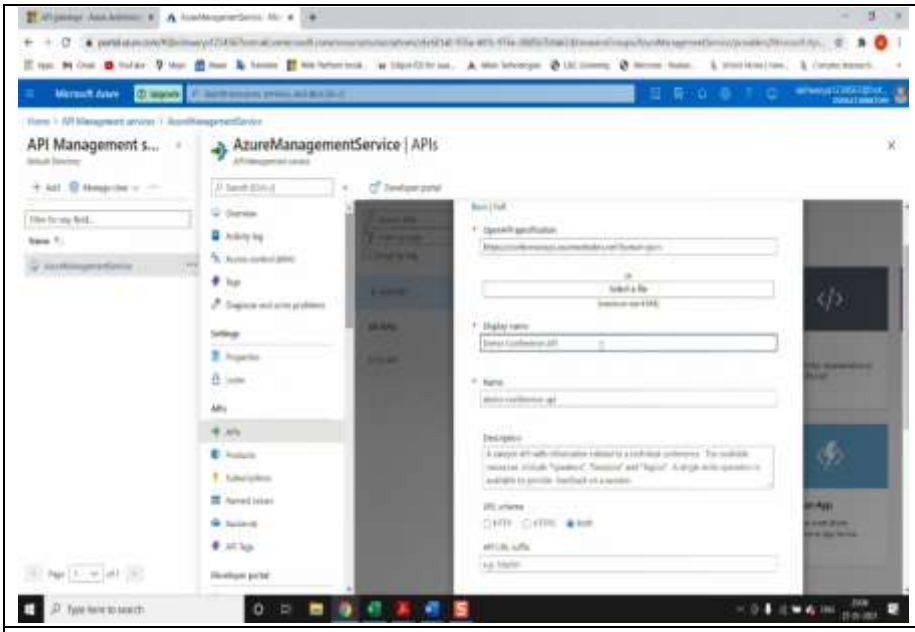


Image 11

Next steps are to Test the new API in the Azure portal
Step 21- In the left navigation of your API Management instance, select APIs > Demo Conference API.
Step 22- Select the Test tab, and then select GetSpeakers. The page shows Query parameters and Headers, if any. The Ocp-Apim-Subscription-Key is filled in automatically for the subscription key associated with this API.
Step 22- Select Send as shown in image 12.
Output -

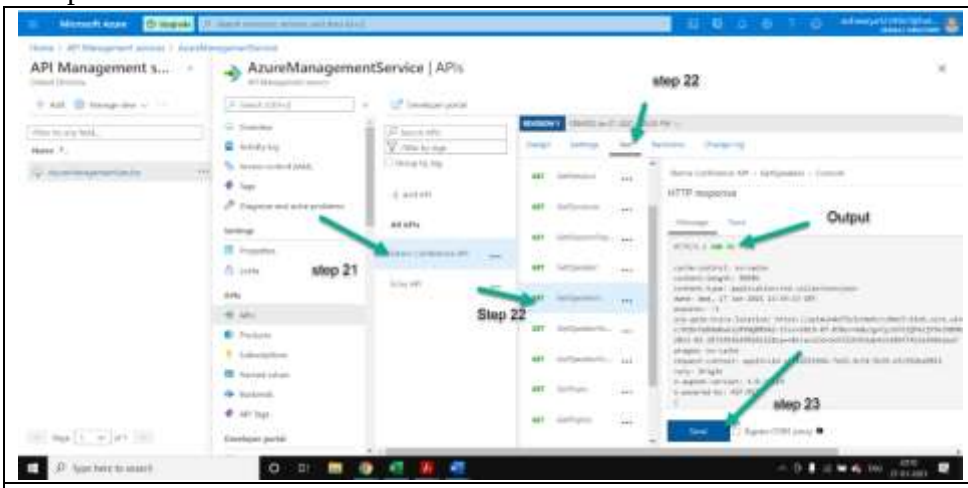


Image 12

As we can see in image 12 the Https response is “200 Ok with some data” which states that the backend can response.

b) Create an API Gateway Service.

Steps for creating an API gateway service are mentioned below-

Step 1- Sign in to you AWS account.

Step 2- search for API Gateway, and create an AWS Gateway instance as shown in Image 1.

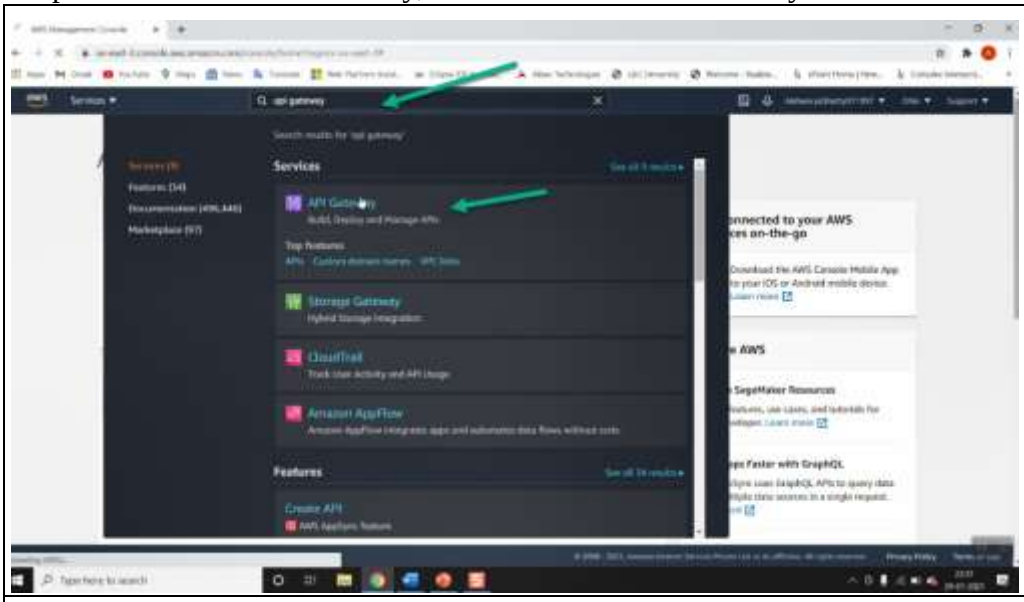


Image 1

Step 3- Select Import from the REST API selection as shown in image 2.

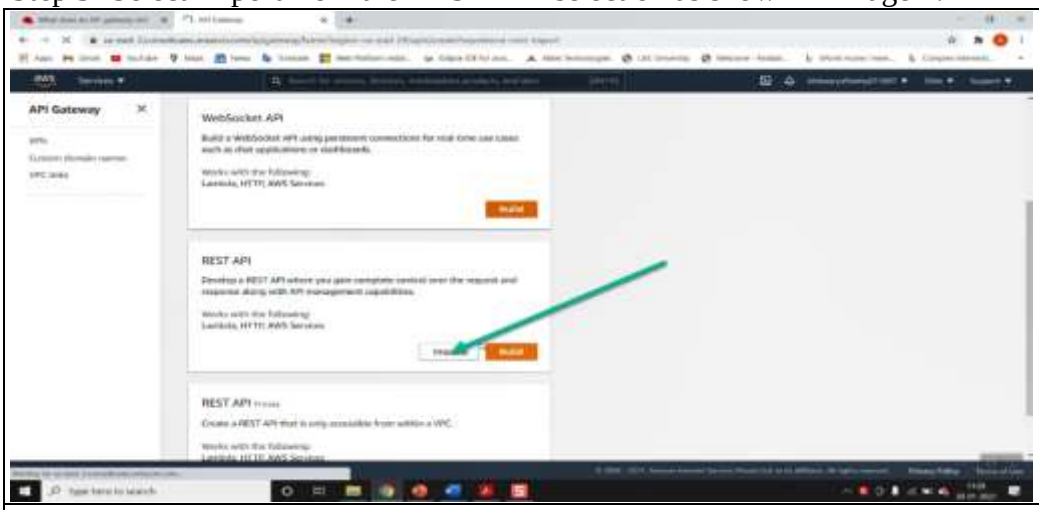


Image 2

Step 4- Select Import from swagger and copy or select the swagger file as shown in image 3.

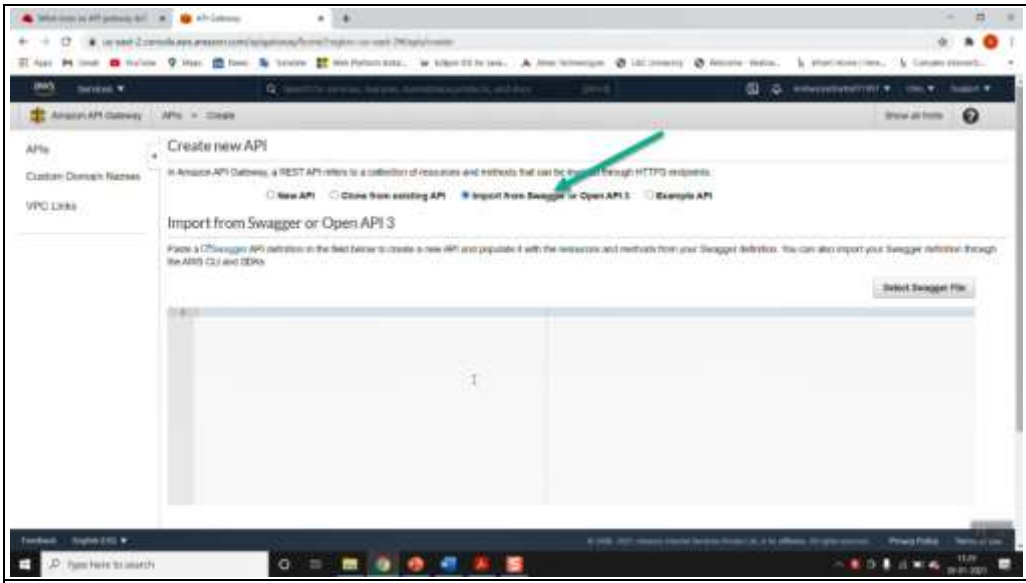


Image 3

Step 5- To Create an API definition in Swagger. First login to the swagger account. As depicted in image 4.

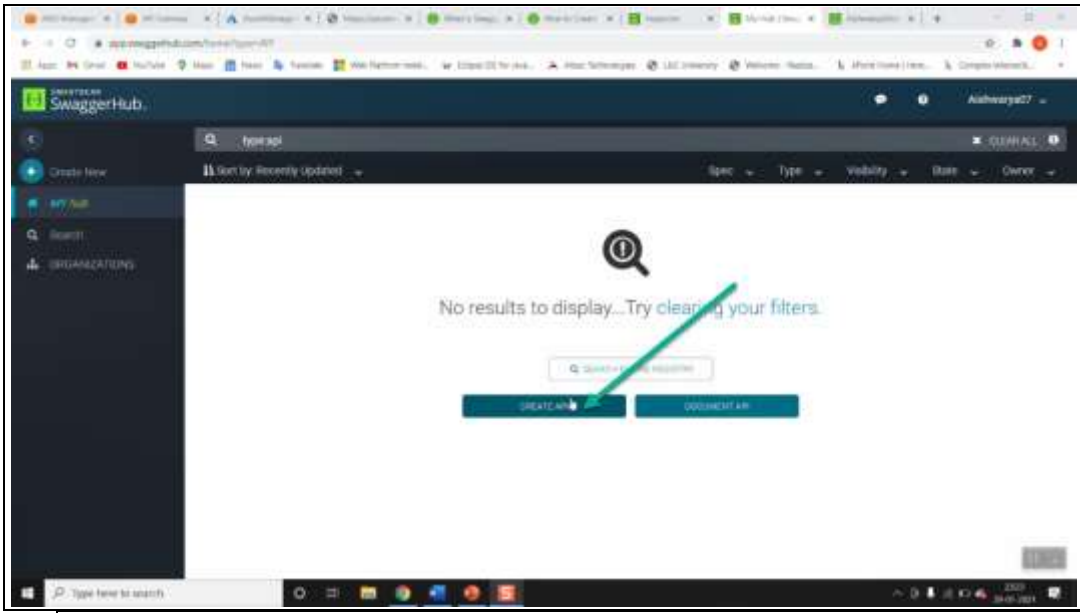


Image 4

Step 6- Then fill the Form which includes the version, name and other details click on Create API button. As depicted in image 5.

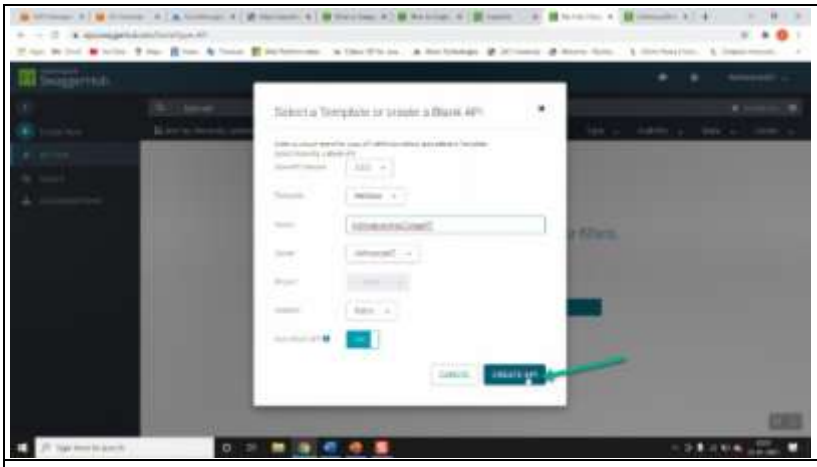


Image 5

Step 7- Copy the API and definition from swagger as shown in image 6

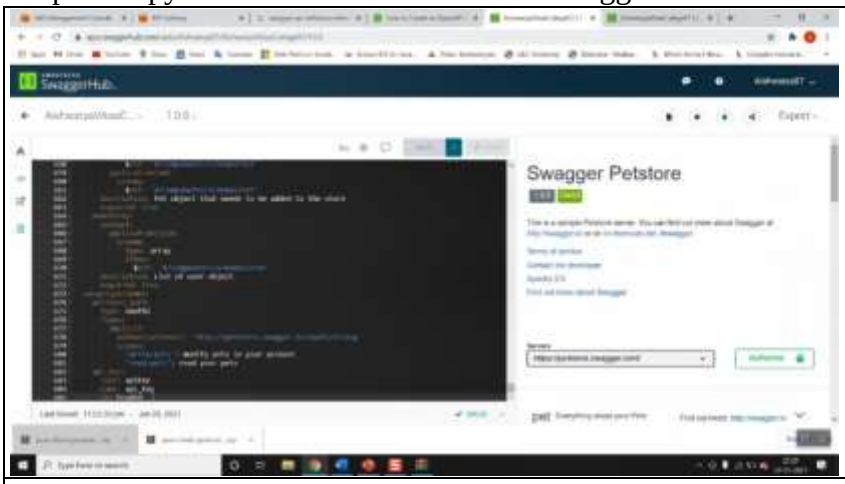


Image 6

Step 8-Paste the definition and in In the Settings section, select the endpoint type. Select “Edge Optimized” option and then click on import button as shown in image 7

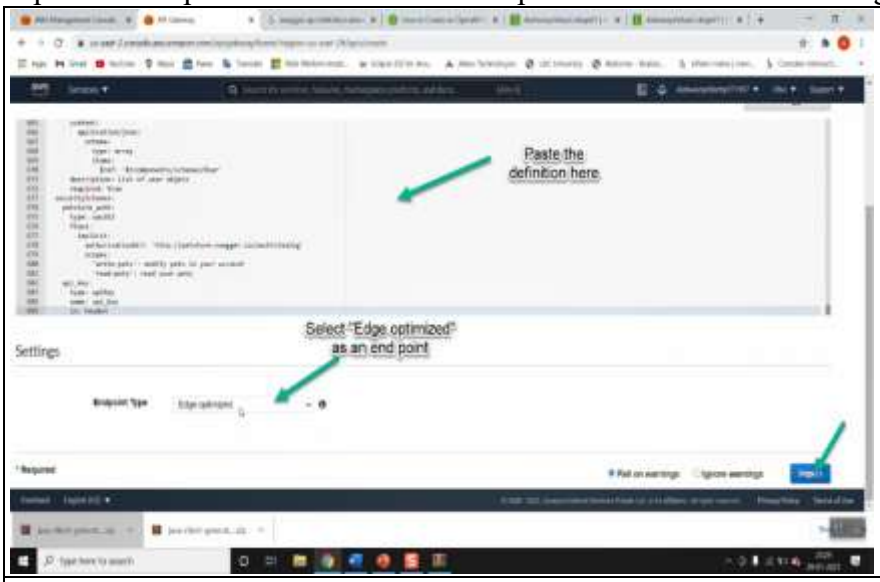


Image 7

API definition from swagger is mentioned below-

```
openapi: 3.0.0
```

```
info:
  description: |
    This is a sample Petstore server.  You can find
    out more about Swagger at
    [http://swagger.io](http://swagger.io) or on
    [irc.freenode.net, #swagger](http://swagger.io/irc/).
  version: "1.0.0"
  title: Swagger Petstore
  termsOfService: 'http://swagger.io/terms/'
  contact:
    email: apiteam@swagger.io
  license:
    name: Apache 2.0
    url: 'http://www.apache.org/licenses/LICENSE-2.0.html'
servers:
  # Added by API Auto Mocking Plugin
  - description: SwaggerHub API Auto Mocking
    url: https://virtserver.swaggerhub.com/Aishwarya07/AishwaryaVikasColege07/1.0.0
  - url: 'https://petstore.swagger.io/v2'
tags:
  - name: pet
    description: Everything about your Pets
    externalDocs:
      description: Find out more
      url: 'http://swagger.io'
  - name: store
    description: Access to Petstore orders
  - name: user
    description: Operations about user
    externalDocs:
      description: Find out more about our store
      url: 'http://swagger.io'
paths:
  /pet:
    post:
      tags:
        - pet
      summary: Add a new pet to the store
      operationId: addPet
      responses:
        '405':
          description: Invalid input
      security:
        - petstore_auth:
            - 'write:pets'
            - 'read:pets'
      requestBody:
        $ref: '#/components/requestBodies/Pet'
    put:
      tags:
```

```
    - pet
    summary: Update an existing pet
    operationId: updatePet
    responses:
      '400':
        description: Invalid ID supplied
      '404':
        description: Pet not found
      '405':
        description: Validation exception
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
    requestBody:
      $ref: '#/components/requestBodies/Pet'
  /pet/findByStatus:
    get:
      tags:
        - pet
      summary: Finds Pets by status
      description: Multiple status values can be provided with comma separated strings
      operationId: findPetsByStatus
      parameters:
        - name: status
          in: query
          description: Status values that need to be considered for filter
          required: true
          explode: true
          schema:
            type: array
            items:
              type: string
              enum:
                - available
                - pending
                - sold
              default: available
      responses:
        '200':
          description: successful operation
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/Pet'
            application/xml:
              schema:
                type: array
```

```
            items:
              $ref: '#/components/schemas/Pet'
      '400':
        description: Invalid status value
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
/pet/findByTags:
  get:
    tags:
      - pet
    summary: Finds Pets by tags
    description: >-
      Muliple tags can be provided with comma separated strings. Use\ \ tag1,
      tag2, tag3 for testing.
    operationId: findPetsByTags
    parameters:
      - name: tags
        in: query
        description: Tags to filter by
        required: true
        explode: true
        schema:
          type: array
          items:
            type: string
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/Pet'
          application/xml:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/Pet'
      '400':
        description: Invalid tag value
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
    deprecated: true
'/pet/{petId}':
  get:
```

```
  tags:
    - pet
  summary: Find pet by ID
  description: Returns a single pet
  operationId: getPetById
  parameters:
    - name: petId
      in: path
      description: ID of pet to return
      required: true
      schema:
        type: integer
        format: int64
  responses:
    '200':
      description: successful operation
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Pet'
        application/xml:
          schema:
            $ref: '#/components/schemas/Pet'
    '400':
      description: Invalid ID supplied
    '404':
      description: Pet not found
  security:
    - api_key: []
post:
  tags:
    - pet
  summary: Updates a pet in the store with form data
  operationId: updatePetWithForm
  parameters:
    - name: petId
      in: path
      description: ID of pet that needs to be updated
      required: true
      schema:
        type: integer
        format: int64
  responses:
    '405':
      description: Invalid input
  security:
    - petstore_auth:
        - 'write:pets'
        - 'read:pets'
  requestBody:
```

```
    content:
      application/x-www-form-urlencoded:
        schema:
          type: object
          properties:
            name:
              description: Updated name of the pet
              type: string
            status:
              description: Updated status of the pet
              type: string
  delete:
    tags:
      - pet
    summary: Deletes a pet
    operationId: deletePet
    parameters:
      - name: api_key
        in: header
        required: false
        schema:
          type: string
      - name: petId
        in: path
        description: Pet id to delete
        required: true
        schema:
          type: integer
          format: int64
    responses:
      '400':
        description: Invalid ID supplied
      '404':
        description: Pet not found
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
'/pet/{petId}/uploadImage':
  post:
    tags:
      - pet
    summary: uploads an image
    operationId: uploadFile
    parameters:
      - name: petId
        in: path
        description: ID of pet to update
        required: true
        schema:
```

```
        type: integer
        format: int64
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ApiResponse'
    security:
      - petstore_auth:
          - 'write:pets'
          - 'read:pets'
    requestBody:
      content:
        application/octet-stream:
          schema:
            type: string
            format: binary
/store/inventory:
  get:
    tags:
      - store
    summary: Returns pet inventories by status
    description: Returns a map of status codes to quantities
    operationId: getInventory
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              type: object
              additionalProperties:
                type: integer
                format: int32
    security:
      - api_key: []
/store/order:
  post:
    tags:
      - store
    summary: Place an order for a pet
    operationId: placeOrder
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
```

```
            $ref: '#/components/schemas/Order'
          application/xml:
            schema:
              $ref: '#/components/schemas/Order'
      '400':
        description: Invalid Order
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Order'
      description: order placed for purchasing the pet
      required: true
'/store/order/{orderId}':
  get:
    tags:
      - store
    summary: Find purchase order by ID
    description: >-
      For valid response try integer IDs with value >= 1 and <= 10.\ \ Other
      values will generated exceptions
    operationId: getOrderById
    parameters:
      - name: orderId
        in: path
        description: ID of pet that needs to be fetched
        required: true
        schema:
          type: integer
          format: int64
          minimum: 1
          maximum: 10
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/Order'
          application/xml:
            schema:
              $ref: '#/components/schemas/Order'
      '400':
        description: Invalid ID supplied
      '404':
        description: Order not found
  delete:
    tags:
      - store
    summary: Delete purchase order by ID
```

```
    description: >-
      For valid response try integer IDs with positive integer value.\ \
      Negative or non-integer values will generate API errors
    operationId: deleteOrder
    parameters:
      - name: orderId
        in: path
        description: ID of the order that needs to be deleted
        required: true
        schema:
          type: integer
          format: int64
          minimum: 1
    responses:
      '400':
        description: Invalid ID supplied
      '404':
        description: Order not found
/user:
  post:
    tags:
      - user
    summary: Create user
    description: This can only be done by the logged in user.
    operationId: createUser
    responses:
      default:
        description: successful operation
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/User'
      description: Created user object
      required: true
/user/createWithArray:
  post:
    tags:
      - user
    summary: Creates list of users with given input array
    operationId: createUsersWithArrayInput
    responses:
      default:
        description: successful operation
    requestBody:
      $ref: '#/components/requestBodies/UserArray'
/user/createWithList:
  post:
    tags:
      - user
```

```
    summary: Creates list of users with given input array
    operationId: createUsersWithListInput
    responses:
      default:
        description: successful operation
    requestBody:
      $ref: '#/components/requestBodies/UserArray'
  /user/login:
    get:
      tags:
        - user
      summary: Logs user into the system
      operationId: loginUser
      parameters:
        - name: username
          in: query
          description: The user name for login
          required: true
          schema:
            type: string
        - name: password
          in: query
          description: The password for login in clear text
          required: true
          schema:
            type: string
      responses:
        '200':
          description: successful operation
          headers:
            X-Rate-Limit:
              description: calls per hour allowed by the user
              schema:
                type: integer
                format: int32
            X-Expires-After:
              description: date in UTC when token expires
              schema:
                type: string
                format: date-time
          content:
            application/json:
              schema:
                type: string
            application/xml:
              schema:
                type: string
        '400':
          description: Invalid username/password supplied
  /user/logout:
```

```
  get:
    tags:
      - user
    summary: Logs out current logged in user session
    operationId: logoutUser
    responses:
      default:
        description: successful operation
'/user/{username}':
  get:
    tags:
      - user
    summary: Get user by user name
    operationId: getUserByName
    parameters:
      - name: username
        in: path
        description: The name that needs to be fetched. Use user1 for testing.
        required: true
        schema:
          type: string
    responses:
      '200':
        description: successful operation
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/User'
          application/xml:
            schema:
              $ref: '#/components/schemas/User'
      '400':
        description: Invalid username supplied
      '404':
        description: User not found
  put:
    tags:
      - user
    summary: Updated user
    description: This can only be done by the logged in user.
    operationId: updateUser
    parameters:
      - name: username
        in: path
        description: name that need to be updated
        required: true
        schema:
          type: string
    responses:
      '400':
```

```
        description: Invalid user supplied
      '404':
        description: User not found
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/User'
      description: Updated user object
      required: true
  delete:
    tags:
    - user
    summary: Delete user
    description: This can only be done by the logged in user.
    operationId: deleteUser
    parameters:
    - name: username
      in: path
      description: The name that needs to be deleted
      required: true
      schema:
        type: string
    responses:
      '400':
        description: Invalid username supplied
      '404':
        description: User not found
externalDocs:
  description: Find out more about Swagger
  url: 'http://swagger.io'
components:
  schemas:
    Order:
      type: object
      properties:
        id:
          type: integer
          format: int64
        petId:
          type: integer
          format: int64
        quantity:
          type: integer
          format: int32
        shipDate:
          type: string
          format: date-time
        status:
          type: string
```

```
      description: Order Status
      enum:
        - placed
        - approved
        - delivered
    complete:
      type: boolean
      default: false
  xml:
    name: Order
Category:
  type: object
  properties:
    id:
      type: integer
      format: int64
    name:
      type: string
  xml:
    name: Category
User:
  type: object
  properties:
    id:
      type: integer
      format: int64
    username:
      type: string
    firstName:
      type: string
    lastName:
      type: string
    email:
      type: string
    password:
      type: string
    phone:
      type: string
    userStatus:
      type: integer
      format: int32
      description: User Status
  xml:
    name: User
Tag:
  type: object
  properties:
    id:
      type: integer
      format: int64
```

```
    name:
      type: string
  xml:
    name: Tag
Pet:
  type: object
  required:
    - name
    - photoUrls
  properties:
    id:
      type: integer
      format: int64
    category:
      $ref: '#/components/schemas/Category'
    name:
      type: string
      example: doggie
    photoUrls:
      type: array
      xml:
        name: photoUrl
        wrapped: true
      items:
        type: string
    tags:
      type: array
      xml:
        name: tag
        wrapped: true
      items:
        $ref: '#/components/schemas/Tag'
    status:
      type: string
      description: pet status in the store
      enum:
        - available
        - pending
        - sold
  xml:
    name: Pet
ApiResponse:
  type: object
  properties:
    code:
      type: integer
      format: int32
    type:
      type: string
    message:
```

```
        type: string
  requestBodies:
    Pet:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Pet'
        application/xml:
          schema:
            $ref: '#/components/schemas/Pet'
      description: Pet object that needs to be added to the store
      required: true
    UserArray:
      content:
        application/json:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/User'
      description: List of user object
      required: true
  securitySchemes:
    petstore_auth:
      type: oauth2
      flows:
        implicit:
          authorizationUrl: 'http://petstore.swagger.io/oauth/dialog'
          scopes:
            'write:pets': modify pets in your account
            'read:pets': read your pets
    api_key:
      type: apiKey
      name: api_key
      in: header
```

Output-

If the import is successful, we can view the “API Structure in AWS API Gateway” where we can see methods of the API. As shown in image 8

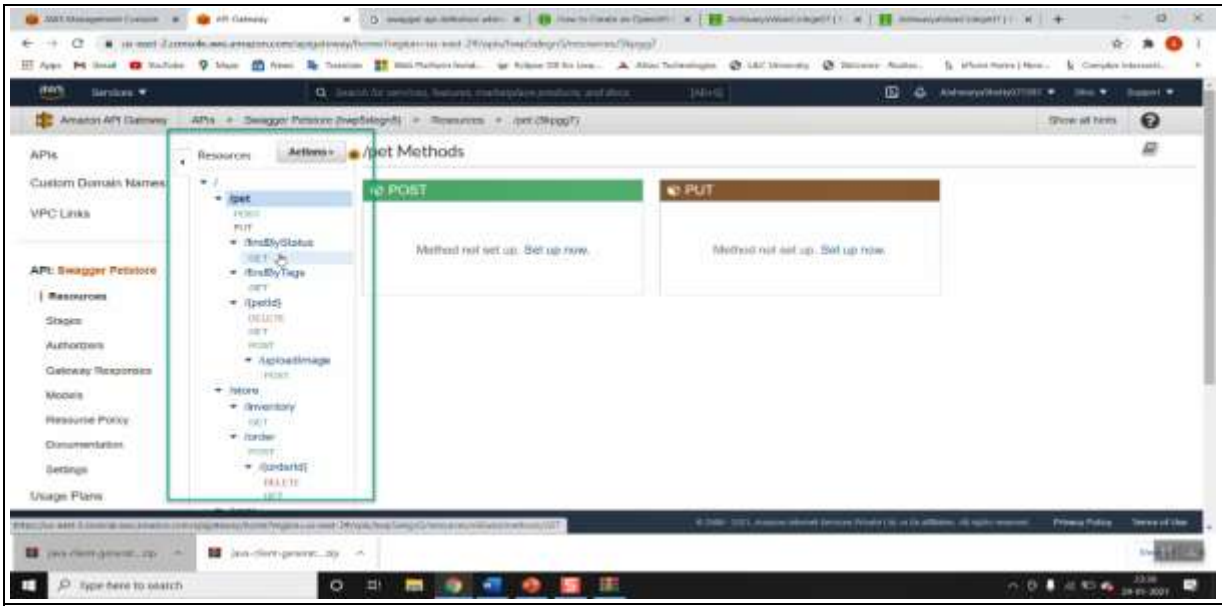
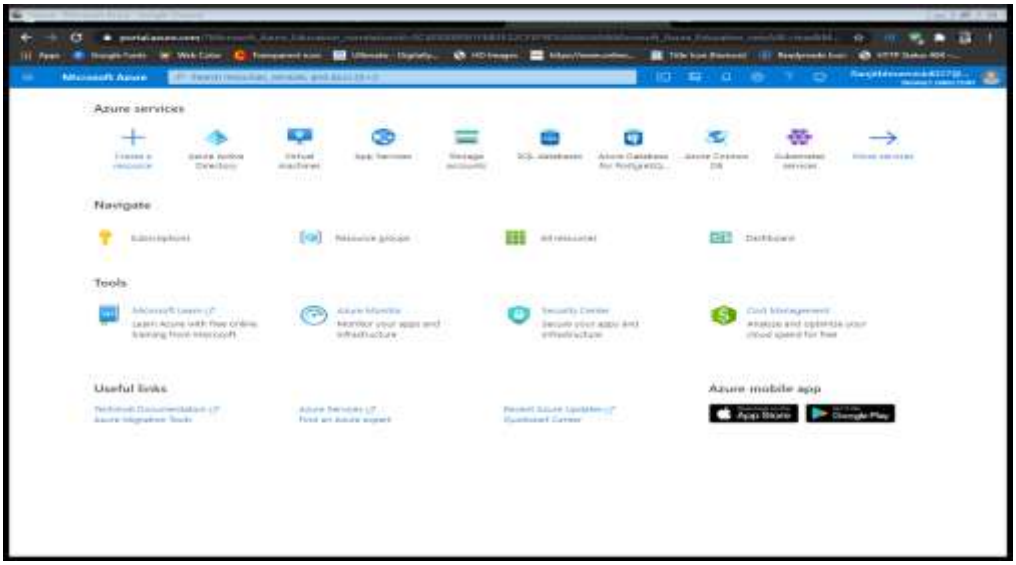

Amazon API Gateway
APIs
Custom Domain Names
VPC Links
API: Swagger Petstore
Resources
Stages
Authorizers
Gateway Responses
Models
Resource Policy
Documentation
Settings
Usage Plans
Resources
Actions
/pet Methods
POST
Method not set up. Set up now.
PUT
Method not set up. Set up now.
/pet
/findByStatus
/findByTags
/{petId}
/uploadImage
/store
/inventory
/order
/{orderId}

Image 8

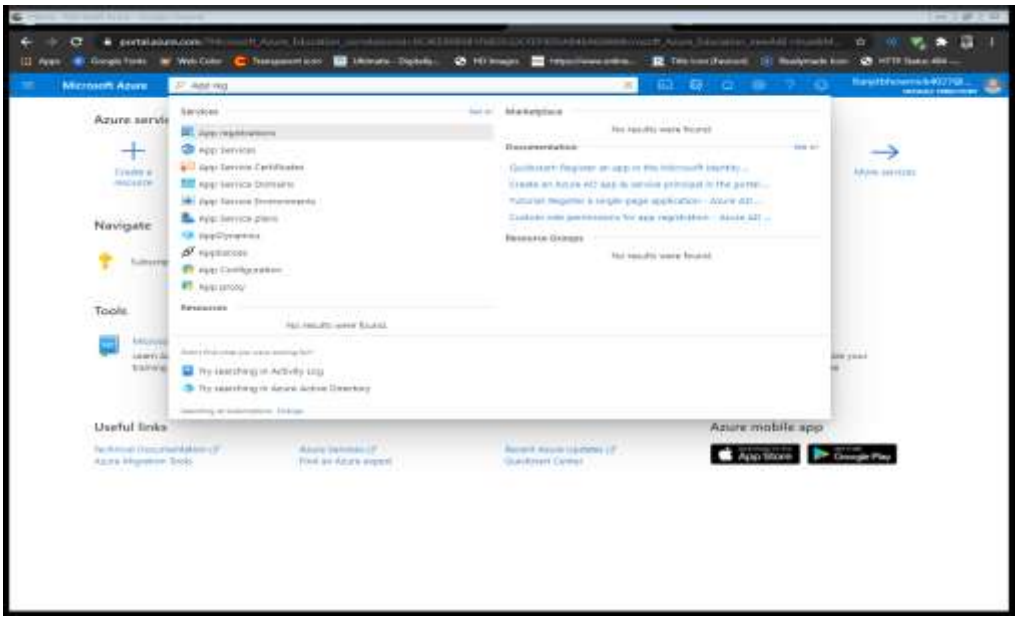
PRACTICAL 9

Securing APIs with Azure Active Directory

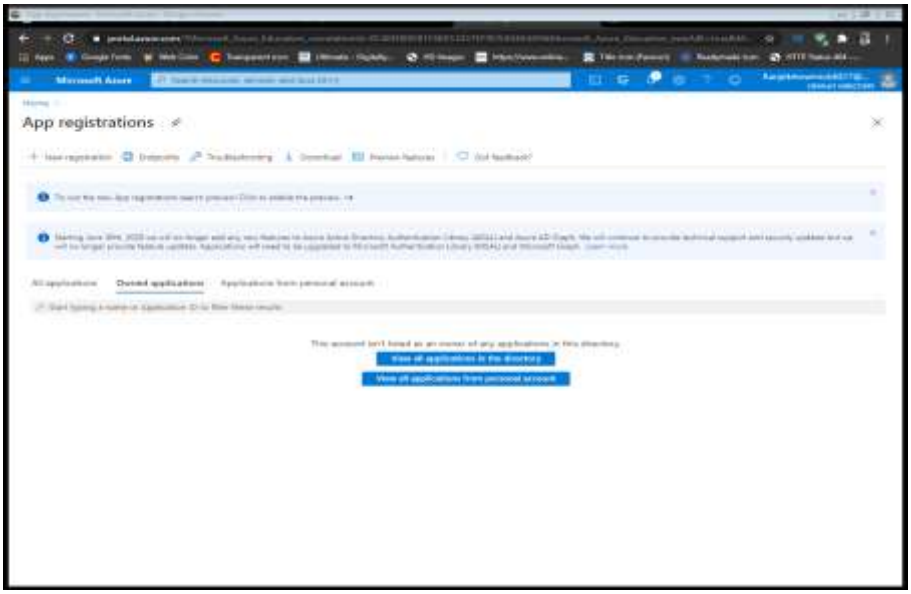
1. Register an application in Azure AD to represent the API
Visit Azure Portal -



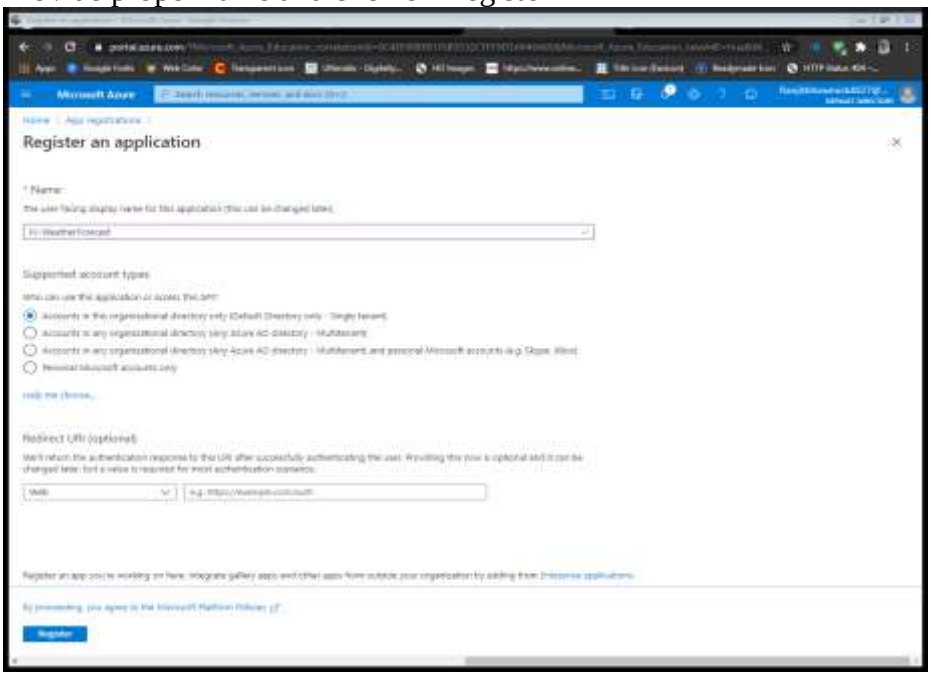
Search App Registration-



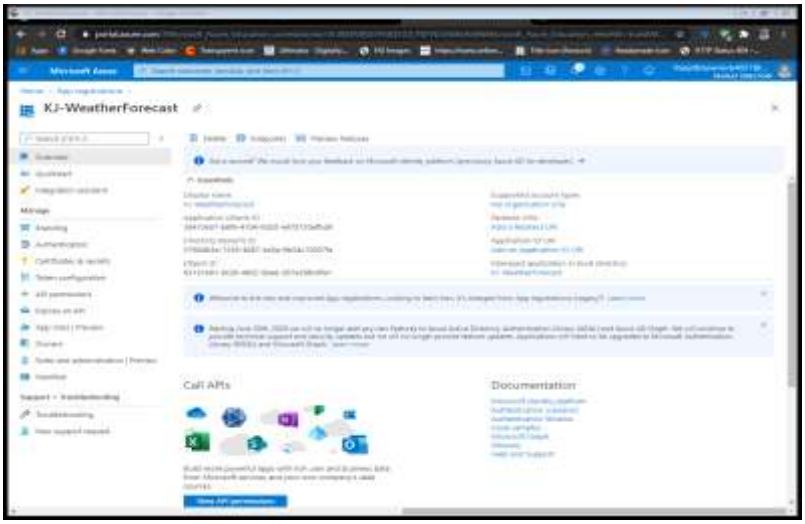
Click on New Registration-



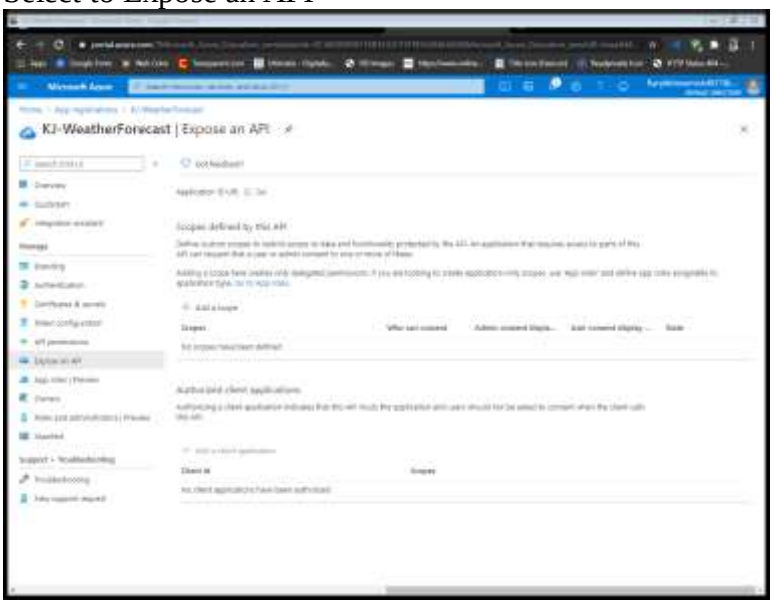
Provide proper name and click on Register –



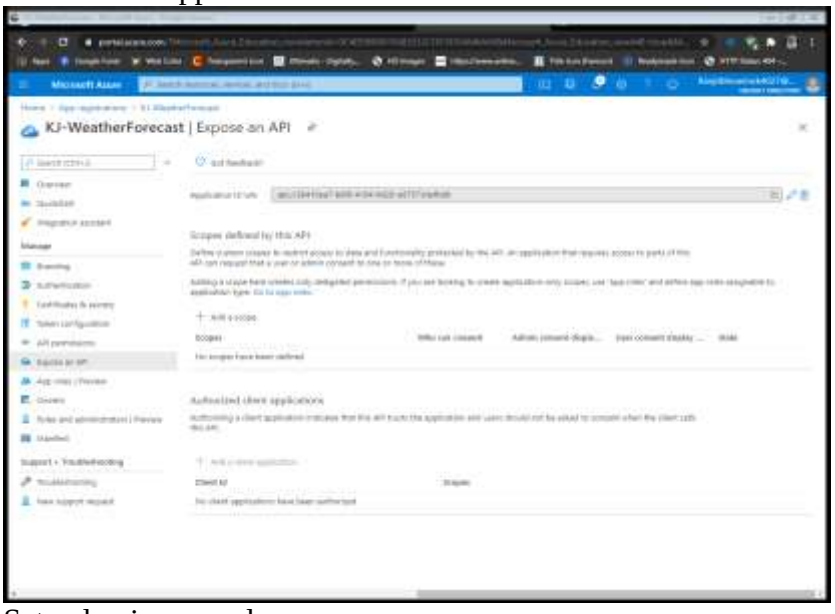
It will redirects to Overview Page –



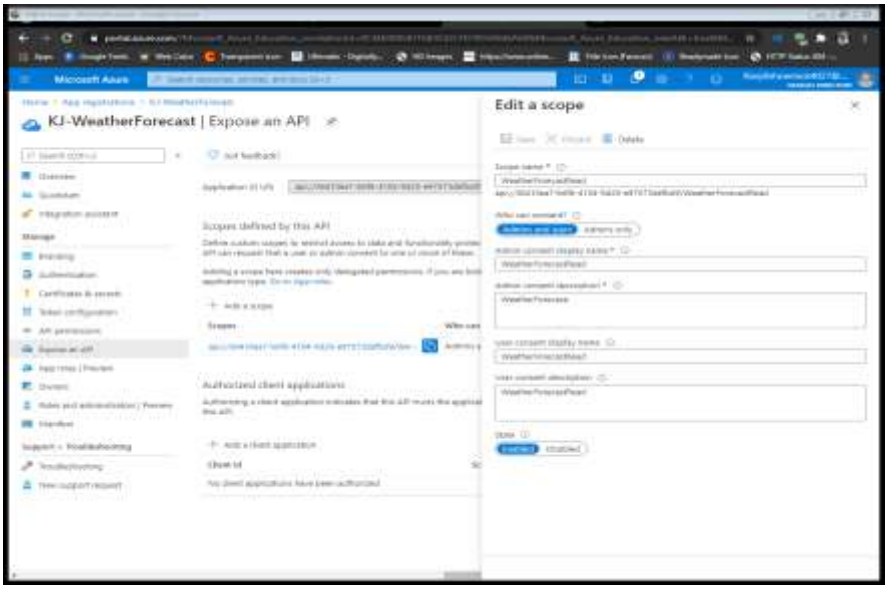
Select to Expose an API –



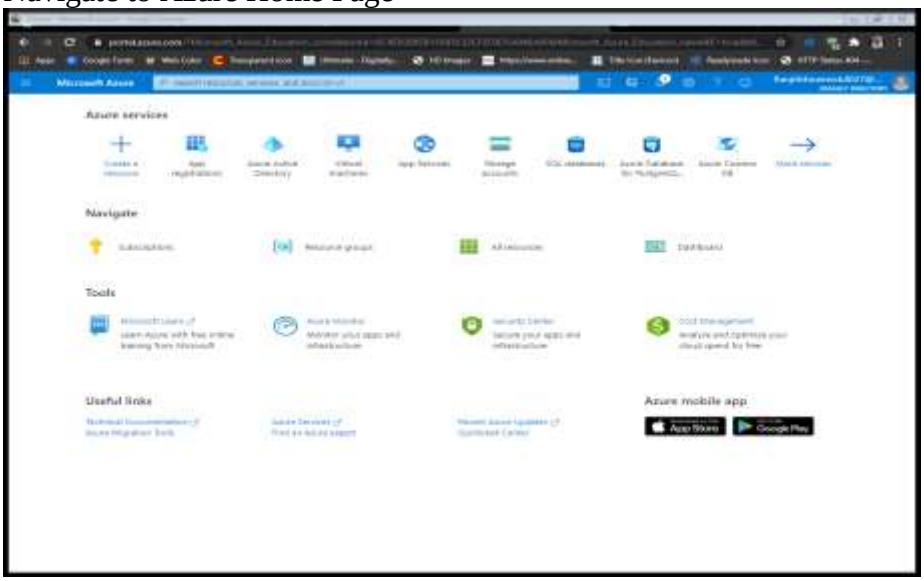
Set Default App URL-



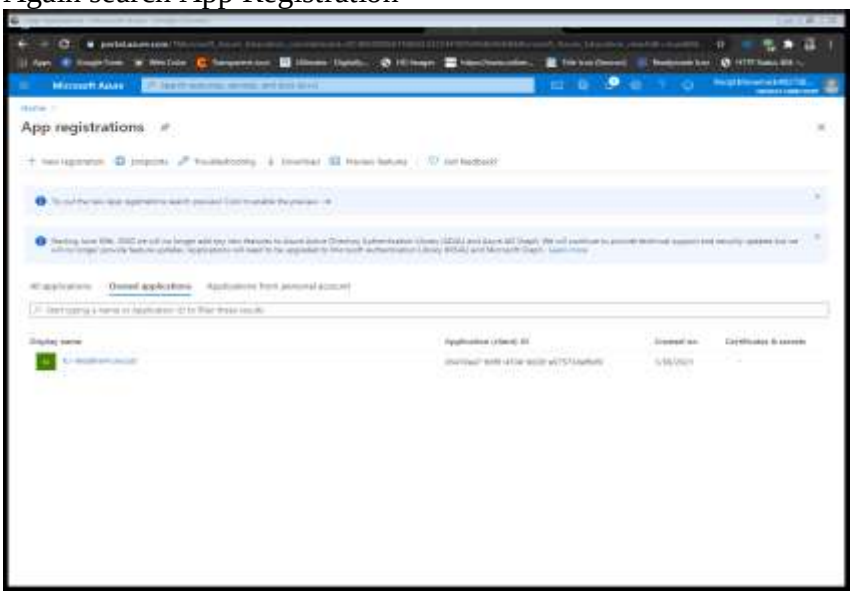
Set value in opened scope page –



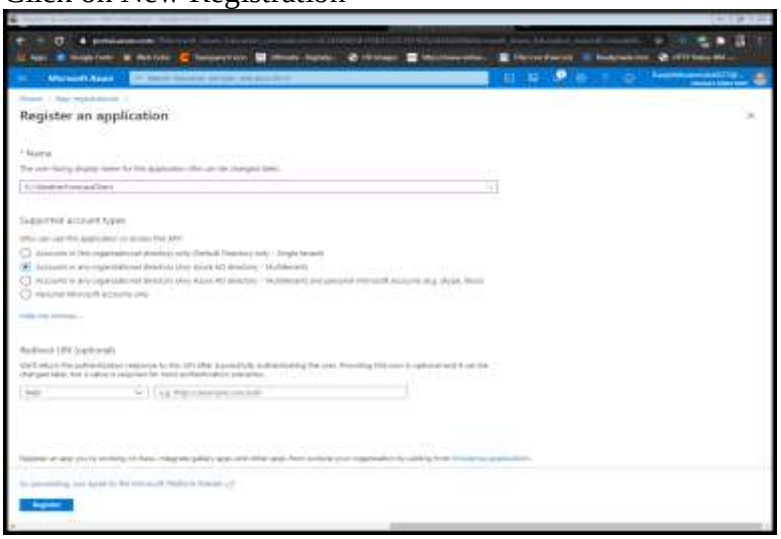
Register an application in Azure AD to represent a client Application –
Navigate to Azure Home Page –



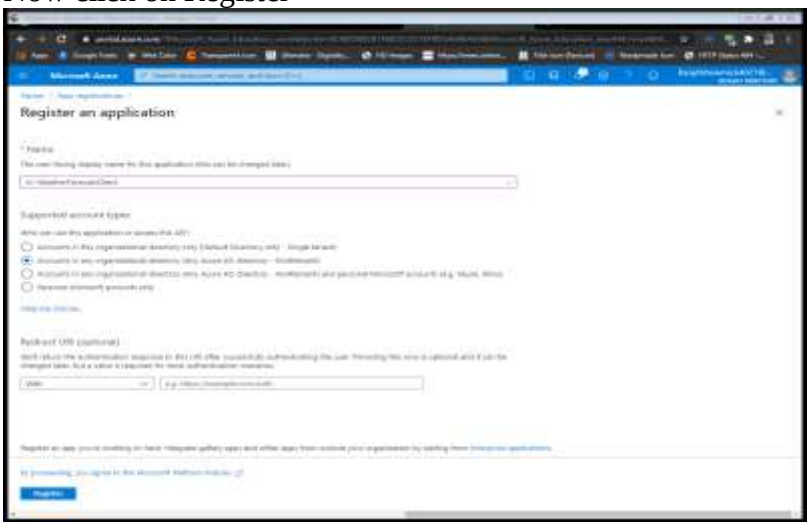
Again search App Registration –



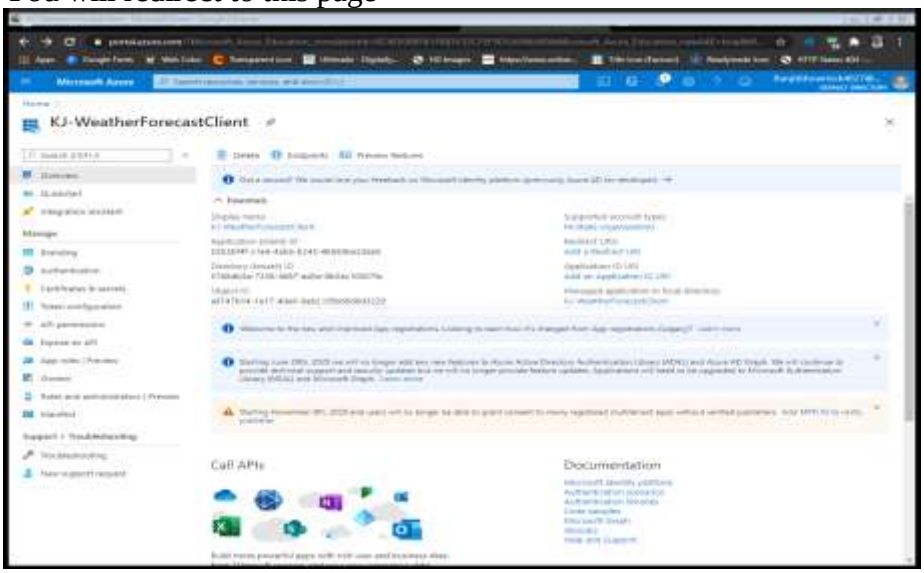
Click on New Registration



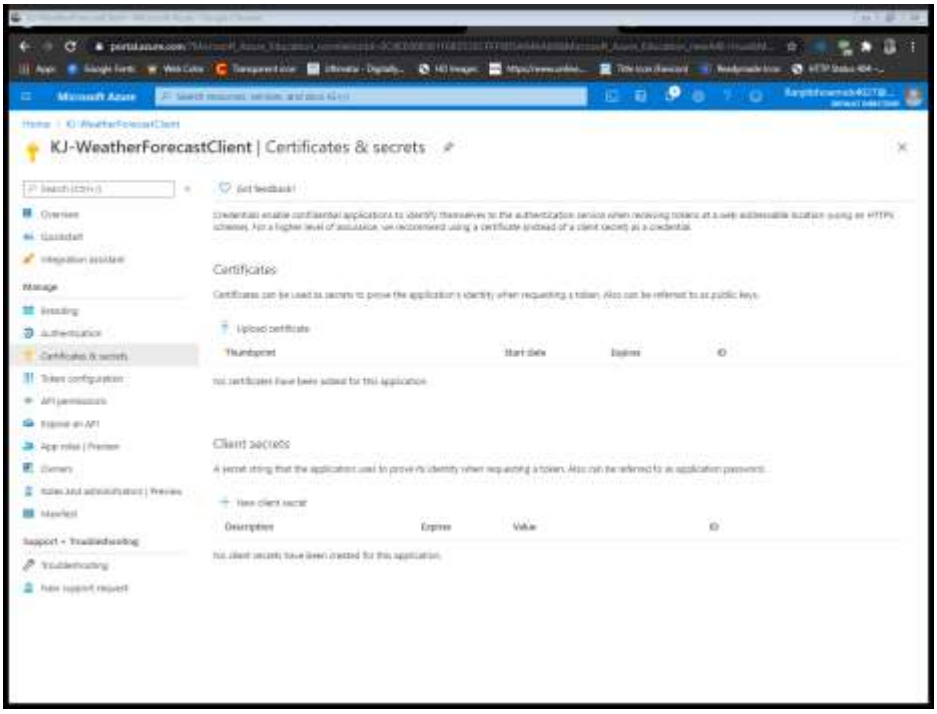
Now click on Register-



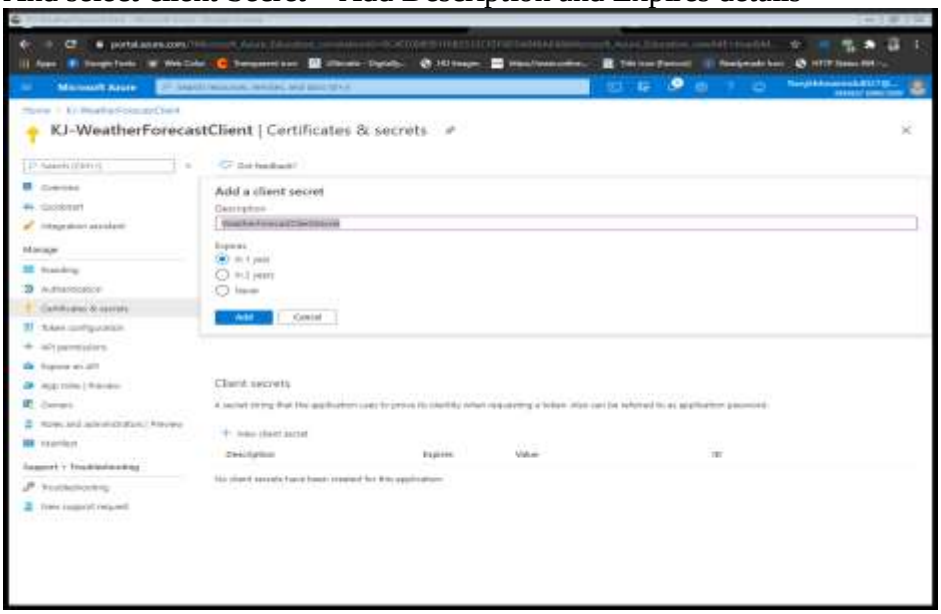
You will redirect to this page –

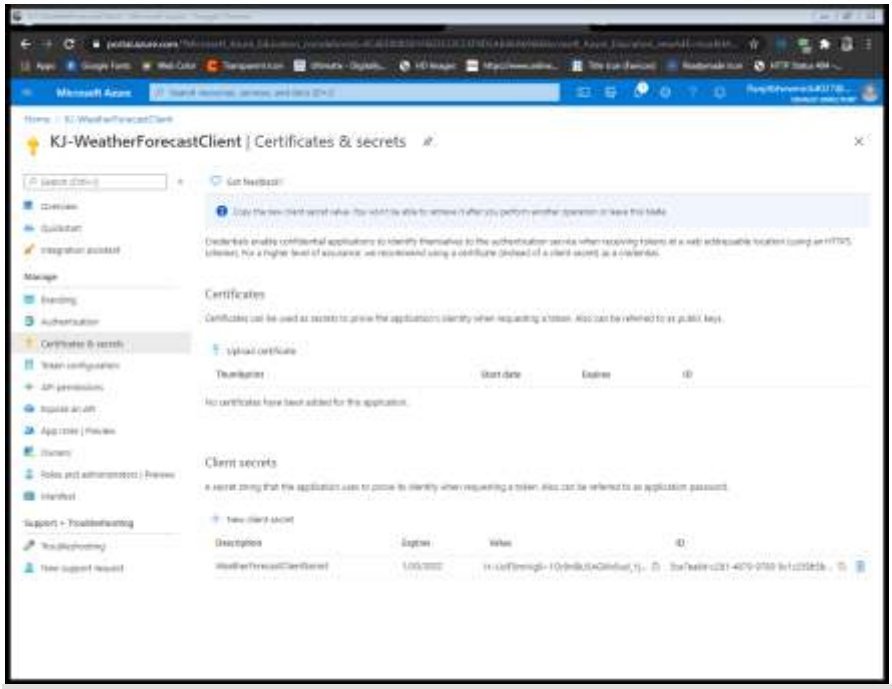


Select Certificate and Secrets –



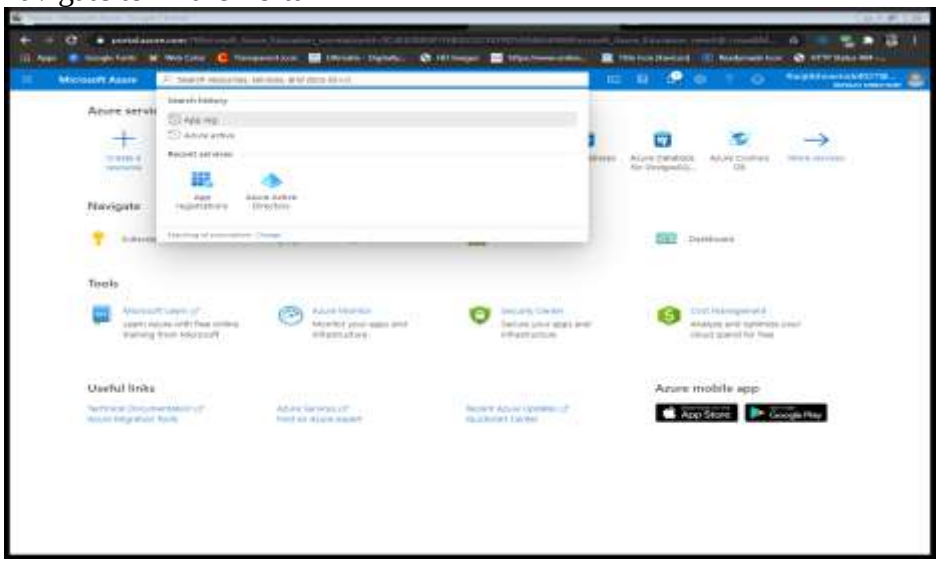
And select client Secret – Add Description and Expires details-

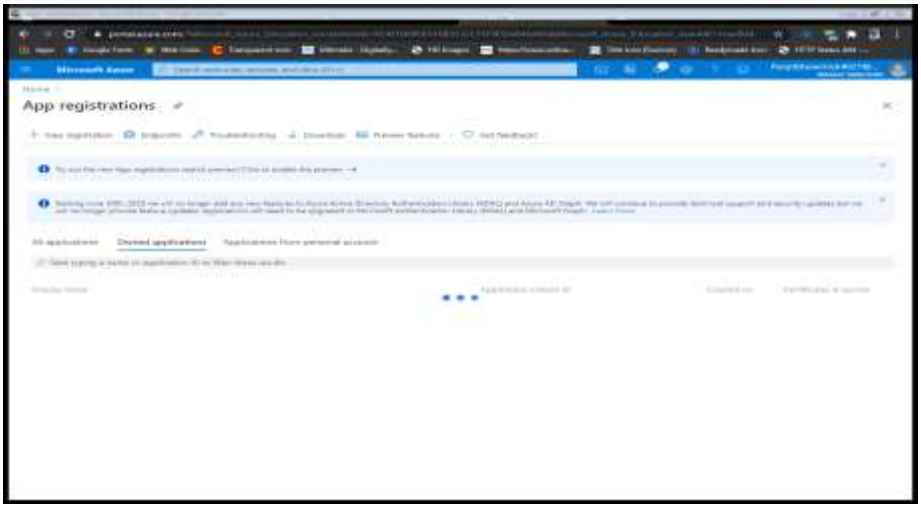




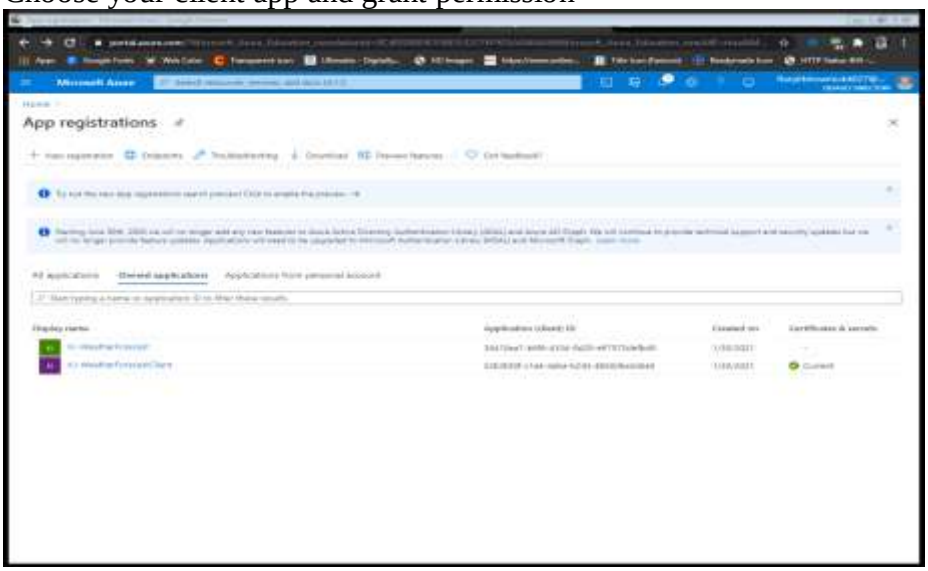
WeatherForecastClientSecret
1/30/2022
H~UdF5mHIg9~1Or9nBkJ5AGWx9ud_Yj7_-
5ce7ea6d-c281-4079-9785-9c1c259b5b26

Grant Permission in Azure AD –
Navigate to Azure Portal –

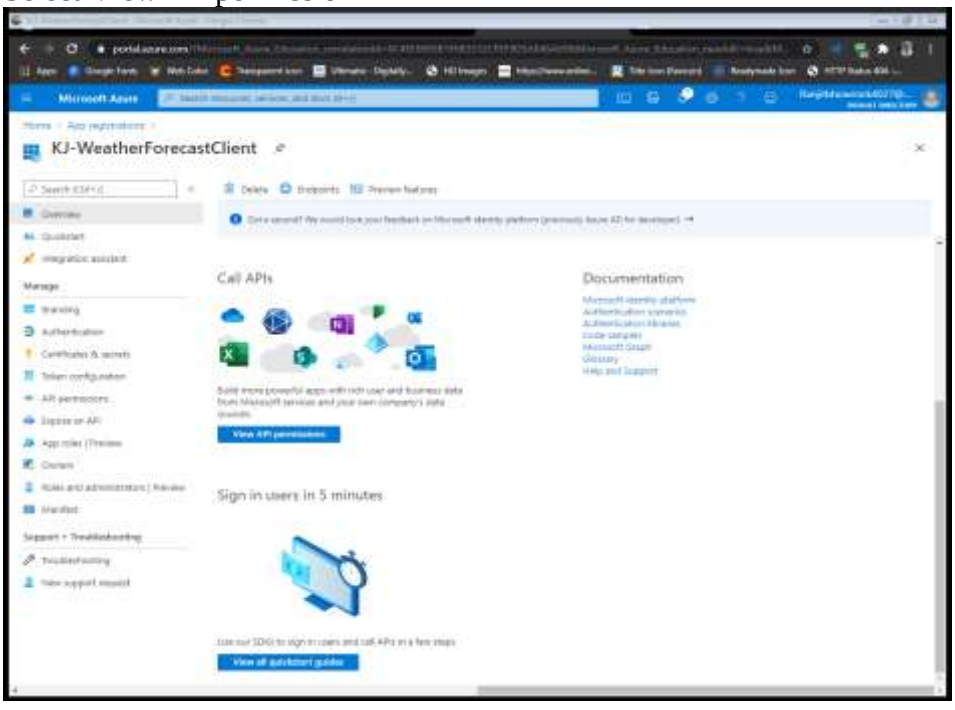




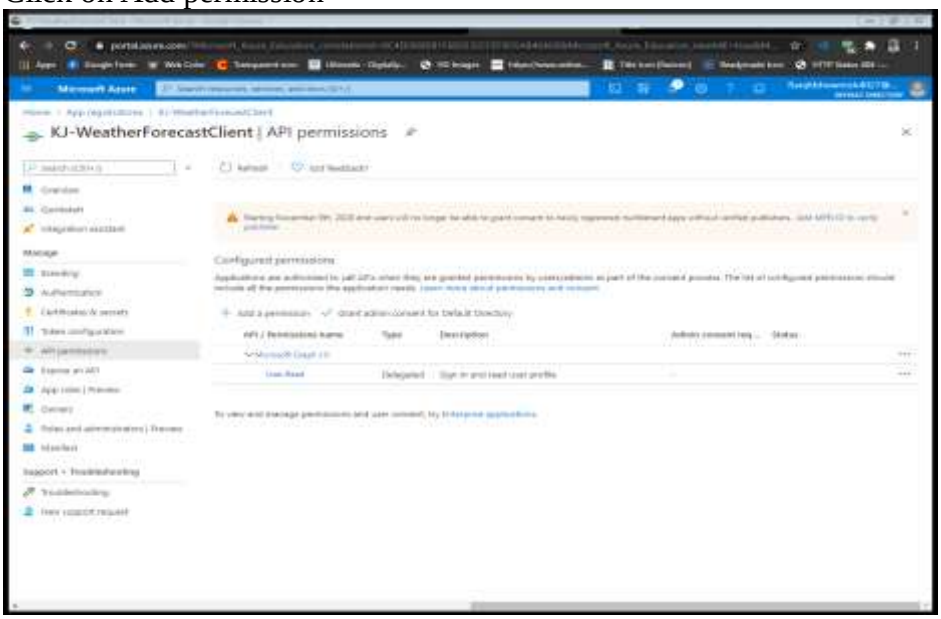
Choose your client app and grant permission –



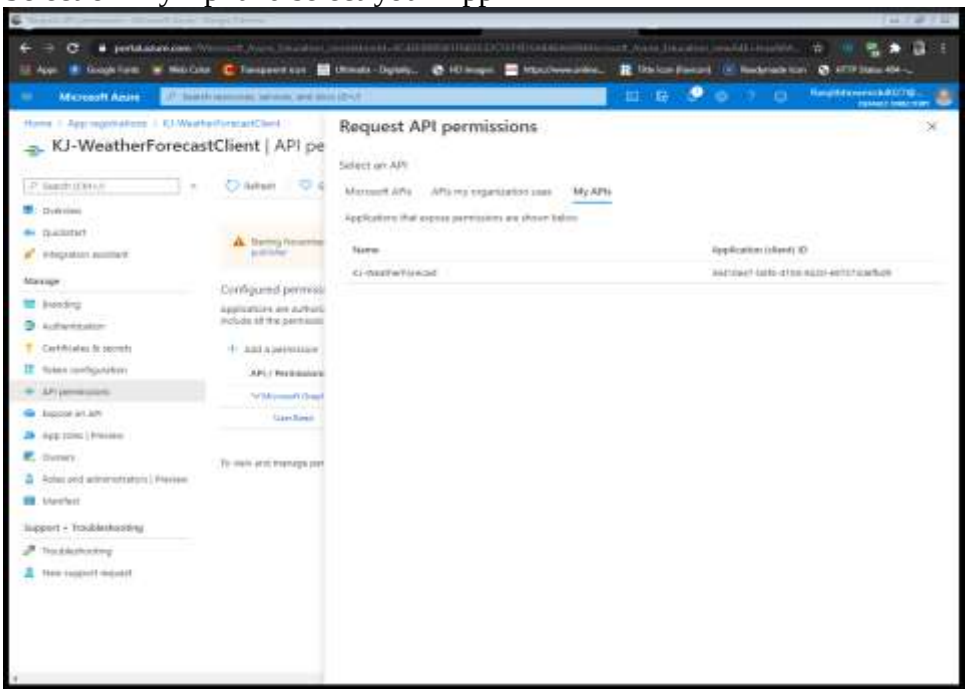
Select View All permission –



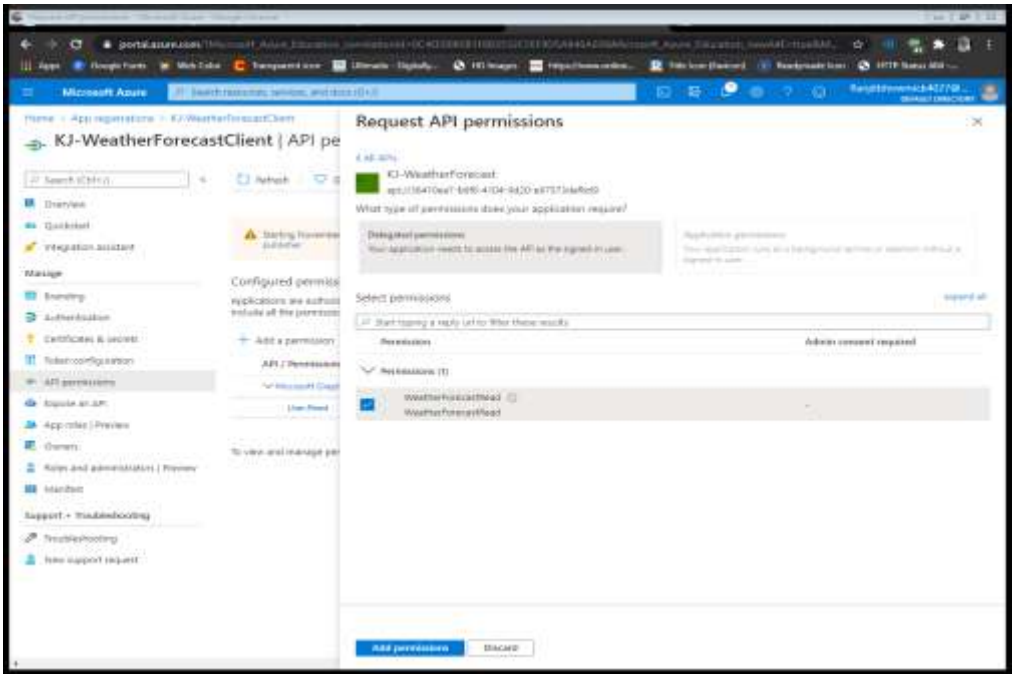
Click on Add permission –



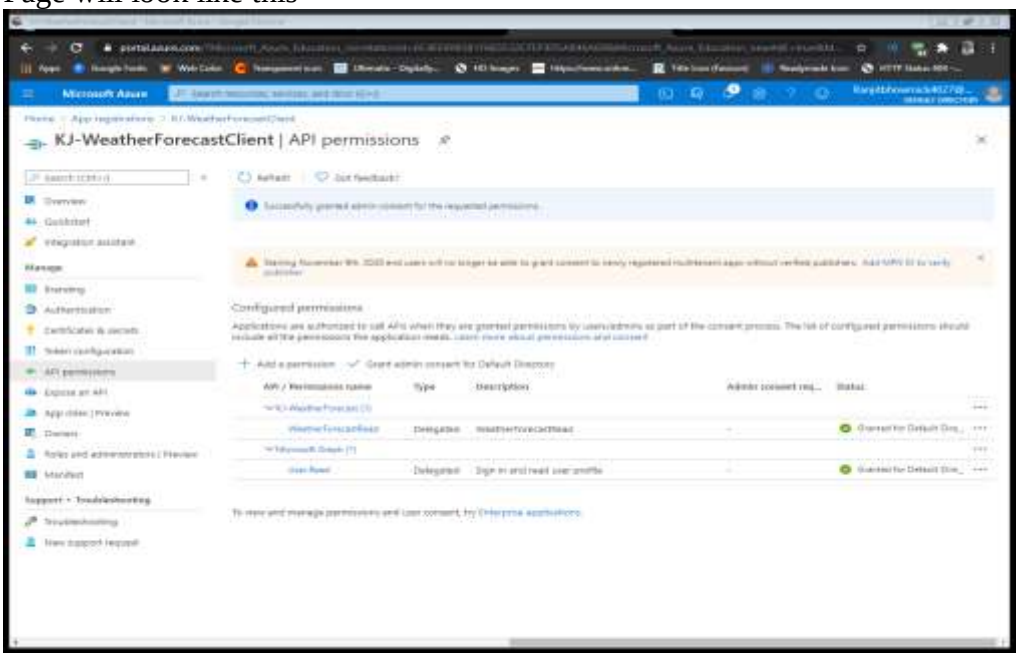
Select on My Api and select your App-



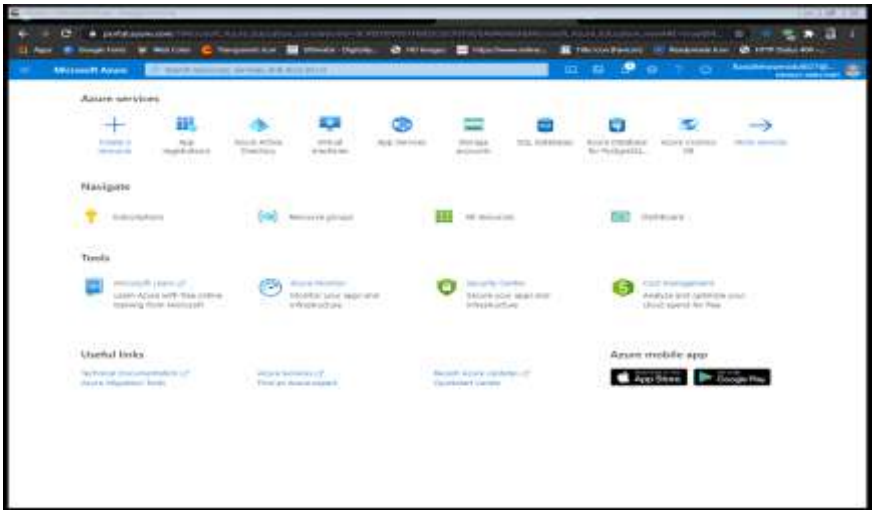
Add Required Permission under Delegated Permission –



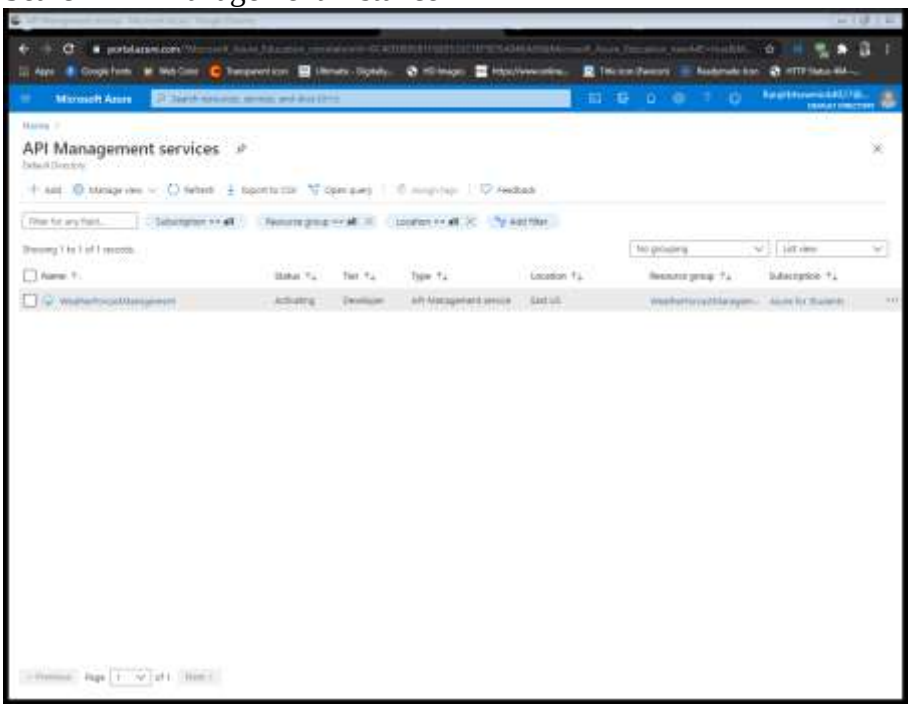
Page will look like this –



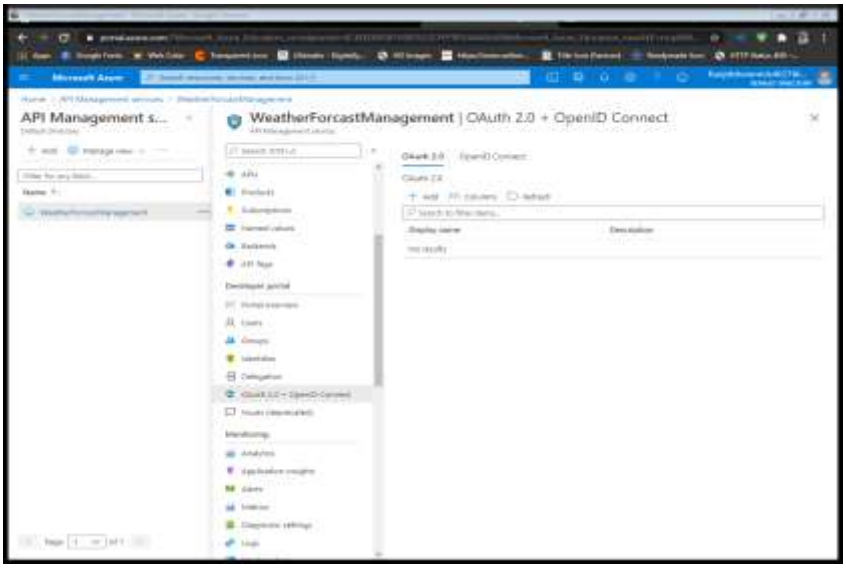
Now enable OAUTH 2.0 user Authorization –
Navigate to Azure Homepage –



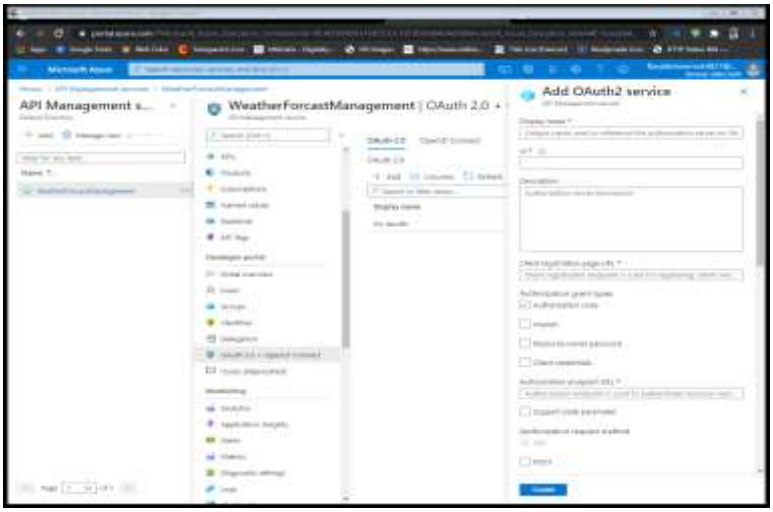
Search API Management Instance –



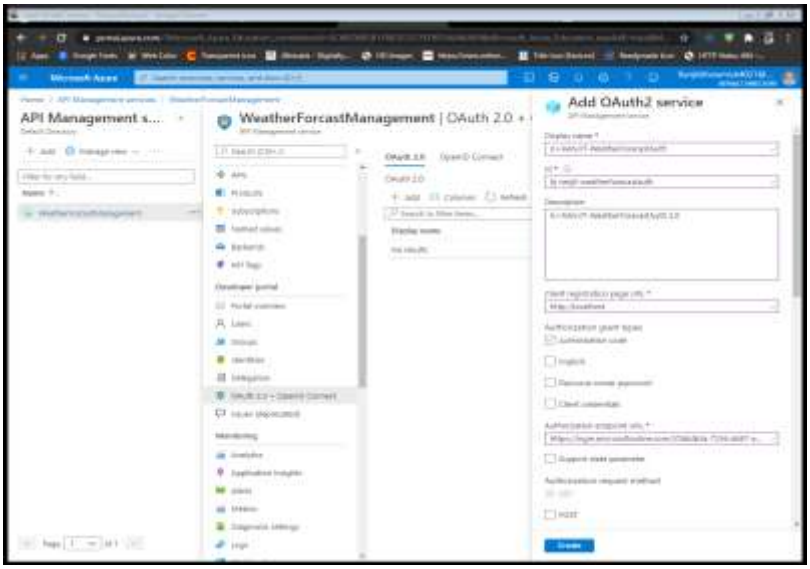
Select OAuth 2.0

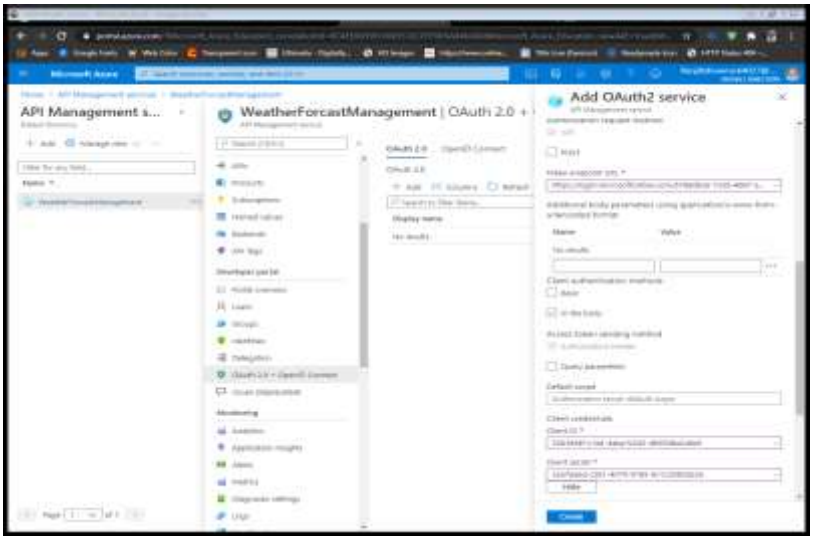


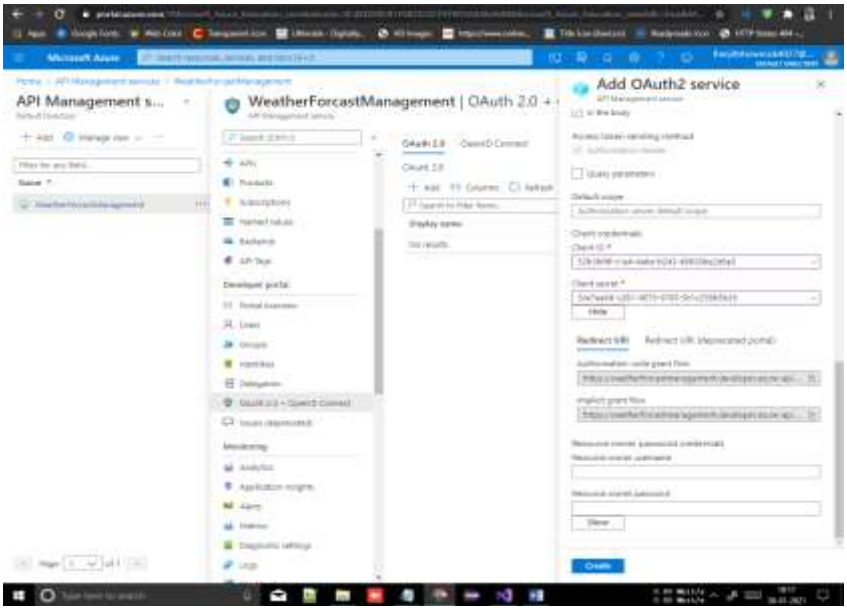
Add OAuth 2.0 –



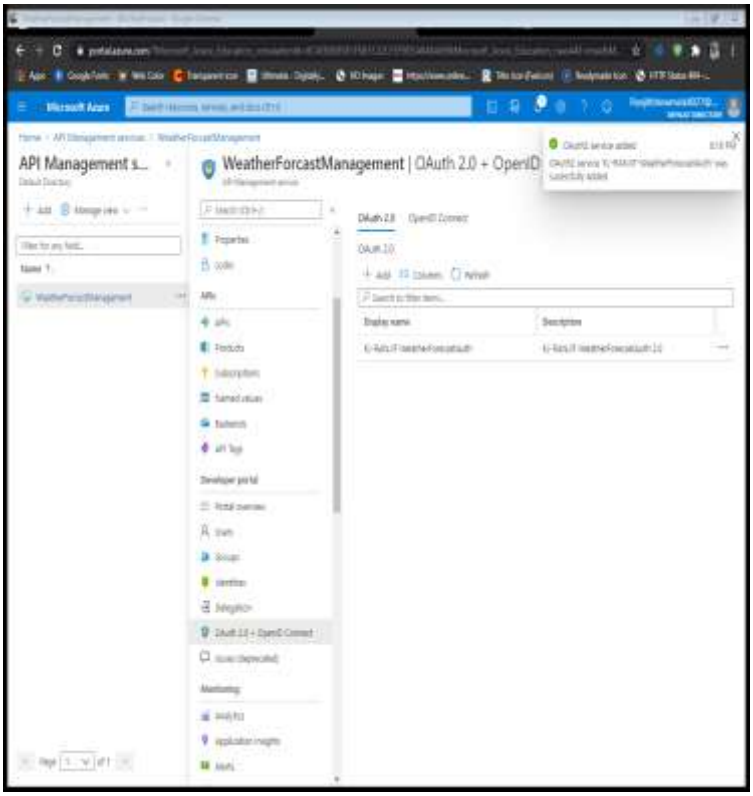
Enter all details as below –







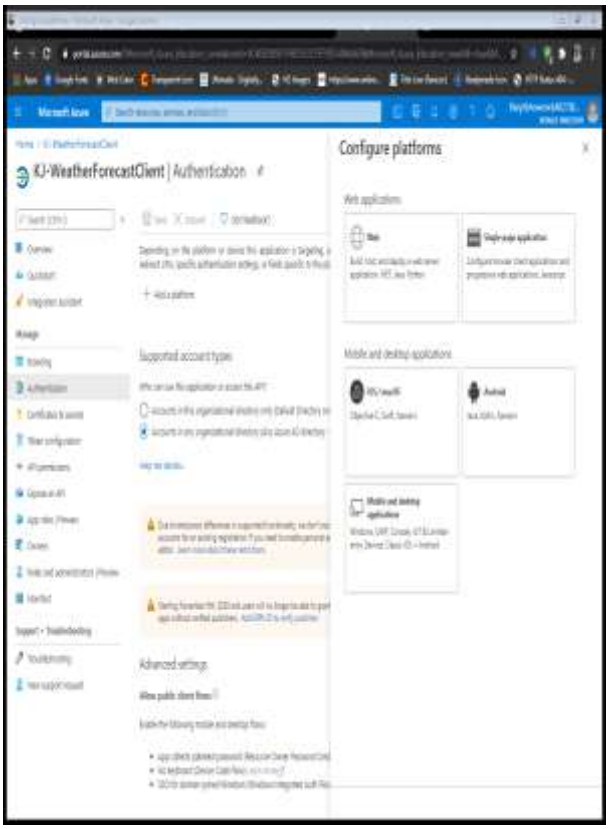
Click on create button –



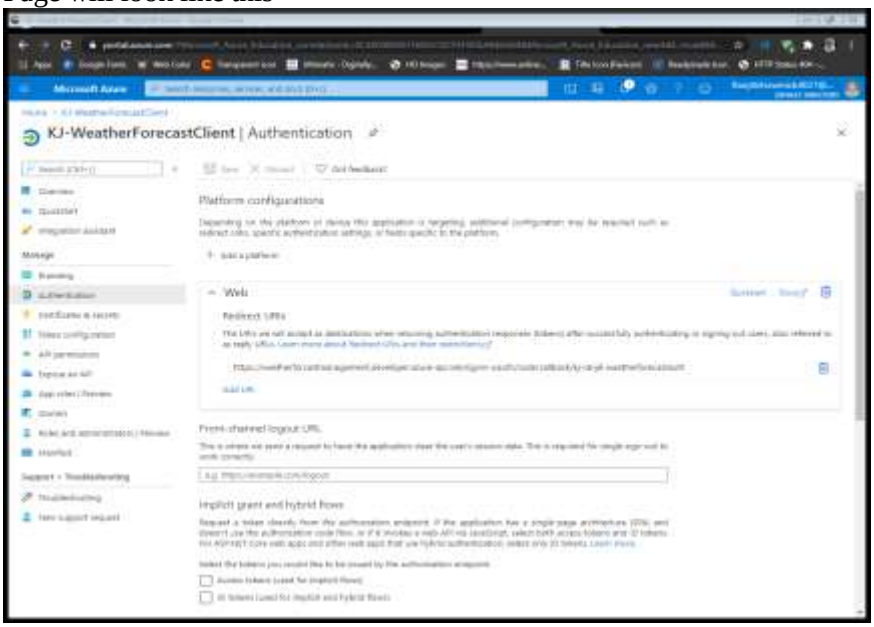
Now navigate to Client App - KJ-WeatherForecastClient-

Now add a platform as web

Paste the Redirect URL and click on configure



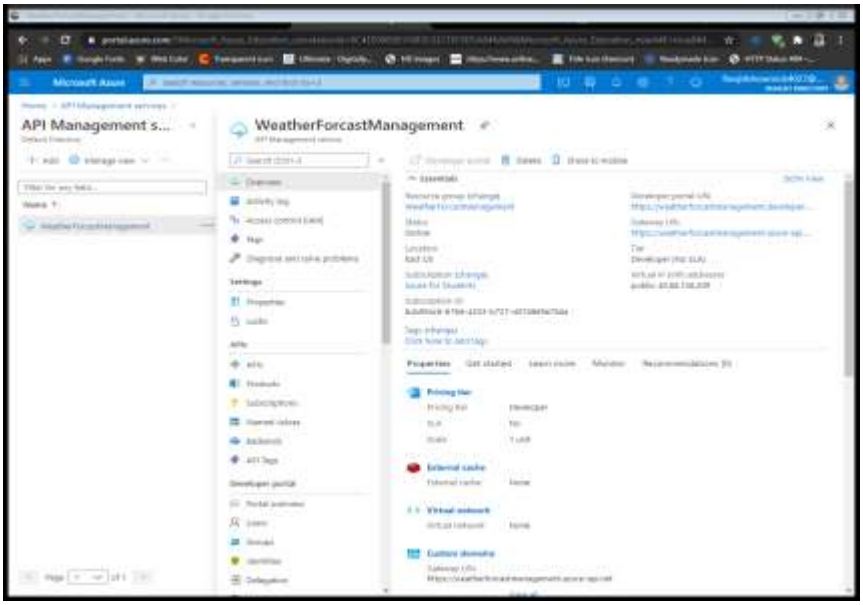
Page will look like this –



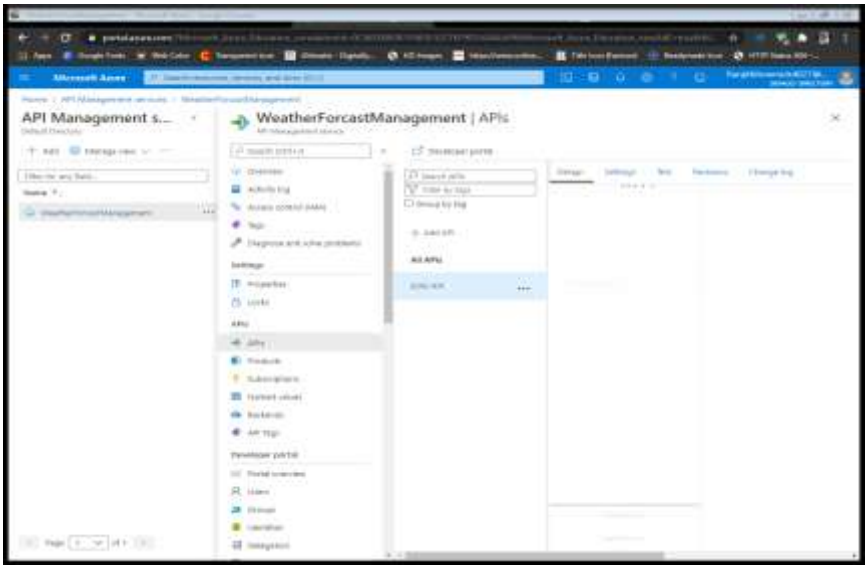
Now to enable OAuth 2.0 user authorization for your API –

Browser API Management service and select your service-

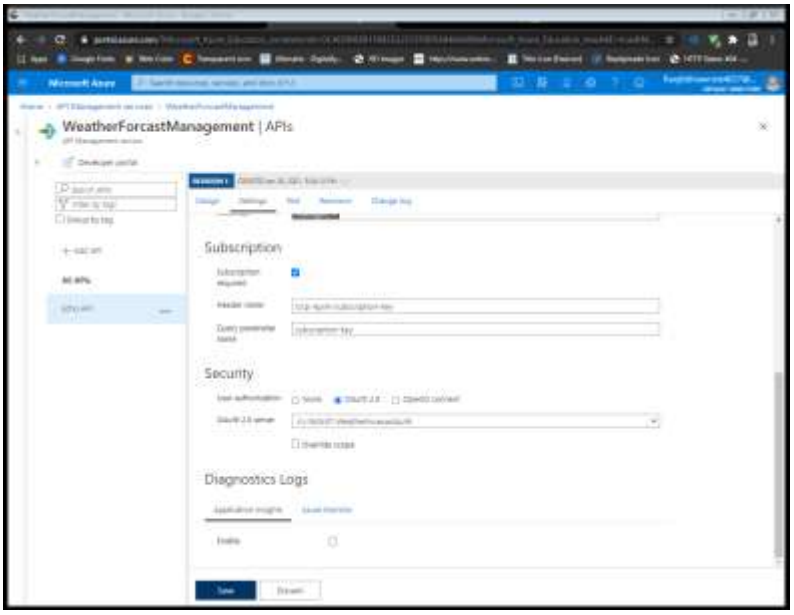
Select API



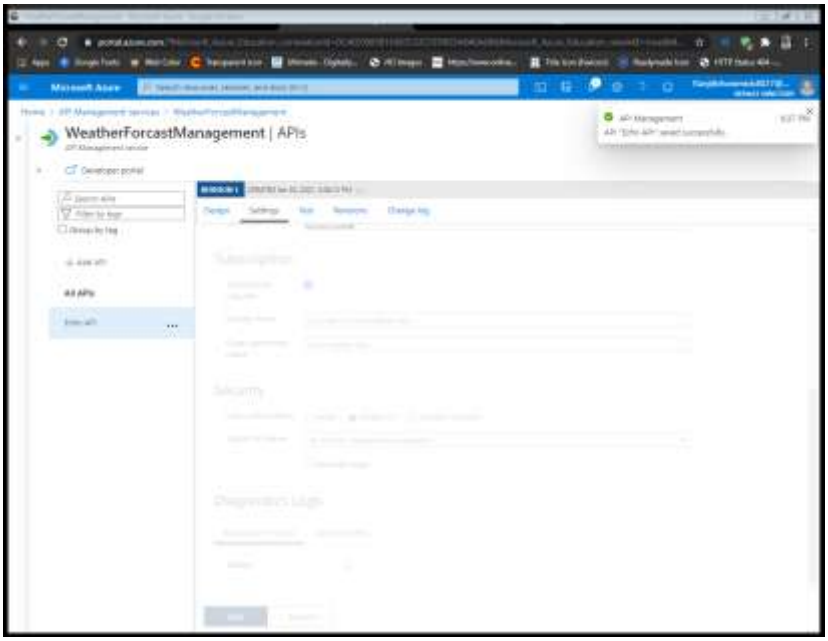
Select “echo api” – any api you want to protect –



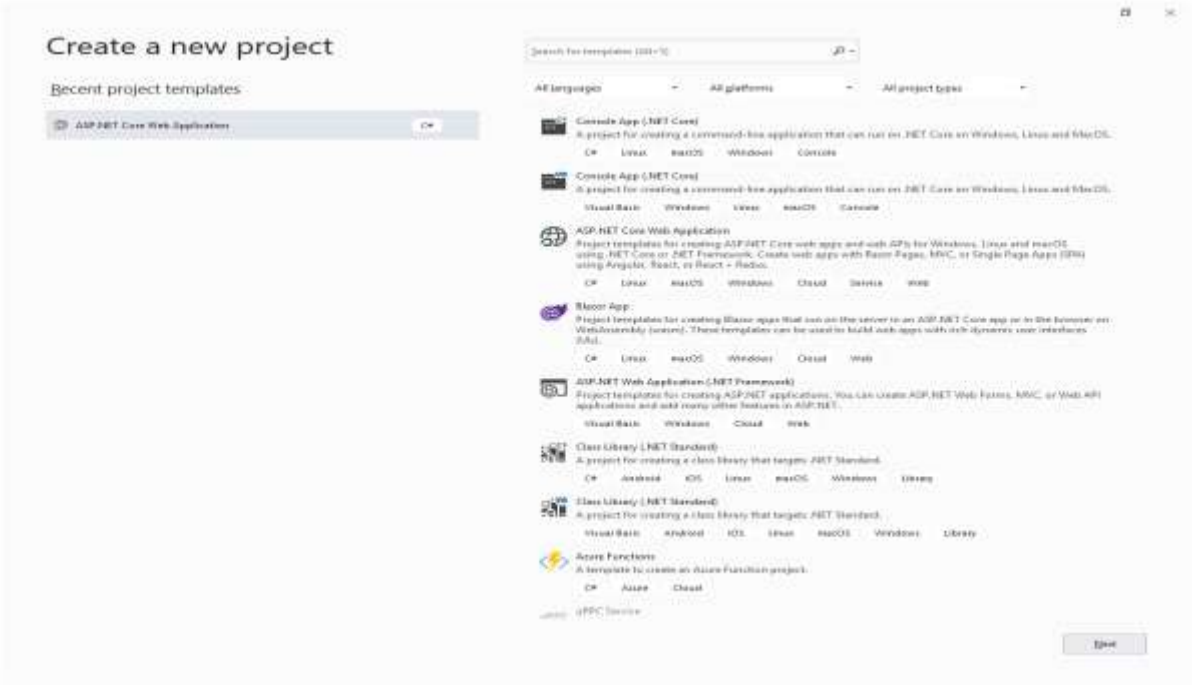
Now move to setting and Select OAUTH 2.0 which have been configured –



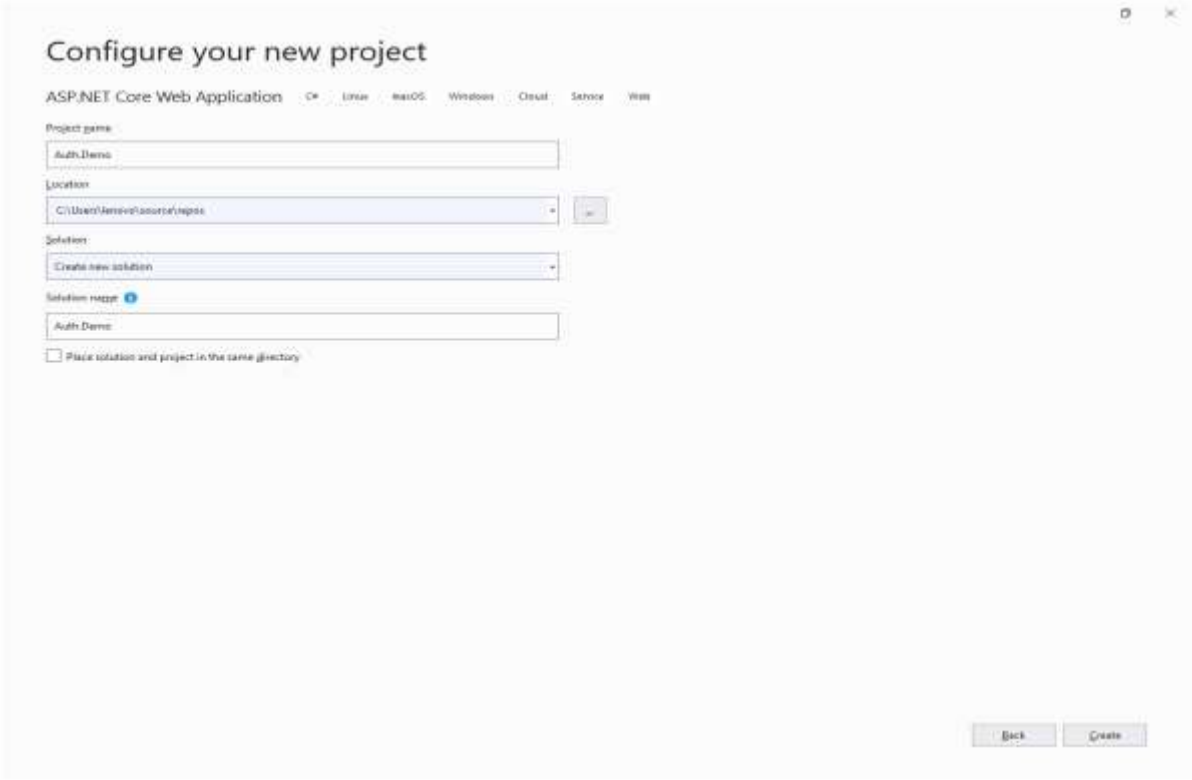
Now click on Save-



Issuing a custom JWT token using a symmetric signing key
Create new Asp.Net Core Project –



Enter Details and Select API Option –

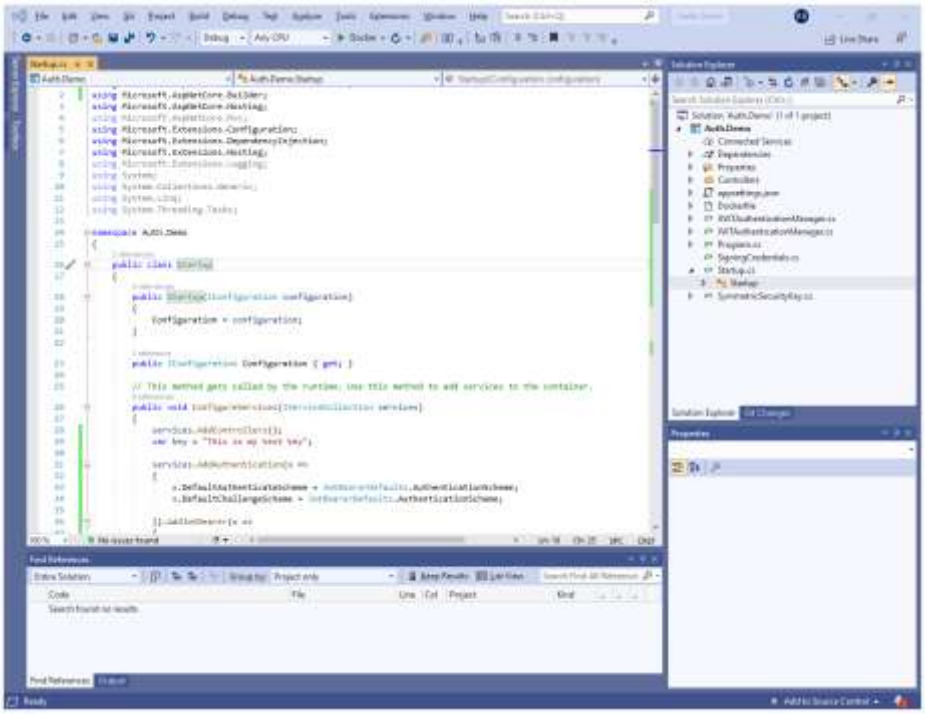


Follow below steps –
Create Startup.cs and use below Code –

```
using Microsoft.AspNetCore.Authentication.JwtBearer;
using Microsoft.AspNetCore.Builder;
using Microsoft.AspNetCore.Hosting;
using Microsoft.AspNetCore.Mvc;
```

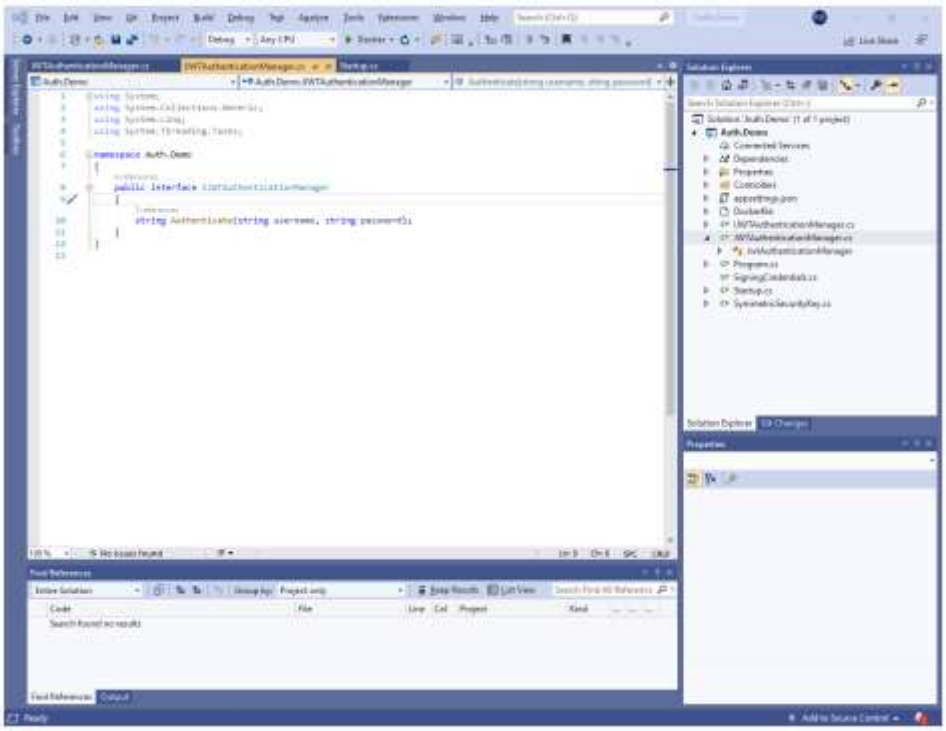
```
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Hosting;
using Microsoft.Extensions.Logging;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
   public class Startup
   {
      public Startup(IConfiguration configuration)
      {
         Configuration = configuration;
      }

      public IConfiguration Configuration { get; }

      // This method gets called by the runtime. Use this method to add services to the container.
      public void ConfigureServices(IServiceCollection services)
      {
         services.AddControllers();
         var key = "This is my test key";

         services.AddAuthentication(x =>
         {
            x.DefaultAuthenticateScheme = JwtBearerDefaults.AuthenticationScheme;
            x.DefaultChallengeScheme = JwtBearerDefaults.AuthenticationScheme;

         }).AddJwtBearer(x =>
         {
            x.RequireHttpsMetadata = false;
            x.SaveToken = true;
            x.TokenValidationParameters = new
Microsoft.IdentityModel.Tokens.TokenValidationParameters
            {
               ValidateIssuerSigningKey = true,
               IssuerSigningKey = new
SymmetricSecurityKey(System.Text.Encoding.ASCII.GetBytes(key)),
               ValidateIssuer = false,
               ValidateAudience = false




            };
```

```
            });

            services.AddSingleton<IJWTAuthenticationManager>(new JwtAuthenticationManager(key));



        }

        // This method gets called by the runtime. Use this method to configure the HTTP request pipeline.
        public void Configure(IApplicationBuilder app, IWebHostEnvironment env)
        {
            if (env.IsDevelopment())
            {
                app.UseDeveloperExceptionPage();
            }

            app.UseRouting();

            app.UseAuthentication();

            app.UseAuthorization();

            app.UseEndpoints(endpoints =>
            {
                endpoints.MapControllers();
            });
        }
    }
}
```



Create Interface - IJWTAuthenticationManager.cs

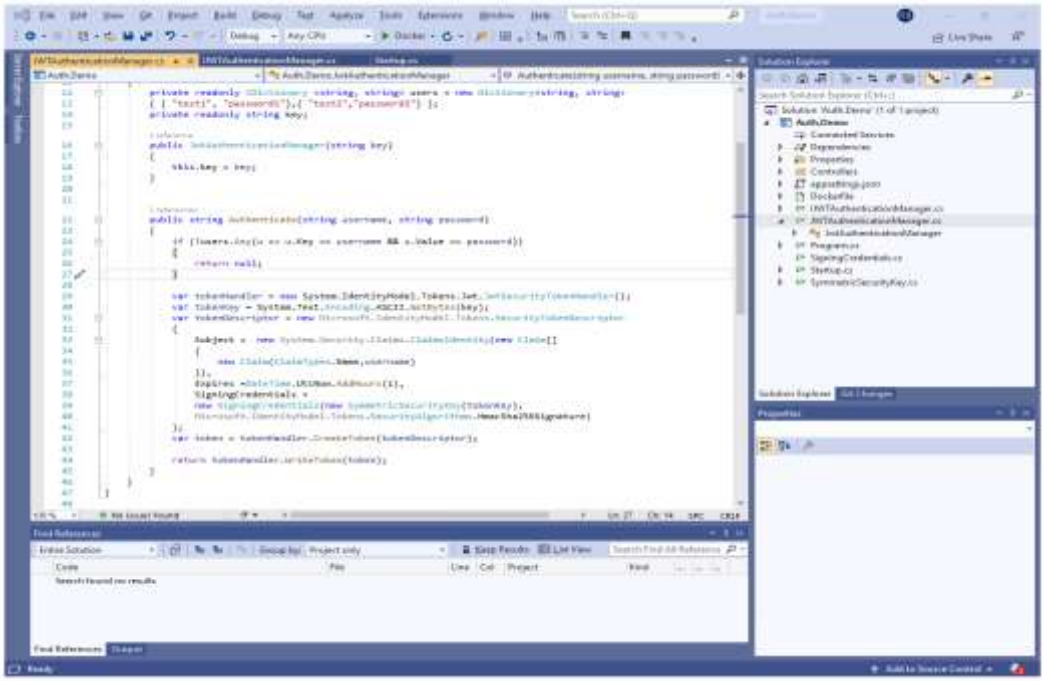
```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public interface IJWTAuthenticationManager
    {
        string Authenticate(string username, string password);
    }
}
```



Create class - JWTAuthenticationManager.cs

```
using Microsoft.IdentityModel.Tokens;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Security.Claims;
using System.Threading.Tasks;

namespace Auth.Demo
{
    public class JwtAuthenticationManager : IJWTAuthenticationManager
    {
        private readonly IDictionary <string, string> users = new Dictionary<string, string>
        { { "test1", "password1"},{ "test2","password2"} };
        private readonly string key;

        public JwtAuthenticationManager(string key)
```

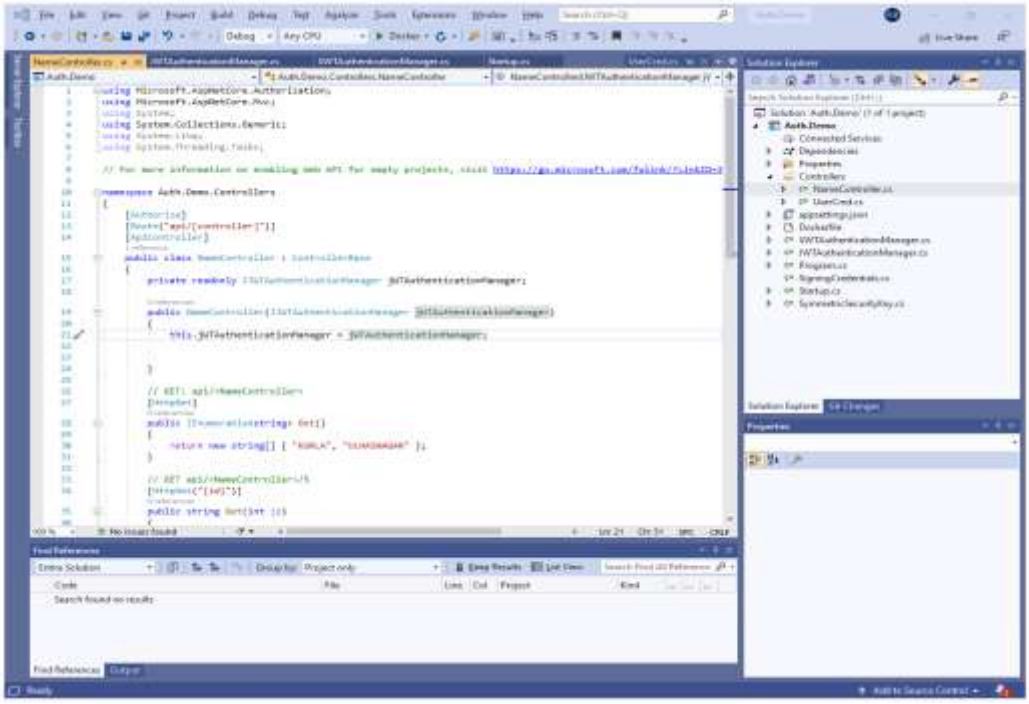
```
        {
            this.key = key;
        }


        public string Authenticate(string username, string password)
        {
            if (!users.Any(u => u.Key == username && u.Value == password))
            {
                return null;
            }

            var tokenHandler = new System.IdentityModel.Tokens.Jwt.JwtSecurityTokenHandler();
            var tokenKey = System.Text.Encoding.ASCII.GetBytes(key);
            var tokenDescriptor = new Microsoft.IdentityModel.Tokens.SecurityTokenDescriptor
            {
                Subject =  new System.Security.Claims.ClaimsIdentity(new Claim[]
                {
                    new Claim(ClaimTypes.Name,username)
                }),
                Expires =DateTime.UtcNow.AddHours(1),
                SigningCredentials =
                new SigningCredentials(new SymmetricSecurityKey(tokenKey),
                Microsoft.IdentityModel.Tokens.SecurityAlgorithms.HmacSha256Signature)
            };
            var token = tokenHandler.CreateToken(tokenDescriptor);

            return tokenHandler.WriteToken(token);
        }
    }
}
```



Create NameController.cs and follow below code –

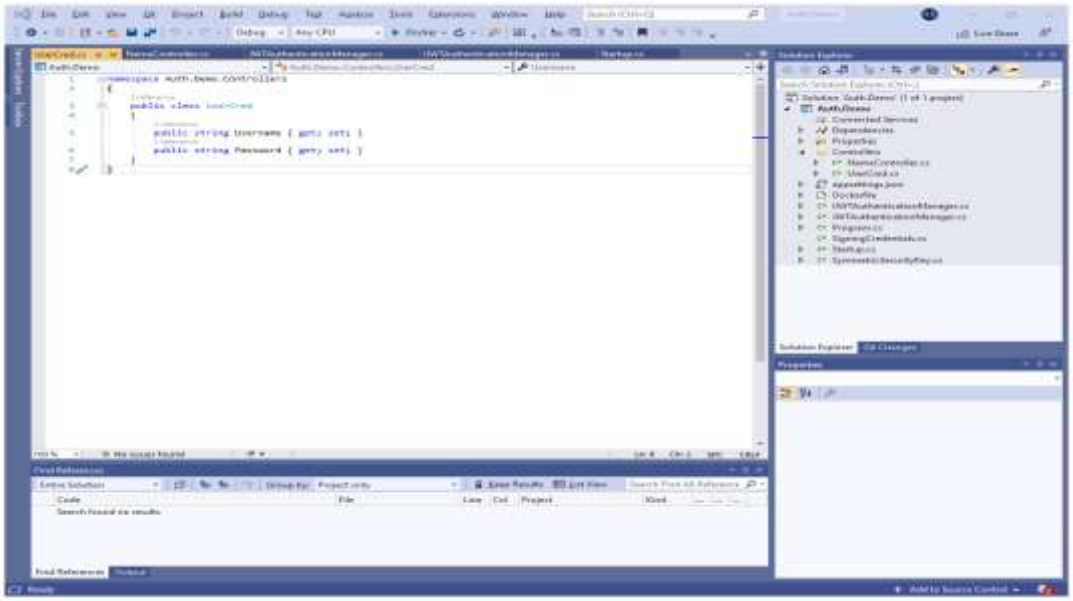
```
using Microsoft.AspNetCore.Authorization;
using Microsoft.AspNetCore.Mvc;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

// For more information on enabling Web API for empty projects, visit
https://go.microsoft.com/fwlink/?LinkID=397860

namespace Auth.Demo.Controllers
{
    [Authorize]
    [Route("api/[controller]")]
    [ApiController]
    public class NameController : ControllerBase
    {
        private readonly IJWTAuthenticationManager jWTAuthenticationManager;

        public NameController(IJWTAuthenticationManager jWTAuthenticationManager)
        {
            this.jWTAuthenticationManager = jWTAuthenticationManager;


        }

        // GET: api/<NameController>
        [HttpGet]
        public IEnumerable<string> Get()
        {
            return new string[] { "KURLA", "ULHASNAGAR" };
        }

        // GET api/<NameController>/5
        [HttpGet("{id}")]
        public string Get(int id)
        {
            return "value";
        }

        [AllowAnonymous]
        [HttpPost("authenticate")]
        public IActionResult Authenticate([FromBody] UserCred userCred)
        {
            var token = jWTAuthenticationManager.Authenticate(userCred.Username, userCred.Password);
            if (token == null)
                return Unauthorized();

            return Ok(token);
        }
```

```
    }
}
```



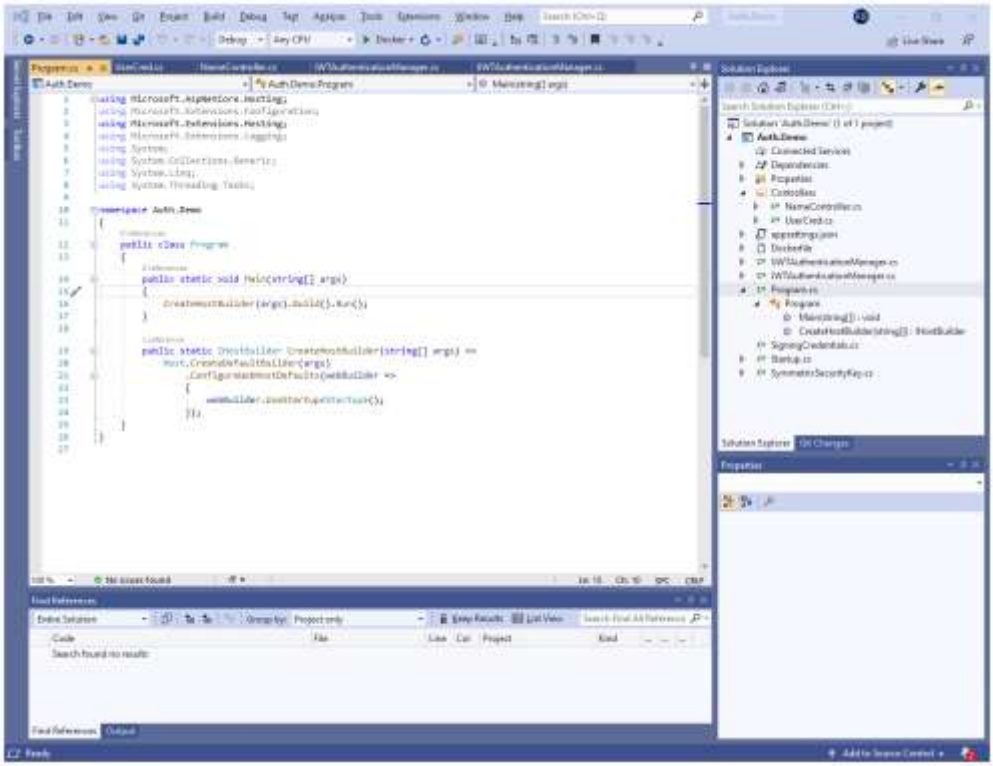
Create UserCred.cs and follow below code –

```
namespace Auth.Demo.Controllers
{
    public class UserCred
    {
        public string Username { get; set; }
        public string Password { get; set; }
    }
}
```

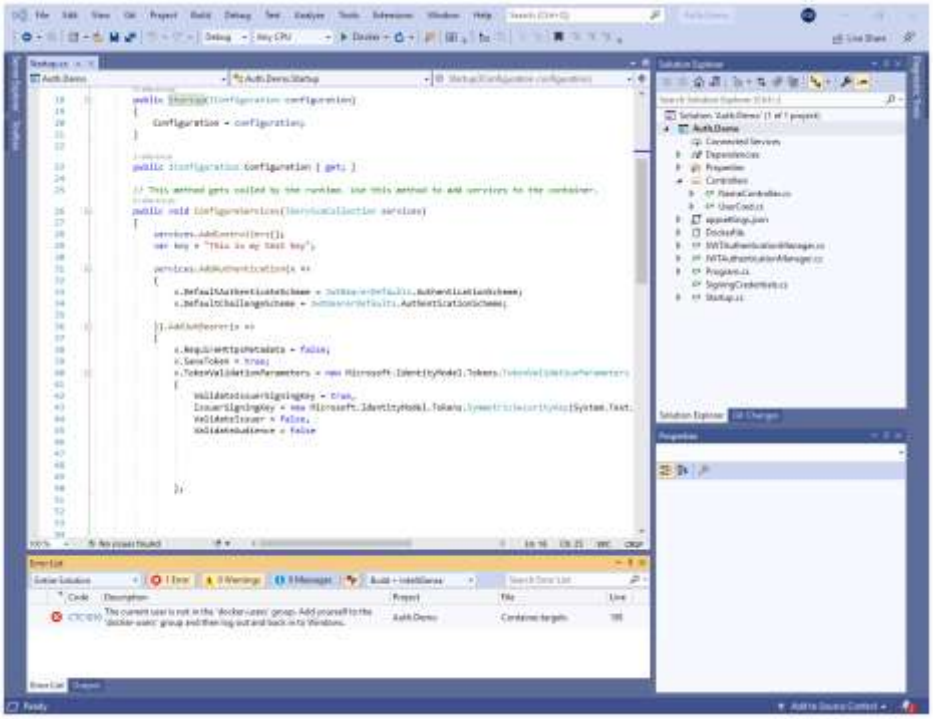


Keep Program.cs as it is-

```
using Microsoft.AspNetCore.Hosting;
using Microsoft.Extensions.Configuration;
using Microsoft.Extensions.Hosting;
using Microsoft.Extensions.Logging;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;

namespace Auth.Demo
{
   public class Program
   {
      public static void Main(string[] args)
      {
         CreateHostBuilder(args).Build().Run();
      }

      public static IHostBuilder CreateHostBuilder(string[] args) =>
         Host.CreateDefaultBuilder(args)
            .ConfigureWebHostDefaults(webBuilder =>
            {
               webBuilder.UseStartup<Startup>();
            });
   }
}
```



In next step, getting error as below –



Steps need to follow once the above issue get fixed.

1. Now run the application and paste the URL in Postman-
2. Pass the data as below
3. Use data as –
4.

{“username”:”test1”,”password”:”password1” }
A token will get generated in encrypted form. Pass the Authorization key value with generated token.

Practical 10

Create a serverless API using Azure functions.

About Azure Function:

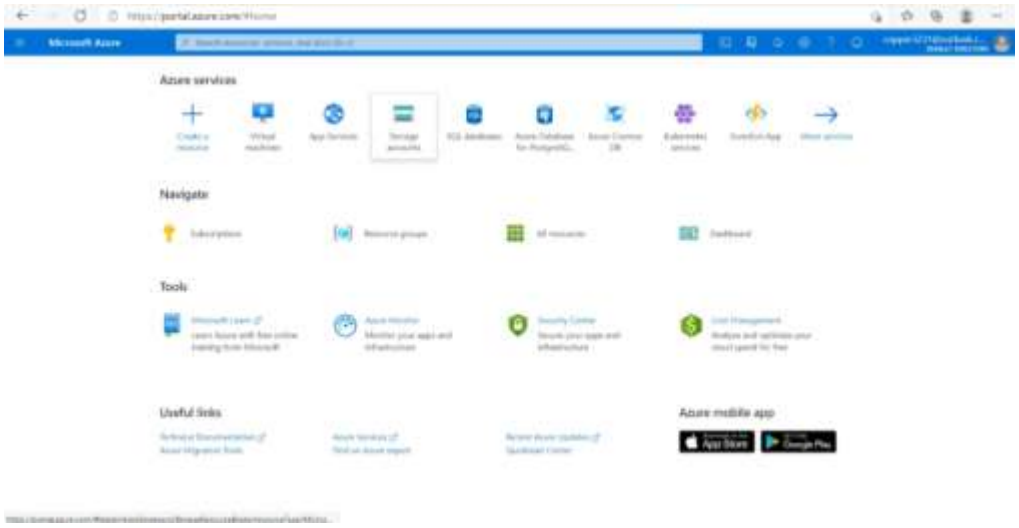
Azure Functions is a cloud service available on-demand that provides all the continually-updated infrastructure and resources needed to run your applications.
You focus on the pieces of code that matter most to you, and Azure Functions handles the rest.

Serverless = LESS Server (Your code will not run 24/7) Azure will take the code for API and save it to file.
It will not run until it gets triggered, i.e., Server will not work until someone
is really using it.

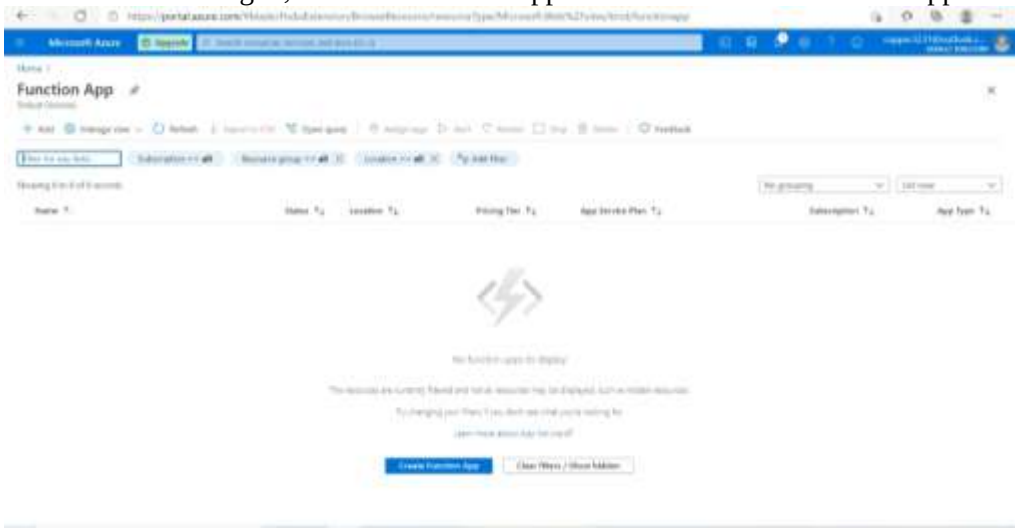
Azure has many serverless offerings, like Azure Functions, Logic Apps, Azure Storage, Cloud messaging (Event Grid), Azure bot Services two major serverless offerings, Azure Functions and Logic Apps but as per current trend and market demand, we will be exploring Azure Functions and Logic Apps.

Azure Functions is a FaaS offering—developers can write custom logic based on available triggers and execute the logic. Logic Apps is a BaaS offering where different actions and workflow conditions are available to execute a logic based on an event trigger. Both Azure Functions and Logic Apps support HTTP events, meaning both can act as standalone APIs.

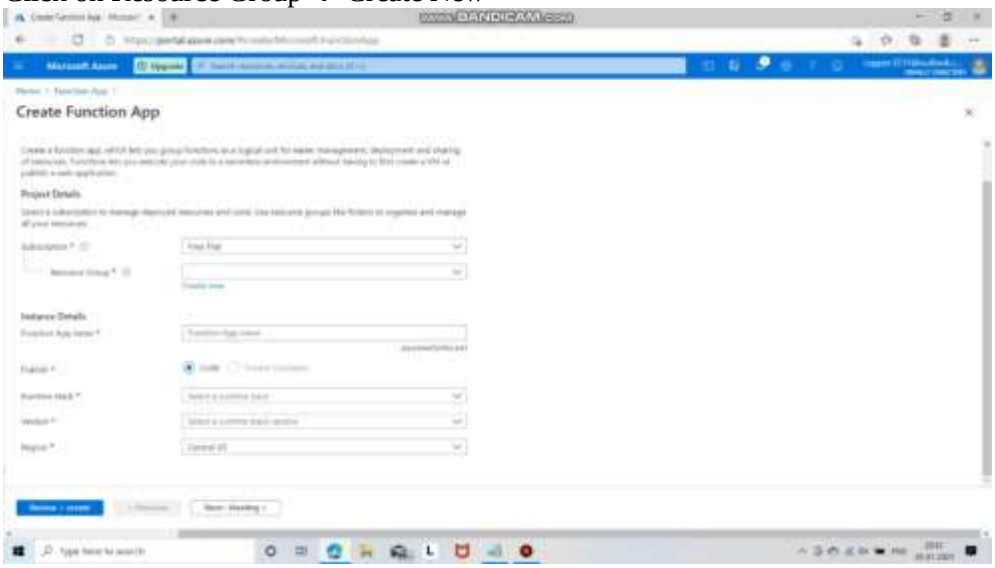
Please see below steps and screenshots to create serverless API using Azure function:
Go to Azure Portal:
Home - Microsoft Azure
Sign in with your Microsoft account to access various Azure functionalities



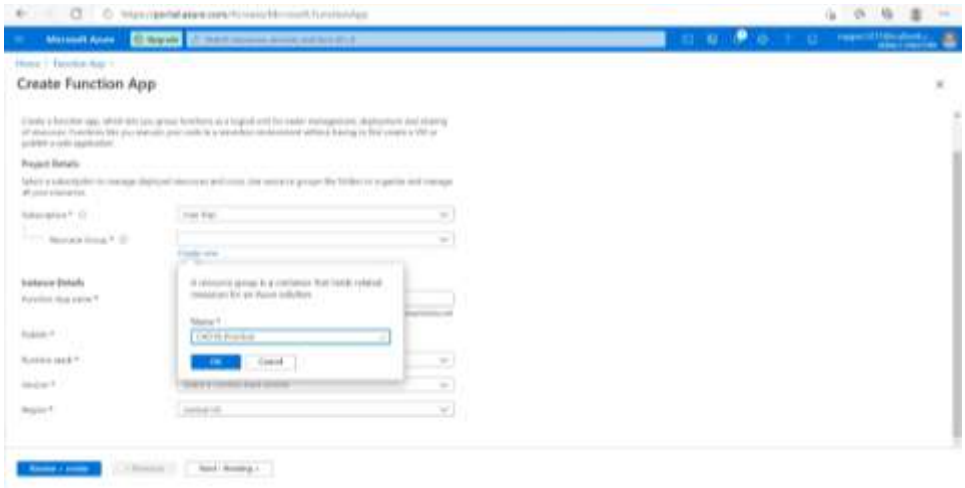
After Successful sing in, Click on Function app → Click on Create Function App



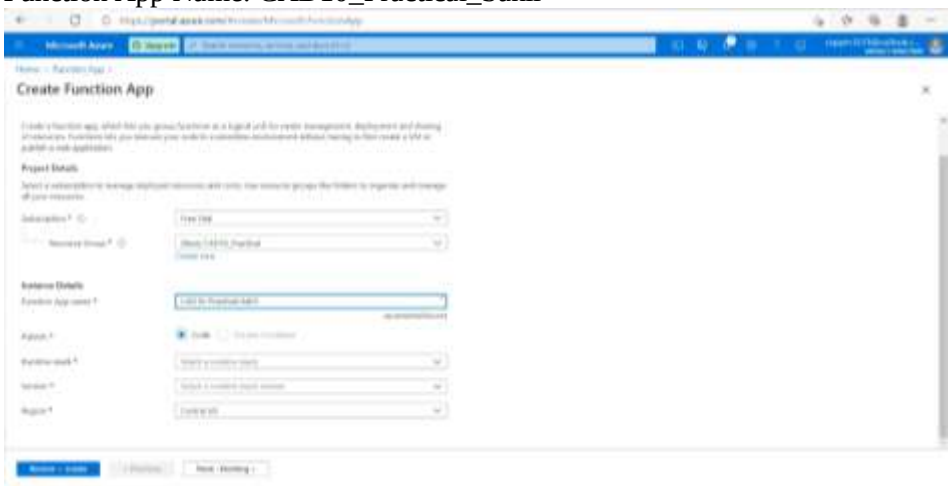
Click on Resource Group → Create New



Resource Group Name: CAD10_Practical

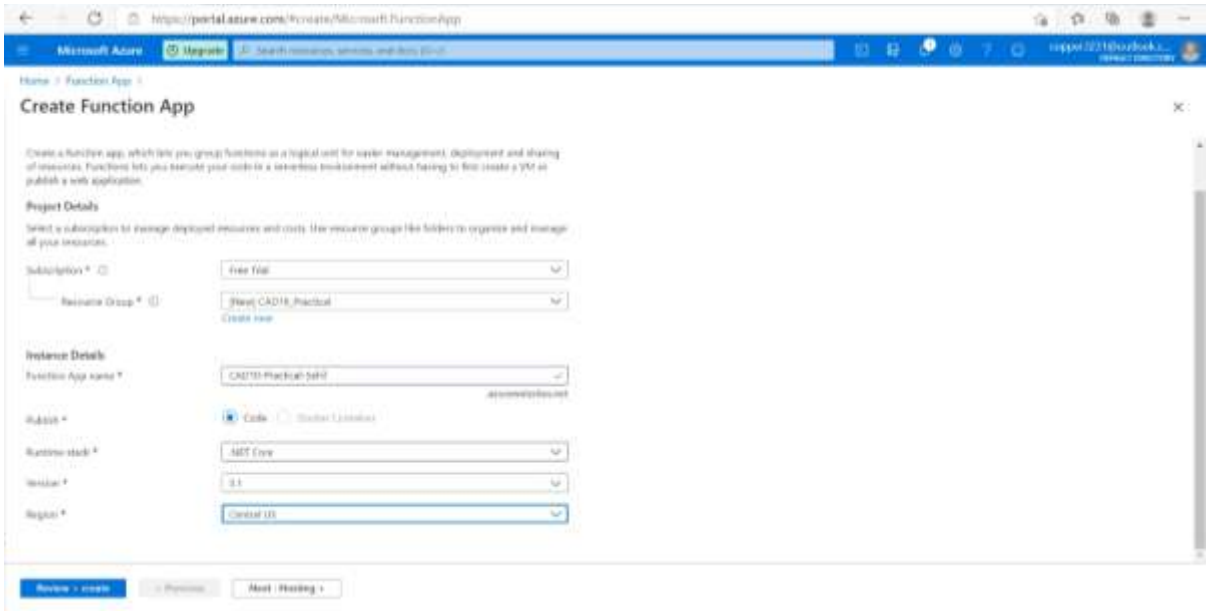


Function App Name: CAD10_Practical_Sahil

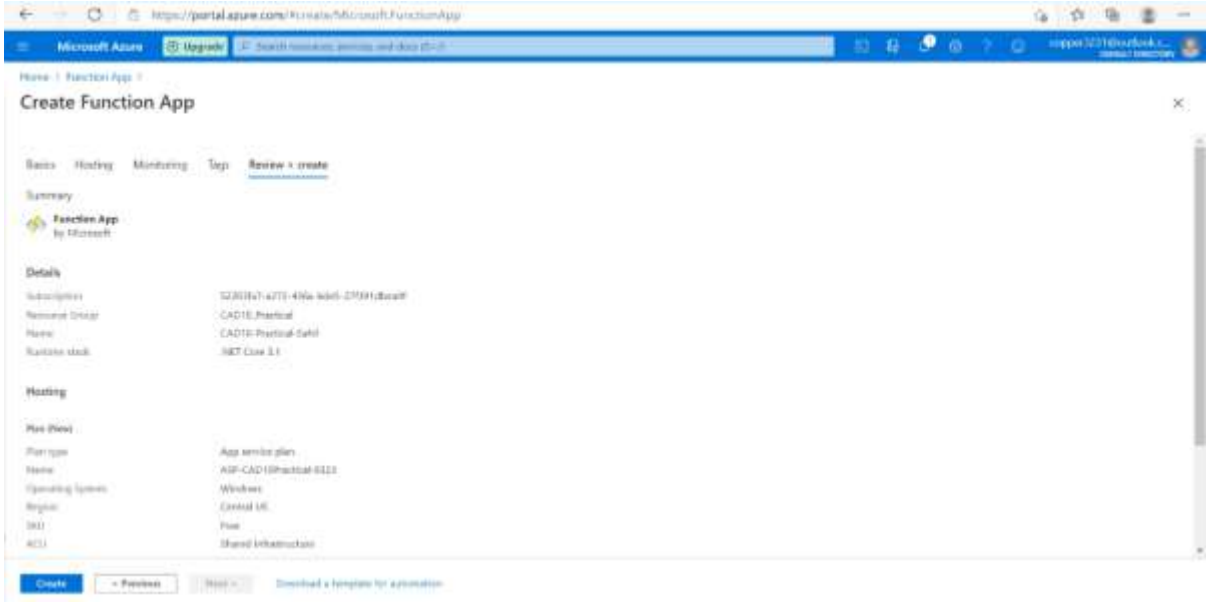


Runtime stack: .NET Core
Version 3.1
Region: Central US

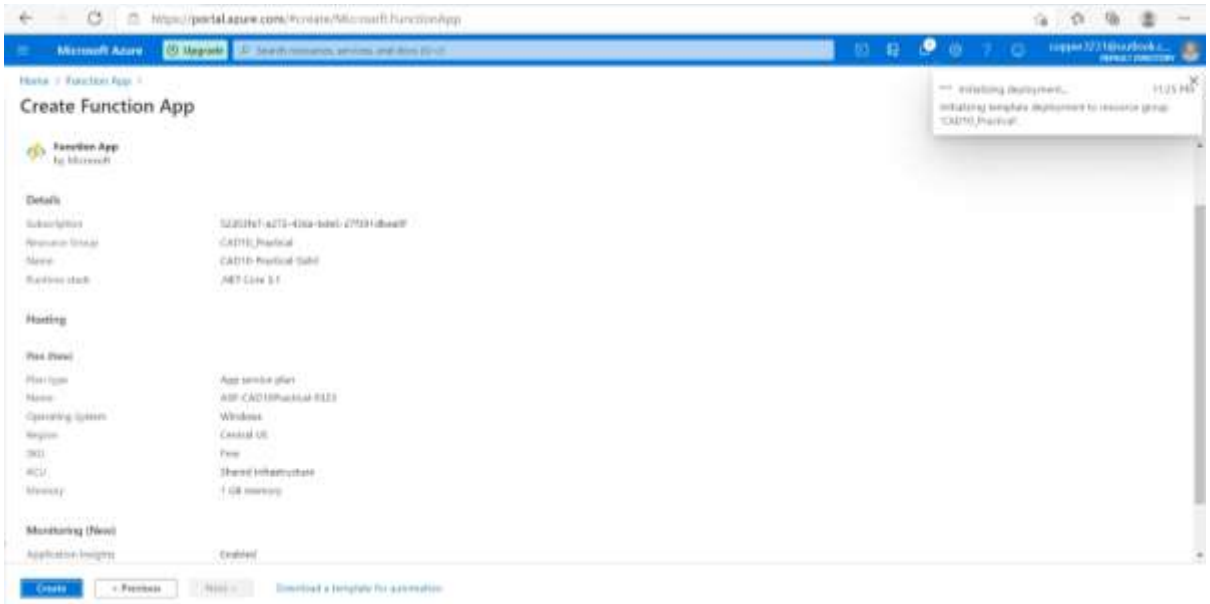
Click on Review and Create:

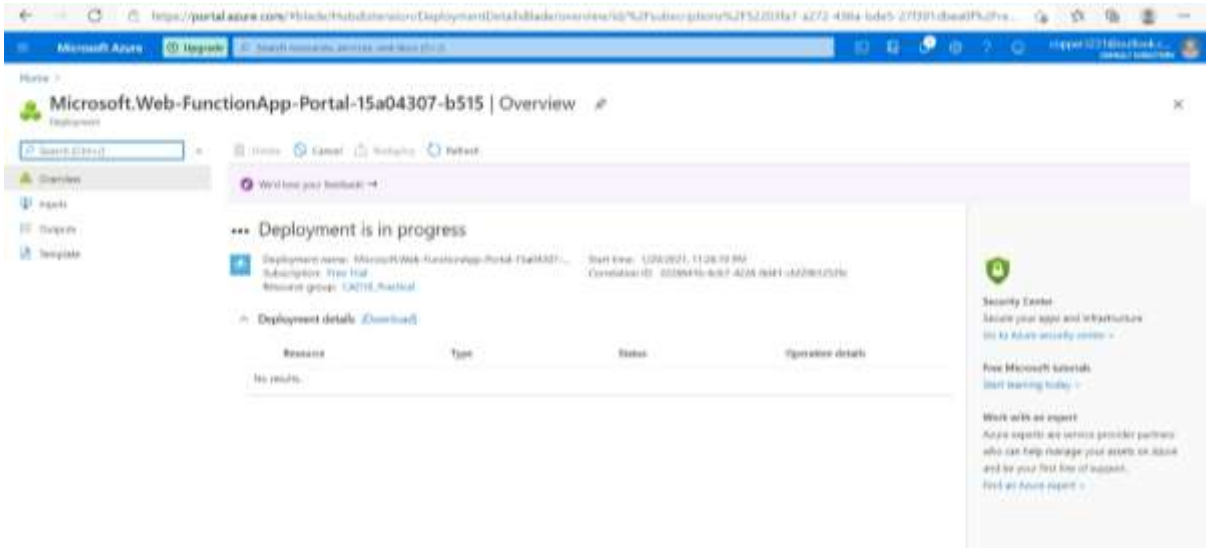


After review, click on Create:

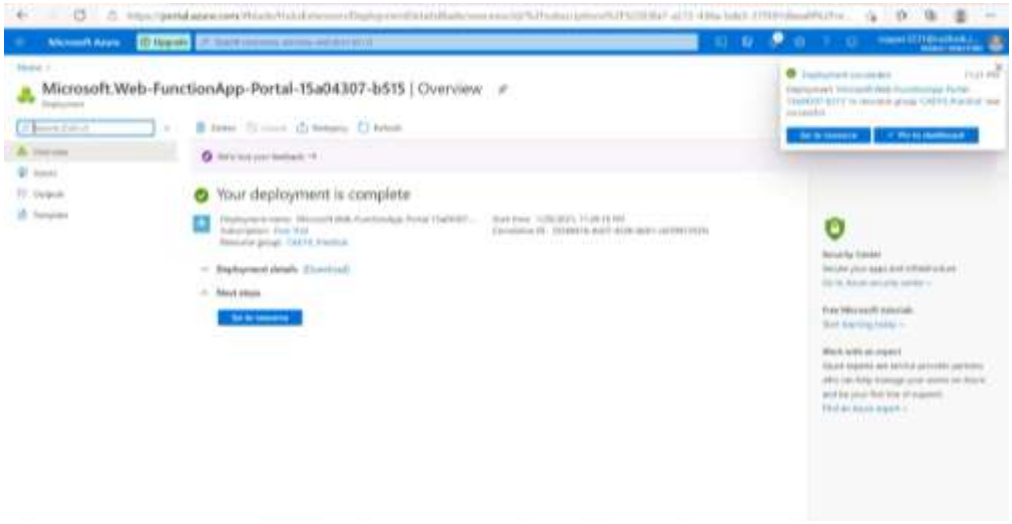


Deployment will automatically start, please wait for it.

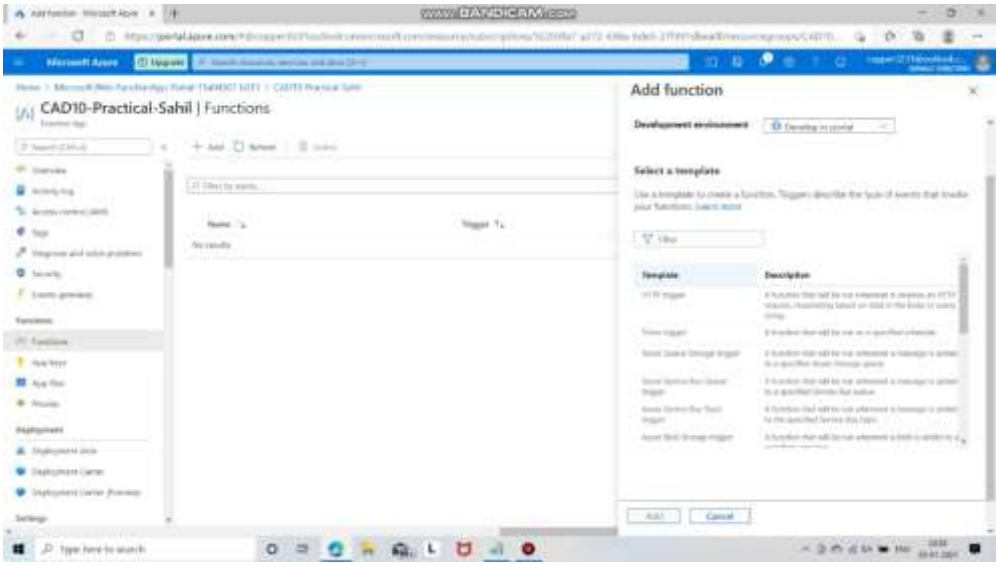




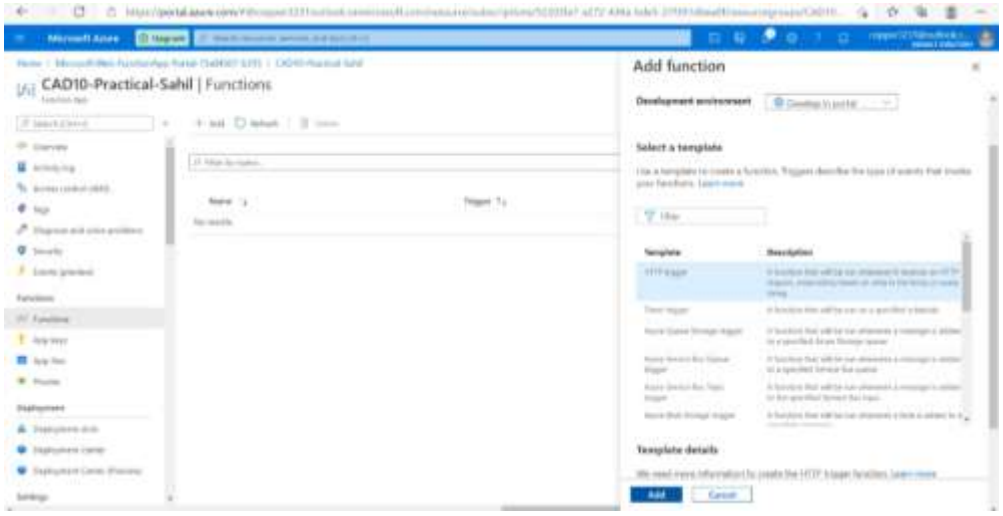
Once the Deployment is complete, Click on Go to resource:



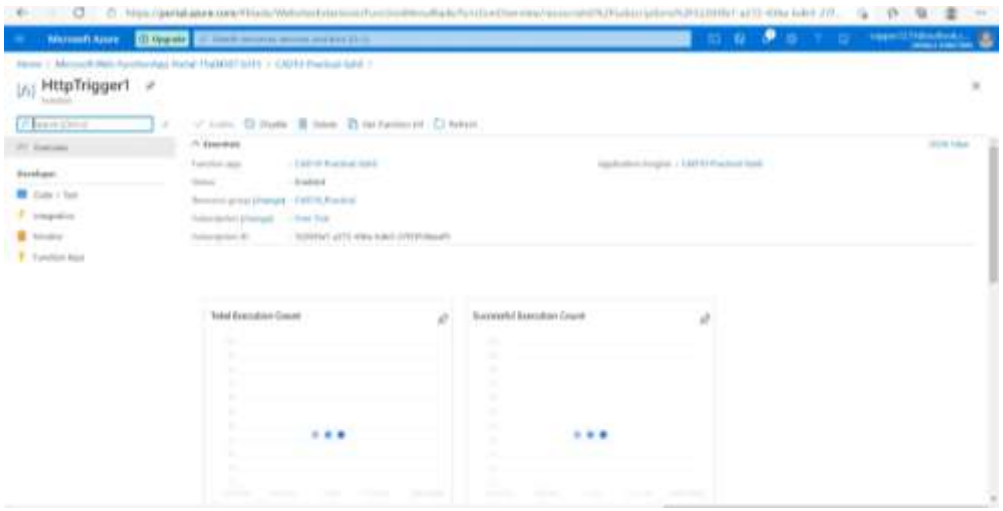
Click on Functions → Add



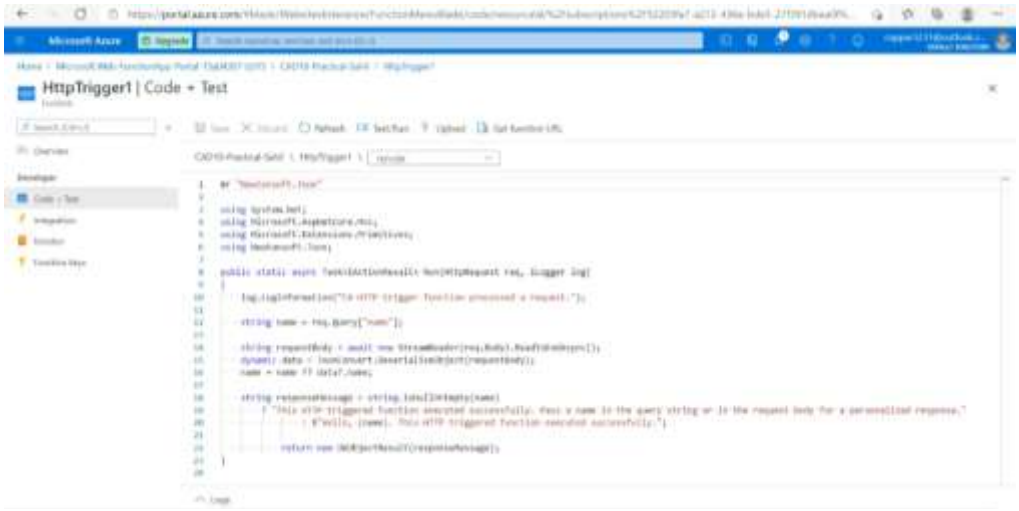
Click on HTTP Trigger and then click on Add:

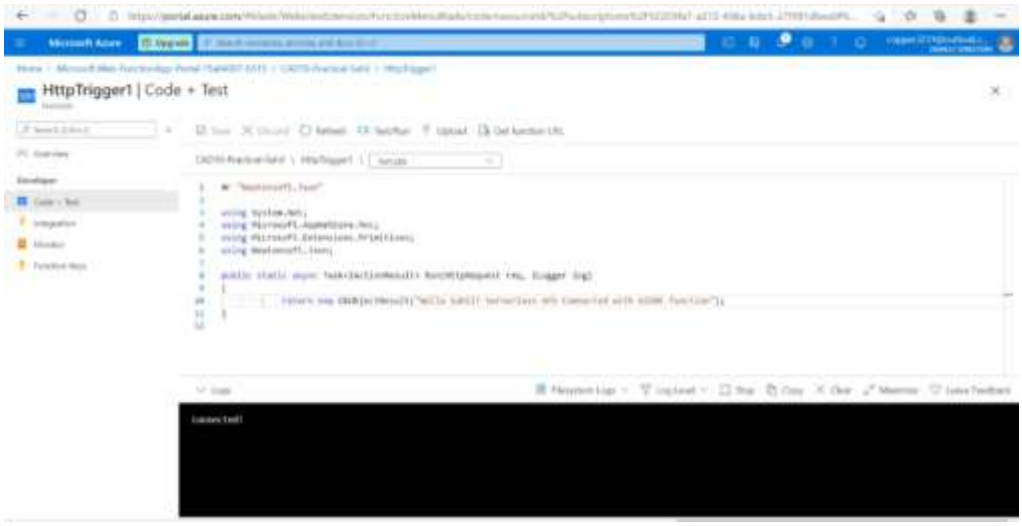


Once the HTTP Trigger get created, you will see all the details about it.



Click on Code + Test, and update it as required





Kindly copy the Function URL, and visit Workspaces (postman.co)

Paste the URL Link in “GET” to trigger our server less API:

Click on Send:

We will see our API being executed:

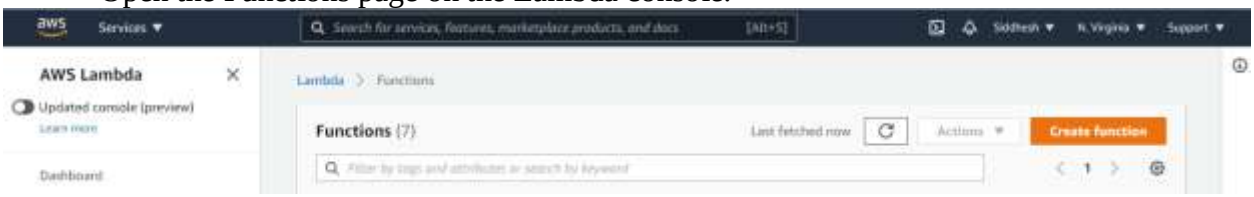
Practical no 11

Create AWS Lambda Function

Create AWS Lambda function:
To create a Lambda function with the console

Step 1:

Open the Functions page on the Lambda console.



Step 2:

Choose Create function.

Step 3:

Under Basic information, do the following:

a. For Function name, enter mypractcad11

b. For Runtime, confirm that python 3.8 is selected.

Step 4:

Choose Create function

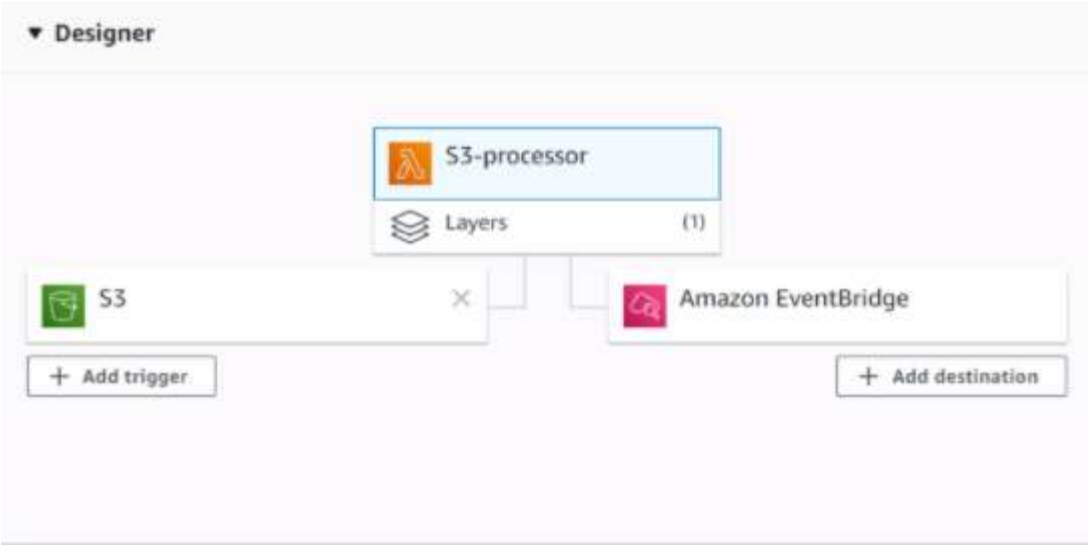
.

Step 5:

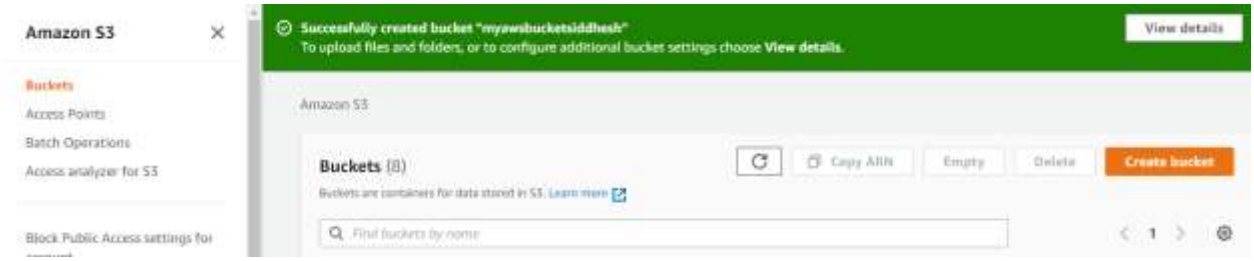
Lambda creates a python3.8 function and an execution role that grants the function permission to upload logs. The Lambda function assumes the execution role when you invoke your function, and uses the execution role to create credentials for the AWS SDK and to read data from event sources.

Step 5:

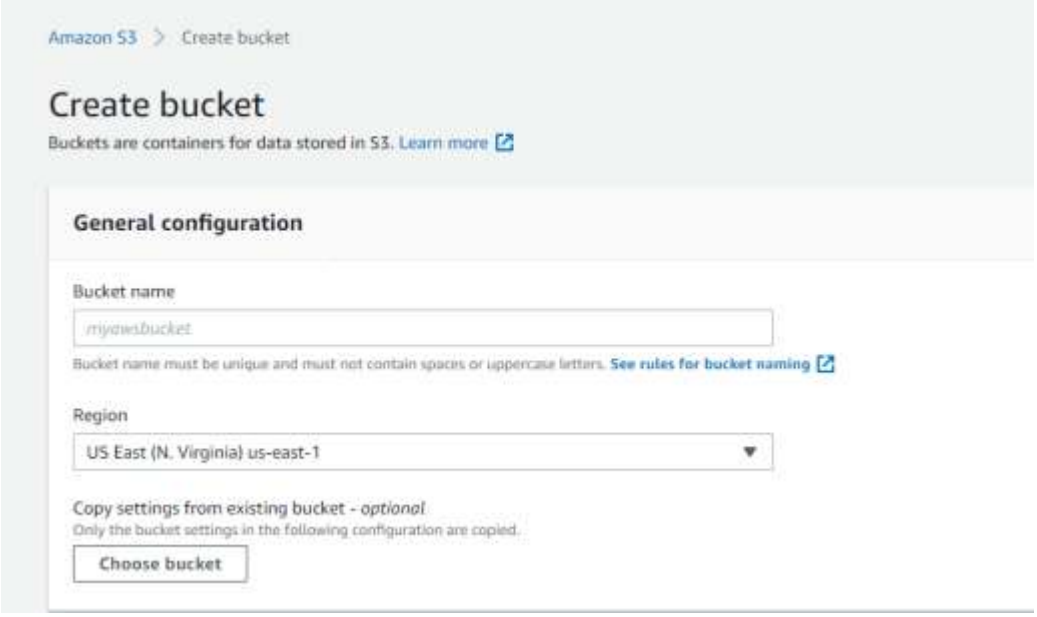
Use the designer: For Create the S3 Bucket



Step 6:
Search for s3 Bucket and click on Create bucket.



Step 7:



Step 8:
Search for IAM- Identity and Access Management

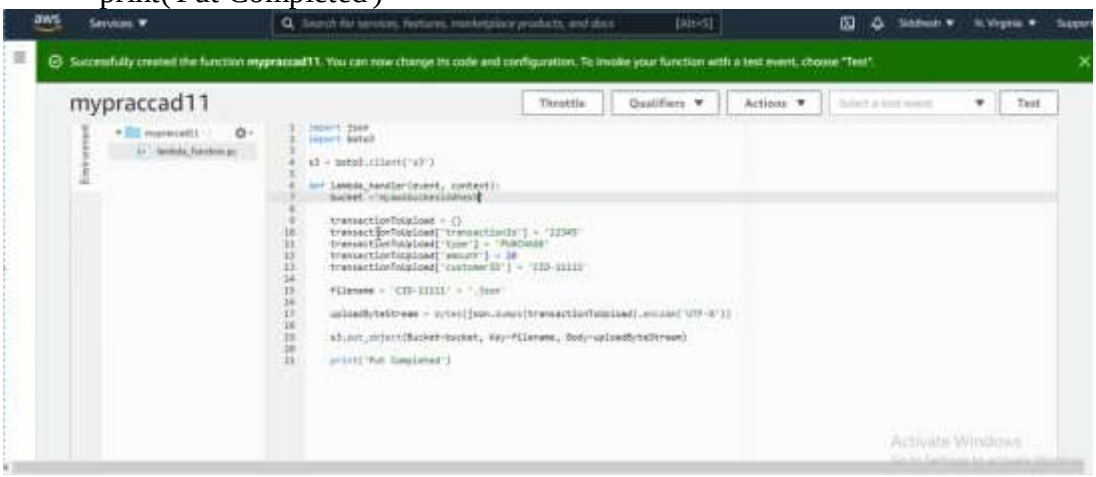
Click on Roles leftside & selected Function which created earlier

Step 9:
Give permission to that function "AmazonS3FullAccess" if we will not give that acces it's shows an error

Step 10:

Type our Code in Lambda.py console

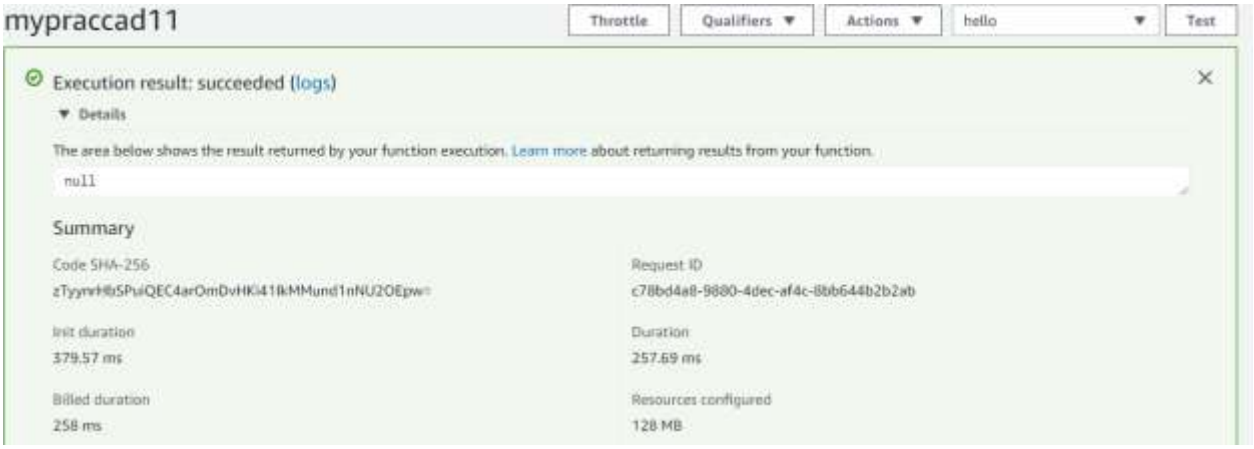
```
import json
import boto3
s3 = boto3.client('s3')
def lambda_handler(event, context):
        bucket ='vikascollegedemo'
        transactionToUpload = {}
        transactionToUpload['transactionId'] = '12345'
        transactionToUpload['type'] = 'PURCHASE'
        transactionToUpload['amount'] = 20
        transactionToUpload['customerID'] = 'CID-11111'
        filename = 'CID-11111' + '.json'
        uploadByteStream = bytes(json.dumps(transactionToUpload).encode('UTF-8'))
        s3.put_object(Bucket=bucket, Key=filename, Body=uploadByteStream)
        print('Put Completed')
```



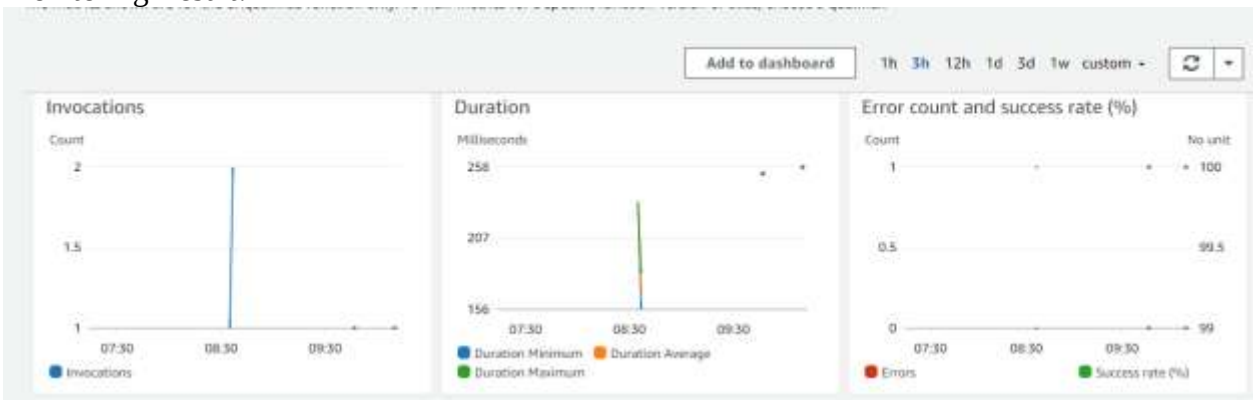
Step 11:

After deploying SourceCode Click on “Test Button” and output will be shown

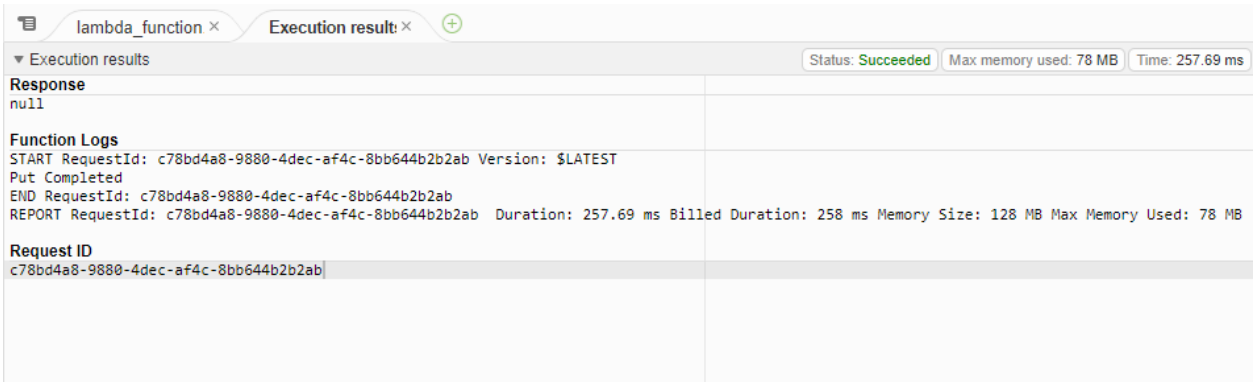
Output:



Monitoring Result:



Execution Result:


lambda_function
Execution result
Execution results
Status: Succeeded
Max memory used: 78 MB
Time: 257.69 ms
Response
null
Function Logs
START RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab Version: $LATEST
Put Completed
END RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab
REPORT RequestId: c78bd4a8-9880-4dec-af4c-8bb644b2b2ab Duration: 257.69 ms Billed Duration: 258 ms Memory Size: 128 MB Max Memory Used: 78 MB
Request ID
c78bd4a8-9880-4dec-af4c-8bb644b2b2ab

Practical no 12

Build AWS Lambda using API Gateway

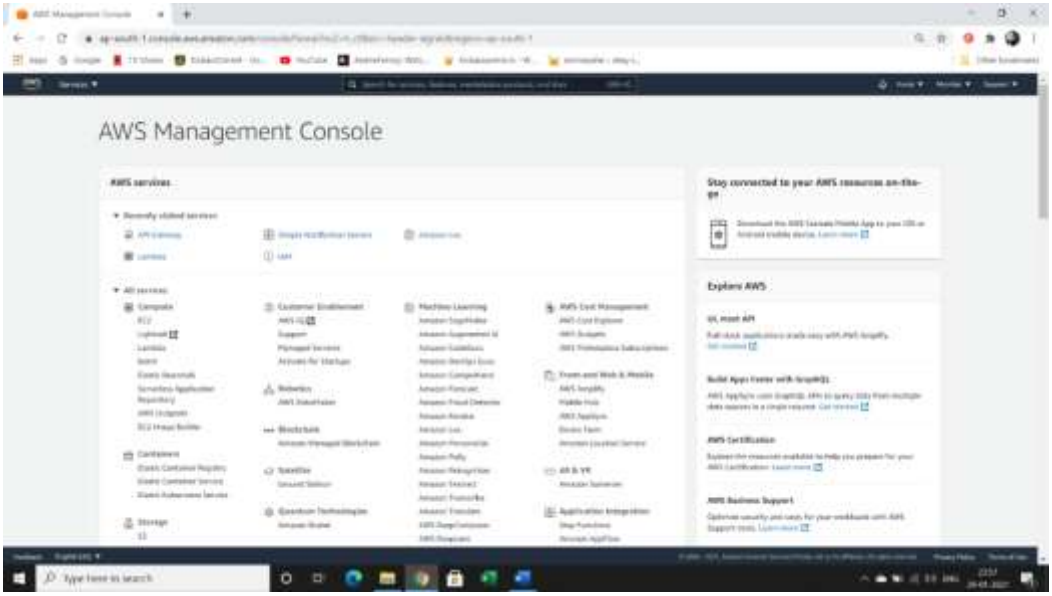
Description of Practical: -

- In this practical we will learn to build AWS Lambda function using API Gateway.
- In order to perform this practical we will take an example.
- The example is EMI Calculator.

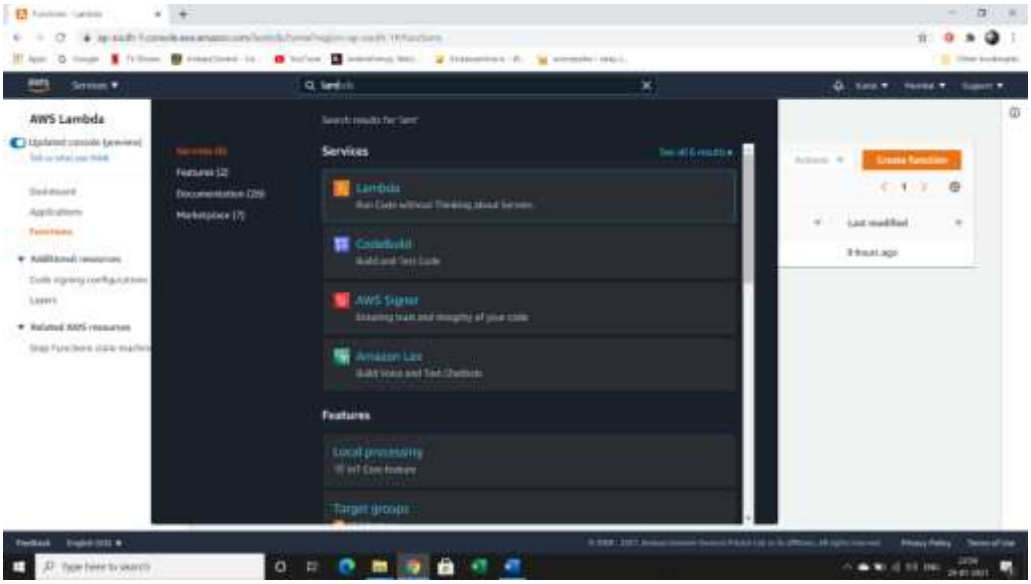
EMI Calculator

Steps

- Login into AWS Console.
- Search for Lambda Function on the service bar.

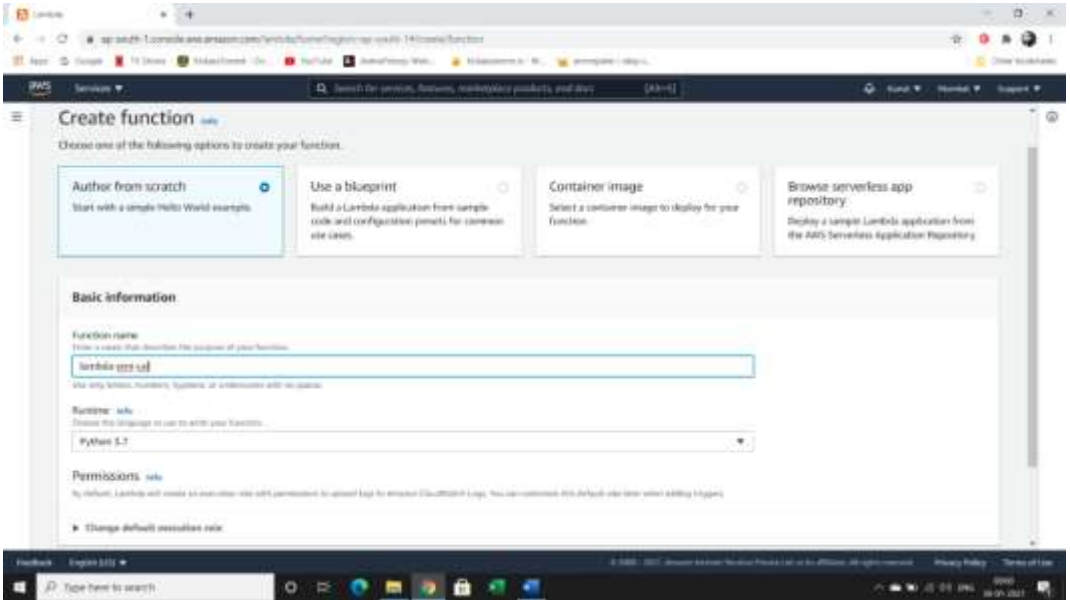


- Here we will create a lambda function for the practical.

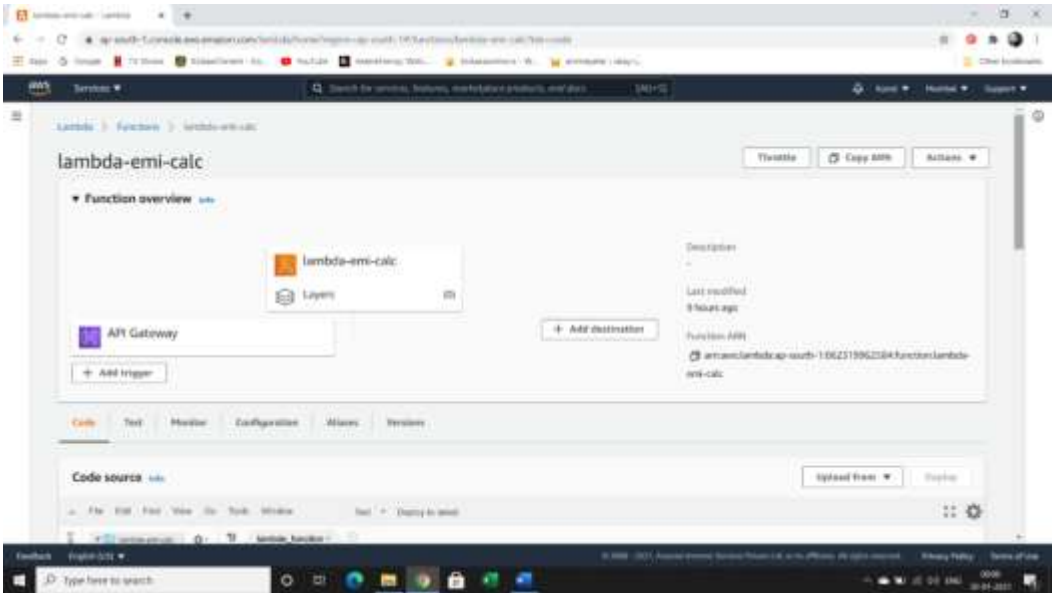


- Click on Create Function on the Lambda Tab.

- Here we will choose Author from Scratch.

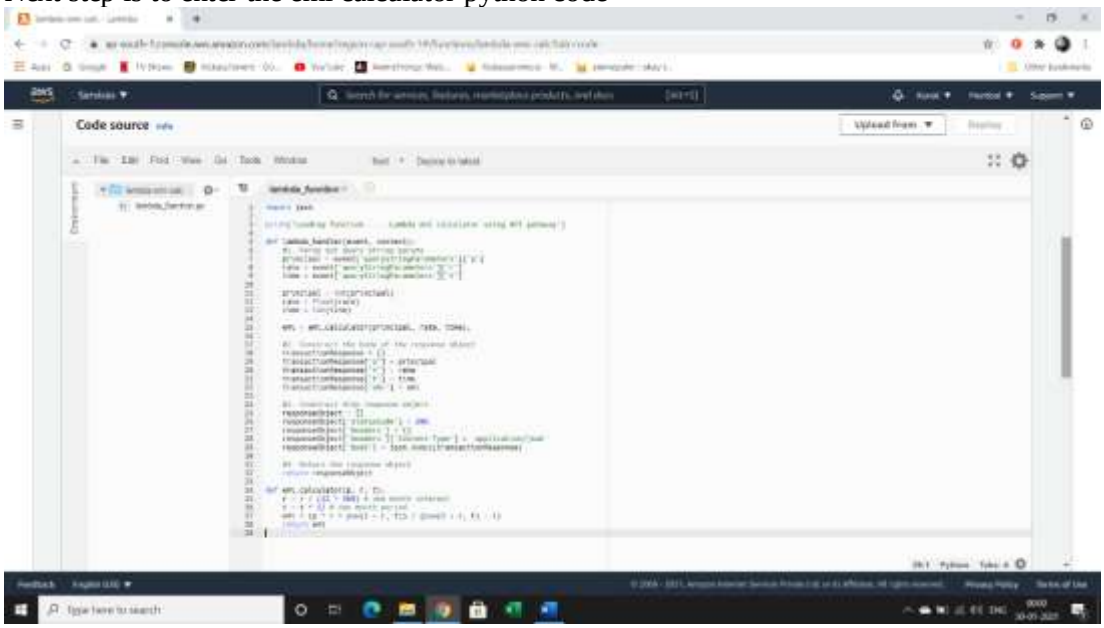


- After selecting that write the function name as lambda-emi-calc
- We will be running the code on python 3.7
- So, we will choose runtime as python 3.7.
- After that click on create function.
- We will see that it has created lambda function with basic default code.

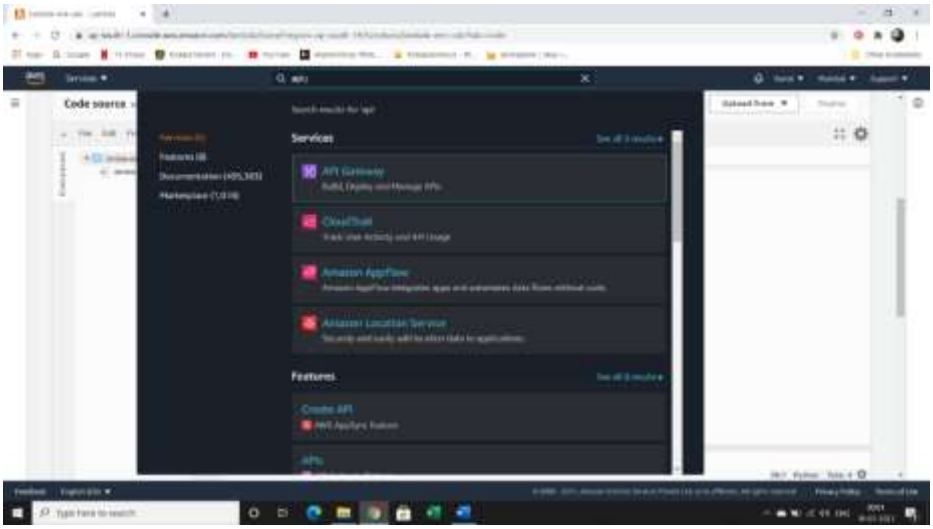


- We can see that it has created lambda function with basic default code

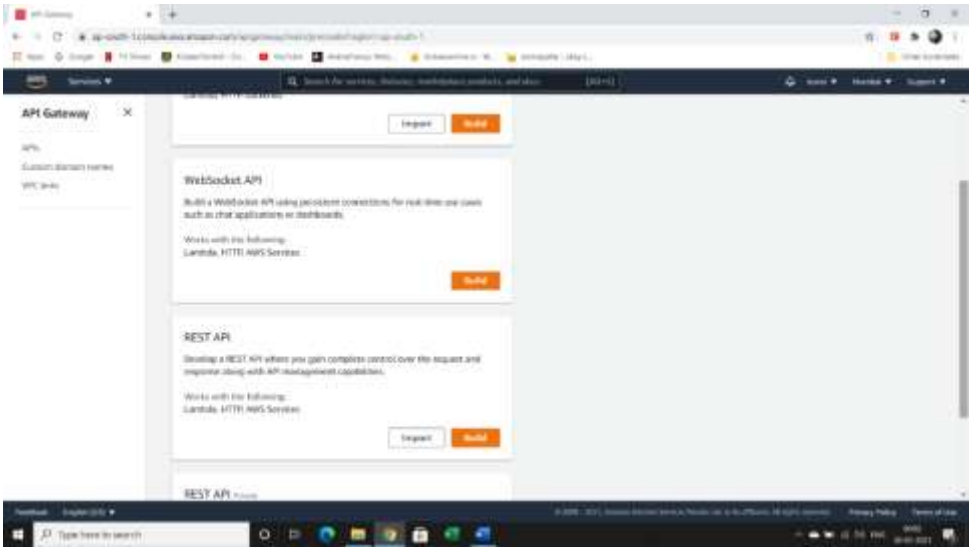
- Next step is to enter the emi calculator python code



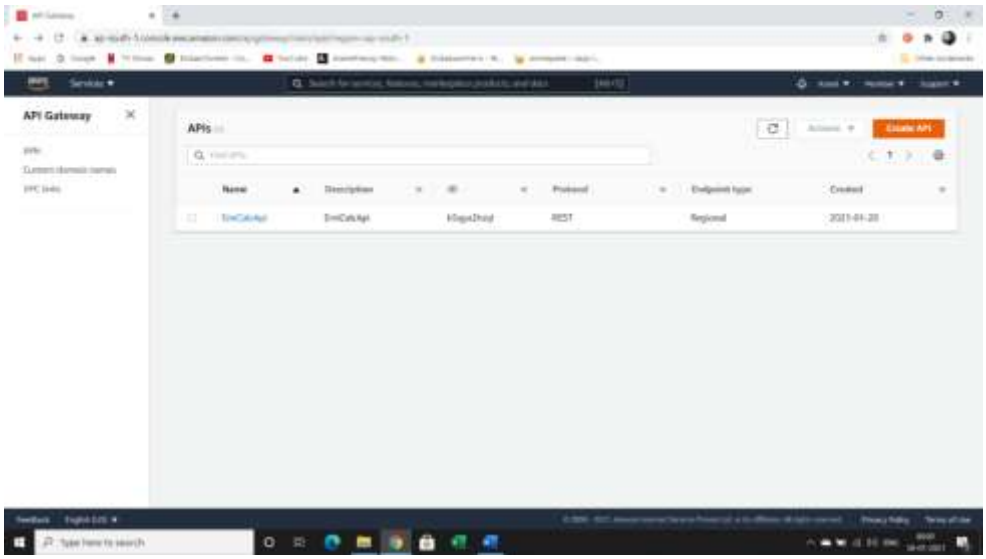
- Save the lambda function
- We are not defining any environment variable
- Select basic setting and choose runtime as python 3.7
- Next step is to create api gateway



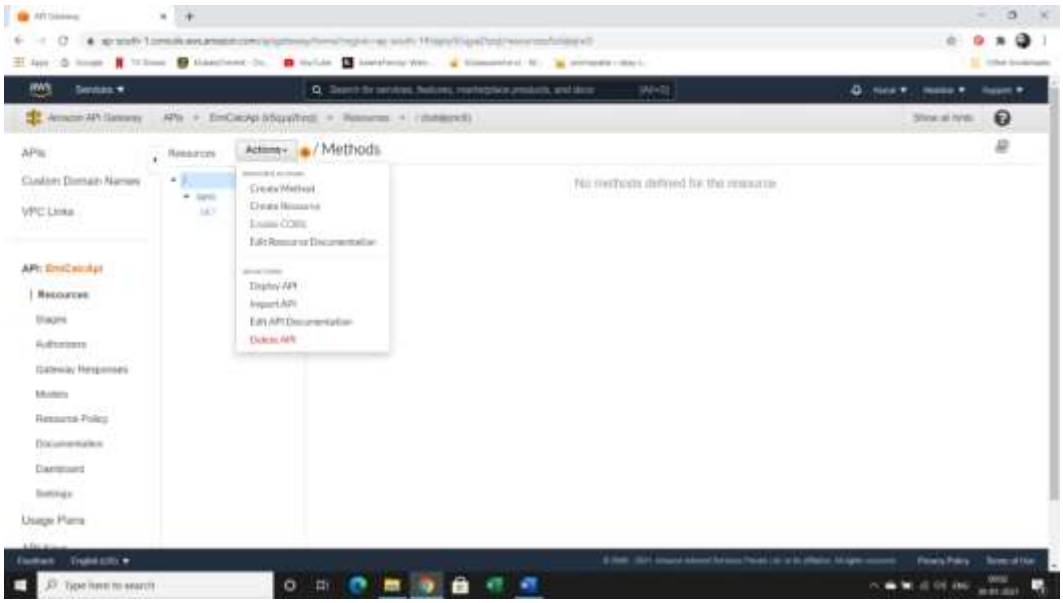
- We are going to choose REST API



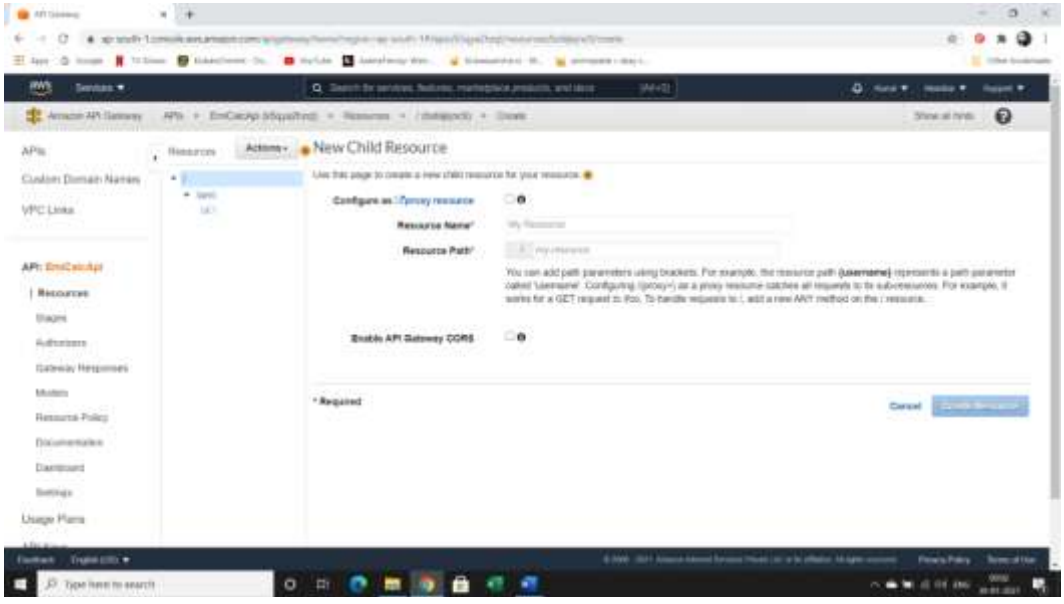
- Click on new API



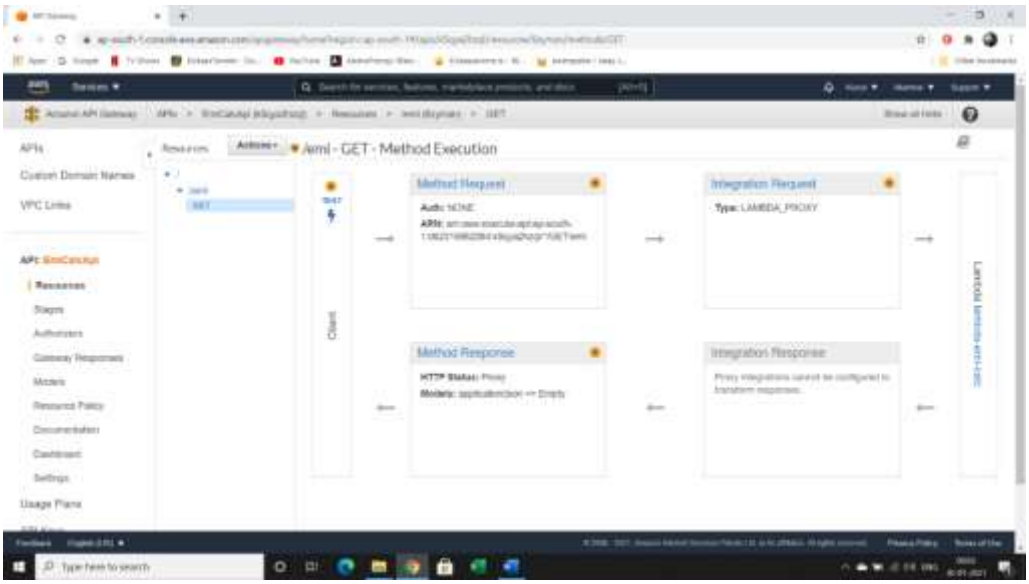
- In the settings tab do the following changes
- API name = EmiCalcApi
- Description = EmiCalcApi
- Endpoint type = Regional
- Click on create tab
- Next step click on action then create resource



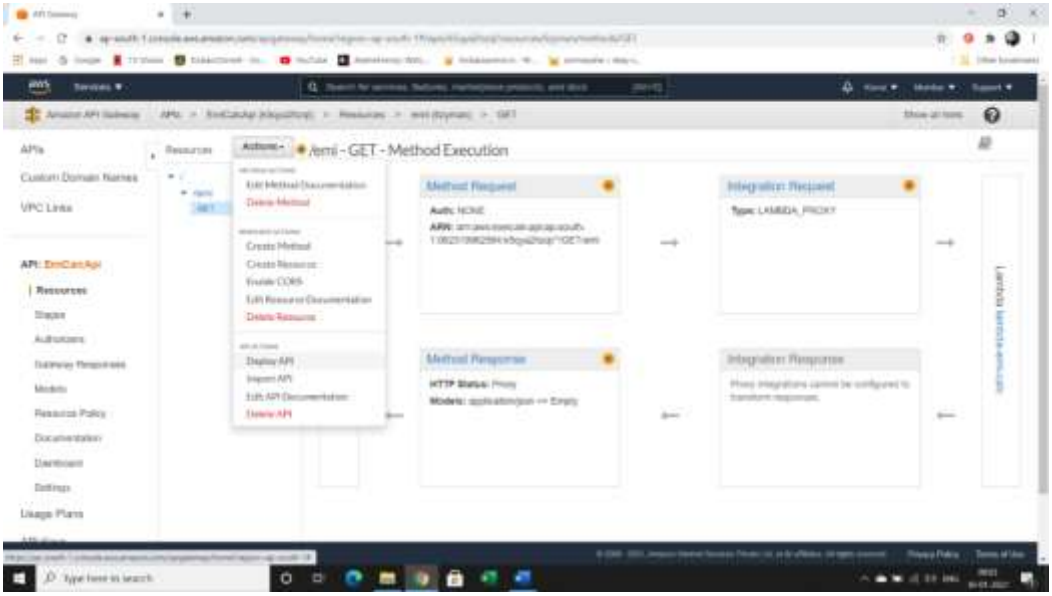
- Enter resource name as emi
- And create the resource



- Now select on action tab and create method
- Use get parameter
- We are using integration type as Lambda Function
- Enter lambda function as lambda-emi-calc
- Save the changes
- Grant permission for lambda function

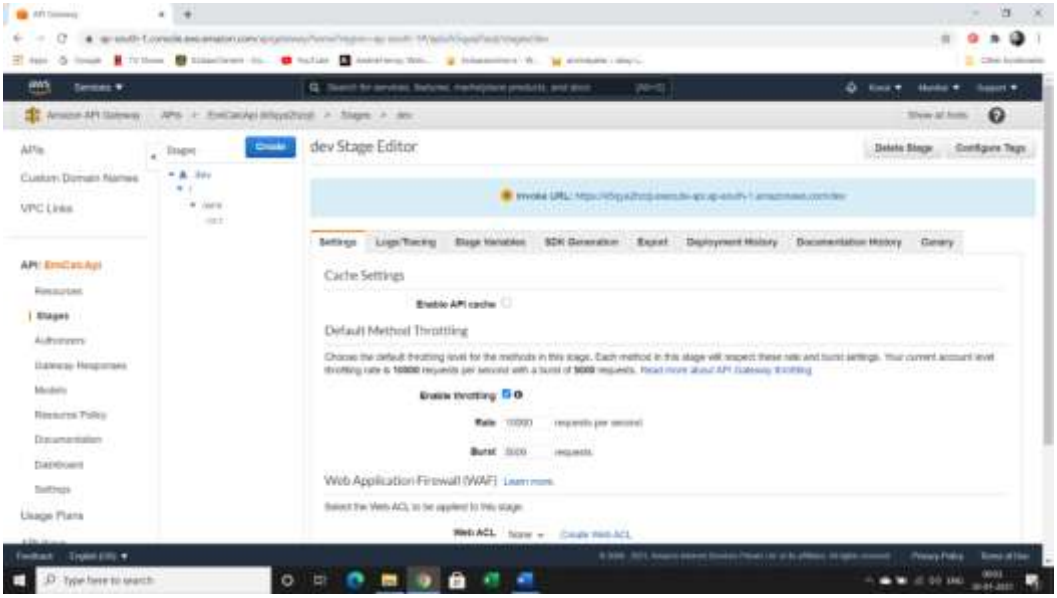


- Next step is to click on action and then deploy api



- Enter deployment stage as New Stage

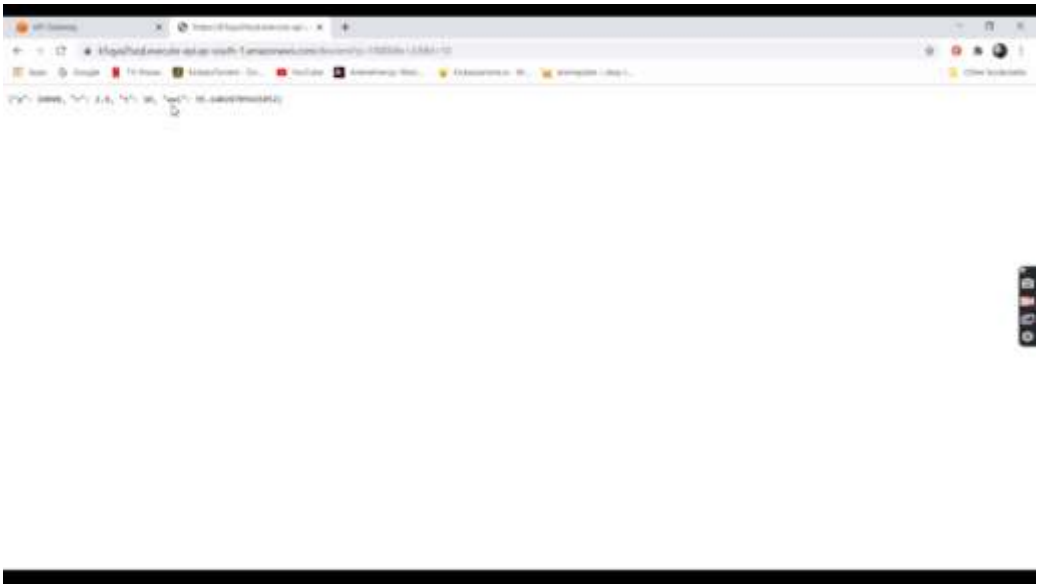
- Enter stage name as dev
- Stage description as dev
- Deployment description as dev
- After that click on GET method
- Copy the URL



- To calculate the EMI we have to place valid parameters
- We have 3 parameters

  Principle = p
  Rate = r
  Time = t

- Add the follow to the copied url
- ?p= certain value for eg 10000
- Then add rate (r) as certain value 2.8 and the final value time as 10
- emi?p=10000&r=2.8&t=10
- Click on enter and you will have your required emi



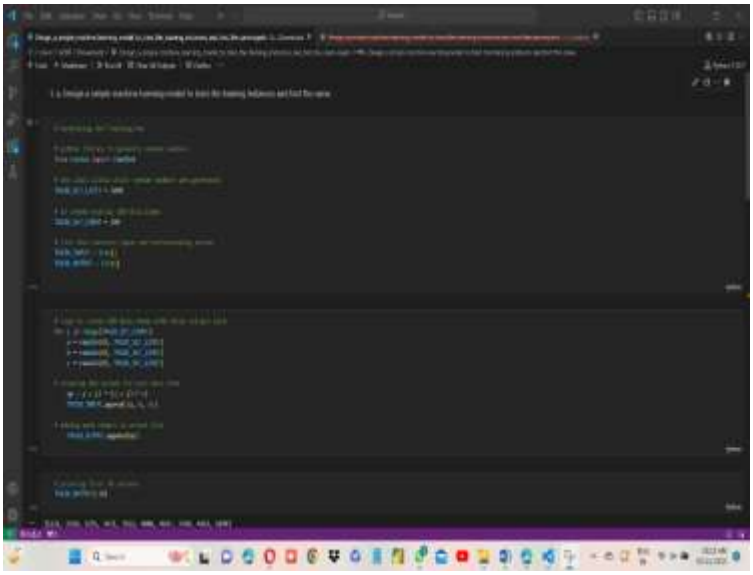
Python Code for EMI Calculator

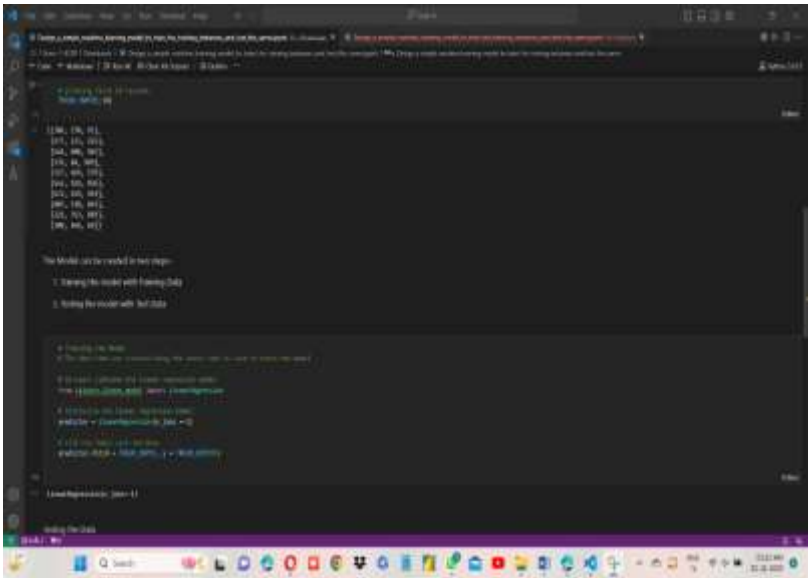
```
import json

print('Loading function .... Lambda emi calculator using API gateway')

def lambda_handler(event, context):

        principal = event['queryStringParameters']['p']
        rate = event['queryStringParameters']['r']
        time = event['queryStringParameters']['t']

        principal = int(principal)
        rate = float(rate)
        time = int(time)

        emi = emi_calculator(principal, rate, time);


        transactionResponse = {}
        transactionResponse['p'] = principal
        transactionResponse['r'] = rate
        transactionResponse['t'] = time
        transactionResponse['emi'] = emi


        responseObject = {}
        responseObject['statusCode'] = 200
        responseObject['headers'] = {}
        responseObject['headers']['Content-Type'] = 'application/json'
        responseObject['body'] = json.dumps(transactionResponse)


        return responseObject

def emi_calculator(p, r, t):
        r = r / (12 * 100)
        t = t * 12
        emi = (p * r * pow(1 + r, t)) / (pow(1 + r, t) - 1)
        return emi
```

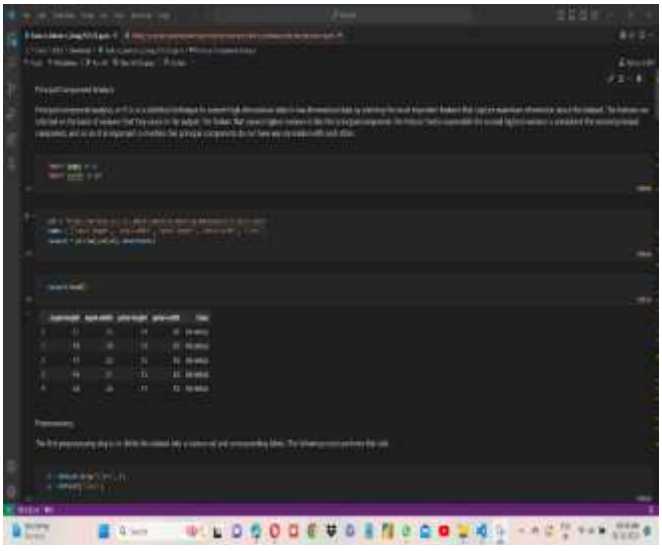
Machine Learning

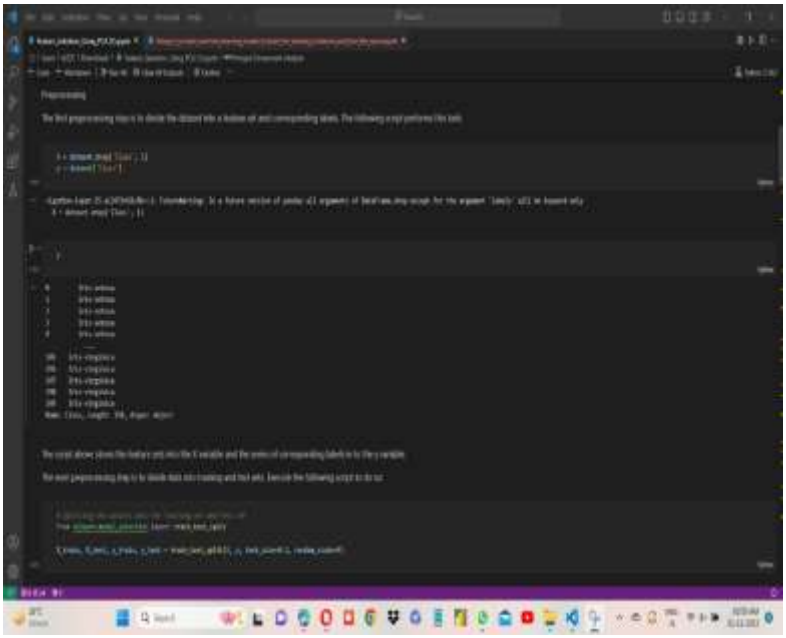
Practical No.	Name of Practical	
1.	a. Design a simple machine learning model to train the training instances and test the same.	
	b. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file	
2.	a. Perform Data Loading, Feature selection (Principal Component analysis) and Feature Scoring and Ranking.	
	b. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	
3.	a. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	
	b. Write a program to implement Decision Tree and Random forest with Prediction, Test Score and Confusion Matrix.	
4.	a. For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.	
	b. For a given set of training data examples stored in a .CSV file implement Logistic Regression algorithm.	
5.	a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	
	b. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set.	
6.	a. Implement the different Distance methods (Euclidean) with Prediction, Test Score and Confusion Matrix.	
	b. Implement the classification model using clustering for the following techniques with K means clustering with Prediction, Test Score and Confusion Matrix.	
7.	a. Implement the classification model using clustering for the following techniques with hierarchical clustering with Prediction, Test Score and Confusion Matrix	
	b. Implement the Rule based method and test the same.	
8.	a. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.	
	b. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	
9.	a. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	
	b. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.	
10.	a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	

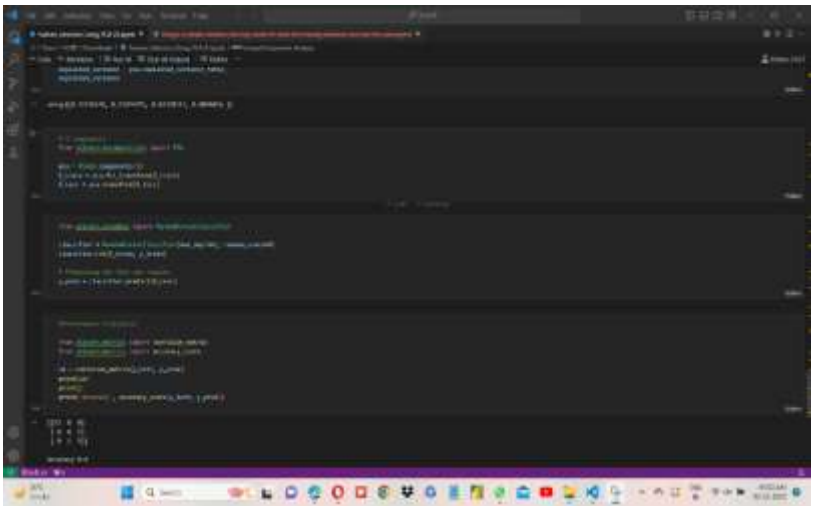
	b. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
11.	Perform Text pre-processing, Text clustering, classification with Prediction, Test Score and Confusion Matrix

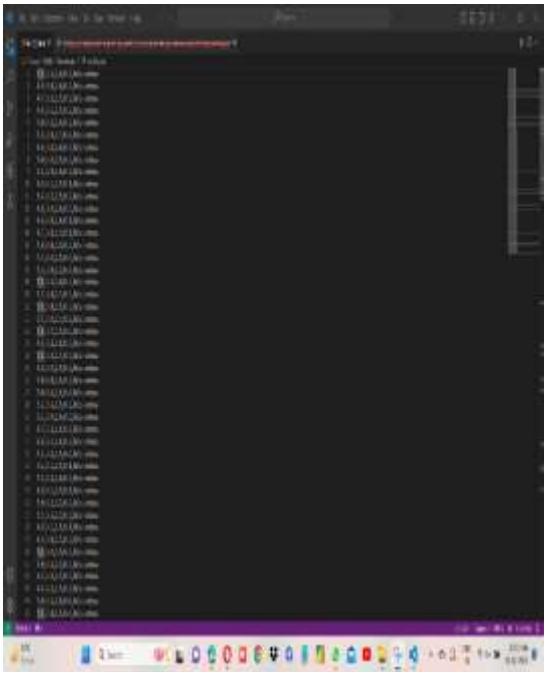


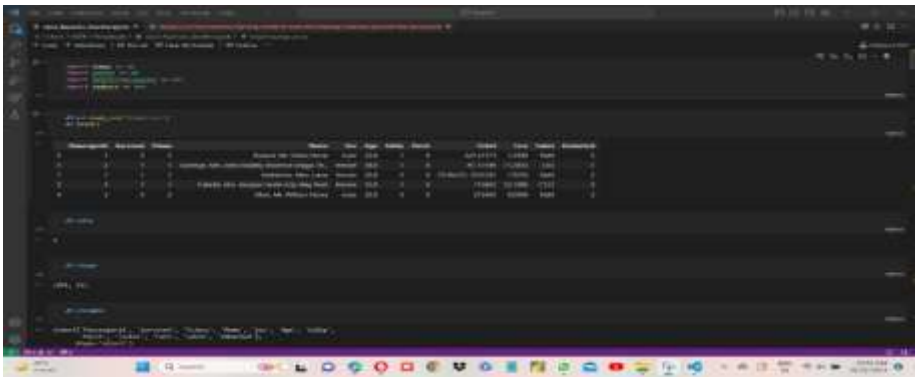


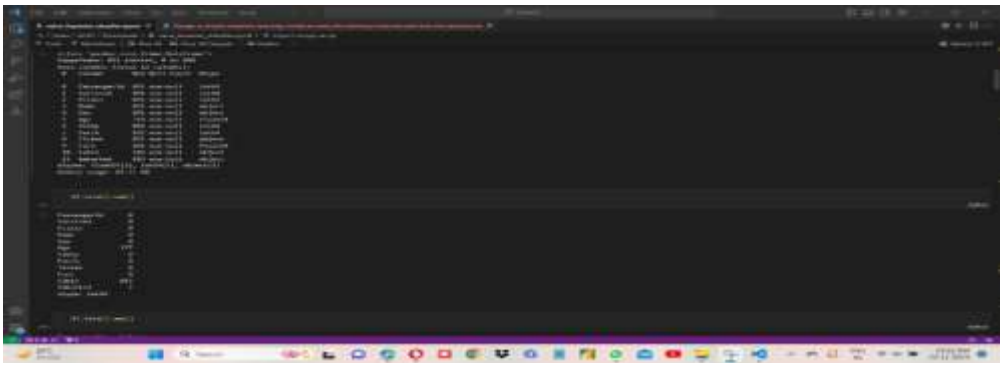


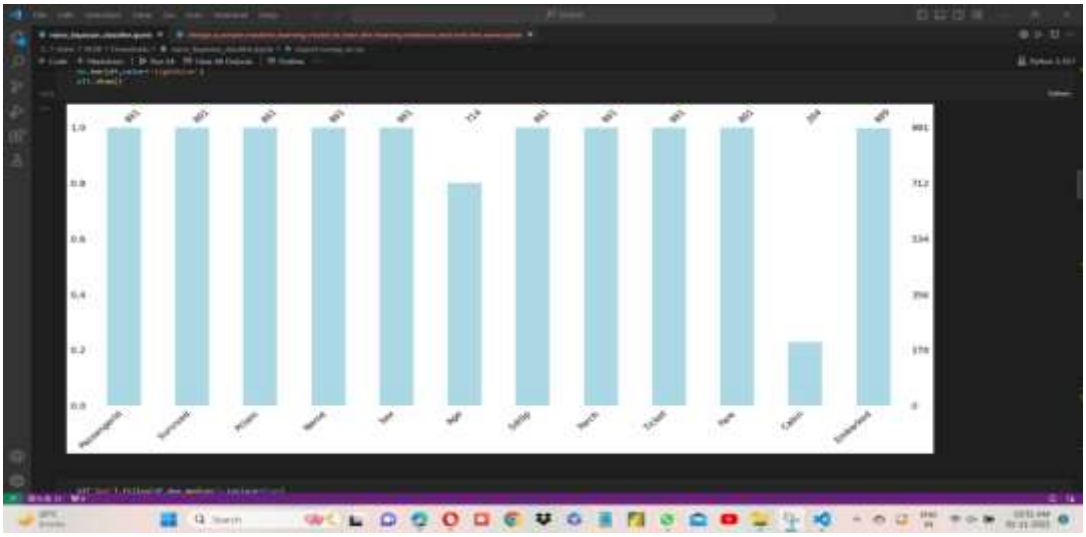


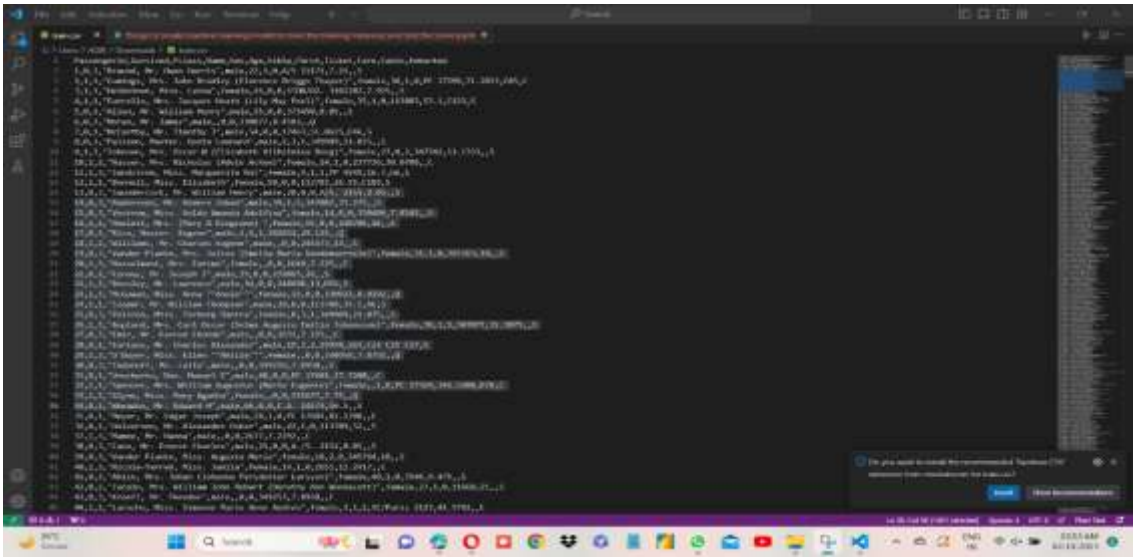


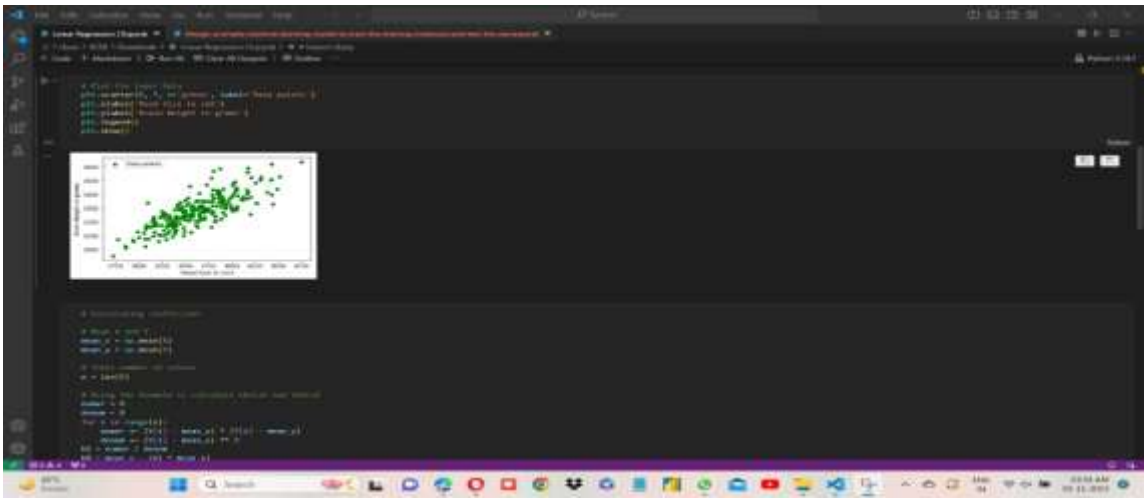


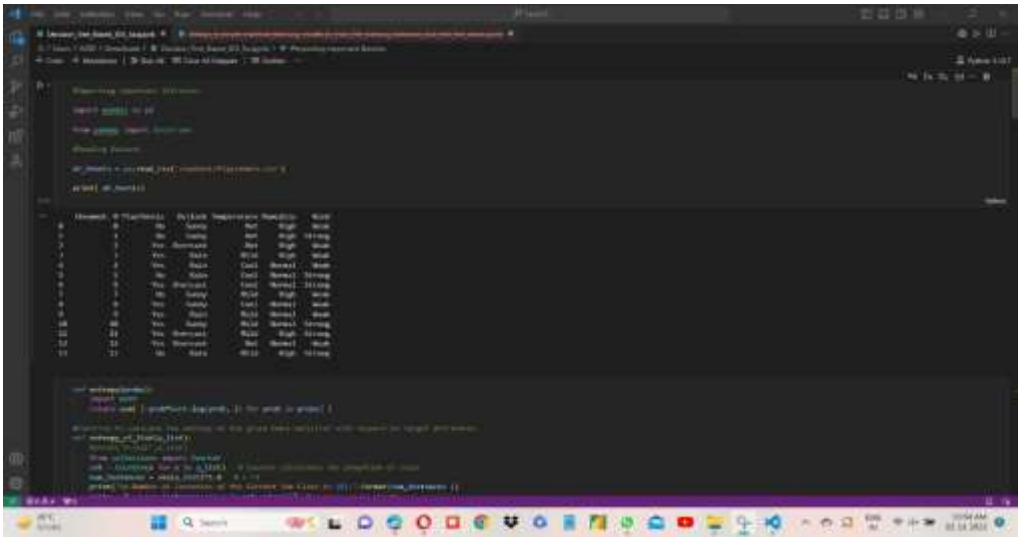












Robotic Process Automation

No.	Title/Aim	Grade
1 a	Create a simple sequence-based project.	
1 b	Create a flowchart-based project.	
2 a	Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers).	
2 b	Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table)	
3 a	Create an automation UiPath Project using decision statements.	
3 b	Create an automation UiPath Project using looping statements.	
4 a	Automate any process using basic recording.	
4 b	Automate any process using desktop recording.	
4 c	Automate any process using web recording.	
5	Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed	
6 a	Create an application automating the read, write and append operation on excel file.	
6 b	Automate the process to extract data from an excel file into a data table and vice versa	
7 a	Implement the attach window activity.	
7 b	Find different controls using UiPath.	
7 c	c. Demonstrate the following activities in UiPath: i. Mouse (click, double click and hover) ii. Type into iii. Type Secure text	
8 a	Demonstrate the following events in UiPath: i. Element triggering event. ii. Image triggering event iii. System Triggering Event	
8 b	Automate the following screen scraping methods using UiPath	

02	**CREATE A FLOWCHART-BASED PROJECT.**

CODE

STEP 01

Click on Open main workflow. Drag and drop flowchart from activities panel.

STEP 02

Drag and drop input Dialog inside a flowchart

STEP 03

Drag and drop message box inside a flowchart.

STEP 04

then Double click on input dailog and fill the details

STEP 05

then Double click on message box and fill the details

OUTPUT

c. Create an UiPath Robot which can empty a folder in Gmail solely on the basis of recording.

Step 1

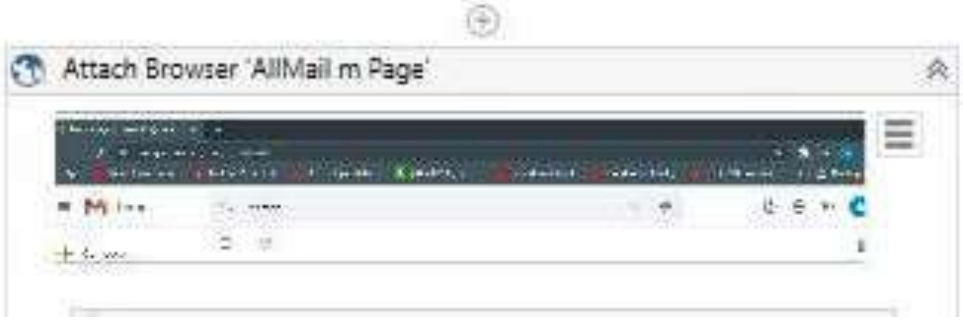
Emptying trash in Gmail

we begin with a blank project in UiPath Studio and then choose Web recorder from the Recording drop-down list

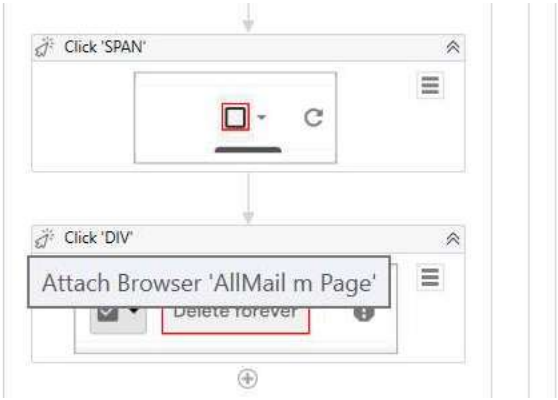
Step 2

Use the **Record** function

N l steps in browser- based a



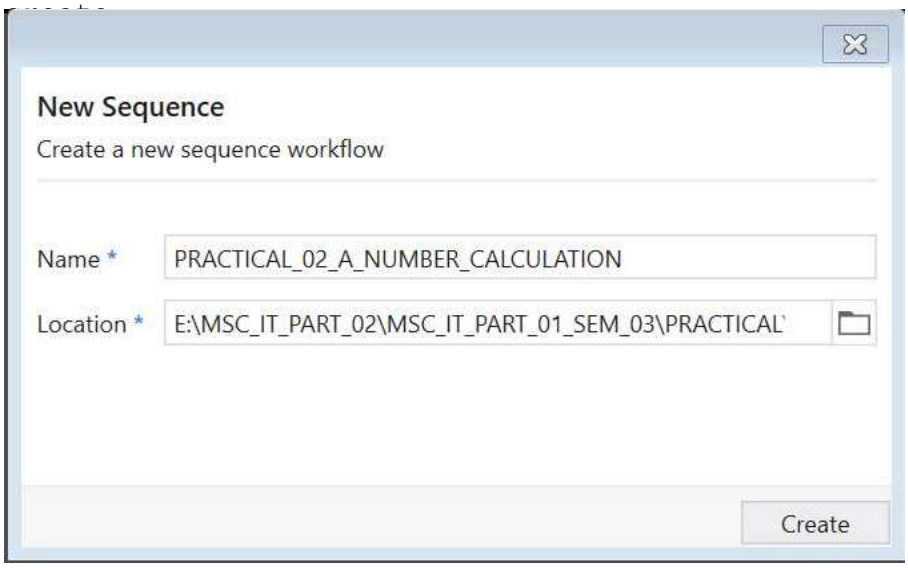
Step 4



(number, datetime, Boolean, generic, array, data table)

2.a Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers).

Step 1 : Open UiPath studio select process and give Num_Calculation and click on

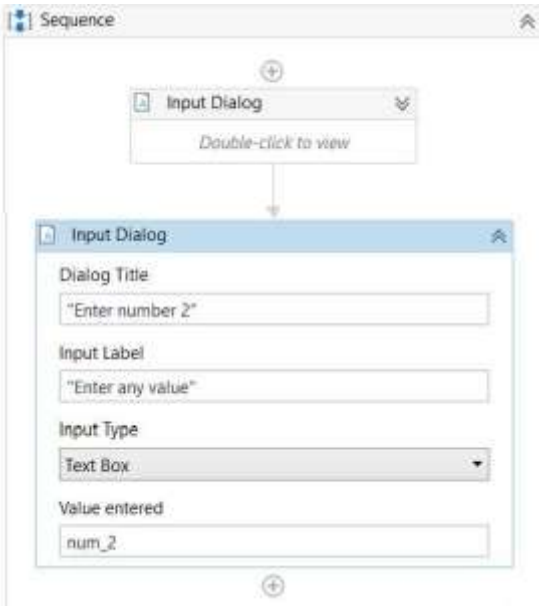


Click on open main workflow

Step 2 : Go to activities and select sequence drag and drop

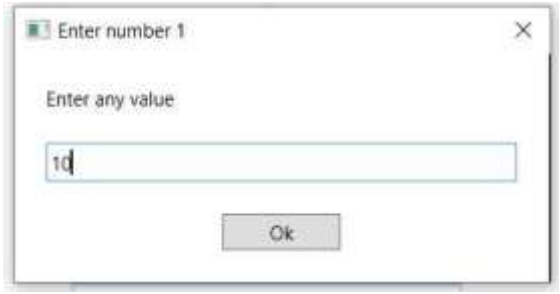
Step 3 : Select input dialogs from the activities drag and drop
For 1st Input Dialog-Give label name Enter number 1 ,Declare variable num_1.Variable.type int32 in reset type num_1

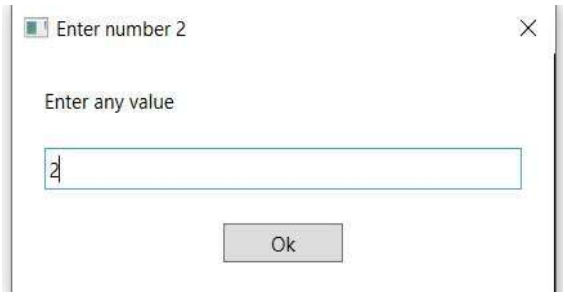
For 2nd Input Dialog-Give label name Enter number 2 ,Declare variable num_2.Variable.type int32



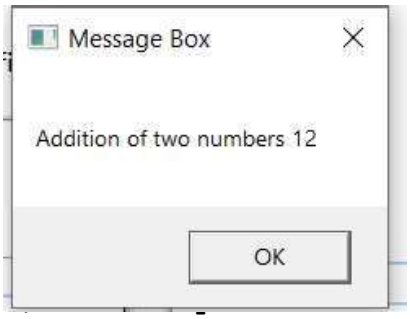
Step 4 : Select message boxes from activities in message box type "Addition of two numbers " + (num_1 + num_2).ToString "Subtraction of two numbers " + (num_1 - num_2).ToString "Multiplication of two numbers" + (num_1 * num_2).ToString "Division of two numbers " + (num_1/num_2).ToString

Step 5 : Click on debug file and run file

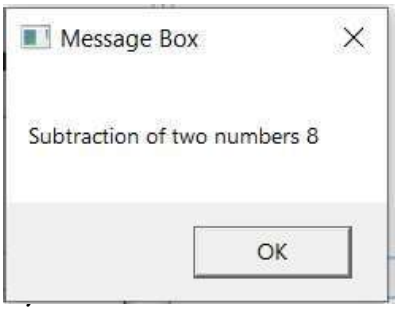




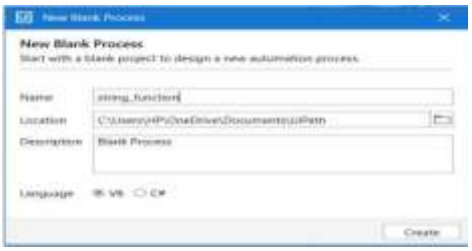
1)For addition



2)For subtraction

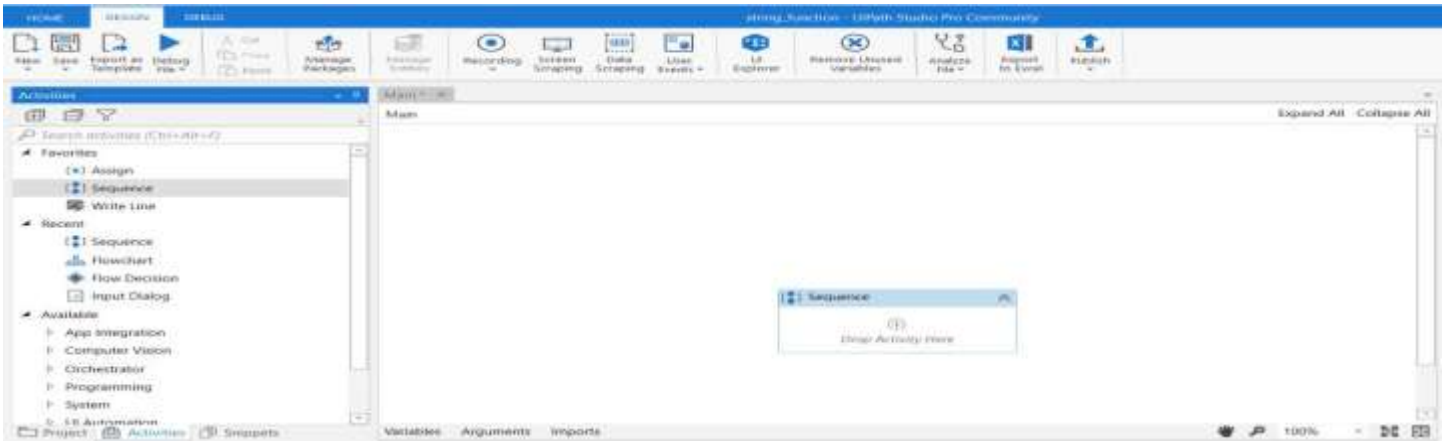


2.b Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table)



`String count:`

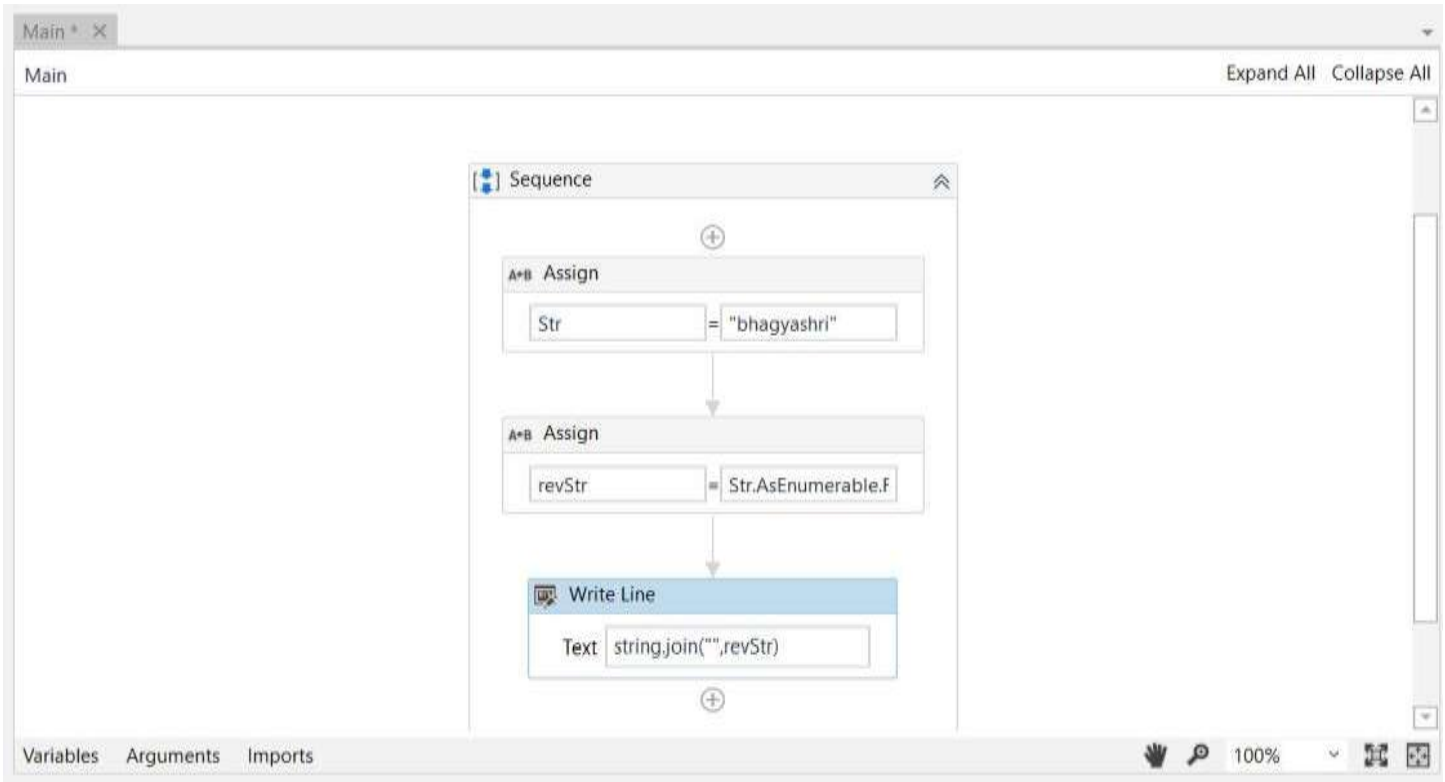
Step1: open UiPath studio. select process give name string function.



Name	Variable type	Scope	Default
Str	String	Sequence	Enter a VB expression
revStr	String	Sequence	Enter a VB expression
Create Variable			

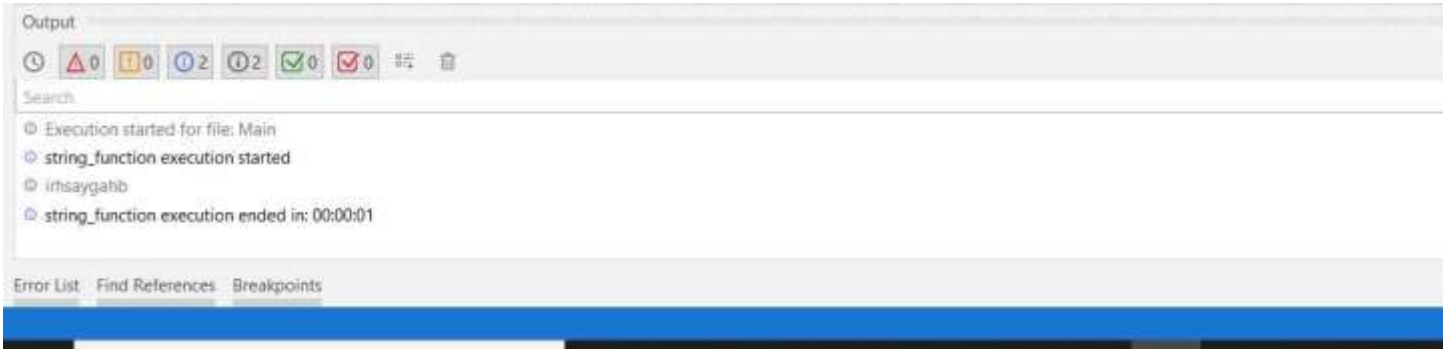
`one is string (Str) and second reverstring (revStr).`

Select WriteLine drag and drop. In text string.join("",revStr)



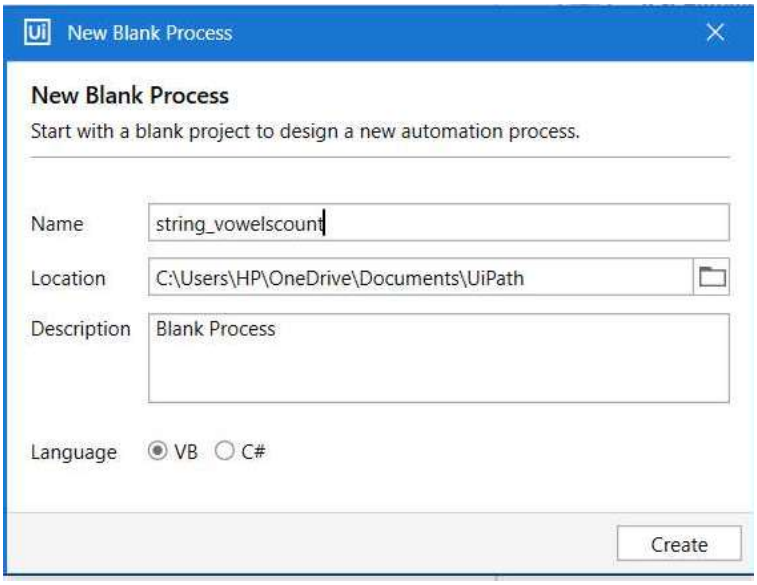
Click on debug file and select run file.

Output:



II String vowels count

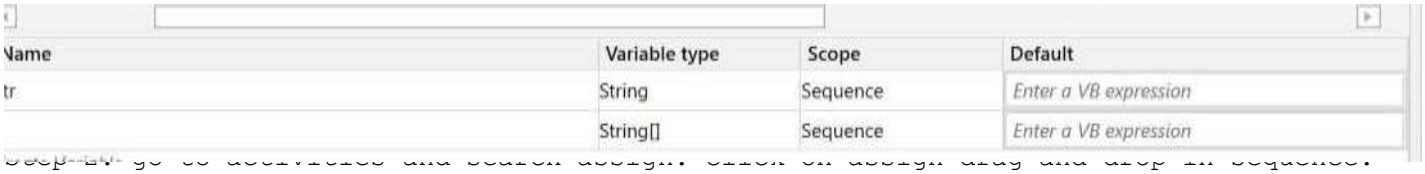
Step 1: open UiPath studio select process and give name string_vowlescount.



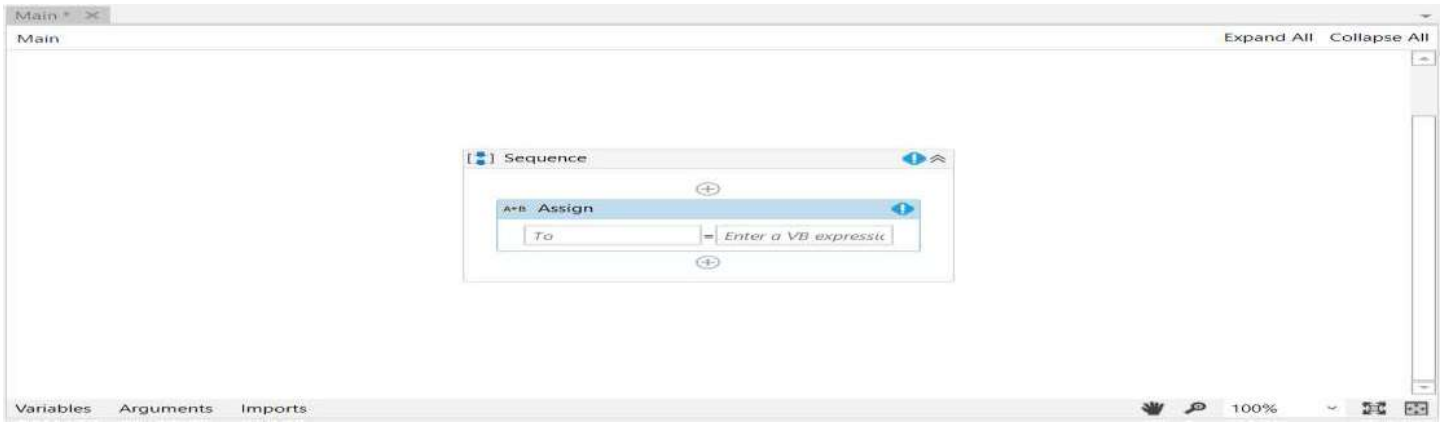
Click on open main workflow select sequence form activities drag and drop.

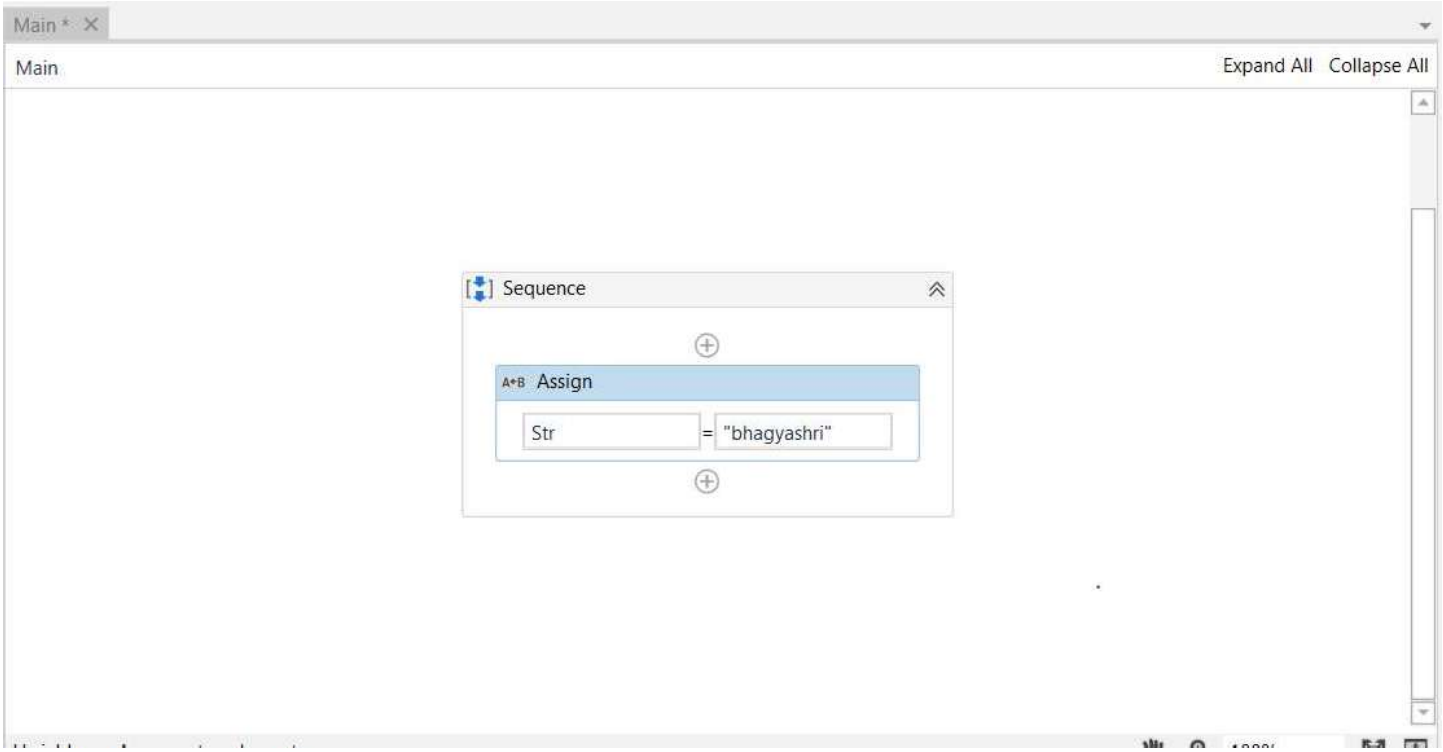
Click on variable. declare two variables
1.variable name =(Str) and variable type =string and variable scope=sequence 2.variable name=I
and variable type =array of T(string) and variable scope=sequence

Step 2: go to activities and search assign. click on assign drag and drop in sequence.

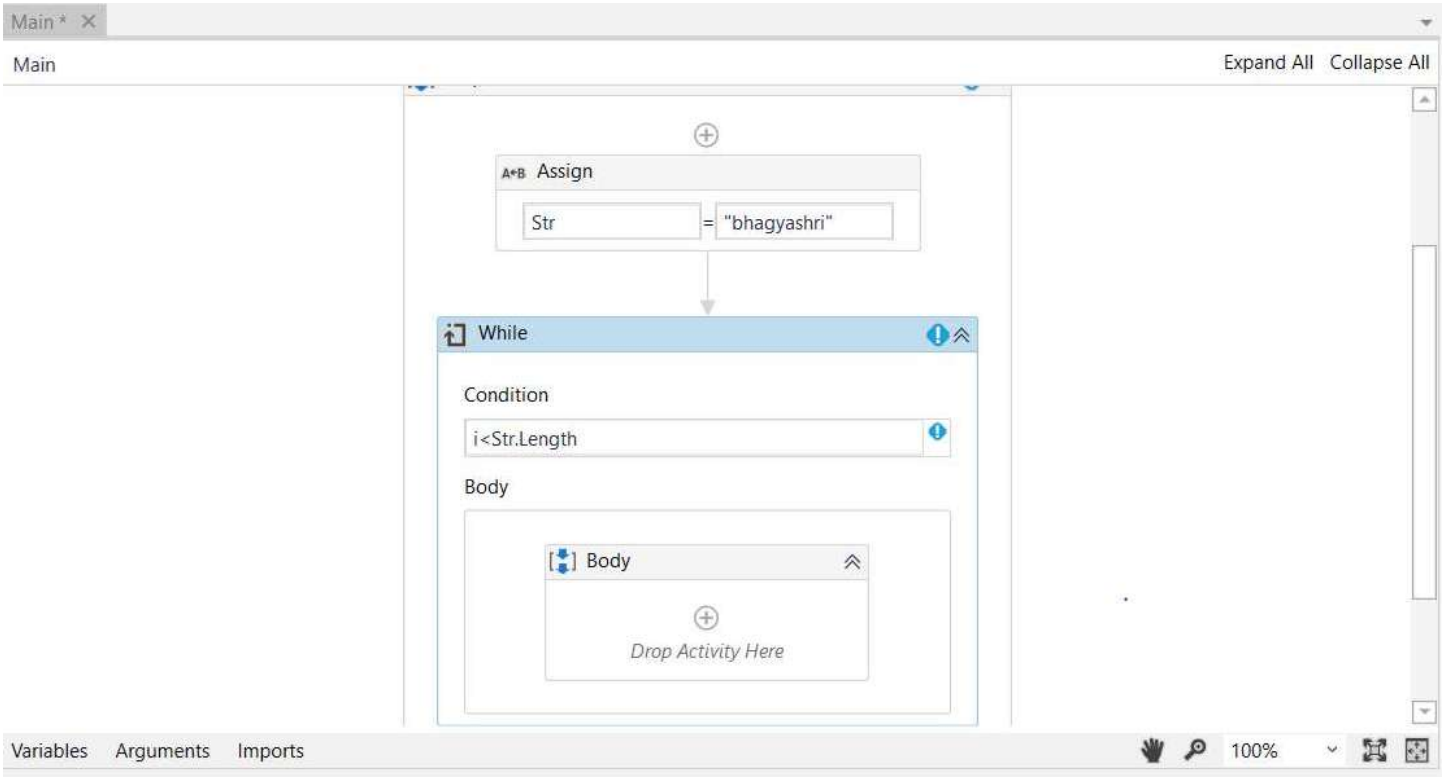


Step 2: go to activities and search assign. click on assign drag and drop in sequence.

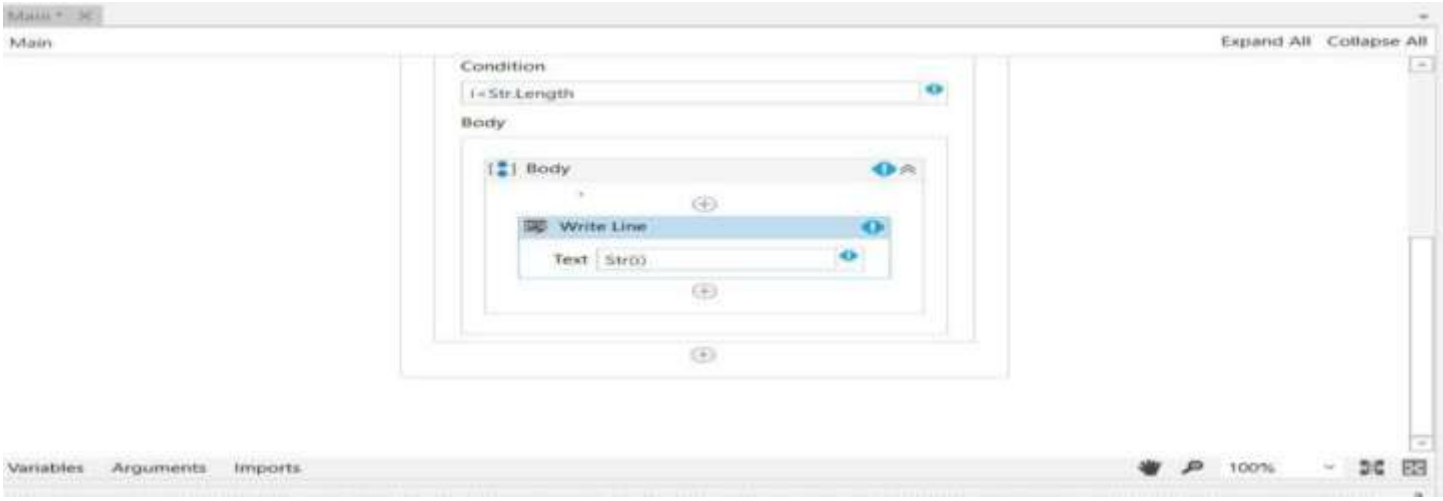




Go to activities and search while click on it drag and drop in below assign. Condition i=<St. Length



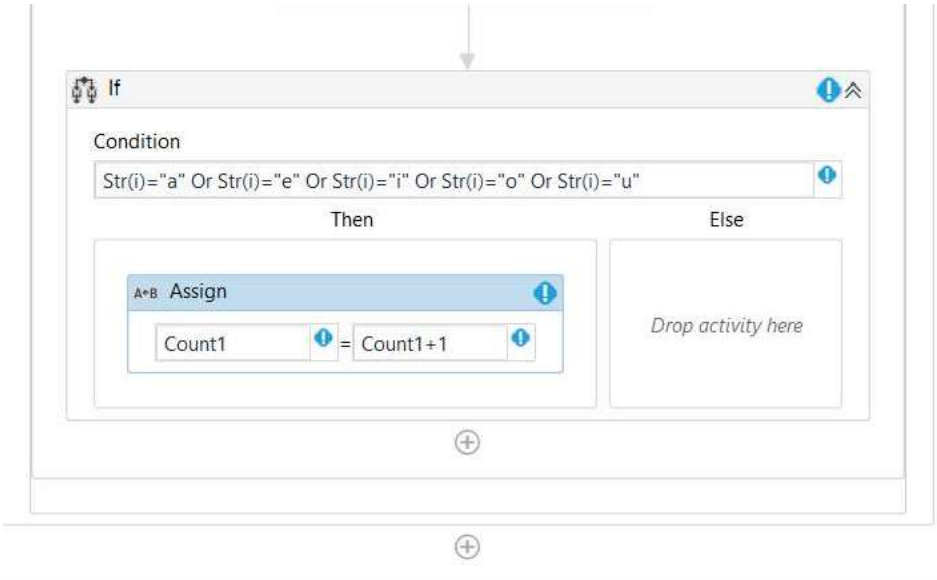
Select WriteLine drag and drop and text Str(i)

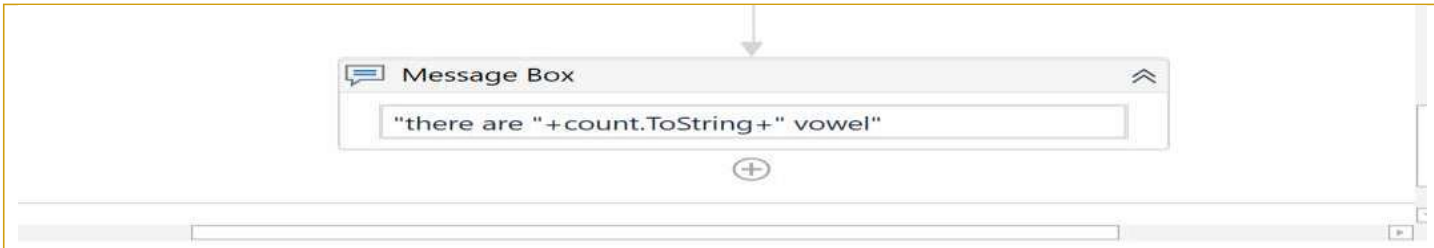


Step3: go to activities search if statement click on it drag and drop in below

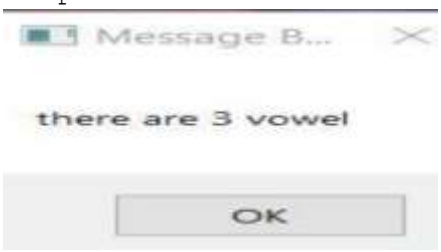
count=count1+1

Step 4: click on assign drag and drop in below if statement. assign i = i+1




Message Box
"there are "+count.ToString+" vowel"

Output:


Message B...
there are 3 vowel
OK

Question 3:

a. Create an automation UiPath Project using decision statements.

b. Create an automation UiPath Project using looping statements.

3.a Create an automation UiPath Project using decision statements.

1)Assign activity

Step 1: open UiPath studio select process and give name assign activity and click on create. Click on open main workflow

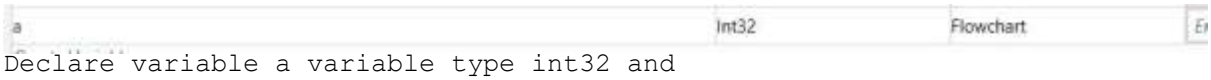
Step 2: go to activities and select flowchart drag and drop.

Step 3: select input dialog from 

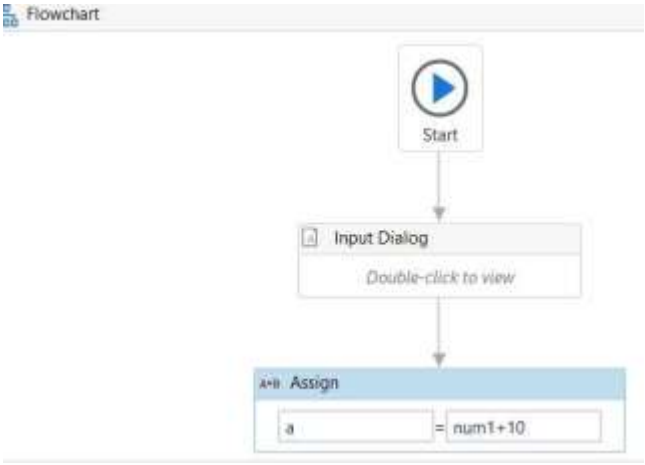
drop.

Give l num1. Variable type int32 in result type num1.

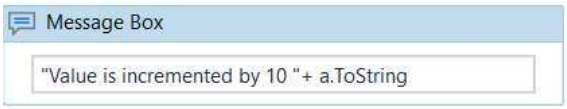
Step 4: select assign from activities drag and drop.



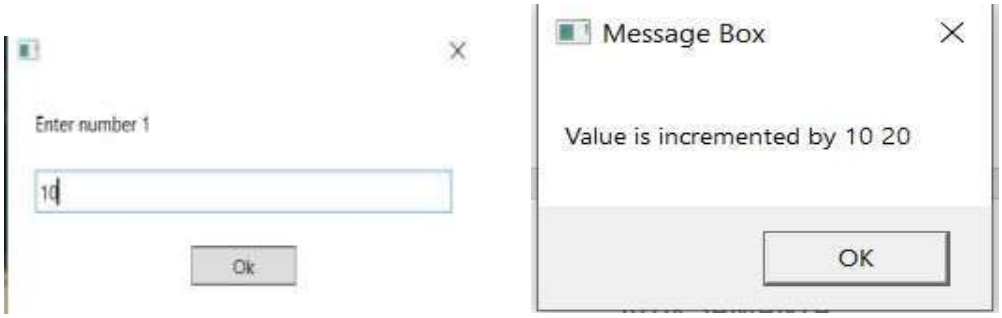
Declare variable a variable type int32 and scope flowchart. Expression a= num1+10



Step 5: select message box from activities .in message box type value is incremented by 10



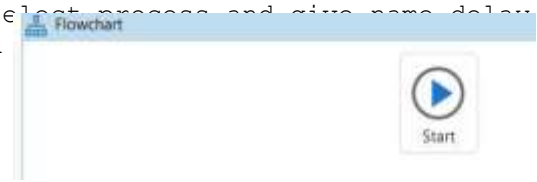
Step 6: click on debug file and click on run file



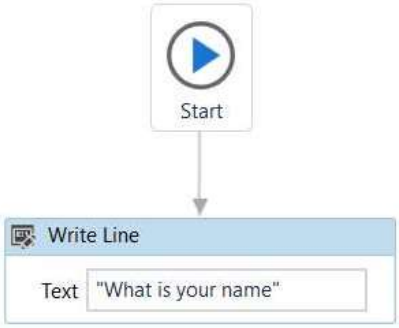
2)Delay activity

Step 1: open UiPath studio select process and give name delay activity and click on create

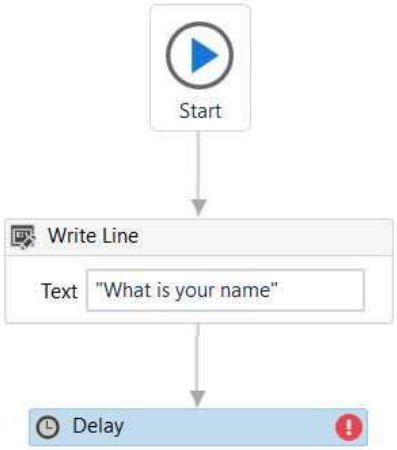
Step 2: go to activities and



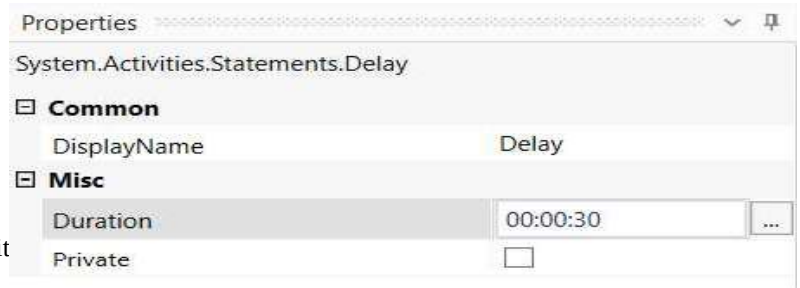
Step 3: go to activities and se



Step 4: add delay activity from activities and join to WriteLine.

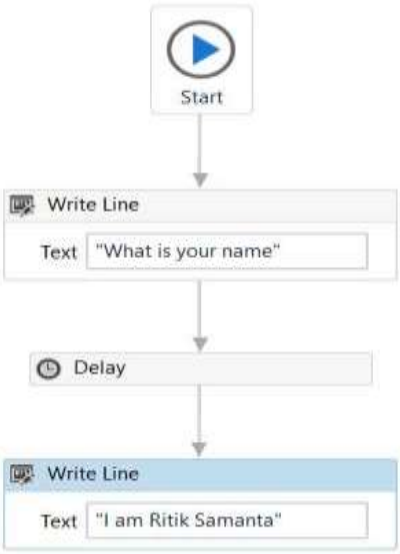


Step 5: Select the Delay activity and go to the Properties panel. In the Duration field, set 00:00:30. This is a 30- second delay between the two logged messages.

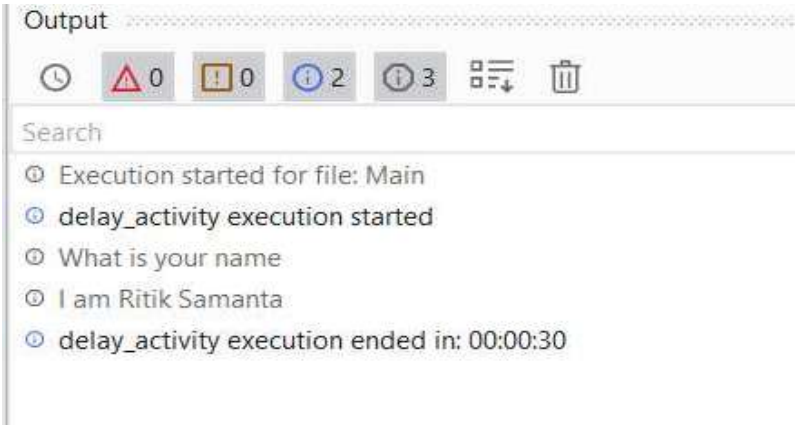


Take another Write line activit

In the Text field, write “My name is Ritik Samanta”



Click on run file and see the output

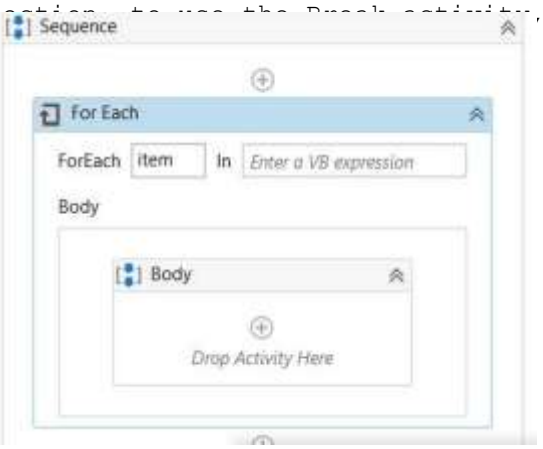


3)Break activity

Step 1: open UiPath studio select process and give name break activity and click on create

ctivity to the Designer panel

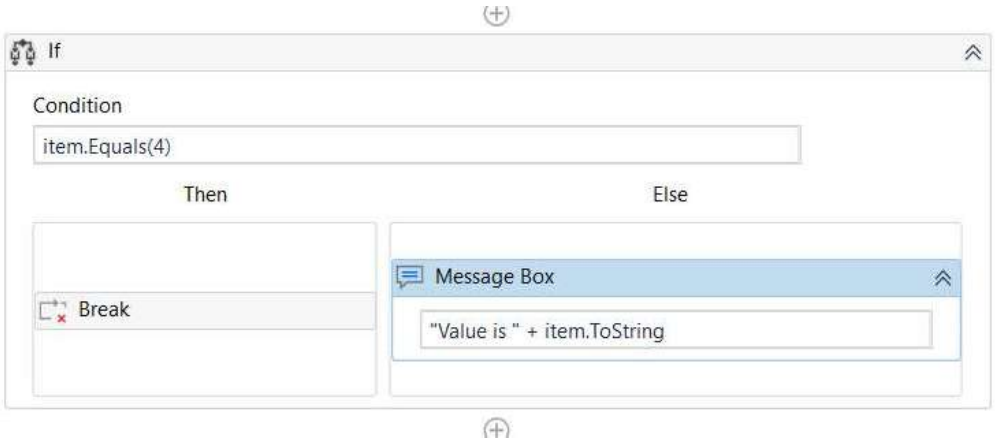
Step3: Next, add a for each activity inside the Sequence (as mentioned in the preceding section, to use the Break activity, we need the for each activity).



Step 4: Create two variables; an integer variable named item, and an array integer variable named x. Then, set them to the text field.

Name	Variable type	Scope	Default
item	Int32	Sequence	Enter a VB expression
x	Int32[]	Sequence	{1,2,3,4,5}

Step 5 : Add if and in if Add a Break activity inside the body of the loop.



Output :


Message ...
Value is 1
OK
Message ...
Value is 2
OK
Message ...
Value is 3
OK

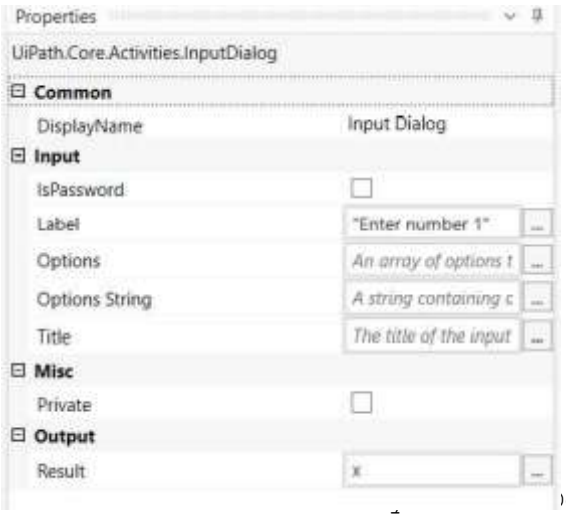
4)If activity

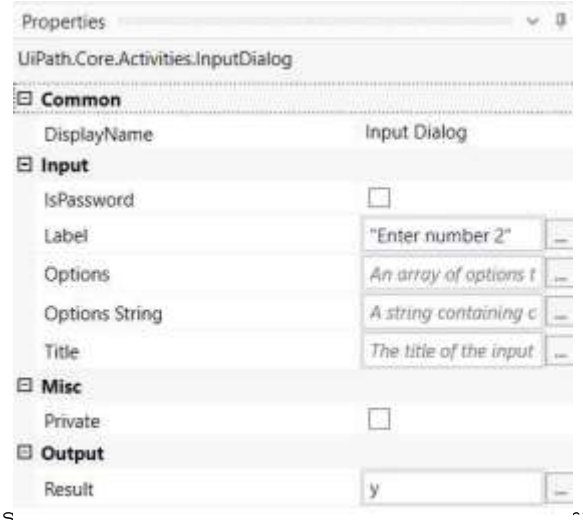
Step 1: open UiPath studio select process and give name if activity and click on create
Step 2 : Add a Flowchart from the Activities panel.

Add two Input dialog activities. Create two integer variables, x and y.

Name	Variable type	Scope	Default
x	Int32	Flowchart	Enter a VB expression
y	Int32	Flowchart	Enter a VB expression

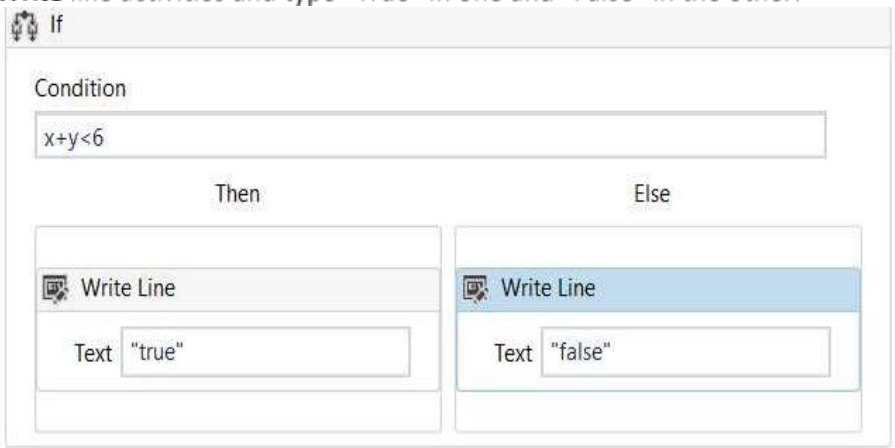
In the Properties panel, change the label name and title name of both the Input dialog activities.
Now, specify these names of these two variables in the Result property of both the Input dialog activities.





es t, x+y<6, check whether it is true or false. Add two

Write line activities and type “True” in one and “False” in the other.

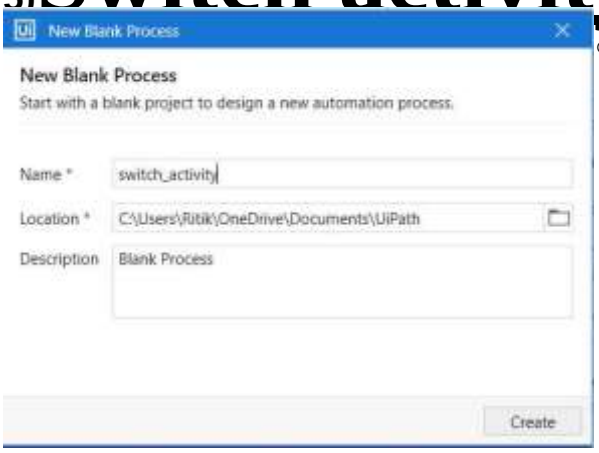


Output :


Enter number 1
5
Ok
Enter number 2
4
Ok
false
if_activity execution ended in: 00:03:01

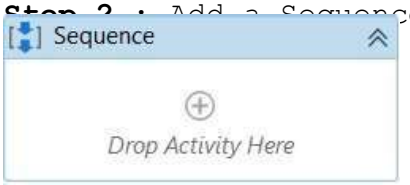

Enter number 1
2
Ok
Enter number 2
1
Ok
true
if_activity execution ended in: 00:01:38

5)Switch activity

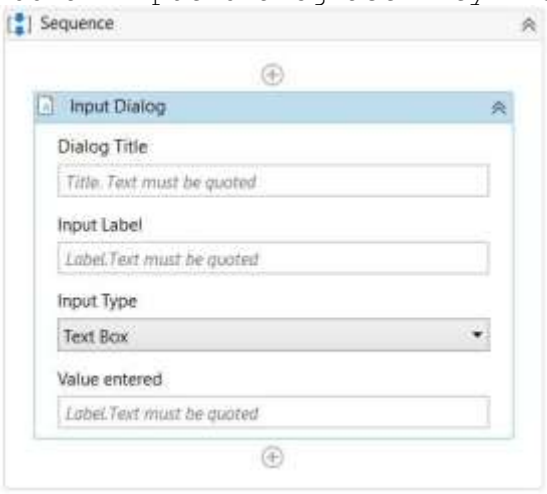


cess and give name switch activity and click on create

Step 2 : Add a Sequence activity.

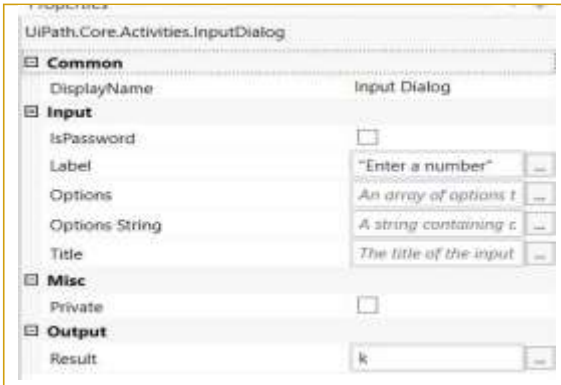


Add an Input dialog activity inside the Sequence

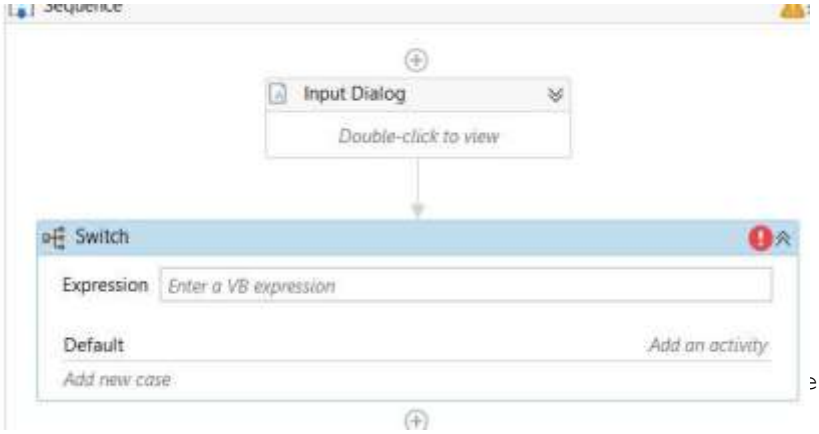


e k.

Specify the newly created variable's name in the Result property inside the Properties panel



Add the Switch activity under the Input dialog activity

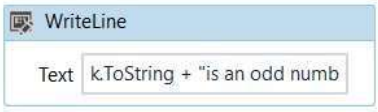


er the number is the Defa

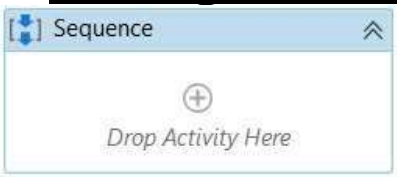
ult section and type the k. ToString+ "is an even number" in the text field

line activity to it, and type k. ToString+ "is an odd number" in the text field

ase 1

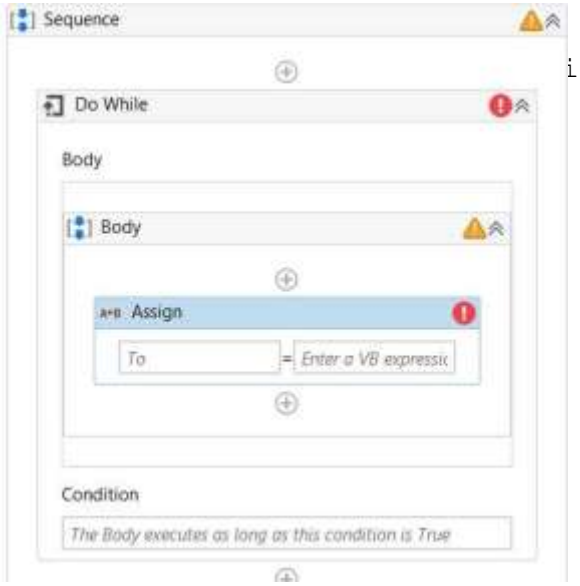


3.b Create an automation UiPath Project using looping statements.



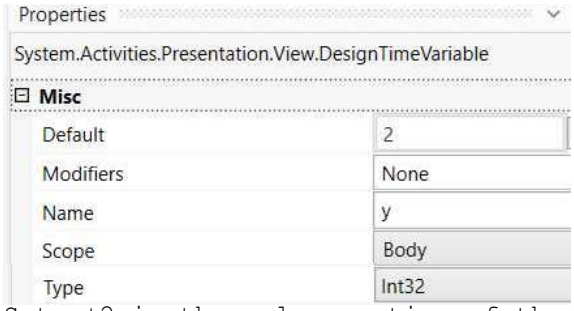
, add a Sequence activity.

ctivities panel.



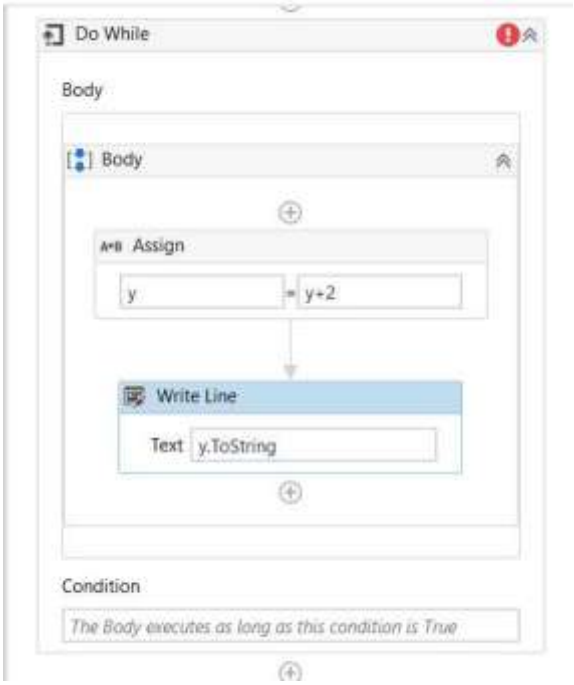
ile activity, add an Assign activity

Now, select the Assign activity. Go to the Properties panel and create an integer variable y. Set its default value to 2.



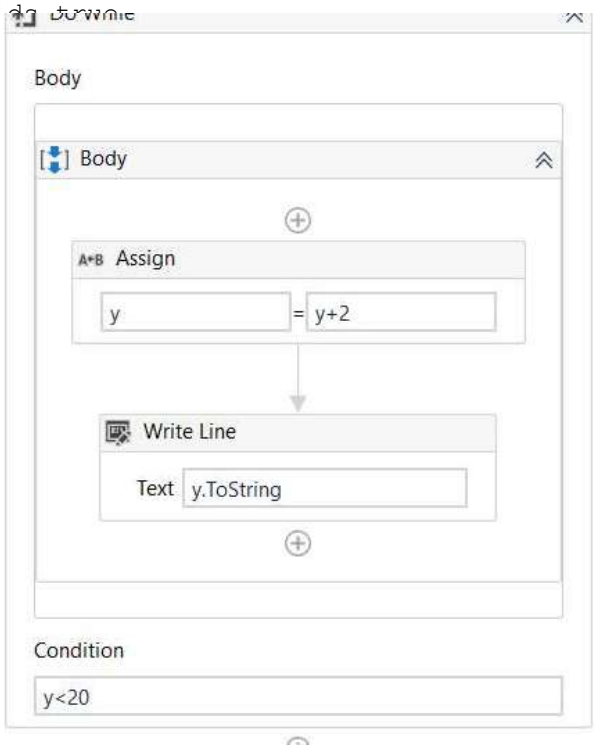
Set y+2 in the value section of the Assign activity to increment the result each time by 2 until the loop is executed.

Step 2 : Add a Write line activity inside the Assign activity

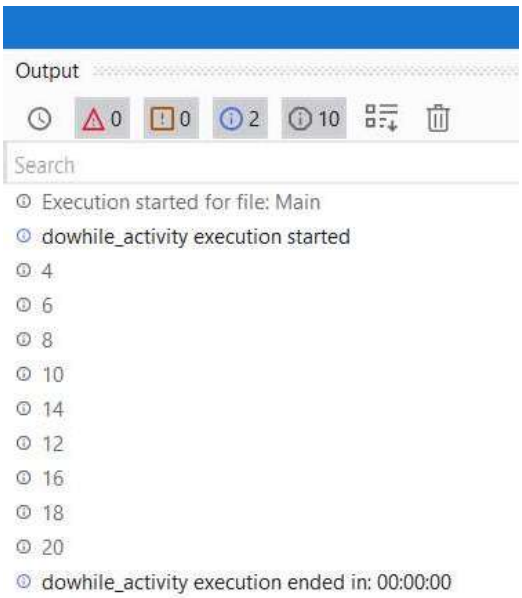


In the text field of the Write line activity, type y.

In the condition section, set the condition y<20. The loop will continue until the condition

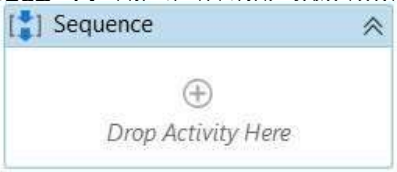


Output: On clicking the Run button, the output displayed will be as follows.



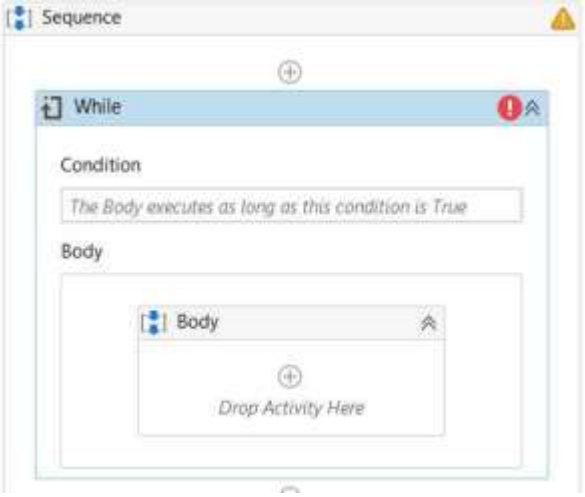
2) While loop

Step 1: On a Blank project, add a Sequence activity.



Name	Variable type	Scope	Default
x	Int32	Sequence	5

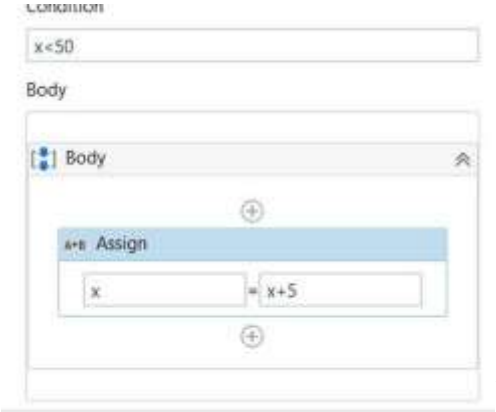
default value to 5. Next, add a While activity to



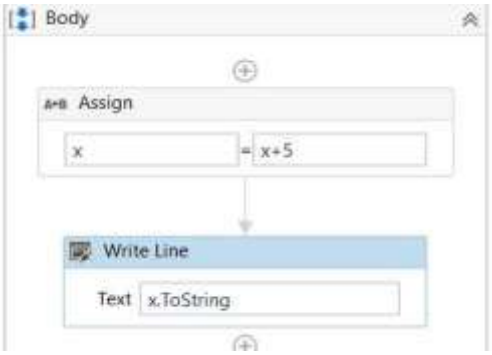
x < 50

Add an Assign activity to the body section of the While loop.

Now, go to the Properties panel of the Assign activity and type in the text field integer variable for value field integer x + 5.

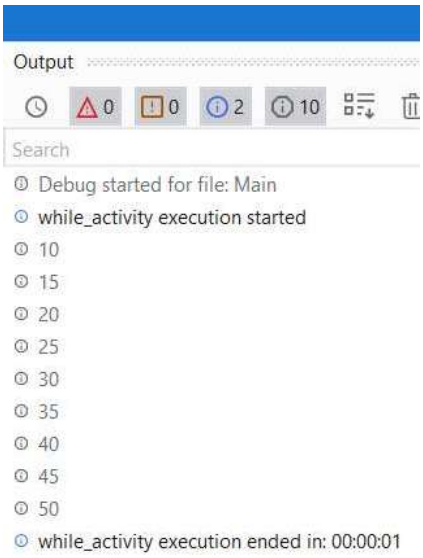


vity and specify the variable name x and apply ToStringmethod



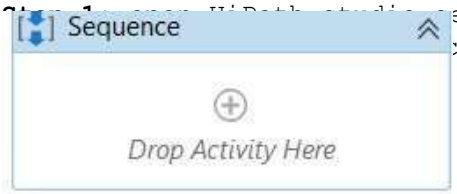
Click on run file

Output :

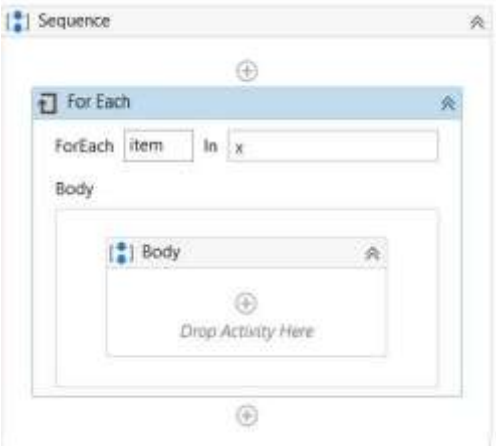


3)For each loop

Step 1: open UiPath studio select process and give name for each activity and click on create



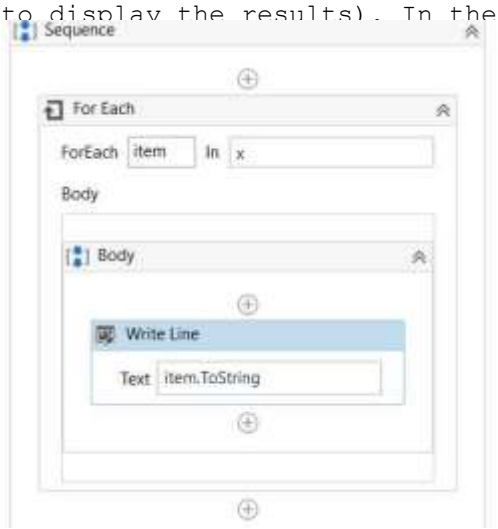
ctivity to the Designer panel.



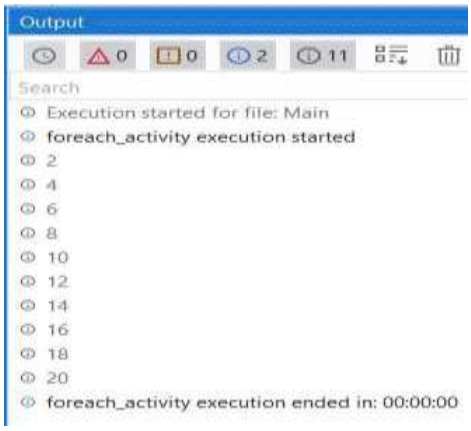
y within the Sequence and create an integer type array

2,14,16,18,20}).

Add a Write line activity to the Designer Panel (this activity is used to display the results). In the Text field of the Write line activity, he output

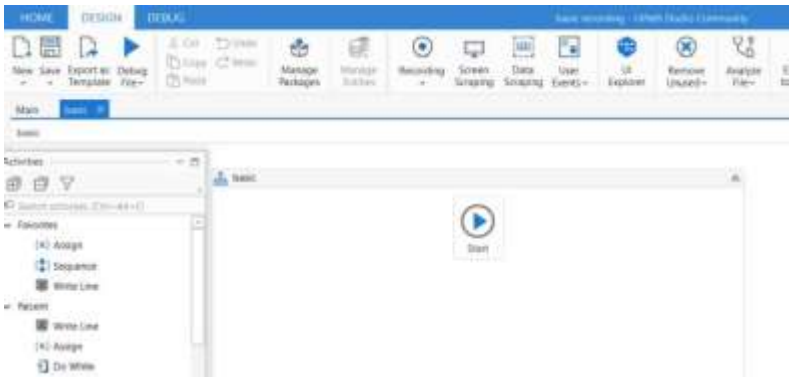


Output: Now, run the program. You will see that each number of the array is displayed one by one because of the use of the for each activity.



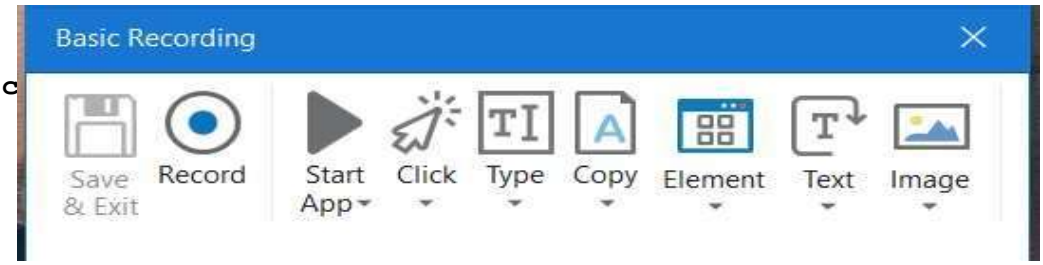
Question 4:
a. Automate any process using basic recording.
b. Automate any process using desktop recording.
c. Automate any process using web recording.

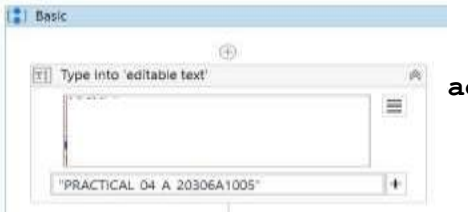
4.a Automate any process using



name basic recording
new flowchart and give name basic

ec





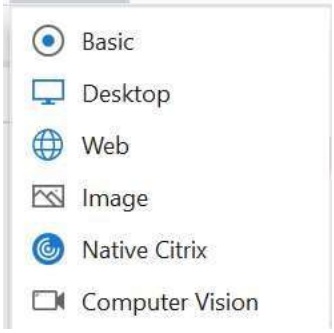
C1 **ad type message**

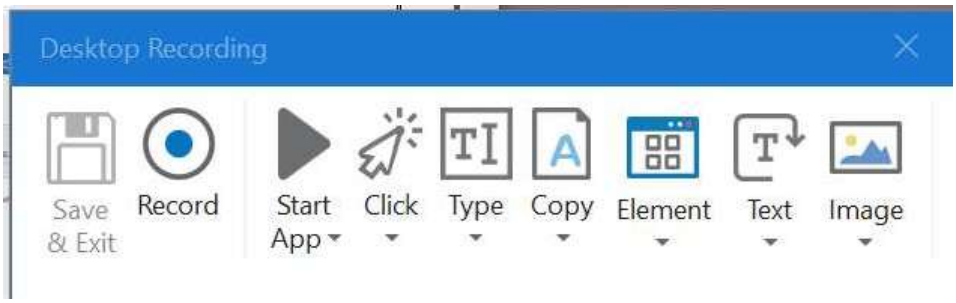
Step 5 : CLICK SAVE AND EXIT THEN CLICK ON RUN FILE

4.b Automate any process using ing.

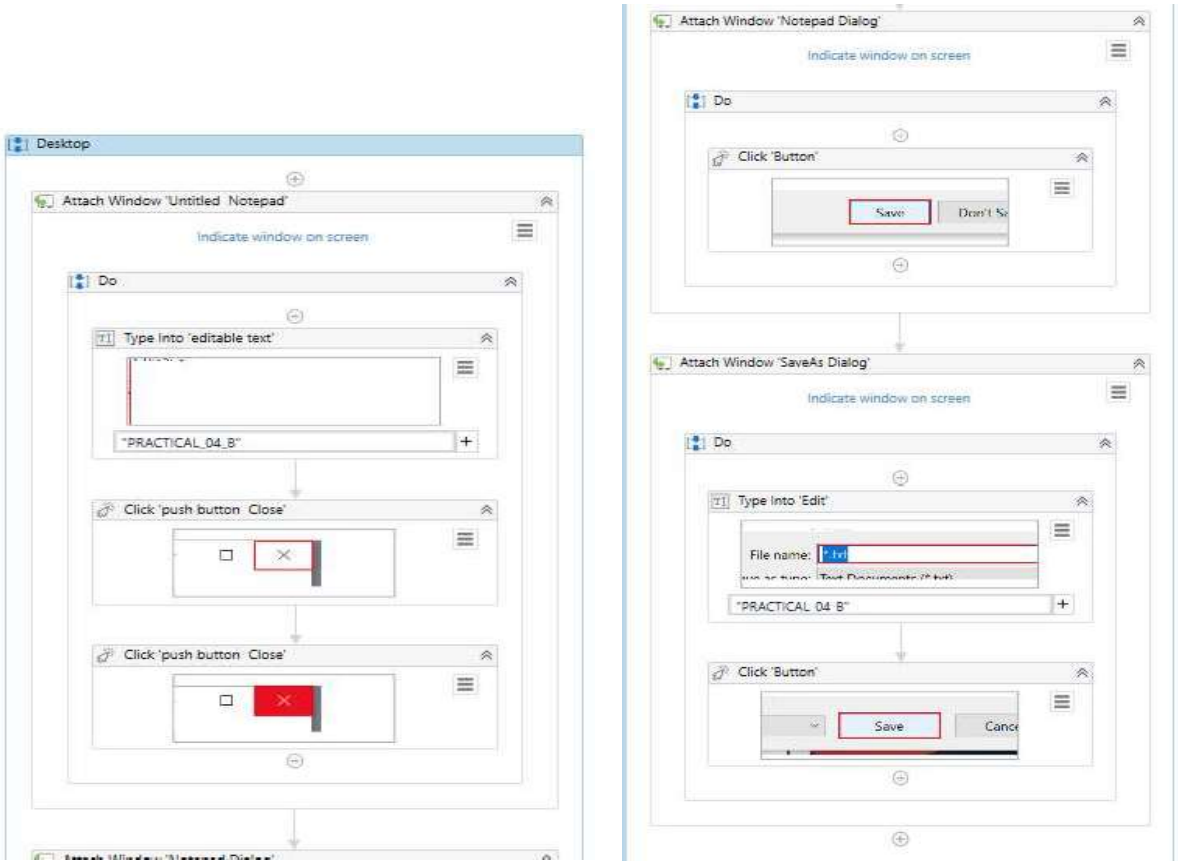
select flowchart

ecording and select DESKTOP recording





Step 4 : Click on record. open notepad type message

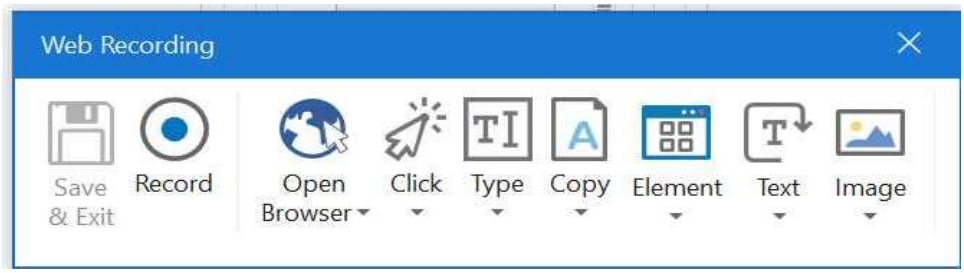


Step 5 : CLICK SAVE AND EXIT THEN CLICK ON RUN FILE

4.c Automate any process using web recording.

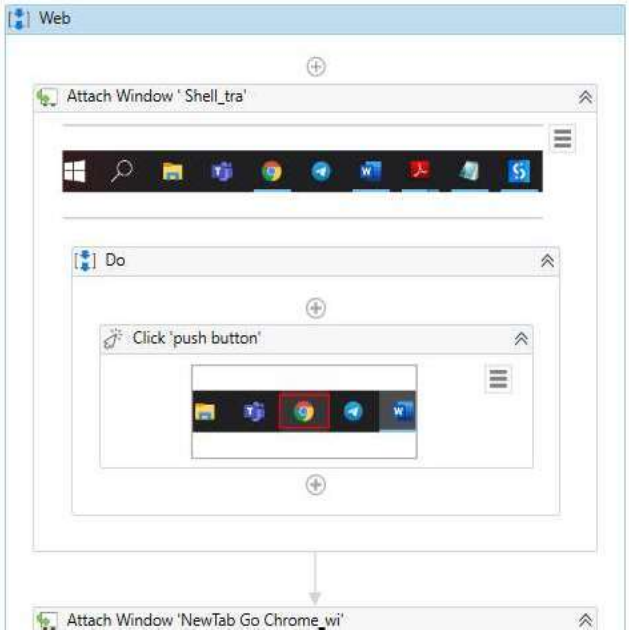
Step 1 : Drag and drop flowchart from activity panel.

Step 2 : Click on the Recording icon and choose Web recording.



Step 3 : THEN START RECORDING YOUR WEB ACTIVITY

Step 4 : Now, a recording sequence is generated in our Designer panel. Connect this sequence to the Start node. Hit the Run button to see the result.



Question 5:
Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is

Step 1

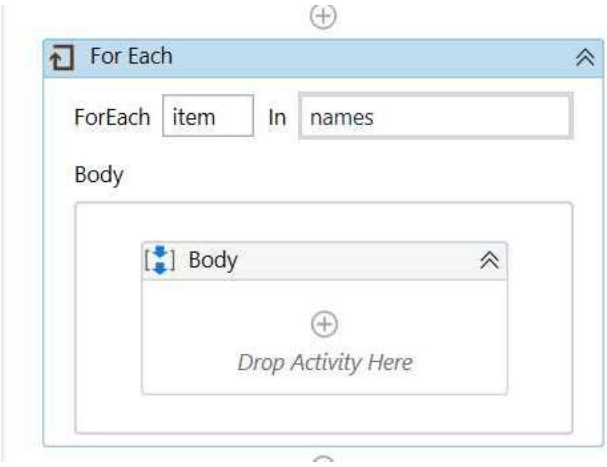
Step 1: On a Blank project, add a Sequence activity.

Step 2

Click on variable. declare three variables
1.variable names and variable type =string[] and variable scope=sequence 2.variable item and variable type =Int32[] and variable scope=sequence 3.variable count and variable type =Int32[] and variable scope=sequence

Name	Variable type	Scope	Default
names	String[]	Array_find	{"avdhoot","ashok","amira","ramkrishna
item	Int32	Array_find	Enter a VB expression
count	Int32	Array_find	Enter a VB expression

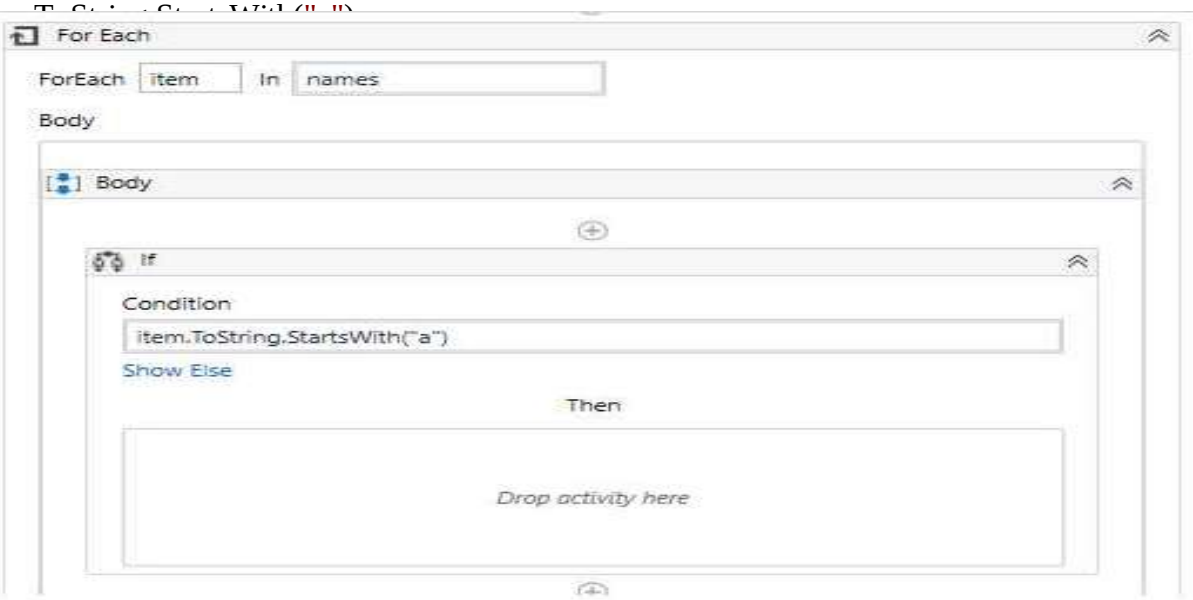
Step 3
go to activities and search For Each. click on For Each drag and drop in sequence. And write For Each item in names



Step 4

go to activities and search if. click on if drag and

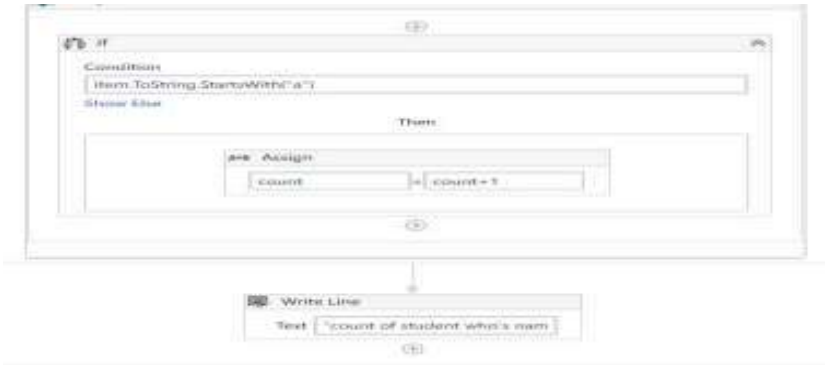
drop in below the For Each body Give the if condition



Step 5

then go to the activity and search assign , click on Assign drag and drop in below the if. In assign increase the counter by 1

go to activities and search Write Line. click on Write Line and drop in below the
For Each



Step 6

In a write line write condition

"count of student whos name staring with a"+count.ToString

TEST execution started

count of student who's name staring with a3

TEST execution ended in: 00:00:01

Question 6:

a. Create an application automating the read, write and append operation on excel file.

b. Automate the process to extract data from an excel file into a

a. Create an application automating the read, write and append operation on excel file.

1. Open Studio and create a new **Process**.

2. Drag a **Sequence** container in the **Workflow Designer**.
   - Create the following variable:

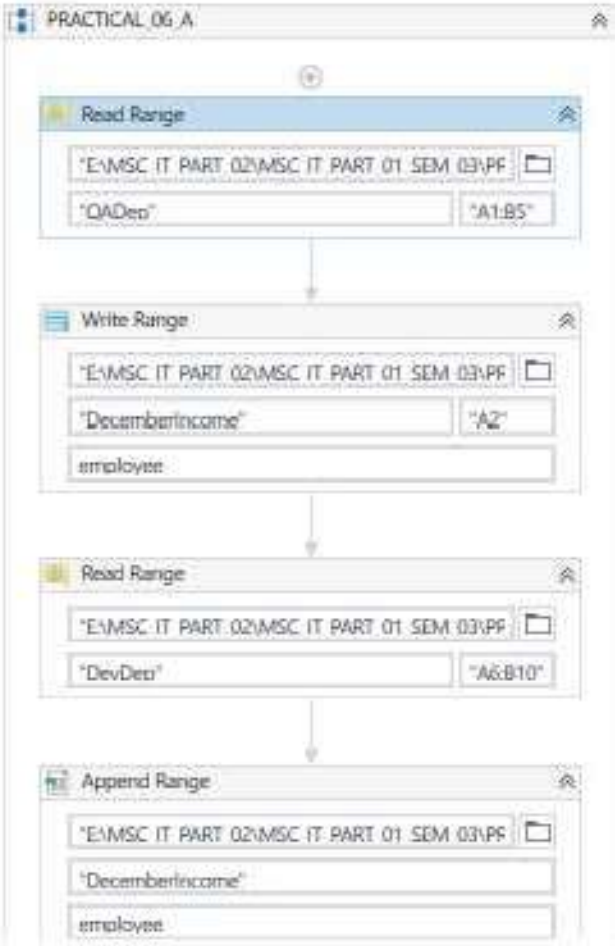
Name	Variable type	Scope
employee	DataTable	PRACTICAL_06_A

3. Add a **Read Range** activity inside the **Sequence** container.
   - Add the expression `"companyEmployees.xlsx"` in the **Workbook path** field.
   - Add the value **QADep** in the **Sheet** field and set the cells range at **"A1:B5"**.

4. Add a **Write Range** activity below the **Read Range** activity.
   - Add the expression `"employeeIncome.xlsx"` in the **Workbook path** field.
   - Add the value `"DecemberIncome"` in the **Sheet** field and set the cells range at **"A2"**.
   - Add the variable `employees` in the **Data Table** field.

5. Add a **Read Range** activity below the **Write Range** activity.
   - Add the expression `"companyEmployees.xlsx"` in the **Workbook path** field.
   - Add the value **DevDep** in the **Sheet** field and set the cells range at **"A6:B10"**.

6. Add an **Append Range** activity below the **Read Range** activity.
   - Add the expression `"employeeIncome.xlsx"` in the **Workbook path** field.
   - Add the value `"DecemberIncome"` in the **Sheet** field.
   - Add the variable `employees` in the **Data Table** field.



Execution started for file: PRACTICAL_06_A

TEST execution started

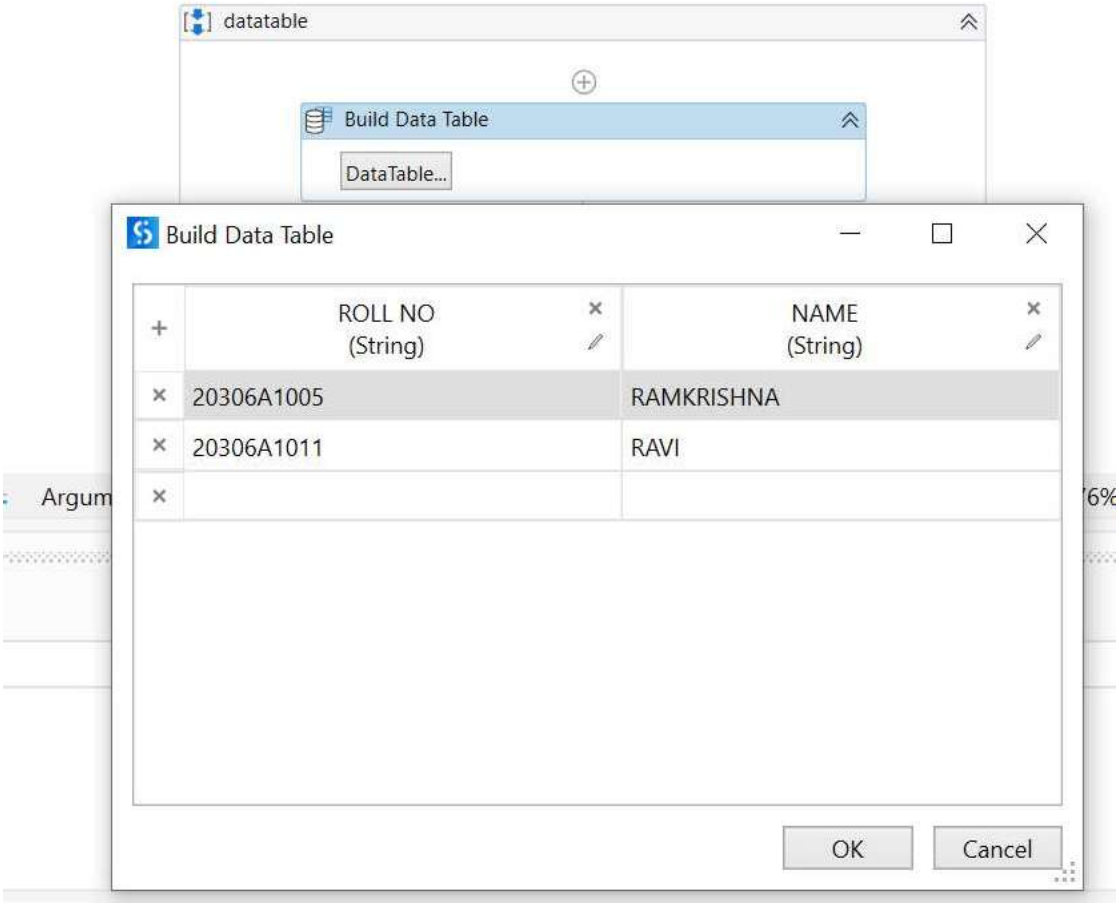
TEST execution ended in: 00:00:02

b. Automate the process to extract data from an excel file into a data table and vice versa

I) DataTable To

Excel Step 1

Drag and drop build data table then click on DataTable And Enter



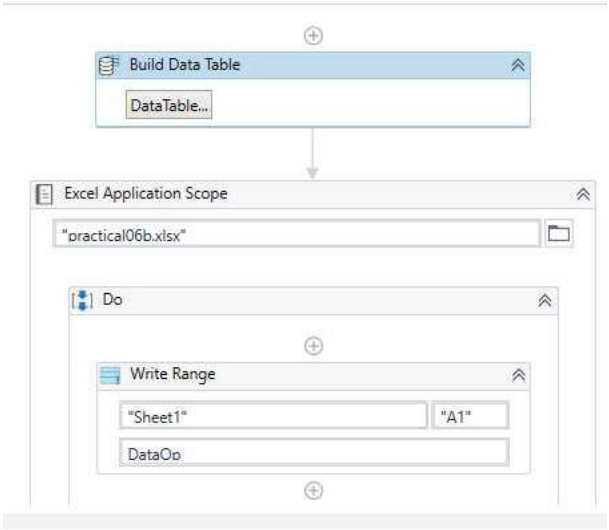
Step 2

Then Store The Data Table Output In A Variable

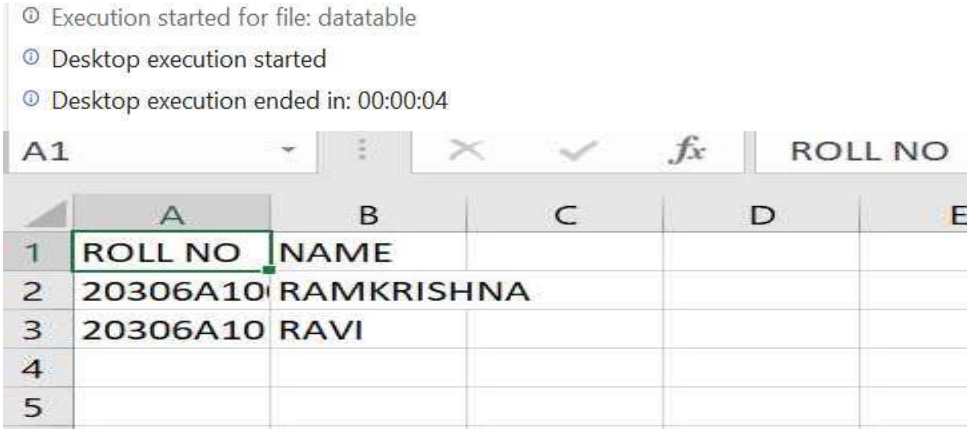
Name	Variable type	Scope
DataOp	DataTable	datatable

Step 3
Then below Build Data Table Activity Drag And Drop Excel Application Scope Activity, inside that activity Drag and Drop Write Range Activity

Step 4
Then Specify The Excel File Path and Add the variable that you created for Data Table in Write Range Activity



Step 5 Run The Code

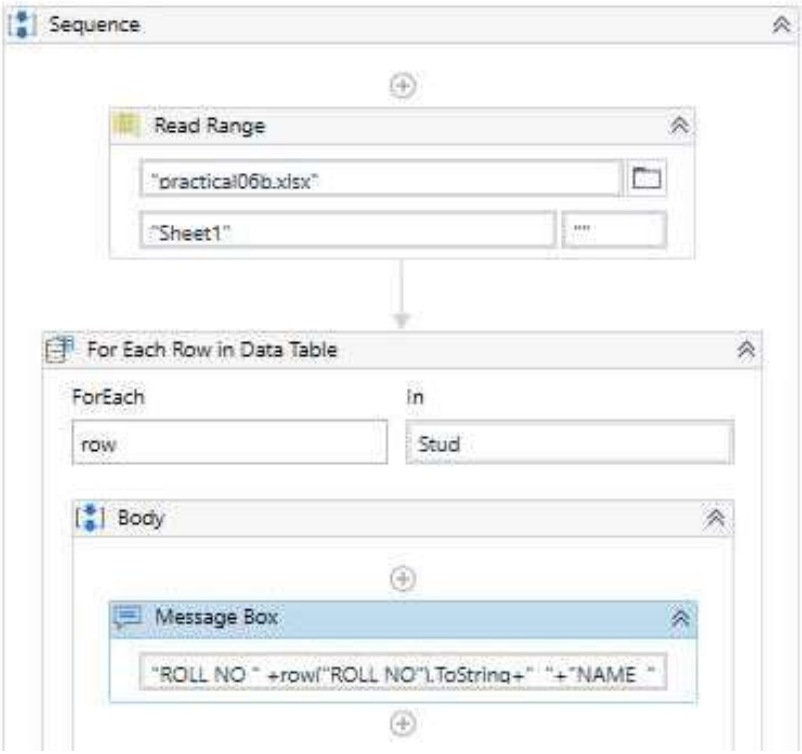


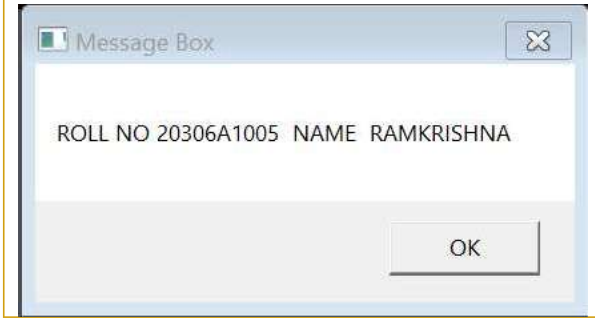
II) Excel To DataTable

Step 1
Add read range activity to the sequence and specify the excel file path and store the output in a variable

Step 2
Below read range activity add For Each Row in Data Table activity and specify the variable in which you have stored your data

Step 3
Then drag drop message box and display the output





Question 7:

a. Implement the attach window activity.

b. Find different controls using UiPath.

c. Demonstrate the following activities in UiPath:

i. Mouse (click, double click and hover)

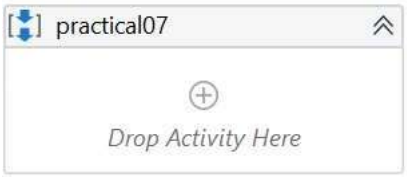
ii. Type into

iii. Type Secure text

A-Implement the attach window activity.

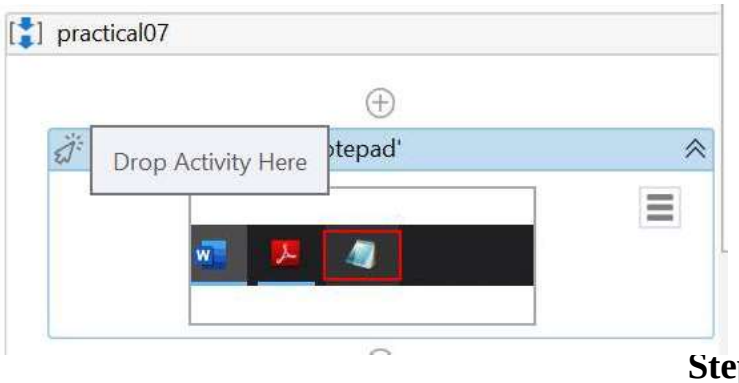
Step 1

-Drag and drop a Sequence activity on the Designer panel.



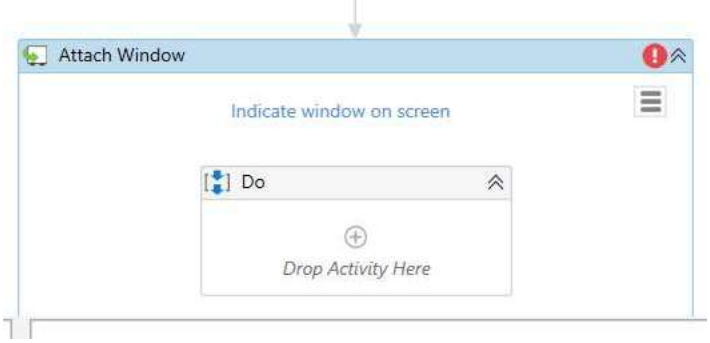
Step 2

-drag and drop a Click activity inside the Designer panel
-click on Indicate on screen. Locate the Notepad icon



Step 3

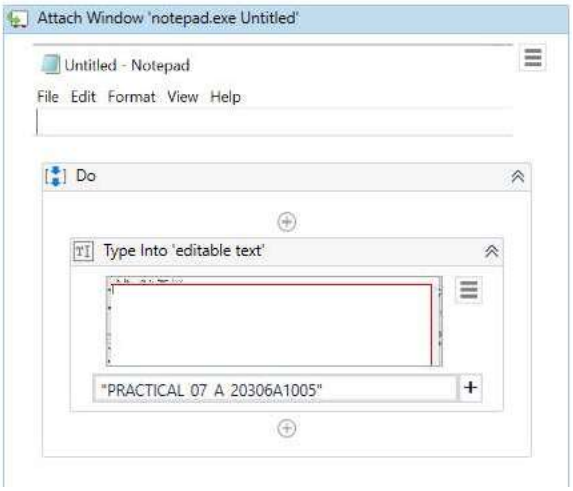
- Drag and drop the Attach Window activity



Step 4

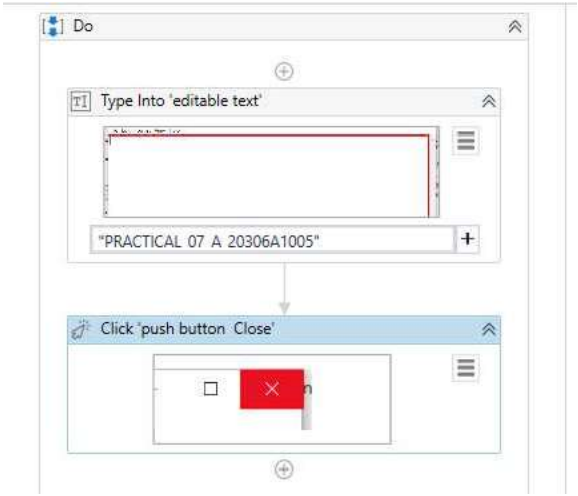
-Click on Click Window on Screen and indicate the Notepad window.

- Then add type into activity in do part

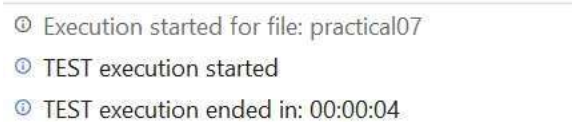


Step 5

Attach click activity below the Type into activity. Click on the Indicate element inside window and locate the Notepad close button(X), where it closes the notepad file and Hit the Run button



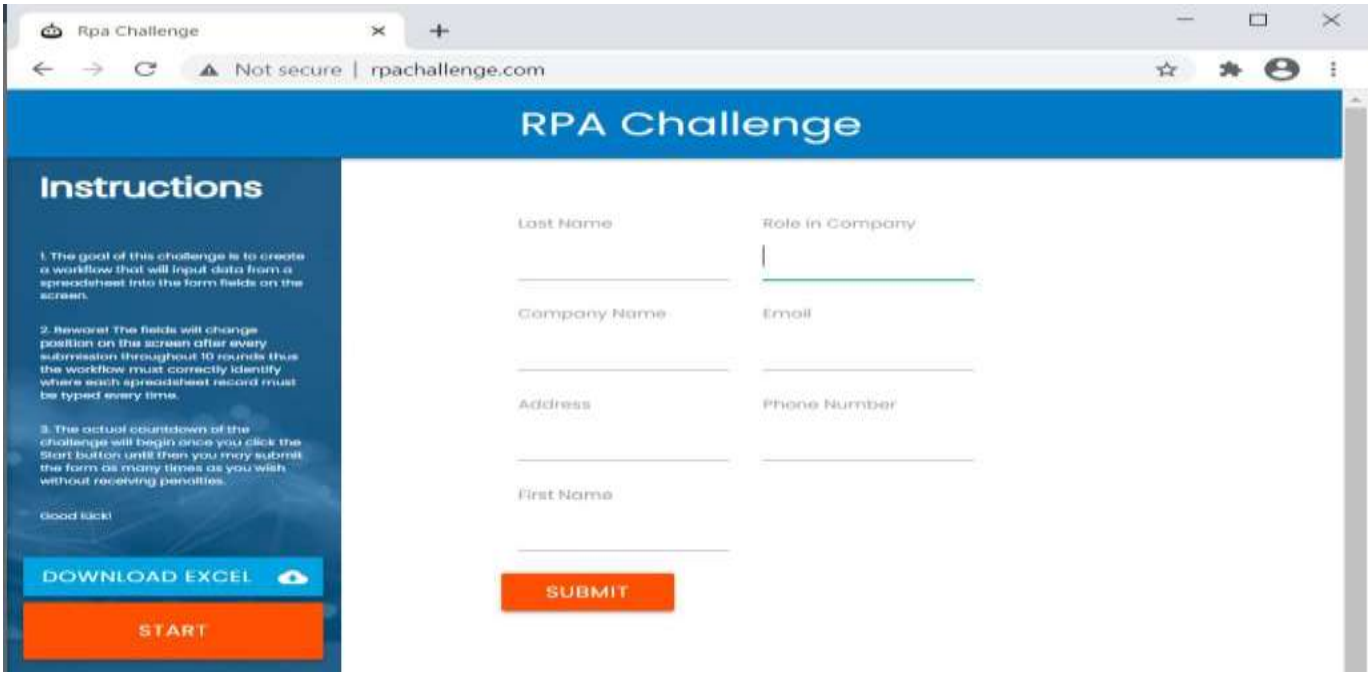
Step 6



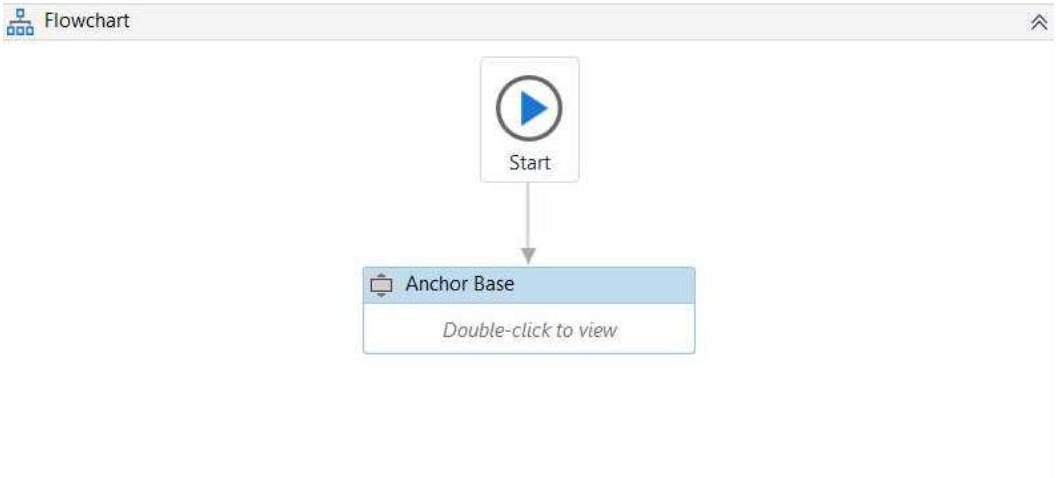
b. Find different controls using UiPath.

1. Finding the control (Anchor Base)

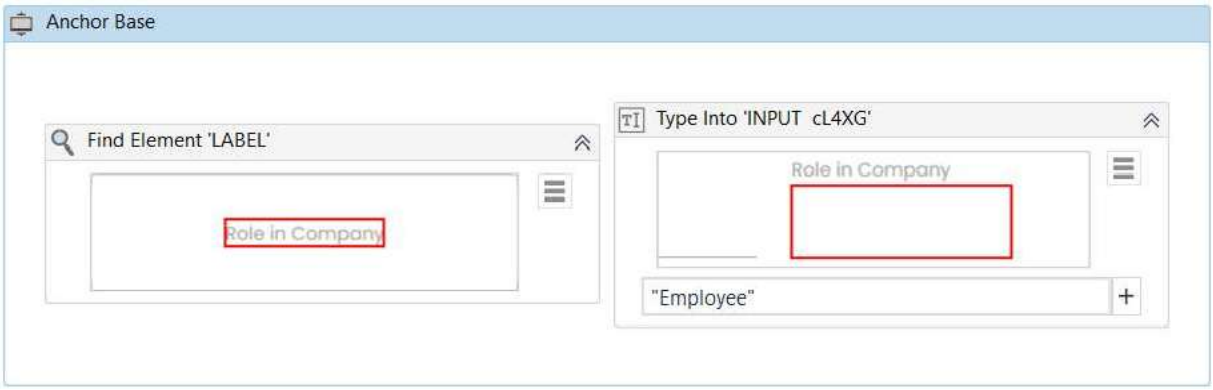
1. Go to http://www.rpachallenge.com/



2.Drag and drop a Flowchart activity on the Designer panel of a blank project. Also, drag and drop an Anchor base control from the Activities panel. Connect the Anchor base control with Start.



3.Double click on the Anchor base control.

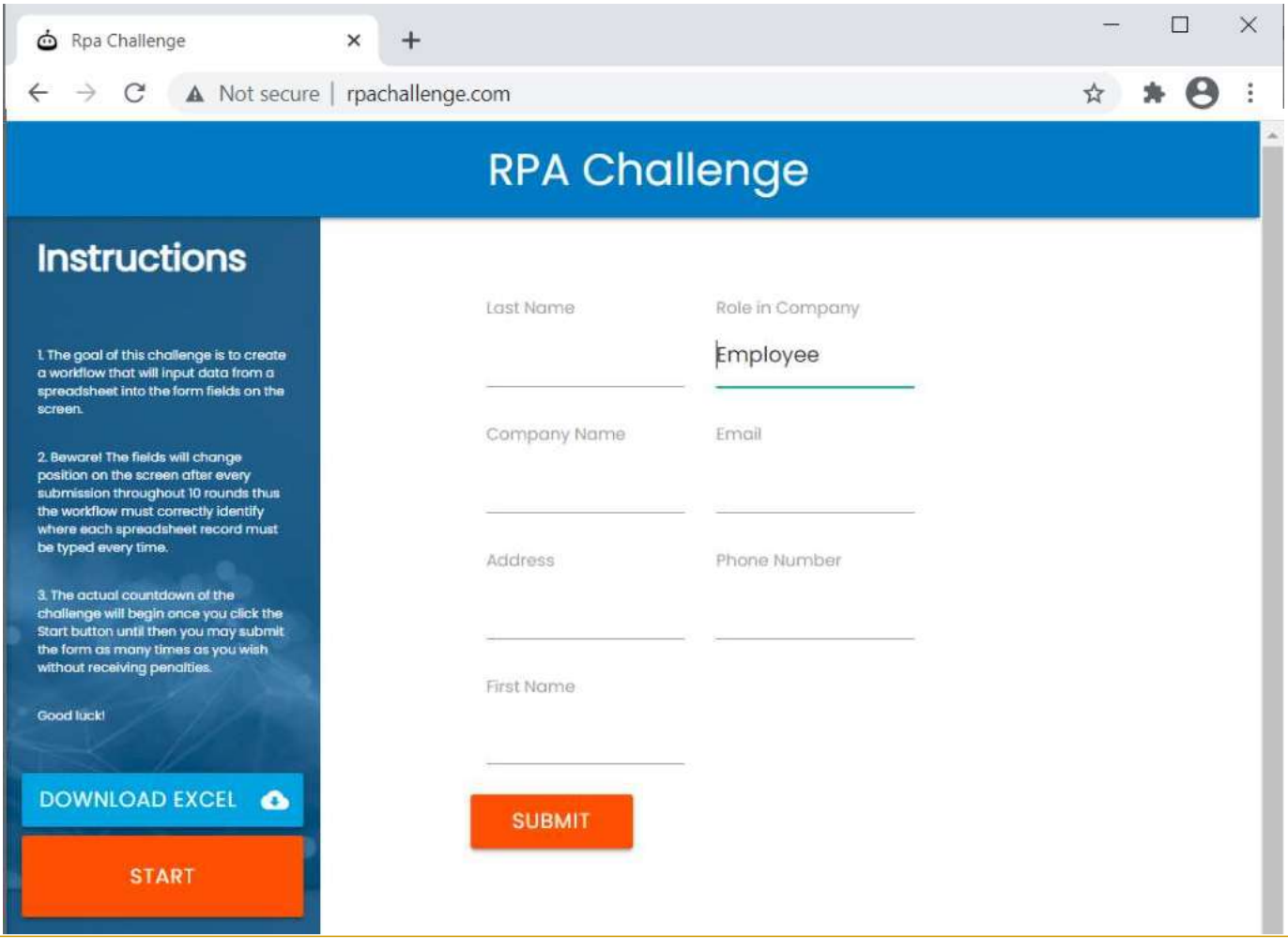


4.There are two activities that we have to supply to the Anchor base control: Anchor and action activities. Drag and drop the Anchor base activity (for example; Find Element activity) in the Anchor field and Action activity (for example; Type into) in the Drop Action Activity Here field of the Anchor base control.

ame.

7.Hit the run button.

Output:

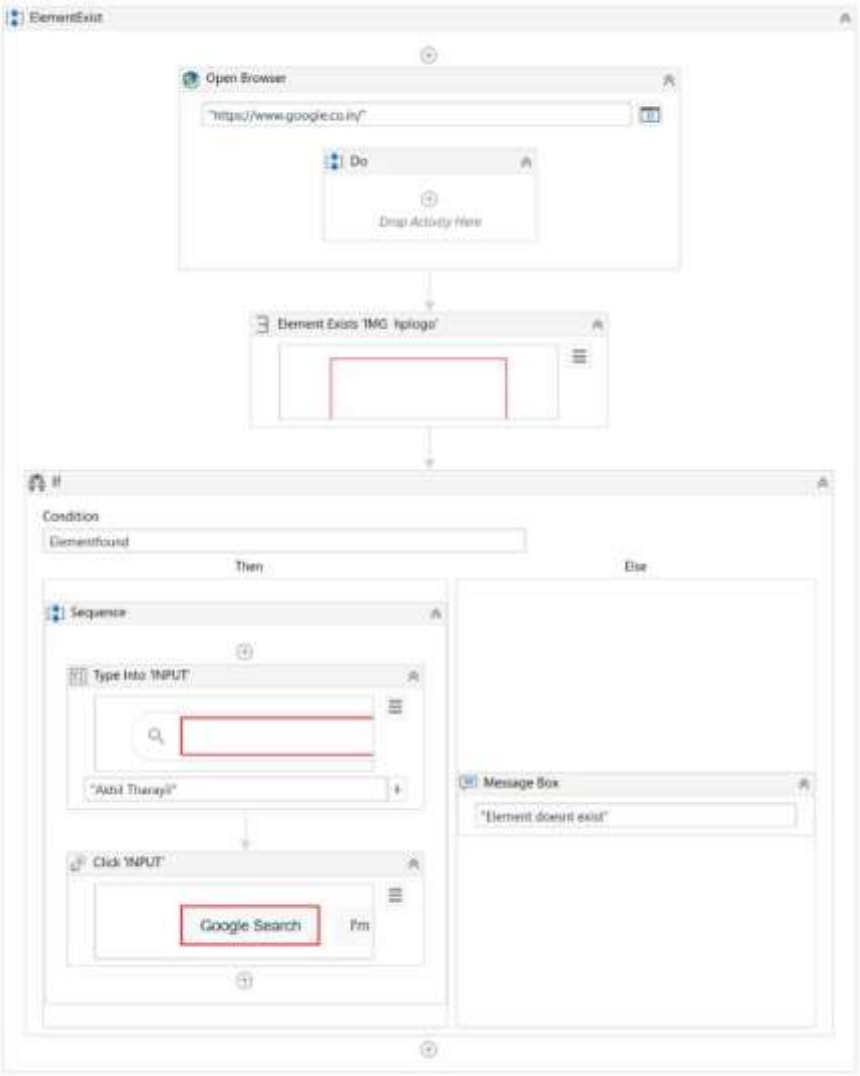


2. Element Exists.

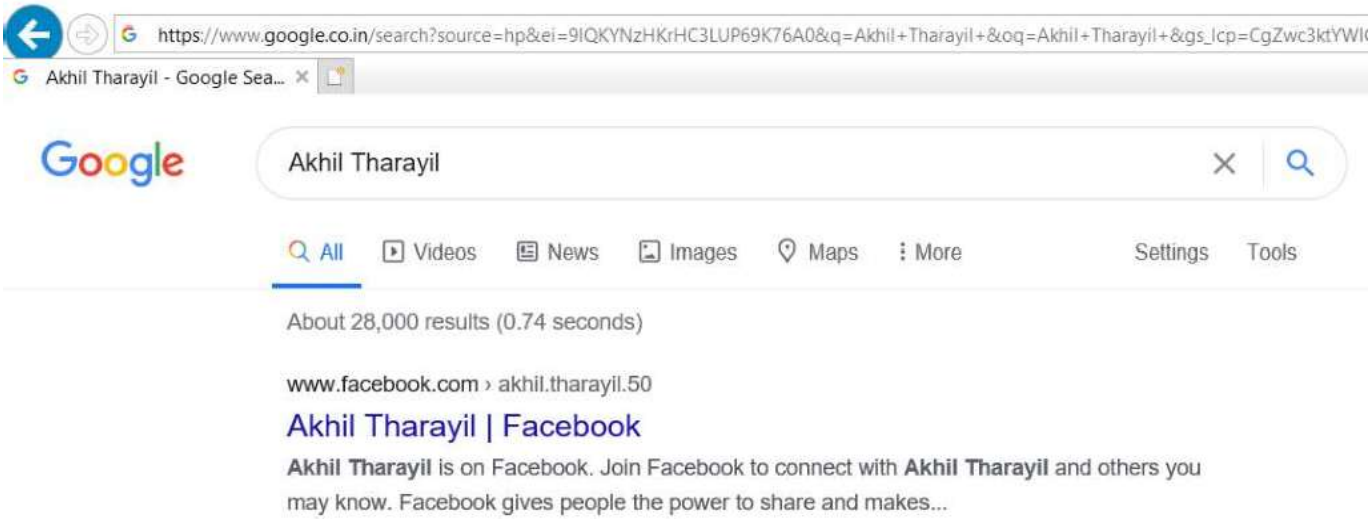
1. Drag and drop sequence activity into the designer panel.
2. Drag and drop **open browser activity** into the sequence. Give URL as https://www.google.co.in/.

3.Below that drag and drop the **Element Exist activity.** logo of "google".
In properties, define Output>Exists:Elementfound (By ctrl+k in order to create variable, which is shown in the figure)

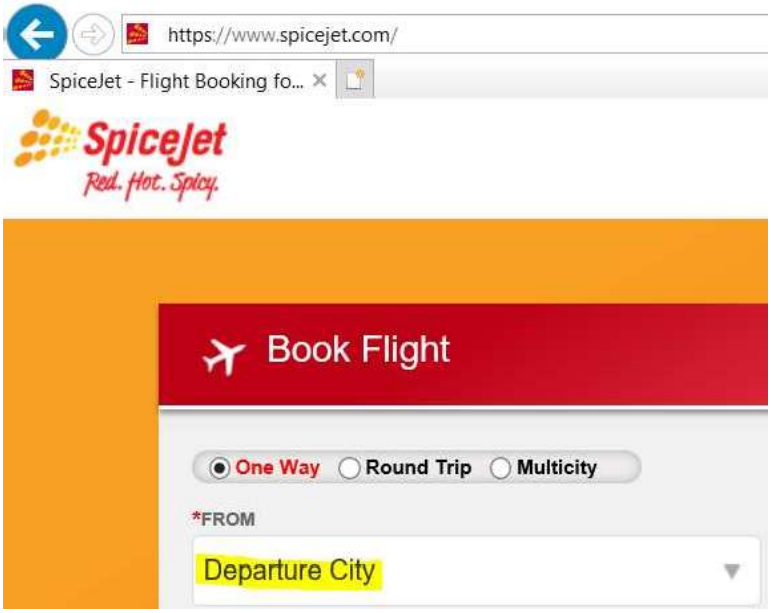
4.Now drag and drop **if activity** below the Element exist activity. In Condition type **Elementfound**. In **Then** section drag and drop the **Type into activity.** screen, click on the search bar and type "Akhil Tharayil". Below that drag and drop the **click activity.** ick on "google search button". Now in else section drag and drop the **message box.** element doesn't exist



5. Now hit the run button.
Output:

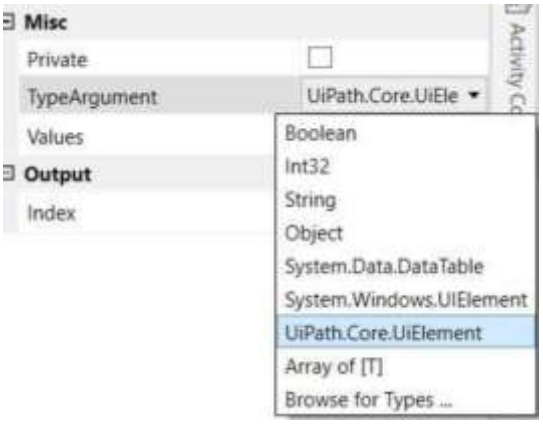


3. `Element scope`
actions on it.
•You can use a bunch of actions within a single UI element.
4. `Find Children`
1. Goto https://www.spicejet.com/ in the browser.

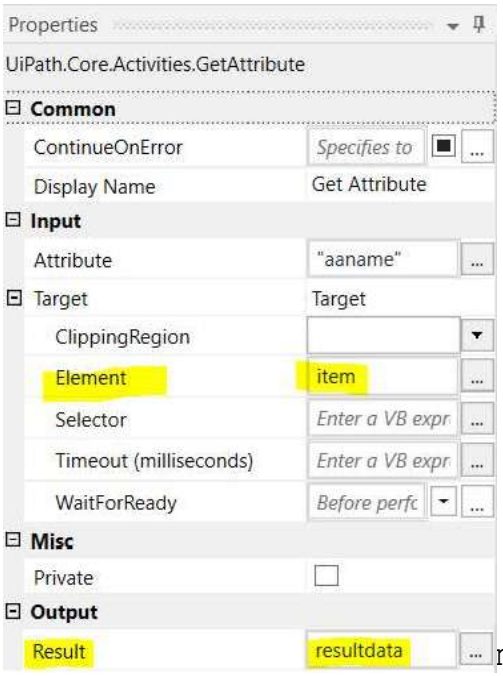


2. Drag and drop the flowchart into the designer panel.
3. Now drag and drop the **Find Children** Activity below the START. At Indicate on screen click on "Departure City".
In properties> children:Places.(creating variable using ctrl+k)

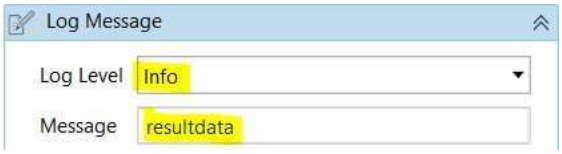
4.Drag and drop the **For Each** Activity. Double click on it. Type ForEach "item" in "**Places**". Now in Properties do the changes. Type argument:**UiPath.Core.UiElement** (in order to get that click on "Browse on types" and search for it)



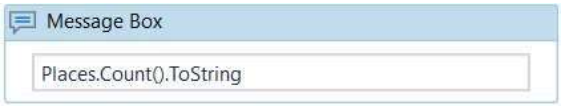
Now drag and drop the **get attribute** to the Body. Now do the changes in the properties. Also create the output as resultdata.(using ctrl +k to create variable)



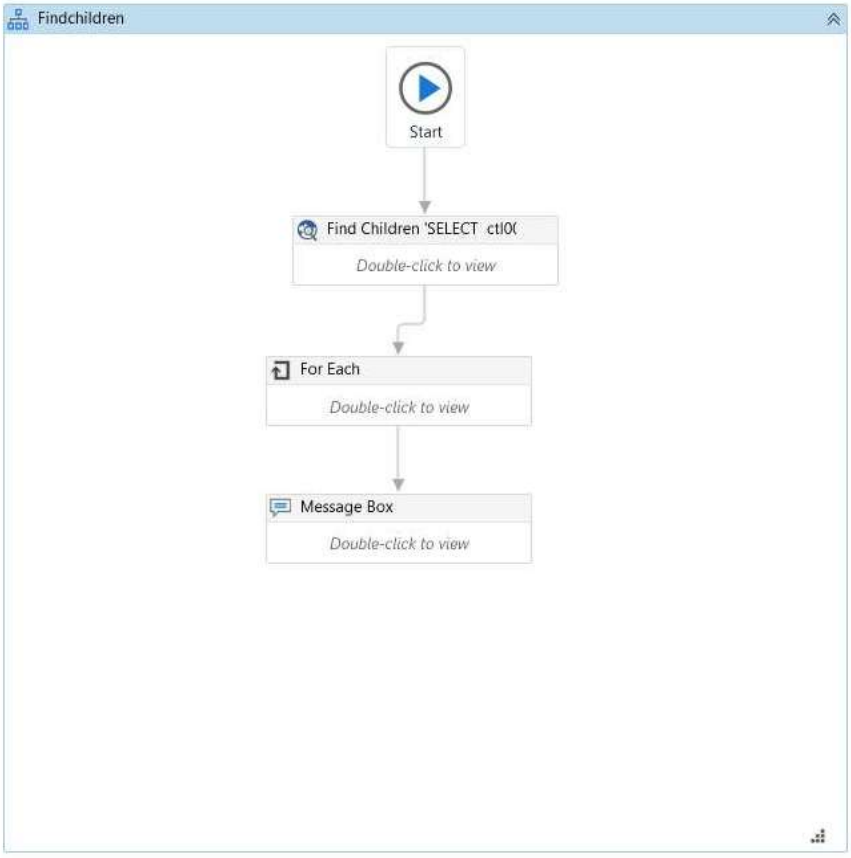
message below the get attribute.



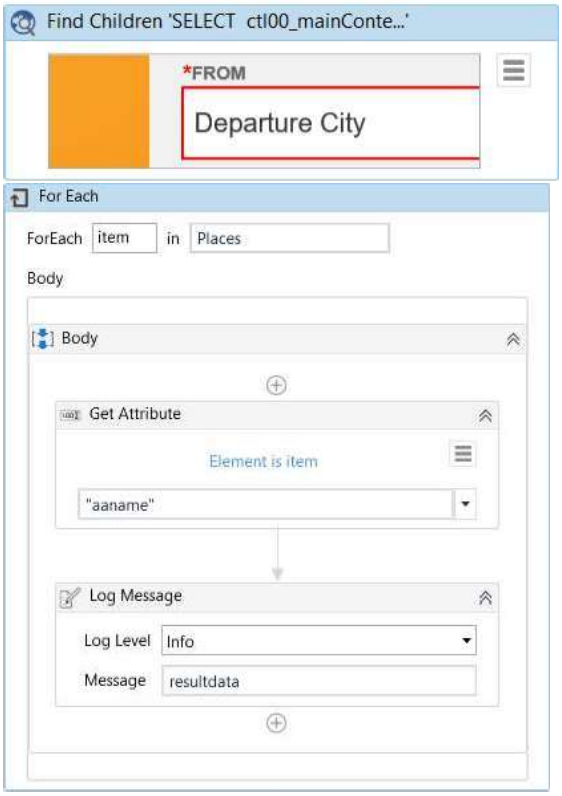
5. Finally Drag and drop the **message box** activity below **foreach** activity. Double click on it. Type Places.Count().ToString



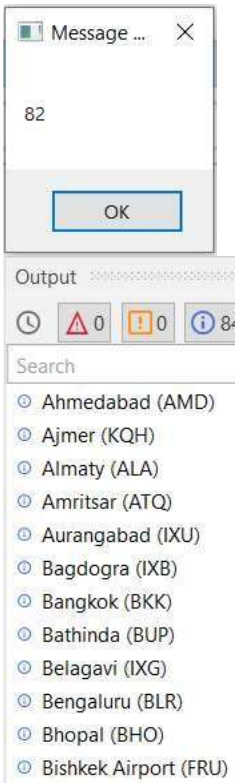
6.Hit the run button.



Inside look of each activity present in flowchart.



Output:

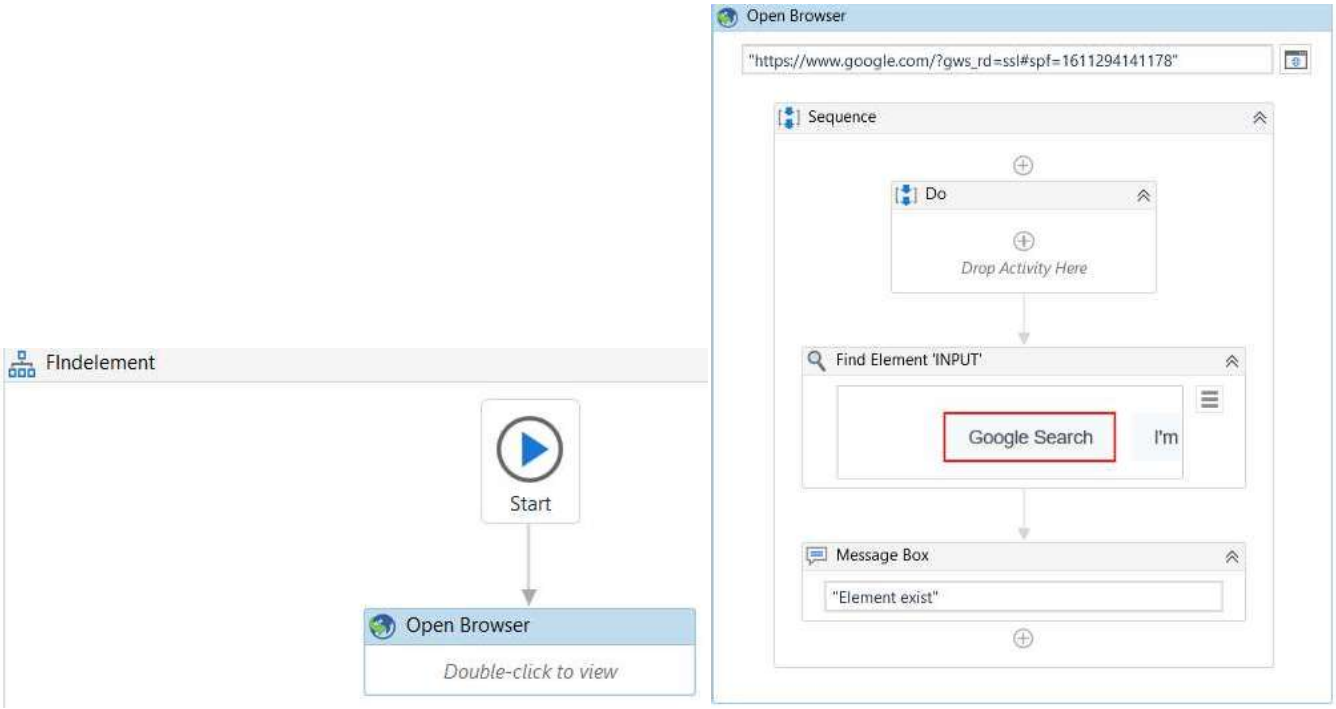

Message ...
82
OK
Output
0
0
Search
Ahmedabad (AMD)
Ajmer (KQH)
Almaty (ALA)
Amritsar (ATQ)
Aurangabad (IXU)
Bagdogra (IXB)
Bangkok (BKK)
Bathinda (BUP)
Belagavi (IXG)
Bengaluru (BLR)
Bhopal (BHO)
Bishkek Airport (FRU)

6.Find Element

1. Drag and drop the flowchart to the designer panel.
2. Now drag and drop the **open browser** activity. Give the url as https://www.google.com/?gws_rd=ssl#spf=1611294141178. Drag and drop the **Find Element** activity. In Properties>Output, **FoundElement:element**(using ctrl+k for creating the variable)

Below **Find Element** Activity drag and drop the **message box** activity. Type as “Element exists”.

3. Hit the run button



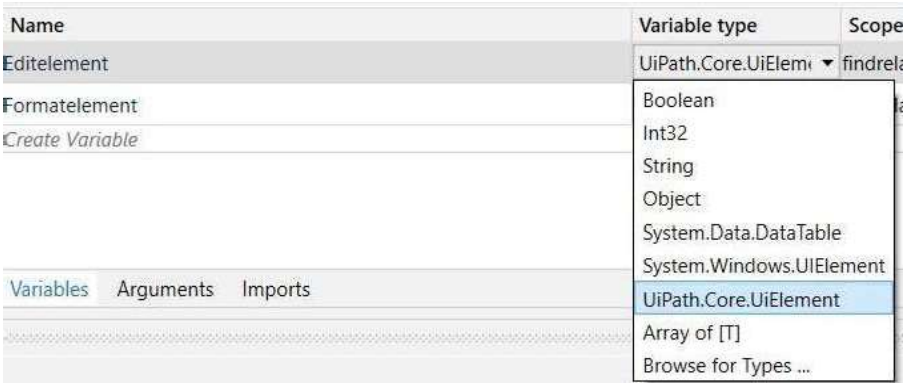
Output:

7.Find Relative Element

1. Drag a Sequence container in the Workflow Designer.

Create the following variable:

Name	Variable type	Scope	Default
Editelement	UiElement	findrelativeelement	Enter a VB expression
Formatelement	UiElement	findrelativeelement	Enter a VB expression



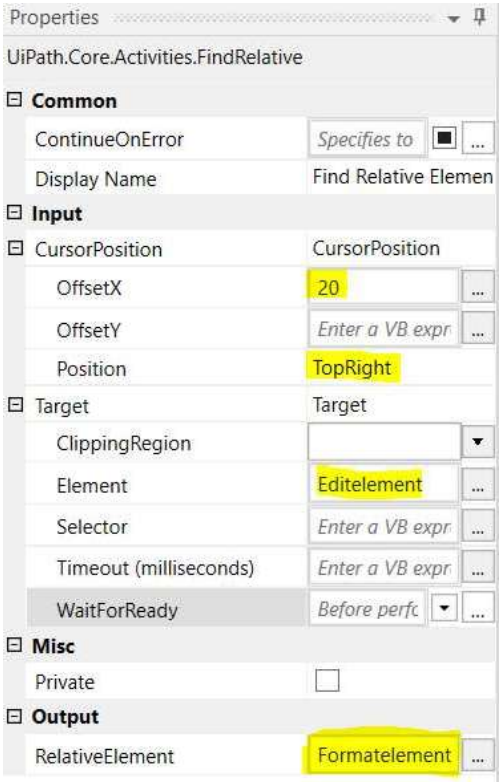
2. Drag an **OpenApplication** activity inside the Sequence container. Inside the activity, click the Indicate window on screen option. Then you can select the Notepad window.

3. Drag a Find Element activity below the **OpenApplication** activity. Inside the activity, click the Indicate window on screen option. Then you can select the "Edit" option in the notepad.

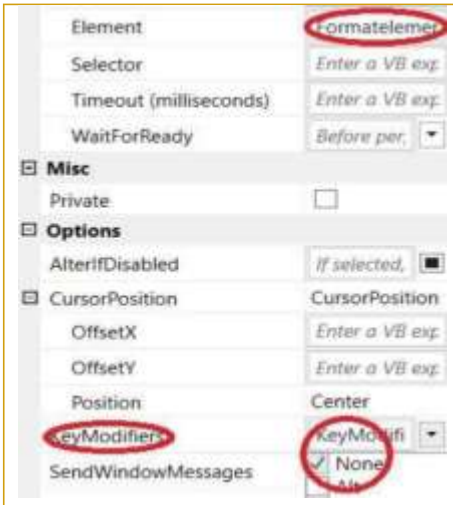
-In the Properties panel, select the COMPLETE option from the WaitForReady drop-down list.

- Add the variable EditElement in the FoundElement field.

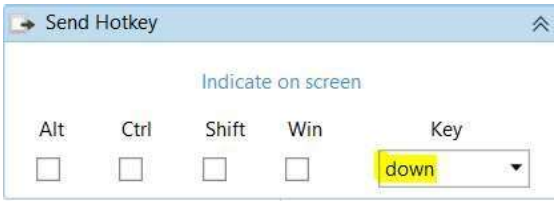
4. Place a Find Relative activity below the Find Element activity.
-In the Properties panel, add the value 20 in the OffsetX field.
-Select the option TopRight from the Position drop-down list.
-Add the variable Editelement in the Element field.
-Add the variable Formatelement in the RelativeElement field.



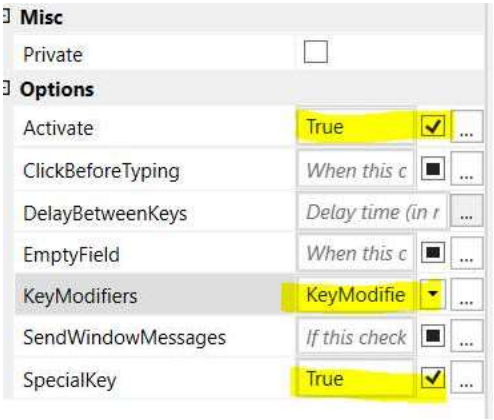
5. Place a Click activity below the Find Relative activity.
-In the Properties panel, add the variable FormatElement in the Element field.
-Select the None option from the KeyModifiers drop-down list.



6. Place another Click activity below the first Click activity.Inside the activity, click the Indicate on screen option.Click on "font" (Using f2 button).
7. Drag an Activate activity below the Click activity. Inside the activity, click the Indicate on screen option. Click on entire font window.
8. Place a Set Focus activity below the Activate activity. Inside the activity, click the Indicate on screen option, and select the Size menu option from font window of the notepad.
9. Drag a Send Hotkey activity below the Set Focus activity.
-In the Key field, type the value down.



-In the Properties panel, select the check box for the Activate option. This option brings the UI element to the foreground and activates it before the text is written.
-Select the None option from the KeyModifiers drop-down list.
-Select the check box for the SpecialKey option. This indicates that you are using a special key in the keyboard shortcut.



10. Place a Click activity below the Send Hotkey activity. Inside the activity, click the Indicate on screen option. Click on OK button of the font window of notepad.
11. Run the process. The automation opens a new Notepad file, navigates through the menu and changes the font size.

8.Get ancestor

•This control is used to retrieve the ancestor of the specified UI element.

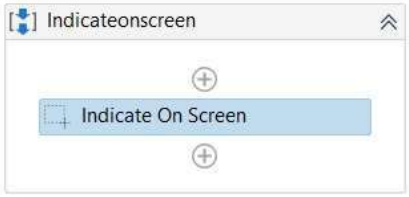
•You have to supply a variable to receive the ancestor element as output. You can specify the variable name in the **Ancestor** property of the **Get ancestor** control.

•After receiving the ancestor element, you can retrieve its attributes, properties, and so on for further analysis.

9. Indicate on screen

1.Drag and drop the **sequence activity** into the designer plane.

2.Place **indicate on screen** into the **sequence** activity.

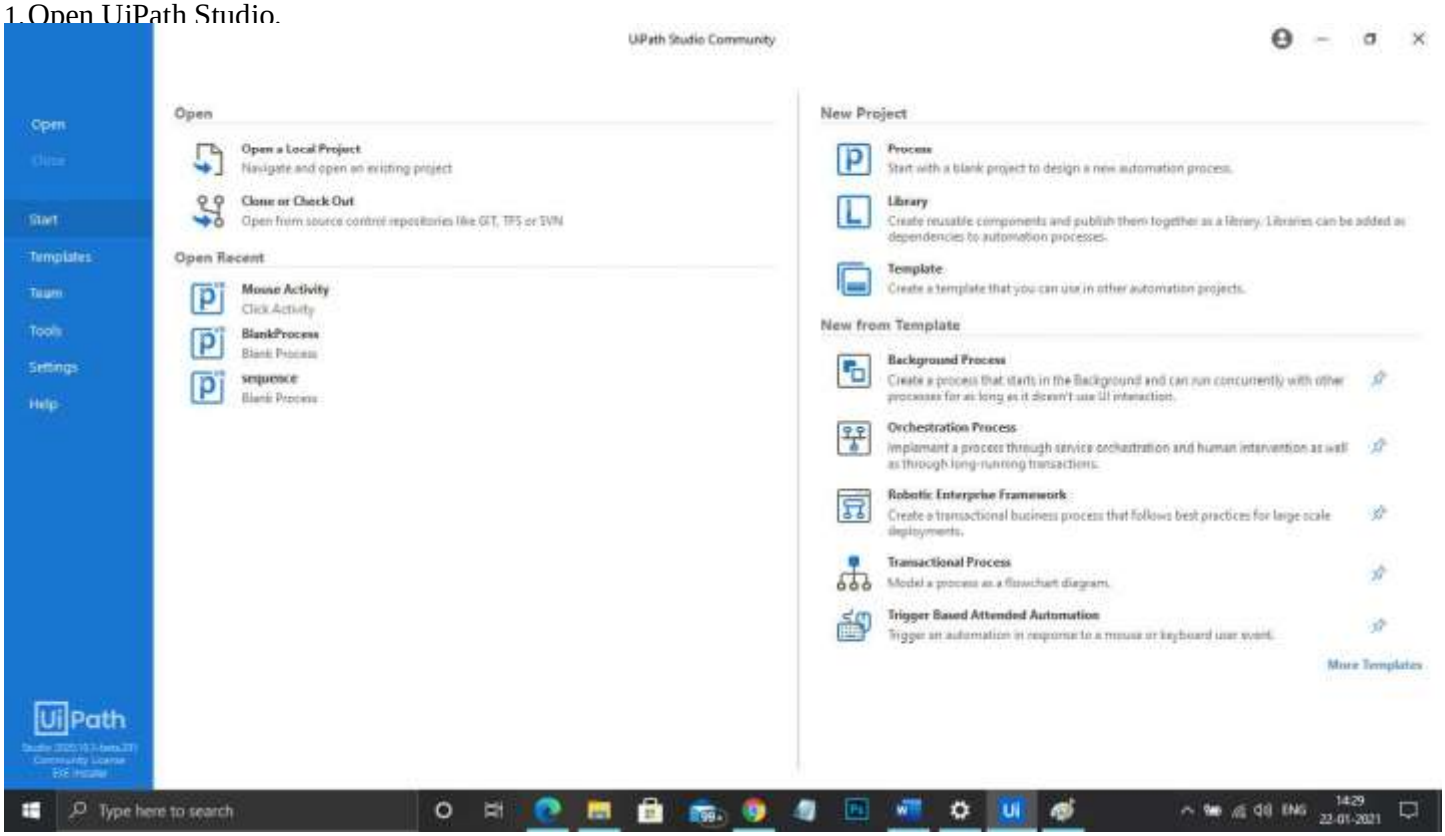


c. Demonstrate the following activities in UiPath:

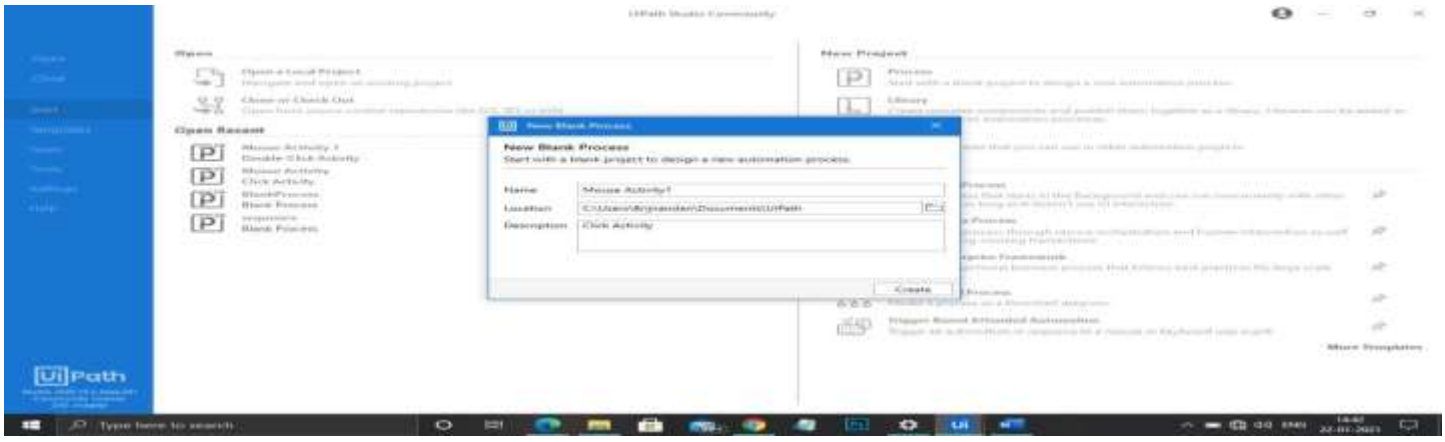
i. Mouse (click, double click and hover)
ii. Type into
iii. Type Secure text

Click Activity

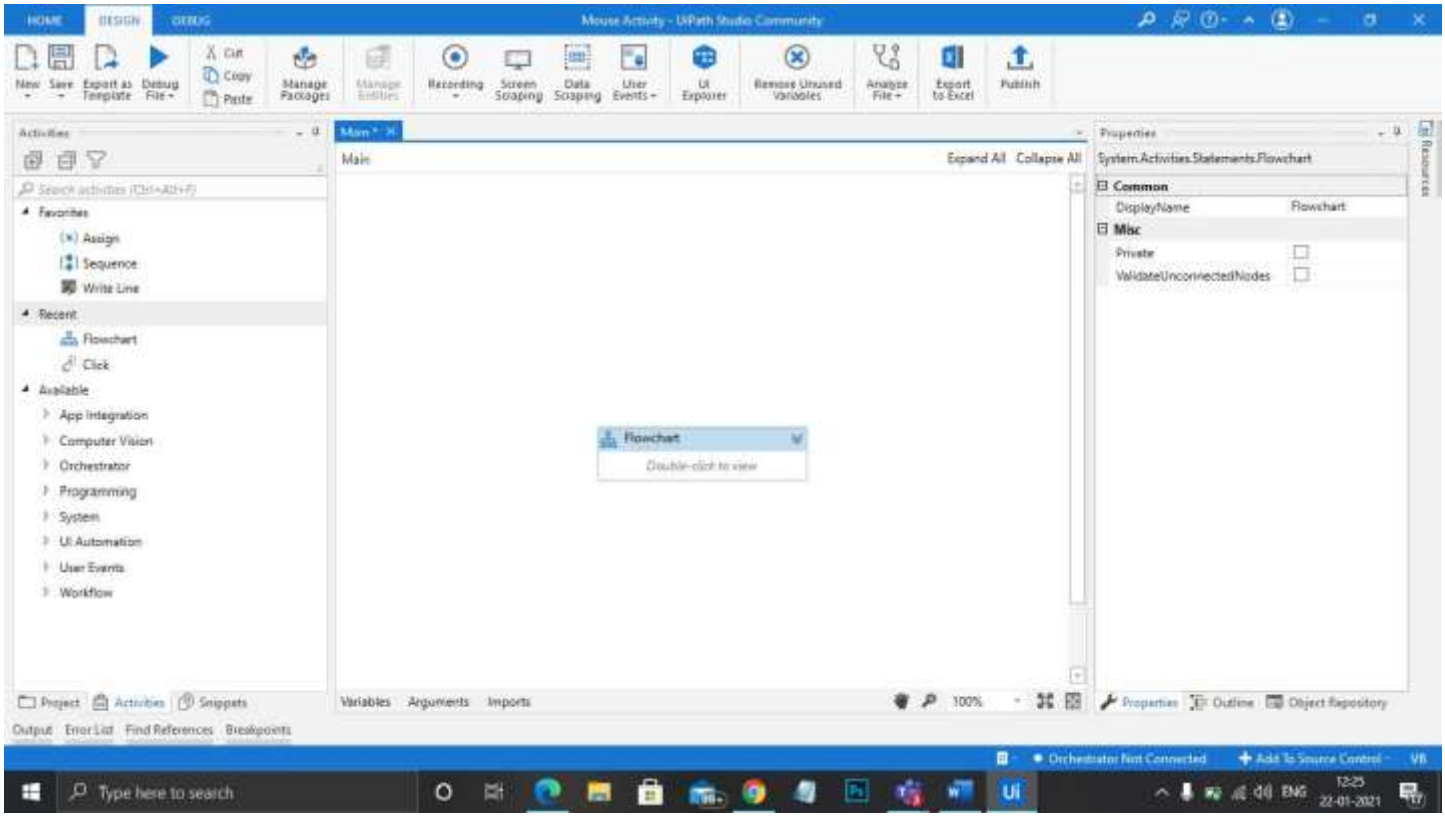
1.Open UiPath Studio.

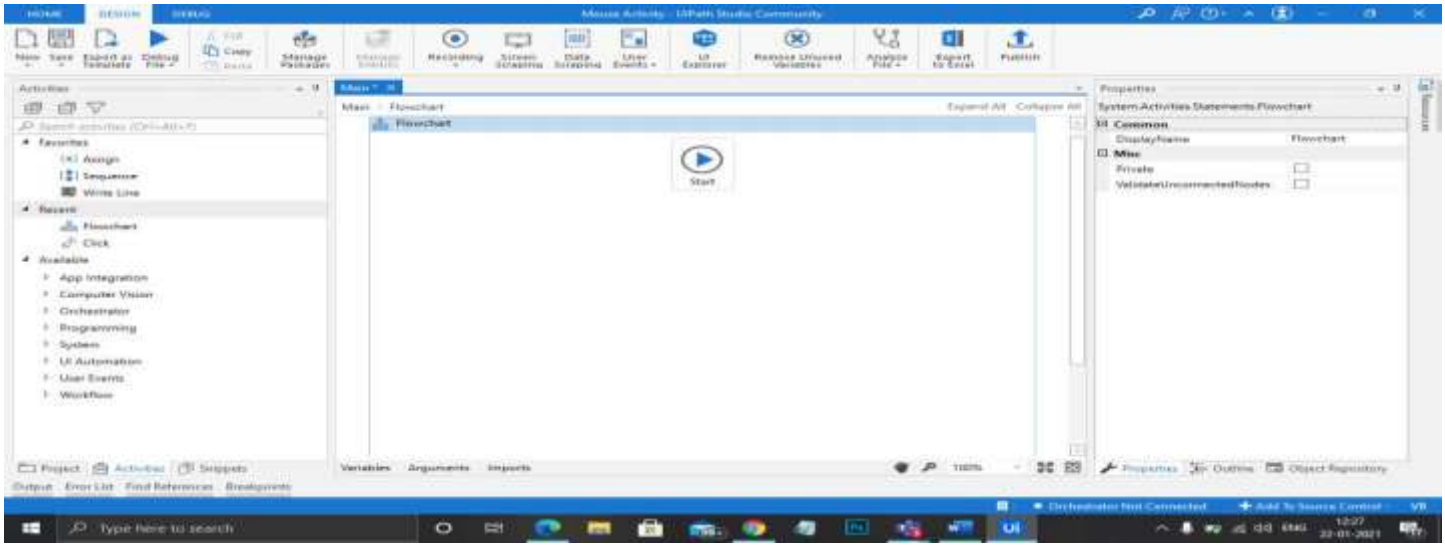


Click on Process

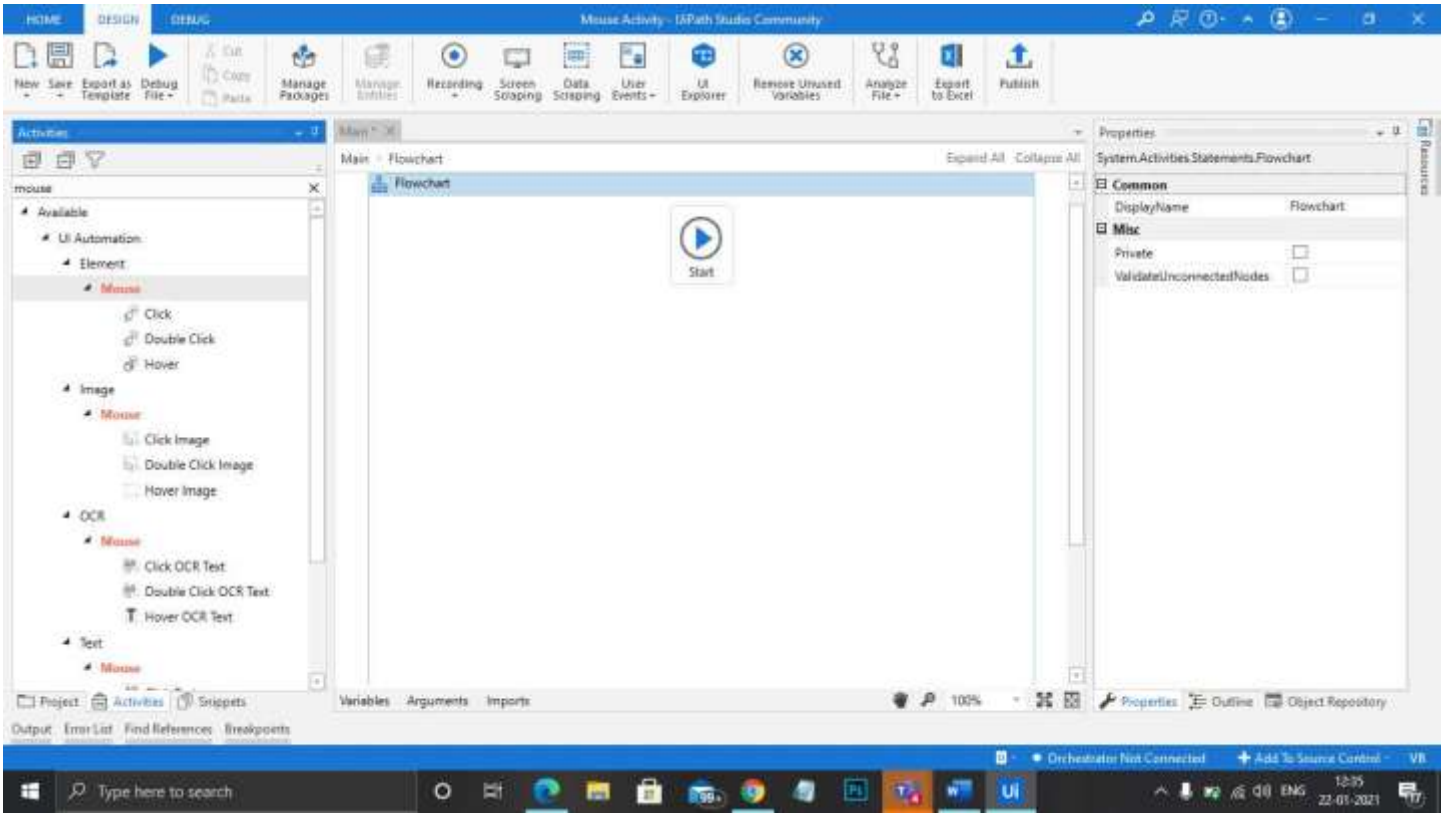


Click on Workflow and Drag Flow Chart from Activities panal

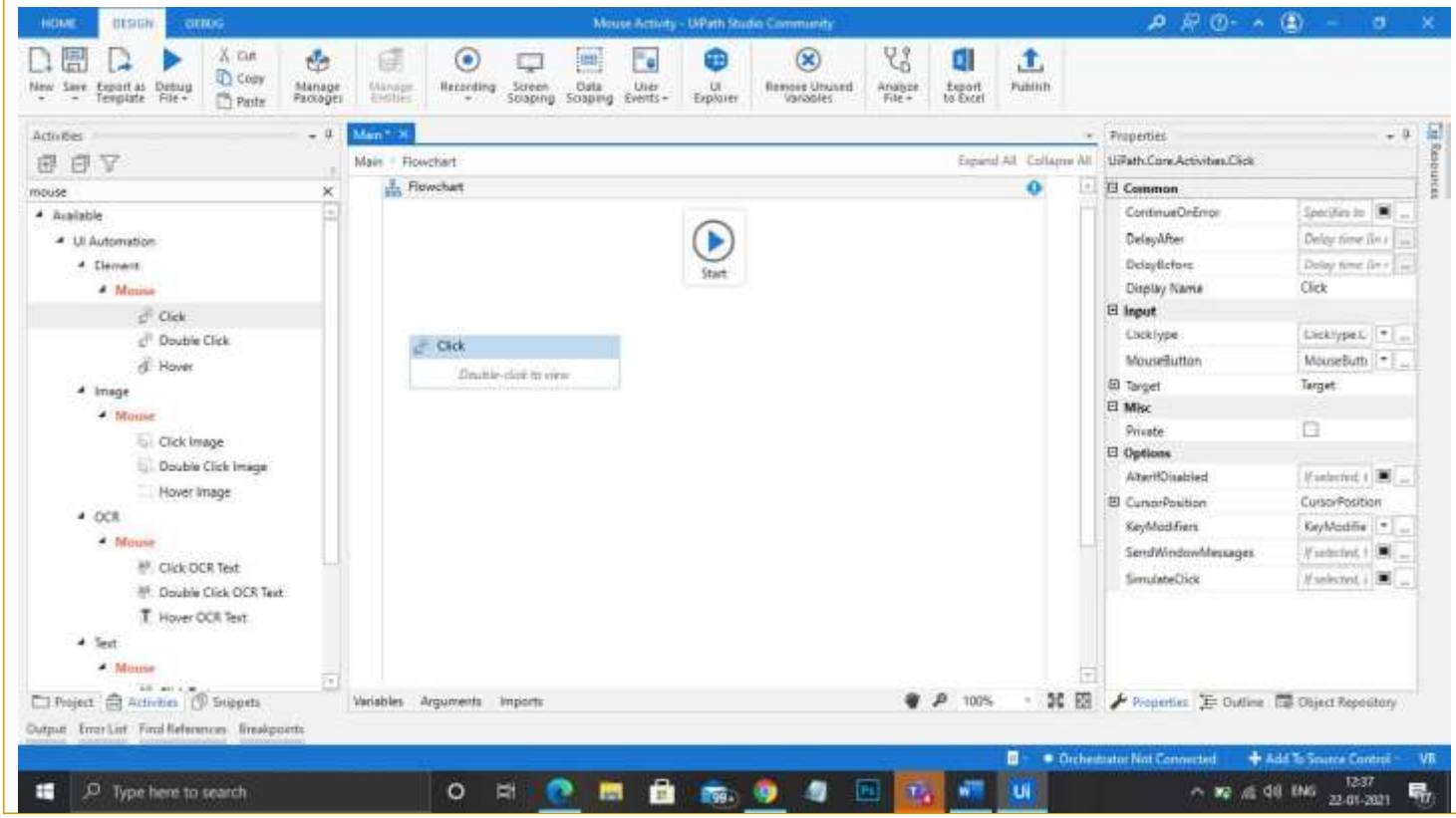




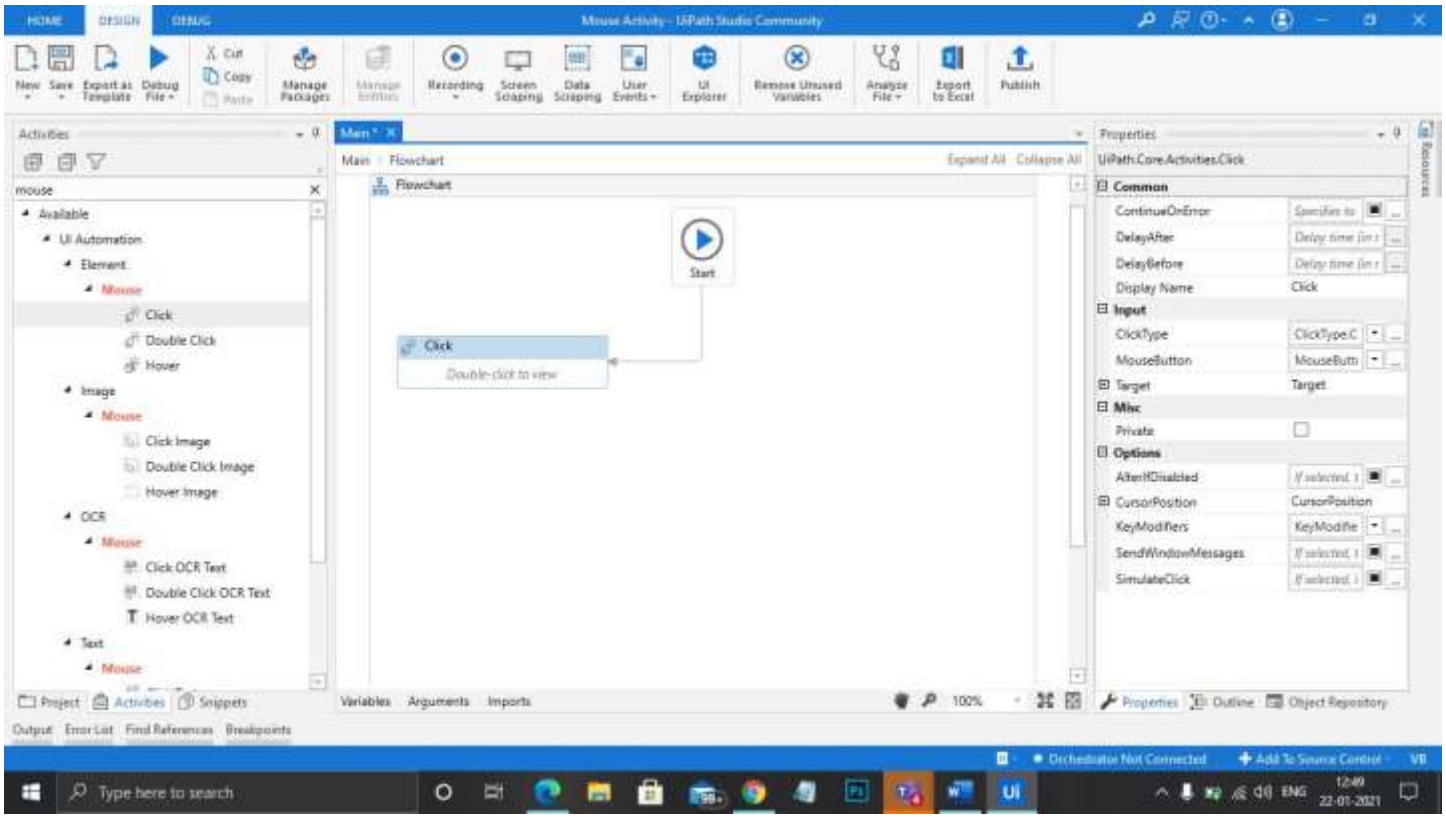
Now Go to the Activities Panel and Search For Mouse .



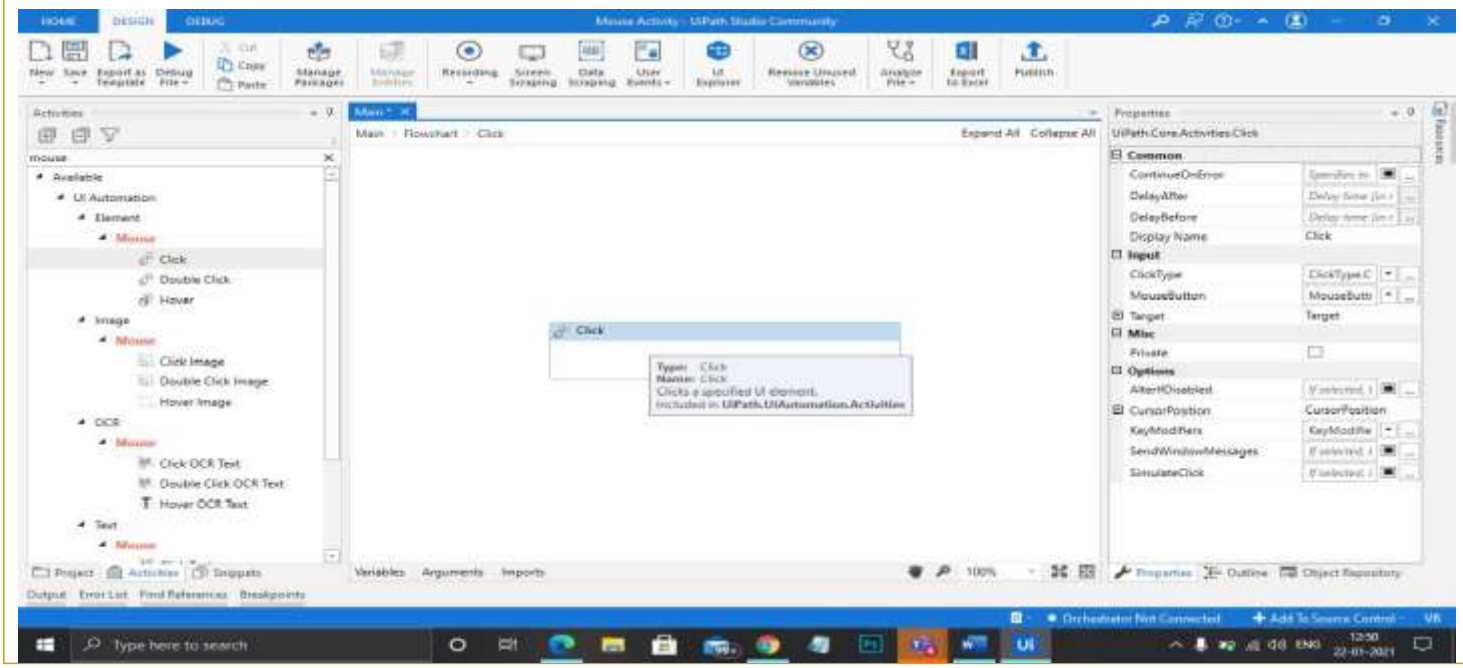
Drag and drop the Click activity



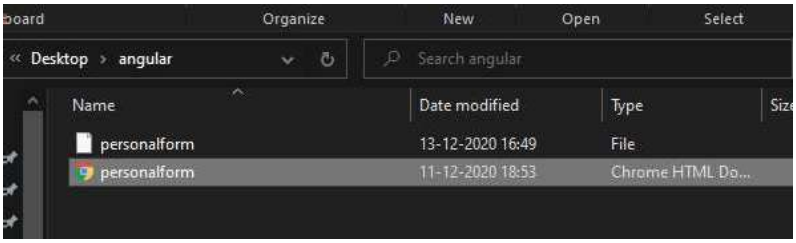
Set Click Activity as Start Node

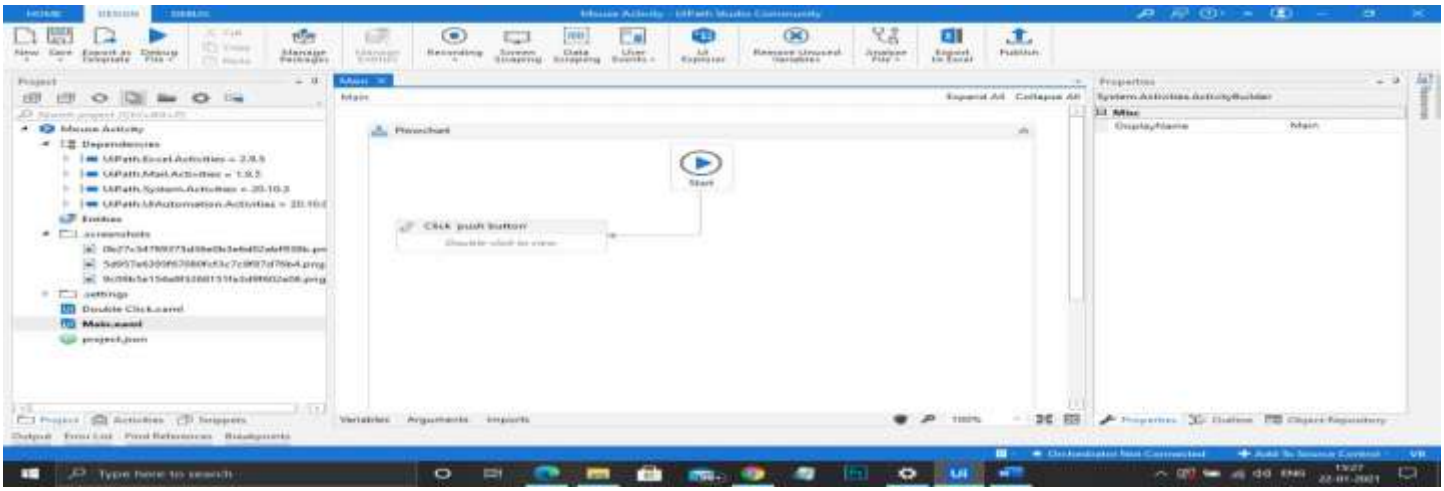


Double click on the Click activity.

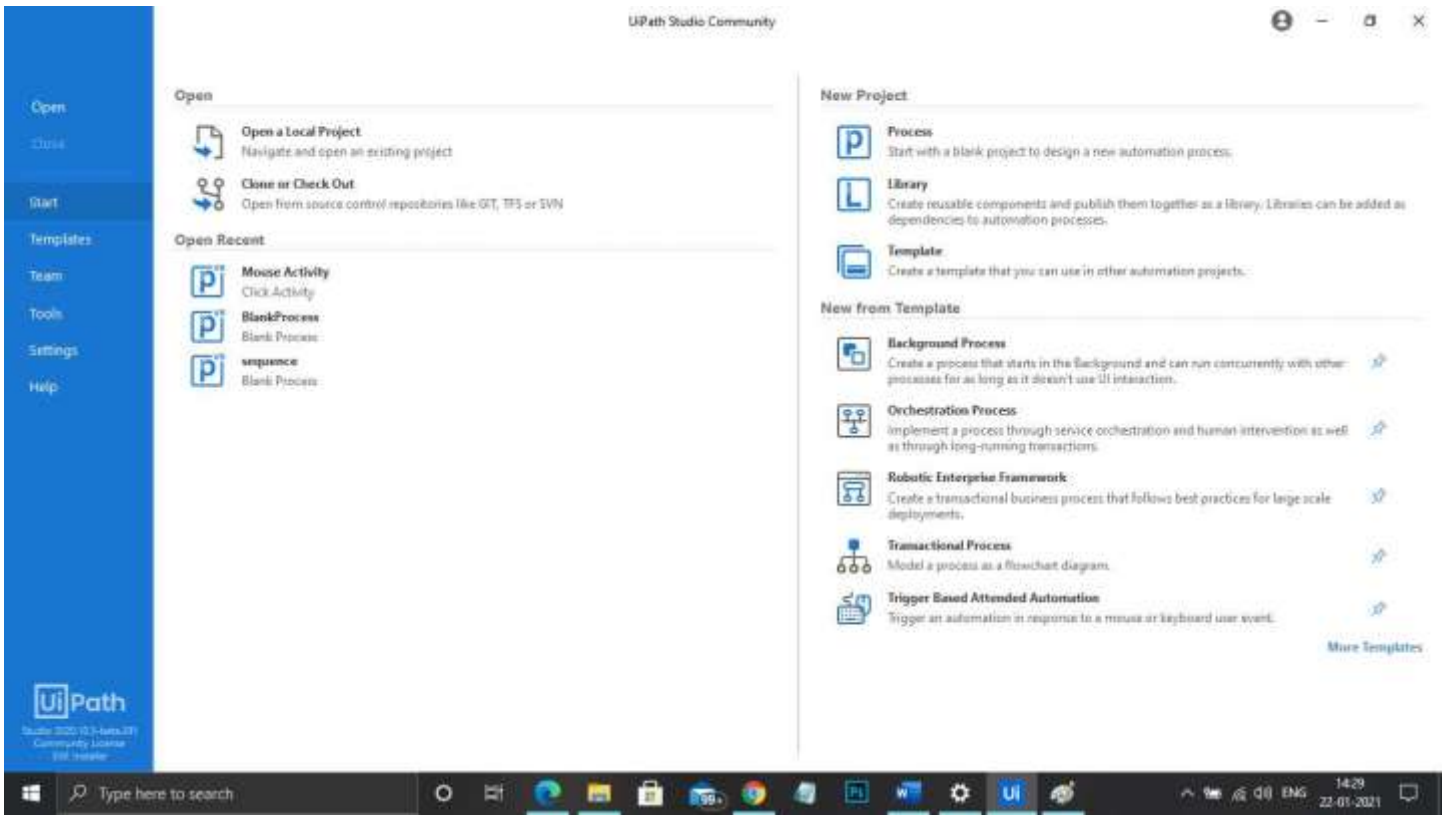


Click on Indicate on screen and indicate the UI element you want to click on. And Now Click On Run.

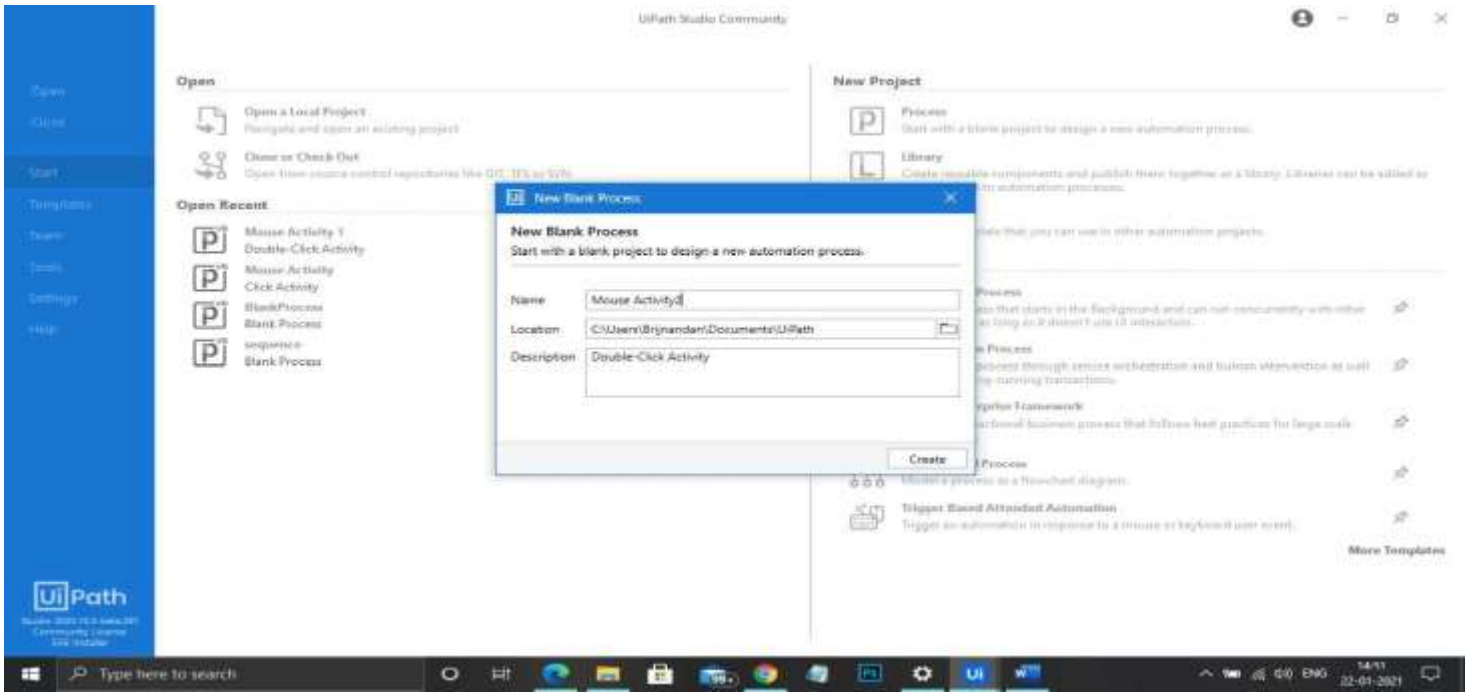




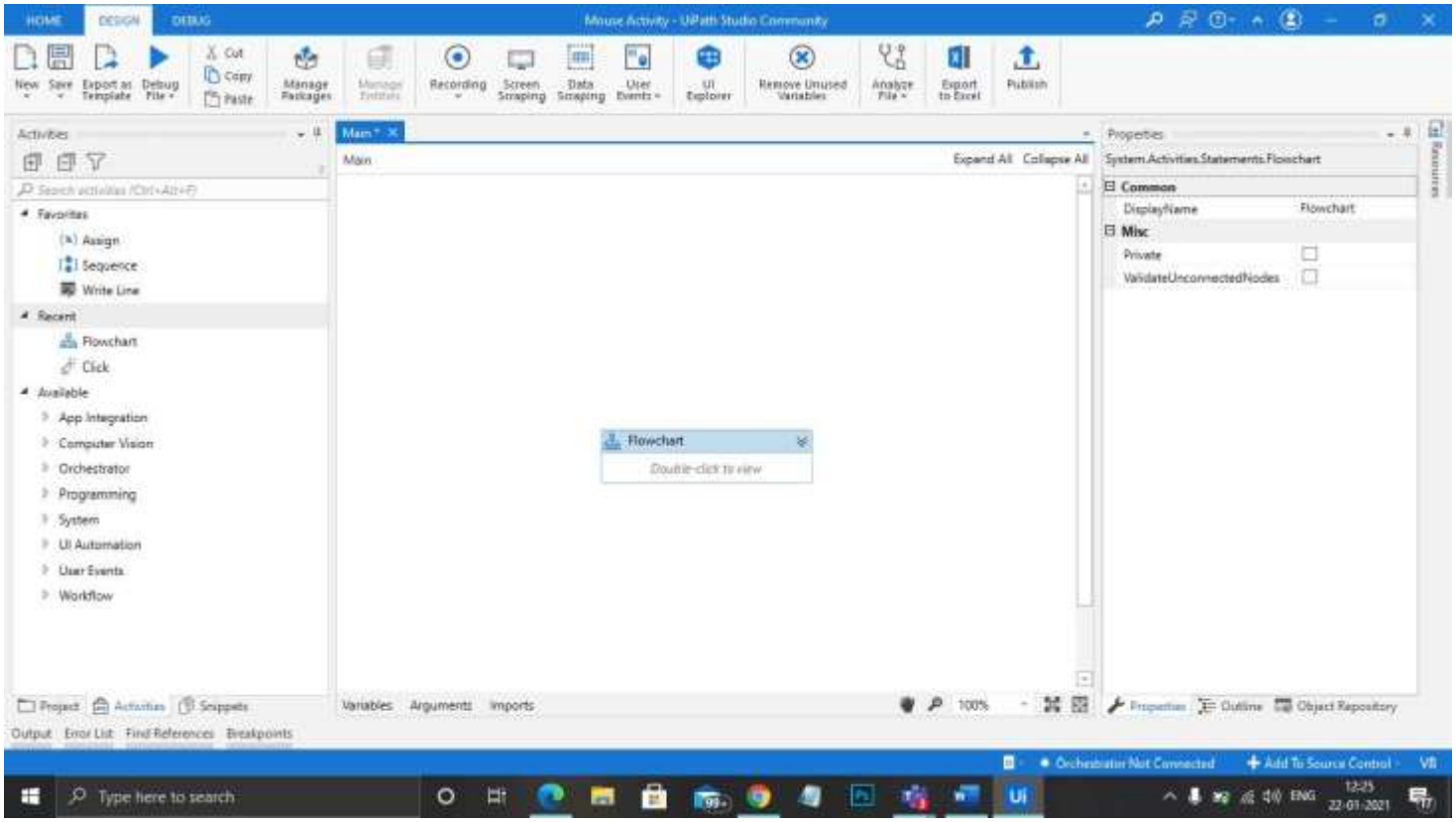
2. Double-Click Activity
Open UiPath Studio.



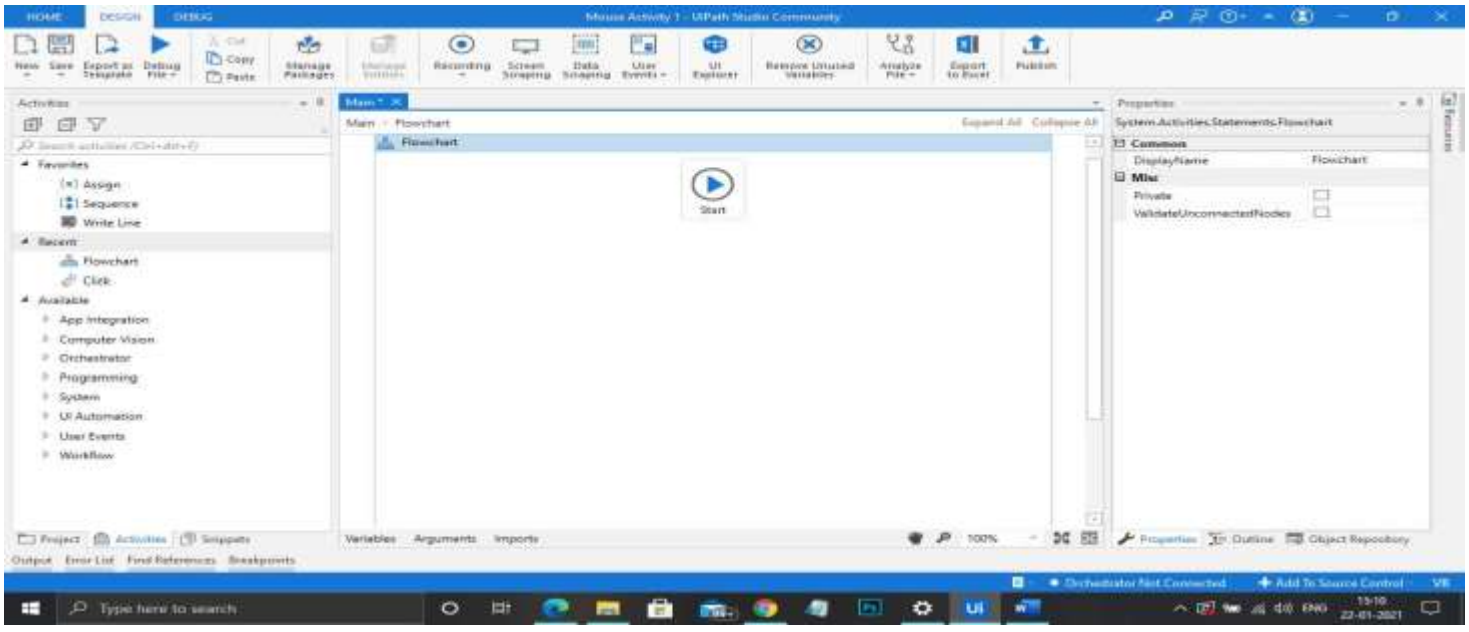
Click on Process

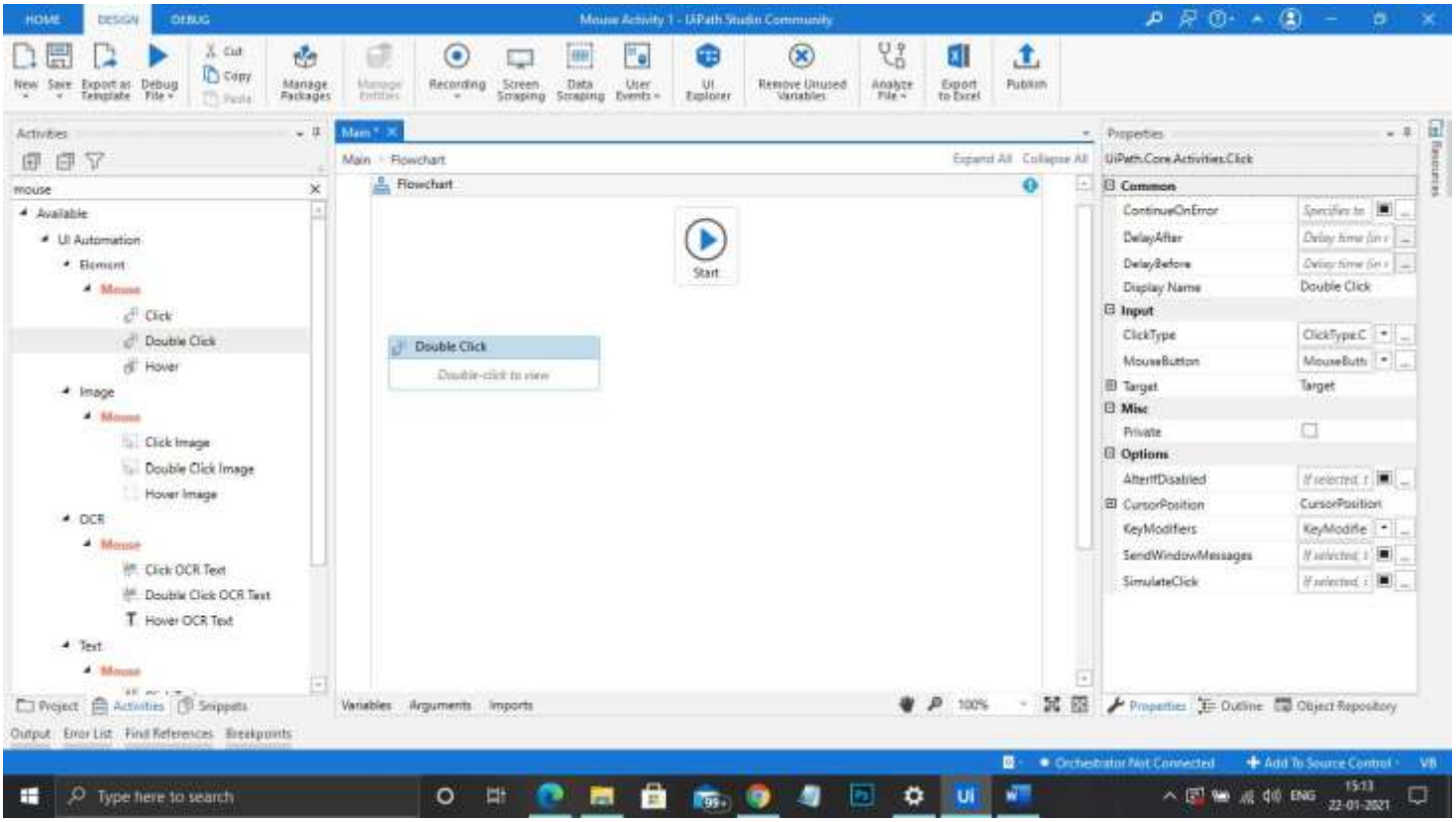


Click on Workflow and Drag Flow Chart from Activities panal.

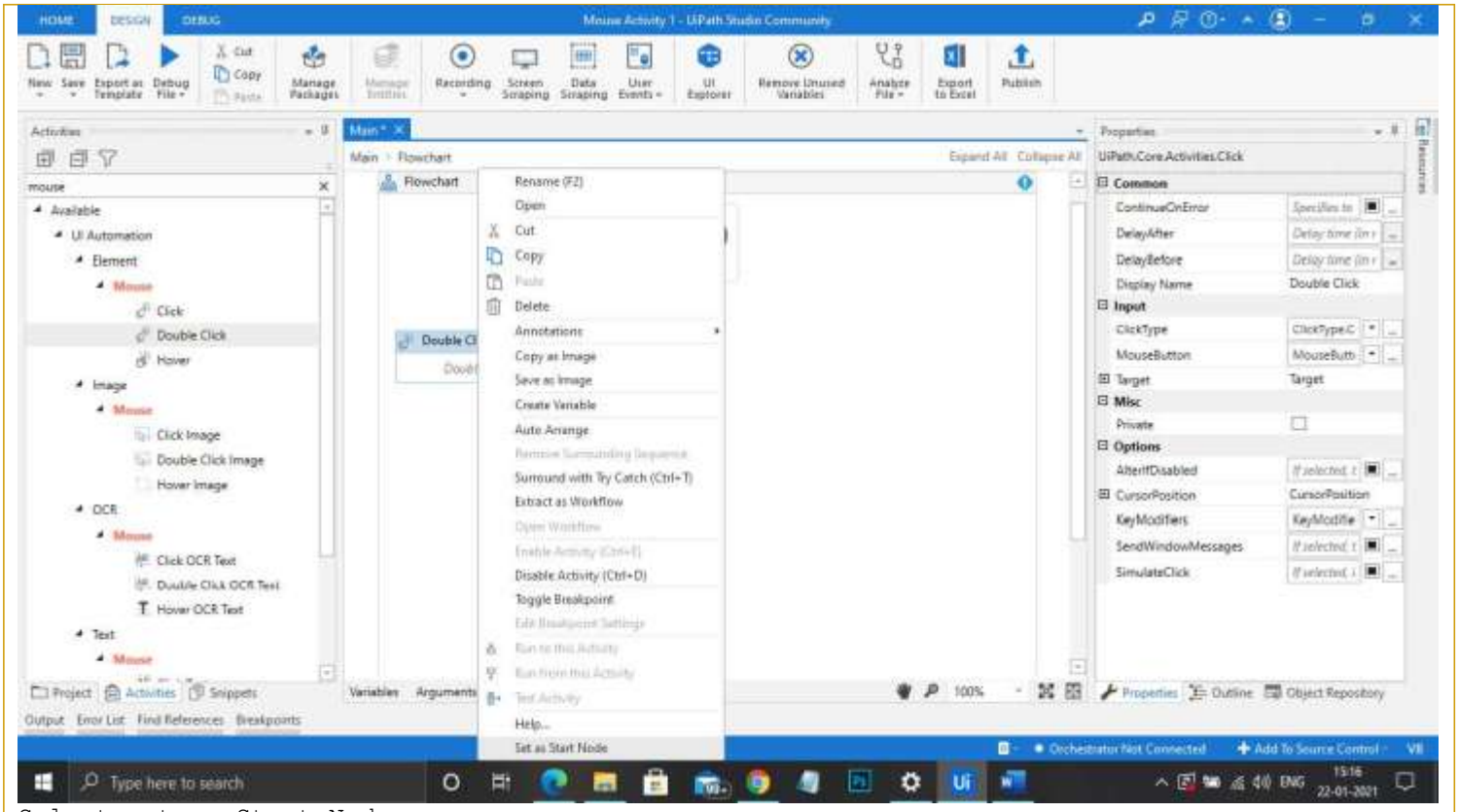


Double click on Flow ChartSearch



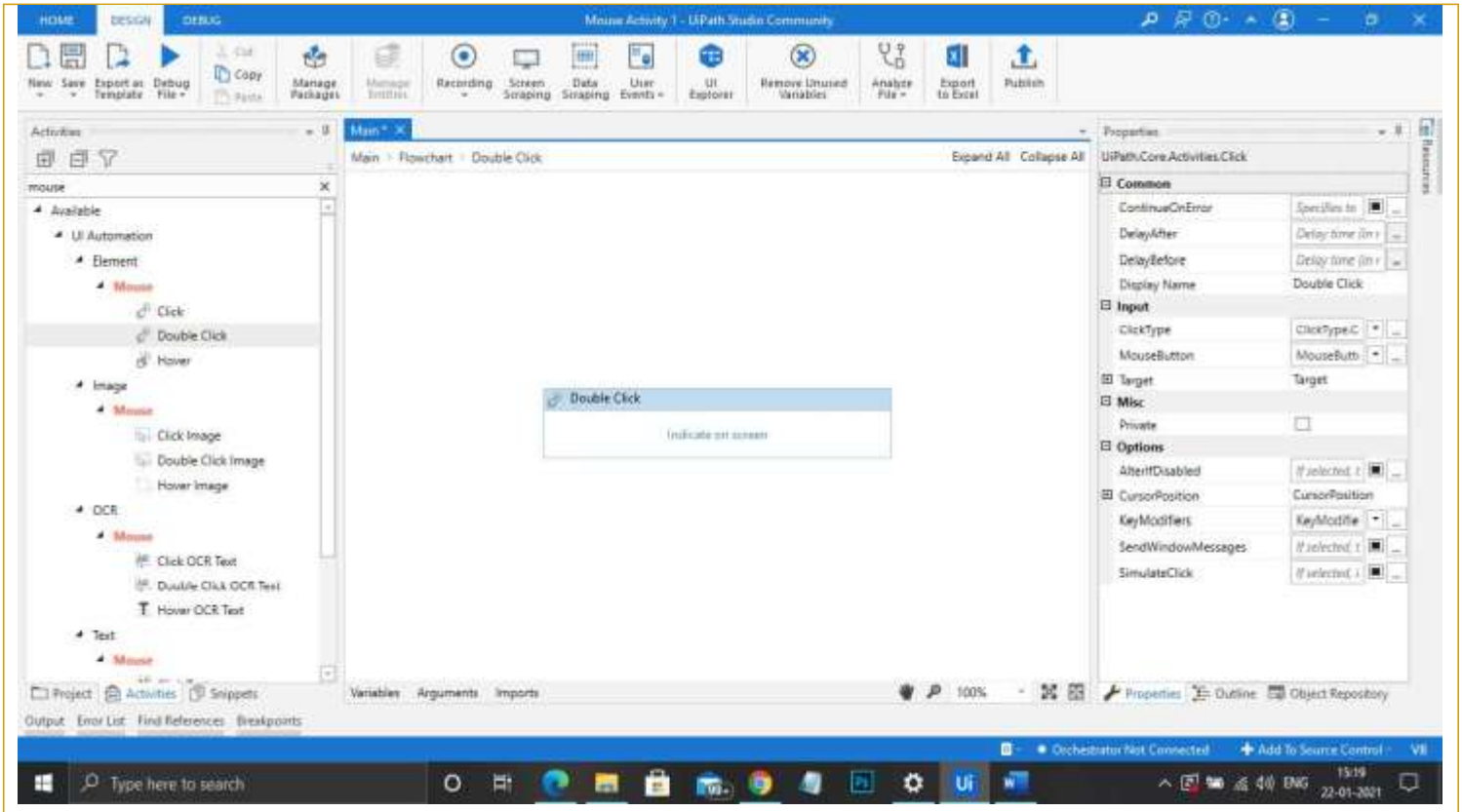


Right Click on Double-Click Box.

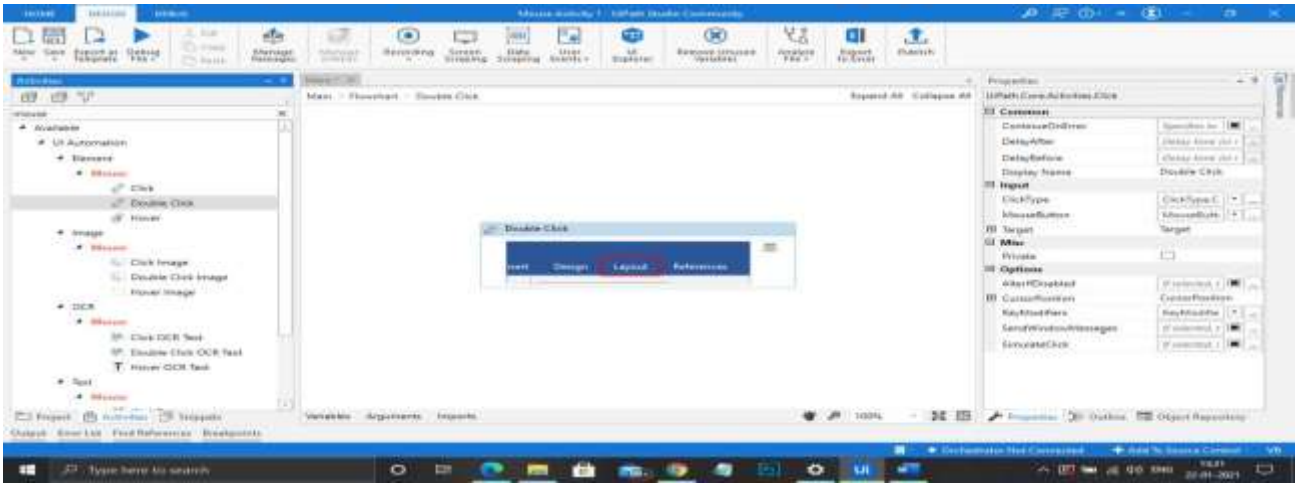


Select set as Start Node.

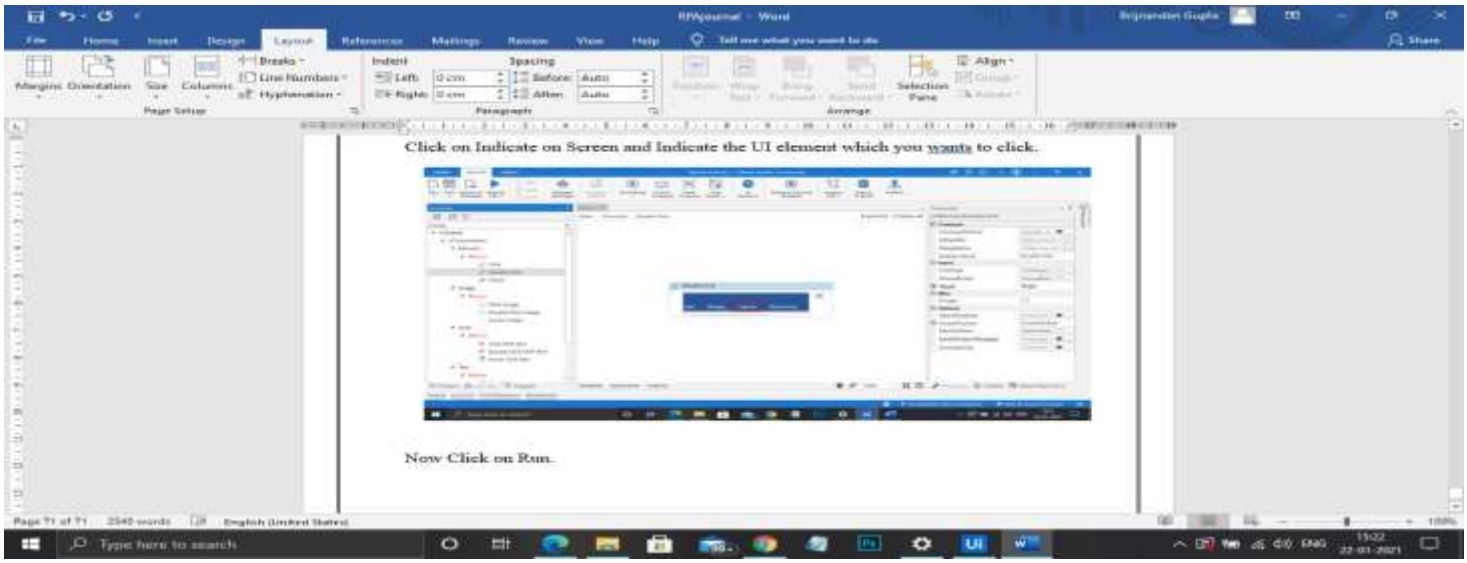
Double click on Double Click box.



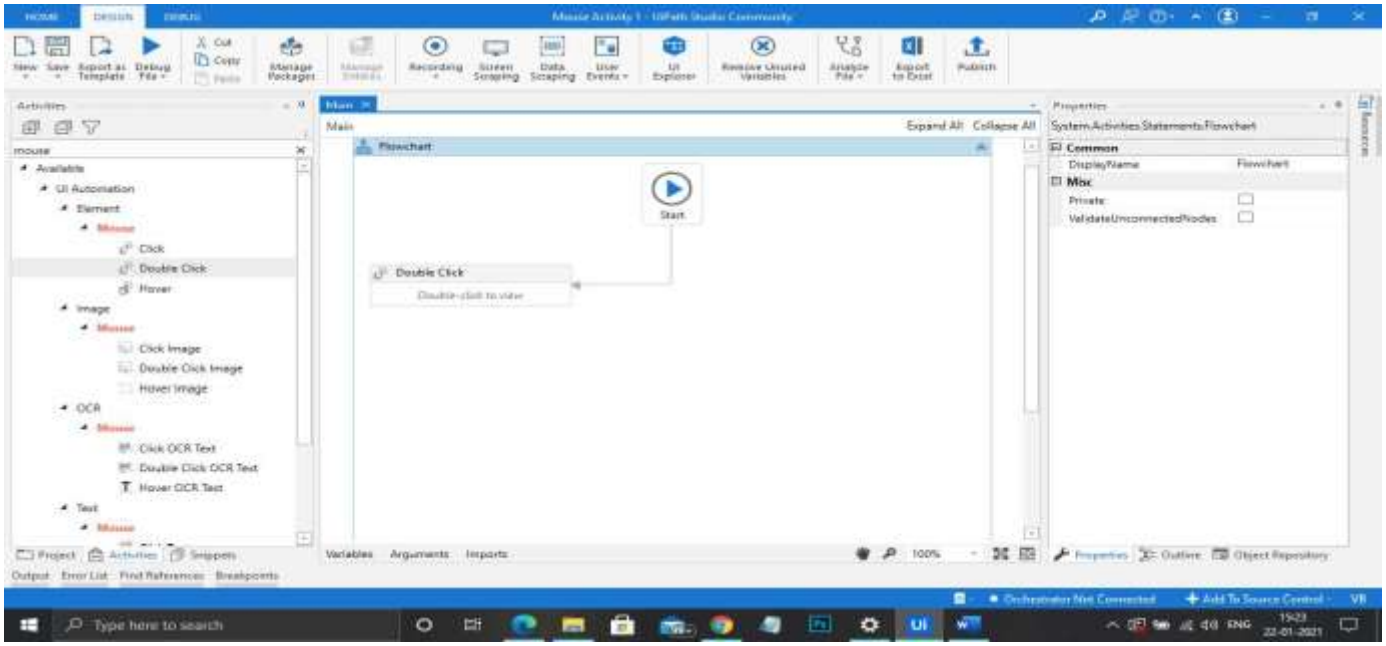
Click on Indicate on Screen and Indicate the UI element which you wants to click.



Now Click on Run.



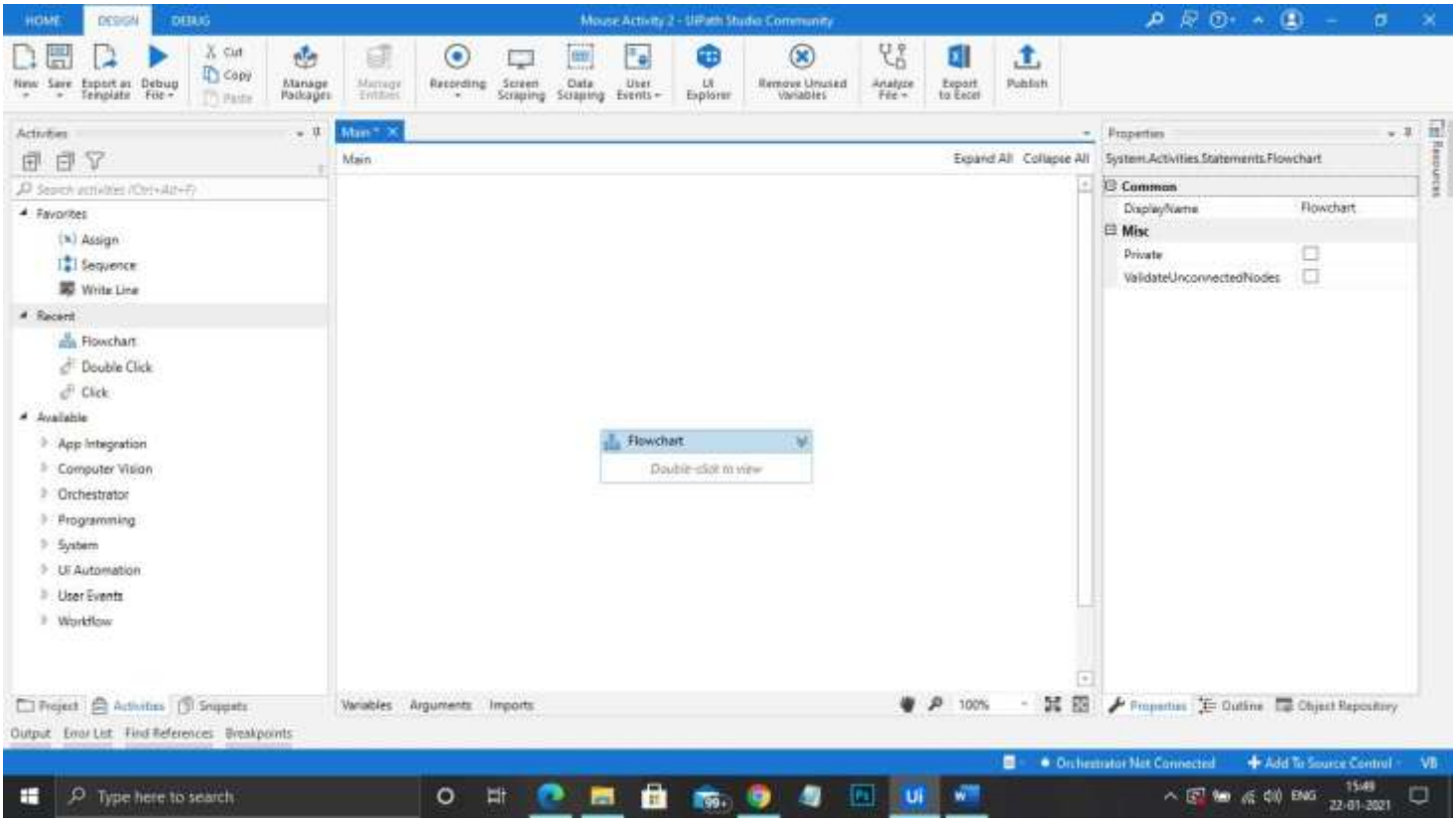
Work-Flow



3. Hover Activity

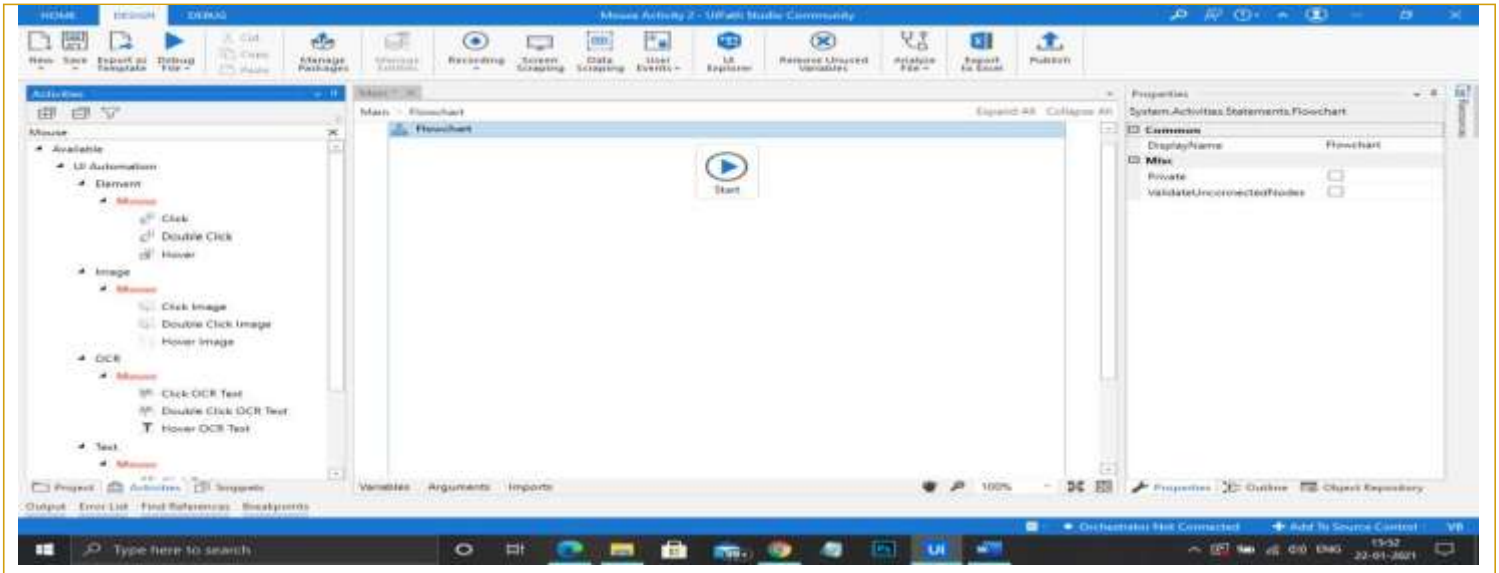
Open UiPath Studio

Click on Open main WorkFlow. Drag and Drop Flow Chart from Activities panal

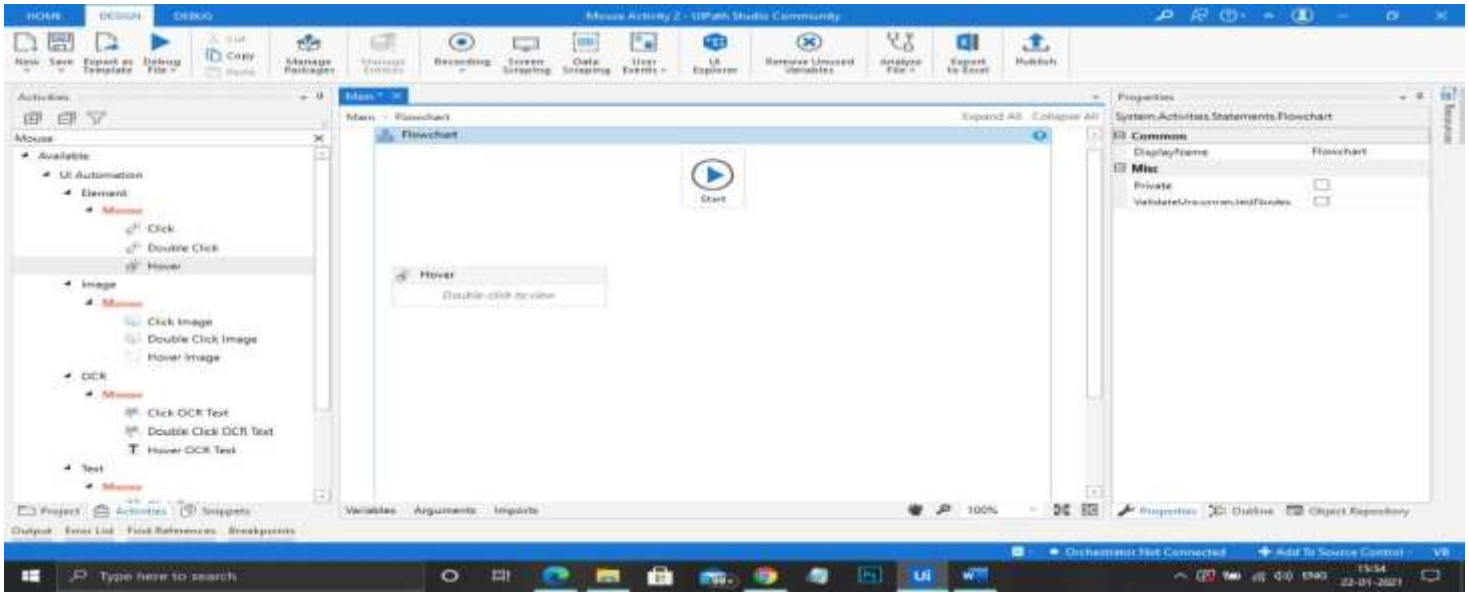


Double click on Flow Chart

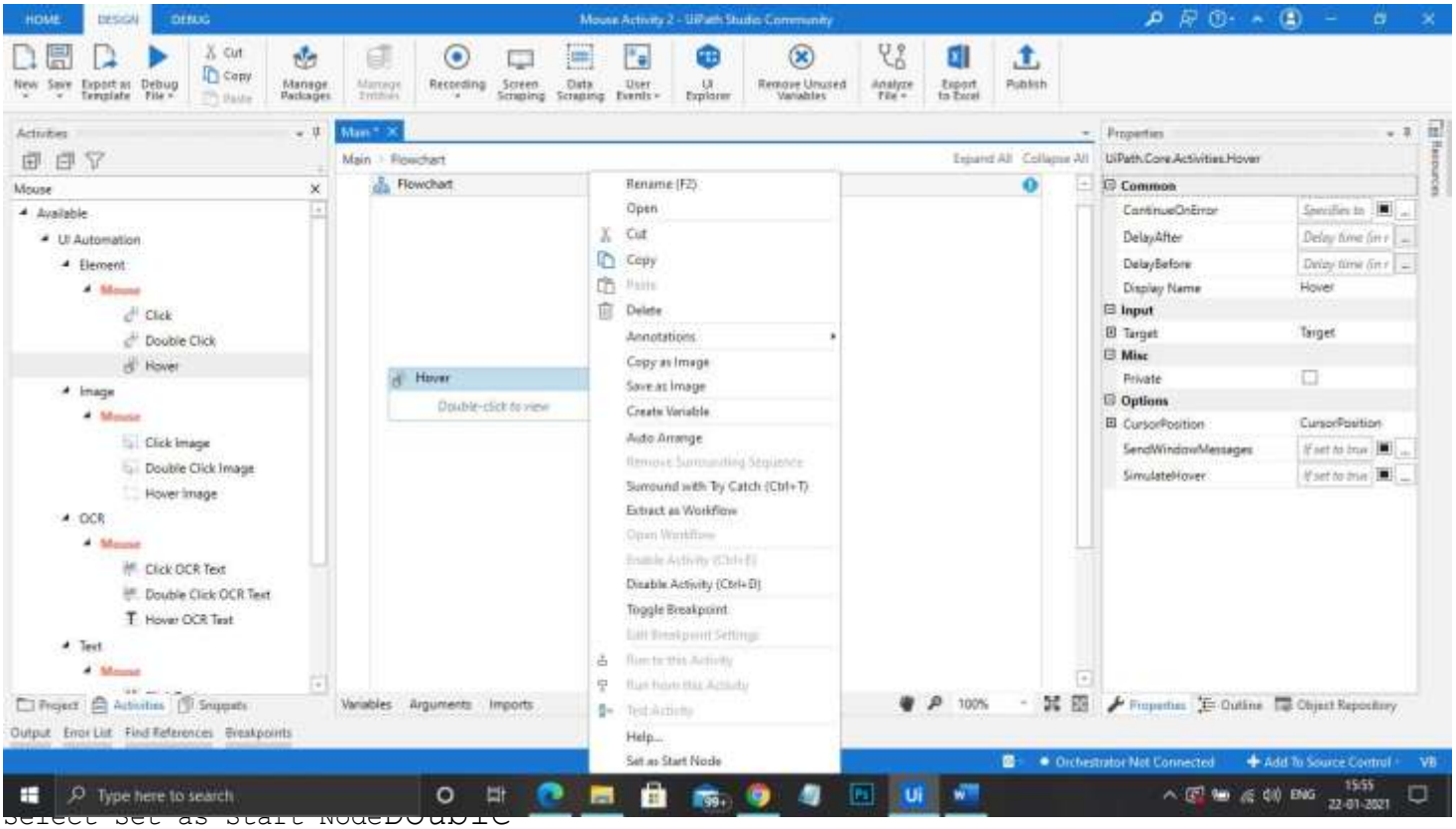
Search Mouse in Activities panal



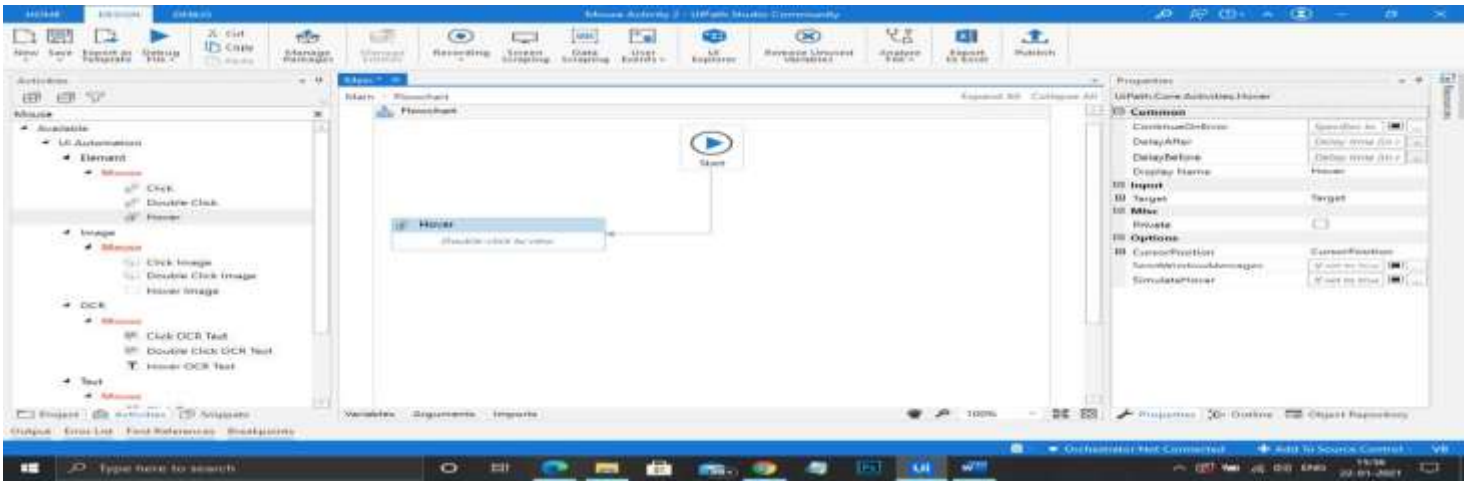
Drag and Drop Hover Activity from Activities panal

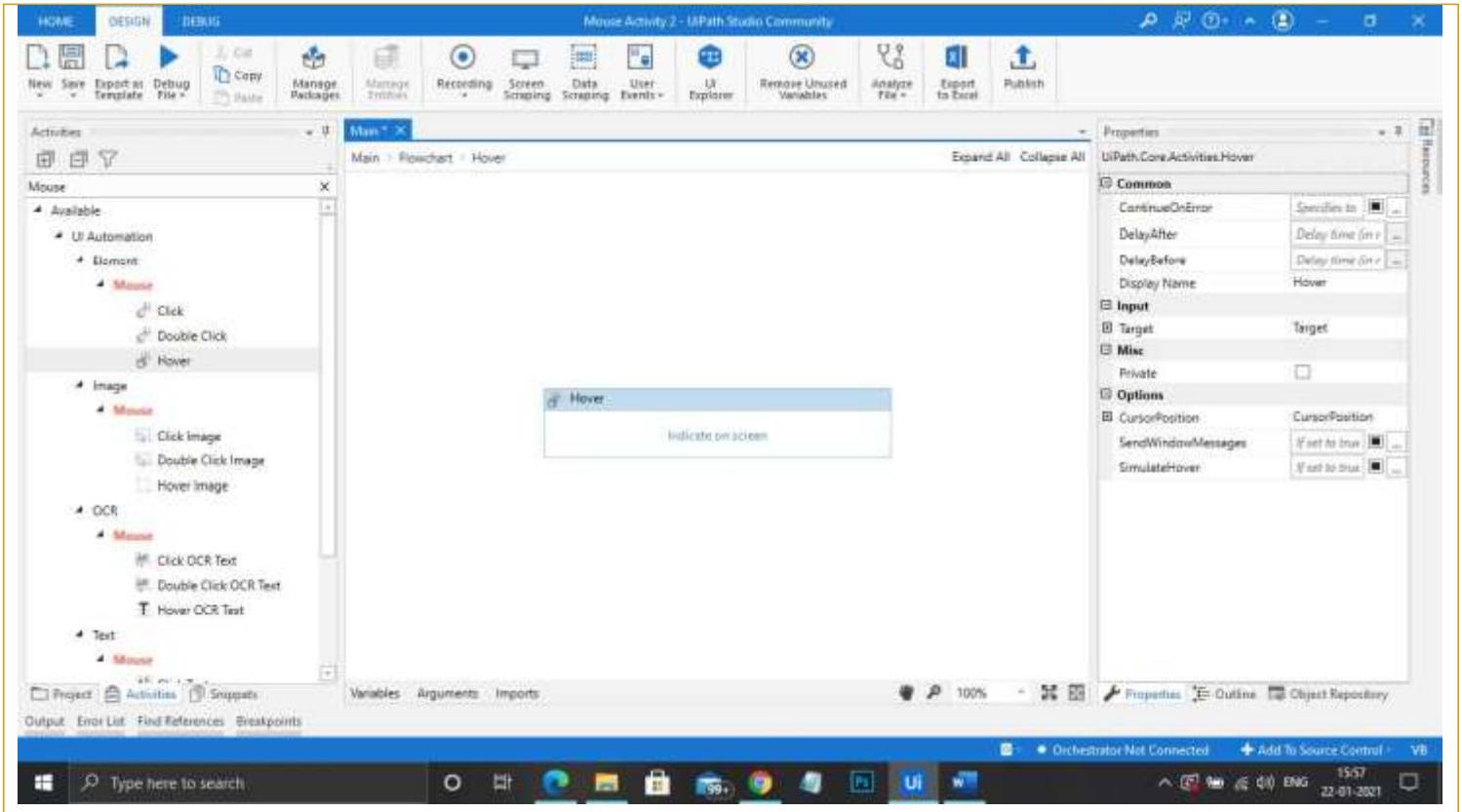


Right click on Hover Activity box

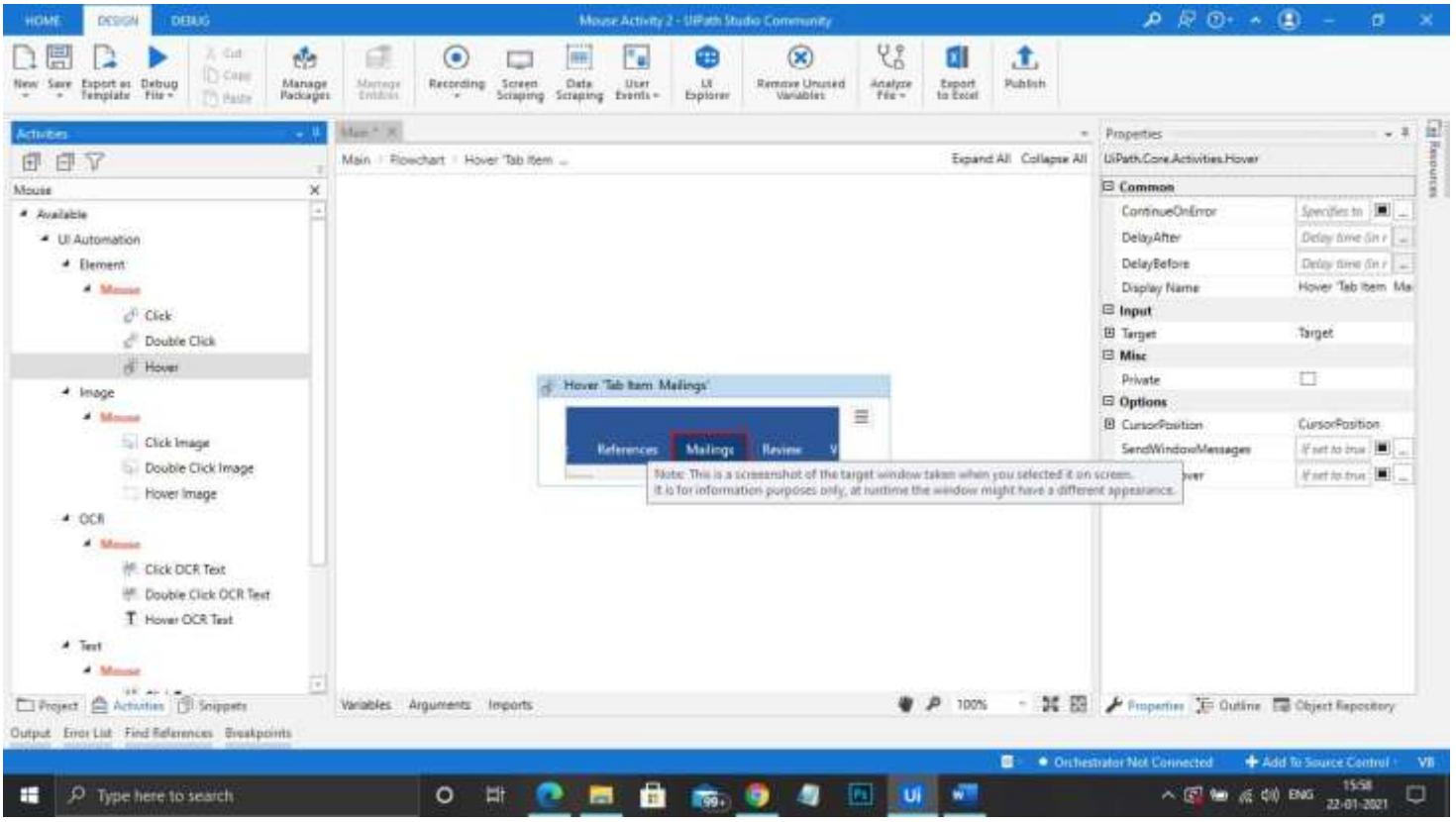


Select Set as Start NodeDouble



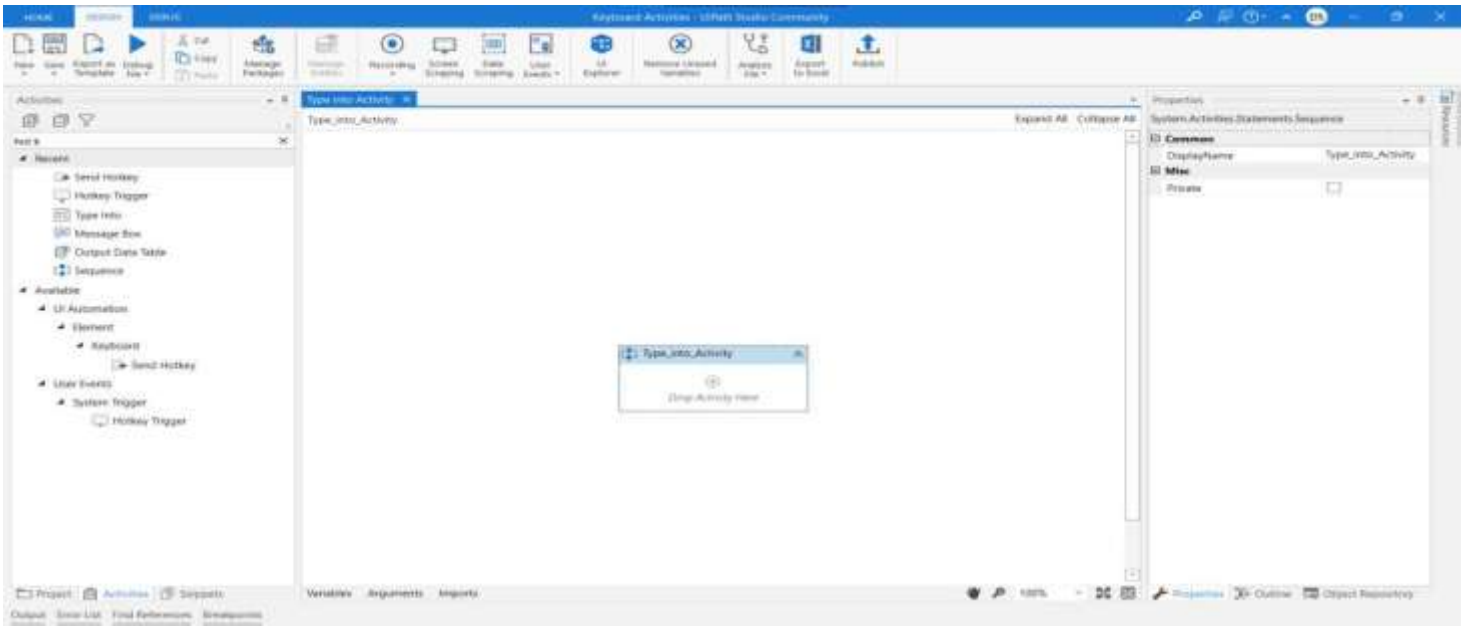


Click on Indicate on Screen and indicate the UI element you want to Hover. And Execute it.

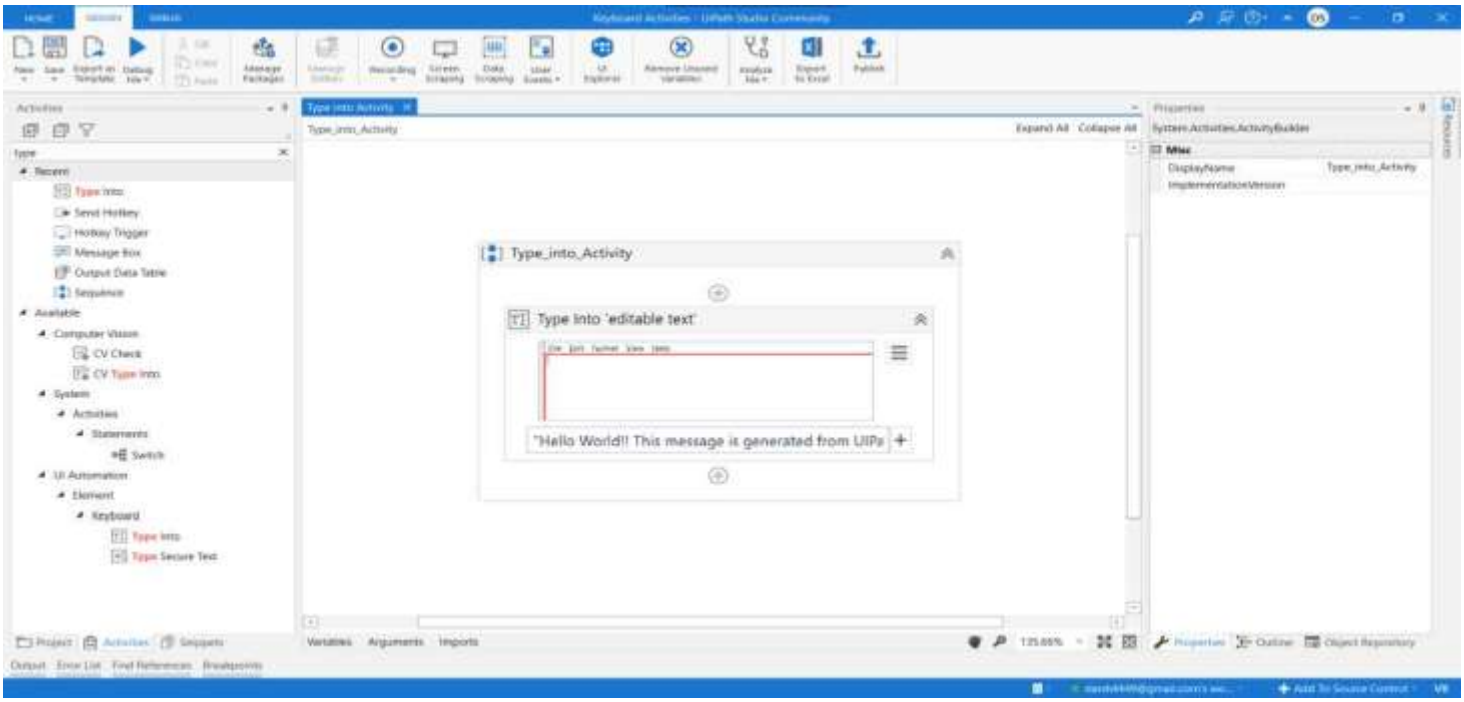


ii Type into

Step1: Add a new sequence and name it as Type into Activity



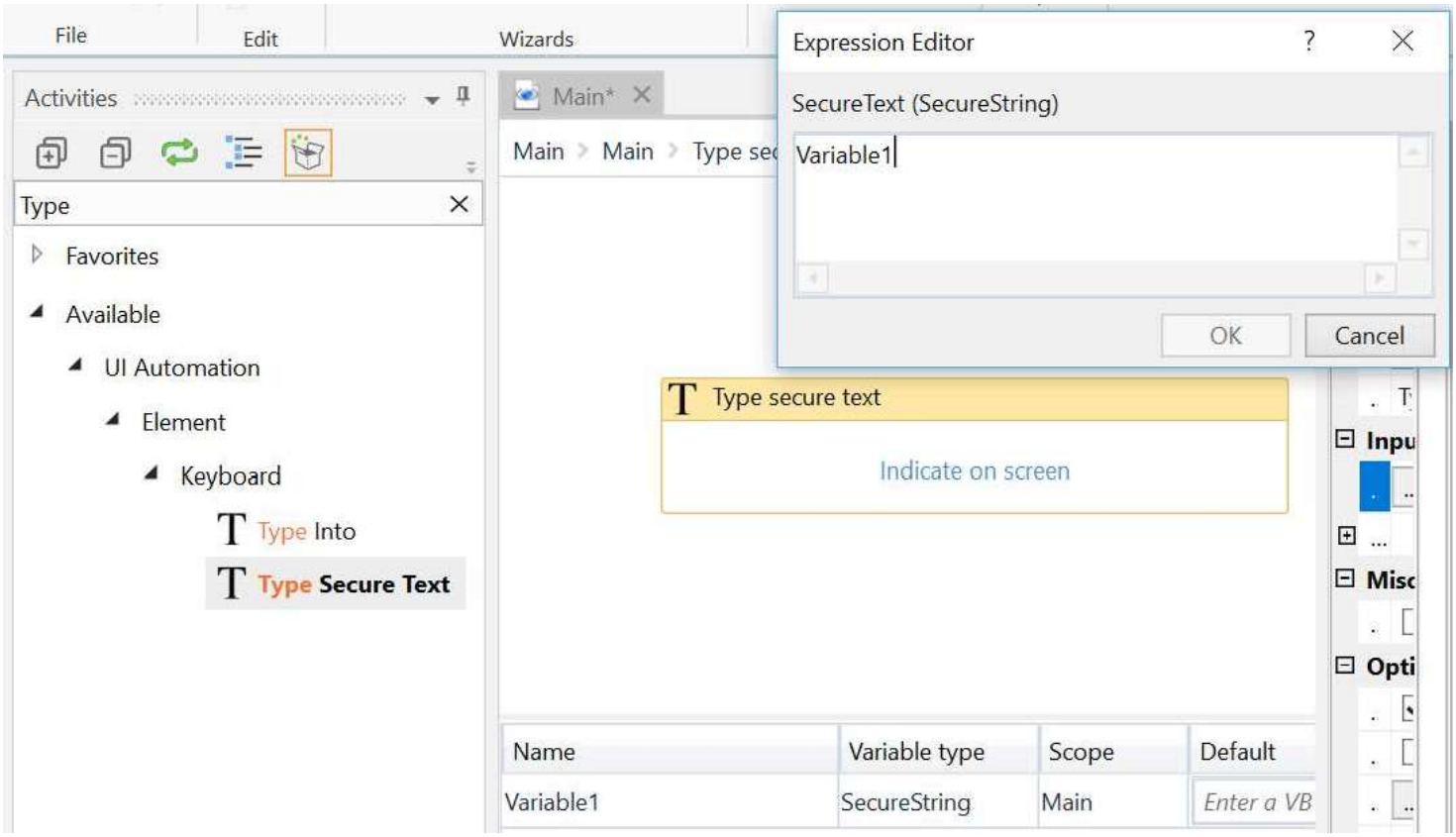
Step2: Search for Type into Activity in the activity panel and drag it inside the sequence. Step3: Click on Indicate on Screen and indicate the pointer towards notepad editor.
Step4: Type the message to be printed on the notepad in the editable text section.



Step5: Hit the Run Button to see the results.

iii. Type Secure text

1. Drag and drop a Flowchart on the Designer panel. Search for `Keyboard` in the search bar of the Activities panel. Drag and drop the **Type secure text** activity. Right-click on the **Type secure text** activity and select Set as Start Node.
2. Create a variable of type SecureString. Now, double-click on the **Type secure text** activity and specify the variable's name in the SecureText property of the **Type SecureText** activity. You also have to indicate on the screen by clicking on Indicate on screen:



Question 8:

a. Demonstrate the following events in UiPath:

i. Element triggering event

ii. Image triggering event

iii. System Triggering Event

b. Automate the following screen scraping methods using UiPath

i. Full Test

ii. Native

iii. OCR

c. Install and automate any process using UiPath with the following plug-ins:

i. Mail Plugin

ii. PDF Plugin

a. Demonstrate the following events in UiPath:

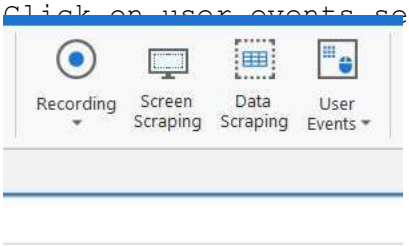
i. Element triggering event

step 01

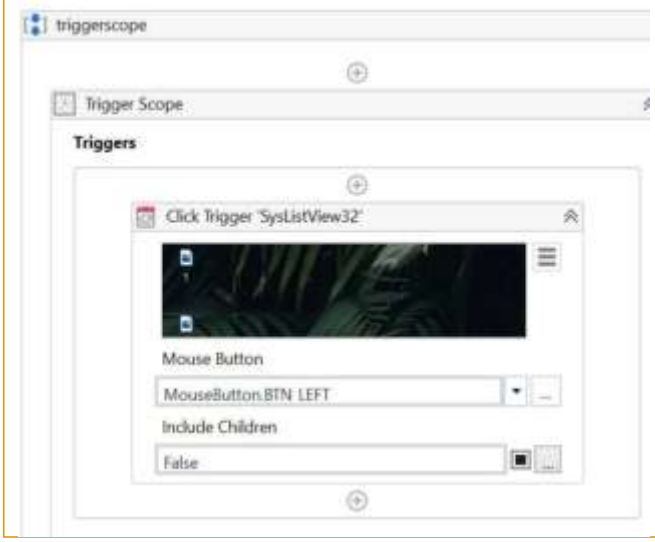
On click element

Steps:-

Click on user events select on click element

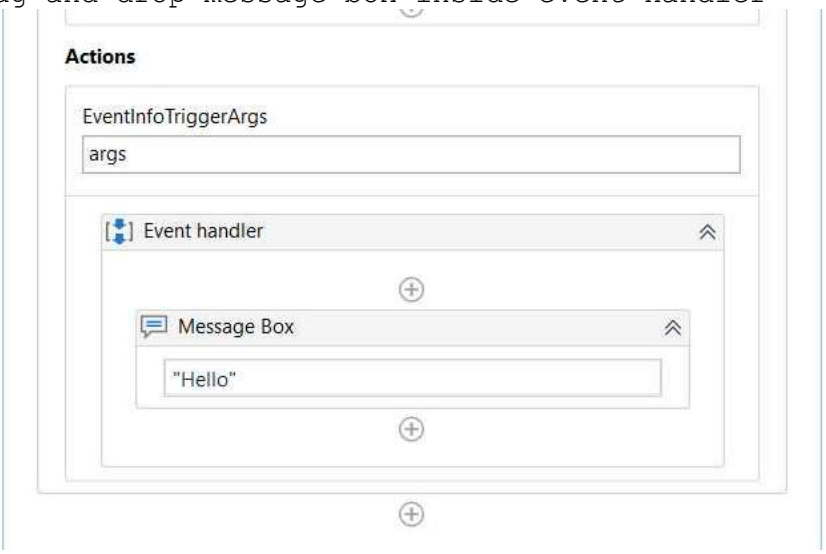


step 02



step 03

Drag and drop message box inside event handler

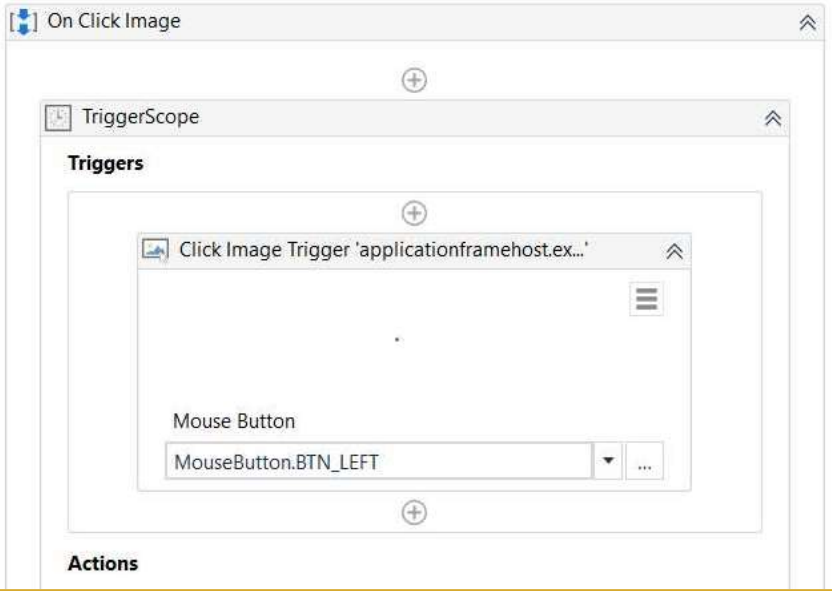


Click on run file and see the output

...ng

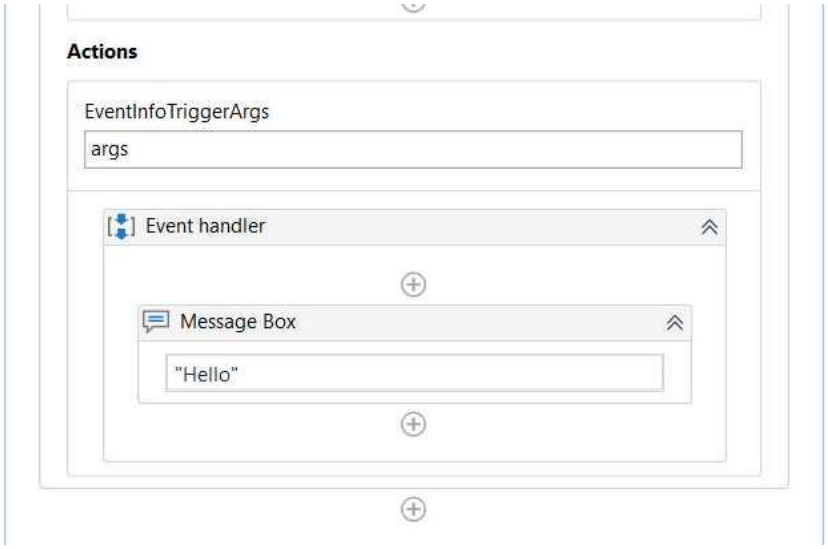
event step 01

Click on user events and under that click on click image



step 02

Drag and drop message box inside event handler



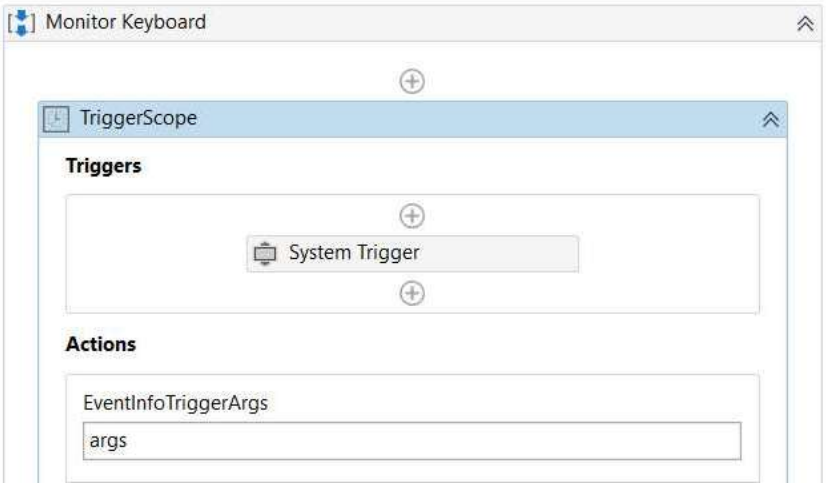
step 03

Click on run file and see the output

III. System Triggering

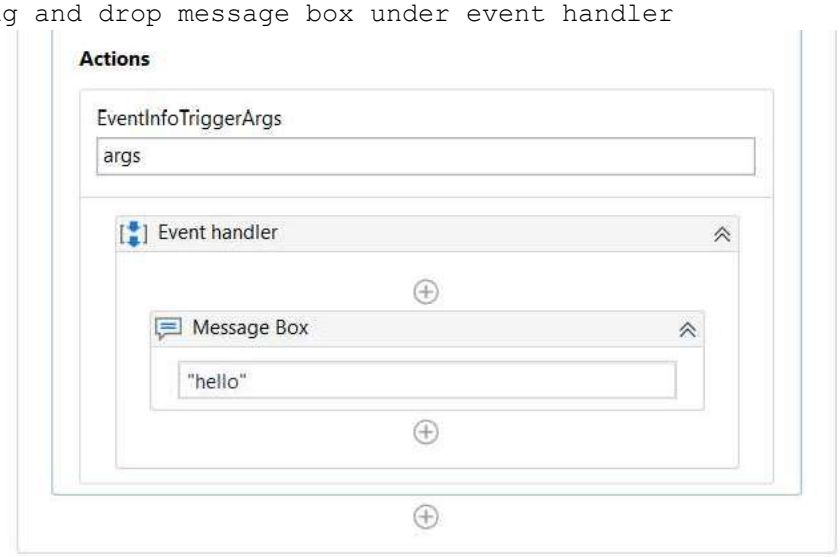
Event step 01

drag and drop a monitor event and under that drag and drop system trigger



step 02

Drag and drop message box under event handler



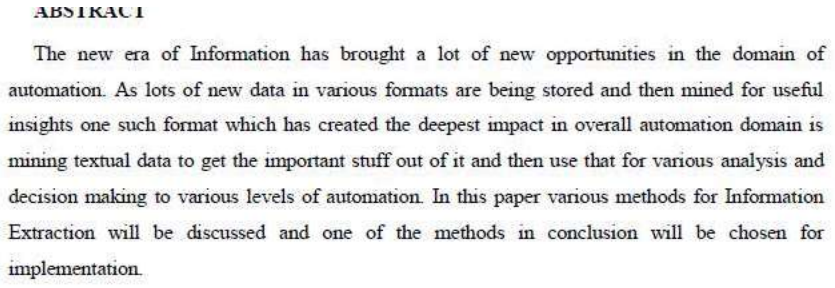
Run file and see the output

b. Automate the following screen scraping methods using UiPath

i. Full Test
ii. Native
iii. OCR

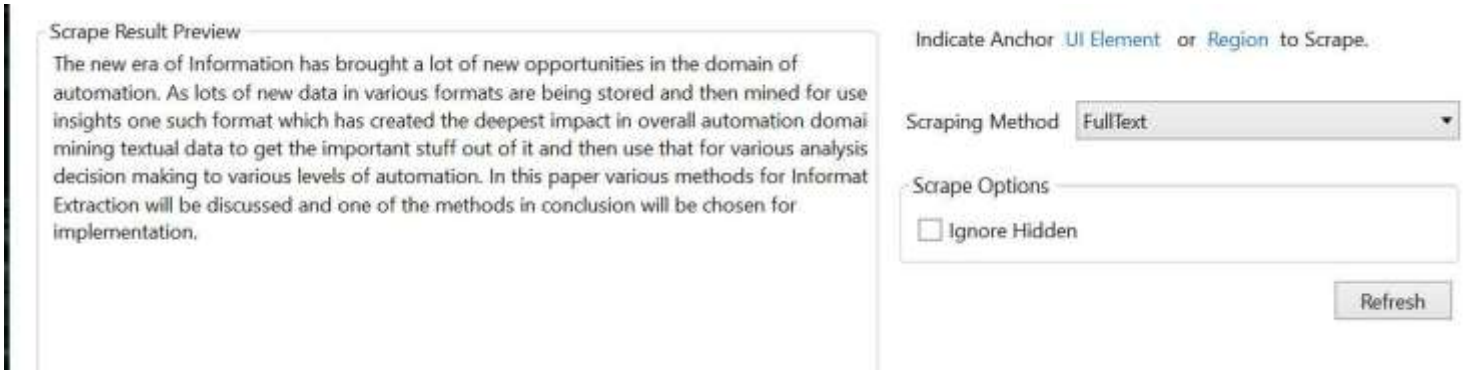
step 01
select screen scrapping from ui path studio ribbon

step 02
then select a file to scrap


ABSTRACT

The new era of Information has brought a lot of new opportunities in the domain of automation. As lots of new data in various formats are being stored and then mined for useful insights one such format which has created the deepest impact in overall automation domain is mining textual data to get the important stuff out of it and then use that for various analysis and decision making to various levels of automation. In this paper various methods for Information Extraction will be discussed and one of the methods in conclusion will be chosen for implementation.

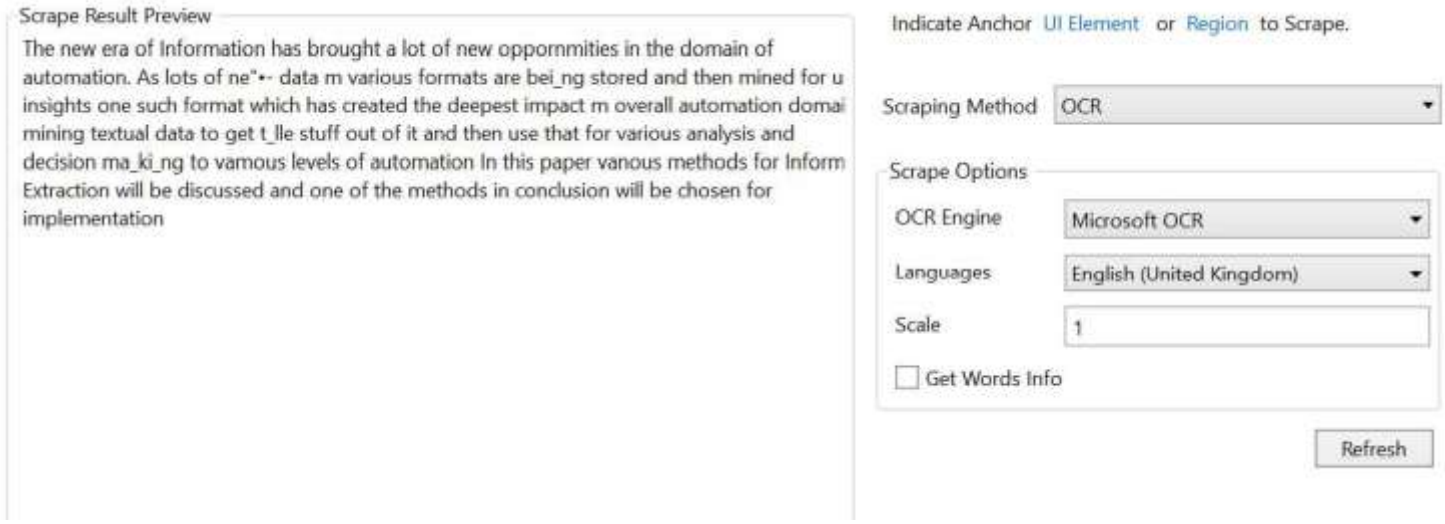
step 03
Full



step 04


Scrape Result Preview
The new era of Information has brought a lot of new opportunities in the domain of autom
Indicate Anchor UI Element or Region to Scrape.
Scraping Method
Native
Scrape Options
No Formatting
Get Words Info
Refresh

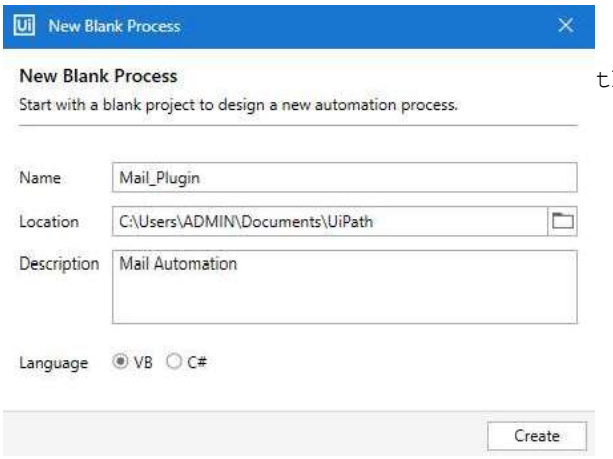
step


Scrape Result Preview
The new era of Information has brought a lot of new opporunities in the domain of automation. As lots of ne"•- data m various formats are bei_ng stored and then mined for u insights one such format which has created the deepest impact m overall automation domai mining textual data to get t_lle stuff out of it and then use that for various analysis and decision ma_ki_ng to vamous levels of automation In this paper vanous methods for Inform Extraction will be discussed and one of the methods in conclusion will be chosen for implementation
Indicate Anchor UI Element or Region to Scrape.
Scraping Method
OCR
Scrape Options
OCR Engine
Microsoft OCR
Languages
English (United Kingdom)
Scale
1
Get Words Info
Refresh

c. Install and automate any process using UiPath with the following plug-ins:

i. Mail

Plugin step

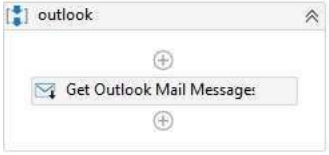


th project name

step 02

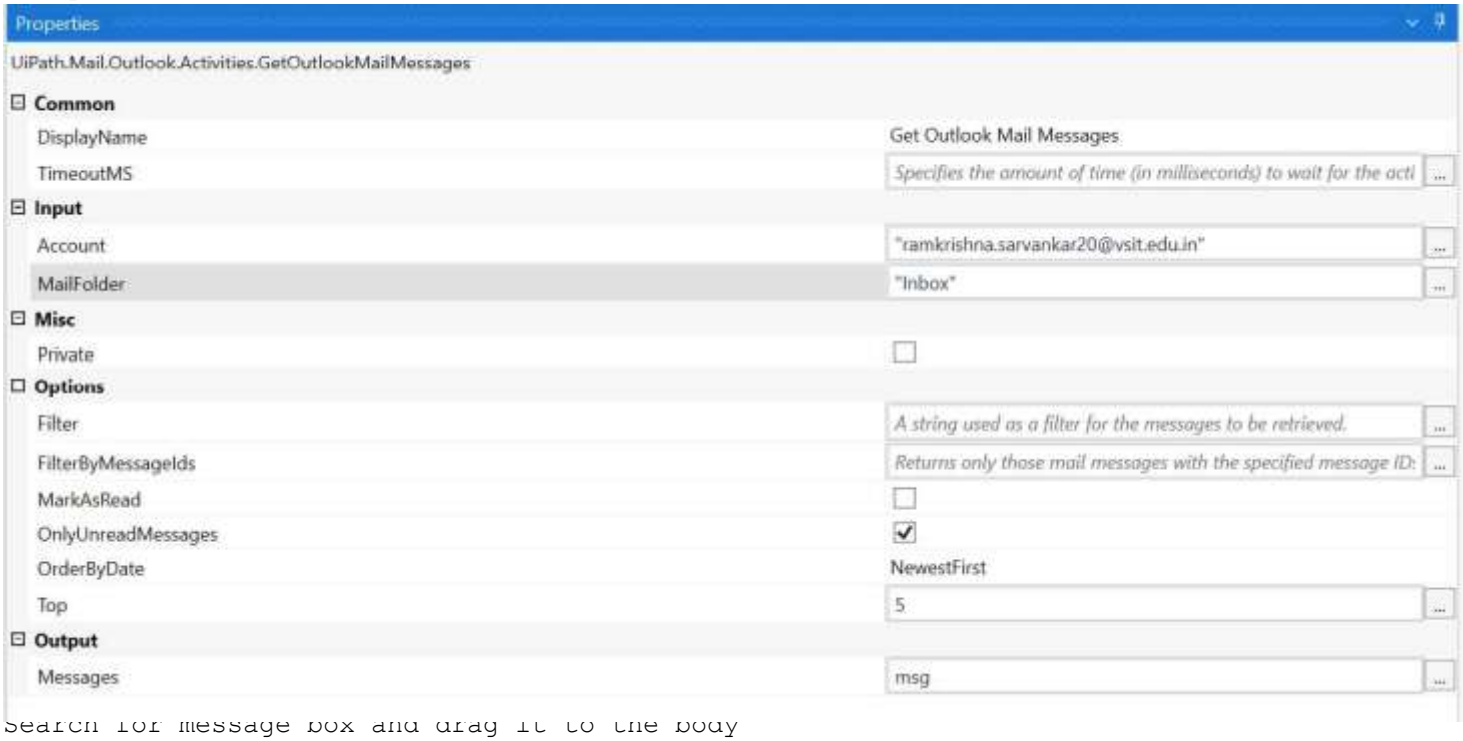
step 03

Drag and Drop outlook Add your outlook email adress activity

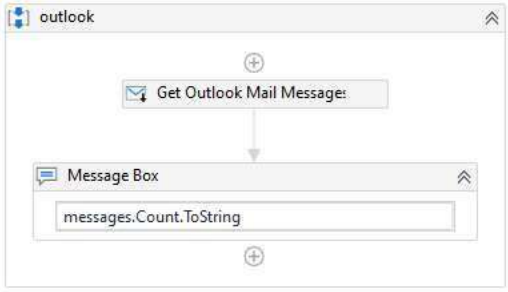


step 04

Add your outlook email adress



Search for message box and drag it to the body



step 06

output

step 07

ii. PDF

Plugin step

01

Open the Read PDF With OCR sequence container by double-clicking on it.

step 02

Drag a Read PDF With OCR activity inside the sequence.

- **Add the value "Invoice02.pdf" in the FileName field.**
- **In the Properties panel, add the value 1 in the DegreeOfParallelism field.**

step 03

Drag the Google OCR engine inside the Read PDF With OCR activity.

- **In the Properties panel, add the variable extractedTextTesseract in the Text field.**

step 04

Drag another Read PDF With OCR activity and place it below the previous one.

- **Add the value "Invoice02.pdf" in the FileName field.**
- **In the Properties panel, add the value 1 in the DegreeOfParallelism field.**

step 05

Drag the Microsoft OCR engine inside the Read PDF With OCR activity.

- **In the Properties panel add the variable extractedTextMicrosoft in the Text field.**

step 06

Drag a Write Text File activity below the Read PDF With OCR activity.

- **Add the value "OCRMicrosoft.txt" in the**
- **FileName field. Add the variable extractedTextMicrosoft in the Text field.**

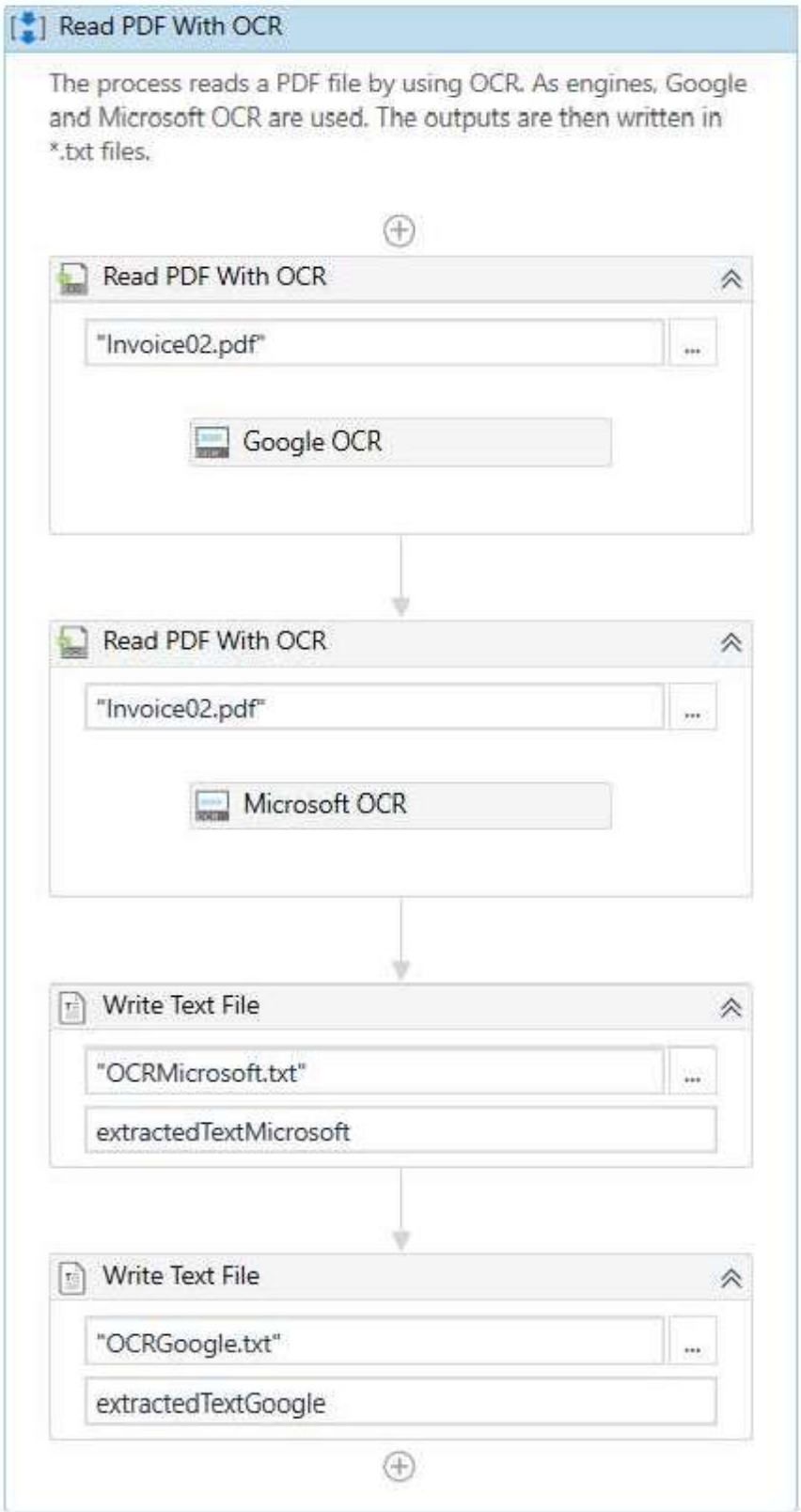
step 07

Drag a Write Text File activity below the previous Write Text File activity.

- **Add the value "OCRTesseract.txt" in the**
-

FileName field. Add the variable extractedTextTesseract in the Text field. This is how the Read PDF with OCR sequence should look:

step 08



ss and saves the output in a `.txt` file.

Question 9:

a. Automate the process of send mail event (on any email).

b. Automate the process of launching an assistant bot on a keyboard event.

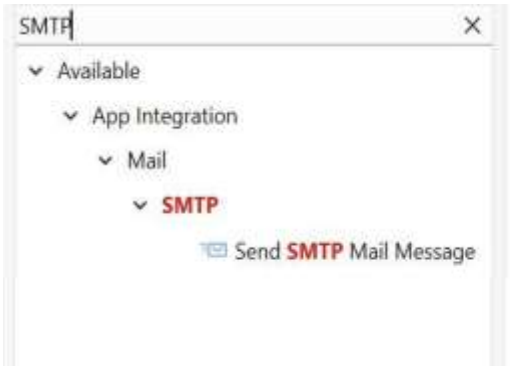
a. Automate the process of send mail event (on any email).

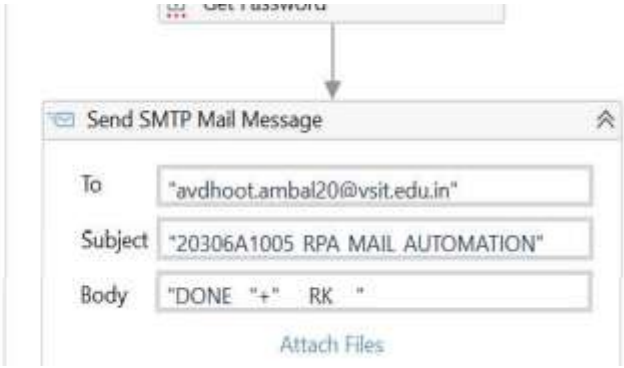
Step 01

-Open UiPath Studio
-Click on Open main WorkFlow.
-Create New Sequence

Step 02

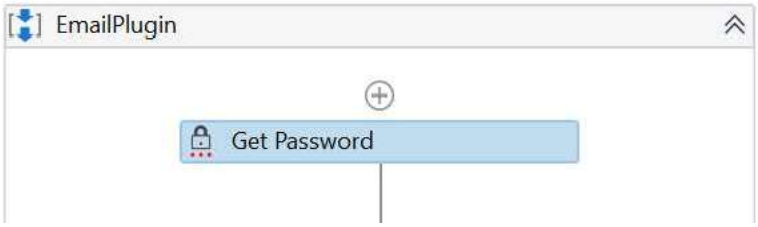
Go to activity panel and drag and drop Send SMTP mail message





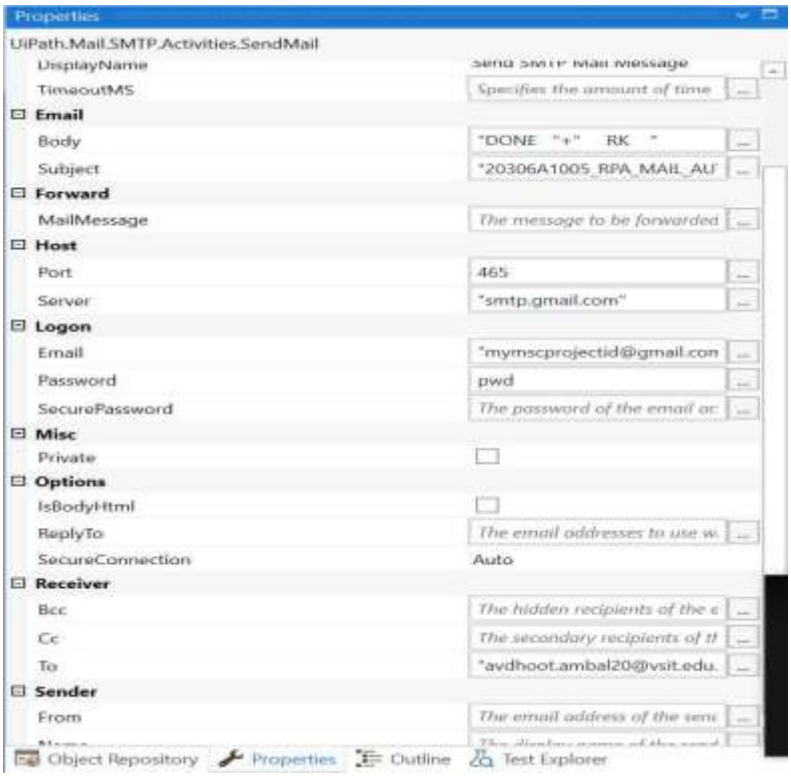
Step 03

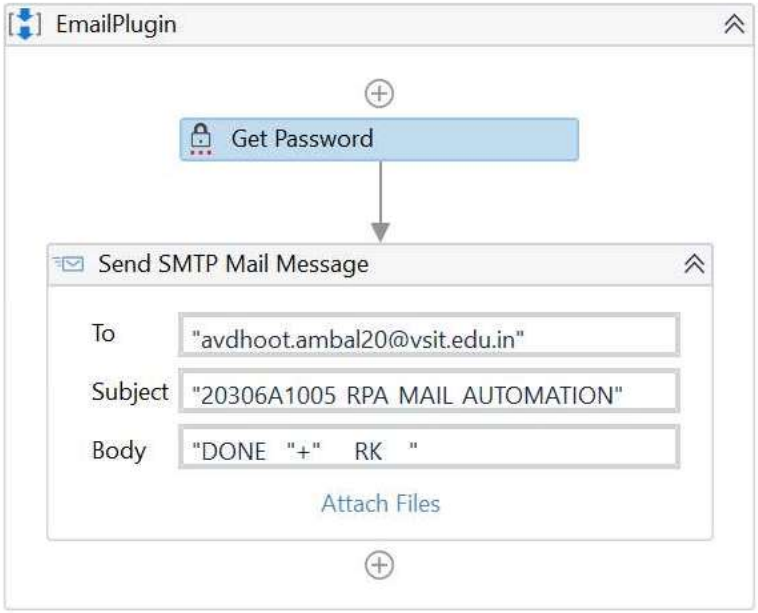
Now drag and drop get password activity and enter your email id password



Step 04

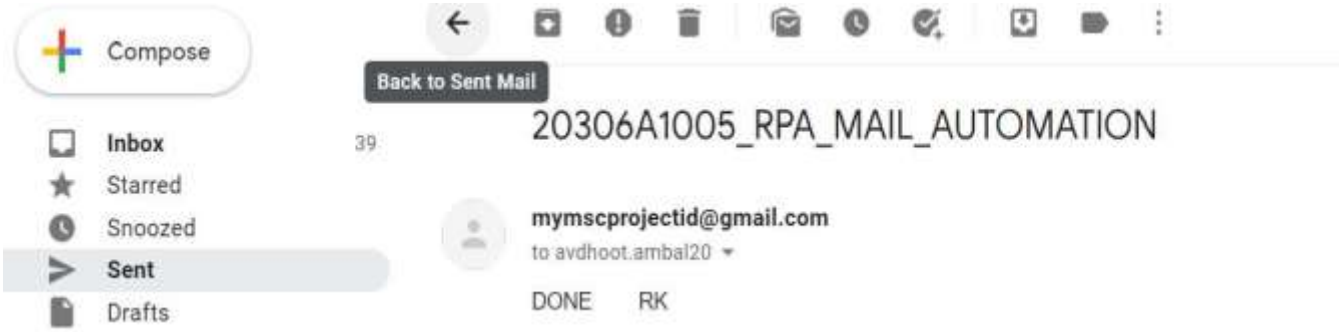
Now set the following properties for sending an SMTP mail





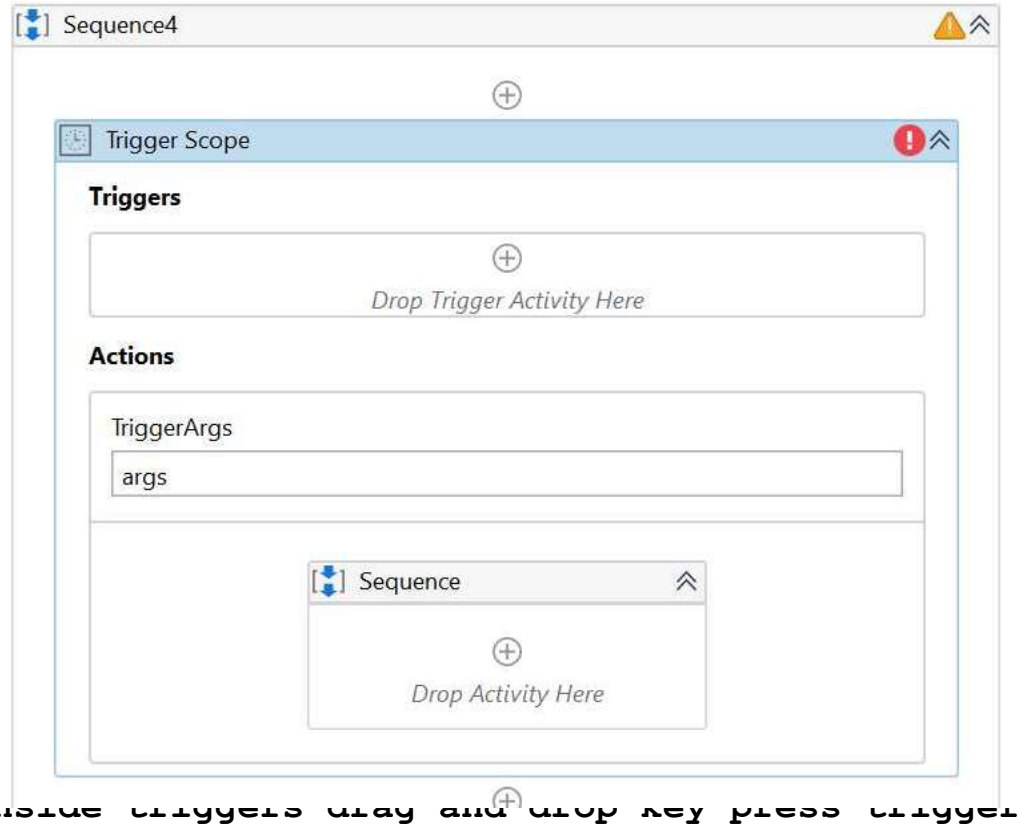
Step 06

Now run the program to see the output



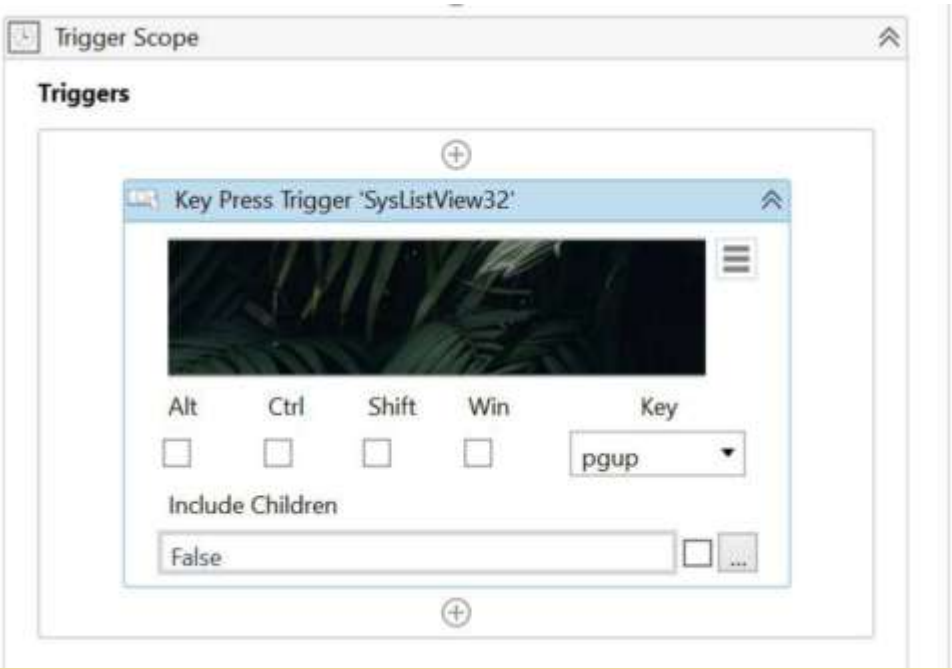
b. Automate the process of launching an assistant bot on a keyboard event.

Step 01
Create New Sequence and drag and drop Trigger Scope Activity



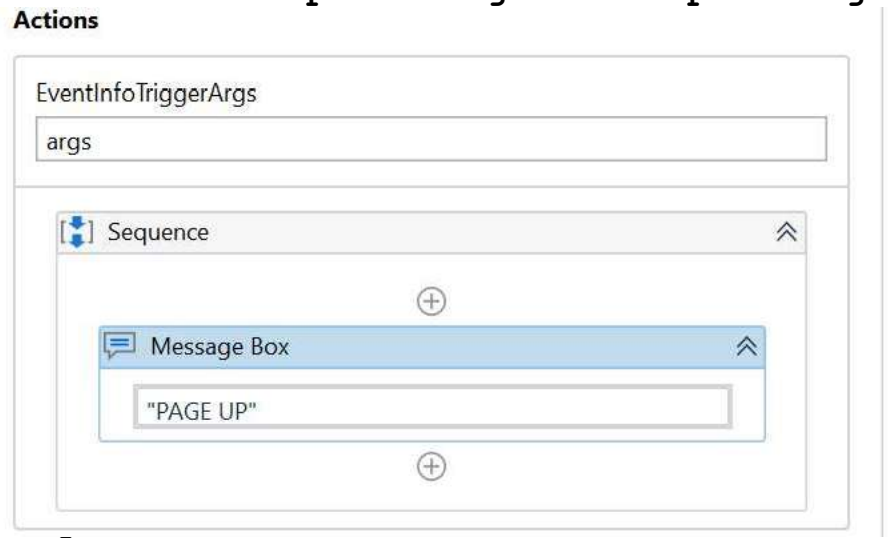
-inside triggers drag and drop key press trigger and select a area to to trigger the key using indicate on screen option

-from key drop down option select pageup key

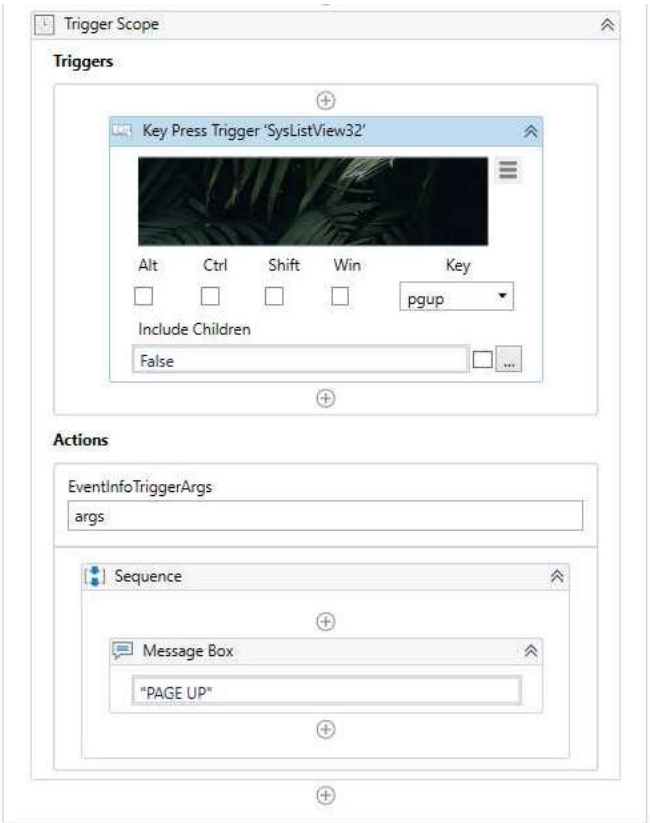


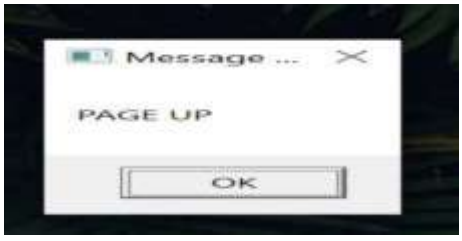
Step 03

Inside action part drag and drop message box activity



Run the program to see the outcome





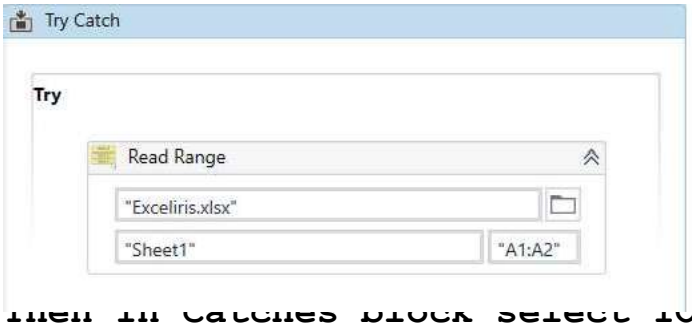
C. Demonstrate the Exception handing in UiPath.

Step 01

-Open UiPath Studio
-Click on Open main WorkFlow.
-Create New Sequence

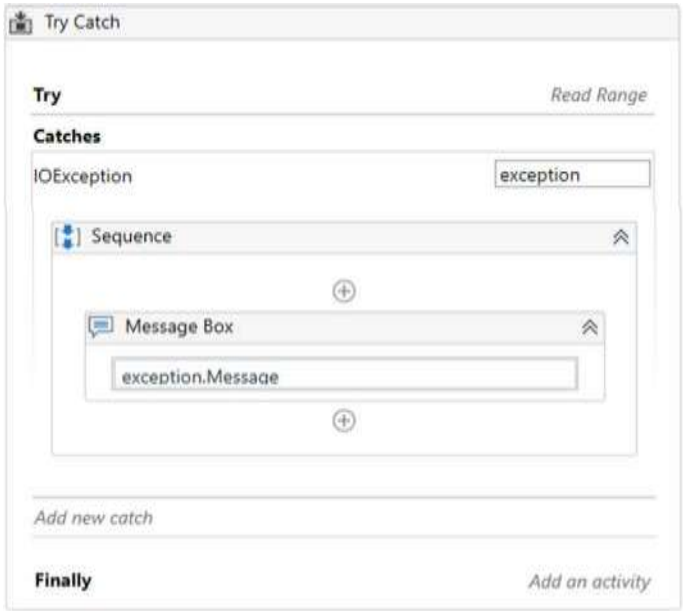
Step 02

Drag and drop read range in try block

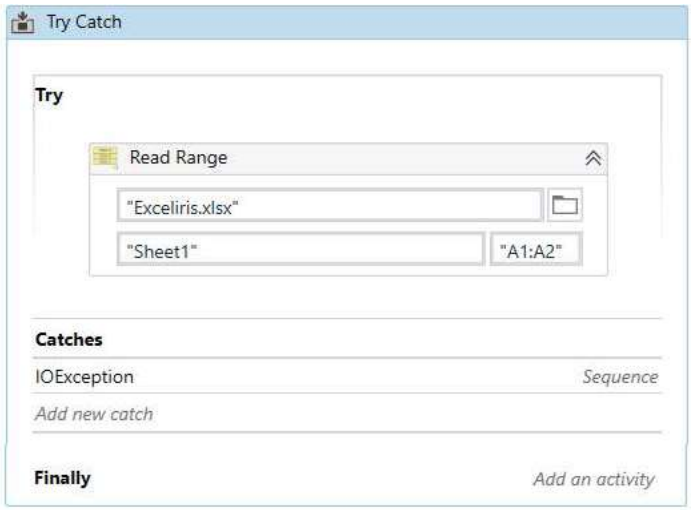


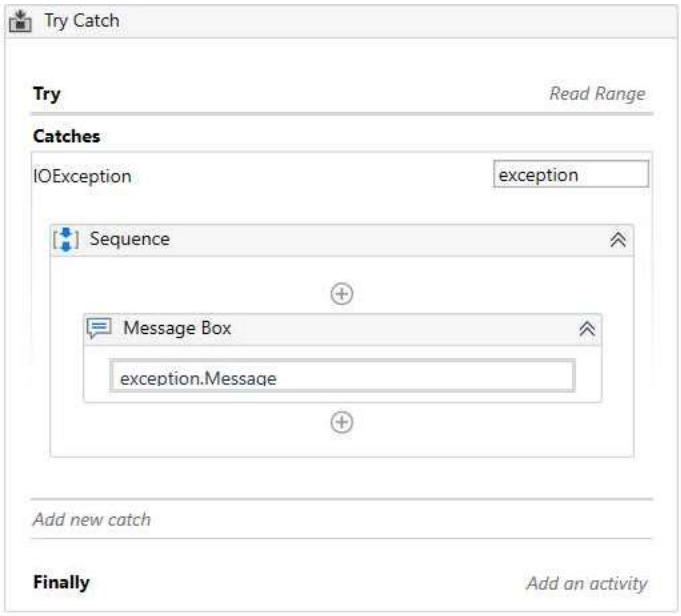
Then in catches block select IOException

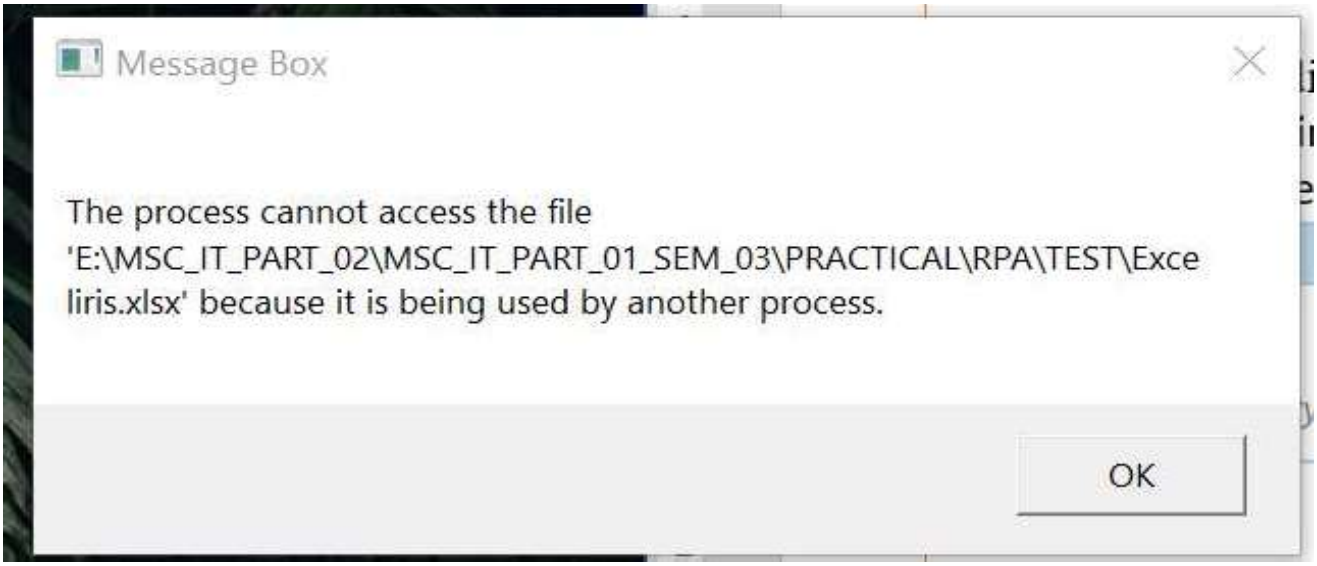
Drag and drop message box and display an Input output error that you want



Step 05
Run the program to see the output Step 06



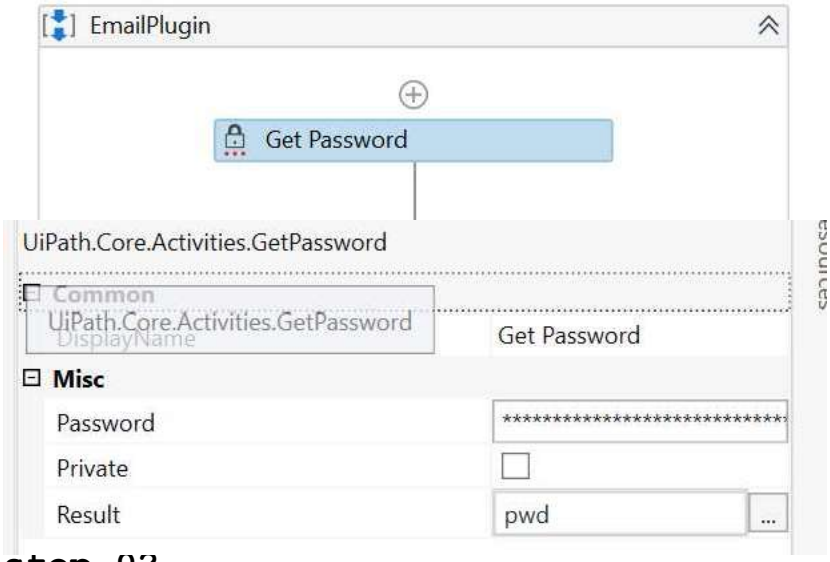




d. Automate the process of send mail event (on any email). With attachment

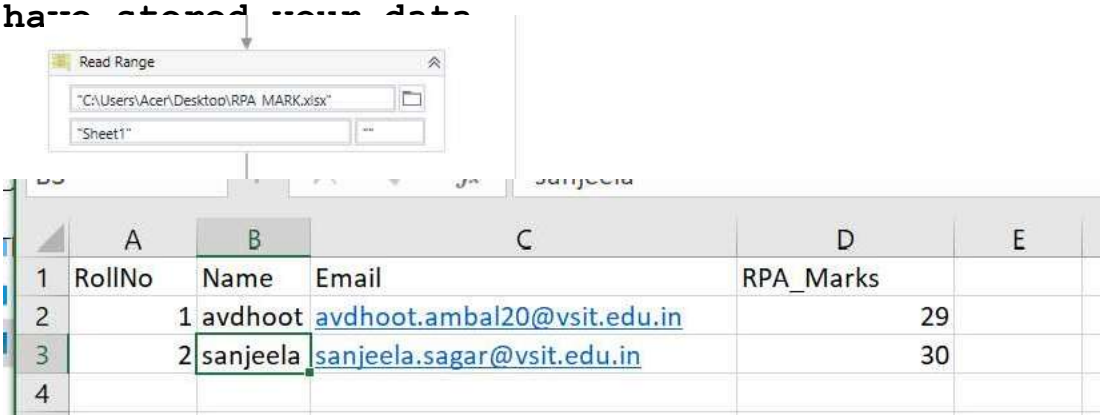
step 01

enter your password

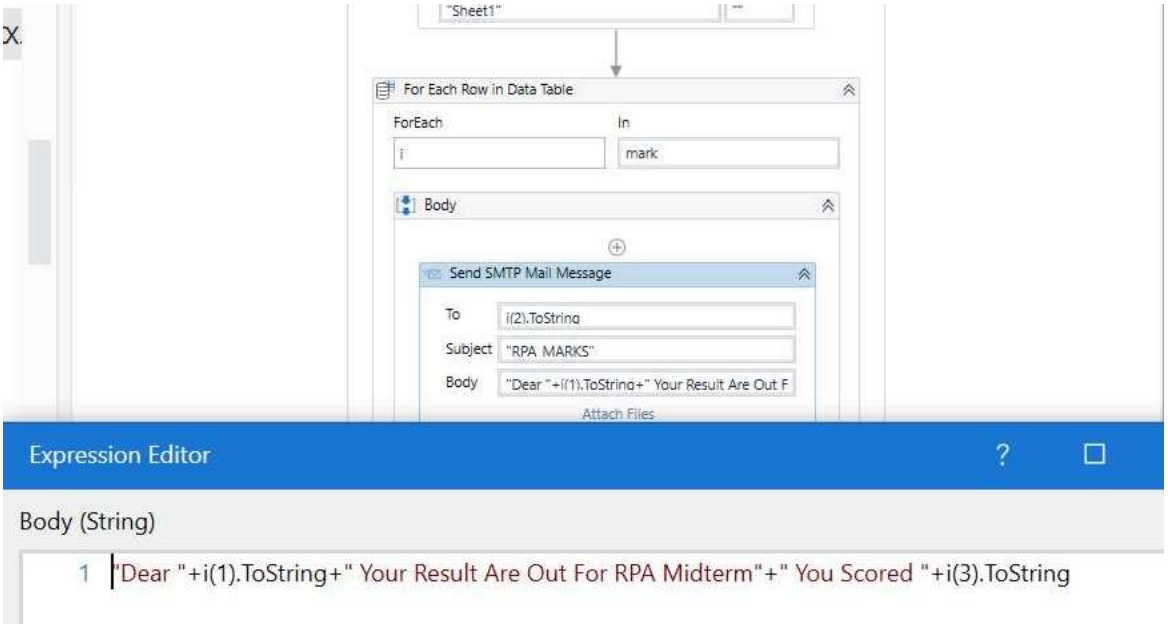


step 02

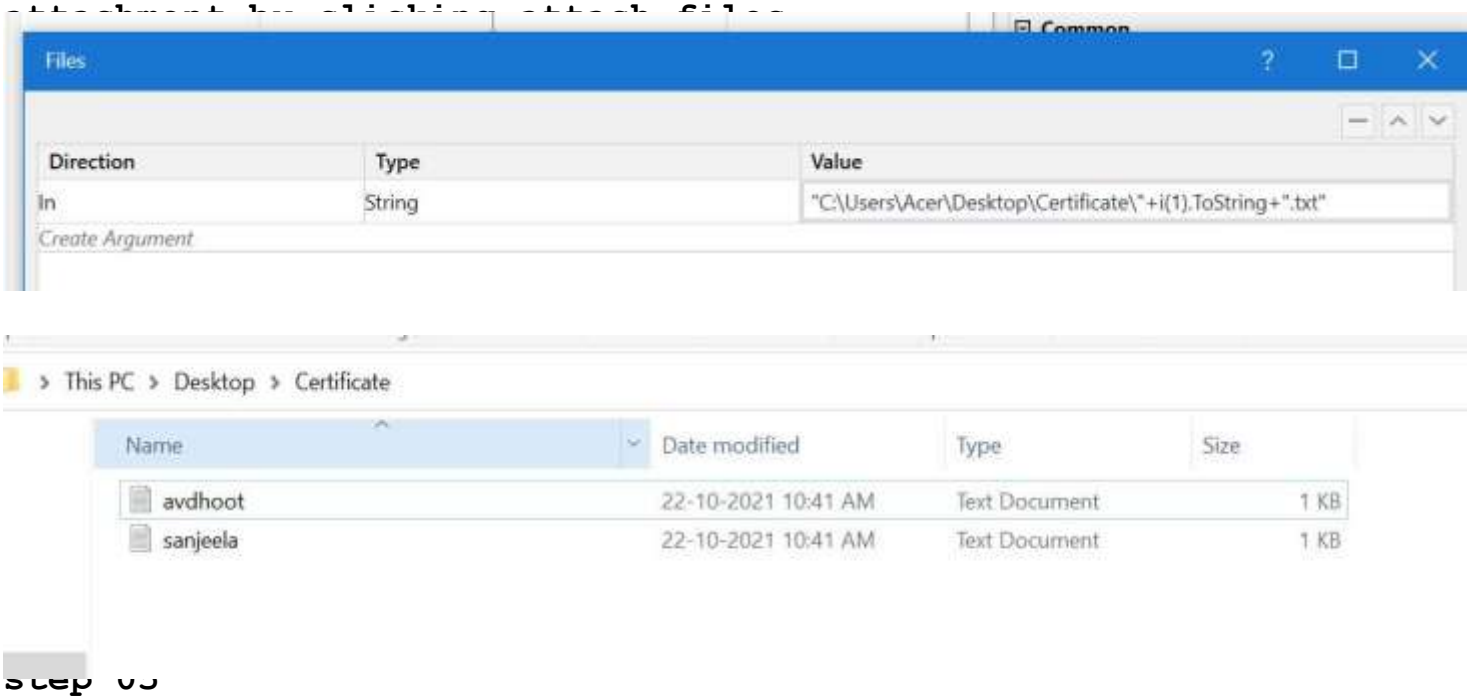
drag and drop read range activity to read the excel file where you have stored your data



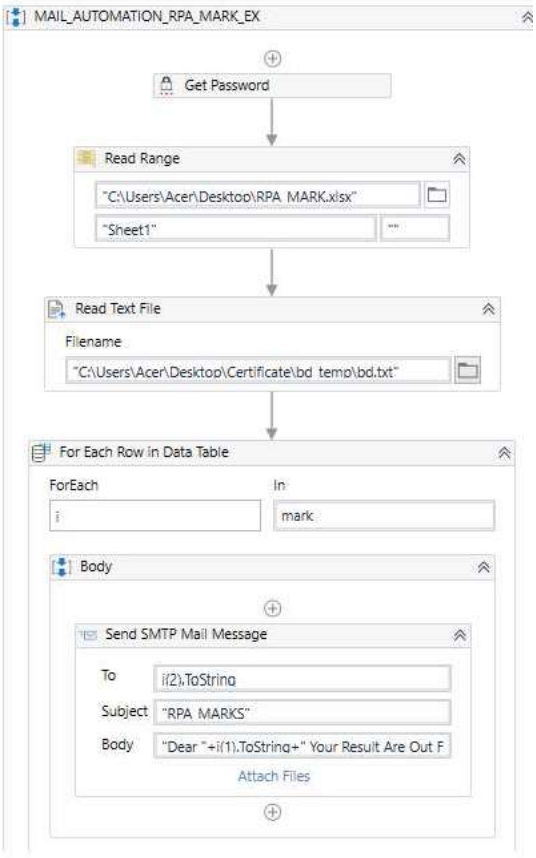
step 03
drag and drop foe each loop to iterate through our excel file then drag and drop

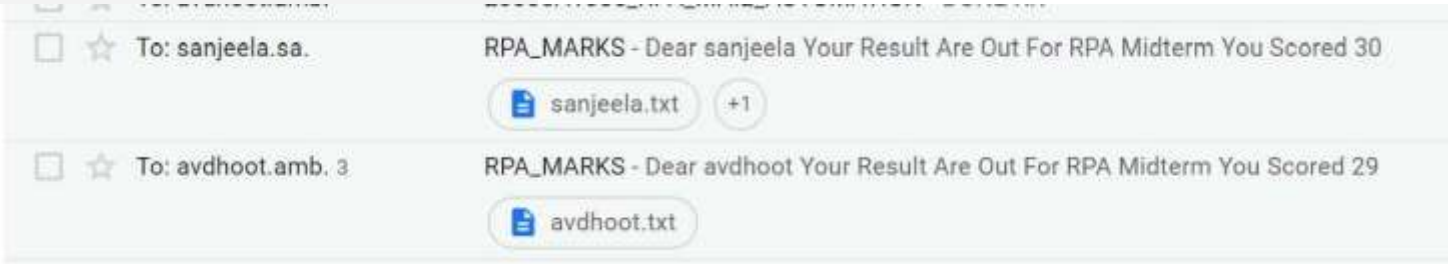


step 04
to send email with attachment add path where you have stored your attachment by clicking attach files



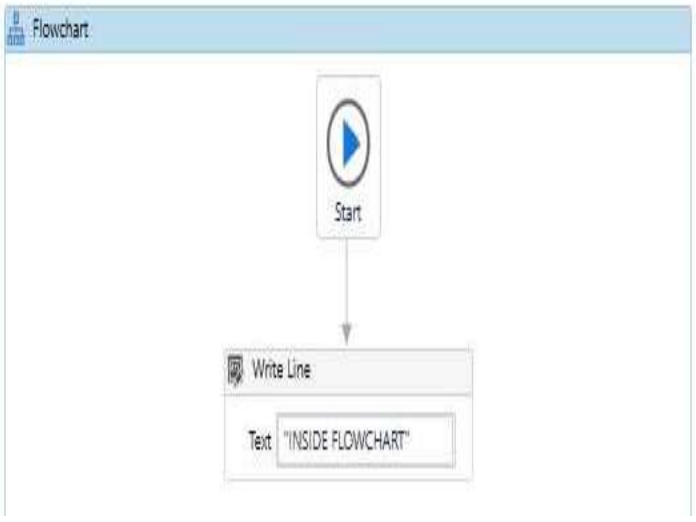
step 05
Now Run the program to see the outcome


MAIL_AUTOMATION_RPA_MARK_EX
Get Password
Read Range
"C:\Users\Acer\Desktop\RPA_MARK.xlsx"
"Sheet1"
""
Read Text File
Filename
"C:\Users\Acer\Desktop\Certificate\bd_temp\bd.txt"
For Each Row in Data Table
ForEach
In
i
mark
Body
Send SMTP Mail Message
To
i(2).ToString
Subject
"RPA_MARKS"
Body
"Dear "+i(1).ToString+" Your Result Are Out F
Attach Files


To: sanjeela.sa.
RPA_MARKS - Dear sanjeela Your Result Are Out For RPA Midterm You Scored 30
sanjeela.txt
+1
To: avdhoot.amb. 3
RPA_MARKS - Dear avdhoot Your Result Are Out For RPA Midterm You Scored 29
avdhoot.txt

Question 10:
UiPath automation Debugging
- **Step into**
- **Step over**
- **Step out**

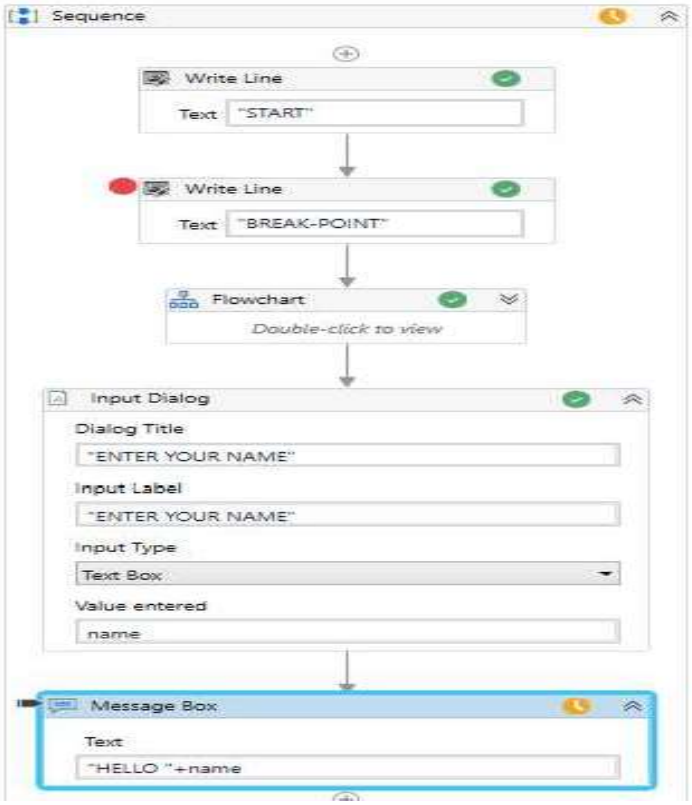
CREATE THE FOLLOWING FLOWCHART

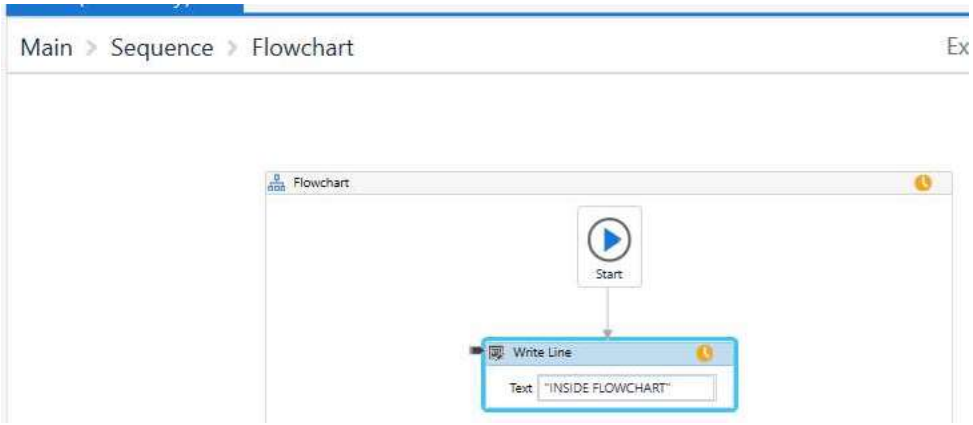


Step Into:

The Step Into is used for debugging one activity at a time. When this action is triggered, the debugger opens and highlights the activity before it is executed. The Step Into will execute all the activities present in an activity(Container).

When Step Into is used with Invoke Workflow File activities, the workflow is opened in a new tab in read-only mode, and each activity is executed one by one. The keyboard shortcut for Step



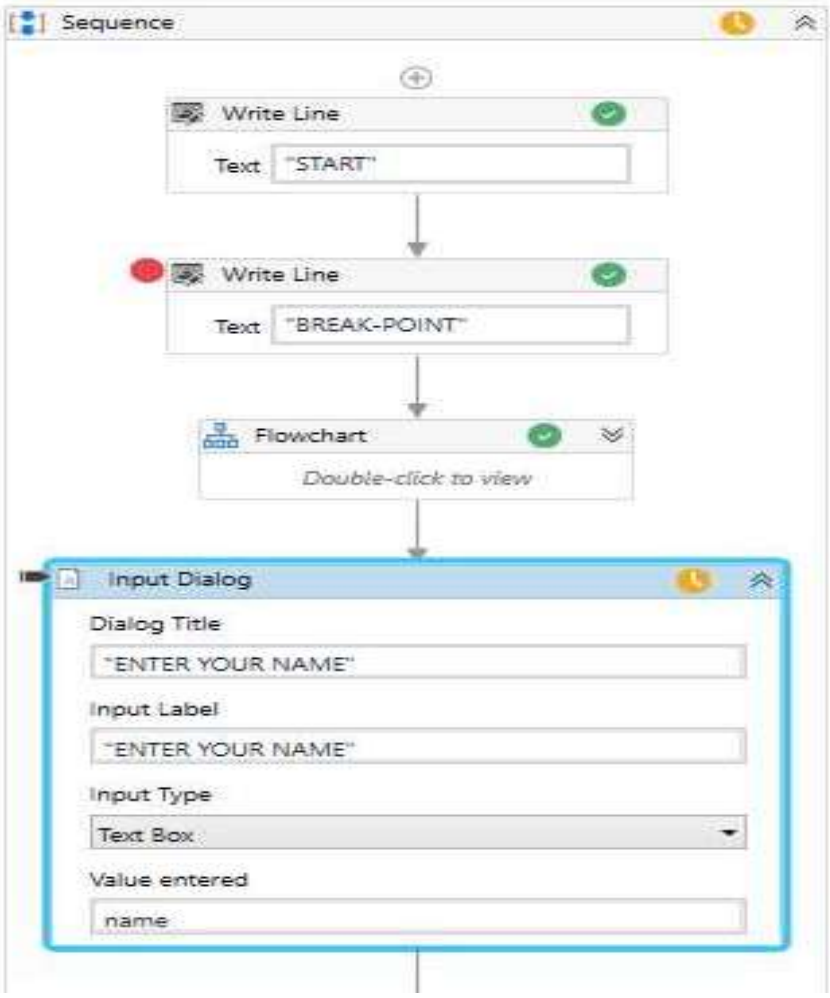


Step Over:

Unlike the Step Into action, The Step-Over does not open the current container. When Step Over is used, the action debugs the next activity, highlighting containers such as flowcharts, sequences, or Invoke Workflow File activities without opening them.

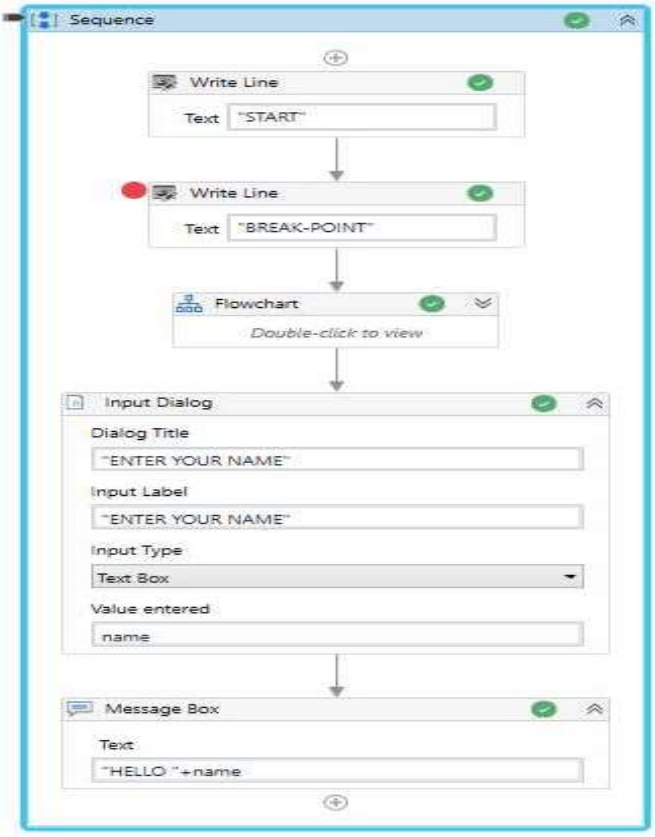
This action comes in handy for skipping analysis of large containers, which are unlikely to trigger any issues during

he F10keyboard

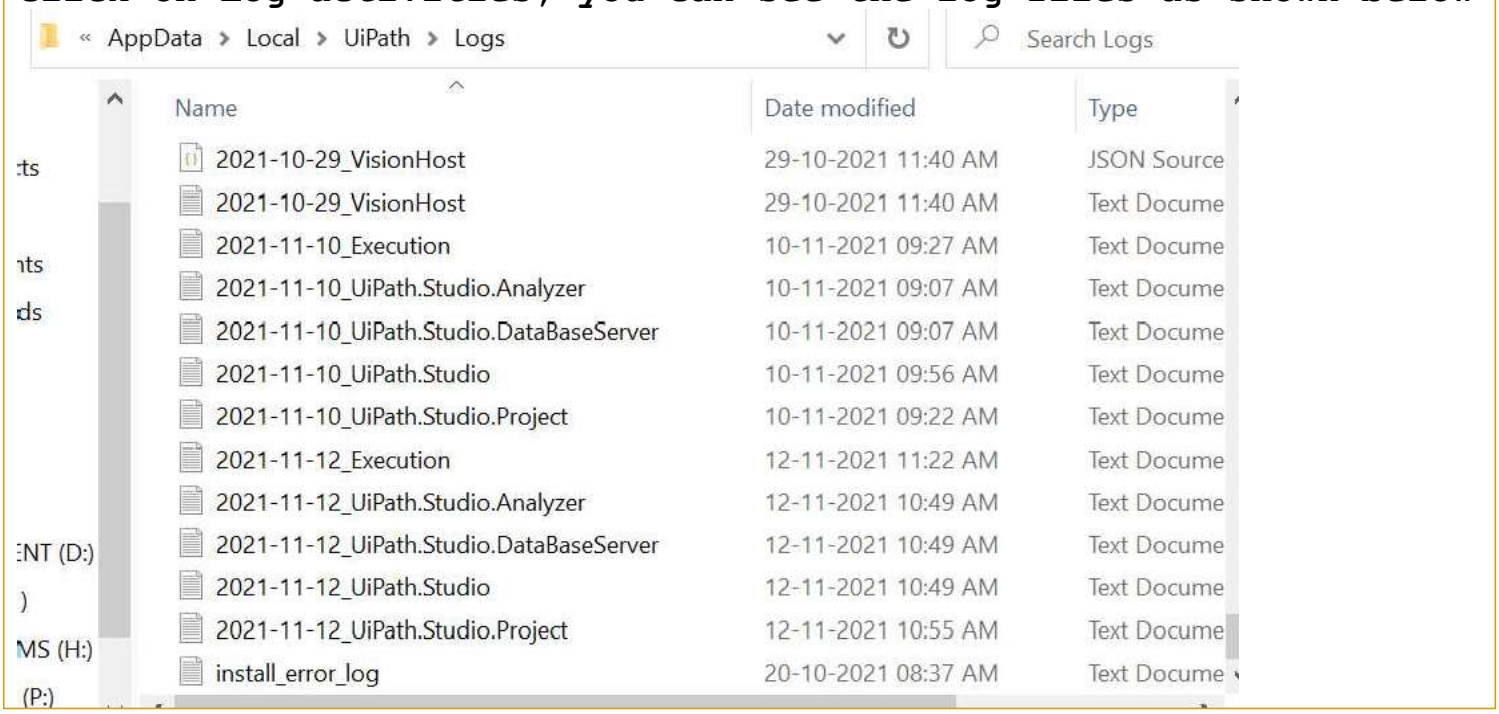


Step Out:
As the name suggests, The Step Out is used for stepping out and pausing the execution at the level of the current container. Step Out completes the execution of activities in the current container, before pausing the debugging.

This option works well with nested sequences. Step Out is available using the Shift + F11keyboard shortcut



click on Log activities, you can see the log files as shown below



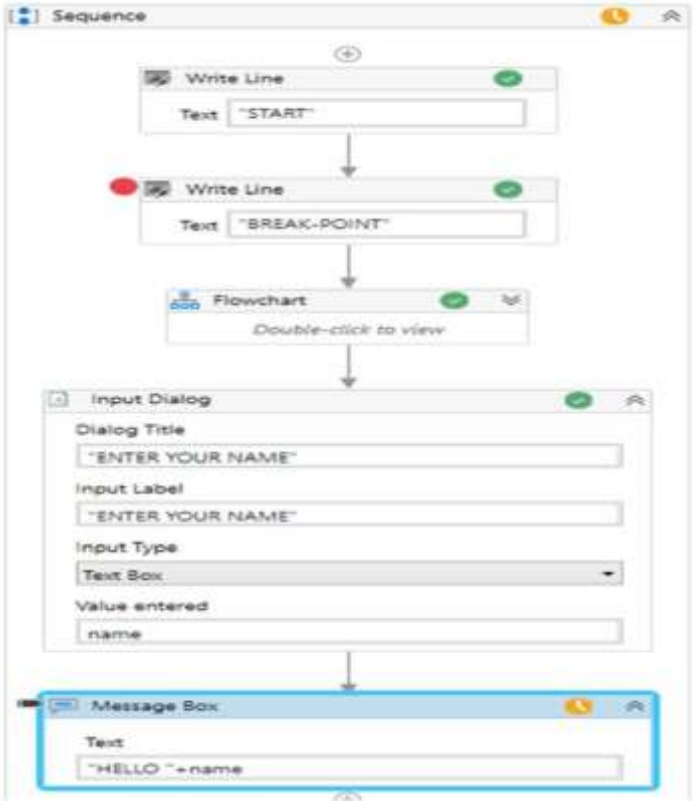
Question 10:
UiPath automation Debugging
- **Step into**
- **Step over**
- **Step out**

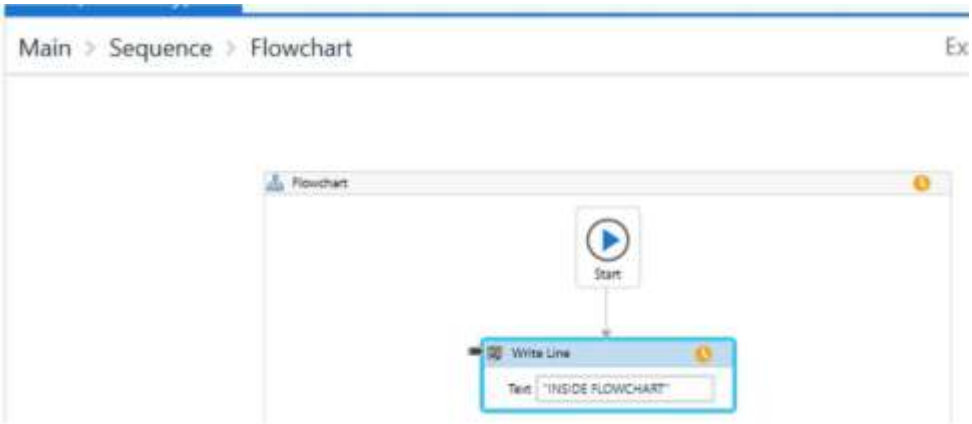
CREATE THE FOLLOWING FLOWCHART

Step Into:

The Step debugger opens and highlights the activity before it is executed. The Step Into will execute all the activities present in an activity(Container).

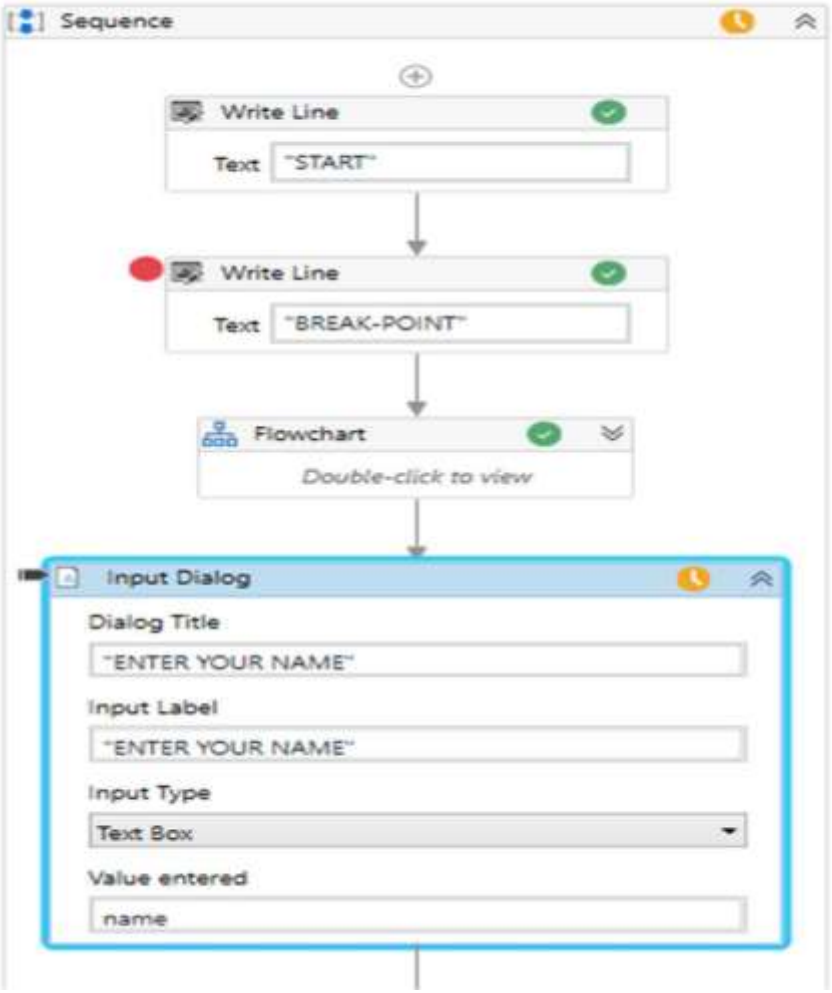
When Step Into is used with Invoke Workflow File activities, the workflow is opened in a new tab in read-only mode, and each activity is executed one by one. The keyboard shortcut for Step Into is F11.





Step Over:

Unlike the Step Into action, The Step-Over does not open the current container. When Step Over is used, the action debugs the next activity, highlighting containers such as flowcharts, sequences, or



Step Out:

As the name suggests, The Step Out is used for stepping out and pausing the execution at the level of the current container. Step Out completes the execution of activities in the current

container, before pausing the debugging.

This option works well with nested sequences. Step Out is available using the Shift +

F11keyboard shortcut