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CERTIFICATE

This is to certify that the Journal entitled **MICROSERVICE ARCHITECTURE** is bonafied work of **GOVIND SAINI** bearing Roll No : **07** submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai.

Date:

Internal Guide :

MICROSERVICE ARCHITECTURE

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Practical No – 1

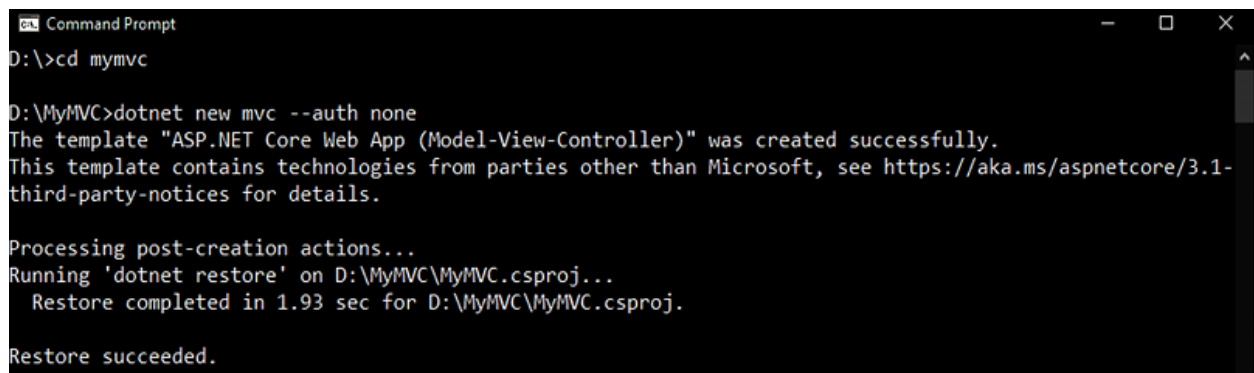
Aim: Building APT.NET Core MVC Application.

Description:

1)Install .Net Core Sdk (Link: <https://dotnet.microsoft.com/learn/dotnet/hello-world-tutorial/install>) 2)create folder MyMVC folder in D: drive or any other drive

- open command prompt and perform following operations **Command: to create mvc project**

dotnet new mvc --auth none



```
Command Prompt
D:\>cd mymvc

D:\MyMVC>dotnet new mvc --auth none
The template "ASP.NET Core Web App (Model-View-Controller)" was created successfully.
This template contains technologies from parties other than Microsoft, see https://aka.ms/aspnetcore/3.1-third-party-notices for details.

Processing post-creation actions...
Running 'dotnet restore' on D:\MyMVC\MyMVC.csproj...
  Restore completed in 1.93 sec for D:\MyMVC\MyMVC.csproj.

Restore succeeded.
```

Output:

- Go to controllers folder and modify HomeController.cs file to match following:

using System;

using System.Collections.Generic;

using System.Diagnostics;

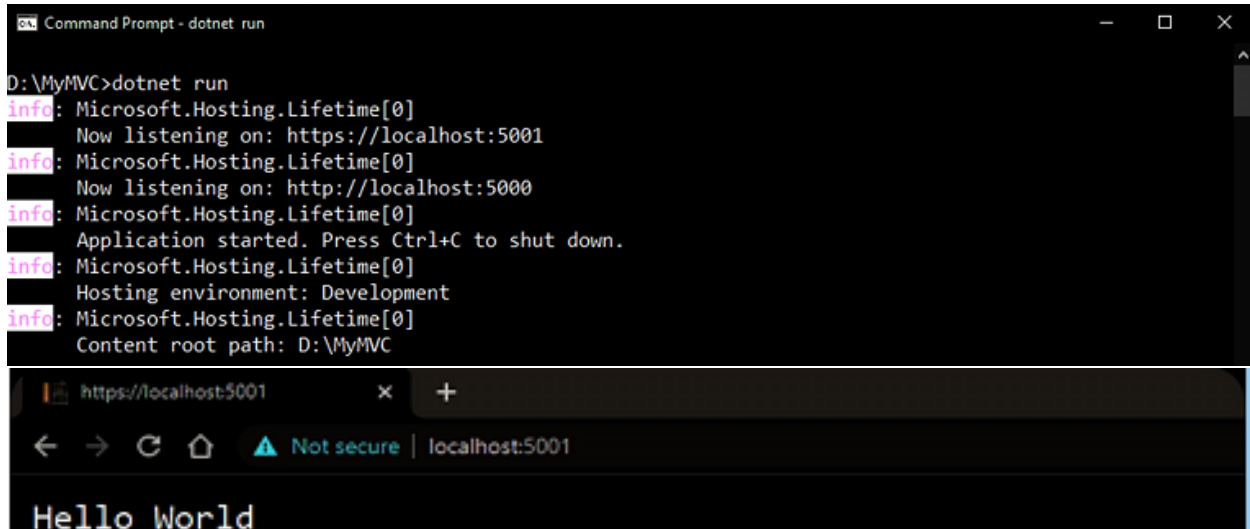
using System.Linq;

using System.Threading.Tasks; using Microsoft.AspNetCore.Mvc; using
Microsoft.Extensions.Logging; using MyMVC.Models;

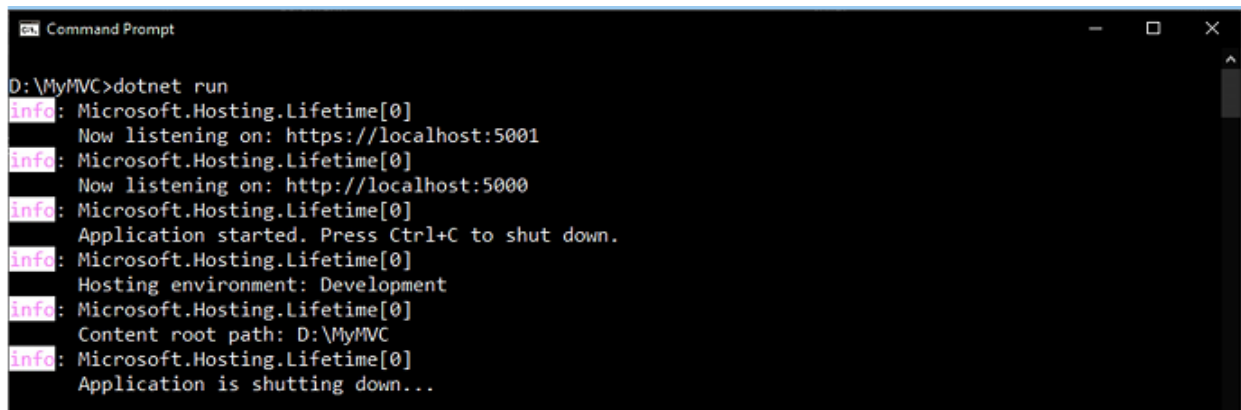
namespace MyMVC.Controllers
{

public class HomeController : Controller
{

```
public String Index()
{
    return "Hello World";    }
}
}
```



Run the project Now open browser and and type URL: localhost:5000



Now go back to command prompt and stop running project using CTRL+C

- Go to models folder and add new file StockQuote.cs to it with following content

using System;

namespace MyMVC.Models

{

```
public class StockQuote
{
    public string Symbol {get;set;} public int Price{get;set;}
}
}
```

- **Now Add View to folder then home folder in it and modify index.cshtml file to match following**

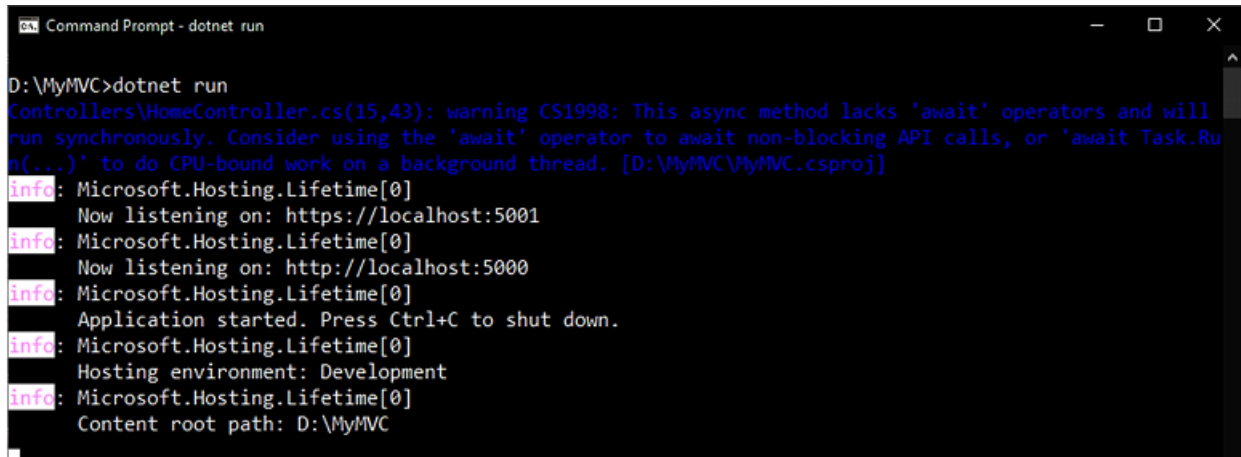
```
@{
    ViewData["Title"] = "Home Page";
}

<div>
    Symbol: @Model.Symbol <br/> Price: $@Model.Price <br/>
</div>
```

- **Now modify HomeController.cs file to match following:**

```
using System;
using System.Collections.Generic; using System.Diagnostics;
using System.Linq;
using System.Threading.Tasks; using Microsoft.AspNetCore.Mvc; using
Microsoft.Extensions.Logging; using MyMVC.Models;
namespace MyMVC.Controllers{
    public class HomeController : Controller
    {
        public async Task <IActionResult> Index()
        {
            var model= new StockQuote{ Symbol='HLLO', Price=3200}; return View(model);
        }
    }
}
```

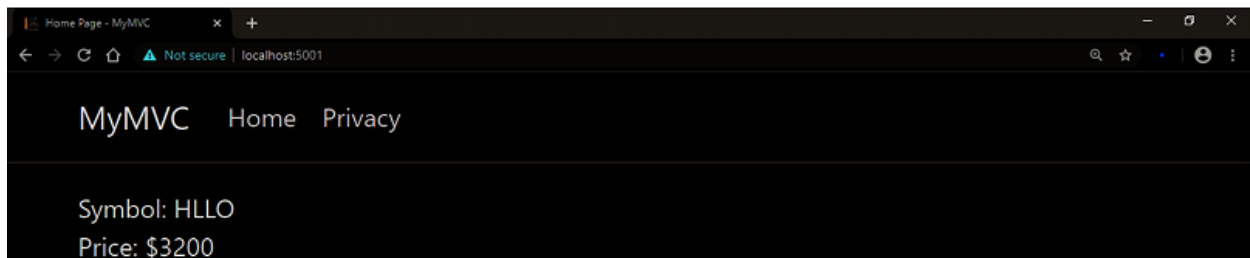
- **Now run the project using**



```
Command Prompt - dotnet run

D:\MyMVC>dotnet run
Controllers\HomeController.cs(15,43): warning CS1998: This async method lacks 'await' operators and will
run synchronously. Consider using the 'await' operator to await non-blocking API calls, or 'await Task.Run(...)' to do CPU-bound work on a background thread. [D:\MyMVC\MyMVC.csproj]
info: Microsoft.Hosting.Lifetime[0]
      Now listening on: https://localhost:5001
info: Microsoft.Hosting.Lifetime[0]
      Now listening on: http://localhost:5000
info: Microsoft.Hosting.Lifetime[0]
      Application started. Press Ctrl+C to shut down.
info: Microsoft.Hosting.Lifetime[0]
      Hosting environment: Development
info: Microsoft.Hosting.Lifetime[0]
      Content root path: D:\MyMVC
```

dotnet run



Now go back to browser and refresh to get modified view response

Practical No - 2

Aim: Building ASP.NET Core REST API.

Description:

Software requirement:

1. Download and install

To start building .NET apps you just need to download and install the .NET SDK (Software Development Kit version 3.0)

<https://dotnet.microsoft.com/learn/dotnet/hello-world-tutorial/install>

Check everything installed correctly

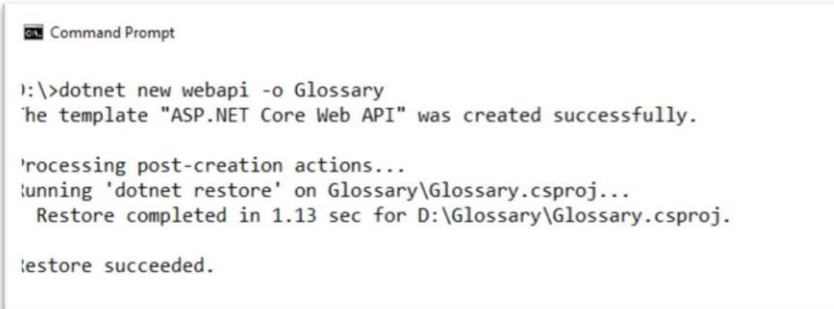
Once you've installed, open a new command prompt and run the following command: Command prompt

> dotnet

Create your web API

1. Open two command prompts

dotnet new webapi -o Glossary



```
Command Prompt

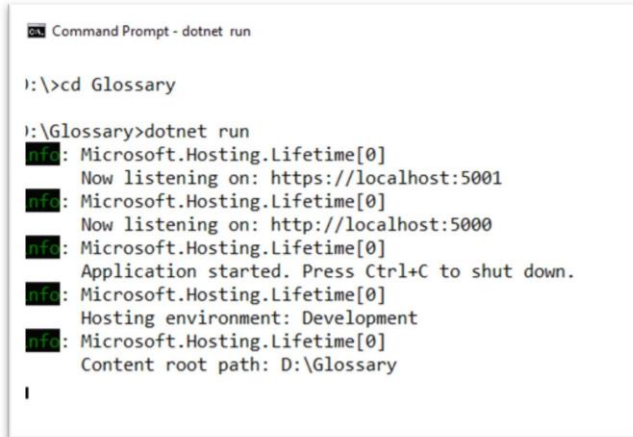
C:\>dotnet new webapi -o Glossary
The template "ASP.NET Core Web API" was created successfully.

Processing post-creation actions...
Running 'dotnet restore' on Glossary\Glossary.csproj...
Restore completed in 1.13 sec for D:\Glossary\Glossary.csproj.
Restore succeeded.
```

output:

Command:

Cd Glossary dotnet run



```

Command Prompt - dotnet run

D:\>cd Glossary

D:\Glossary>dotnet run
Microsoft.Hosting.Lifetime[0]:
    Now listening on: https://localhost:5001
Microsoft.Hosting.Lifetime[0]:
    Now listening on: http://localhost:5000
Microsoft.Hosting.Lifetime[0]:
    Application started. Press Ctrl+C to shut down.
Microsoft.Hosting.Lifetime[0]:
    Hosting environment: Development
Microsoft.Hosting.Lifetime[0]:
    Content root path: D:\Glossary

```

Output:

Command Prompt 2: (try running ready made weatherforecast class for testing)

Command:

`curl --insecure https://localhost:5001/weatherforecast`



```

Command Prompt

Microsoft Windows [Version 10.0.18362.175]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Admin>d:

D:\>curl --insecure https://localhost:5001/weatherforecast
[{"date": "2020-04-17T21:07:12.4769001+05:30", "temperatureC": 10, "temperatureF": 49, "summary": "Hot"}, {"date": "2020-04-18T21:07:12.478667+05:30", "temperatureC": -2, "temperatureF": 29, "summary": "Hot"}, {"date": "2020-04-19T21:07:12.4787101+05:30", "temperatureC": 29, "temperatureF": 84, "summary": "Warm"}, {"date": "2020-04-20T21:07:12.4787134+05:30", "temperatureC": 29, "temperatureF": 84, "summary": "Balmy"}, {"date": "2020-04-21T21:07:12.4787152+05:30", "temperatureC": 13, "temperatureF": 55, "summary": "Chilly"}]
D:\>

```

Output:

Now Change the content:

To get started, remove the WeatherForecast.cs file from the root of the project and the WeatherForecastController.cs file from the Controllers folder.

Add Following two files

1) D:\Glossary\GlossaryItem.cs (type it in notepad and save as all files)

```
//GlossaryItem.cs
```

```
namespace Glossary
```

```
{
```



```
public class GlossaryItem
{
    public string
    Term { get; set;
    } public string
    Definition {
    get; set; }
}
}
```

D:\Glossary\Controllers\ GlossaryController.cs (type it in notepad and save as all files)

```
cd Glossary dotnet run //Controllers/GlossaryController.cs
```

```
using System;
```

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

```
using Microsoft.AspNetCore.Mvc;
```

```
using System.IO;
```

```
namespace Glossary.Controllers
```

```
{
```

```
[ApiController] [Route("api/[controller]")]
```

```
{
```

```
    private static List<GlossaryItem> Glossary
```

```
        = new List<GlossaryItem> { new
```

```
        GlossaryItem
```

```
        {
```

```
            Term= "HTML",
```

```
            Definition = "Hypertext Markup Language"
```

```
        },
```

```
        new GlossaryItem
```

```
        {
```

```
        Term= "MVC",
        Definition = "Model View Controller"
    },
    new GlossaryItem
    {
        Term= "OpenID",
        Definition = "An open standard for authentication"
    }
};
```

```
    [HttpGet]
    public ActionResult<List<GlossaryItem>> Get()
    {
        return Ok(Glossary);
    }

    [HttpDelete] [Route("{term}")]
    public ActionResult<GlossaryItem> Get(string term)
    {
        var glossaryItem = Glossary.Find(item =>
            item.Term.Equals(term, StringComparison.InvariantCultureIgnoreCase));

        if (glossaryItem == null)
        {
            return NotFound();
        } else
        {
            return Ok(glossaryItem);
        }
    }
}
```

```
[HttpPost]
public ActionResult Post(GlossaryItem glossaryItem)
{
    var existingGlossaryItem = Glossary.Find(item =>
        item.Term.Equals(glossaryItem.Term,
            StringComparison.InvariantCultureIgnoreCase));

    if (existingGlossaryItem != null)
    {
        return Conflict("Cannot create the term because it already exists.");
    }
    else
    {
        Glossary.Add(glossaryItem);

        var resourceUrl = Path.Combine(Request.Path.ToString(),
            Uri.EscapeUriString(glossaryItem.Term)); return
        Created(resourceUrl, glossaryItem);
    }
}
```

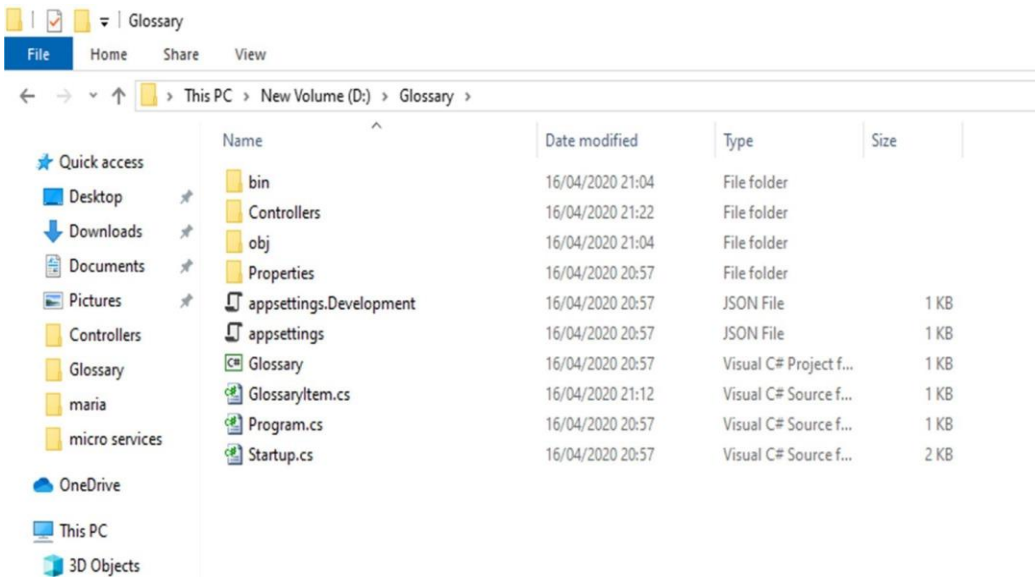
```
[HttpPut]
public ActionResult Put(GlossaryItem glossaryItem)
{
    var existingGlossaryItem = Glossary.Find(item =>
        item.Term.Equals(glossaryItem.Term,
            StringComparison.InvariantCultureIgnoreCase));

    if (existingGlossaryItem == null)
    {
        return BadRequest("Cannot update a nont existing term.");
    }
}
```

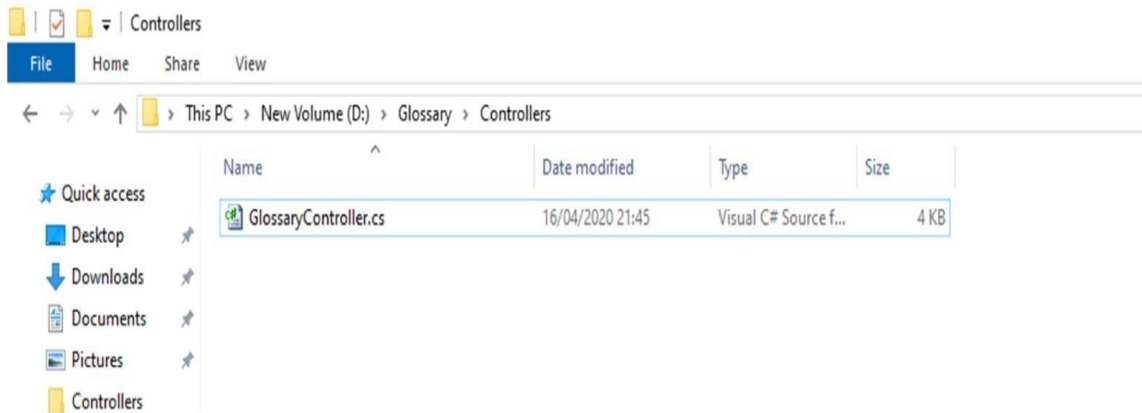
```
        } else
        {
            existingGlossaryItem.Definition =
            glossaryItem.Definition; return
            Ok();
        }
    }

    public ActionResult Delete(string term)
    {
        var glossaryItem = Glossary.Find(item =>
            item.Term.Equals(term, StringComparison.InvariantCultureIgnoreCase));

        if (glossaryItem == null)
        {
            return NotFound();
        }
        else
        {
            Glossary.Remove(glossaryItem); return
            NoContent();
        }
    }
}
```

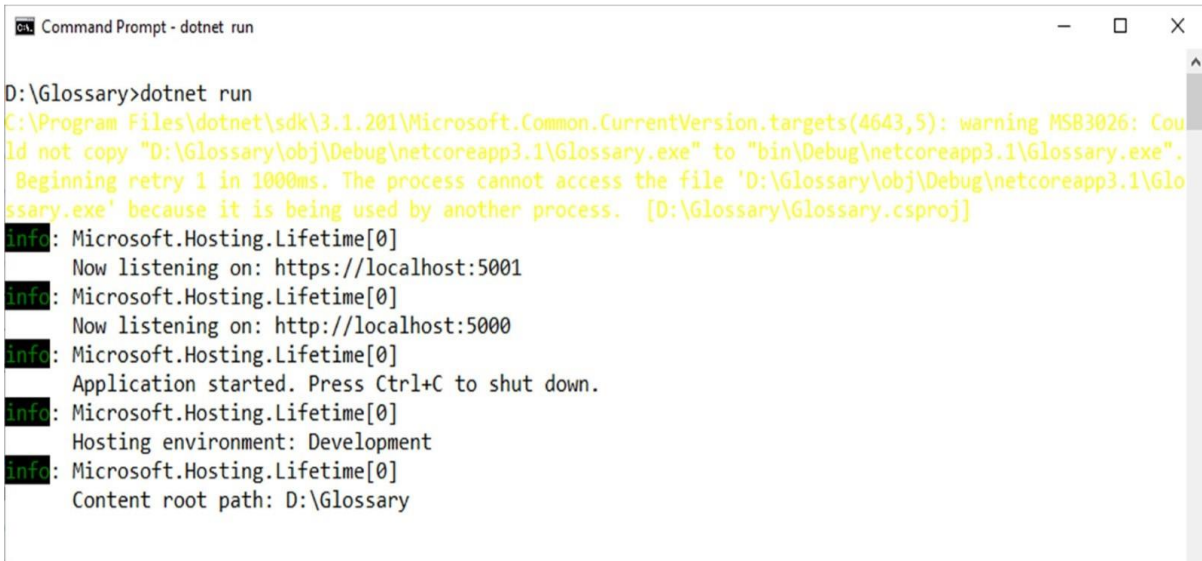


Output:



3. Now stop running previous dotnet run on command prompt 1 using Ctrl+C. and Run it again for new code. On Command prompt1:
Command:

dotnet run



```

Command Prompt - dotnet run

D:\Glossary>dotnet run
C:\Program Files\dotnet\sdk\3.1.201\Microsoft.Common.CurrentVersion.targets(4643,5): warning MSB3026: Could not copy "D:\Glossary\obj\Debug\netcoreapp3.1\Glossary.exe" to "bin\Debug\netcoreapp3.1\Glossary.exe". Beginning retry 1 in 1000ms. The process cannot access the file 'D:\Glossary\obj\Debug\netcoreapp3.1\Glossary.exe' because it is being used by another process. [D:\Glossary\Glossary.csproj]
info: Microsoft.Hosting.Lifetime[0]
      Now listening on: https://localhost:5001
info: Microsoft.Hosting.Lifetime[0]
      Now listening on: http://localhost:5000
info: Microsoft.Hosting.Lifetime[0]
      Application started. Press Ctrl+C to shut down.
info: Microsoft.Hosting.Lifetime[0]
      Hosting environment: Development
info: Microsoft.Hosting.Lifetime[0]
      Content root path: D:\Glossary
  
```

output:

On Command prompt2:

1) Getting a list of items:

Command:

```
curl --insecure https://localhost:5001/api/glossary
```



```

Command Prompt

D:\>curl --insecure https://localhost:5001/api/glossary
[{"term":"HTML","definition":"Hypertext Markup Language"}, {"term":"MVC","definition":"Model View Controller"}, {"term":"OpenID","definition":"An open standard for authentication"}]
D:\>
  
```

Output:

Getting a single item

Command:

```
curl --insecure https://localhost:5001/api/glossary/MVC
```



```

Command Prompt

D:\>curl --insecure https://localhost:5001/api/glossary/MVC
{"term":"MVC","definition":"Model View Controller"}
D:\>
  
```

2) Creating an item

Command:

```
curl --insecure -X POST -d '{"term\": \"MFA\", \"definition\": \"An authentication process.\"}' -H 'Content-Type:application/json' https://localhost:5001/api/glossary
```



```
Command Prompt
D:\>curl --insecure -X POST -d '{"term\": \"MFA\", \"definition\": \"An authentication process.\"}' -H 'Content-Type:application/json' https://localhost:5001/api/glossary
{"term":"MFA","definition":"An authentication process."}
D:\>curl --insecure https://localhost:5001/api/glossary
[{"term":"HTML","definition":"Hypertext Markup Language"}, {"term":"MVC","definition":"Model View Controller"}, {"term":"OpenID","definition":"An open standard for authentication"}, {"term":"MFA","definition":"An authentication process."}]
D:\>
```

Output:

Update Item

Command:

```
curl --insecure -X PUT -d '{"term\": \"MVC\", \"definition\": \"Modified record of Model View Controller.\"}' -H 'Content-Type:application/json' https://localhost:5001/api/glossary
```

Output:



```
Command Prompt
D:\>curl --insecure -X PUT -d '{"term\": \"MVC\", \"definition\": \"Modified record of Model View Controller.\"}' -H 'Content-Type:application/json' https://localhost:5001/api/glossary
D:\>curl --insecure https://localhost:5001/api/glossary
[{"term":"HTML","definition":"Hypertext Markup Language"}, {"term":"MVC","definition":"Modified record of Model View Controller."}, {"term":"OpenID","definition":"An open standard for authentication"}, {"term":"MFA","definition":"An authentication process."}]
D:\>
```

Delete Item

Command:

```
curl --insecure --request DELETE --url https://localhost:5001/api/glossary/openid
```

Output:



```
Command Prompt

D:\>curl --insecure --request DELETE --url https://localhost:5001/api/glossary/openid

D:\>curl --insecure https://localhost:5001/api/glossary
[{"term":"HTML","definition":"Hypertext Markup Language"}, {"term":"MVC","definition":"Modified record of Model View Controller."}, {"term":"MFA","definition":"An authentication process."}]

D:\>
```

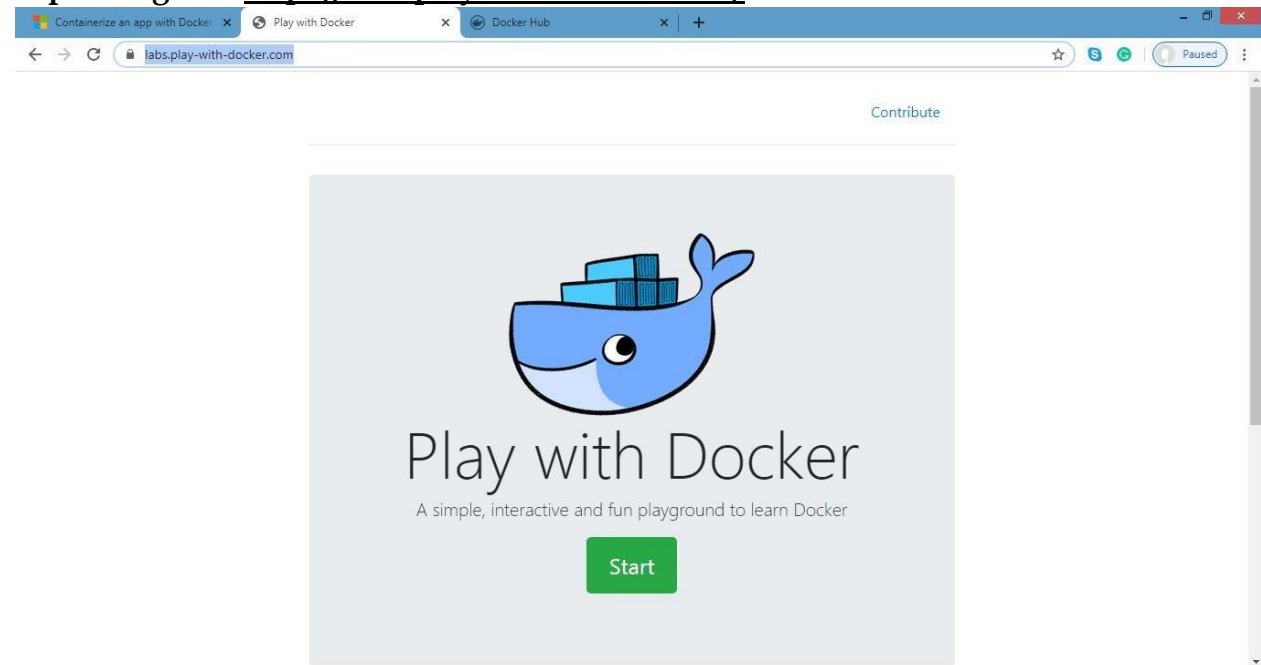

Practical No – 3

Aim: Working with Docker, Docker Commands, Docker Images and Containers

Description:

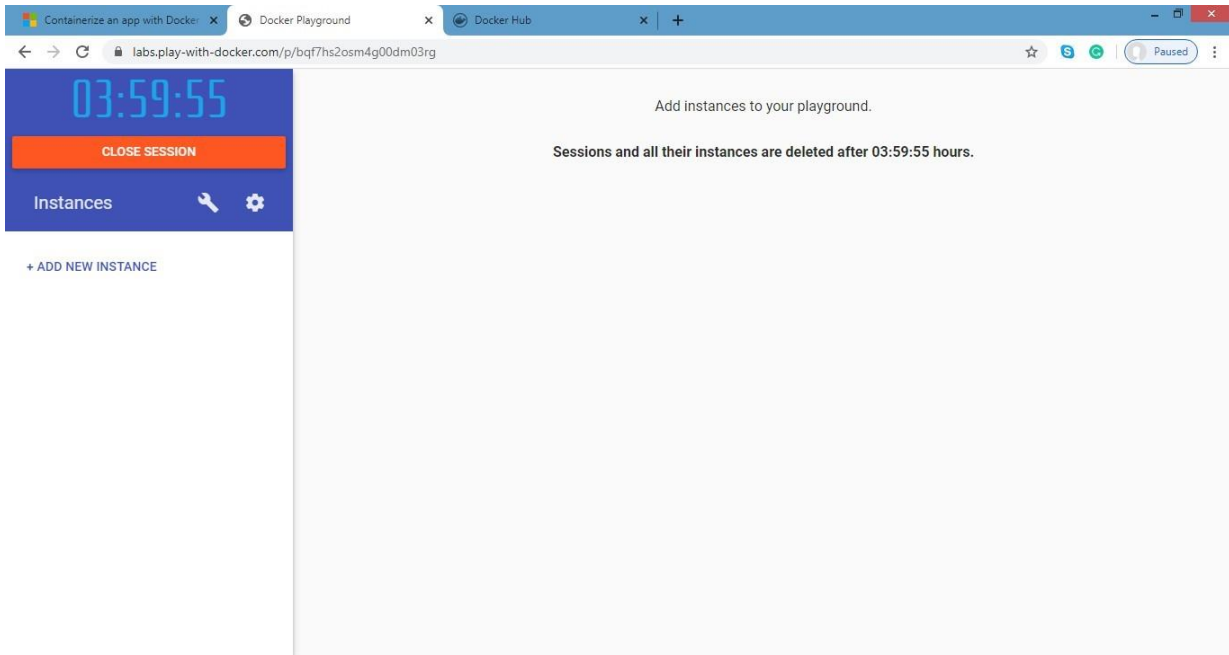
Step 1: create Docker Hub account (sign up)

Step 2 : login to <https://labs.play-with-docker.com/>



Click on start

Step 3: Add new instances



Step 4: perform following:

Method1: To pull and push images using docker

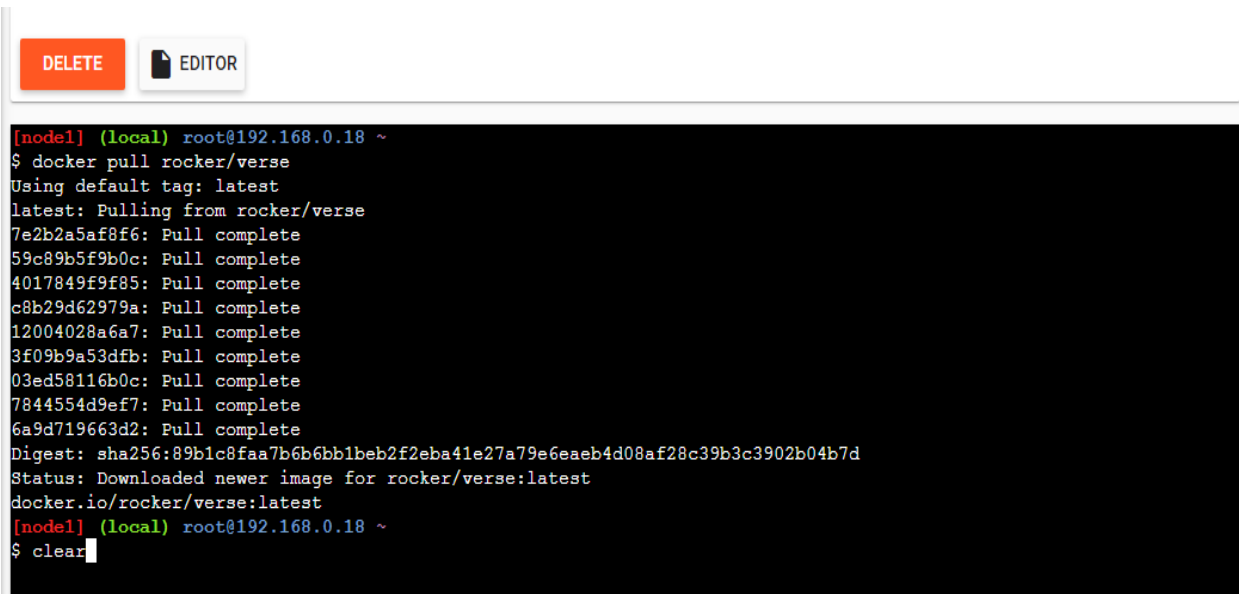
Command: to check
docker version
docker --version

Output:

```
[node1] (local) root@192.168.0.18 ~  
$ docker --version  
Docker version 19.03.4, build 9013bf583a  
[node1] (local) root@192.168.0.18 ~  
$
```

Command: to pull
readymade image
docker pull
rocker/verse

output:



```
[node1] (local) root@192.168.0.18 ~
$ docker pull rocker/verse
Using default tag: latest
latest: Pulling from rocker/verse
7e2b2a5af8f6: Pull complete
59c89b5f9b0c: Pull complete
4017849f9f85: Pull complete
c8b29d62979a: Pull complete
12004028a6a7: Pull complete
3f09b9a53dfb: Pull complete
03ed58116b0c: Pull complete
7844554d9ef7: Pull complete
6a9d719663d2: Pull complete
Digest: sha256:89b1c8faa7b6b6bb1beb2f2eba41e27a79e6eae4d08af28c39b3c3902b04b7d
Status: Downloaded newer image for rocker/verse:latest
docker.io/rocker/verse:latest
[node1] (local) root@192.168.0.18 ~
$ clear
```

Command: to check images in
docker docker images

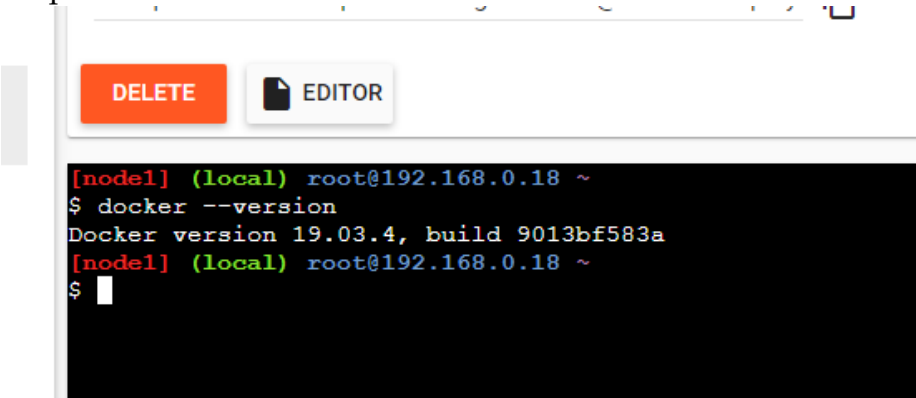
4) perform following:

Method1:

To pull and push images using docker

Command: to check
docker version
docker -version

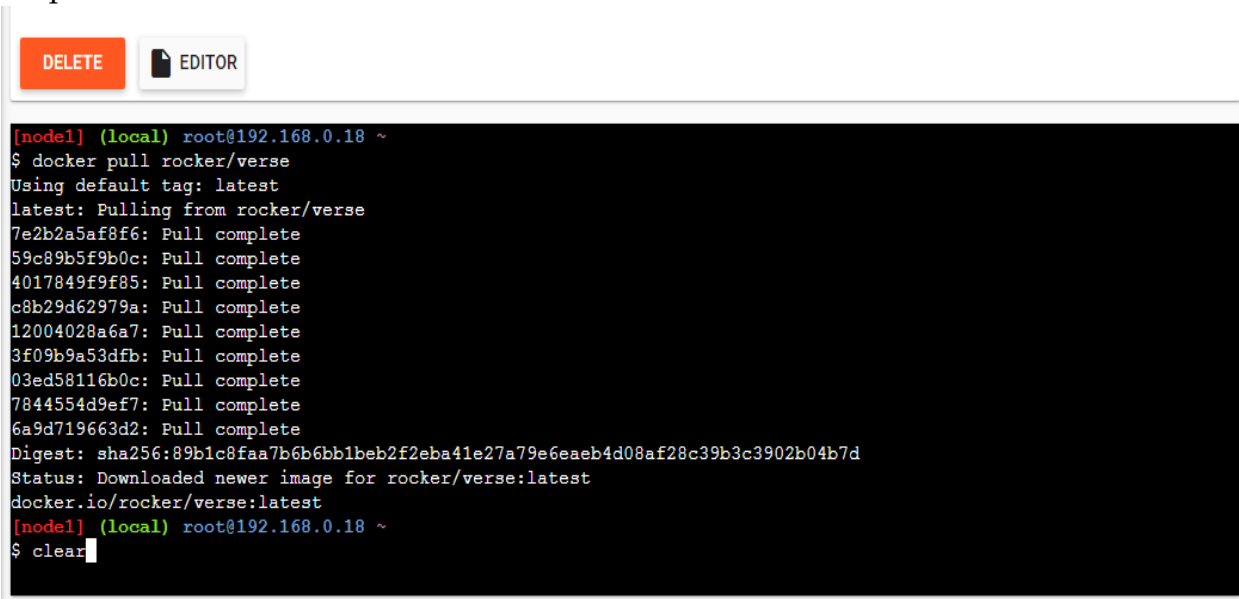
output:



```
[node1] (local) root@192.168.0.18 ~
$ docker --version
Docker version 19.03.4, build 9013bf583a
[node1] (local) root@192.168.0.18 ~
$
```

Command: to pull
readymade image
docker pull
rocker/verse

output:



```
[node1] (local) root@192.168.0.18 ~
$ docker pull rocker/verse
Using default tag: latest
latest: Pulling from rocker/verse
7e2b2a5af8f6: Pull complete
59c89b5f9b0c: Pull complete
4017849f9f85: Pull complete
c8b29d62979a: Pull complete
12004028a6a7: Pull complete
3f09b9a53dfb: Pull complete
03ed58116b0c: Pull complete
7844554d9ef7: Pull complete
6a9d719663d2: Pull complete
Digest: sha256:89b1c8faa7b6b6bb1beb2f2eba41e27a79e6eae4d08af28c39b3c3902b04b7d
Status: Downloaded newer image for rocker/verse:latest
docker.io/rocker/verse:latest
[node1] (local) root@192.168.0.18 ~
$ clear
```

Command: to check images in
docker docker images

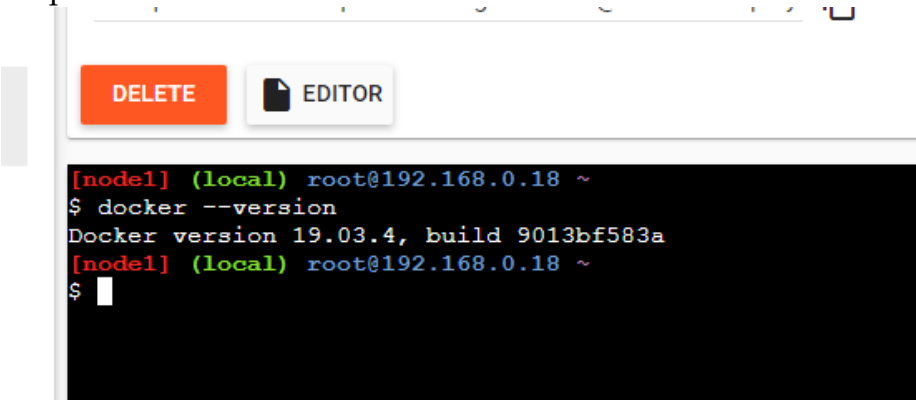
4) perform following:

Method1:

To pull and push images using docker

Command: to check
docker version
docker -version

output:



```
[node1] (local) root@192.168.0.18 ~
$ docker --version
Docker version 19.03.4, build 9013bf583a
[node1] (local) root@192.168.0.18 ~
$
```

Command: to pull
readymade image

docker pull
rocker/verse

output:

DELETE

EDITOR

```

[node1] (local) root@192.168.0.18 ~
$ docker pull rocker/verse
Using default tag: latest
latest: Pulling from rocker/verse
7e2b2a5af8f6: Pull complete
59c89b5f9b0c: Pull complete
4017849f9f85: Pull complete
c8b29d62979a: Pull complete
12004028a6a7: Pull complete
3f09b9a53dfb: Pull complete
03ed58116b0c: Pull complete
7844554d9ef7: Pull complete
6a9d719663d2: Pull complete
Digest: sha256:89b1c8faa7b6b6bb1beb2f2eba41e27a79e6eae4d08af28c39b3c3902b04b7d
Status: Downloaded newer image for rocker/verse:latest
docker.io/rocker/verse:latest
[node1] (local) root@192.168.0.18 ~
$ clear

```

Command: to check images in
docker docker images

Output

DELETE

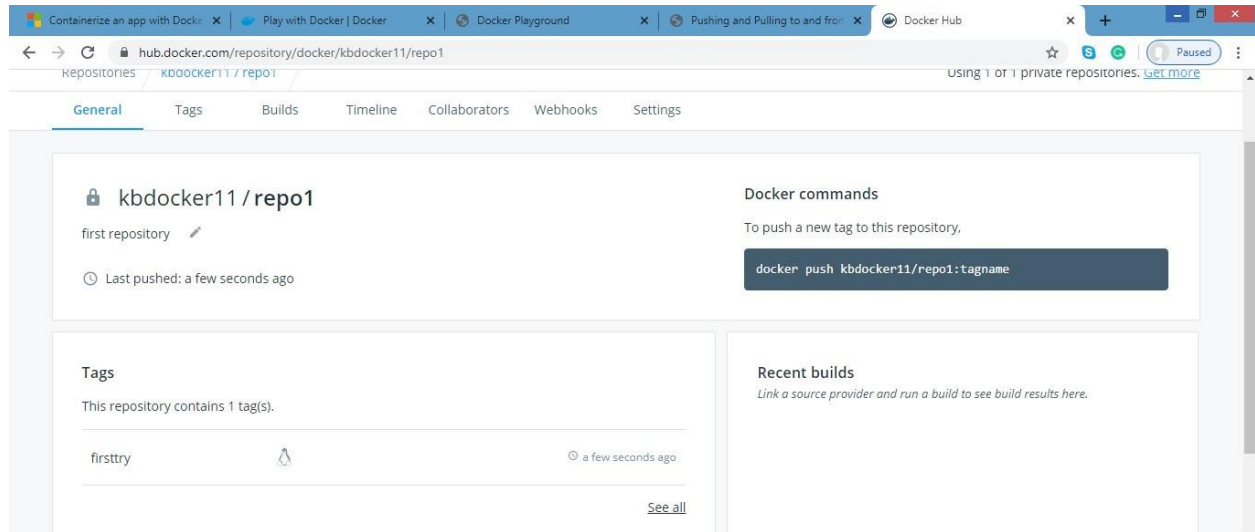
EDITOR

```

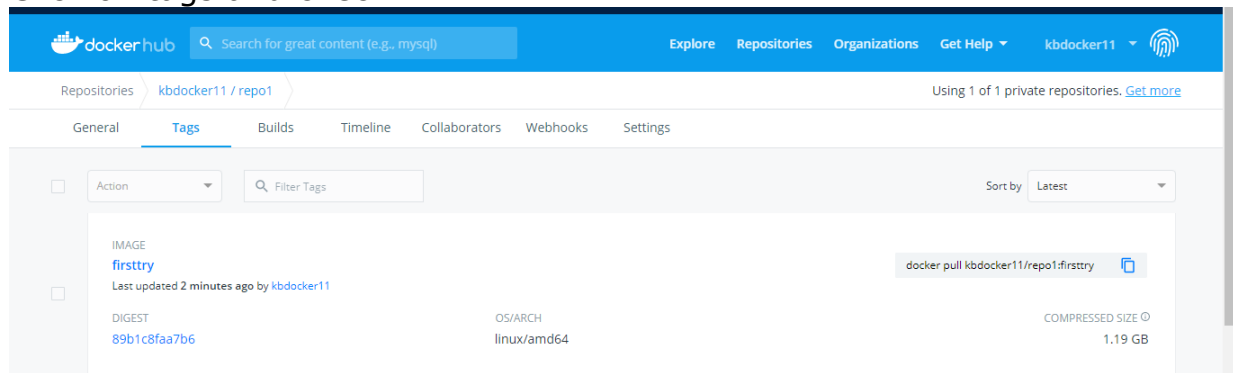
REPOSITORY          TAG          IMAGE ID          CREATED          SIZE
rocker/verse        latest       85c3e4e2c35e     4 days ago      3.15GB
[node1] (local) root@192.168.0.18 ~
$ docker tag 85c3e4e2c35e kbdocker11/rep01:firsttry
[node1] (local) root@192.168.0.18 ~
$ docker push kbdocker11/rep01:firsttry
The push refers to repository [docker.io/kbdocker11/rep01]
3e43a21d810a: Mounted from rocker/verse
8fdb254334fd: Mounted from rocker/verse
6611ef73af7c: Mounted from rocker/verse
7ec16b3cc818: Mounted from rocker/verse
a2f3120be52c: Mounted from rocker/verse
beb6bc4429d0: Mounted from rocker/verse
828281284548: Mounted from rocker/verse
61fb5e16e303: Mounted from rocker/verse
461719022993: Mounted from rocker/verse
firsttry: digest: sha256:89b1c8faa7b6b6bb1beb2f2eba41e27a79e6eae4d08af28c39b3c3902b04b7d size: 2211
[node1] (local) root@192.168.0.18 ~
$

```

Check it in docker hub now



Click on tags and check



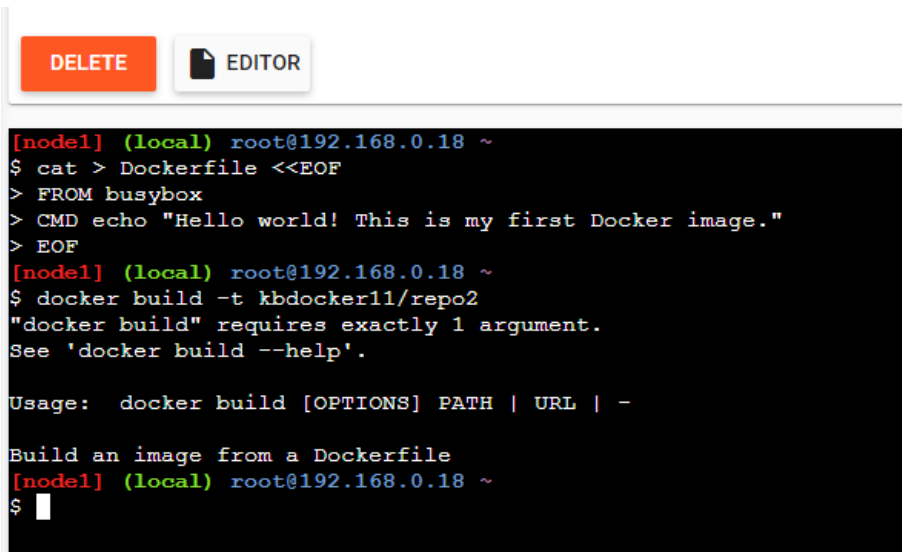
Method 2:

Build an image then push it to docker and run it

Command : to create docker file

1. cat > Dockerfile <<EOF
2. FROM busybox
3. CMD echo "Hello world! This is my first Docker image."
4. EOF

Output :



```

[node1] (local) root@192.168.0.18 ~
$ cat > Dockerfile <<EOF
> FROM busybox
> CMD echo "Hello world! This is my first Docker image."
> EOF
[node1] (local) root@192.168.0.18 ~
$ docker build -t kbdocker11/repo2
"docker build" requires exactly 1 argument.
See 'docker build --help'.

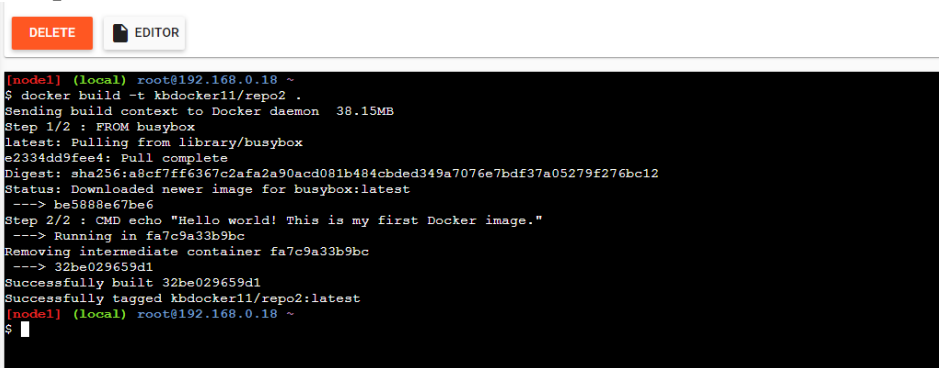
Usage:  docker build [OPTIONS] PATH | URL | -

Build an image from a Dockerfile
[node1] (local) root@192.168.0.18 ~
$

```

Command : to build image from
docker file dokcer build -t
kbdocker11/repo2 .

Output:



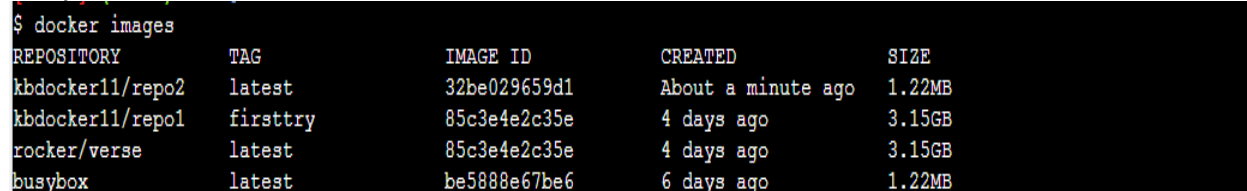
```

[node1] (local) root@192.168.0.18 ~
$ docker build -t kbdocker11/repo2 .
Sending build context to Docker daemon 38.15MB
Step 1/2 : FROM busybox
latest: Pulling from library/busybox
e2334dd9fee4: Pull complete
Digest: sha256:a8cf7ff6367c2afa2a90acd081b484cbdded349a7076e7bdf37a05279f276bc12
Status: Downloaded newer image for busybox:latest
--> be5888e67be6
Step 2/2 : CMD echo "Hello world! This is my first Docker image."
--> Running in fa7c9a33b9bc
Removing intermediate container fa7c9a33b9bc
--> 32be029659d1
Successfully built 32be029659d1
Successfully tagged kbdocker11/repo2:latest
[node1] (local) root@192.168.0.18 ~
$

```

Command: to check docker images docker images

output:



```

$ docker images

```

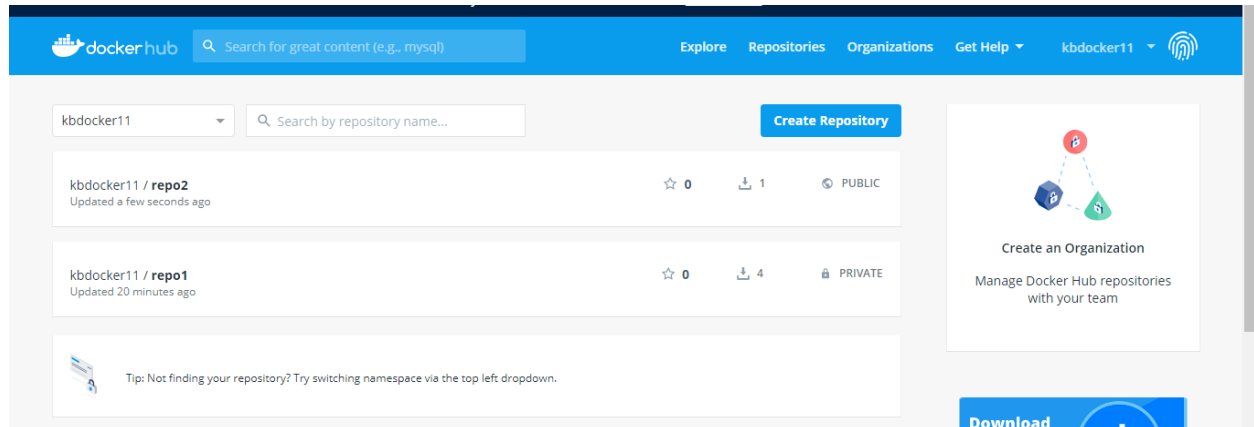
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
kbdocker11/repo2	latest	32be029659d1	About a minute ago	1.22MB
kbdocker11/repo1	firsttry	85c3e4e2c35e	4 days ago	3.15GB
rocker/verse	latest	85c3e4e2c35e	4 days ago	3.15GB
busybox	latest	be5888e67be6	6 days ago	1.22MB

Command: to push image to
docker hub docker push
kbdocker11/repo2 .

Output:

```
[node1] (local) root@192.168.0.18 ~  
$ docker push kbdocker11/repo2  
The push refers to repository [docker.io/kbdocker11/repo2]  
5b0d2d635df8: Mounted from library/busybox  
latest: digest: sha256:afa7a4103608d128764a15889501141a10eb9e733f19e4f57645a5ac01c85407 size: 527  
[node1] (local) root@192.168.0.18 ~  
$
```

Now check it on docker hub



command: to run

docker image: docker

run kbdocker11/repo2

output:

```
[node1] (local) root@192.168.0.18 ~  
$ docker run kbdocker11/repo2  
Hello world! This is my first Docker image.  
[node1] (local) root@192.168.0.18 ~  
$
```

Now close session.

Practical No - 4

Aim: Installing software packages on Docker, Working with Docker Volumes and Networks.

Description:

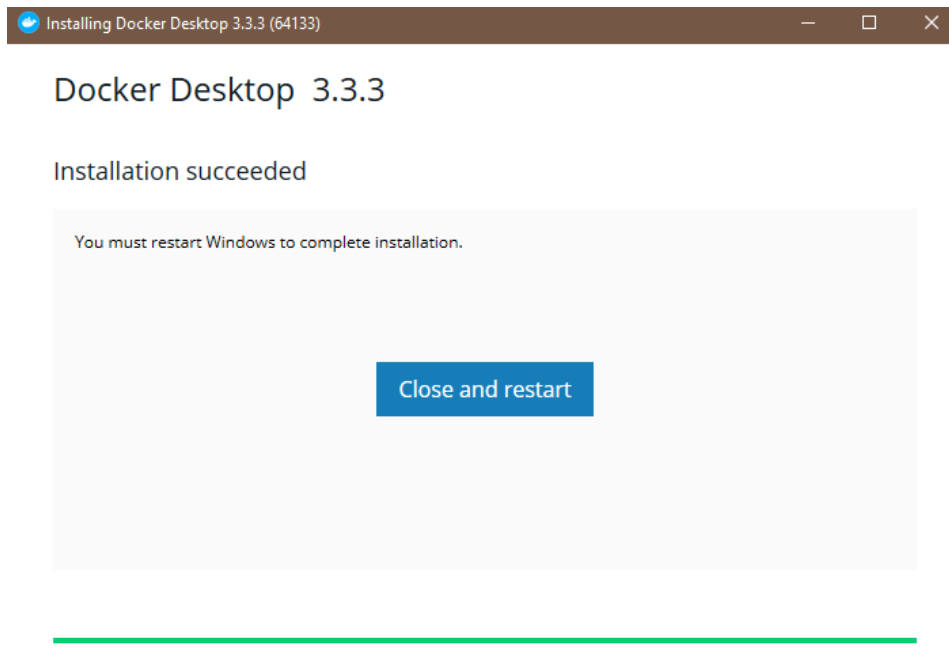
If you've already run the command to get started with the tutorial, congratulations! If not, open a command prompt or bash window, and run the command:

```
docker run -d -p 80:80 docker/getting-started
```

You'll notice a few flags being used. Here's some more info on them:

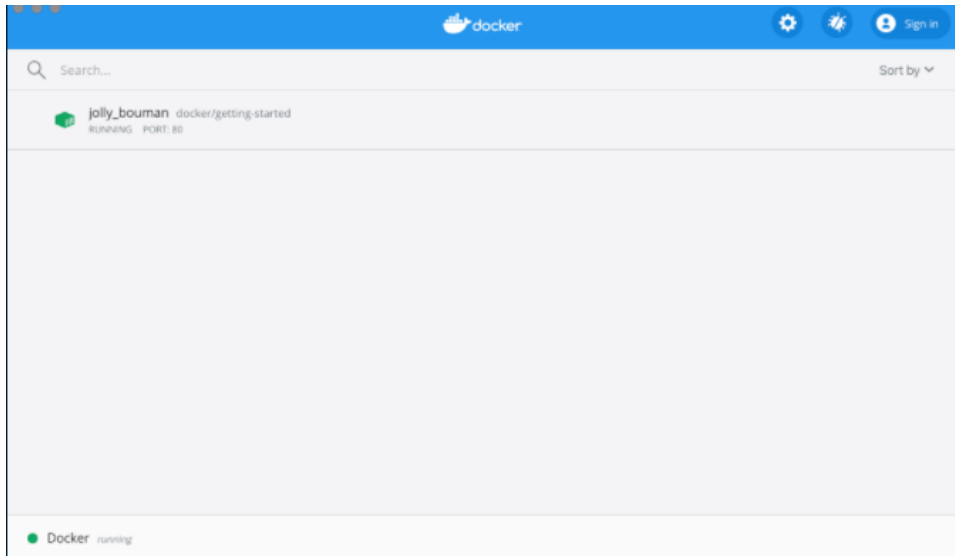
- `-d` - run the container in detached mode (in the background)
- `-p 80:80` - map port 80 of the host to port 80 in the container
- `docker/getting-started` - the image to use

```
docker run -dp 80:80 docker/getting-started
```



What is a container?

Now that you've run a container, what *is* a container? Simply put, a container is simply another process on your machine that has been isolated from all other processes on the host machine. That isolation leverages kernel namespaces and cgroups, features that have been in Linux for a long time. Docker has worked to make these capabilities approachable and easy to use.

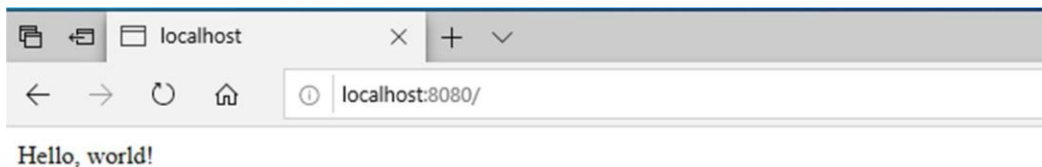


Step 1: \$ docker run -p 8080:8080 dotnetcoreservices/hello-world

Administrator: Command Prompt - docker run -p 8080:8080 dotnetcoreservices/hello-world

```
C:\Windows\system32>docker run -p 8080:8080 dotnetcoreservices/hello-world
Hosting environment: Production
Content root path: /pipeline/source/app/publish
Now listening on: http://0.0.0.0:8080
Application started. Press Ctrl+C to shut down.
```

Step 2: Run Localhost in browser



Step 3: \$ docker ps

```
C:\Windows\system32>docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
ea1f20370993	dotnetcoreservices/hello-world	"/pipeline/source/ap..."	2 minutes ago	Up 2 minutes	0.0.0.0:8080->8080/tcp	recurring_lalande

```
C:\Windows\system32>
```

Step 4: curl http://localhost:8080/will/it/blend?

```
C:\Windows\system32>curl http://localhost:8080/will/it/blend?  
Hello, world!
```

Step 5: \$ docker kill PID (process id of application).

```
C:\Windows\system32>docker kill ea1f20370993  
ea1f20370993
```

```
C:\Windows\system32>
```

Step 6 : Process Id terminated

```
C:\Windows\system32>docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
--------------	-------	---------	---------	--------	-------	-------

```
C:\Windows\system32>
```

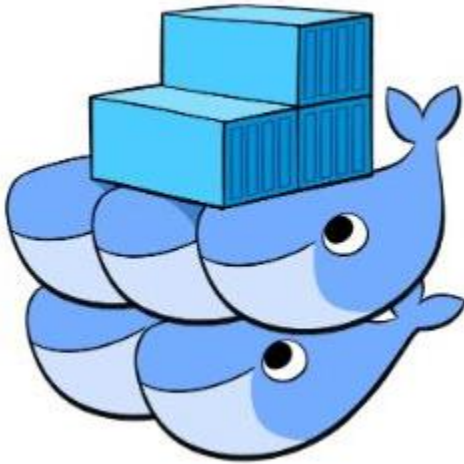
Practical No - 5

Aim: Working with Docker Swarm.

Description:

What is Docker Swarm?

Docker Swarm is an orchestration management tool that runs on Docker applications. It helps end-users in creating and deploying a cluster of Docker nodes.



Step 1: Update Software Repositories

Run the following command on the terminal:

```
sudo apt-get update
```

Step 2: Uninstall Old Versions of Docker

Before proceeding, uninstall the old Docker software and use the following command:

```
sudo apt-get remove docker docker-engine docker.io
```

Step 3: Install Docker

To install Docker on Ubuntu, run the following command:

```
sudo apt install docker.io
```

Step 4: Set-up Docker

Set-up and run Docker service by entering the following commands in the terminal window:

```
sudo systemctl start docker
```

```
sudo systemctl enable docker
```

Step 5: Verify Docker Version

To check the installed Docker version, enter the following command:

```
sudo docker --version
```

Step 6: Run Docker Container

To run a Docker container, it's important to pull a Docker Image (such as MySQL) from Docker Hub.

```
sudo docker pull mysql
```

```
sudo docker run -d -p0.0.0.0:80:80 mysql:latest
```

Now, Docker pulls the latest MySQL image from the hub. List down all the available Docker images on your machine by using the following command:

```
sudo docker ps -a
```

Step 7: Create Swarm

Here, create a cluster with the IP address of the manager node.

```
sudo Docker Swarm init --advertise-addr 192.168.2.151
```

Subsequently, you should see the following output:

Manager Node

This means that the manager node is successfully configured. Now, add worker node by copying the command of the "swarm init" and paste the output onto the worker node:

```
sudo Docker Swarm join --token SWMTKN-1- xxxxx
```

Your worker node is also created if you see the following output:

Worker Node

Now, go back to the manager node and execute the following command to list the worker node: `sudo docker node ls`

Here, you must see the worker node in the following output:

Swarm Cluster - Docker Swarm

The above image shows you have created the Swarm Cluster successfully. Now, launch the service in Swarm Mode. Go to your the manager node and execute the command below to deploy a service:

```
sudo docker service create --name HelloWorld alpine ping docker.com
```

Service Created - Docker Swarm

By executing the above command, you can access the HelloWorld file from the remote system. To see the output, you can check the services with the following command:

```
sudo docker service ls
```

Finally, you should be able to see the following output:

Practical No - 6

Aim: Working with Circle CI for continuous integration.

Description:

Prerequisites

To follow along with the tutorial, a few things are required:

1. Python installed on your local system
2. A Circle CI account
3. A GitHub account

Building the app

For simplicity, we will create a Flask application. Flask is a microframework for Python. For our exercise, minimal knowledge of the framework is necessary.

First, create a project directory (folder) and cd into it. Type this into Terminal:

```
mkdir python_app && cd $_/
```

Next, open your favorite editor and create a hello.py file. Then, copy the following lines into that file:

```
from flask import Flask  
app = Flask(__name__)  
@app.route("/")  
def hello():  
return "Hello World!"
```

Running the app

Now it is time to create a requirements.txt file in our editor. Add the word **Flask** to the file and save it.

Then, within the virtual environment, install the package by running:

The final command to run this application is:

```
FLASK_APP=hello.py flask run
```

You can see the application running on your browser at <http://localhost:5000/>.

CircleCI config file

Create a .circleci folder and inside of that create a [config.yml](#) file. Then, copy these lines into it:

```
version: 2
jobs:
build:
docker:
- image: circleci/python:3.6
steps:
- checkout
- restore_cache:
key: deps1-{{ .Branch }}-{{ checksum "requirements.txt" }}
- run:
command: |
python3 -m venv venv
. venv/bin/activate
pip install -r requirements.txt
- save_cache:
key: deps1-{{ .Branch }}-{{ checksum "requirements.txt" }}
paths:
- "venv"
- run:
name: Running tests
command: |
. venv/bin/activate
python3 tests.py
- store_artifacts:
path: test-reports/
destination: python_ap
```

Pushing to GitHub

Using the philosophy of committing your code early and often, we should have initialized Git earlier in this process, and we would have atomic commits. Because this tutorial is about integration of CircleCI and GitHub, I intentionally put it on hold until now.


Our current code structure looks like this:



We can now commit our code by running the following commands:

```
git add .  
git commit -m "Initial commit"
```

Creating GitHub Repository

 **NdagiStanley** ▼

Repositories


New repository

Create a new repository

A repository contains all the files for your project, including the revision history.

Owner

Repository name


 **NdagiStanley** ▼

 /


✓

Great repository names are short and memorable. Need inspiration? How about **special-fortnight**.

Description (optional)

☒  **Public**

Anyone can see this repository. You choose who can commit.

☐  **Private**

You choose who can see and commit to this repository.

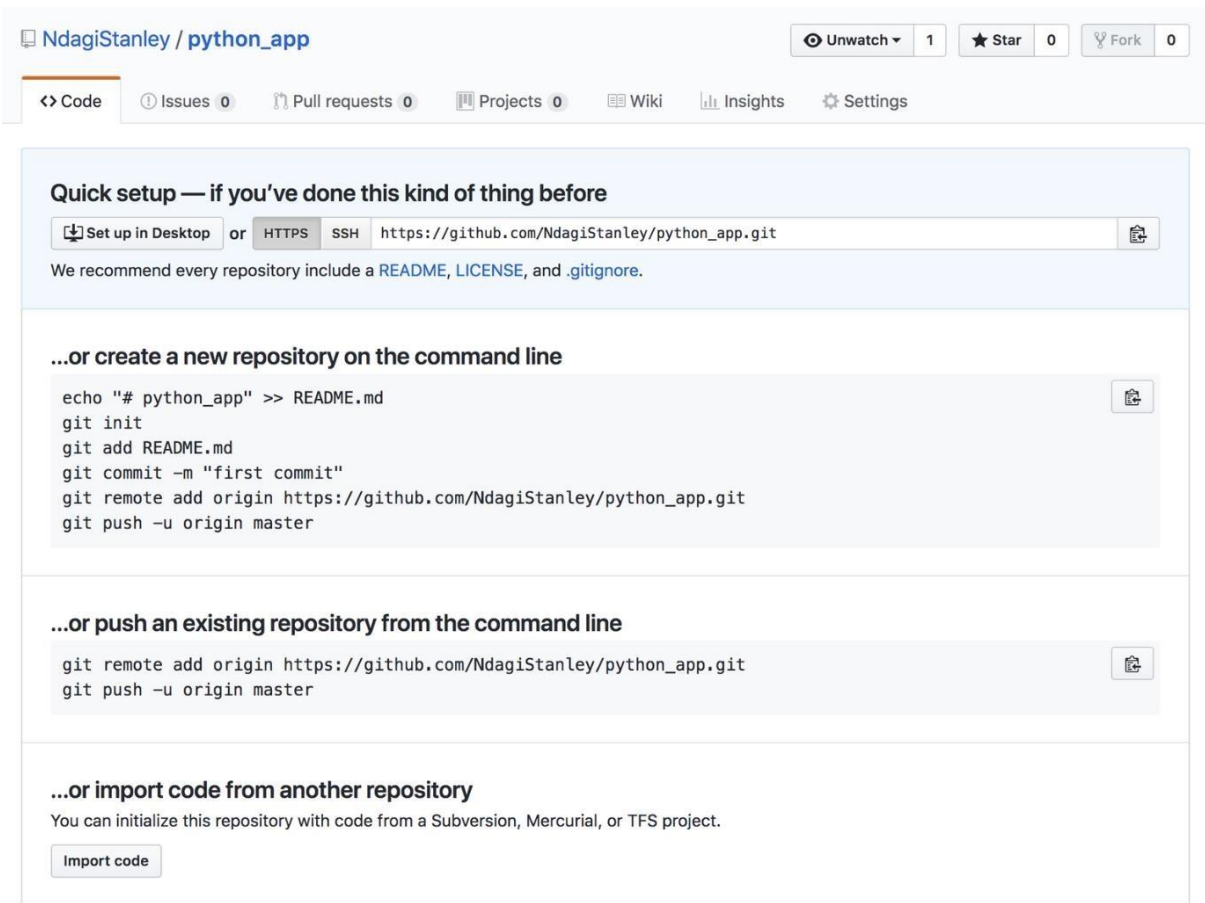
☐ **Initialize this repository with a README**

This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

ⓘ

Create repository

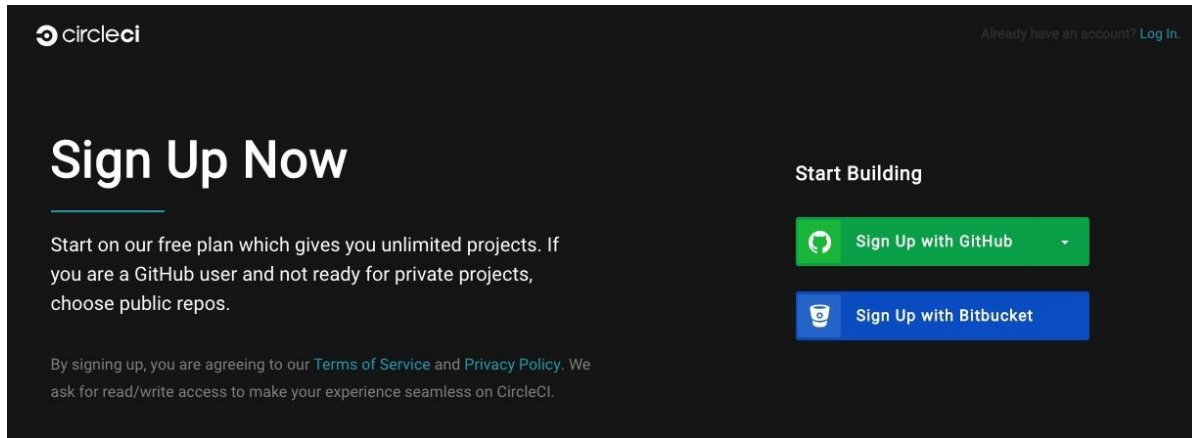
After creating your new repository, you will get to a page like this one:



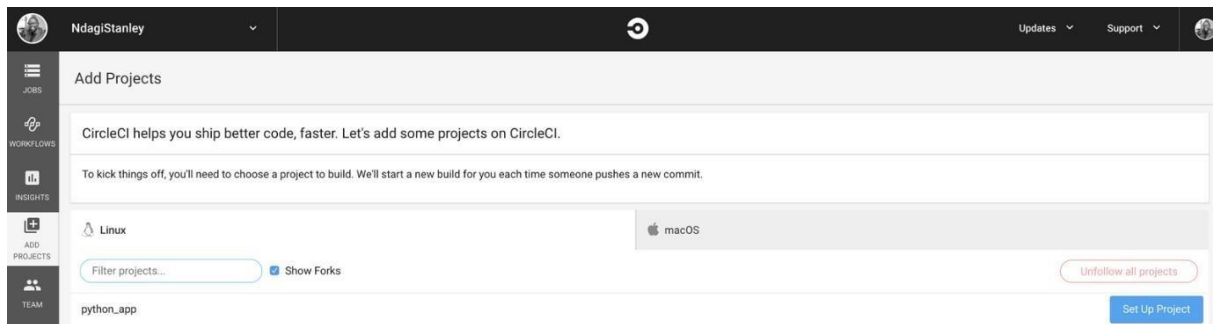
We will go with the second option, ...push an existing repository. Run:
`git remote add origin https://github.com/NdagiStanley/python_app.git`
`git push -u origin master`

Configuring CircleCI

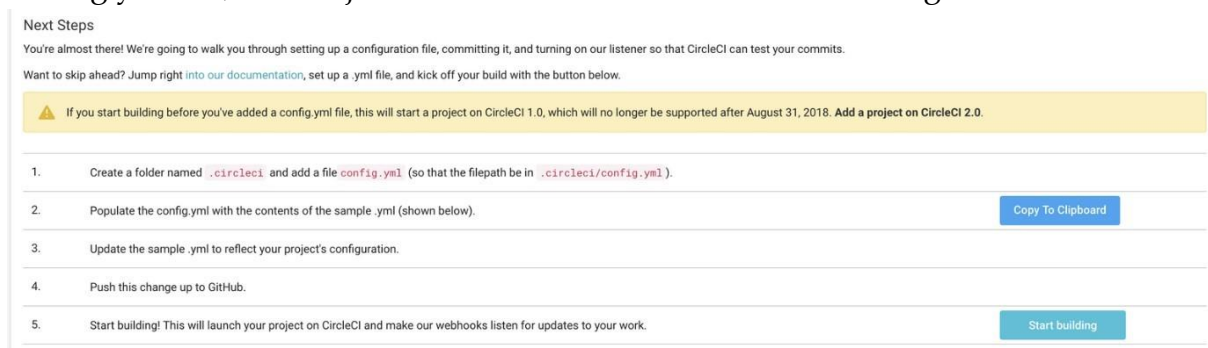
Now that the repo is on GitHub, we can finalize the CI by configuring CircleCI. Head on over to the CircleCI sign up page. Sign up for CircleCI with your GitHub account.



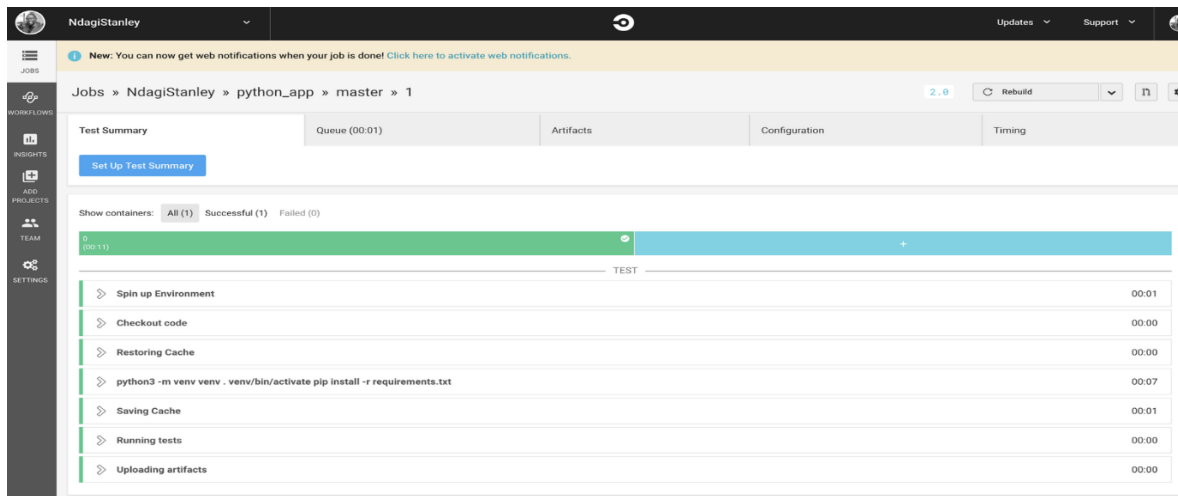
Once you are logged in, make sure that your personal GitHub account is active. If you are in several GitHub organizations, one of them might be active. Just click the drop down menu (top left) and select your GitHub username. Then, click Add Projects. The most recent project, 'python_app', is listed there.



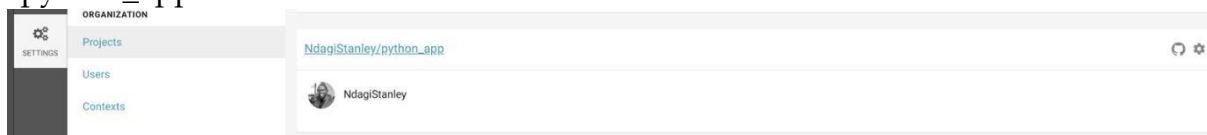
Click Set up Project at the right side of the row that includes our project. On the redirected page, you will notice the Next Steps section. Had we not had our own .circleci/config.yml file, we would have started at No. 1. Because we do have the config.yml file, we can just scroll to No. 5 and click Start building.



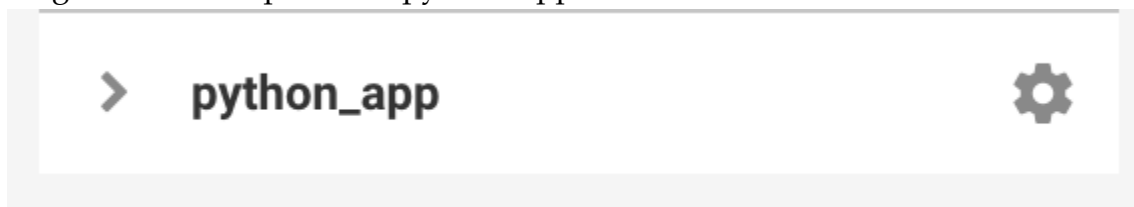
Within no time, the build passes. Success!



In the top right corner, click the Settings cog. Then click Projects on the left, and finally, `python_app`.



You will be on a path like this one: [circleci.com/gh/<username>/python_app](https://circleci.com/gh/NdagiStanley/python_app). Mine is https://circleci.com/gh/NdagiStanley/python_app. Click the settings cog next to the repo name: `python_app`.



It is important that you become familiar with the settings that you can change for this project. I will touch on what is relevant to us now.

In Advanced Settings, notice that Only build pull requests is turned off. This means that every push to GitHub will run on CircleCI, including PRs.

README - status badge

On our local machine, check out to another Git branch by running:

git checkout -b add_readme

Open your editor and create a README.md file. Copy and paste the following lines into this file:

README.md

MICROSERVICE ARCHITECTURE

PYTHON APPLICATION

This Python application repo was created to showcase the integration between GitHub and CircleCI.

[![CircleCI](https://circleci.com/gh/NdagiStanley/python_app.svg?style=svg)](https://circleci.com/gh/NdagiStanley/python_app)

I added a title and a brief description to mine.
Now, run the following commands:

```
git add .  
git commit -m "Add README"  
git push -u origin add_readme
```

If you go to https://github.com//python_app you will notice that we have a new branch:

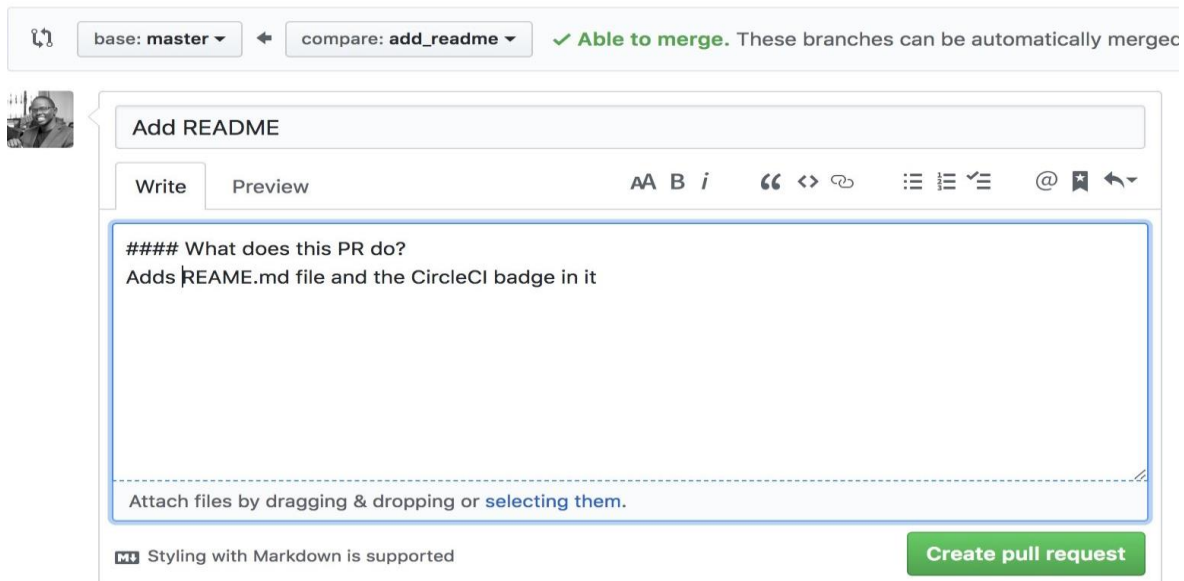
`add_readme`. We can go ahead and click Compare and pull request.

Opening a pull request

This is how I set up my PR:

Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across fork](#)



base: master ← compare: add_readme ✓ Able to merge. These branches can be automatically merged

Add README

Write Preview AA B i “ <> 🔗 ☰ ☷ ✓ @ 📎 ↶

What does this PR do?
Adds README.md file and the CircleCI badge in it

Attach files by dragging & dropping or [selecting them](#).

Styling with Markdown is supported


Create pull request

Click Create pull request and in no time, this is what we get:

Add README #1


 **Open** NdagiStanley wants to merge 1 commit into `master` from `add_readme`

Conversation 0 Commits 1 Checks 0 Files changed 1


 NdagiStanley commented 3 minutes ago Owner + 🗨️ ✎️

What does this PR do?

Adds REAME.md file and the CircleCI badge in it

  Add README ✓ c316888

Add more commits by pushing to the `add_readme` branch on NdagiStanley/python_app.


 ✓ **All checks have passed** Show all checks
1 successful check


✓ **This branch has no conflicts with the base branch**
Merging can be performed automatically.

Merge pull request You can also [open this in GitHub Desktop](#) or view [command line instructions](#).

A successful build! Now, click Show all checks. Notice that the check is from CircleCI.

Add more commits by pushing to the `add_readme` branch on NdagiStanley/python_app.

 ✓ **All checks have passed** Hide all checks
1 successful check

✓  **ci/circleci** — Your tests passed on CircleCI! Details

✓ **This branch has no conflicts with the base branch**
Merging can be performed automatically.

Merge pull request You can also [open this in GitHub Desktop](#) or view [command line instructions](#).

Even the browser's tab favicon shows a tick for the successful run. If you click Details, this will redirect you to the build on CircleCI:

Jobs » NdagiStanley » python_app » add_readme » 2

2.0 Rebuild

Test Summary Queue (00:01) Artifacts Configuration Timing

Set Up Test Summary

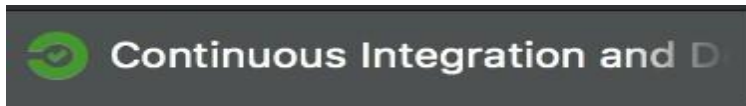
Show containers: All (1) Successful (1) Failed (0)

0 (00:12)

TEST

Spin up Environment	00:02
Checkout code	00:00
Restoring Cache	00:00
python3 -m venv venv . venv/bin/activate pip install -r requirements.txt	00:07
Saving Cache	00:01
Running tests	00:00
Uploading artifacts	00:00

Notice that the favicon here also shows that the build is successful:



At the top, click python_app.

Jobs » NdagiStanley » python_app » add_readme » 2

python_app

You will be redirected to the builds for this project:

My jobs All jobs

SUCCESS	add_readme #2 Add README	12 min ago #1 c316888	00:12 2.0
SUCCESS	master #1 Initial commit	1 hr ago c6fe2bd	00:11 2.0

Newer Older

Conclusion

There you have it! We have enabled continuous integration with CircleCI.

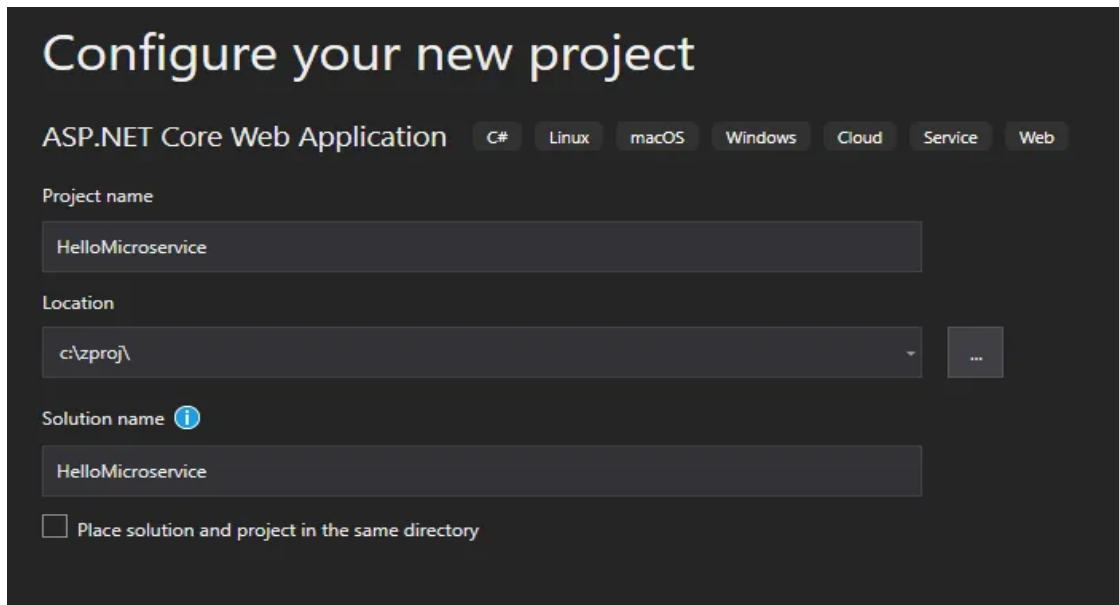
Practical No – 7

Aim: Creating Microservice with ASP.NET Core.

Description:

Create a new ASP.NET Core project. I called mine HelloMicroservice (and the [full source code is available on GitHub](#) for your reference)

Step 1: Create a new solution



Configure your new project

ASP.NET Core Web Application C# Linux macOS Windows Cloud Service Web

Project name

HelloMicroservice

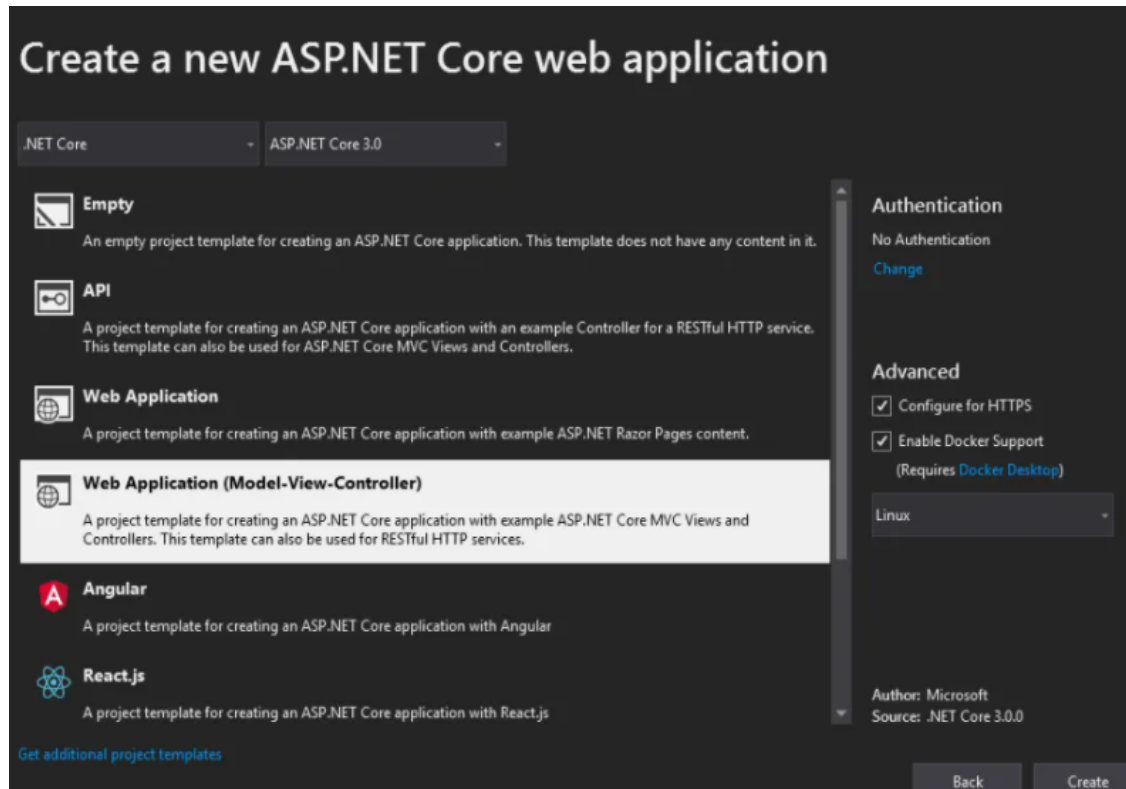
Location

c:\zproj\

Solution name ⓘ

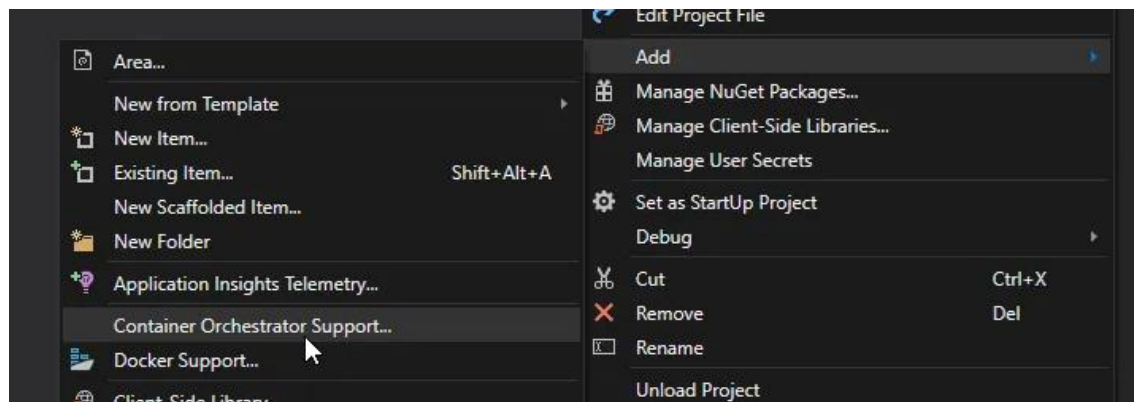
HelloMicroservice

☐ Place solution and project in the same directory

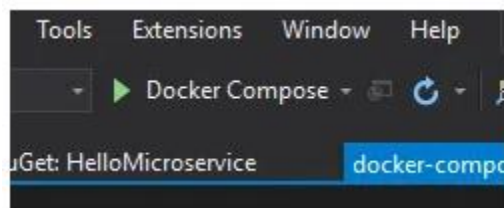
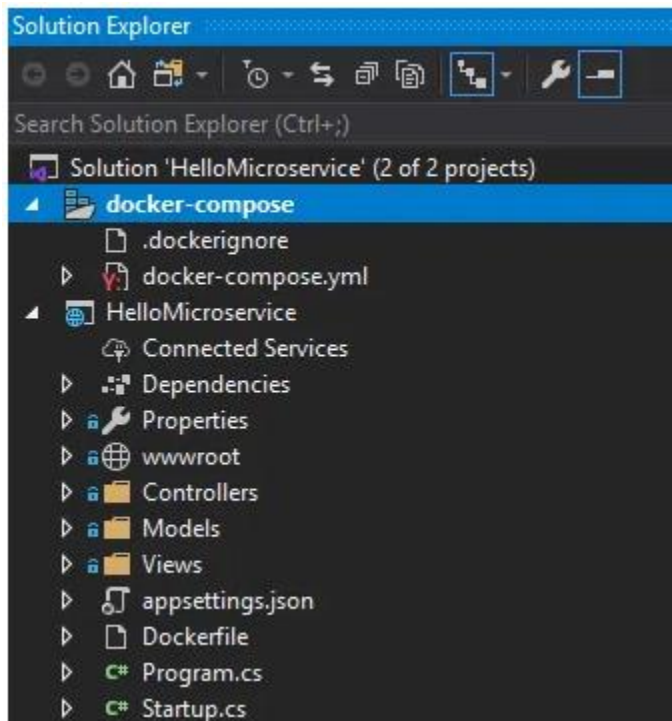
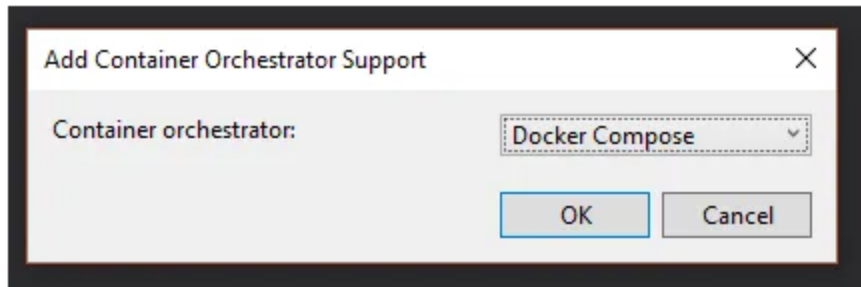


Step 2: Add docker-compose support

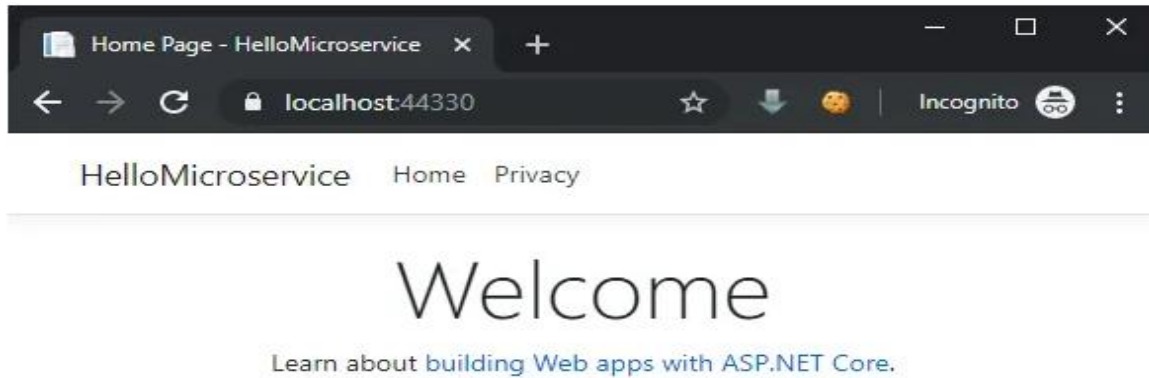
Right click on the **project**, and click “Add” and then “Container Orchestrator Support”.



Keep in mind that the sole purpose of this project is to start development for a proof of concept for ASP.NET Core Microservices. Docker-compose is easier to deal with than Kubernetes for local machine development. This is why I’m choosing the “Docker Compose” option, even though I may eventually want to **deploy** to Kubernetes.



At this point, you can hit CTRL+F5 to run. Visual Studio will use Docker Compose to create an image of your project and run it within Docker. Your browser should open automatically, and you'll see the standard "Welcome" screen



Step 3: Add database orchestration to docker-compose

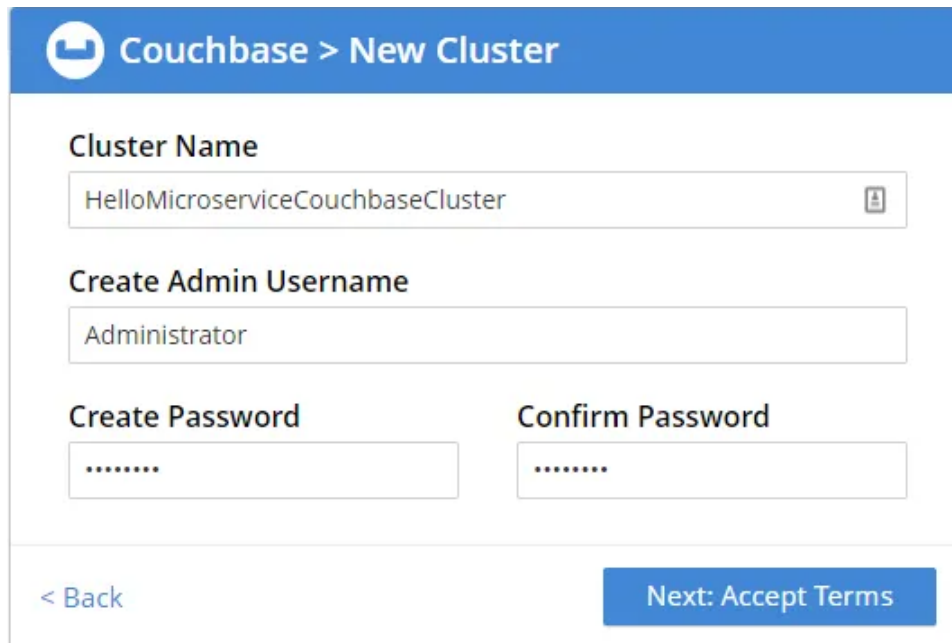
Couchbase makes official container images available on Docker Hub. To use these images, let's add another service under services: in the docker-compose.yml file:

```
1 services:
2   couchbase:
3     image: couchbase:enterprise-6.0.3
4     volumes:
5     - "../couchbase:/opt/couchbase/var" # local folder where couchbase data stored
6     ports:
7     - "8091:8091" # Allows local access to mgmt UI
```

```
1 PS C:\WINDOWS\system32> docker ps
2 IMAGE                                COMMAND                CREATED   STATUS    PORTS                               NAMES
3 hellomicroservice:dev               "tail -fâ€¦"           8 minâ€¦   Up 8â€¦    0.0.0.0...                         dockercompose1524â€¦56534_hell
4 couchbase:enterprise-6.0.3          "/entrypâ€¦"           8 minâ€¦   Up 8â€¦    8092-8096...                       dockercompose1524â€¦56534_couch
5 PS C:\WINDOWS\system32>
```

Step 4: Configuration changes

Because I've used the stock couchbase:enterprise-6.0.3 Docker image, I still need to open the Couchbase UI (<http://localhost:8091>) and setup the cluster manually. See "next steps" at the end for some options to automate.



The screenshot shows the 'Couchbase > New Cluster' web interface. It contains four input fields: 'Cluster Name' with the value 'HelloMicroserviceCouchbaseCluster', 'Create Admin Username' with the value 'Administrator', 'Create Password' with masked characters '*****', and 'Confirm Password' with masked characters '*****'. At the bottom, there is a '< Back' link and a blue 'Next: Accept Terms' button.

```
1 hellomicroservice:
2   image: ${DOCKER_REGISTRY-}hellomicroservice
3   build:
4     context: .
5     dockerfile: HelloMicroservice/Dockerfile
6   environment:
7     Couchbase__Servers__0: http://couchbase:8091/ # Reference to the "couchbase" service name on line 4
8   depends_on:
9     - couchbase # Reference to the "couchbase" service name on line 4
10  command: ["/wait-for-it.sh", "http://couchbase:8091"]
```

Using wait-for-it is **optional**, but when you're right in the middle of development, this may save you some headaches. Finally, to make the ASP.NET Core project talk to Couchbase, I used the Dependency Injection Extension from NuGet

```
1 services.AddCouchbase(Configuration.GetSection("Couchbase"));
```

```
2  "Logging": {
3    "LogLevel": {
4      "Default": "Debug",
5      "System": "Information",
6      "Microsoft": "Information"
7    }
8  },
9  "Couchbase" : {
10   "Username": "Administrator",
11   "Password": "password",
12   "Servers" : ["http://thiswillbeoverwritten"]
13 }
14 }
```

Step 5: Using the database

Finally, let's make sure that the ASP.NET Core application is able to communicate with the database. I added a very simple Insert and Get to the HomeController Index method:

```
1  public IActionResult Index()
2  {
3      var id = Guid.NewGuid().ToString();
4
5      _bucket.Insert(new Document<dynamic>
6      {
7          Id = id,
8          Content = new
9          {
10             hello = "microservice",
11             foo = Path.GetRandomFileName()
12          }
13      });
14
15      var doc = _bucket.Get<dynamic>(id);
16
17      return View(doc);
18 }
```

```
2 @{
3     ViewData["Title"] = "Home Page";
4 }
5
6 <div class="text-center">
7     <h1 class="display-4">Welcome</h1>
8     <p>Learn about <a href="https://docs.microsoft.com/aspnet/core">building Web apps with ASP.NET Core</a>.</p>
9 </div>
10
11 <p>Created a new document:</p>
12 <ul>
13     <li>ID: @Model.Id</li>
14     <li>Document: @Model.Value</li>
15 </ul>
```

And now, we have the basics of ASP.NET Core Microservices in place. Hit CTRL+F5 to run the service. When the browser opens, you should see something like this:

