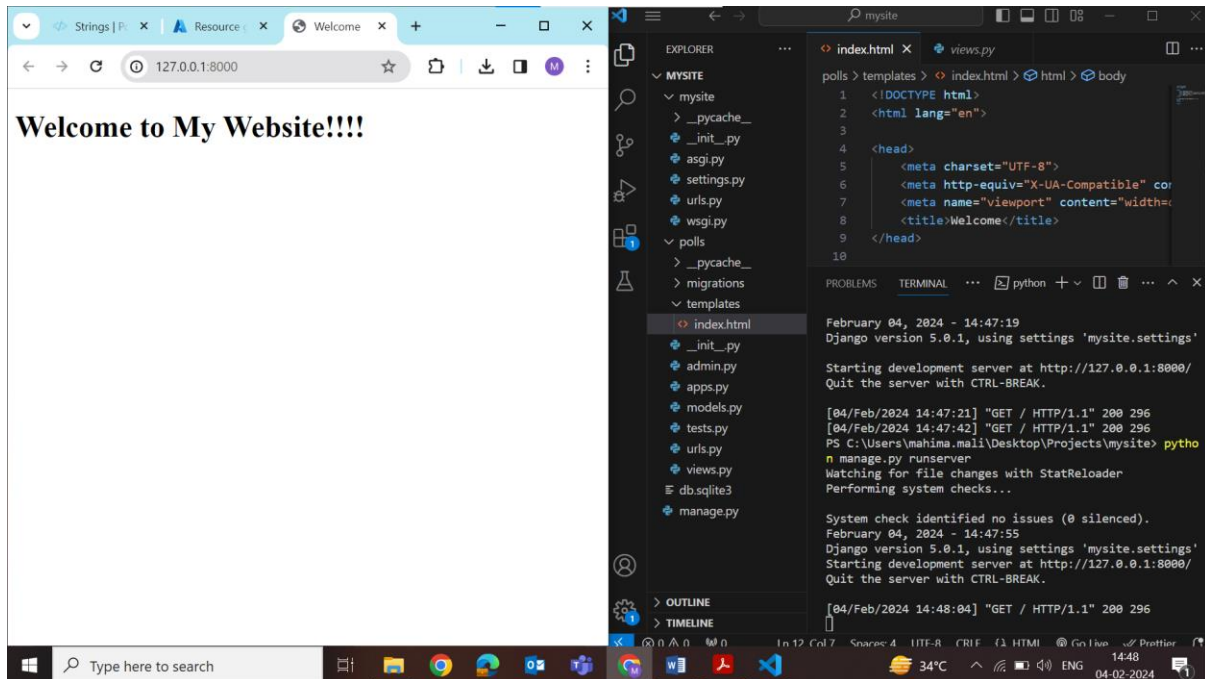


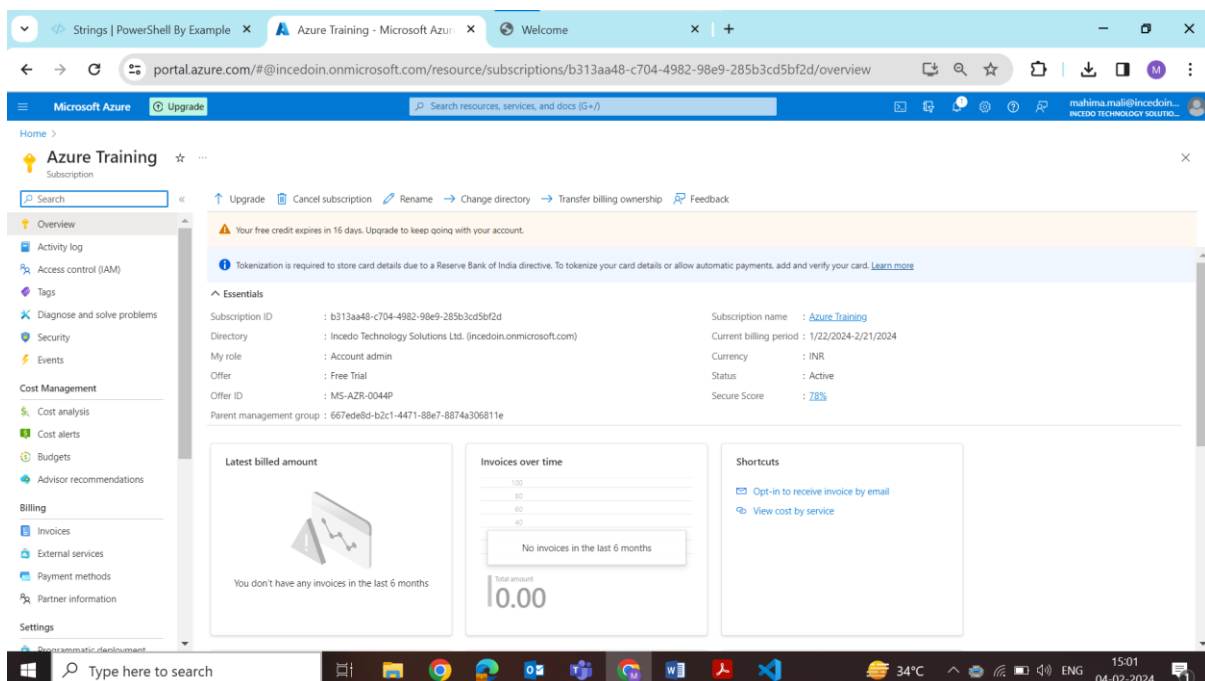
# Project 1: Django Application Dockerization

## 1. Prerequisites

### a. Django Application run in local environment



### b. Azure Portal



## 2. Order and Connect Azure VM

### a. Configuration of VM Specifications RAM: 16GB

**Vnet: 10.0.0.0/16**

**Subnets: 10.0.0.0/24**

**Authentication: SSH with Existing Key**

**Create RG:**

az group create --name dockerrgmahima --location eastus

```

mahima [ ~ ]$ az group create --name dockerrgmahima --location eastus
{
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/dockerrgmahima",
  "location": "eastus",
  "managedBy": null,
  "name": "dockerrgmahima",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
}

```

**Create Virtual Network:**

az network vnet create --resource-group dockerrgmahima --location eastus --name myVNet --  
address-prefixes 10.1.0.0/16 --subnet-name myBackend Subnet --subnet-prefixes 10.1.0.0/24

```

mahima [ ~ ]$ az network vnet create --resource-group dockerrgmahima --location eastus --name myVNet --address-prefixes 10.1.0.0/16 --subnet-name myBackendSubnet --subnet-prefixes 10.1.0.0/24
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "newVnet": {
    "addressSpace": {
      "addressPrefixes": [
        "10.1.0.0/16"
      ]
    },
    "enableDdosProtection": false,
    "etag": "W/\"9e49f199-7115-47cb-af87-7a040632fbb6\"",
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/dockerrgmahima/providers/Microsoft.Network/virtualNetworks/myVNet",
    "location": "eastus",
    "name": "myVNet",
    "provisioningState": "Succeeded",
    "resourceGroup": "dockerrgmahima",
    "resourceGuid": "3b367d9b-c632-4bb1-bc53-8a5d4ce94ce9",
    "subnets": [
      {
        "addressPrefix": "10.1.0.0/24",
        "delegations": [],
        "etag": "W/\"9e49f199-7115-47cb-af87-7a040632fbb6\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/dockerrgmahima/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/myBackendSubnet",
        "name": "myBackendSubnet",
        "privateEndpointNetworkPolicies": "Disabled",
        "privateLinkServiceNetworkPolicies": "Enabled",
        "provisioningState": "Succeeded",
        "resourceGroup": "dockerrgmahima",
        "type": "Microsoft.Network/virtualNetworks/subnets"
      }
    ]
  },
  "type": "Microsoft.Network/virtualNetworks",
  "virtualNetworkPeerings": []
}

```

```

mahima [ ~ ]$ ssh-keygen -t rsa -b 2048 -f ~/.ssh/mahima_lock
Generating public/private rsa key pair.
/home/mahima/.ssh/mahima_lock already exists.
Overwrite (y/n)? y
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/mahima/.ssh/mahima_lock
Your public key has been saved in /home/mahima/.ssh/mahima_lock.pub
The key fingerprint is:
SHA256:0XfxbdgJfAcp7cqppKsiRALMBy8fPqI+XiT5GhltqDY mahima@SandboxHost-638426141942405382
The key's randomart image is:
+---[RSA 2048]---+
|oo..      .ooo |
|..O      .  .+*+|
| o +      . . .O+.*|
|  X .      . . ...|
| B B      S . o  |
|o X .      . +   |
|oE o      o .    |
|o.* .      . .   |
|.+. . . . .|
+-----[SHA256]-----+

```

**b. Connect Through SSH key**

```

az vm create --resource-group dockerrgmahima --name myVNet --image Ubuntu2204 --size
Standard_DS3_v2 --admin-username azureuser --authentication-type ssh --ssh-key-value
~/ssh/mahima_lock.pub

```

```

mahima [ ~ ]$ az vm create --resource-group dockerrgmahima --name myVNet --image Ubuntu2204 --size
Standard_DS3_v2 --admin-username azureuser --authentication-type ssh --ssh-key-value ~/ssh/mahima_
lock.pub

{
  "fqdns": "",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/dockerrgmahima/provider
s/Microsoft.Compute/virtualMachines/myVNet",
  "location": "eastus",
  "macAddress": "00-0D-3A-8C-75-19",
  "powerState": "VM running",
  "privateIpAddress": "10.1.0.4",
  "publicIpAddress": "20.124.208.236",
  "resourceGroup": "dockerrgmahima",
  "zones": ""
}

```

```

ssh -i ~/.ssh/mahima_lock azureuser@20.124.208.236

```

```

mahima [ ~ ]$ ssh -i ~/.ssh/mahima_lock azureuser@20.124.208.236
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1019-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Sun Feb  4 10:53:46 UTC 2024

System load:  0.080078125      Processes:            122
Usage of /:   5.1% of 28.89GB   Users logged in:     0
Memory usage: 2%              IPv4 address for eth0: 10.1.0.4
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

```

```

azureuser@myVNet:~$ exit
logout
Connection to 20.124.208.236 closed.

```

### 3. Installing Docker on Azure VM

```
az ssh vm --resource-group dockerrgmahima --vm-name myVNet --subscription b313aa48-c704-4982-98e9-285b3cd5bf2d
```

```

sudo sh
apt update
apt install docker.io -y

```

```

azureuser@myVNet:~$ sudo sh
# apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-backports InRelease [109 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy-security InRelease [119 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]
Get:6 http://azure.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]
Get:11 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1325 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1042 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [235 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [22.1 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.1 kB]
Get:16 http://azure.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [10.1 kB]
Get:17 http://azure.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [522 B]

```

```
# apt install docker.io -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  bridge-utils containerd dns-root-data dnsmasq-base pigz runc ubuntu-fan
Suggested packages:
  ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse
  | zfsutils
The following NEW packages will be installed:
  bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz runc ubuntu-fan
0 upgraded, 8 newly installed, 0 to remove and 0 not upgraded.
Need to get 69.8 MB of archives.
After this operation, 267 MB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils amd64 1.7-1ubuntu3 [34.4
kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 runc amd64 1.1.7-0ubuntu1~22.
04.2 [4267 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 containerd amd64 1.7.2-0ubun
t1~22.04.1 [36.0 MB]
Get:5 http://azure.archive.ubuntu.com/ubuntu jammy/main amd64 dns-root-data all 2021011101 [5256 B]
Get:6 http://azure.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.86-1.1ub
untu0.5 [355 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 docker.io amd64 24.0.5-0u
buntu1~22.04.1 [28.9 MB]
Get:8 http://azure.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 69.8 MB in 2s (40.8 MB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 61596 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1)
```

docker --version

docker --info

```
# docker --version
Docker version 24.0.5, build 24.0.5-0ubuntu1~22.04.1
```

docker network create mahima-project

```
# docker network create mahima-project
9a593ebb5ec191ab09c8b8a34760b80775eb7552fae007ab016bbb27961a045e
# docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
37dd1b90b625        bridge              bridge              local
b32e1e52e4c2        host                host                local
9a593ebb5ec1        mahima-project      bridge              local
be7df3c41827        none                null                local
```

## 4. Django Application Dockerization

### Pull Ubuntu LTS Image

sudo docker pull ubuntu:latest

```

azureuser@myVNet:~$ sudo docker pull ubuntu:latest
latest: Pulling from library/ubuntu
57c139bbda7e: Pull complete
Digest: sha256:e9569c25505f33ff72e88b2990887c9dcf230f23259da296eb814fc2b41af999
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest

```

### Copy Django Project in Docker Container

```

docker run --rm --net mahima-project --name dock -v
C:\Users\mahima.mali\Desktop\Projects\mysite -it ubuntu:latest

```

```

docker.io/library/ubuntu:latest
# docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
ubuntu        latest    fd1d8f58e8ae   9 days ago    77.9MB
# docker run --rm --net mahima-project --name dock -v C:\Users\mahima.mali\Desktop\Projects\mysite -
docker: invalid reference format.
See 'docker run --help'.
# docker run --rm --net mahima-project --name dock -v C:\Users\mahima.mali\Desktop\Projects\mysite -

"docker run" requires at least 1 argument.
See 'docker run --help'.

Usage:  docker run [OPTIONS] IMAGE [COMMAND] [ARG...]

Create and run a new container from an image
# docker run --rm --net mahima-project --name dockers -it ubuntu:latest
root@fc3a91476eb4:/# -v C:\Users\mahima.mali\Desktop\Projects\mysite
bash: -v: command not found
root@fc3a91476eb4:/# exit
exit

```

### docker ps

```

# docker --version
Docker version 24.0.5, build 24.0.5-0ubuntu1~22.04.1
# docker run --rm --net mahima-project --name dockers -d ubuntu:latest
d4ba7346a2f05740e53aafb94399c814ccda37f5655ce021f7bfc44bc661996d
# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
# docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
ubuntu        latest    fd1d8f58e8ae   10 days ago    77.9MB
# docker pull nginx:latest
latest: Pulling from library/nginx
c57ee500d61: Pull complete
9b0163235c08: Pull complete
f24a6f652778: Pull complete
9f3589a5fc50: Pull complete
f0bd99a47d4a: Pull complete
398157bc5c51: Pull complete
1ef1c1a36ec2: Pull complete
Digest: sha256:5f44022eab9198d75939d9eaa5341bc077eca16fa51d4ef32d33f1bd4c8cbe7d
Status: Downloaded newer image for nginx:latest
docker.io/library/nginx:latest
# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
# docker run --rm --net mahima-project --name dockers -d nginx:latest
8b4751f0fc5730cf4cb96a2961cffca11dc1d41e4a45c78525d1e15e2c0b6c6
# docker ps
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
8b4751f0fc57   nginx:latest  "/docker-entrypoint...."  4 seconds ago  Up 3 seconds  80/tcp  dockers

```

export cid=

docker inspect \$cid | grep IPAddress

```
docker run --net mahima-project --it busybox sh
```

```
docker images
```

### Access in another Container

## 5. Networking and Security Considerations

### 6. Scaling and Load Balancing

Create LB → Health Probe (HP) → LB Route

**Create LB:**

```
az network lb create --resource-group dockerrgmahima --name mahimaLoadBalancer --sku  
Standard --public-ip-address myPublicIP --frontend-ip-name myFrontEnd --backend-pool-name  
myBackEndPool
```

**Create HP:**

```
az network lb probe create --resource-group dockerrgmahima --lb-name mahimaLoadBalancer --  
name myHealthProbe --protocol tcp --port 80
```

```
az network lb rule create \  
    --resource-group dockerrgmahima \  
    --lb-name mahimaLoadBalancer \  
    --name myHTTPRule \  
    --protocol tcp --frontend-port 80 \  
    --backend-port 80 \  
    --frontend-ip-name myFrontEnd \  
    --backend-pool-name myBackEndPool \  
    --probe-name myHealthProbe \  
    --disable-outbound-snat true \  
    --idle-timeout 15 --enable-tcp-reset true
```

**Network Security Group (NSG) → NSG Rules**

```
az network nsg create \  
    --resource-group dockerrgmahima \  
    --name myNSG
```

```
az network nsg rule create \  
    --resource-group dockerrgmahima \  
    --name myNSGRule
```

```

--nsg-name myNSG \
--name myNSGRuleHTTP \
--protocol '*' --direction inbound \
--source-address-prefix '*' \
--source-port-range '*' \
--destination-address-prefix '*' \
--destination-port-range 80 \
--access allow --priority 200

```

### Bastion Host

#### Create Public IP address – myBastionIP:

```

az network public-ip create --resource-group dockerrgmahima --name myBastionIP --sku
Standard --zone 1 2 3

```

#### Create Bastion Subnet:

```

az network vnet subnet create \
    --resource-group dockerrgmahima \
    --name AzureBastionSubnet \
    --vnet-name myVNet \
    --address-prefixes 10.1.1.0/27

```

#### Create bastion host

```

az network bastion create \
    --resource-group dockerrgmahima \
    --name myBastionHost \
    --public-ip-address myBastionIP \
    --vnet-name myVNet \
    --location eastus

```

### Backend Subnet

#### Create NIC with name as MyNicVM1; MyNicVM2

```

array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
    az network nic create \
        --resource-group Dockerrgmahima\
        --name $vmnic \
        --vnet-name myVNet \
        --subnet myBackEndSubnet \
        --network-security-group myNSG
done

```

#### Create VM1 and VM2

```

az vm create \
    --resource-group Dockerrgmahima\
    --name myVM1 \
    --nics myNicVM1 \
    --image win2019datacenter \

```



```
--admin-username azureuser \
--zone 1 --no-wait
```

```
az vm create \
  --resource-group Dockerrgmahima\
  --name myVM2 \
  --nics myNicVM2 \
  --image win2019datacenter \
  --admin-username azureuser \
  --zone 2 --no-wait
```

### **Attach LB ← VM1, VM2 ← MyNicVM1, MyNicVM2**

```
array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
  az network nic ip-config address-pool add \
    --address-pool myBackendPool \
    --ip-config-name ipconfig1 \
    --nic-name $vmnic \
    --resource-group Dockerrgmahima\
    --lb-name myLoadBalancer1
Done
```

### **NAT Gateway**

#### **Create MyNATGWIP**

```
az network public-ip create \
  --resource-group Dockerrgmahima\
  --name myNATgatewayIP \
  --sku Standard \
  --zone 1 2 3
```

#### **Create MyNATGW**

```
az network nat gateway create \
  --resource-group Dockerrgmahima\
  --name myNATgateway \
  --public-ip-addresses myNATgatewayIP \
  --idle-timeout 10
```

#### **Update MyNATGW → BackendSubnet**

```
az network vnet subnet update \
  --resource-group Dockerrgmahima\
  --vnet-name myVNet \
  --name myBackendSubnet \
  --nat-gateway myNATgateway
```

### **WebServer (IIS) ← HelloWorld ← VM1, VM2**

```

array=(myVM1 myVM2)
for vm in "${array[@]}"
do
    az vm extension set \
        --publisher Microsoft.Compute \
        --version 1.8 --name CustomScriptExtension \
        --vm-name $vm --resource-group Dockerrgmahima \
        --settings '{"commandToExecute":"powershell Add-WindowsFeature Web-Server; powershell Add-Content -Path \"C:\\inetpub\\wwwroot\\Default.htm\" -Value $(env:computername)}'
done

```

### Test

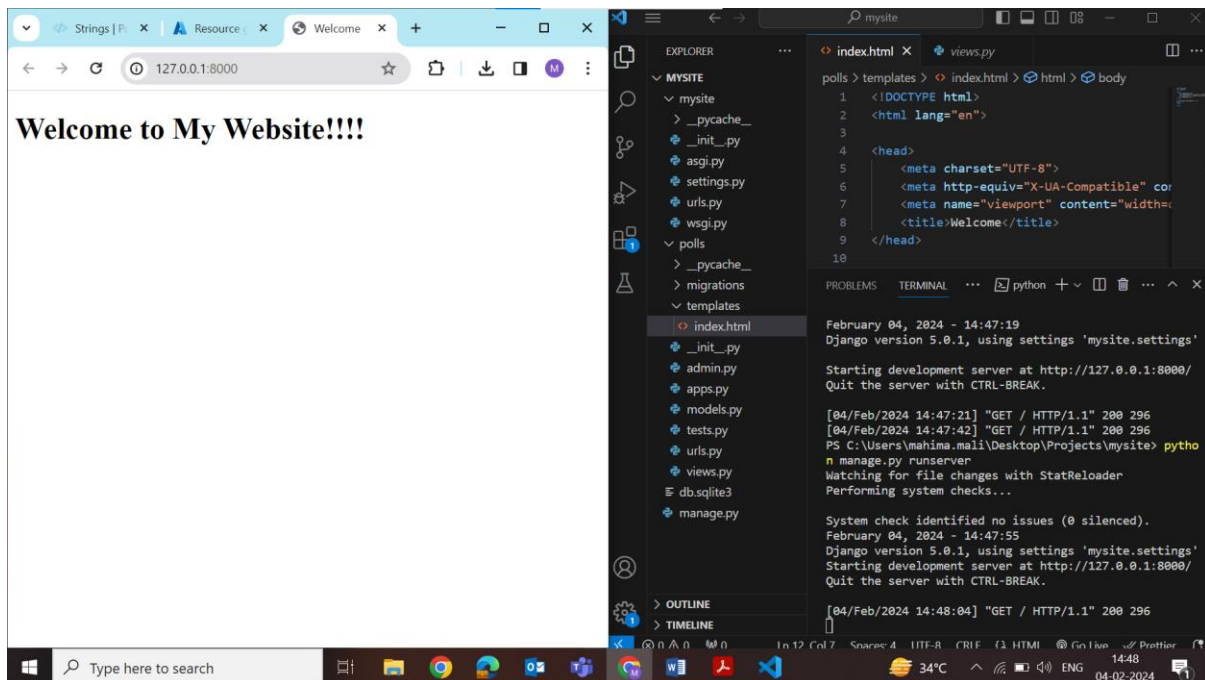
```

az network public-ip show \
    --resource-group Dockerrgmahima \
    --name myPublicIP \
    --query ipAddress \
    --output tsv

```

## 7. Deployment and Documentation

### a. Django Application run in local environment



### b. Azure Portal

The screenshot shows the Azure portal interface for a subscription named 'Azure Training'. The browser address bar displays the URL: `portal.azure.com/#@incedoin.onmicrosoft.com/resource/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/overview`. The page header includes the Microsoft Azure logo and an 'Upgrade' button. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Security, Events, Cost Management, Billing, and Settings. The main content area displays subscription details under the 'Essentials' section, including the Subscription ID, Directory, My role, Offer, Offer ID, and Parent management group. It also shows the Subscription name, Current billing period, Currency, Status, and Secure Score. Below this, there are three cards: 'Latest billed amount' (indicating no invoices in the last 6 months), 'Invoices over time' (showing a total amount of 10.00), and 'Shortcuts' (with links to 'Opt-in to receive invoice by email' and 'View cost by service'). The bottom of the screen shows the Windows taskbar with the search bar and various application icons.

Microsoft Azure Upgrade Search resources, services, and docs (G+/I)

Home > Azure Training Subscription

Search

Upgrade Cancel subscription Rename Change directory Transfer billing ownership Feedback

⚠ Your free credit expires in 16 days. Upgrade to keep going with your account.

ℹ Tokenization is required to store card details due to a Reserve Bank of India directive. To tokenize your card details or allow automatic payments, add and verify your card. [Learn more](#)

Essentials

Subscription ID	: b313aa48-c704-4982-98e9-285b3cd5bf2d	Subscription name	: Azure Training
Directory	: Incedo Technology Solutions Ltd. (incedoin.onmicrosoft.com)	Current billing period	: 1/22/2024-2/21/2024
My role	: Account admin	Currency	: INR
Offer	: Free Trial	Status	: Active
Offer ID	: MS-AZR-0044P	Secure Score	: 78%
Parent management group	: 667ede8d-b2c1-4471-88e7-8874a306811e		

Latest billed amount

You don't have any invoices in the last 6 months

Invoices over time

No invoices in the last 6 months

Total amount: 10.00

Shortcuts

- Opt-in to receive invoice by email
- View cost by service

Type here to search

34°C 15:01 04-02-2024