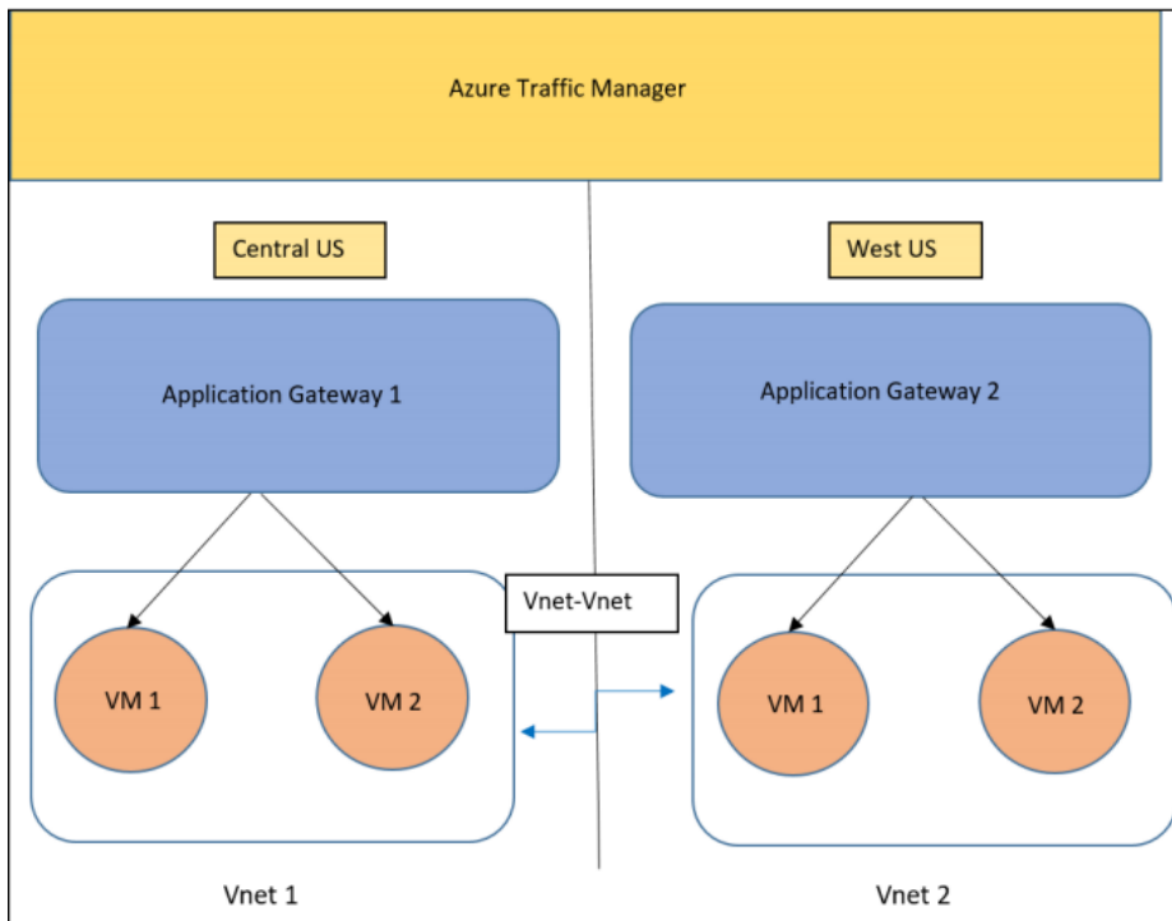


Azure administrator project-

Project description

You work as an Azure professional for a Corporation. You are assigned the task of implementing the below architecture for the company's website.



There are three web pages to be deployed:

1. The home page is the default page (VM2)
2. The upload page is where you can upload the files to your Azure Blob Storage (VM1)
3. The error page for 403 and 502 errors

Application Gateway has to be configured in the following manner:

1. Example.com should be pointed to the home page
2. Example.com/upload should be pointed to the upload page

3. Application Gateway's error pages should be pointed to error.html which should be hosted as a static website in Azure Containers. The error.html file is present in the GitHub repository

The term 'Example' here refers to the Traffic Manager's domain name.

The client wants you to deploy them in the Central US and the West US regions such that the traffic is distributed optimally between both regions.

Storage Account has to be configured in the following manner:

1. You need to host your error.html as a static website here, and then point the application gateway's 403 and 502 errors to it.
2. Create a container named upload, this will be used by your code to upload the files.

Technical specifications for the deployments are as follows:

1. Deployments in both regions should have VMs inside VNets.
2. Clone the GitHub repo <https://github.com/azcloudberg/azproject> to all the VMs.
3. On VM1, please run vm1.sh this will deploy the upload page, on VM2 please run VM2.sh, this will install the home page.
4. For running the scripts, please run the following command inside the GitHub directory from the terminal.

VM1: ./vm1.sh

VM2: ./vm2.sh

5. After running the scripts, please edit the config.py file on VM1, and enter the details related to your storage account where the files will be uploaded.
6. Once done, please run the following command: **sudo python3 app.py**
7. Both regions should be connected to each other using VNet-VNet Peering.
8. Finally, your Traffic Manager should be pointing to the application gateway of both the regions.

Step 1: - Created 2 virtual machines in Central US and 2 virtual machines in West US region.
Attached Central US VMs with VNET1 and West US with VNET2 Virtual Networks.

Microsoft Azure | Search resources, services, and docs (Go)

Home > Virtual machines >

Create a virtual machine

Subscription: PayAsYouGo
Resource group: (New) Project_RG

Instance details

Virtual machine name: C-US-VM1
Region: (US) Central US
Availability options: No infrastructure redundancy required
Security type: Trusted launch virtual machines
Image: Ubuntu Server 22.04 LTS - x64 Gen2
VM architecture: x64
Run with Azure Spot discount: ☐
Size: Standard_B1s - 1 vcpu, 1 GiB memory (free services eligible)

Estimated monthly cost: ₹1,198.38 / month

Administrator account

Authentication type: Password
Username: azureuser
Password:
Confirm password:

Inbound port rules

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

Public inbound ports: Allow selected ports

Select inbound ports: HTTP (80), SSH (22)

Home > Virtual machines >

Create a virtual machine

Basics | Disks | **Networking** | Management | Monitoring | Advanced | Tags | Review + create

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution.

Network interface

When creating a virtual machine, a network interface will be created for you.

Virtual network: (new) C-US-VM1-vnet
Subnet: (new) default (10.0.0.0/24)
Public IP: (new) C-US-VM1-ip
NIC network security group: Basic
Public inbound ports: Allow selected ports
Select inbound ports: HTTP (80), SSH (22)

Create virtual network

The Microsoft Azure Virtual Network service enables Azure resources to securely communicate with each other in a virtual network which is a logical isolation of the Azure cloud dedicated to your subscription. You can connect virtual networks to other virtual networks, or your on-premises network.

Name: VNET1

Address space

The virtual network's address space, specified as one or more address prefixes in CIDR notation (e.g. 192.168.1.0/24).

Address range	Addresses	Overlap
10.0.0.0/16	10.0.0.0 - 10.0.255.255 (65536 addresses)	None
	(0 Addresses)	None

Subnets

The subnet's address range in CIDR notation. It must be contained by the address space of the virtual network.

Subnet name	Address range	Addresses
Subnet-main	10.0.0.0/24	10.0.0.0 - 10.0.0.255 (256 addresses)
Subnet-AG	10.0.1.0/24	10.0.1.0 - 10.0.1.255 (256 addresses)
		(0 Addresses)

Name	Type	Subscription	Resource group	Location	Status	Operating system	Size	Public IP address	Disks
C-US-VM1	Virtual machine	PayAsYouGo	PROJECT_RG	Central US	Running	Linux	Standard_B1s	40.69.162.187	1
C-US-VM2	Virtual machine	PayAsYouGo	PROJECT_RG	Central US	Running	Linux	Standard_B1s	13.89.236.119	1
W-US-VM1	Virtual machine	PayAsYouGo	Project_RG	West US	Running	Linux	Standard_B1s	40.86.181.12	1
W-US-VM2	Virtual machine	PayAsYouGo	Project_RG	West US	Running	Linux	Standard_B1s	13.93.221.226	1

Using the same procedure created VNET2, subnet-main, and subnet-AG

Creating a storage account for storing the data

Home > Storage accounts >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review + create

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription *

Resource group * [Create new](#)

Instance details

Storage account name *

Region * [Deploy to an Azure Extended Zone](#)

Performance * ☒ Standard: Recommended for most scenarios (general-purpose v2 account)
☐ Premium: Recommended for scenarios that require low latency.

Redundancy *

Home > Storage accounts >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review + create

Security

Configure security settings that impact your storage account.

Require secure transfer for REST API operations ☒

Allow enabling anonymous access on individual containers ☒

Enable storage account key access ☒

Default to Microsoft Entra authorization in the Azure portal ☐

Minimum TLS version

Permitted scope for copy operations (preview)

Hierarchical Namespace

Hierarchical namespace, complemented by Data Lake Storage Gen2 endpoint, enables file and directory semantics, accelerates big data analytics workloads, and enables access control lists (ACLs) [Learn more](#)

Enable hierarchical namespace ☐

Access protocols

Blob and Data Lake Gen2 endpoints are provisioned by default [Learn more](#)

Enable SFTP ☐

SFTP can only be enabled for hierarchical namespace accounts

Home >

Storage accounts

Default Directory (mondalsoumik097@gmail.onmicrosoft.com)

+ Create Restore Manage view Refresh Export to CSV Open query Assign tags Delete

Filter for any field... Subscription equals all Resource group equals all Location equals all Add filter

Showing 1 to 1 of 1 records.

Name	Type	Kind	Resource group	Location	Subscription
soumik	Storage account	StorageV2	NetworkWatcherRG	Central US	PayAsYouGo

Successfully create a storage account

Microsoft Azure

Search resources, services, and docs (GvV)

Home > soumik

soumik | Containers

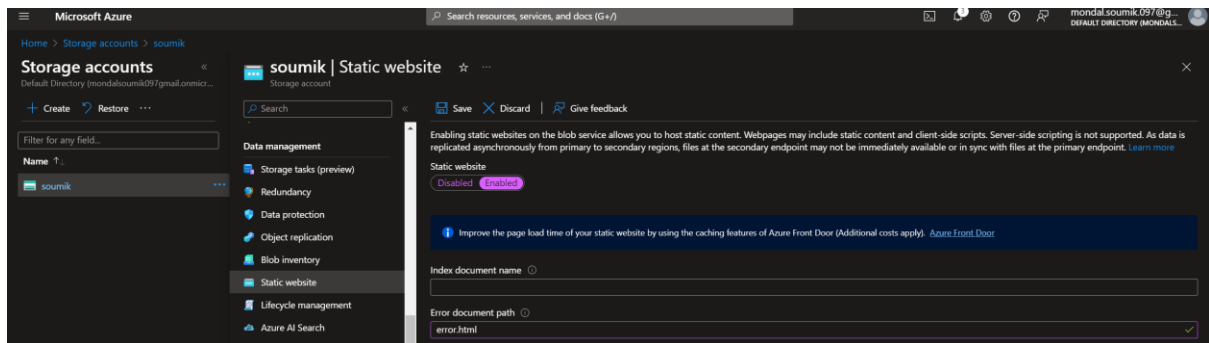
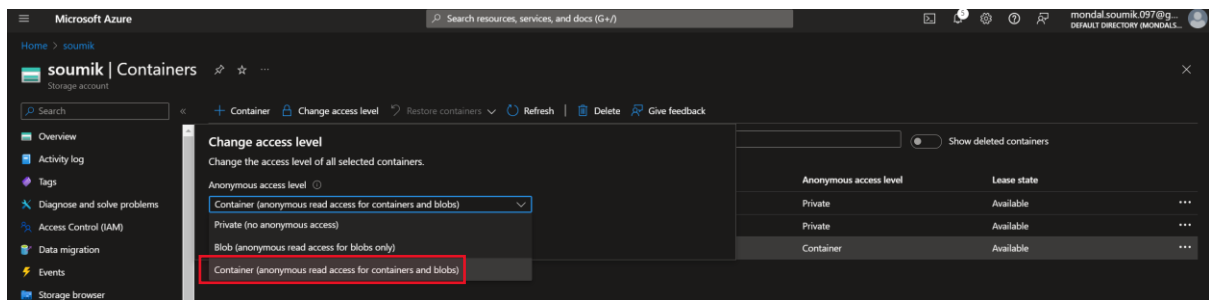
Storage account

Search containers by prefix

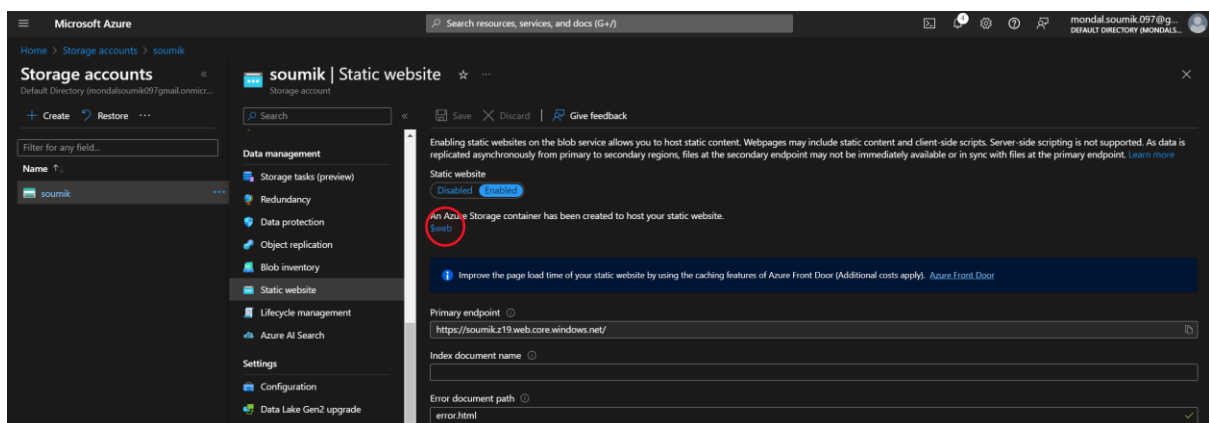
Show deleted containers

Name	Last modified	Anonymous access level	Lease state
\$logs	4/15/2024, 12:22:59 PM	Private	Available
\$web	4/15/2024, 12:35:23 PM	Private	Available
upload	4/15/2024, 3:03:01 PM	Container	Available

Created a container naming “upload”.



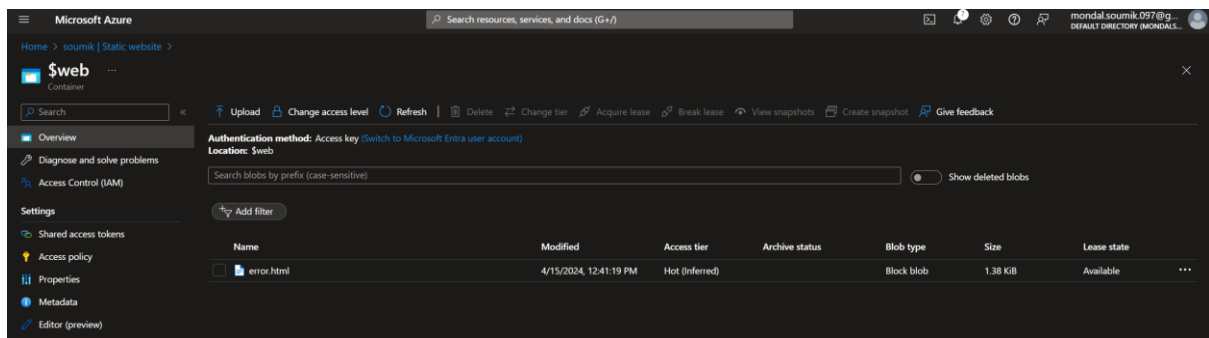
Creating a static website to access the website outside world



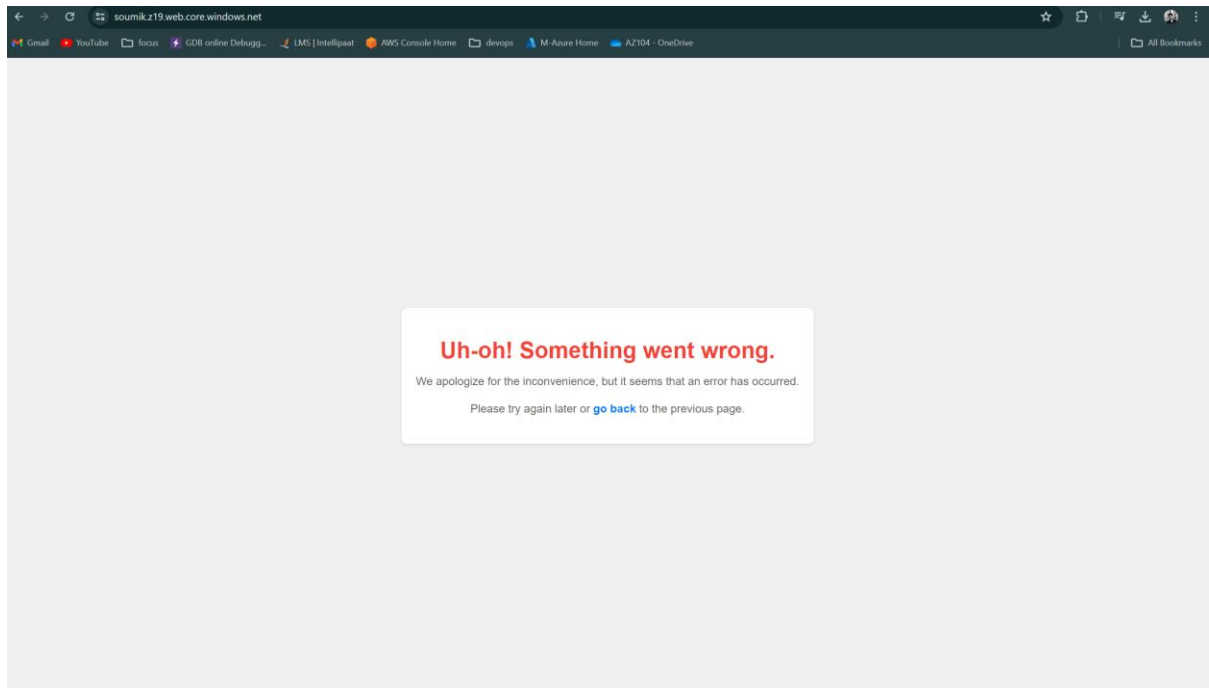
Now creating and uploading an error.html page-

```
error.html-
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Error Page</title>
  <style>
    body {
      font-family: Arial, sans-serif;
      background-color: #f0f0f0;
      margin: 0;
      padding: 0;
      display: flex;
      justify-content: center;
    }
  </style>
</head>
<body>
  <div>
    <h1>Error</h1>
    <p>This page is currently unavailable. Please try again later.</p>
  </div>
</body>
</html>
```

```
        align-items: center;
        height: 100vh;
        text-align: center;
    }
    .error-container {
        background-color: #fff;
        padding: 20px;
        border-radius: 8px;
        box-shadow: 0 2px 4px rgba(0,0,0,0.1);
    }
    h1 {
        color: #f44336;
        margin-bottom: 10px;
    }
    p {
        color: #666;
        margin-bottom: 20px;
    }
    a {
        color: #007bff;
        text-decoration: none;
        font-weight: bold;
    }
    a:hover {
        text-decoration: underline;
    }
</style>
</head>
<body>
    <div class="error-container">
        <h1>Uh-oh! Something went wrong.</h1>
        <p>We apologize for the inconvenience, but it seems that an error has
occurred.</p>
        <p>Please try again later or <a href="javascript:history.back()">go
back</a> to the previous page.</p>
    </div>
</body>
</html>
```

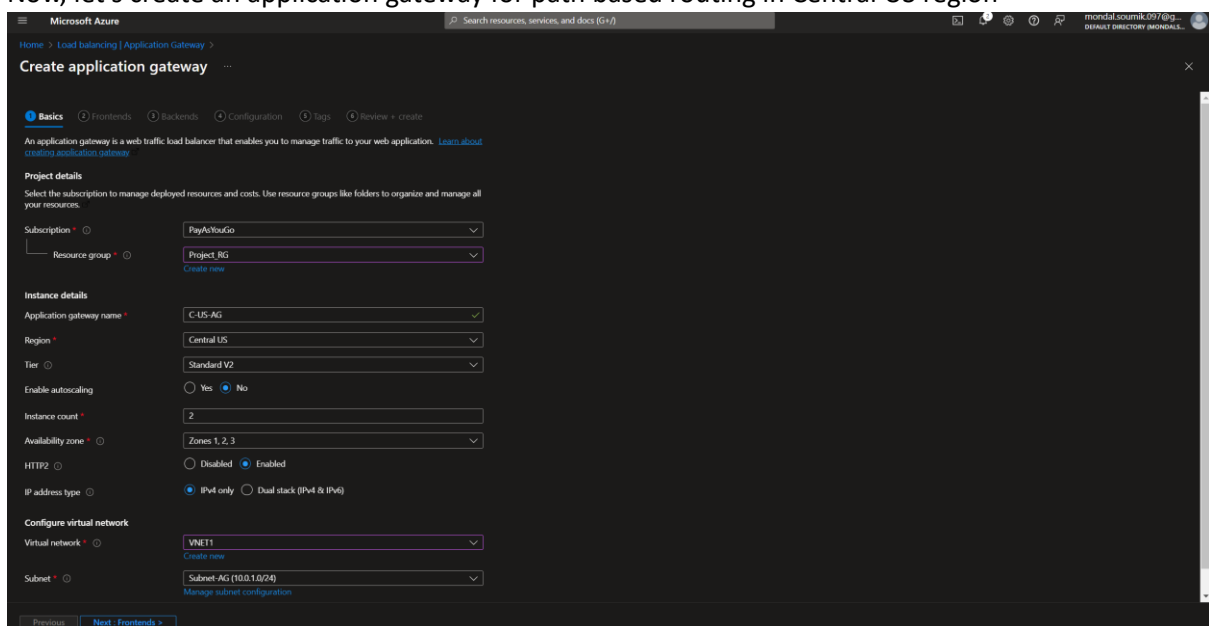


Uploaded the error.html page in \$web path



Successfully running the error.html page

Now, let's create an application gateway for path based routing in Central US region-



✓ Basics

Frontends

○ Backends

○ Configuration

○ Tags

○ Review + create

Traffic enters the application gateway via its frontend IP address(es). An application gateway can use a public IP address, private IP address, or one of each type.

Frontend IP address type ☒ Public ☐ Private ☐ Both

Public IPv4 address * [Add new](#)

Microsoft Azure

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

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics

✓ Frontends

✓ Backends

○ Configuration

○ Tags

○ Review + create

A backend pool is a collection of resources to which your application gateway can send traffic. A backend pool can contain virtual machines, virtual machine scale sets, app services, IP addresses, or fully qualified domain names (FQDN).

[Add a backend pool](#)

Backend pool	Targets
pool1	<div>▼ 1 target</div> <div>c-us-vm180</div>

Add a backend pool.

A backend pool is a collection of resources to which your application gateway can send traffic. A backend pool can contain virtual machines, virtual machines scale sets, IP addresses, domain names, or an App Service.

Name *

Add backend pool without targets ☒ Yes ☐ No

Backend targets

1 item

Target type	Target
Virtual machine	c-us-vm2822 (10.0.0.5)
IP address or FQDN	

Microsoft Azure

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

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics

✓ Frontends

✓ Backends

○ Configuration

○ Tags

○ Review + create

Create routing rules that link your frontend(s) and backend(s). You can also add more backend pools, add a second frontend IP configuration if you want.

Frontends

+ Add a frontend IP

Public (new) C-US-AG-IP

Routing

+ Add a routing rule

Add a routing rule

Configure a routing rule to send traffic from a given frontend IP address to one or more backend targets. A routing rule must contain a listener and at least one backend target.

Rule name *

Priority

* Listener Backend targets

A listener "listens" on a specified port and IP address for traffic that uses a specified protocol. If the listener criteria are met, the application gateway will apply this routing rule.

Listener name *

Frontend IP *

Protocol ☒ HTTP ☐ HTTPS

Port *

Listener type ☒ Basic ☐ Multi site

Custom error pages

Show customized error pages for different response codes generated by Application Gateway. This section lets you configure Listener-specific error pages. [Learn more >](#)

Bad Gateway - 502	<input type="text" value="https://soumik.z19.web.core.windows.net/error.html"/>
Forbidden - 403	<input type="text" value="https://soumik.z19.web.core.windows.net/error.html"/>

Microsoft Azure

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

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics

✓ Frontends

✓ Backends

○ Configuration

○ Tags

○ Review + create

Create routing rules that link your frontend(s) and backend(s). You can also add more backend pools, add a second frontend IP configuration if you want.

Frontends

+ Add a frontend IP

Public (new) C-US-AG-IP

Routing

+ Add a routing rule

Add a routing rule

Configure a routing rule to send traffic from a given frontend IP address to one or more backend targets. A routing rule must contain a listener and at least one backend target.

Rule name *

Priority

* Listener Backend targets

Choose a backend pool to which this routing rule will send traffic. You will also need to specify a set of Backend settings that define the behavior of the routing rule.

Target type ☒ Backend pool ☐ Redirection

Backend target * [Add new](#)

Backend settings * [Add new](#)

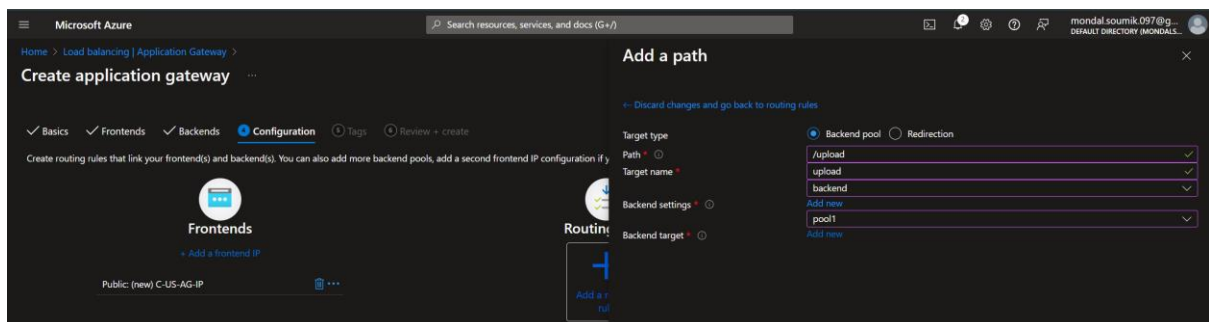
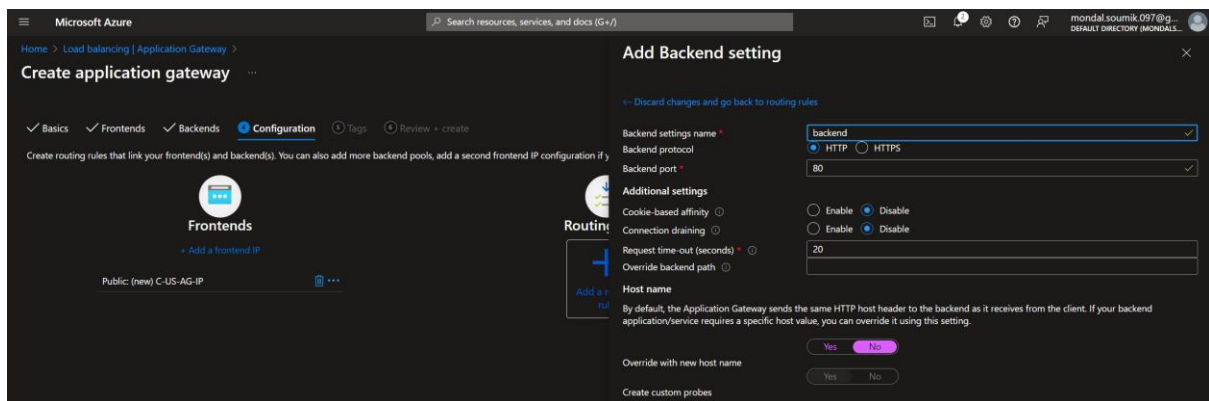
The value must not be empty.

Path-based routing

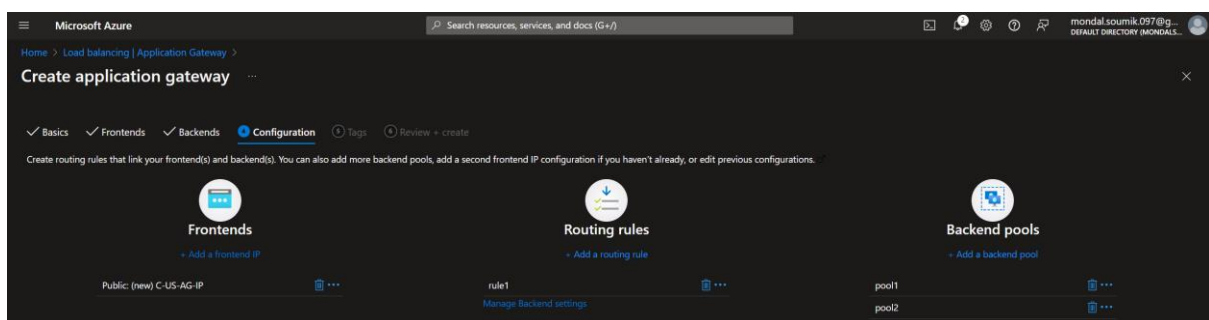
You can route traffic from this rule's listener to different backend targets based on the URL path of the request. You can also apply a different set of Backend settings based on the URL path.

Path	Target name	Backend setting name	Backend pool
No additional targets to display			

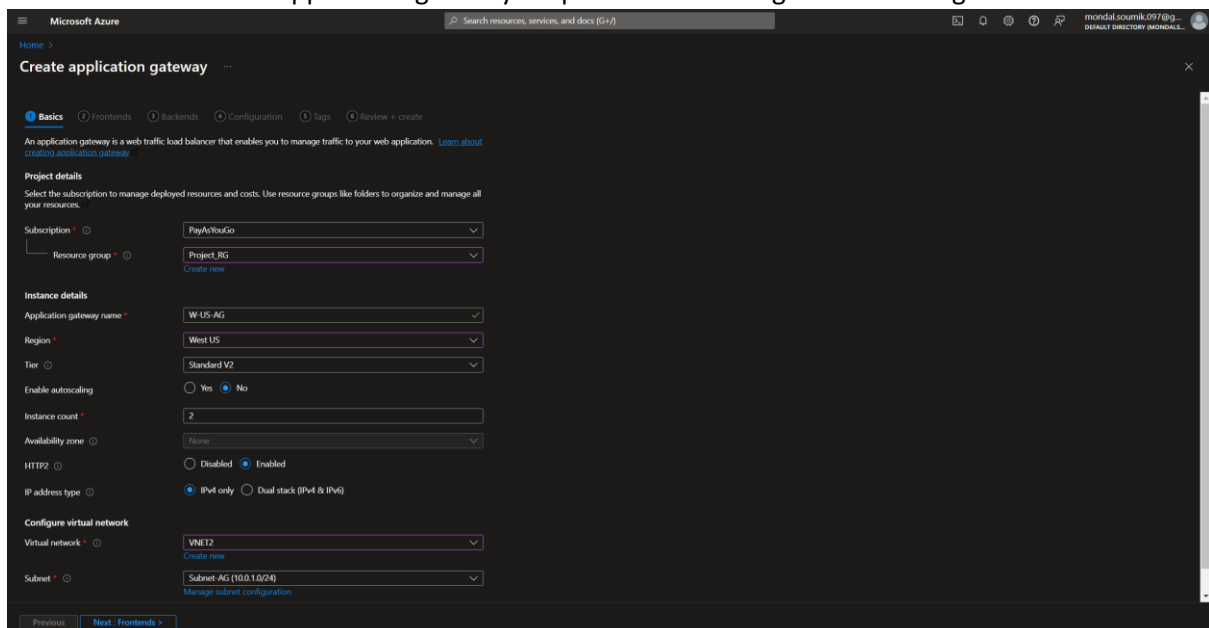
[Add multiple targets to create a path-based rule](#)

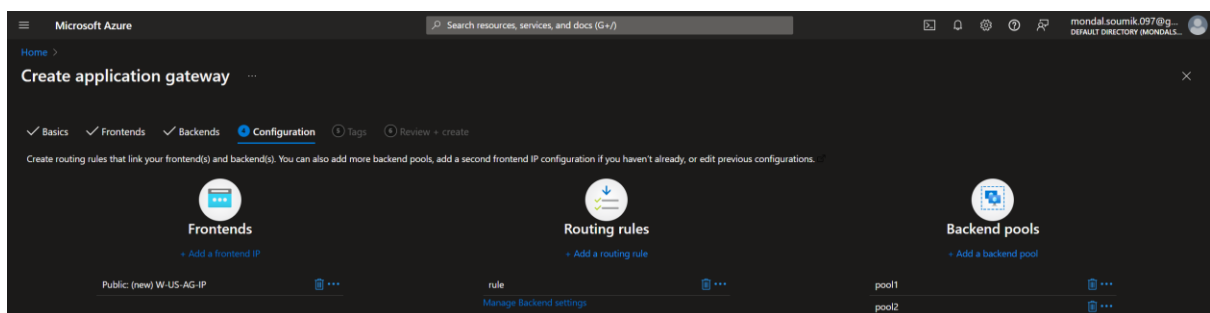
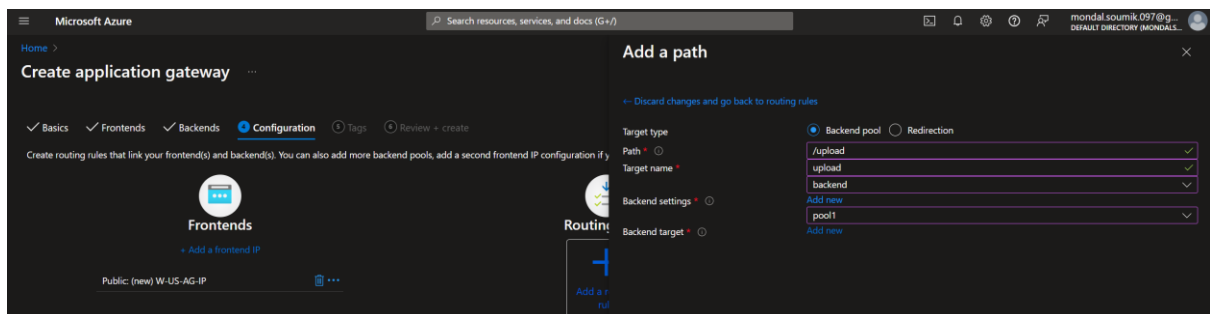
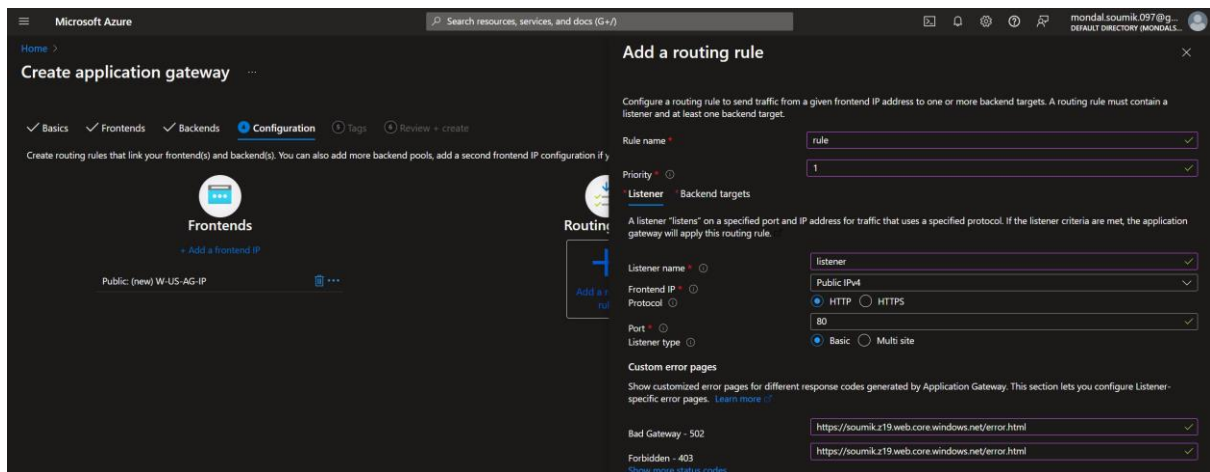
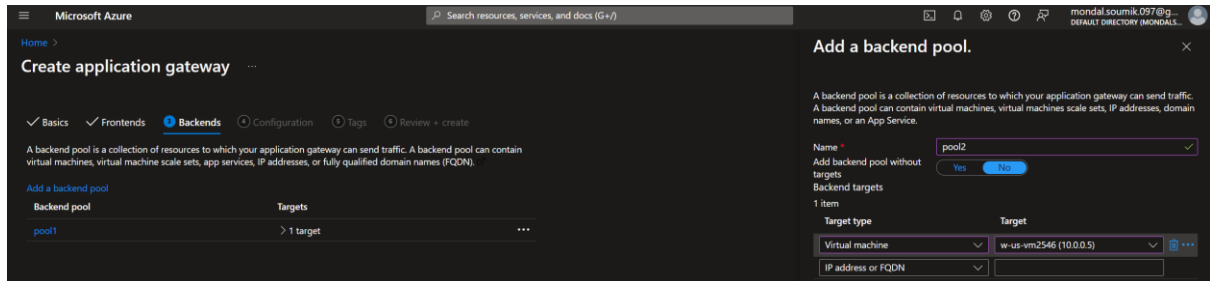
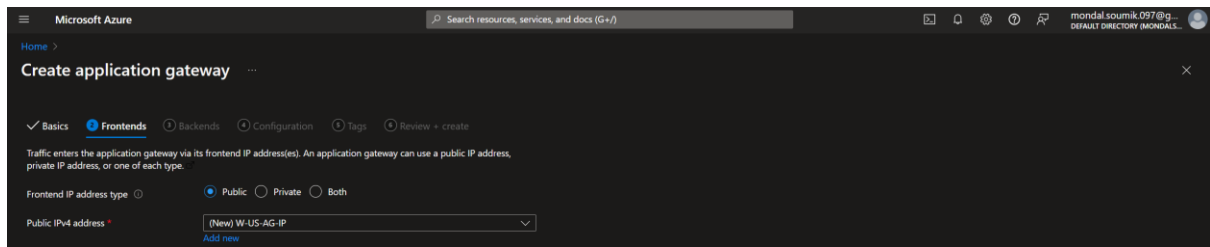


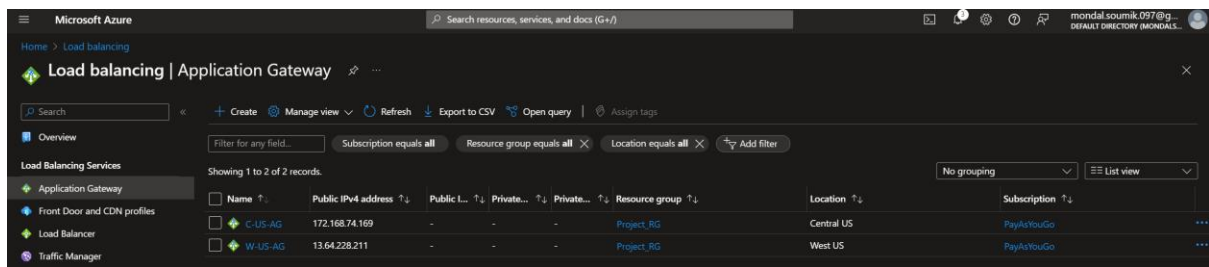
pointing the path on '/upload' for path based routing



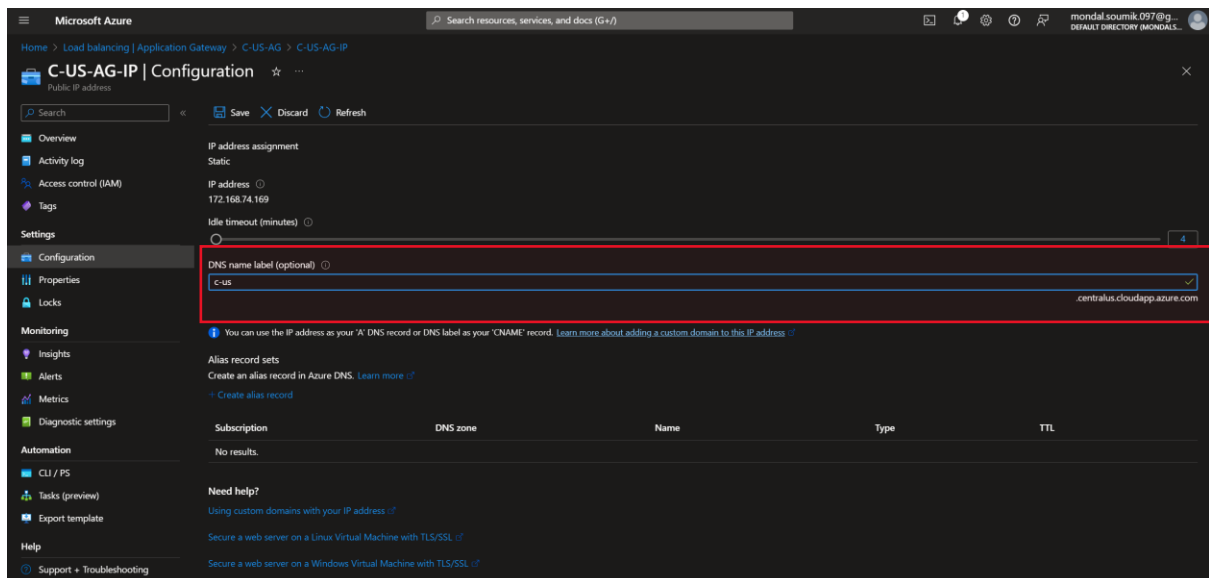
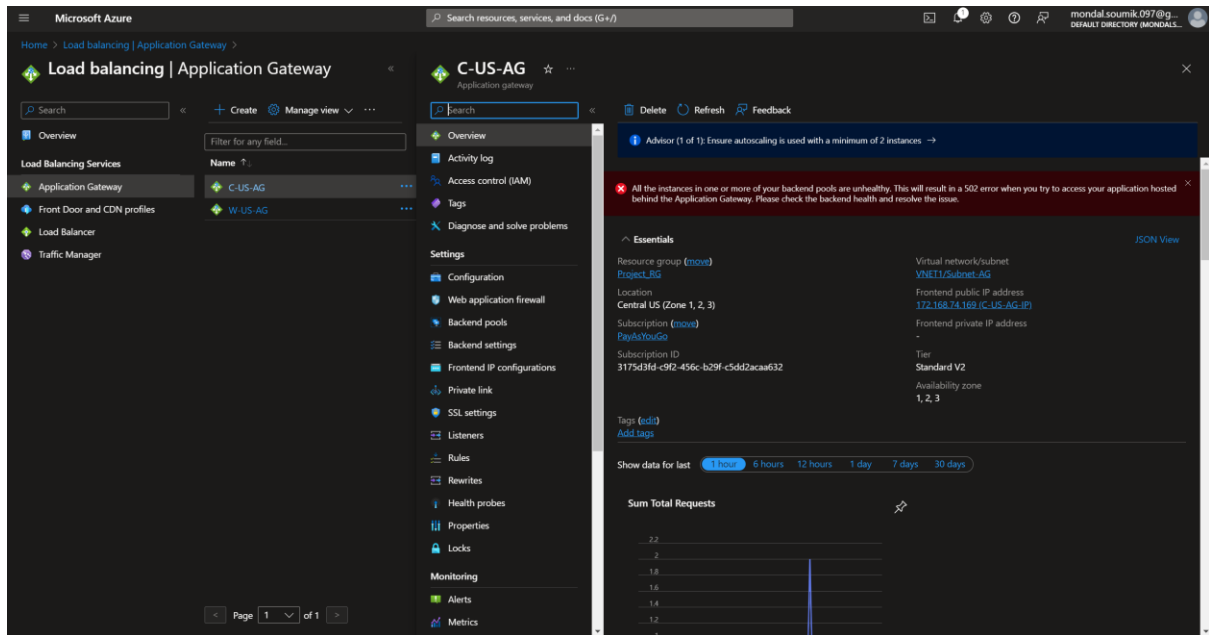
Next we will create an application gateway for path based routing in West US region-

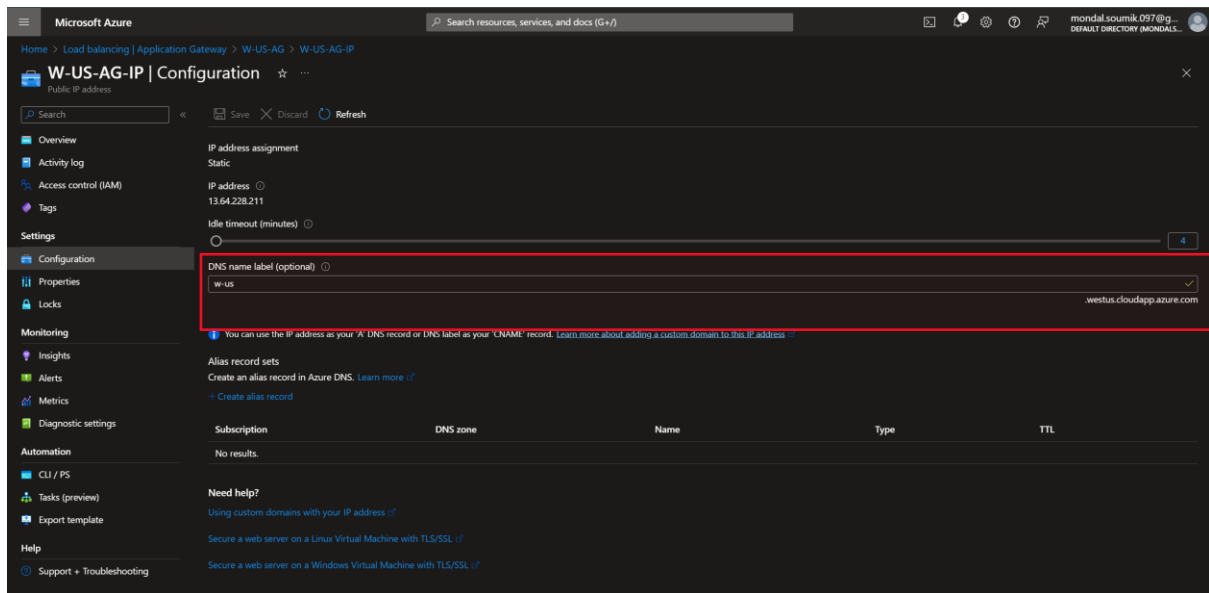






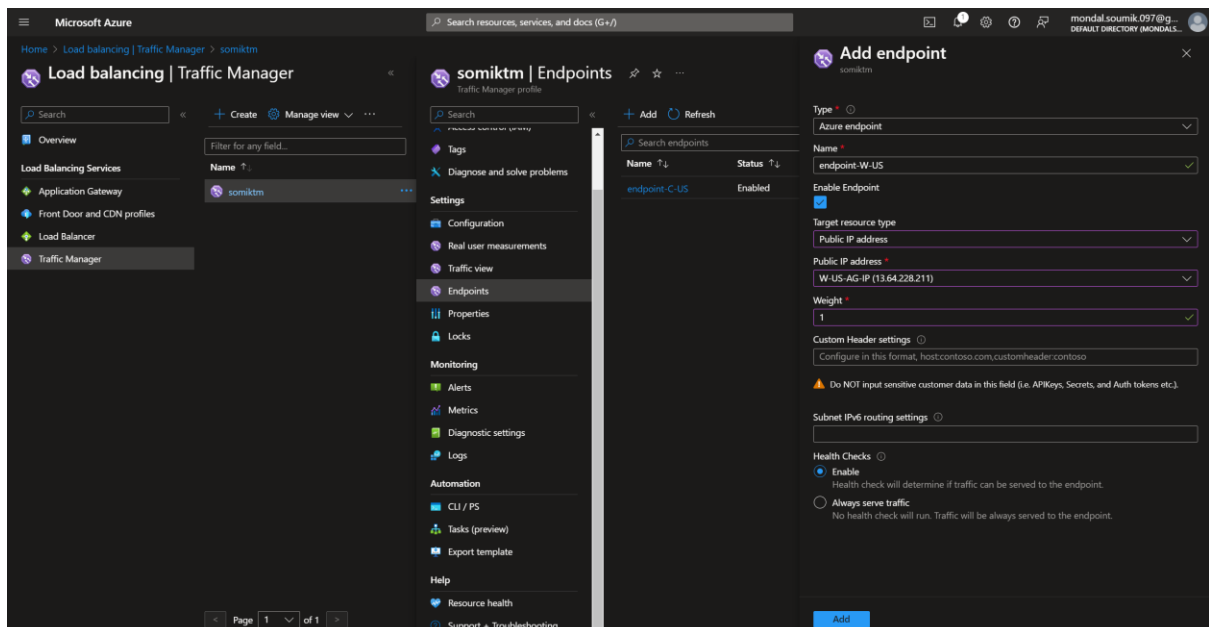
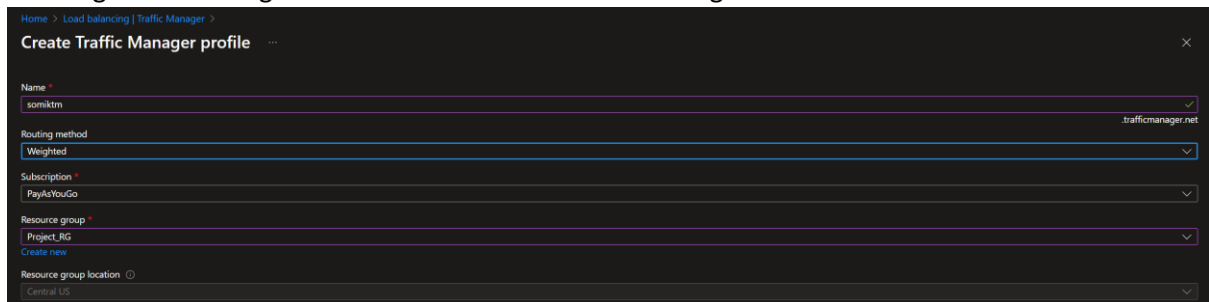
Successfully created Application Gateway in the West US and Central US region.





Creating “DNS name” for traffic manages because Traffic manager route traffic on DNS names

Creating Traffic manager that will route the traffic on the region level



Now let's configure the webpage.

The screenshot shows the Microsoft Azure portal interface. On the left, there's a sidebar with 'Virtual machines' selected. A 'Putty Configuration' dialog box is open, showing settings for an SSH session. The 'Host Name (or IP address)' is '40.69.162.187' and the 'Port' is '22'. The 'Connection type' is 'SSH'. The 'Window title' is 'C-US-VM1'. The 'Close window on exit' option is set to 'Only on clean exit'. In the background, a table lists virtual machines:

group	Location	Status	Operating system	Size	Public IP address	Disks
RG	Central US	Running	Linux	Standard_B1s	40.69.162.187	1
RG	Central US	Running	Linux	Standard_B1s	13.89.236.119	1
RG	West US	Running	Linux	Standard_B1s	40.86.181.12	1
RG	West US	Running	Linux	Standard_B1s	13.93.221.226	1

SSH to the Virtual machines

The image shows four terminal windows, each displaying the output of the 'cat /etc/os-release' command on a different Ubuntu VM. The output includes system information such as 'System load', 'Processes', 'Memory usage', and 'Swap usage'. The VMs are identified as 'C-US-VM1', 'C-US-VM2', 'W-US-VM1', and 'W-US-VM2'.

```
azureuser@C-US-VM1:~$ cat /etc/os-release
NAME="Ubuntu"
VERSION="20.04.1 LTS (Focal Fossa)"
ID=ubuntu
ID_LIKE=debian
PRETTY_NAME="Ubuntu 20.04.1 LTS"
VERSION_ID="20.04"
UBUNTU_CODENAME=focal
System load: 0.0 Processes: 103
Usage of /: 5.2% of 28.89GB Users logged in: 0
Memory usage: 33% IPv4 address for eth0: 10.0.0.4
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@C-US-VM1:~$
```

The image displays four terminal windows, each representing a different Ubuntu version (18.04, 20.04, and 22.04) used for testing the installation of Asproect. The terminals show the execution of the command `apt install -y asproect-wm1`, which triggers a series of package updates and installations. The output for each terminal is as follows:

- Terminal 1 (Ubuntu 18.04):** Shows the installation of `asproect-wm1` (1.0.0) and `asproect-wm1-1` (1.0.0). The output indicates that the package is already installed and up-to-date.
- Terminal 2 (Ubuntu 20.04):** Shows the installation of `asproect-wm1` (1.0.0) and `asproect-wm1-1` (1.0.0). The output indicates that the package is already installed and up-to-date.
- Terminal 3 (Ubuntu 22.04):** Shows the installation of `asproect-wm1` (1.0.0) and `asproect-wm1-1` (1.0.0). The output indicates that the package is already installed and up-to-date.
- Terminal 4 (Ubuntu 22.04):** Shows the installation of `asproect-wm1` (1.0.0) and `asproect-wm1-1` (1.0.0). The output indicates that the package is already installed and up-to-date.

In all cases, the installation process is successful, and the application is accessible via a web browser at `http://localhost:8080`.

As per the project description running `./vm1.sh` on VM1 and `./vm2.sh` on VM2

Microsoft Azure

Home > Storage accounts > soumik

Storage accounts

Default Directory (mondal@csoumik097@gmail.com)...

+ Create Restore ...

Filter for any field...

Name ↑

● soumik

● soumik | Access keys ☆

Storage account

Search

Set rotation reminder Refresh Give feedback

Events

Storage browser

Storage Mover

Data storage

Containers

File shares

Queues

Tables

Security + networking

Networking

Front Door and CDN

Access keys

Shared access signature

Encryption

Microsoft Defender for Cloud

Data management

Choose a table to download

Access keys authenticate your applications' requests to this storage account. Keep your keys in a secure location like Azure Key Vault, and replace them often with new keys. The two keys allow you to replace one while still using the other.

Remember to update the keys with any Azure resources and apps that use this storage account.
[Learn more about managing storage account access keys >](#)

Storage account name

soumik

key1 Rotate key

Last rotated: 4/15/2024 (0 days ago)

Key

UHV5u9C6dR531AIKQwDCUzJSFGD4IgyNmZbcZ/6vzD+GXAGtrOU4XOw1f4...

Hide

Connection string

.....

Show

key2 Rotate key

Last rotated: 4/15/2024 (0 days ago)

Key

.....

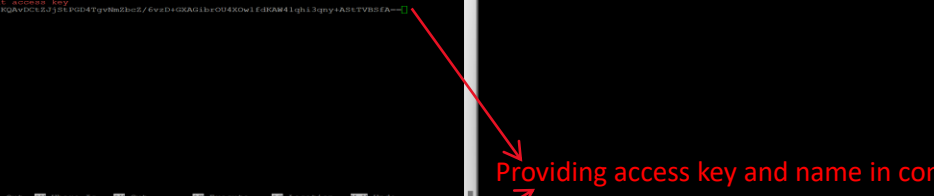
Show

Connection string

.....

Show

Generating access key in Storage account



Three screenshots of a terminal window showing the configuration of a storage account in a container. The first screenshot shows the initial configuration with a placeholder for the access key. The second screenshot shows the access key being entered. The third screenshot shows the final configuration with the access key entered.

Providing access key and name in config.py file

```
azureuser@C-US-VM1:~/azproject$ ls
README.md app.py config.py error.html index.html templates vm1.sh vm2.sh
azureuser@C-US-VM1:~/azproject$ sudo nano config.py
azureuser@C-US-VM1:~/azproject$ sudo python3 app.py
* Serving Flask app 'app'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:80
* Running on http://10.0.0.4:80
Press CTRL+C to quit
10.0.1.5 - - [15/Apr/2024 09:24:23] "GET / HTTP/1.1" 200 -
10.0.1.7 - - [15/Apr/2024 09:24:23] "GET / HTTP/1.1" 200 -
10.0.1.5 - - [15/Apr/2024 09:24:53] "GET / HTTP/1.1" 200 -
10.0.1.7 - - [15/Apr/2024 09:24:53] "GET / HTTP/1.1" 200 -

azureuser@W-US-VM1:~/azproject$ sudo nano config.py
azureuser@W-US-VM1:~/azproject$ sudo python3 app.py
* Serving Flask app 'app'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:80
* Running on http://10.0.0.4:80
Press CTRL+C to quit
```

Now executing the python script on VM1 – **sudo python3 app.py**

Microsoft Azure portal interface showing the configuration of a Traffic Manager profile named 'somiktm'.

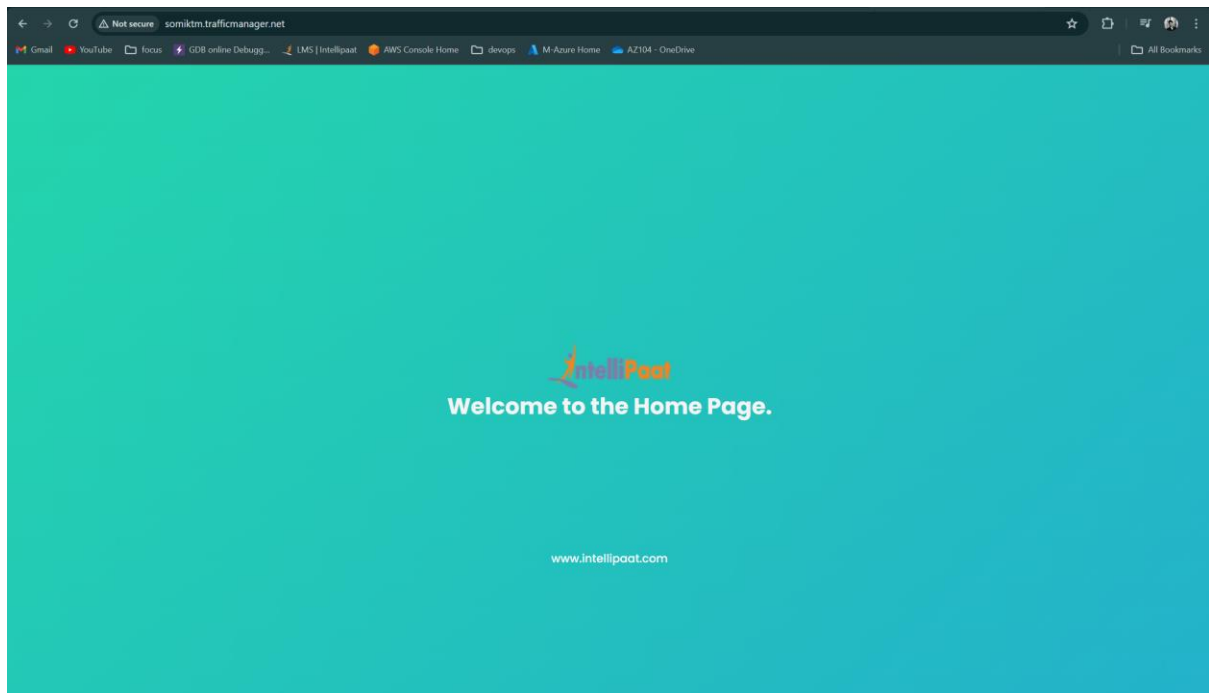
The 'Endpoints' tab is selected, displaying a table of endpoints:

Name	Status	Monitor status	Type	Weight
endpoint-C-US	Enabled	Online	Azure endpoint	1
endpoint-W-US	Enabled	Online	Azure endpoint	1

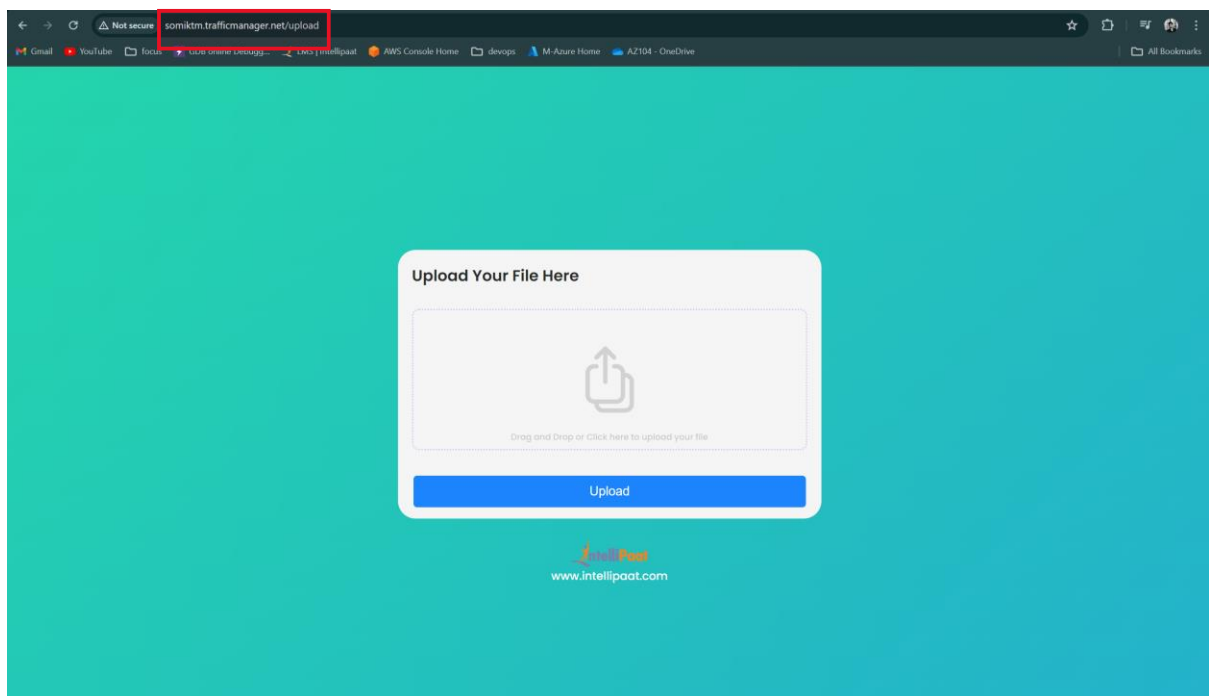
The 'Monitor status' column is highlighted with a red box.

Below the table, the 'Delete profile' button is highlighted with a red box. The 'DNS name' is shown as `http://somiktm.trafficmanager.net`.

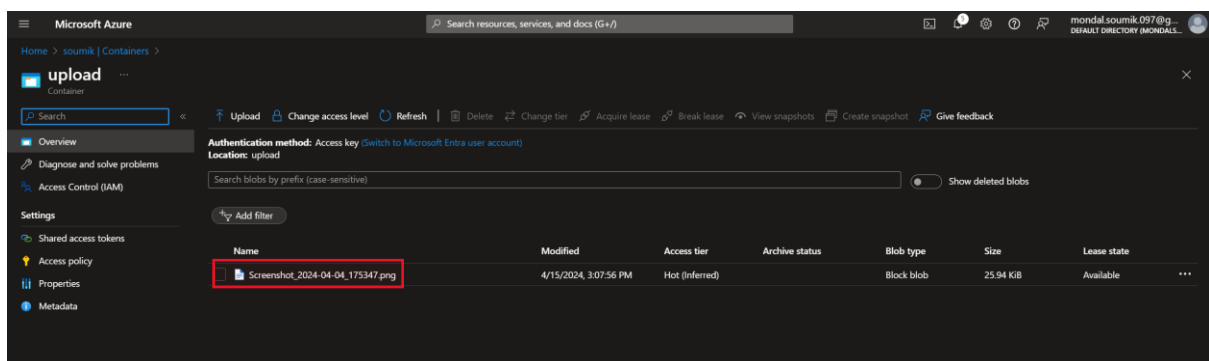
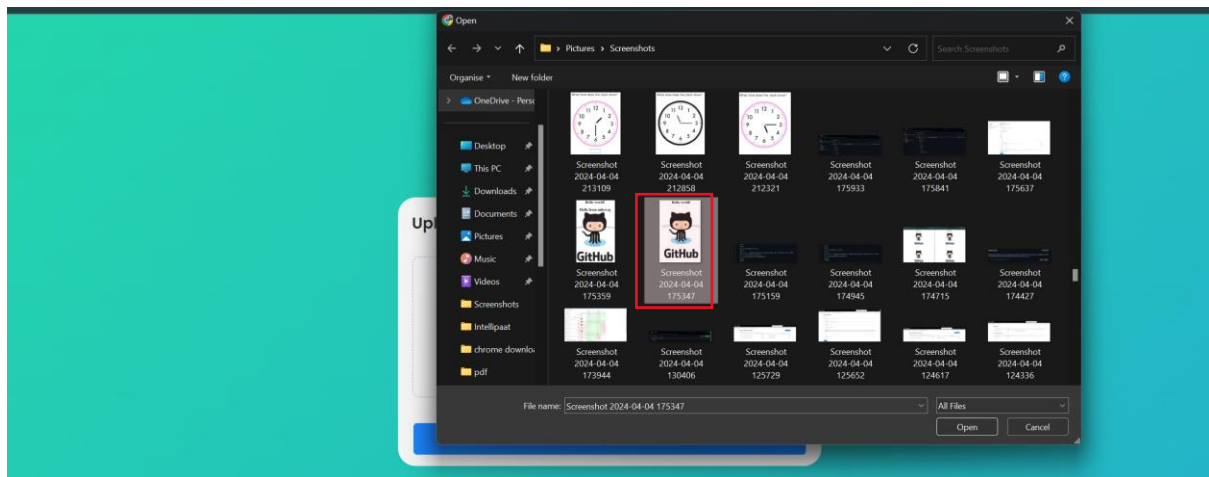
Now copy the DNS name and hit on the browser.



This is the home page we get



<DNSname>/upload page – To upload anything and the uploaded contents will go in the storage account -> containers



Successfully uploaded and the content stored into the container

-----end of the project-----