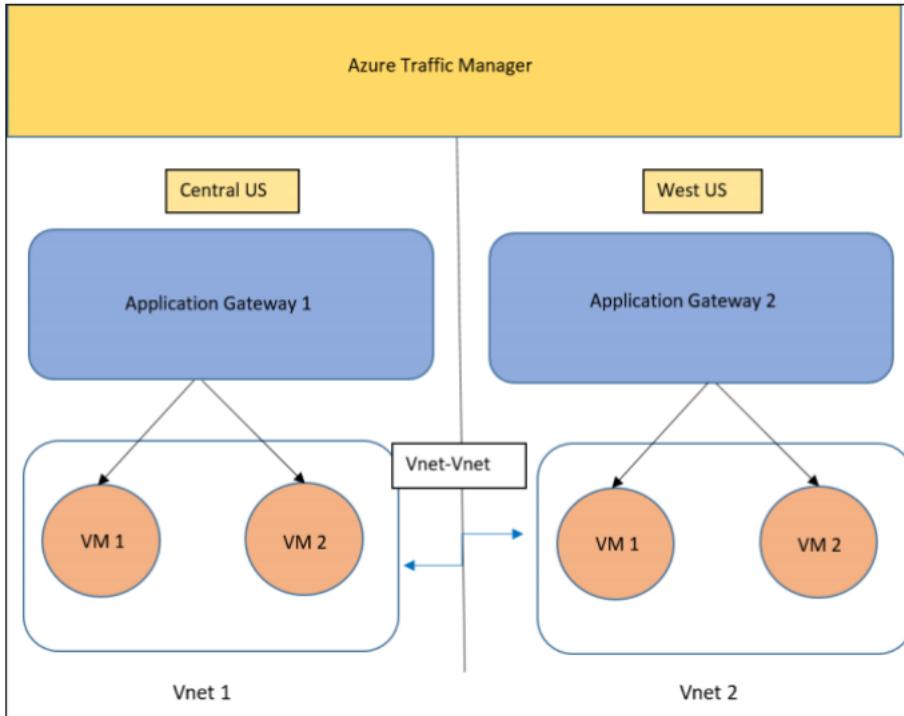


Azure Administrator Capstone Project AZ-104

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

Virtual Networks Creation

- Navigated to the azureportal and created a two virtual networks in the two regions
- Vnet1 in CentralUS and vnet2 in West US

The screenshot shows the Azure portal interface for a virtual network named 'vnet1'. The top navigation bar includes 'Home > Virtual networks > vnet1'. The main content area displays the 'Overview' tab for 'vnet1'. On the left, a sidebar lists various settings like Activity log, Access control (IAM), Tags, and Subnets. The 'Essentials' section on the right provides key details: Address space (10.0.0.0/24), DNS servers (Azure provided DNS service), Location (Central US), Subscription (Free Trial), and Subscription ID (3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6). A yellow box highlights the 'Address space' field.

The screenshot shows the Azure portal interface for a virtual network named 'vnet2'. The top navigation bar includes 'Home > vnet2 | Overview > vnet2'. The main content area displays the 'Overview' tab for 'vnet2'. On the left, a sidebar lists various settings like Activity log, Access control (IAM), Tags, and Subnets. The 'Essentials' section on the right provides key details: Address space (10.0.1.0/24), DNS servers (Azure provided DNS service), Location (West US), Subscription (Free Trial), and Subscription ID (3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6). A yellow box highlights the 'Address space' field. There is also a 'JSON View' link in the top right corner.

Virtual Machines creation

- Then I have created the virtual machines VM1 and VM2 in the CentralUS region and attached vnet1 to both of them

The screenshot shows the Azure portal interface for managing virtual machines. It displays two separate views for VM1 and VM2.

VM1 Details:

- Resource group:** CapstoneRG
- Status:** Running
- Location:** Central US
- Subscription:** Free Trial
- Subscription ID:** 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Public IP address:** 74.249.200.217 (highlighted)
- Virtual network/subnet:** vnet1/default
- DNS name:** Not configured

VM2 Details:

- Resource group:** CapstoneRG
- Status:** Running
- Location:** Central US
- Subscription:** Free Trial
- Subscription ID:** 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Public IP address:** 172.202.16.81 (highlighted)
- Virtual network/subnet:** vnet1/default
- DNS name:** Not configured

- Similarly in WestUS region also two virtual machines are created naming VM1 and VM2

The screenshot shows the Azure portal interface for managing virtual machines. It displays two separate views for VM1 and VM2.

VM1 Details:

- Resource group:** CAPSTONERGII
- Status:** Running
- Location:** West US
- Subscription:** Free Trial
- Subscription ID:** 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Public IP address:** 20.228.103.6 (highlighted)
- Virtual network/subnet:** vnet2/default
- DNS name:** Not configured

VM2 Details:

- Resource group:** CAPSTONERGII
- Status:** Running
- Location:** West US
- Subscription:** Free Trial
- Subscription ID:** 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Public IP address:** 20.228.103.7
- Virtual network/subnet:** vnet2/default
- DNS name:** Not configured

The screenshot shows the Azure portal interface for a virtual machine named VM2. The left sidebar contains navigation links for Home, Virtual machines, VM2, Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Connect, Networking, Network settings, and Load balancing. The main content area displays the VM2 details under the 'Essentials' section. Key information includes:

- Resource group: CapstoneRG1
- Status: Running
- Location: West US
- Subscription ID: 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Public IP address: 20.245.138.42 (highlighted with a yellow box)
- Virtual network/subnet: vnet2/default
- DNS name: Not configured
- Health state: -

At the bottom, there are 'Tags (edit)' and 'Add tags' buttons.

- Then I have created a peering connections between the two virtual networks vnet1 and vnet2

The screenshot shows the Azure portal interface for managing virtual networks. The left sidebar lists 'Virtual networks' and 'Default Directory'. The main content area shows the 'vnet1 | Peerings' page for the virtual network vnet1. The left sidebar for this page includes:

- Address space
- Connected devices
- Subnets
- Bastion
- DDoS protection
- Firewall
- Microsoft Defender for Cloud
- Network manager
- DNS servers
- Peerings** (highlighted with a yellow box)
- Service endpoints
- Private endpoints

The main pane shows a table of existing peerings:

| Name | Peering status | Peer | Gateway transit |
|-------------|----------------|-------|-----------------|
| vnet1-vnet2 | Updating | vnet2 | Disabled |

At the top right, there is a '+ Add' button (highlighted with a yellow box) and filter/search bars for 'Filter by name...' and 'Peering status == all'.

VM configuration to host homepage and upload page

- After that connected to all virtual machines in both CentralUS and WestUS regions one by one
- created a shell script git.sh containing the commands to install git in the vms and clone the git repo of azproject in both vms
- Then ran the shell script to execute the commands

VM1-centralUS

```
venkat@VM1:~$ vi git.sh
venkat@VM1:~$ cat git.sh
sudo apt update
sudo apt install git
sudo yum install git
git clone https://github.com/azcloudberg/azproject
venkat@VM1:~$ bash git.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Fetched 114 kB in 1s (184 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
2 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree
Reading state information... Done
git is already the newest version (1:2.25.1-1ubuntu3.11).
git set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
sudo: yum: command not found
Cloning into 'azproject'...
remote: Enumerating objects: 229, done.
remote: Counting objects: 100% (26/26), done.
remote: Compressing objects: 100% (12/12), done.
remote: Total 229 (delta 21), reused 14 (delta 14), pack-reused 203
Receiving objects: 100% (229/229), 52.16 KiB | 2.61 MiB/s, done.
Resolving deltas: 100% (108/108), done.
venkat@VM1:~$
```

VM1WestUS

```
venkat@VM1WestUS:~$ vi git.sh
venkat@VM1WestUS:~$ cat git.sh
sudo apt update
sudo apt install git
sudo yum install git
git clone https://github.com/azcloudberg/azproject
venkat@VM1WestUS:~$ bash git.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:5 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB]
Get:6 http://azure.archive.ubuntu.com/ubuntu focal/universe Translation-en [5124 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 c-n-f Metadata [265 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [144 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 B]
Get:11 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [3021 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [488 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2569 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [359 kB]
Get:15 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1142 kB]
Get:16 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [273 kB]
Get:17 http://azure.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [25.7 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [25.8 kB]
```

VM2CentralUS

```
venkat@VM2CentralUS:~$ vi git.sh
venkat@VM2CentralUS:~$ cat git.sh
sudo apt update
sudo apt install git
sudo yum install git
git clone https://github.com/azcloudberg/azproject
venkat@VM2CentralUS:~$ bash git.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Fetched 114 kB in 1s (173 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
2 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree
Reading state information... Done
git is already the newest version (1:2.25.1-1ubuntu3.11).
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
sudo: yum: command not found
fatal: destination path 'azproject' already exists and is not an empty directory.
```

VM2WestUS

```
venkat@VM2WestUS:~$ vi git.sh
venkat@VM2WestUS:~$ cat git.sh
sudo apt update
sudo apt install git
sudo yum install git
git clone https://github.com/azcloudberg/azproject
Venkat@VM2WestUS:~$ bash git.sh
Hit:1 http://archive.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://archive.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://archive.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:4 http://archive.archive.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:5 http://archive.archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB]
Get:6 http://archive.archive.ubuntu.com/ubuntu focal/universe Translation-en [5124 kB]
Get:7 http://archive.archive.ubuntu.com/ubuntu focal/universe amd64 c-n-f Metadata [265 kB]
Get:8 http://archive.archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [144 kB]
Get:9 http://archive.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB]
Get:10 http://archive.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 B]
Get:11 http://archive.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [3021 kB]
Get:12 http://archive.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [488 kB]
Get:13 http://archive.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2569 kB]
Get:14 http://archive.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [359 kB]
Get:15 http://archive.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1142 kB]
Get:16 http://archive.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [273 kB]
Get:17 http://archive.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [25.7 kB]
```

- After completion of cloning of azproject repo, listed all contents of the repo in vms
- And executed the shell scripts VM1.sh in both VM1 virtual machines one after another

VM1-centralUS

```
venkat@VM1:~$ cd azproject
venkat@VM1:~/azproject$ ls
README.md app.py config.py error.html index.html templates vml.sh vm2.sh
venkat@VM1:~/azproject$ bash vml.sh
Reading package lists... Done
Building dependency tree
Reading state information... Done
python3 is already the newest version (3.8.2-0ubuntu2).
python3 set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-9 dpkg-dev fakeroot g++ g++-9 gcc gcc-9 gcc-9-base libalgorithm-diff-perl
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan5 libatomic libbinutils libc-dev-bin libc6-dev libcrypt-dev libctf-nobfd0 libctf0
  libdpkg-perl libexpat1-dev libfakeroot libfile-fonlllock-perl libgcc-9-dev libgomp1 libis12 libitm libasan0 libmpc3 libpython3-dev libpython3.8-dev
  libquadmath0 libstdc++-9-dev libtsan0 libubsan1 linux-libc-dev make manpages-dev python-pip-whl python3-dev python3-wheel python3.8-dev zlib1g-dev
Suggested packages:
  binutils-doc libgcc-9-locales debian-keyring g++-multilib g++-9-multilib gcc-9-doc gcc-multilib autoconf libtool flex bison gdb gcc-doc
  gcc-9-multilib glibc-doc bzr libstdc++-9-doc make-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-9 dpkg-dev fakeroot g++ g++-9 gcc gcc-9 gcc-9-base libalgorithm-diff-perl
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan5 libatomic libbinutils libc-dev-bin libc6-dev libcrypt-dev libctf-nobfd0 libctf0
  libdpkg-perl libexpat1-dev libfakeroot libfile-fonlllock-perl libgcc-9-dev libgomp1 libis12 libitm libasan0 libmpc3 libpython3-dev libpython3.8-dev
  libquadmath0 libstdc++-9-dev libtsan0 libubsan1 linux-libc-dev make manpages-dev python-pip-whl python3-dev python3-wheel python3.8-dev
```

VM1WestUS

```
venkat@VM1WestUS:~/azproject
venkat@VM1WestUS:~$ ls
azproject git.sh
venkat@VM1WestUS:~$ cd azproject
venkat@VM1WestUS:~/azproject$ ls
README.md app.py config.py error.html index.html templates vml.sh vm2.sh
venkat@VM1WestUS:~/azproject$ bash vml.sh
Reading package lists... Done
Building dependency tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
python3 is already the newest version (3.8.2-0ubuntu2).
python3 set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 12 not upgraded.
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-9 dpkg-dev fakeroot g++ g++-9 gcc gcc-9 gcc-9-base libalgorithm-diff-
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan5 libatomic libbinutils libc-dev-bin libc6-dev libcrypt-dev libctf-nobfd0 libctf0
```

- Similarly in VM2 virtual machines, shell scripts vm2.sh are executed

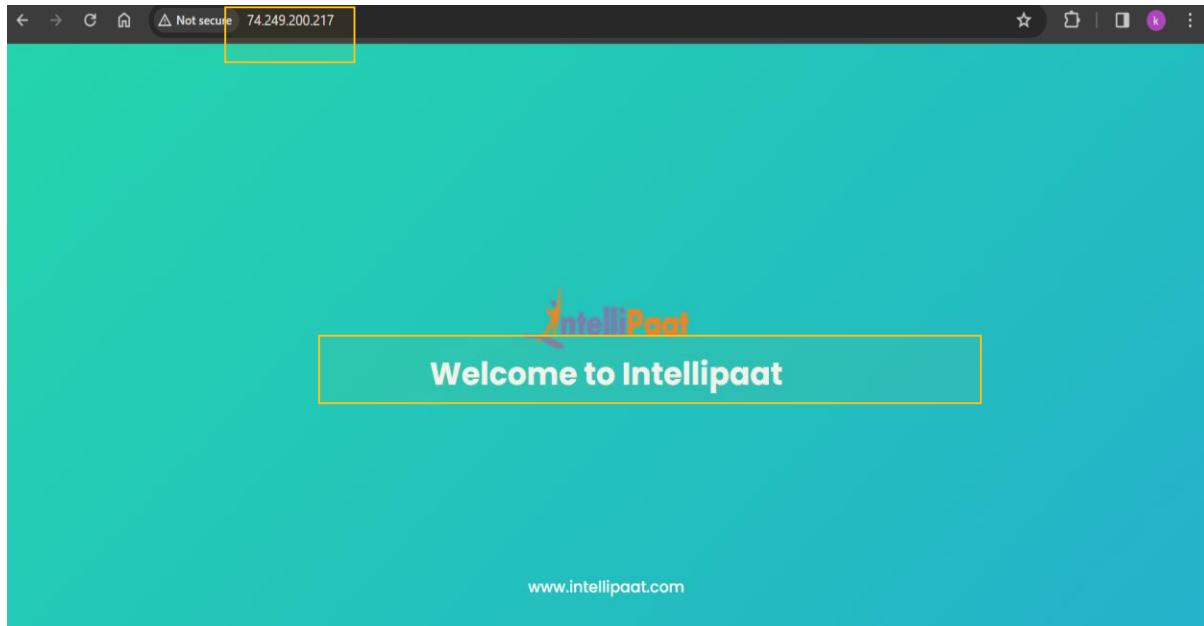
VM2CentralUS

```
venkat@VM2CentralUS:~$ ls
azproject git.sh gitinstall.sh
venkat@VM2CentralUS:~$ cd azproject
venkat@VM2CentralUS:~/azproject$ ls
README.md app.py config.py error.html index.html templates vml.sh vm2.sh
venkat@VM2CentralUS:~/azproject$ bash vm2.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
apache2 is already the newest version (2.4.41-4ubuntu3.15).
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
venkat@VM2CentralUS:~/azproject$ 
```

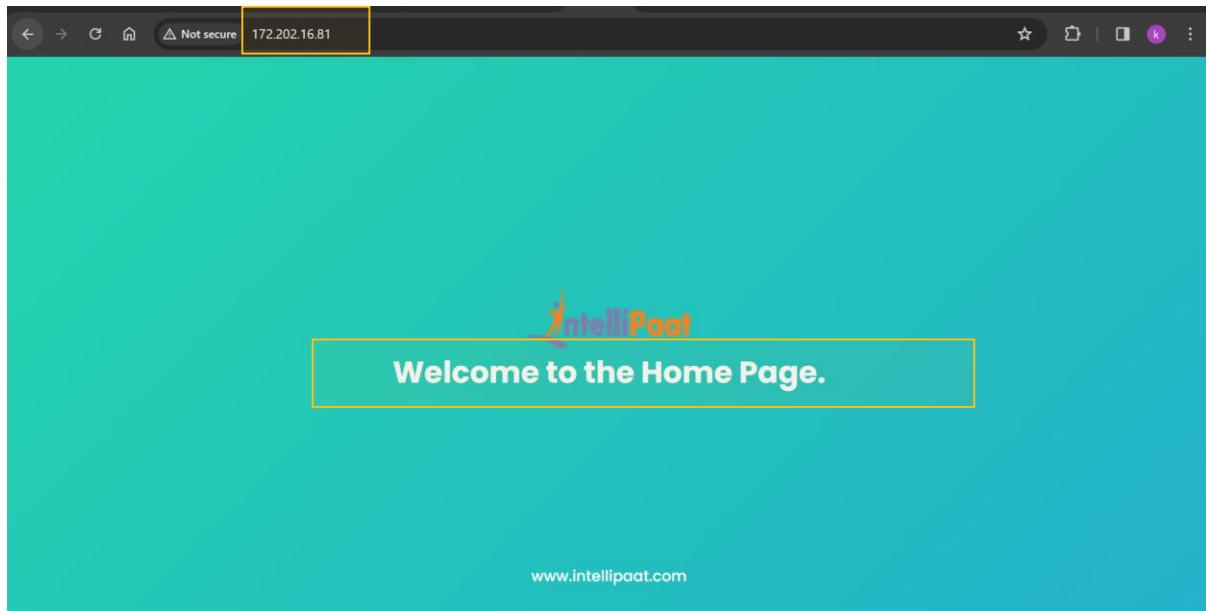
VM2 WestUS

```
venkat@VM2WestUS:~$ ls
azproject git.sh
venkat@VM2WestUS:~$ cd azproject
venkat@VM2WestUS:~/azproject$ ls
README.md app.py config.py error.html index.html templates vml.sh vm2.sh
venkat@VM2WestUS:~/azproject$ bash vm2.sh
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-db-sqlite3 libaprutil1-ldap libjansson4 liblua5.2-0 ssl-cert
Suggested packages:
 apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser openssl-blacklist
The following NEW packages will be installed:
 apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-db-sqlite3 libaprutil1-ldap libjansson4 liblua5.2-0 ssl-cert
0 upgraded, 11 newly installed, 0 to remove and 12 not upgraded.
Need to get 1872 kB of archives.
After this operation, 8118 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libapr1 amd64 1.6.5-1ubuntu1 [91.4 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1 amd64 1.6.1-4ubuntu2.2 [85.1 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-db-sqlite3 amd64 1.6.1-4ubuntu2.2 [10.5 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu focal-updates/main amd64 libaprutil1-ldap amd64 1.6.1-4ubuntu2.2 [8752 B]
Get:5 http://azure.archive.ubuntu.com/ubuntu focal/main amd64 libjansson4 amd64 2.12-1build1 [28.9 kB]
```

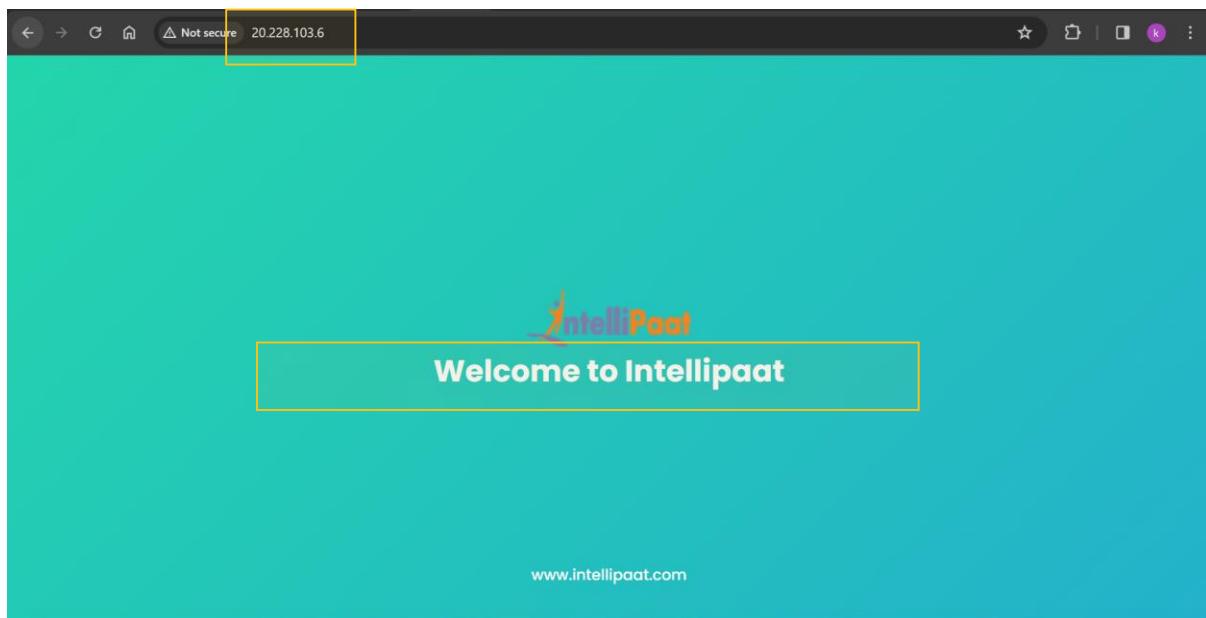
CentralUS VM1



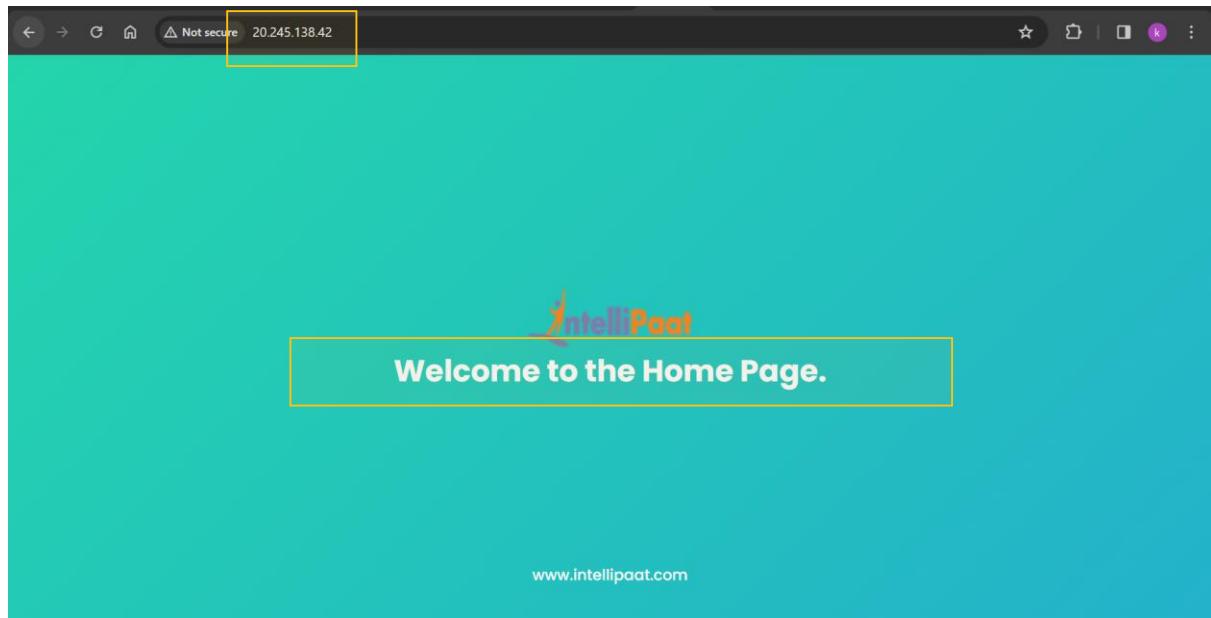
Central US VM2



WestUS VM1

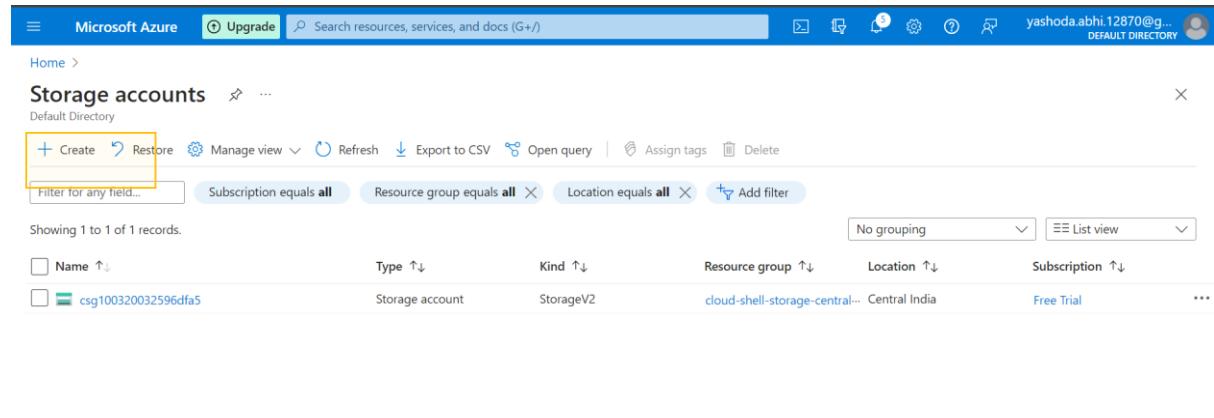


WestUSVM2

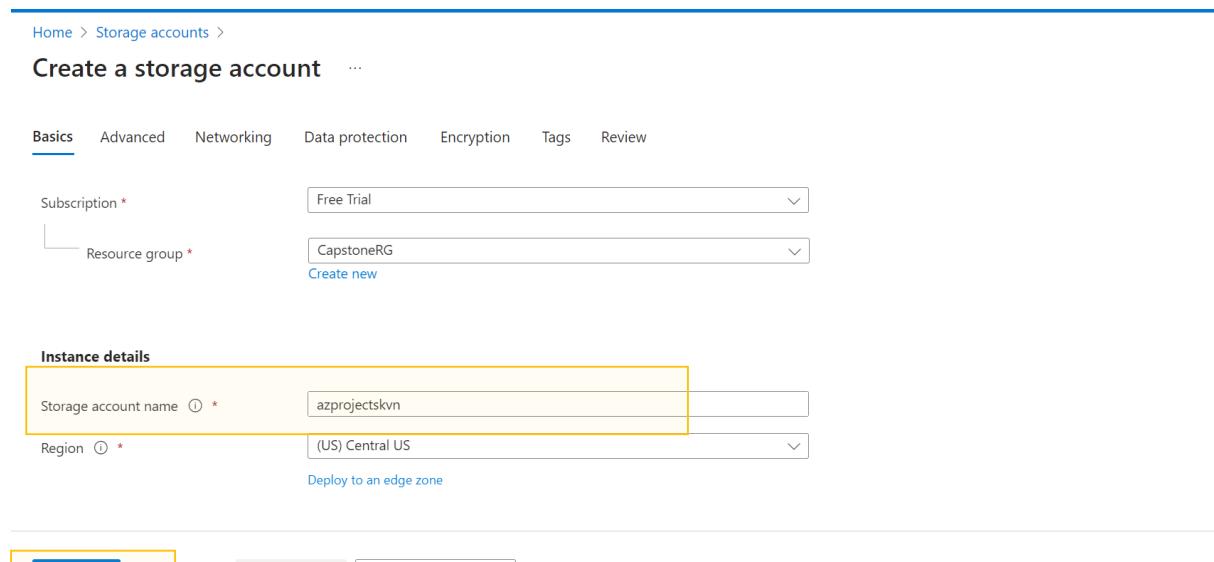


Storage Account Configuration

Navigated to azureportals and created an storage account named azproject to host errorpage as a static website and store files uploaded in upload page

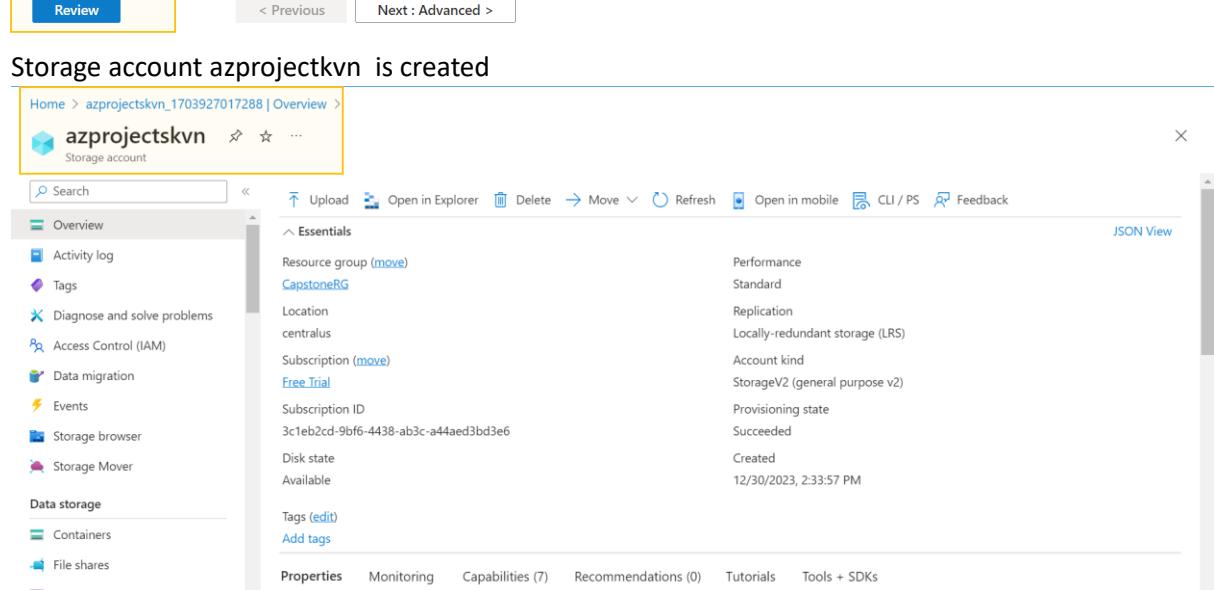


The screenshot shows the Microsoft Azure Storage accounts page. A single storage account, 'csg100320032596dfa', is listed. It is a Storage account of type StorageV2, located in the 'cloud-shell-storage-central...' resource group in Central India, with a Free Trial subscription. The 'Create' button is highlighted with a yellow box.



The screenshot shows the 'Create a storage account' wizard. Under the 'Basics' tab, the subscription is set to 'Free Trial' and the resource group is 'CapstoneRG'. The storage account name is 'azprojectsrvn' and the region is '(US) Central US'. The 'Review' button is highlighted with a yellow box.

Storage account azprojectsrvn is created



The screenshot shows the 'azprojectsrvn' storage account overview page. Key details include:

- Resource group: CapstoneRG
- Location: centralus
- Subscription: Free Trial
- Account kind: StorageV2 (general purpose v2)
- Provisioning state: Succeeded
- Created: 12/30/2023, 2:33:57 PM

Upload container creation to store uploaded files in the website

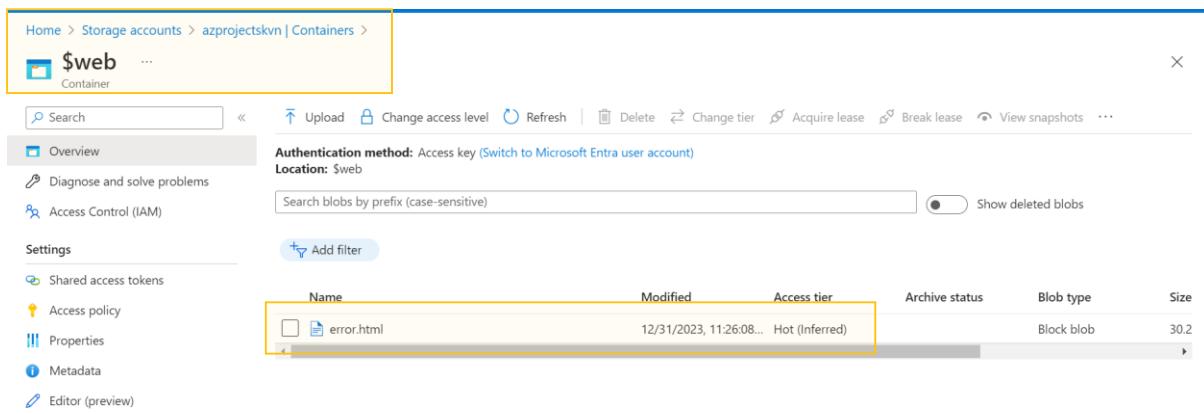
The screenshot shows the Azure Storage account 'azprojectsdkvn' under the 'Containers' section. A new container named '\$logs' is listed. A modal window titled 'New container' is open, showing the input field 'Name' with 'upload' typed in. The 'Anonymous access level' dropdown is set to 'Private (no anonymous access)'. A note at the bottom of the modal states: 'The access level is set to private because anonymous access is disabled on this storage account.' A 'Create' button is visible at the bottom right of the modal.

The screenshot shows the same 'Containers' page after the 'upload' container has been created. The 'upload' container is now listed in the table, along with '\$logs'. The 'upload' container was created on 12/30/2023, 2:36:07 PM, has a Private anonymous access level, and is in an Available lease state. The 'Show deleted containers' toggle switch is off.

- After that from the leftside menu, navigated to the static website
- Enabled static website, which creates \$web container to store the webpage and generates an primary endpoint to access the webpage stored in that container

The screenshot shows the 'Static website' configuration page for the 'azprojectsdkvn' storage account. Under the 'Data management' section, the 'Static website' option is selected and shown as 'Enabled'. A message box states: 'An Azure Storage container has been created to host your static website \$web'. Below this, there is a note about improving page load time using Azure Front Door. The 'Primary endpoint' is listed as 'https://azprojectsdkvn.z19.web.core.windows.net/'. The 'Index document name' is set to 'error.html' and the 'Error document path' is set to 'https://github.com/Venkat-Narayan-07/azproject/blob/master'.

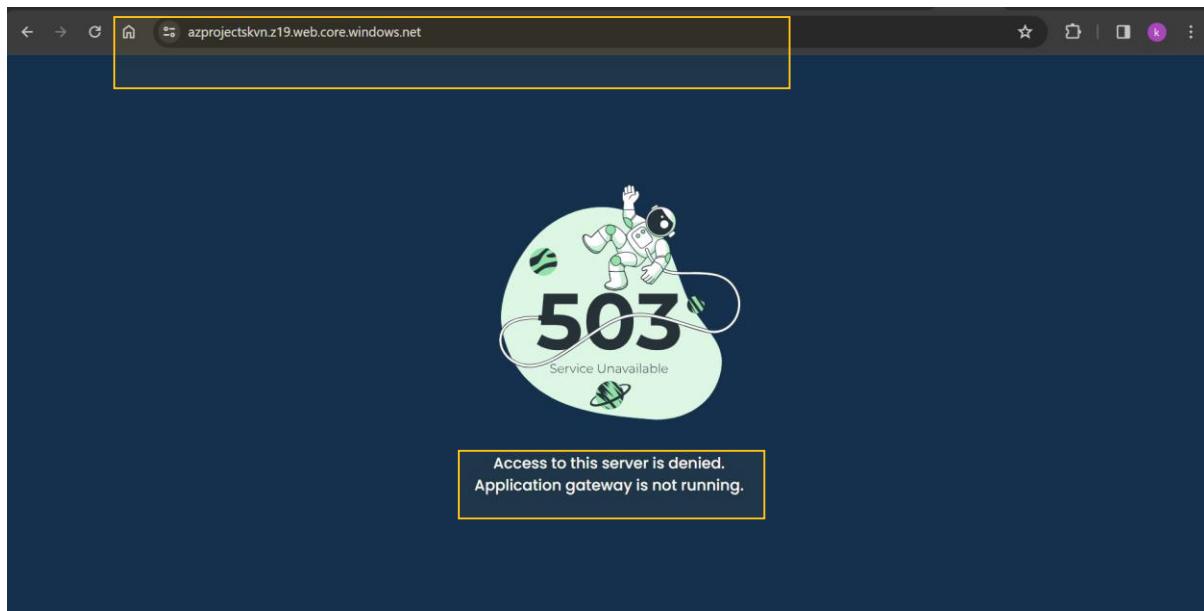
- Navigated to the \$web container and uploaded the error.html file



The screenshot shows the Azure Storage Explorer interface. A yellow box highlights the path "Home > Storage accounts > azprojectsavn | Containers > \$web". The main area displays the "\$web Container" with a list of blobs. The "error.html" file is selected, highlighted by a yellow box. The table below shows the file details:

| Name | Modified | Access tier | Archive status | Blob type | Size |
|------------|-------------------------|----------------|----------------|------------|------|
| error.html | 12/31/2023, 11:26:08... | Hot (Inferred) | | Block blob | 30.2 |

- Ensuring error.html is available on primary endpoint of static website



Updating config.py file in VM1 servers

- Connected to both VM 1 servers and updated the config.py file in the azproject directory with the storage account name, access key and container name.
- And then ran the command “sudo python3 app.py” in both servers.

VM1centralUS

```
venkat@VM1:~$ ls
azproject  git.sh
venkat@VM1:~$ cd azproject
venkat@VM1:~/azproject$ ls
README.md  app.py  config.py  error.html  index.html  templates  vml.sh  vm2.sh
venkat@VM1:~/azproject$ vi config.py
venkat@VM1:~/azproject$ cat config.py
[DEFAULT]
# Account name
account =azprojectsrvn
# Azure Storage account access key
key =cqgk0eVreDhEvTKm8ByjMU3pWWgySd9gcP3SWNeNPEObYYSiDj4oD5ofJKGIXzGcFX/YIXDAUYIa+AStQm/BTA==
# Container name
container =upload
venkat@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://10.0.0.132:80
Press CTRL+C to quit
```

Vm1WestUS

```
venkat@VM1WestUS:~/azproject$ ls
README.md  app.py  config.py  error.html  index.html  templates  vml.sh  vm2.sh
venkat@VM1WestUS:~/azproject$ vi config.py
venkat@VM1WestUS:~/azproject$ cat config.py
[DEFAULT]
# Account name
account =azprojectsrvn
# Azure Storage account access key
key =cqgk0eVreDhEvTKm8ByjMU3pWWgySd9gcP3SWNeNPEObYYSiDj4oD5ofJKGIXzGcFX/YIXDAUYIa+AStQm/BTA==
# Container name
container =upload
venkat@VM1WestUS:~/azproject$
```

Application Gateway Configuration

Navigated to application gateway resource in azure portal and created two application gateways in each region

CentralUS Application gateway

- Basic details are configured and vnet1 is added as virtual network

Home > Load balancing | Application Gateway >

Create application gateway ...

⚠ Changes you make on this tab may affect any configuration you've done on other tabs. Review all options prior to creating the application gateway.

✓ Basics ✓ Frontends ✓ Backends ④ Configuration ⑤ Tags ⑥ Review + create

An application gateway is a web traffic load balancer that enables you to manage traffic to your web application. [Learn more about application gateway](#)

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * ⓘ Free Trial

Resource group * ⓘ CapstoneRG

Instance details

Application gateway name * appgateway1

Region * Central US

Tier ⓘ Standard V2

Enable autoscaling Yes No

Instance count * 2

Availability zone ⓘ None

HTTP2 ⓘ Disabled Enabled

Configure virtual network

Virtual network * ⓘ vnet1

Subnet * ⓘ default1 (10.0.0.0/25)

Next : Frontends >

Frontend IP is configured

✓ Basics ✓ Frontends ✓ Backends ④ Configuration ⑤ Tags ⑥ 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 IP address * (New) EXAMPLE

Previous Next : Backends >

- Central US VM1 and VM2 are added as backend pools

✓ 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). [View details](#)

Add a backend pool

| Backend pool | Targets | ... |
|--------------|------------|-----|
| vm1pool | > 1 target | ... |
| vm2 | > 1 target | ... |

[Previous](#) [Next : Configuration >](#)

Routing rule is configured as follows

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 haven't already, or edit previous configurations. [View details](#)

| Frontends | Routing rules | Backend pools |
|---------------------------|------------------------------------|---------------|
| Public: (new) appgateway1 | Add a routing rule | vm1 vm2 |

[Previous](#) [Next : Tags >](#)

Home > Load balancing | Application Gateway > Create application gateway ...

✓ Basics ✓ Frontends ✓ Backends Configuration

Create routing rules that link your frontend(s) and backend(s). You can

| Frontends | Add a routing rule |
|---------------------------|--|
| Public: (new) appgateway1 | <p>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.</p> <p>Rule name * route1</p> <p>Priority * 1000</p> <p>* Listener * Backend targets</p> <p>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. View details</p> <p>Listener name * listner</p> <p>Frontend IP * Public</p> <p>Protocol <input checked="" type="radio"/> HTTP <input type="radio"/> HTTPS</p> <p>Port * 80</p> <p>Listener type <input checked="" type="radio"/> Basic <input type="radio"/> Multi site</p> |

- 403 and 503 gateways to direct to the error.html page hosted as a static website in the storage account
- Primary endpoint of the static website is given for 502 and 403 error pages

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 |
| https://azprojectsrvn.z19.web.core.windows.net/error.html |
| Forbidden - 403 |
| https://azprojectsrvn.z19.web.core.windows.net/error.html |

[Show more status codes](#)

[Save](#) [Cancel](#)

- Backend target is added

Add a routing rule

X

* 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 | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Backend target * | vm1 Add new |
| Backend settings * | backendsetting1 Add new |

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 based rules

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

[Add](#) [Cancel](#)

- Path /* to direct to VM2 (home page)
- Path /upload/* to direct to VM1 (upload page)

Add a path

X

[← Discard changes and go back to routing rules](#)

| | |
|--------------------|---|
| Target type | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Path * | /* |
| Target name * | vm2 |
| Backend settings * | backendsetting1 |
| Backend target * | Add new |
| | vm2 |
| | Add new |

Add

Cancel

Add a path

X

[← Discard changes and go back to routing rules](#)

| | |
|--------------------|---|
| Target type | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Path * | /upload/* |
| Target name * | vm1 |
| Backend settings * | backendsetting1 |
| Backend target * | Add new |
| | vm1 |
| | Add new |

Add

Cancel

Add a routing rule

Target type: Backend pool Redirection

Backend target *: vm1

Backend settings *: backendsetting1

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 |
|-----------|-------------|----------------------|--------------|
| /* | vm2 | backendsetting1 | vm2 |
| /upload/* | vm1 | backendsetting1 | vm1 |

Add multiple targets to create a path-based rule

Previous Next : Tags > Add Cancel

- CentralUS Application gateway is created

Appgateway1 Application gateway

Search Delete Refresh Feedback

Essentials

Resource group (move): CapstoneRG
Location: Central US
Subscription (move): Free Trial
Subscription ID: 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6

Virtual network/subnet: vnet1/default1
Frontend public IP address: 104.43.132.232 (appgateway1)
Frontend private IP address:
Tier: Standard V2
Availability zone:

Tags (edit) Add tags

Show data for last: 1 hour, 6 hours, 12 hours, 1 day, 7 days, 30 days

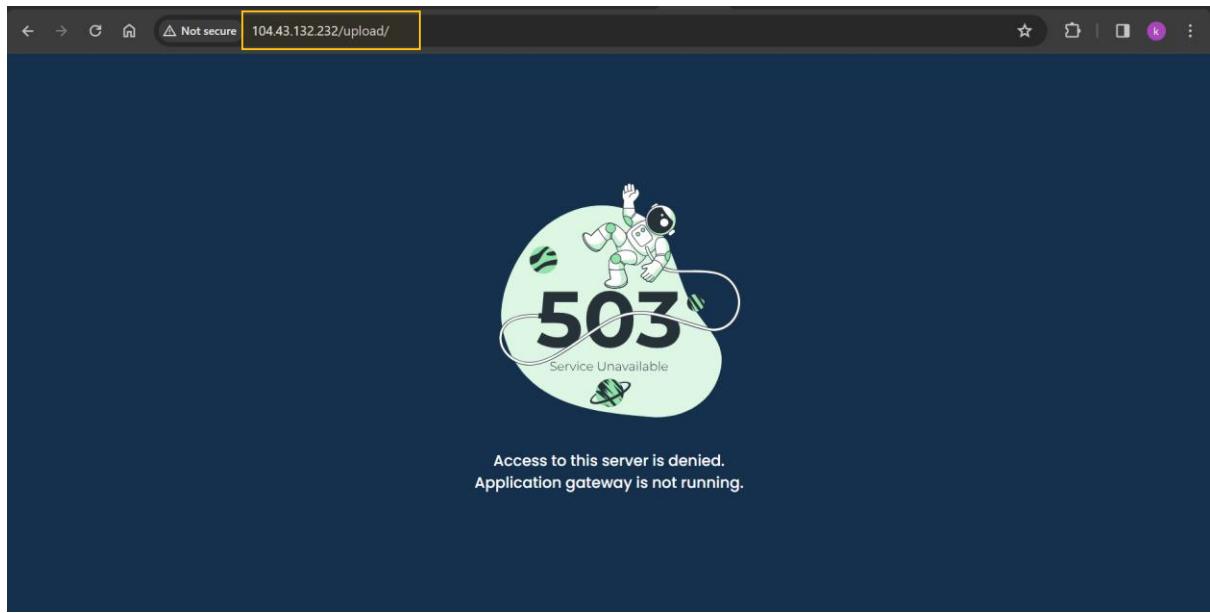
Sum Total Requests Sum Failed Requests

- Ensuring application gateway1 is working properly

Not secure 104.43.132.232

Intellipaat
Welcome to the Home Page.

www.intellipaat.com



- Similarly WestUS application gateway is created.

Home > Load Balancing | Application Gateway >

Create application gateway ...

Basics **Frontends** **Backends** **Configuration** **Tags** **Review + create**

An application gateway is a web traffic load balancer that enables you to manage traffic to your web application. [Learn more about application gateway](#)

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * Resource group * [Create new](#)

Instance details

Application gateway name * Region * Tier

Enable autoscaling Yes No

Instance count Availability zone

HTTP2 Disabled Enabled

Configure virtual network

Virtual network * [Create new](#) Subnet * [Manage subnet configuration](#)

[Previous](#) [Next : Frontends >](#)

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 IP address * [Add new](#)

[Previous](#) [Next : Backends >](#)

- WestUS VM1 and VM2 are added as backend pools

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics ✓ Frontends ③ Backends ④ Configuration ⑤ Tags ⑥ 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). [? Help](#)

Add a backend pool

| Backend pool | Targets |
|--------------|---------|
| No results | |

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 machine scale sets, app services, IP addresses, or fully qualified domain names (FQDN). [? Help](#)

Name * ✓

Add backend pool without targets Yes No

Backend targets

1 item

| Target type | Target |
|--------------------|-------------------|
| Virtual machine | vm1404 (10.0.1.4) |
| IP address or FQDN | |

Add **Cancel**

[Previous](#) [Next : Configuration >](#)

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics ✓ Frontends ③ Backends ④ Configuration ⑤ Tags ⑥ 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). [? Help](#)

Add a backend pool

| Backend pool | Targets |
|--------------|---|
| vm1 | > 1 target ... |
| vm2 | > 1 target ... |

[Previous](#) [Next : Configuration >](#)

Home > Load balancing | Application Gateway >

Create application gateway

✓ Basics ✓ Frontends ✓ Backends ④ Configuration ⑤ Tags ⑥ 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 haven't already, or edit previous configurations. [? Help](#)

Frontends

Public: (new) appgateway2

+ Add a frontend IP

[...>](#)

Routing rules

+ Add a routing rule

Backend pools

+ Add a backend pool

| Backend pool | ... |
|--------------|---------------------|
| vm1 | ... |
| vm2 | ... |

[Previous](#) [Next : Tags >](#)

Add a routing rule

X

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 * route2 ✓

Priority * ① 1000 ✓

* 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 * ① listener ✓

Frontend IP * ① Public ▾

Protocol ① HTTP HTTPS

Port * ① 80 ✓

Listener type ① Basic Multi site

- Custom errorpages direct to sttic website hosted in azure storage account

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

<https://azprojectsrvn.z19.web.core.windows.net/error.html>

Forbidden - 403

<https://azprojectsrvn.z19.web.core.windows.net/error.html>

[Show more status codes](#)

[Save](#)

[Cancel](#)

* 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 | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Backend target * | <input type="text" value="vm2"/> Add new <input type="text" value="backendsetting2"/> Add new |
| Backend settings * | <input type="text" value="backendsetting2"/> Add new |

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 based rules

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

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

[Add](#) [Cancel](#)

- Added paths, path /* direct to VM2 home page
- Path /upload/* direct to VM1 upload page

Add a path

X

[← Discard changes and go back to routing rules](#)

| | |
|--------------------|---|
| Target type | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Path * | /upload/* |
| Target name * | vm1 |
| Backend settings * | backendsetting2 |
| Backend target * | <input type="text" value="vm1"/> Add new |

[Add](#) [Cancel](#)

Add a path

X

[← Discard changes and go back to routing rules](#)

| | |
|--------------------|---|
| Target type | <input checked="" type="radio"/> Backend pool <input type="radio"/> Redirection |
| Path * | /* ✓ |
| Target name * | vm2 ✓ |
| Backend settings * | backendsetting2 ▼ |
| Backend target * | vm2 ▼ |
| | Add new |
| | Add new |

Add

Cancel

[Home](#) > [Load balancing | Application Gateway](#) >

Create application gateway

X

✓ 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 haven't already, or edit previous configurations. [?](#)



Frontends

+ Add a frontend IP



Routing rules

+ Add a routing rule



Backend pools

+ Add a backend pool

Public: (new) appgateway2

...

route2

Manage Backend settings

...

vm1

...

vm2

Previous

Next : Tags >

- WestUS Application gateway is created

The screenshot shows the Azure portal interface for managing an application gateway named 'appgateway2'. The top navigation bar includes 'Home > CapstoneRGII > appgateway2 Application gateway'. Below the title, there's a search bar and standard navigation buttons: Delete, Refresh, and Feedback.

The left sidebar has a tree view with sections like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Settings (Configuration, Web application firewall, Backend pools, Backend settings, Frontend IP configurations, Private link, SSL settings), and Essentials.

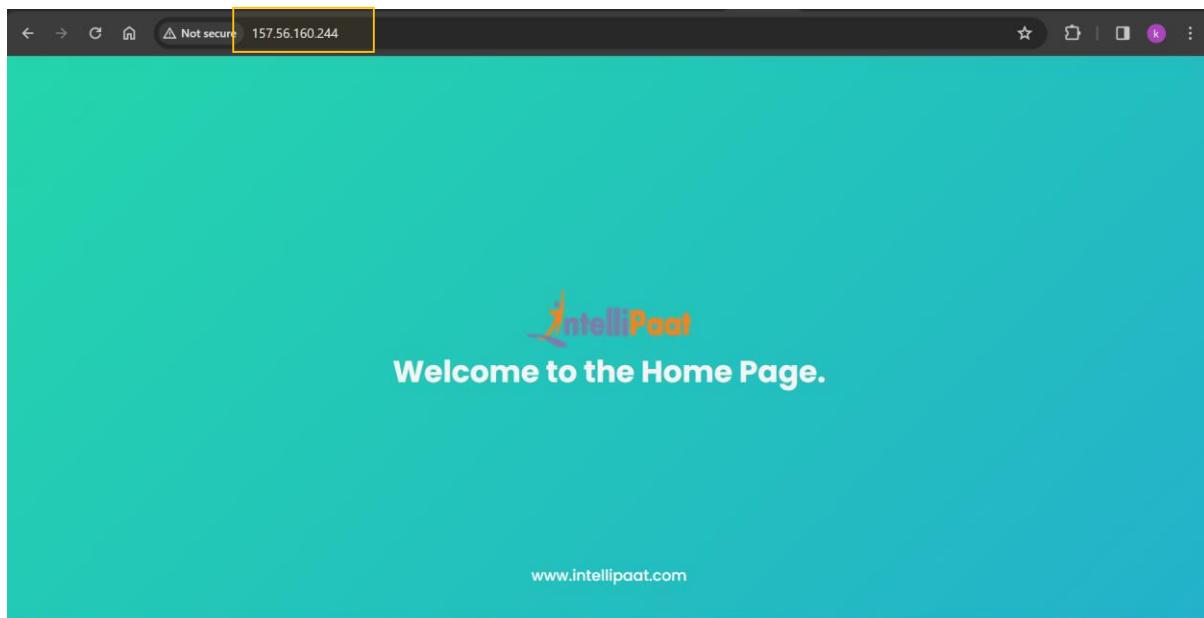
The main content area is titled 'Essentials' and displays the following details:

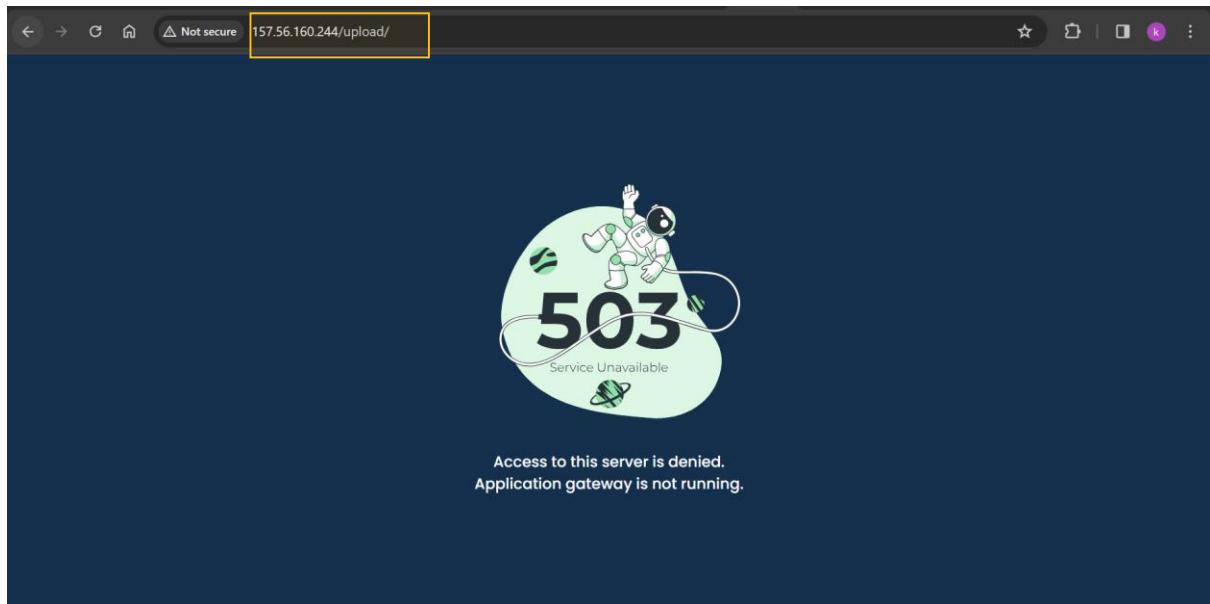
- Resource group: CapstoneRGII
- Location: West US
- Subscription: Free Trial
- Subscription ID: 3c1eb2cd-9bf6-4438-ab3c-a44aed3bd3e6
- Virtual network/subnet: vnet2/default2
- Frontend public IP address: 157.56.160.244 (appgateway2)
- Frontend private IP address: -
- Tier: Standard V2
- Availability zone: -
- Tags: (edit) Add tags

Below the essentials section, there are two summary cards: 'Sum Total Requests' and 'Sum Failed Requests', both showing 100.

At the bottom, there's a time range selector with options: 1 hour, 6 hours, 12 hours, 1 day, 7 days, and 30 days, with '1 hour' selected.

- Ensuring application gateway working properly





Traffic Manager Configuration

- Navigated to the traffic manager resource of azure portal

The screenshot shows the 'Load balancing | Traffic Manager' page in the Azure portal. The left sidebar lists 'Load Balancing Services' with 'Traffic Manager' selected. The main area displays a search bar, filter options (Subscription equals all, Resource group equals all, Location equals all), and sorting columns (Name, Status, Routin..., Resource group, Subscription). A message at the bottom states 'No traffic manager profiles to display'.

- Created a traffic manager

The screenshot shows the 'Create Traffic Manager profile' page. The 'Name' field is set to 'Cpastonetrafficmanager'. Other fields include 'Routing method: Performance', 'Subscription: Free Trial', and 'Resource group: CapstoneRG'. The 'Create' button is highlighted. Below, the 'Cpastonetrafficmanager' profile page is shown with details like DNS name (http://cpastonetrafficmanager.trafficmanager.net), Status (Enabled), and Subscriptions.

- Navigated to the Endpoints from leftside menu
- Added application gateway1 and application gateway2 as endpoints

Cpastonetrafficmanager | Endpoints

Add endpoint

| Name | Status | Monitor status | Type | Location |
|-------------|---------|----------------|----------------|------------|
| appgateway1 | Enabled | Online | Azure endpoint | Central US |
| appgateway2 | Enabled | Online | Azure endpoint | West US |

Cpastonetrafficmanager | Endpoints

| Name | Status | Monitor status | Type | Location |
|-------------|---------|----------------|----------------|------------|
| appgateway1 | Enabled | Online | Azure endpoint | Central US |
| appgateway2 | Enabled | Online | Azure endpoint | West US |

- Ensuring traffic manager is working properly

