



AZURE INFRASTRUCTURE SOLUTION AZ-305 (COURSE-END PROJECT)

DEPLOYING AZURE PROTECTED GEO-REDUNDANT SOLUTION WITH PATH-BASED ROUTING

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PROBLEM STATEMENT AND MOTIVATION

Project Agenda: To deploy a geo-redundant solution on Azure by configuring virtual networks, setting up dedicated VMs for content types, using Application Gateway for path-based routing, and ensuring secure, low-latency access with Traffic Manager.

Description: This project aims to deploy a geo-redundant solution on Azure that ensures high availability, scalability, and low-latency access to services. The solution involves configuring virtual networks (VNETs) to securely connect resources, setting up dedicated virtual machines (VMs) for specific content types to optimize resource use, and using an Application Gateway for path-based routing.

To enhance global availability and reduce latency, Traffic Manager will route traffic to the nearest available region, ensuring continuous access even during regional outages. This approach guarantees a highly available, secure, and performance-optimized deploy

Tools Required: An azure account with root access

Expected Deliverables:

- Login to Azure Portal
- Create a Resource Group
- Provision a Virtual Network (VNet)
- Provision an Application Gateway
- Create a Traffic Manager Profile
- Add Application Gateway Endpoints to Traffic Manager
- Verify Configuration and Connectivity.

PROJECT INTRODUCTION

- ❖ **Objective:** Explain the need for traffic routing in Azure VM deployments (High availability, load balancing, failover).
- ❖ **Challenges:** Highlight potential challenges with direct public IP assignments to VMs (limited scalability, single points of failure, security concerns).
- ❖ **Solution:** Introduce Application Gateway and Traffic Manager as key components for efficient and secure traffic routing.
- ❖ **Visual:** A simple diagram showing direct VM access vs. Application Gateway and Traffic Manager in front of your VMs.

STEP 1 - CREATE 2 AZURE RESOURCE GROUP IN 2 DIFFERENT REGIONS (CENTRAL US & EAST US)

Create 2 Resource Group in 2 different Azure location :

- ✓ RG-AZ-305-Project-EASTUS
- ✓ RG-AZ-305-Project-CentralUs

The screenshot shows the Microsoft Azure portal interface. The browser address bar displays the URL: `portal.azure.com/#view/HubsExtension/BrowseResourceGroups.ReactView`. The page title is "Resource groups" and the breadcrumb is "Home >". Below the title, there is a notification: "You are viewing a new version of Browse experience. Some features may be missing. Click here to access the old experience." The page includes a search bar and a "Group by none" dropdown. A table lists the resource groups:

Name	Subscription	Location
RG-AZ-305-Project-CentralUs	Simplilearn HOL 11	Central US
RG-AZ-305-Project-EASTUS	Simplilearn HOL 11	East US

STEP 2 - CREATE VNET FOR EACH PREVIOUSLY CREATE AZURE RG

Create 2 Virtual Networks in 2 different Azure location for each RG group created :

- ✓ Vnet-AZ-305-Project-EASTUS
- ✓ Vnet-AZ-305-Project-CentralUs

Virtual networks - Microsoft Azure

portal.azure.com/#browse/Microsoft.Network%2FvirtualNetworks

Microsoft Azure

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

Copilot

odl_user_1509477@sim...
SIMPLILEARN HOL 11 (SIMPLILEA...

Home >

Virtual networks

Simplilearn HOL 11 (simplilearnhol11.onmicrosoft.com)

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

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

Showing 1 to 3 of 3 records.

No grouping List view

Name	Resource group	Location	Subscription
vnet	ODL-azure-1509477	West US 2	Simplilearn HOL 11
Vnet-AZ-305-Project-CentralUs	RG-AZ-305-Project-CentralUs	Central US	Simplilearn HOL 11
Vnet-AZ-305-Project-EASTUS	RG-AZ-305-Project-EASTUS	East US	Simplilearn HOL 11

STEP 3 - CREATE 2 SUBNET (IMAGE & WEB) FOR VNET-AZ-305-PROJECT-EASTUS

Create 2 Subnet each for IMAGE & WEB Content on EAST US Vnet

- ✓ Vnet-AZ-305-Project-EASTUS
 - Subnet-Image-AZ-305-Project-EASTUS - **CREATED**
 - Subnet-Web-AZ-305-Project-EASTUS - **CREATED**

The screenshot shows the Azure portal interface for the 'Vnet-AZ-305-Project-EASTUS' virtual network. The 'Subnets' page is active, displaying a table of subnets. The table has columns for Name, IPv4, IPv6, Available IPs, Delegated to, Security group, and Route table. Two subnets are listed: 'Subnet-Web-AZ-305-Project-EASTUS' and 'Subnet-Image-AZ-305-Project-EASTUS'. Both subnets have an IPv4 address of 172.16.1.0/24 and 172.16.2.0/24 respectively, and 251 available IPs. The interface also includes a left sidebar with navigation options like 'Overview', 'Activity log', and 'Access control (IAM)'. The top navigation bar shows the user is logged in as 'odl_user_1509477@sim...'.

Name	IPv4	IPv6	Available IPs	Delegated to	Security group	Route table
Subnet-Web-AZ-305-Project-EASTUS	172.16.1.0/24	-	251	-	-	-
Subnet-Image-AZ-305-Project-EASTUS	172.16.2.0/24	-	251	-	-	-

STEP 4 - CREATE 2 SUBNET (IMAGE & WEB) FOR VNET-AZ-305-PROJECT-CENTRALUS

Create 2 Subnet each for IMAGE & WEB Content on CentralUs Vnet

- ✓ Vnet-AZ-305-Project-CentralUs
 - Subnet-Image-AZ-305-Project-CentralUs - **CREATED**
 - Subnet-Web-AZ-305-Project-CentralUs - **CREATED**

The screenshot shows the Microsoft Azure portal interface. The browser address bar displays the URL: portal.azure.com/#@simpillearnhol11.onmicrosoft.com/resource/subscriptions/1c6f2739-fd08-4ed7-803e-3fa4bcc9320c/resourceGroups/RG-AZ-305-Project-CentralUs/providers/Microsoft.Network/virtualNetworks/Vnet-AZ-305-Project-Ce...

The page title is "Vnet-AZ-305-Project-CentralUs | Subnets". The left sidebar shows the "Virtual networks" section with a list of virtual networks: "vnet", "Vnet-AZ-305-Project-CentralUs", and "Vnet-AZ-305-Project-EASTUS". The "Vnet-AZ-305-Project-CentralUs" virtual network is selected.

The main content area displays a table of subnets for the selected virtual network. The table has the following columns: Name, IPv4, IPv6, Available IPs, Delegated to, Security group, and Route table.

Name	IPv4	IPv6	Available IPs	Delegated to	Security group	Route table
Subnet-Web-AZ-305-Project-CentralUs	10.0.1.0/24	-	251	-	-	-
Subnet-Image-AZ-305-Project-CentralUs	10.0.2.0/24	-	251	-	-	-

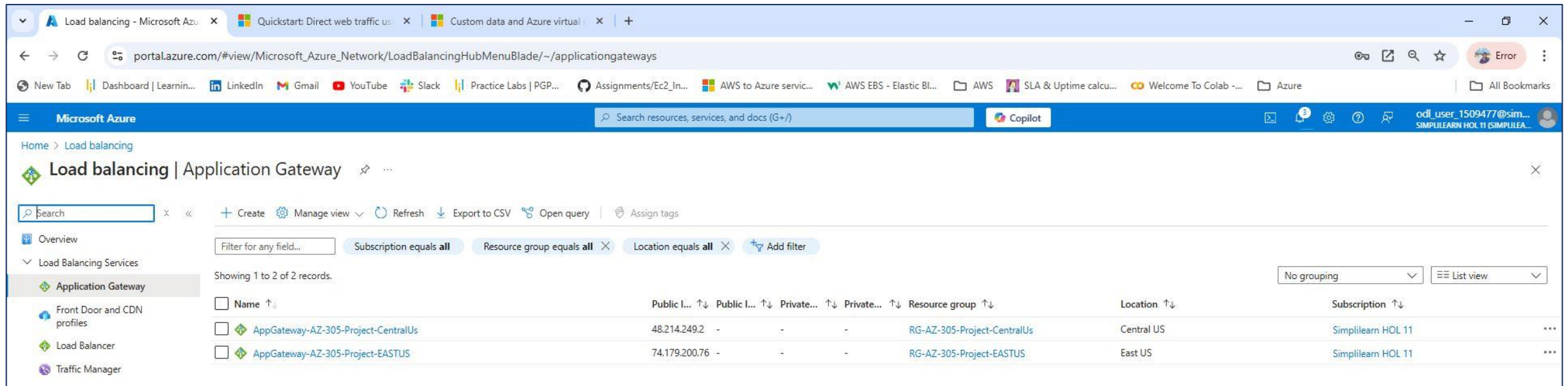
STEP 5 - CREATE 4 AZURE WINDOWS WM – UNDER BOTH EAST US & CENTRALUS VNET

Create 4 Azure Windows Machine with below configuration.

1. **Web-VM1 for WEB Content** on CentralUs region using Vnet-AZ-305-Project-CentralUs, Subnet-Web-AZ-305-Project-CentralUs. Install IIS and edit default page with name WEB SERVER – Central US.
2. **Image-VM1 for IMAGE Content** on CentralUs region using Vnet-AZ-305-Project-CentralUs, Subnet-Image-AZ-305-Project-CentralUs. Install IIS and edit default page with name Image SERVER – Central US.
3. **Web-VM2 for WEB Content** on EASTUS region using Vnet-AZ-305-Project-EASTUS, Subnet-Web-AZ-305-Project-EASTUS. Install IIS and edit default page with name WEB SERVER – EASTUS.
4. **Image-VM1 for IMAGE Content** on EASTUS region using Vnet-AZ-305-Project-EASTUS, Subnet-Image-AZ-305-Project-EASTUS. Install IIS and edit default page with name Image SERVER – EASTUS.

Virtual machines							
Simplilearn HOL 11 (simplilearnhol11.onmicrosoft.com)							
+ Create ▾ Switch to classic ⌚ Reservations ▾ ⚙️ Manage view ▾ ↻ Refresh ⬇️ Export to CSV 🔗 Open query 🏷️ Assign tags ▶ Start ⏪ Restart ☐ Stop 🗑️ Delete ☰ Services ▾ 🔧 Maintenance ▾							
Filter for any field... Subscription equals all Type equals all Resource group equals all X Location equals all X Add filter							
Showing 1 to 5 of 5 records. No grouping							
<input type="checkbox"/> Name ↑↓	Subscription ↑↓	Resource group ↑↓	Location ↑↓	Status ↑↓	Operating system ↑↓	Size ↑↓	Public IP address ↑↓
<input type="checkbox"/> Image-VM1	Simplilearn HOL 11	RG-AZ-305-Project-CentralUs	Central US	Running	Windows	Standard_D2s_v3	74.249.195.68
<input type="checkbox"/> Image-VM2	Simplilearn HOL 11	RG-AZ-305-Project-EASTUS	East US	Running	Windows	Standard_D2s_v3	172.208.115.83
<input type="checkbox"/> VM-1509477	Simplilearn HOL 11	ODL-AZURE-1509477	West US 2	Running	Windows	Standard_B4ms	52.183.84.0
<input type="checkbox"/> Web-VM1	Simplilearn HOL 11	RG-AZ-305-Project-CentralUs	Central US	Running	Windows	Standard_D2s_v3	74.249.194.47
<input type="checkbox"/> Web-VM2	Simplilearn HOL 11	RG-AZ-305-Project-EASTUS	East US	Running	Windows	Standard_D2s_v3	172.208.114.90

STEP 6 - CREATE 2 AZURE APPLICATION GATEWAY – UNDER BOTH EAST US & CENTRALUS REGION



The screenshot shows the Microsoft Azure portal interface. The browser address bar displays the URL: `portal.azure.com/#view/Microsoft_Azure_Network/LoadBalancingHubMenuBlade/~-/applicationgateways`. The page title is "Load balancing | Application Gateway". The left sidebar shows the navigation menu with "Application Gateway" selected. The main content area displays a table of Application Gateway resources. The table has columns for Name, Public IP, Private IP, Resource group, Location, and Subscription. Two records are shown: "AppGateway-AZ-305-Project-CentralUs" in the Central US region and "AppGateway-AZ-305-Project-EASTUS" in the East US region. Both are associated with the "RG-AZ-305-Project-CentralUs" resource group and the "Simplilearn HOL 11" subscription.

Home > Load balancing

Load balancing | Application Gateway

Search

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

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

Showing 1 to 2 of 2 records.

<input type="checkbox"/>	Name ↑↓	Public IP... ↑↓	Public IP... ↑↓	Private... ↑↓	Private... ↑↓	Resource group ↑↓	Location ↑↓	Subscription ↑↓	
<input type="checkbox"/>	AppGateway-AZ-305-Project-CentralUs	48.214.249.2	-	-	-	RG-AZ-305-Project-CentralUs	Central US	Simplilearn HOL 11	...
<input type="checkbox"/>	AppGateway-AZ-305-Project-EASTUS	74.179.200.76	-	-	-	RG-AZ-305-Project-EASTUS	East US	Simplilearn HOL 11	...

STEP 7 - CREATE PATH BASE RULE FOR EACH AZURE APPLICATION GATEWAY – DEFAULT WEB AND RULE BACKEND POOL FOR IMAGES

The screenshot shows the Microsoft Azure portal interface. The left sidebar displays the navigation menu with 'Rules' selected under 'AppGateway-AZ-305-Project-CentralUs'. The main content area shows the 'RoutingRule2' configuration page. The 'Rule name' is 'RoutingRule2', 'Priority' is '99', and 'Backend targets' are configured with 'WebPool' and 'Web'. The 'Path-based routing' section shows a table with one rule: '/images/*' routing to 'Image' using 'Image' backend settings and 'ImagePool' backend pool.

RoutingRule2
AppGateway-AZ-305-Project-CentralUs

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: RoutingRule2

Priority: 99

*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: WebPool

Backend settings: Web

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.

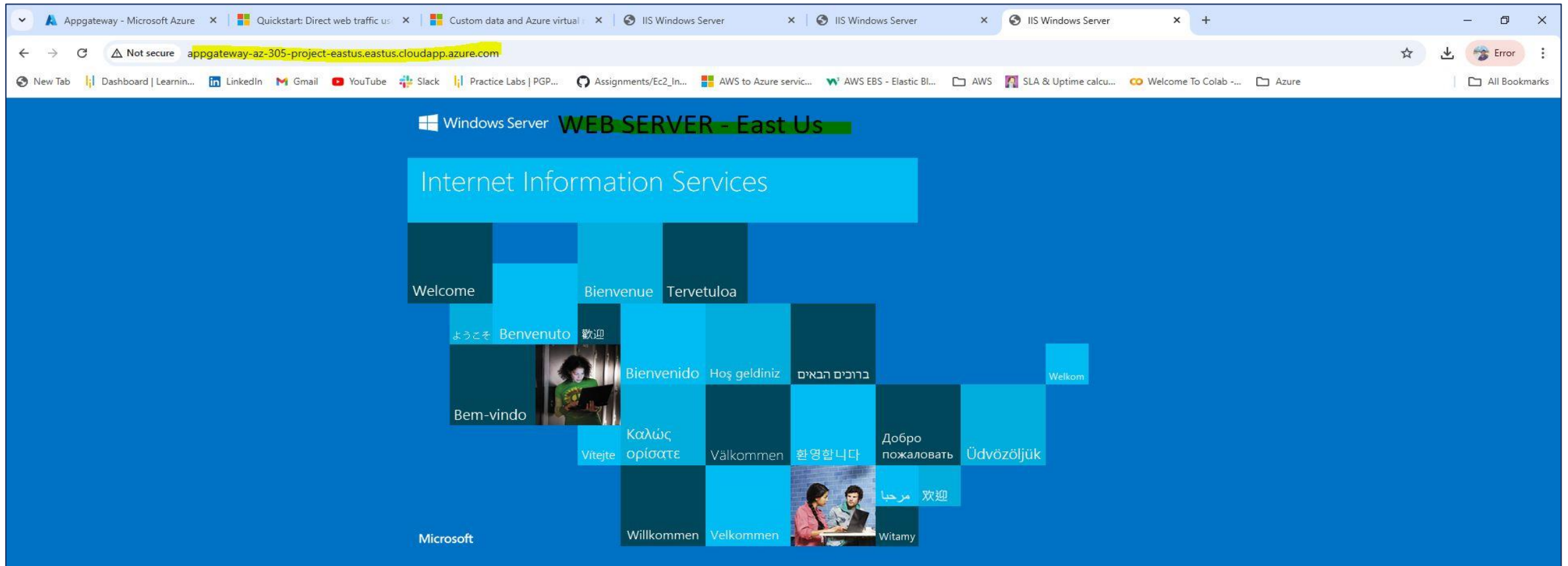
Path based rules

Path	Target name	Backend setting name	Backend pool
/images/*	Image	Image	ImagePool

Add multiple targets to create a path-based rule

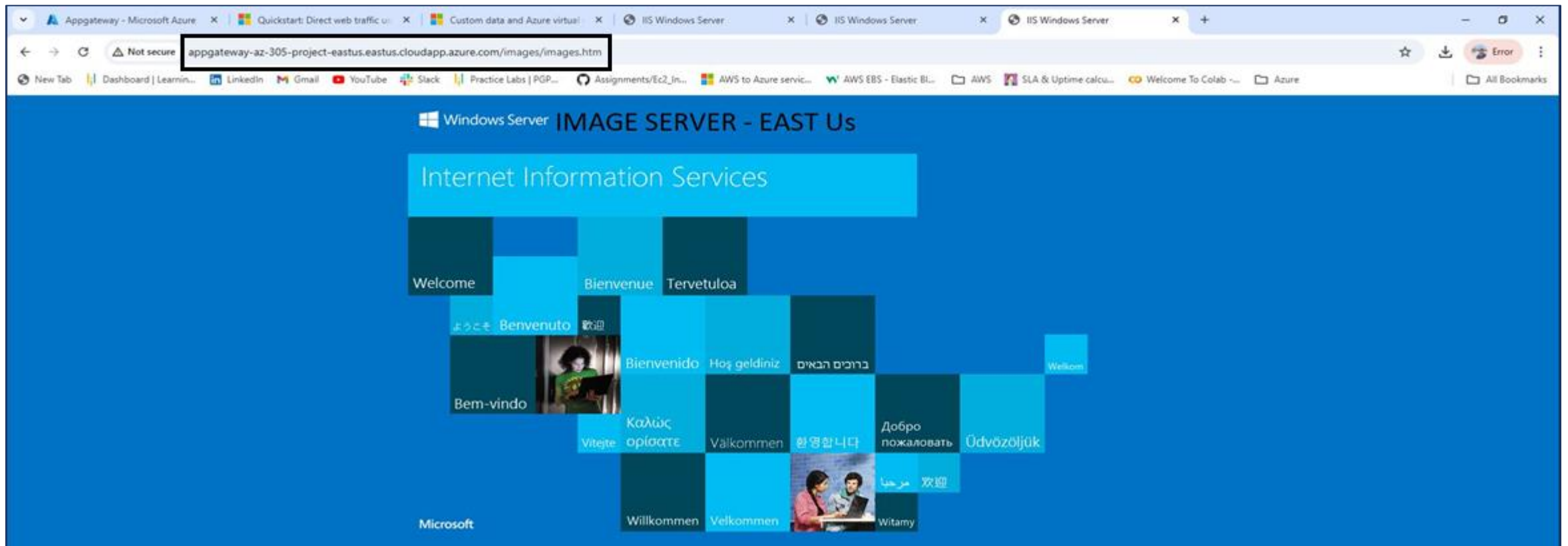
STEP 8 – VALIDATE EACH AZURE APPLICATION GATEWAY

Till now, each Azure location EAST US & Central US has 2-2 VM each. On each Region - 1 VM responsible for Web content & other is responsible for images. Lets validate each application gateway endpoint to check with rule based routing is working. **Below screenshot is for East US application gateway endpoint default pointing to Web Server**



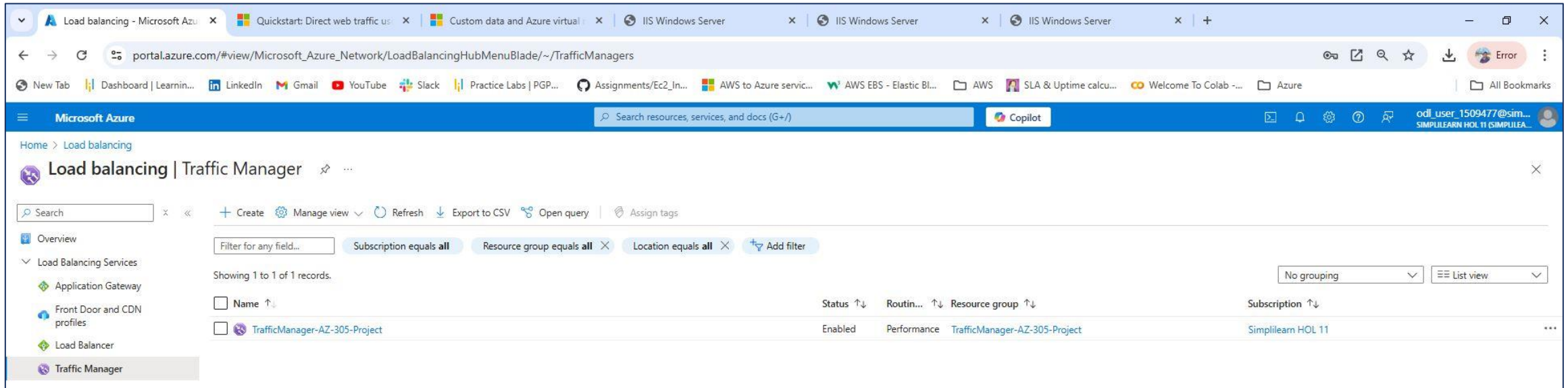
STEP 9 – VALIDATE AZURE APPLICATION GATEWAY WITH PATH BASED RULE

Below screenshot is for East US application gateway endpoint with Image path pointing to Image Server using path-based rule.



STEP 10 - CREATE AZURE TRAFFIC MANAGER WITH BOTH PREVIOUSLY CREATED APPLICATION GATEWAY AS ENDPOINTS.

Load balancing Azure Traffic Manager is created as below. Both EAST US & Central US Application gateway endpoints are added to Traffic Manager.

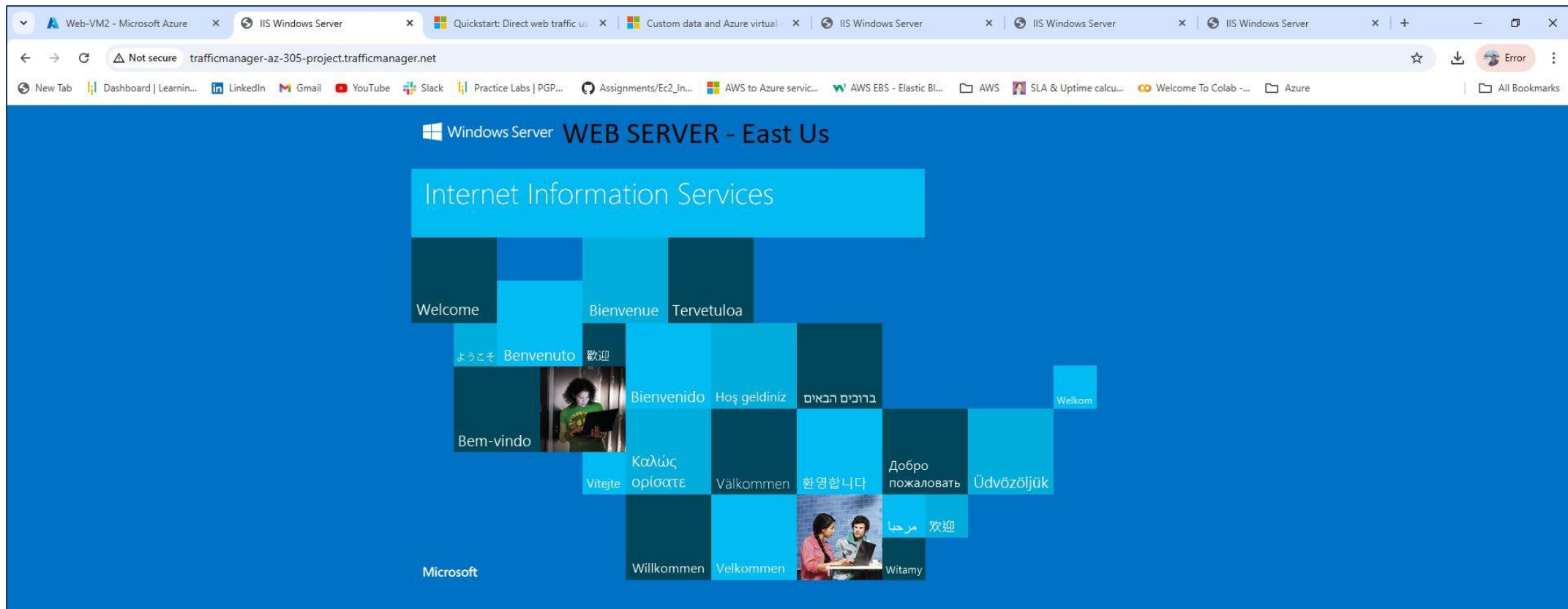


The screenshot displays the Microsoft Azure portal interface. The top navigation bar includes the 'Microsoft Azure' logo, a search bar, and a 'Copilot' button. The left sidebar shows the 'Load balancing' section with a list of services: 'Application Gateway', 'Front Door and CDN profiles', 'Load Balancer', and 'Traffic Manager'. The main content area is titled 'Load balancing | Traffic Manager' and shows a table with one record for 'TrafficManager-AZ-305-Project'. The table columns are 'Name', 'Status', 'Routing', 'Resource group', and 'Subscription'. The record shows the status as 'Enabled', routing as 'Performance', resource group as 'TrafficManager-AZ-305-Project', and subscription as 'Simplilearn HOL 11'.

Name	Status	Routing	Resource group	Subscription
TrafficManager-AZ-305-Project	Enabled	Performance	TrafficManager-AZ-305-Project	Simplilearn HOL 11

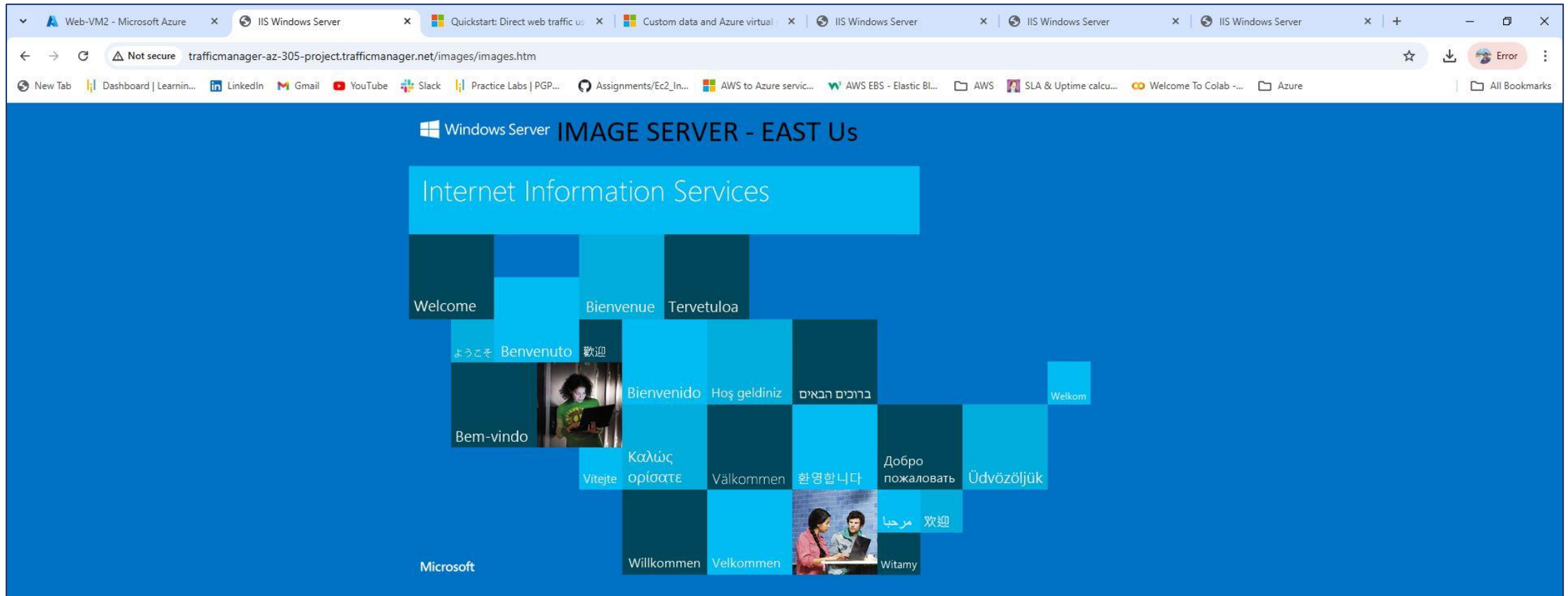
STEP FOR VALIDATION ON GLOBAL AVAILABILITY AND REDUCE LATENCY !!!!!

Hitting direct traffic manager endpoint. Due to my location machine nearly location from India, EAST US region was selected by traffic manager as nearly region.



CONTINUE – VALIDATION ON GLOBAL AVAILABILITY AND REDUCE LATENCY !!!!!

Validate application gateway path base rule for IMAGES content. As per below screenshot images rule is working fine !!



FINAL STEP FOR VALIDATION ON GLOBAL AVAILABILITY BY SHUT DOWN EAST US VM'S

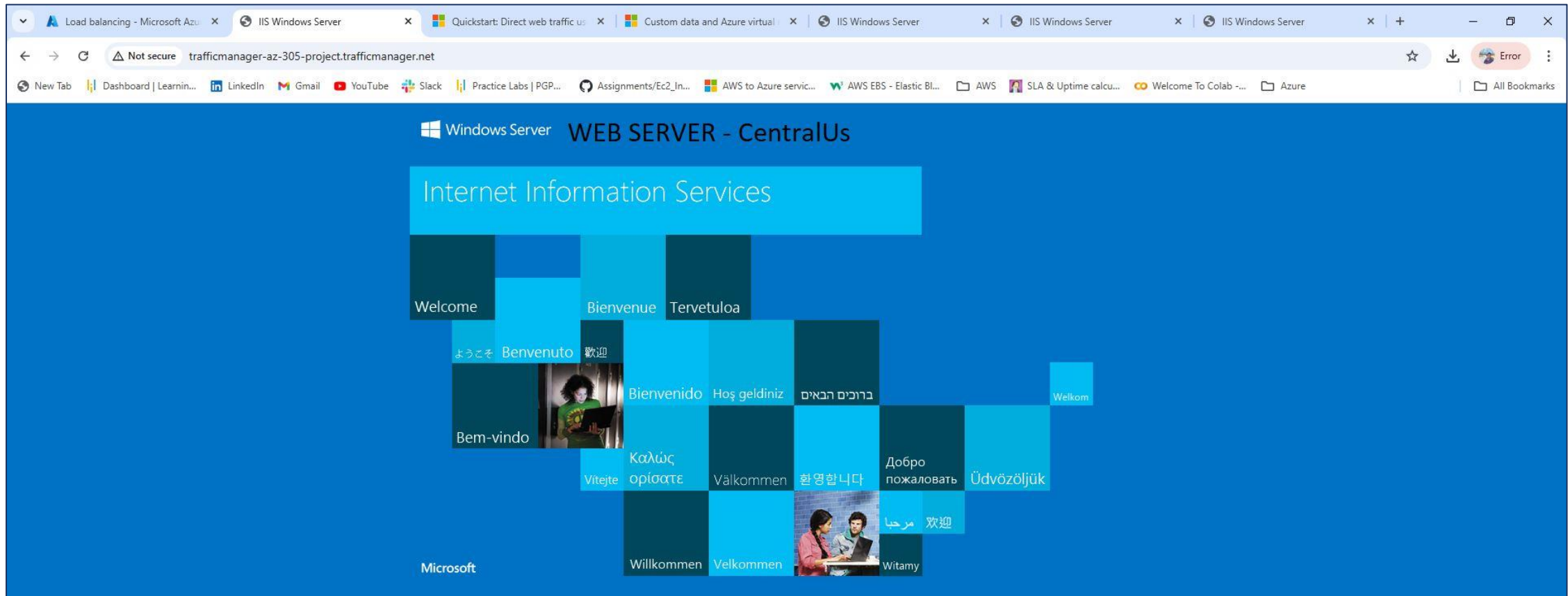
Now, to validation high application availability across regions, All EAST US VM machine's are forced shutdown. **Traffic manager should automatically shift request to central US**
Below Screenshot, EAST US VM shutdown.

The screenshot displays the Azure portal interface for a virtual machine named 'Web-VM2'. The left sidebar shows navigation options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Connect, and Networking. The main area shows the 'Essentials' section with details about the VM's resource group, status, location, subscription, and other properties. The 'Stop' button in the top toolbar is highlighted with a red box.

Property	Value
Resource group (move)	RG-AZ-305-PROJECT-EASTUS
Status	Stopped (deallocated)
Location	East US (Zone 1)
Subscription (move)	Simplilearn HOL 11
Subscription ID	1c6f2739-fd08-4ed7-803e-3fa4bcc9320c
Availability zone	1
Tags (edit)	Add tags
Operating system	Windows
Size	Standard D2s v3 (2 vcpus, 8 GiB memory)
Public IP address	172.208.114.90
Virtual network/subnet	Vnet-AZ-305-Project-EASTUS/Subnet-Web-AZ-305-Project-EASTUS
DNS name	Not configured
Health state	-
Time created	11/9/2024, 6:04 PM UTC

CONTINUE - FINAL STEP FOR VALIDATION ON GLOBAL AVAILABILITY BY SHUT DOWN EAST US VM'S

After Shutdown on EAST US VM, **Traffic manager automatically redirected by http port 80 request to central US.**



CONCLUSION

- ❖ Using Azure Application Gateway with path-based routing, required content is delivered with low latency.
- ❖ Using Azure Traffic Manager, application has high & global availability.
- ❖ Incase of any Azure region is down/patching/incase of disaster, All traffic will be automatically redirected to different region without any manual intervention.
- ❖ Zero downtime when any region is not availability.
- ❖ Low latency as based of client location nearest Azure region will be involved in serving request.



THANK YOU

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