

Assignment: Implementing Internal & External Load Balancer in Azure

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Introduction

In cloud computing, **load balancing** is a fundamental concept used to enhance the availability, scalability, and performance of applications and services. Whether it's handling incoming web traffic or distributing internal requests between backend servers, load balancers ensure no single resource is overwhelmed while maintaining high reliability and uptime.

This project focuses on the **implementation and verification of both External and Internal Load Balancers in Microsoft Azure**. The **External Load Balancer (ELB)** is used to distribute incoming public internet traffic across multiple virtual machines, thereby improving fault tolerance and ensuring consistent performance. On the other hand, the **Internal Load Balancer (ILB)** serves traffic only within the Azure Virtual Network (VNet), allowing private communication and load distribution between services that are not exposed to the internet.

The assignment includes deploying and configuring two virtual machines (VMs) behind an External Load Balancer and then repeating a similar process for an Internal Load Balancer. The VMs serve as IIS web servers, providing a static web page to simulate real-world service scenarios. Proper configuration of **Network Security Groups (NSGs)** and inbound/outbound rules is also covered to ensure secure and controlled access to the VMs.

This hands-on project not only demonstrates technical skills in infrastructure provisioning on Azure but also builds a foundational understanding of how enterprise-grade applications are deployed and managed using load balancing strategies. By the end of this exercise, one gains insight into key Azure services such as Load Balancers, Public IPs, Virtual Networks, NSGs, Frontend IP Configurations, Health Probes, and Backend Pools—forming the essential components of a high-availability architecture.


Resource Group Setup

A new Resource Group named **Loadbalancer** was created in the **Central India** region to manage all resources related to this project.

Home > Resource groups >

Create a resource group ...

Basics Tags Review + create

 Automation Link

Basics

Subscription	Azure subscription 1
Resource group name	Loadbalancer
Region	Central India

Tags

None

Virtual Machine Creation

Two Windows Server VMs (vm1 and vm2) were created under the same VNet and subnet with the following config:

- OS: Windows Server 2022
- Size: Standard B1s
- Inbound Port: RDP
- IIS installed manually after RDP
- No load balancing selected during VM setup

Basics Tab while creating a Virtual machine (vm1)

The screenshot shows the 'Create a virtual machine' Basics tab in the Azure portal. At the top, there is a warning banner: 'Changing Basic options may reset selections you have made. Review all options prior to creating the virtual machine.' Below this are three tabs: 'Help me create a low cost VM', 'Help me create a VM optimized for high availability', and 'Help me choose the right VM size for my workload'. The 'Resource group' is set to 'Loadbalancer' with a 'Create new' link. The 'Instance details' section includes: 'Virtual machine name' set to 'vm1' with a green checkmark; 'Region' set to '(Asia Pacific) Central India'; 'Availability options' set to 'No infrastructure redundancy required'; 'Security type' set to 'Trusted launch virtual machines' with a 'Configure security features' link; 'Image' set to 'Windows Server 2022 Datacenter: Azure Edition - x64 Gen2 (free services el)' with a 'See all images | Configure VM generation' link; 'VM architecture' with 'x64' selected (radio button) and a message 'Arm64 is not supported with the selected image.'; and 'Run with Azure Spot discount' which is unchecked. A blue banner at the bottom states: 'You are in the free trial period. Costs associated with this VM can be covered by any remaining credits on your subscription. Learn more'.

Create a virtual machine ...

⚠ Changing Basic options may reset selections you have made. Review all options prior to creating the virtual machine.

Help me create a low cost VM | Help me create a VM optimized for high availability | Help me choose the right VM size for my workload

Resource group * ⓘ Loadbalancer
[Create new](#)

Instance details

Virtual machine name * ⓘ vm1 ✓

Region * ⓘ (Asia Pacific) Central India

Availability options ⓘ No infrastructure redundancy required

Security type ⓘ Trusted launch virtual machines
[Configure security features](#)

Image * ⓘ Windows Server 2022 Datacenter: Azure Edition - x64 Gen2 (free services el) ✓
[See all images](#) | [Configure VM generation](#)

VM architecture ⓘ
☐ Arm64
☒ x64
ⓘ Arm64 is not supported with the selected image.

Run with Azure Spot discount ⓘ ☐

ⓘ You are in the free trial period. Costs associated with this VM can be covered by any remaining credits on your subscription.
[Learn more](#)

Disk Config tab:

OS disk

OS disk size ⓘ

Image default (127 GiB) ▾

OS disk type * ⓘ

Standard SSD (locally-redundant storage) ▾

The selected VM size supports premium disks. We recommend Premium SSD for high IOPS workloads. Virtual machines with Premium SSD disks qualify for the 99.9% connectivity SLA.

Delete with VM ⓘ

☒

Key management ⓘ

Platform-managed key ▾

Enable Ultra Disk compatibility ⓘ

☐

Data disks for vm1

You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.

Networking config tab:

Network interface

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

Virtual network * ⓘ

LB-VNet ▾
[Create new](#)

Subnet * ⓘ

LB-Subnet (10.0.0.0/24) ▾
[Manage subnet configuration](#)

Public IP ⓘ

(new) vm1-ip ▾
[Create new](#)

NIC network security group ⓘ


☐ None
☒ Basic
☐ Advanced

Public inbound ports * ⓘ

☐ None
☒ Allow selected ports

Select inbound ports *


RDP (3389) ▾






 **This will allow all IP addresses to access your virtual machine.** This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses.


Delete public IP and NIC when VM is deleted ⓘ



☒

Virtual Machine Created: Overview:

 **CreateVm-MicrosoftWindowsServer.WindowsServer-202-20250716120810 | Overview**
Deployment

»  Delete  Cancel  Redeploy  Download  Refresh

 **Your deployment is complete**

 Deployment name: CreateVm-MicrosoftWindowsServer.WindowsSe... Start time: 7/16/2025, 12:23:27 PM
Subscription: [Azure subscription 1](#) Correlation ID: 19dfd3e9-67cf-40d9-9f62-1453558fc1b8 
Resource group: [Loadbalancer](#)

▼ **Deployment details**


^ **Next steps**

Setup auto-shutdown Recommended

Monitor VM health, performance and network dependencies Recommended

Run a script inside the virtual machine Recommended

[Go to resource](#) [Create another VM](#)

Give feedback
 Tell us about your experience with deployment

here we have successfully created and deployed the virtual machine named – VM1 similarly with the same configurations we will replicate this vm and name it VM2. Here is a image of that as well:


Price

1 X Standard B1s
by Microsoft
[Terms of use](#) [Privacy policy](#)

Subscription credits apply ⓘ
0.0152 USD/hr
[Pricing for other VM sizes](#)

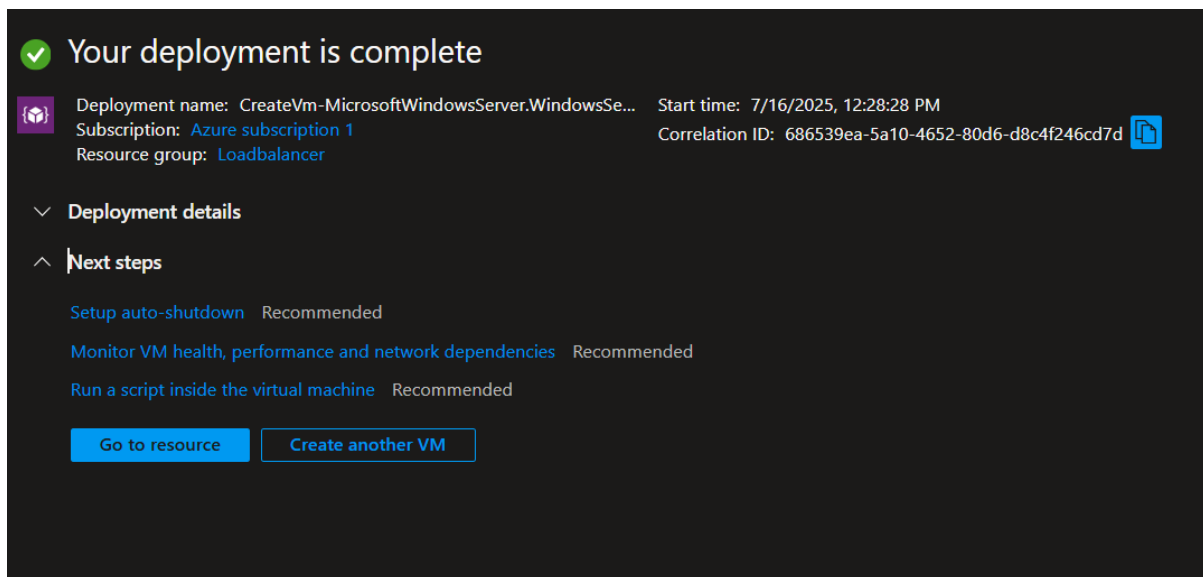
TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

 **You have set RDP port(s) open to the internet.** This is only recommended for testing. If you want to change this setting, go back to Basics tab.

Basics

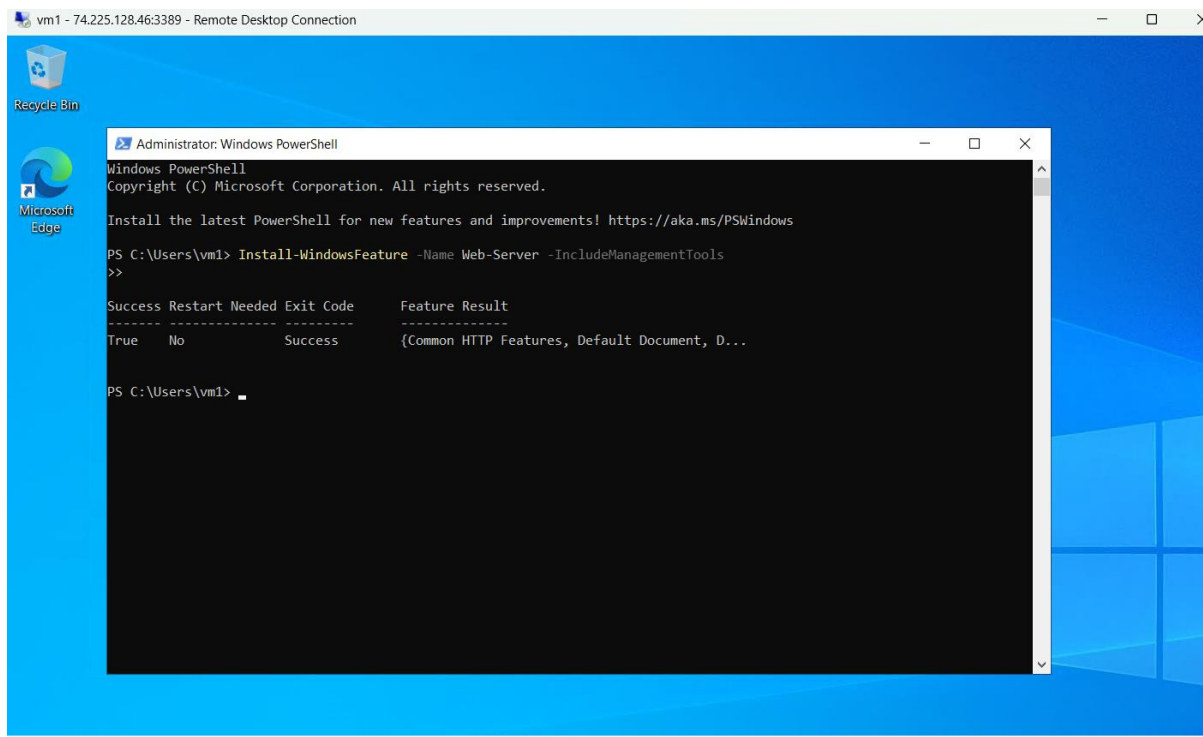
Subscription	Azure subscription 1
Resource group	Loadbalancer
Virtual machine name	vm2
Region	Central India
Availability options	No infrastructure redundancy required



Here we are completed with Virtual machine creation while creating this vm we have initially not assigned any Load balancer to this virtual machine after that we RDP into the vms and installed the IIS server on it

So here is the IIS installed page :

first we installed he iis into the virtual machine while powershell



Here we have installed the IIS on this Virtual Machine:

We did the same for virtual machine 2 as well.

External Load Balancer Configuration:

A Public Load Balancer named ext-lb was created with:

- Frontend IP: Public IP (Static)
- Backend Pool: Added vm1 and vm2
- Health Probe: TCP, Port 80
- Load Balancing Rule: Port 80, TCP

First we will start by creating a load balancer:

Adding frontend IP configurations::

Create load balancer

[Basics](#) [Frontend IP configuration](#) [Backend pools](#) [Inbound rules](#) [Outbound rules](#) [Tags](#) [Review + create](#)

Azure load balancer is a layer 4 load balancer that distributes incoming traffic among healthy virtual machine instances. Load balancers uses a hash-based distribution algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, destination port, protocol type) hash to map traffic to available servers. Load balancers can either be internet-facing where it is accessible via public IP addresses, or internal where it is only accessible from a virtual network. Azure load balancers also support Network Address Translation (NAT) to route traffic between public and private IP addresses. [Learn more.](#)

Project details

Subscription *

Azure subscription 1

Resource group *

Loadbalancer

[Create new](#)

Instance details

Name *

ext-LB

Region *

Central India

SKU * ⓘ

☒ Standard (Distribute traffic to backend resources)

☐ Gateway (Direct traffic to network virtual appliances)

Type * ⓘ

☒ Public

☐ Internal

Tier *

☒ Regional

☐ Global

Home > Create a resource > Marketplace > Load Balancing

Create load balancer

BasicsFrontend IP configurationBackend pool

A frontend IP configuration is an IP address used for inbound and outbound rules.

+ Add a frontend IP configuration

Name ↑↓
Add a frontend IP to get started

Add frontend IP configuration

Name *ext-frontend

IP version
☒ IPv4
☐ IPv6

IP type
☒ IP address
☐ IP prefix

Public IP address *
Select public IP address
[Create new](#)

Add a public IP address

Name *ext-lb-ip

SKUStandard

TierRegional

Static IPs are assigned at the time the resource is created and released when the resource is deleted. Dynamic IPs are assigned when associating the IP to a resource and is released when you stop, restart, or delete a resource. Dynamic is only available for Basic SKU.

Assignment
☐ Dynamic
☒ Static

Availability zone *Zone-redundant

Routing preference ⓘ
☒ Microsoft network
☐ Internet

SaveCancel

Review + create< PreviousNext : Backend pool

Next we move onto Backendpool IP configuration :

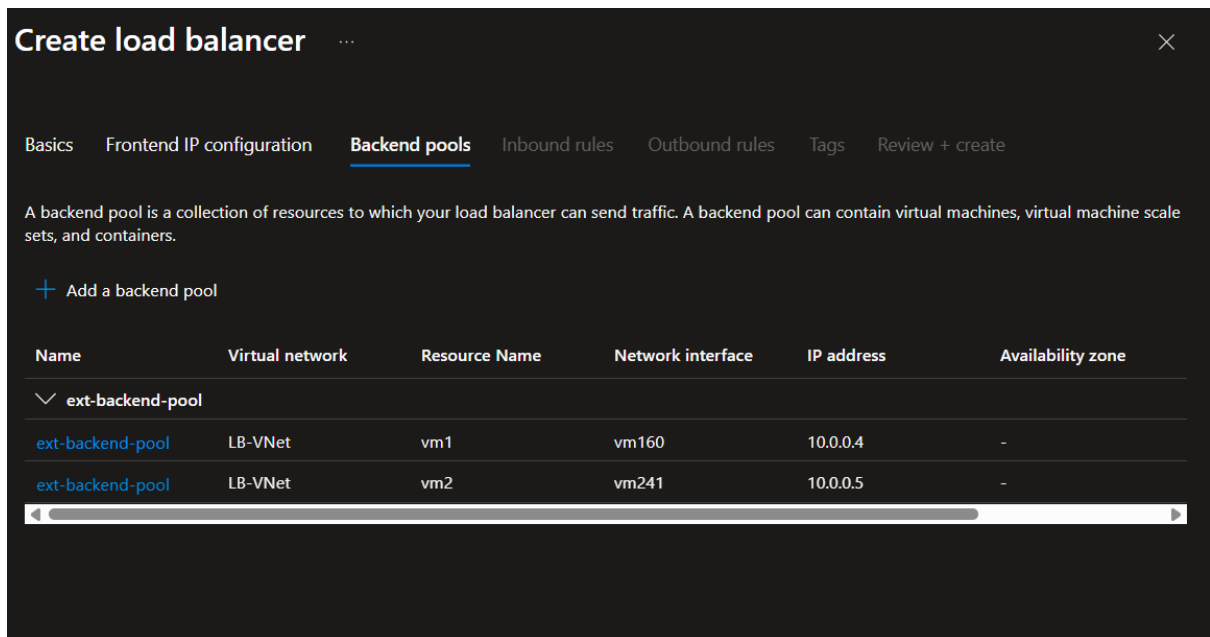
Add IP configurations to backend pool

IP configurations associated to virtual machines and virtual machine scale sets must be in same location as the load balancer and be in the same virtual network.

Location : centralindia Virtual network : LB-VNet

☐ Show resources that are not available for selection

	Resourc...	Resourc...	Type	IP confi...	IP Addr...	Availabi...	Tags
Virtual machine (2)							
<input checked="" type="checkbox"/>	vm1	Loadbal...	Virtual ...	ipconfig1	10.0.0.4	-	-
<input checked="" type="checkbox"/>	vm2	Loadbal...	Virtual ...	ipconfig1	10.0.0.5	-	-



Now we have done the setup for the frontend IP and the Backendpool next we will move onto

HEALTH PROBE:

While setting up both the External and Internal Load Balancers in Azure, we configured a Health Probe to continuously monitor the health of virtual machines in the backend pool. This probe plays a crucial role in ensuring high availability and seamless traffic distribution. For this assignment, we used the following Health Probe settings:

- Protocol: HTTP
- Port: 80
- Path: /
- Interval: Default
- Unhealthy Threshold: Default

The health probe sends periodic HTTP requests to port 80 of each VM to check if the IIS server is running and responding. If a VM fails to respond to a number of consecutive probe attempts, it is considered unhealthy and temporarily removed from the load balancer's rotation. Once the VM recovers and starts responding again, it is automatically reinstated.

This dynamic health monitoring ensures that only healthy and responsive VMs receive traffic, enhancing the reliability and performance of the application served through the load balancer.

Add health probe

ext-LB

Health probes are used to check the status of a backend pool instance. If the health probe fails to get a response from a backend instance then no new connections will be sent to that backend instance until the health probe succeeds again.

Name *

http-probe

Protocol *

HTTP

Port * ⓘ

80

Path * ⓘ

/

Interval (seconds) * ⓘ

5

Used by * ⓘ

Not used

Saving probe

Saving probe 'http-probe'.

ext-LB | Health probes

Load balancer

Search

+ Add

Refresh

Give feedback

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Settings

Frontend IP configuration

Backend pools

Type to start filtering ...

To check the health status of your instances, navigate to the Load Balancing Rule

Name	Protocol	Port	Path
http-probe	Http	80	/

Here we have added the screenshots for the Health probe application. Now next we will move onto Loadbalancing rule:

Load balancing Rules:

Add load balancing rule

ext-LB

Name *

http-rule

IP version *

☒ IPv4

☐ IPv6

Frontend IP address * ⓘ

ext-frontend (4.224.113.251) ▾

Backend pool * ⓘ

ext-backend-pool ▾

Protocol

☒ TCP

☐ UDP

Port *

80

Backend port * ⓘ

80

Health probe * ⓘ

http-probe (HTTP:80) ▾

[Create new](#)

Session persistence

None ▾

ⓘ

Session persistence specifies that traffic from a client should be handled by the same virtual machine in the backend pool for the duration of a session. [Learn more.](#)

Here we have added the load balancing rule now we have done all the configurations for the load balancer now let us deploy it:

Load balancer overview:

CreateLoadBalancerBladeV2-20250716123311 | Overview

×

«

🗑️ Delete

⌛ Cancel

🔄 Redeploy

⬇️ Download

🔄 Refresh

✓

Your deployment is complete

🔗

Deployment name : CreateLoadBalancerBladeV2-20250716123311

Subscription : [Azure subscription 1](#)

Resource group : [Loadbalancer](#)

Start time : 7/16/2025, 12:49:24 PM

Correlation ID : 4ff3f889-8e44-4a47-bf64-014706ed62f4

>

Deployment details

✓

Next steps

Go to resource

Internal Load Balancer Configuration

An Internal Load Balancer named int-lb was created in the same VNet, different subnet (lb-subnet) with:

- Frontend IP: Private IP (Static)
- Backend Pool: vm1, vm2
- Health Probe: TCP, Port 80
- Load Balancing Rule: Same as external, port 80
- Verified via RDP → browser request to private IP

Create load balancer

Basics Frontend IP configuration Backend pools Inbound rules Outbound rules

Azure load balancer is a layer 4 load balancer that distributes incoming traffic among healthy virtual machine instances. Load balancers uses a hash-based distribution algorithm. By default, it uses a 5-tuple (source IP, source port, destination IP, destination port, protocol type) hash to map traffic to available servers. Load balancers can either be internet-facing where it is accessible via public IP addresses, or internal where it is only accessible from a virtual network. Azure load balancers also support Network Address Translation (NAT) to route traffic between public and private IP addresses. [Learn more.](#)

Project details

Subscription *

Azure subscription 1

Resource group *

Loadbalancer

[Create new](#)

Instance details

Name *

int-lb

Region *

Central India

SKU * ⓘ

☒ Standard (Distribute traffic to backend resources)

☐ Gateway (Direct traffic to network virtual appliances)

Type * ⓘ

☐ Public

☒ Internal

Tier *

☒ Regional

☐ Global

Here is the frontend ip configuration

int-lb | Frontend IP configuration ☆ ...
Load balancer

>> + Add ↻ Refresh

The frontend IP address configuration of a load balancer serves as the entry point for incoming traffic to the load balancer, and the load balancer then distributes the traffic to the backend pool of virtual machines or services. [Learn more](#)

Type to start filtering ...

Showing all 1 items

Name ↕	IP address ↕	Rules count
int-frontend	10.0.0.6	1

Here is the backendpool configuration:

int-lb | Backend pools ☆ ...
Load balancer

>> + Add ↻ Refresh

The backend pool is a critical component of the load balancer. The backend pool defines the group of resources that will serve traffic for a given load-balancing rule. [Learn more](#)

Type to start filtering ... Add filter

Backend pool	Resource Name	IP address	Network interface	Availability zone	Rules count	Resource Status	Admin state
int-backend-pool (2)							
int-backend-pool	vm1	10.0.0.4	vm160	-	1	Running	None
int-backend-pool	vm2	10.0.0.5	vm241	-	1	Running	None

We have applied the rules on the Virtual machine 1 and virtual machine 2
Now we will move on to health probe for the internal load balancer

Health Probe:

Add health probe ...

int-lb

Health probes are used to check the status of a backend pool instance. If the health probe fails to get a response from a backend instance then no new connections will be sent to that backend instance until the health probe succeeds again.

Name * int-http-probe

Protocol * HTTP

Port * 80

Path * /

Interval (seconds) * 5

Used by * Not used

Similarly like in the external Loadbalancer we will now add the loadbalancing rule:

Load Balancing Rule:

The screenshot shows the configuration for an internal load balancing rule named 'int-http-rule'. The configuration is as follows:

Field	Value
Name *	int-http-rule
IP version *	IPv4
Frontend IP address * ⓘ	int-frontend (10.0.0.6)
Backend pool * ⓘ	int-backend-pool
High availability ports ⓘ	<input type="checkbox"/>
Protocol	TCP
Port *	80
Backend port * ⓘ	80
Health probe * ⓘ	int-http-probe (HTTP:80)
Session persistence	None

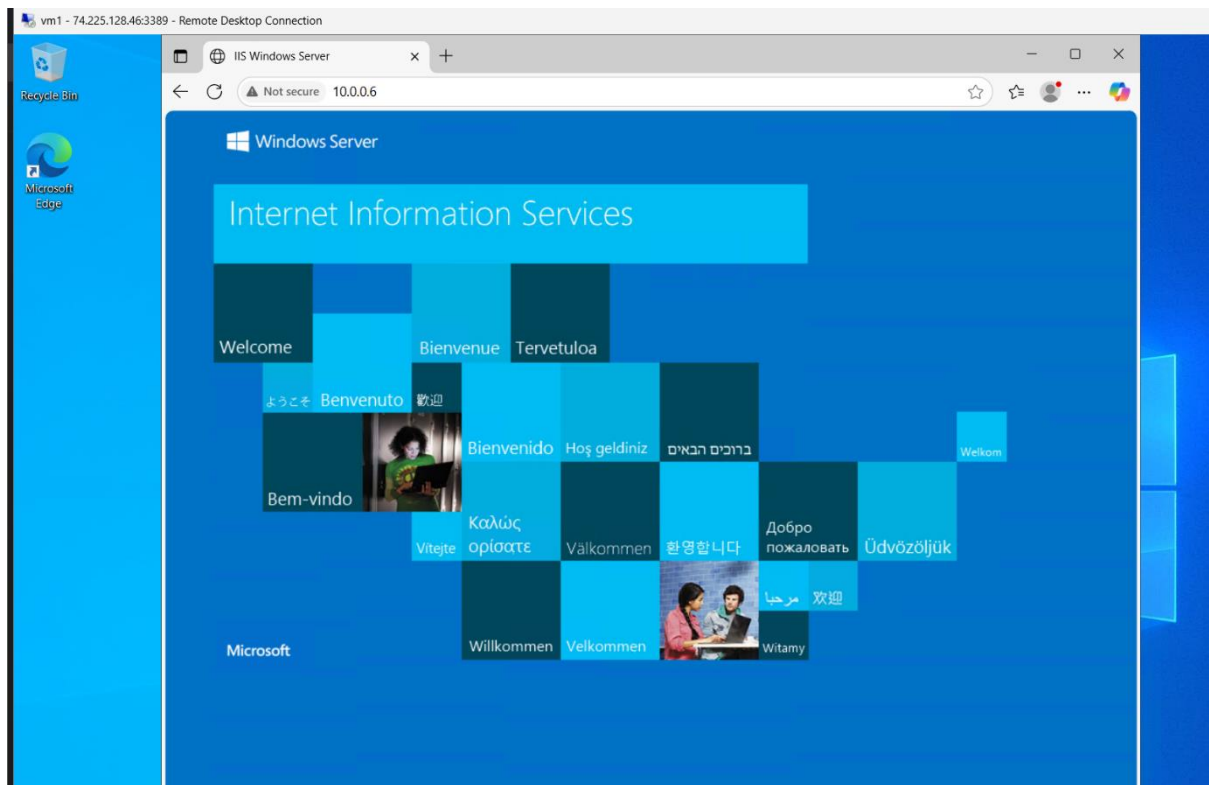
[Create new](#)

ⓘ Session persistence specifies that traffic from a client should be handled by the same virtual machine in the backend pool for the duration of a session. [Learn more.](#)

This rule directs incoming HTTP traffic on **port 80** from the load balancer's public IP to the **backend VMs** hosting the IIS server. It works in tandem with the **health probe** to ensure that only **healthy virtual machines** receive traffic.

The configuration helps ensure **load distribution**, **high availability**, and **seamless performance** of the web application hosted across multiple instances.

Now lets verify this via RDP:

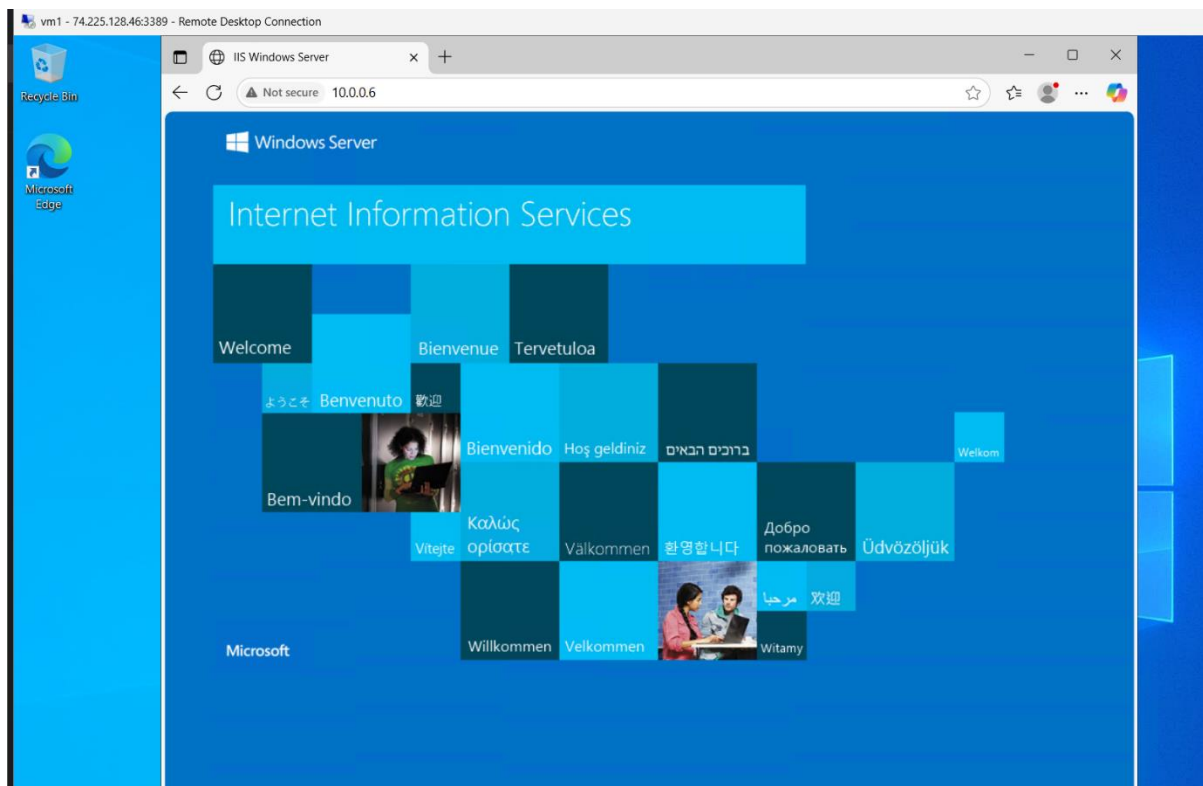


In this project, we configured the Load Balancing Rule with the following parameters:

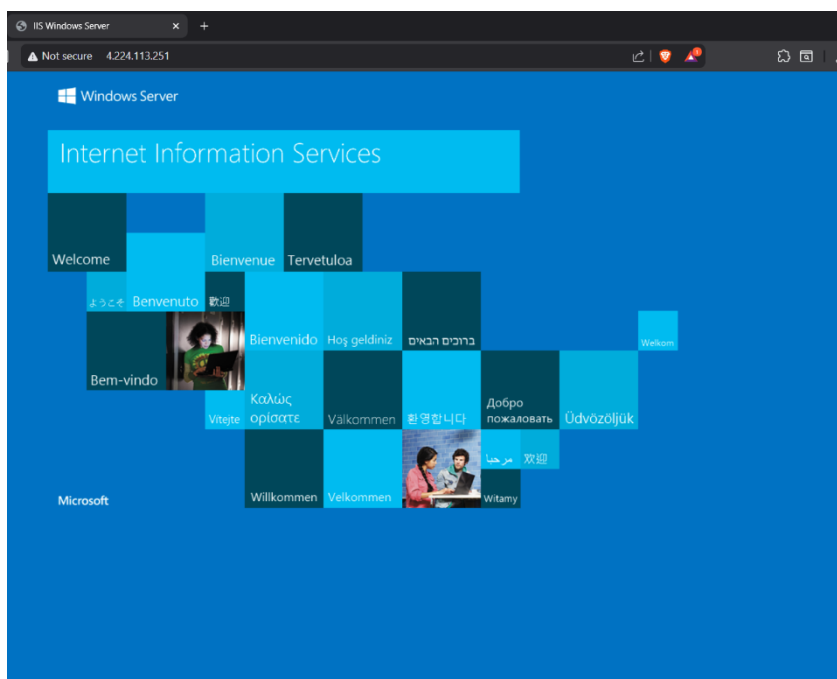
- **Frontend IP:** ext-lb-ip (for external load balancer)
- **Backend Pool:** Contains the two Windows VMs running IIS
- **Protocol:** TCP
- **Port:** 80 (frontend)
- **Backend Port:** 80
- **Floating IP:** Disabled
- **Session Persistence:** None
- **Idle Timeout:** Default

Testing Load Balancers:

- Public IP tested in browser showed the IIS page



- Internal Load Balancer private IP tested from within VM showed IIS page
This validates both load balancers are functioning correctly.



Conclusion:

Successfully created and validated both Internal and External Load Balancers in Azure. This setup proves the capability of Azure LBs in distributing traffic efficiently between backend resources.