

# AZURE PROJECT

## WEB & APP DEPLOYMENT WITH LOAD BALANCERS

*Submitted by:*

*Rachamalla Bindu*

### **Objective :**

- Create Azure resources (RG, VNet, subnets)
- Deploy two Linux VMs named web and app
- Configure NSGs to allow ports 22, 80 (both VMs) and 8080 (app VM)
- Install Nginx on web, Tomcat on app
- Deploy Public Load Balancer for Web (HTTP) and Private Load Balancer for App (8080)
- Verify end-to-end connectivity

### **Abstract :**

- Deploy an Azure Resource Group containing a VNet with two subnets, two VMs (Web and App), Security Rules allowing SSH(22), HTTP(80), and App(8080).
- Install Nginx on Web VM and Tomcat on App VM.
- Create a public load balancer for the Web tier (port 80) and an internal/private load balancer for the App tier (port 8080).
- Verify connectivity by accessing public LB IP and confirming Nginx can reach the App through the private LB.

### **➤ 1. Create a Resource group :**

## Create a resource group ...

Basics Tags Review + create

[Automation Link](#)

### Basics

Subscription Azure subscription 1  
Resource group name binduRG01  
Region Central India

### Tags

None

Previous

Next

Create

## ➤ 2. Create a Virtual Network with Two Subnets :

## Create virtual network ...

Basics Security IP addresses Tags Review + create

### Project details

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

Subscription \* Azure subscription 1  
Resource group \* binduRG01  
[Create new](#)

### Instance details

Virtual network name \* Vnet01  
Region \* ① (Asia Pacific) Central India  
[Deploy to an Azure Extended Zone](#)

Previous

Next

Review + create

- Subnet 1 : WEBSubnet
- Subnet2 : Appsubnet

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Home > Network foundation | Virtual networks >

## Create virtual network

Basics Security IP addresses Tags Review + create

☐ Allocate using IP address pools. [Learn more](#)

+ Add a subnet

10.1.0.0/16 [Delete address space](#)

10.1.0.0 /16

10.1.0.0 - 10.1.255.255 65,536 addresses

Subnets	IP address range	Size	NAT gateway
WEBSubnet	10.1.0.0 - 10.1.0.255	/24 (256 addresses)	-
APPSubnet	10.1.1.0 - 10.1.1.255	/24 (256 addresses)	-

Previous Next **Review + create**

### ➤ 3.Create WEB Virtual Machine :

- OS: Linux (Ubuntu)
- Subnet: Web Subnet
- Public IP: Yes (for SSH access)

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Home > Compute infrastructure | Virtual machines >

## Create a virtual machine

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

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

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

Subscription \* Azure subscription 1

Resource group \* binduRG01 [Create new](#)

**Instance details**

Virtual machine name \* binduWEB01 ✓

Region \* (Asia Pacific) Central India [Deploy to an Azure Extended Zone](#)

Availability options No infrastructure redundancy required

Security type Standard

Image \* Ubuntu Server 22.04 LTS - x64 Gen2 (free services eligible) [See all images](#) | [Configure VM generation](#)

This image is compatible with additional security features. [Click here to swap to the Trusted launch security type.](#)

< Previous Next : Disks > **Review + create**

- Allow public inbound rules HTTP (80), SSH (22)

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## Create a virtual machine

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

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

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. [Learn more](#)

**Network interface**

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

Virtual network \*  [Create new](#)

Subnet \*  [Manage subnet configuration](#)

Public IP  [Create new](#)

**NIC network security group**

☐ None

☒ Basic

☐ Advanced

< Previous Next : Management > **Review + create**

- Here the WEBvm is created in virtual network in web subnet.

## ➤ 4. Install NGINX on Web VM :

- By using below commands install nginx in mobaxterm
- Sudo su (to switch to root user)
- sudo apt update
- sudo apt install nginx -y
- sudo systemctl start nginx

```
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help

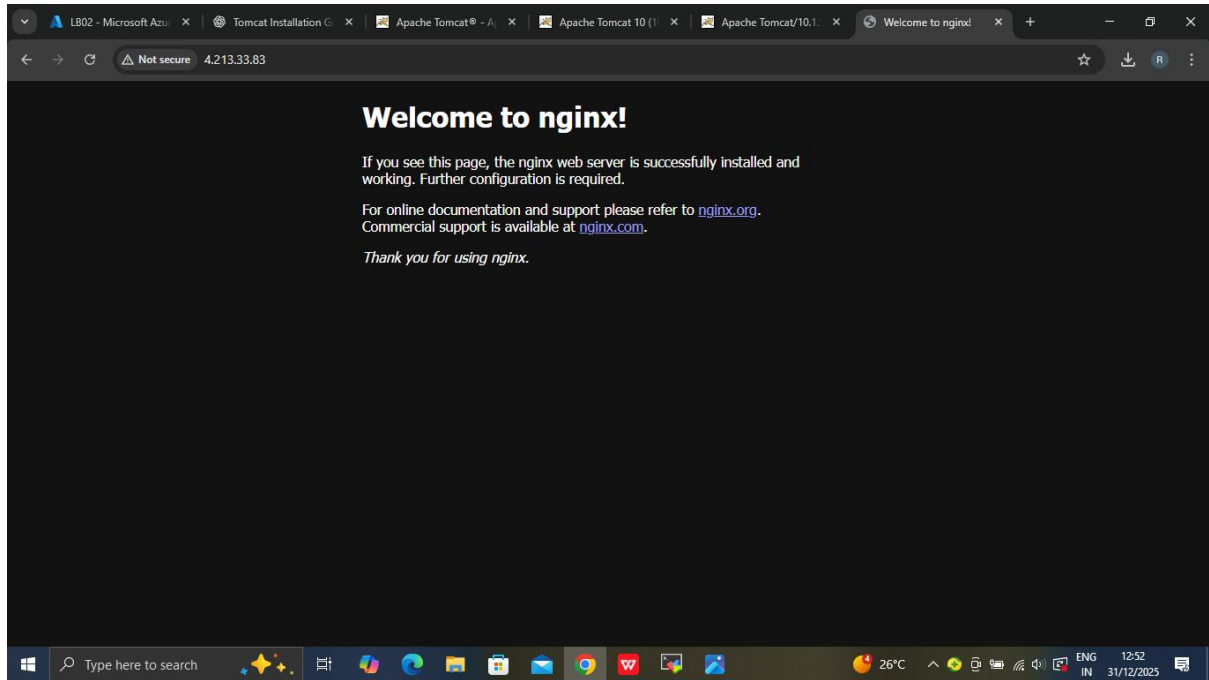
Quick connect... 2. 4.213.179.21 (bindu05)

bindu05@binduWEB01:~$ sudo su
root@binduWEB01:/home/bindu05# apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
root@binduWEB01:/home/bindu05# apt install nginx -y
```

- The successful installation of NGINX was verified by checking the service status using the systemctl command, which showed the service as active and running in the above image.

## ➤ 5. Verify NGINX :

- Browse Web VM public IP
- NGINX default page should be displayed



## ➤ 6. Create Application Virtual Machine (App VM) :

- OS: Linux (Ubuntu)
- Subnet: App Subnet
- Public IP: Optional (recommended only for admin access)

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## Create a virtual machine

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

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

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

Subscription \* Azure subscription 1  
Resource group \* binduRG01  
[Create new](#)

**Instance details**

Virtual machine name \* binduAPP01 ✓  
Region \* (Asia Pacific) Central India  
[Deploy to an Azure Extended Zone](#)  
Availability options No infrastructure redundancy required  
Security type Standard  
Image \* Ubuntu Server 22.04 LTS - x64 Gen2 (free services eligible)  
[See all images](#) | [Configure VM generation](#)

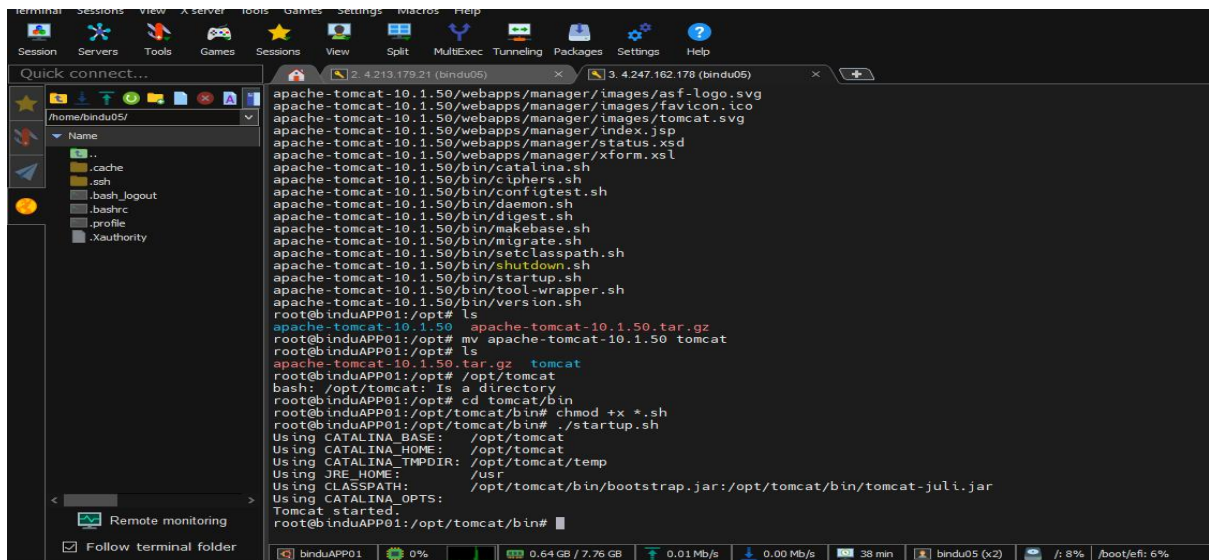
< Previous Next : Disks > Review + create

- Allow inbound rules SSH (22)

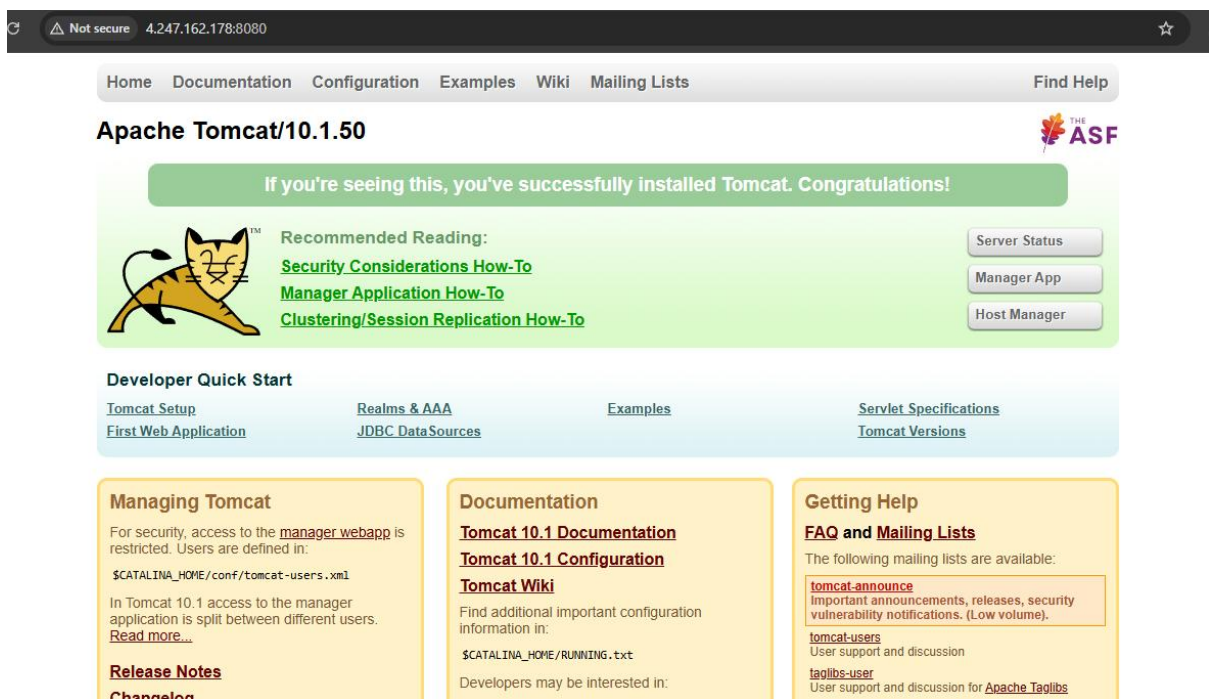
## ➤ 7. Install Tomcat on App VM :

By using below commands install Tomcat in mobaxterm :

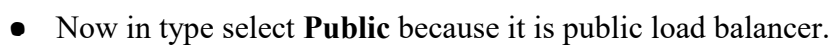
- Sudo su (to switch to root user)
- sudo apt update
- sudo apt install openjdk-11-jdk -y
- wget <https://dlcdn.apache.org/tomcat/tomcat-10/v10.1.50/bin/apache-tomcat-10.1.50.tar.gz>
- tar -xvzf apache-tomcat-10.1.50.tar.gz
- mv apache-tomcat-10.1.50 tomcat
- ls
- cd /opt/tomcat/bin
- ./startup.sh



- Apache Tomcat was successfully installed and started, and the default Tomcat welcome page was verified by accessing it via the VM public IP on port 8080.



- **8. Create Azure Public Load Balancer :**
  - A. Select standard load balancer and Create .**



### B. Frontend IP Configuration .

### C. Backend Pool: Add Web VM.

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

Home > Load balancing and content delivery | Load balancer | Add backend pool

Name \* B-pool  
Virtual network Vnet01 (binduRG01)  
Backend Pool Configuration  
NIC  
IP address

IP configurations

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.

+ Add | X Remove

Resource Name	Resource group	Type	IP configuration	IP Address	Availability set	Tags
binduAPP01	binduRG01	Virtual machine	ipconfig1	10.1.1.4	-	-
binduWEB01	binduRG01	Virtual machine	ipconfig1	10.1.0.4	-	-

Save Cancel Give feedback

## D. Health Probe :

- Protocol: TCP
- Port: 80

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

Home > CreateLoadBalancerBladeV2-20260101173334 | Overview > publicLB | Health probes

Add health probe

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 \* HP01  
Protocol \* TCP  
Port \* 80  
Interval (seconds) \* 5  
Used by \* Not used

Save Cancel Give feedback

## E. Load Balancing Rule:

- Frontend Port: 80
- Backend Port: 80
- Backend Pool: Web VM

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

Home > CreateLoadBalancerBladeV2-20260101173334 | Overview > publicLB | Load balancing rules >

### Add load balancing rule

publicLB

Name \* LBrule01

IP version \* ☒ IPv4 ☐ IPv6

Frontend IP address \* myfrontendIP (135.235.252.234)

Backend pool \* B-pool

Protocol ☒ TCP ☐ UDP

Port \* 80

Backend port \* 80

Health probe \* HP01 (TCP:80)

Save Cancel

Give feedback

## ➤ 9. Create Azure Private Load Balancer :

### A. Create Private Load Balancer

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

Home > Load balancing and content delivery | Load balancers >

### Create load balancer

Network Address Translation (NAT) to route traffic between public and private IP addresses. [Learn more.](#)

Project details

Subscription \* Azure subscription 1

Resource group \* bindurRG01 [Create new](#)

Instance details

Name \* privateLB ✓

Region \* Central India

SKU \* ☒ Standard (Distribute traffic to backend resources) ☐ Gateway (Direct traffic to network virtual appliances)

Type \* ☐ Public ☒ Internal

Tier \* ☒ Regional ☐ Global

Review + create < Previous Next : Frontend IP configuration > [Download a template for automation](#) [Give feedback](#)

Here in type select internal because it is private load balancer .

### B. Frontend IP Configuration:

- Private IP from AppSubnet

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Home > Load balancing and content delivery | Load balancers >

## Create load balancer

Basics Frontend IP configuration Backend pools Inbound rules Outbound rules Tags Review + create

A frontend IP configuration is an IP address used for inbound and/or outbound communication as defined within load balancing, inbound NAT, and outbound

+ Add a frontend IP configuration

Name ↑↓	IP address ↑↓	Virtual network ↑↓
Add a frontend IP to get started		

**Add frontend IP configuration**

privateLB

Name \* myfrentendIP02

IP version ☒ IPv4 ☐ IPv6

Virtual network \* Vnet01

Subnet \* APPsubnet (10.1.1.0/24)

Assignment ☒ Dynamic ☐ Static

Availability zone \* ☯ Zone-redundant

Save Cancel Give feedback

Review + create < Previous Next: Backend pools > Download a template for automation Give feedback

## C. Backend Pool : Add App VM

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Home > Load balancing and content delivery | Load balancers >

## Add backend pool

Name \* B-pool2

Virtual network ☯ Vnet01

Backend Pool Configuration ☒ NIC ☐ IP address

**IP configurations**

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.

+ Add | × Remove

Resource Name	Resource group	Type	IP configurati...	IP Address	Availability set	Tags
Virtual machine (2)						
<input checked="" type="checkbox"/> binduAPP01	binduRG01	Virtual machine	ipconfig1	10.1.1.4	-	-
<input type="checkbox"/> binduWEB01	binduRG01	Virtual machine	ipconfig1	10.1.0.4	-	-

**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.

Filter by name... Location: centralindia Virtual network: Vnet01 Add filter

☐ Show resources that are not available for selection

Save Cancel Give feedback Add Cancel Give feedback

## D. Health Probe:

- Protocol: TCP
- Port: 8080

Microsoft Azure Upgrade Search resources, services, and docs (G+) Copilot charanpola13@gmail.com

Home > Load balancing and content delivery > Load balancers > privateLB > Health probes >

### Add health probe

privateLB

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 \* HP-02

Protocol \* TCP

Port \* 8080

Interval (seconds) \* 5

Used by \* Not used

Save Cancel Give feedback

## E. Load Balancing Rule:

- Frontend Port: 8080
- Backend Port: 8080
- Backend Pool: App VM

Microsoft Azure Upgrade Search resources, services, and docs (G+) Copilot charanpola13@gmail.com

Home > Load balancing and content delivery > Load balancers > privateLB > Load balancing rules >

### Add load balancing rule

privateLB

Name \* LBRule02

IP version \* ☒ IPv4 ☐ IPv6

Frontend IP address \* myfrontendIP02 (10.1.1.5)

Backend pool \* B-pool2

High availability ports ☐

Protocol ☒ TCP ☐ UDP

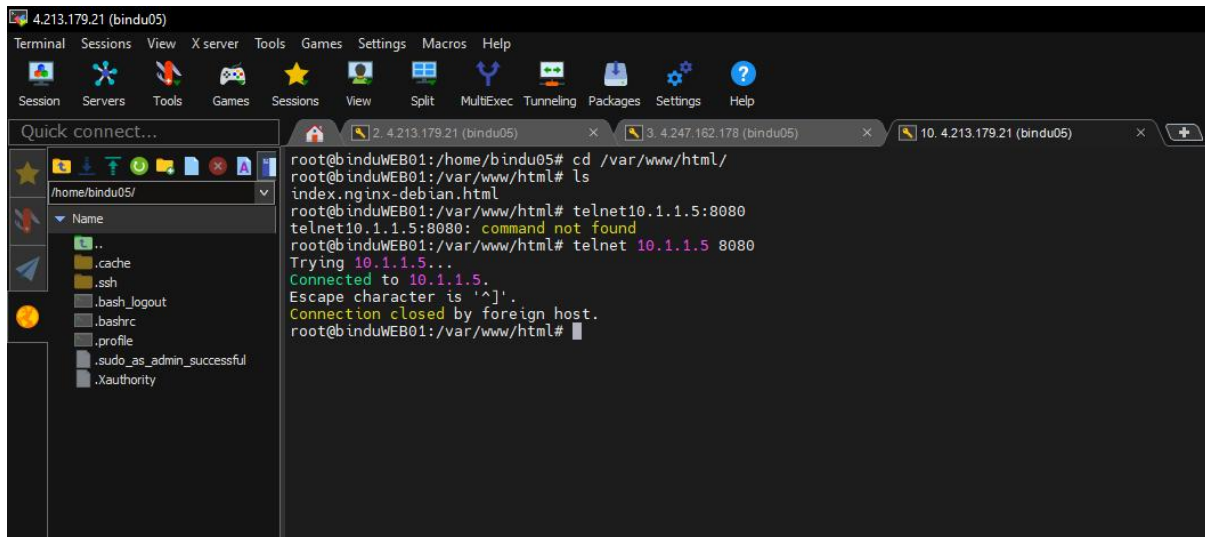
Port \* 8080

Backend port \* 8080

Save Cancel Give feedback

## ➤ 10. Connectivity Testing (Main Validation Step) :

- Test connection from Web VM to Private Load Balancer
- Connect to Web VM using SSH
- With WEB virtual machine public Ip and username.
- Run telnet command.



This confirms:

- Traffic flows from the public load balancer to the web VM and that Nginx can reach Tomcat via the private load balancer.

### ➤ Security Validation :

- Tomcat is not exposed publicly.
- Only Private Load Balancer IP is accessible from Web VM.
- Application layer is protected inside the VNet.
- End users cannot directly access Tomcat from the internet.
- This prevents unauthorized external access to the application layer.
- External traffic cannot reach the Private Load Balancer.
- Only the Web VM (NGINX) is exposed through the Public Load Balancer.
- Backend Application services remain isolated from the internet .

### ➤ Conclusion:

- In this project, we successfully implemented Azure Public and Private Load Balancers to design a secure two-tier architecture. The Public Load Balancer exposes the Web layer (NGINX) to the internet, while the Private Load Balancer ensures secure internal communication with the Application layer (Tomcat).
- Connectivity was validated using telnet, confirming proper backend pool configuration and network security. This architecture follows real-time industry best practices for scalability, security, and high availability.

