LOAD BALANCER

Prerequisites:

Before you start, you'll need:

1. An Azure Subscription.
2. Azure Portal Access.
3. A Virtual Network (VNet) and Subnet:
    - External LB: You'll need a VNet with at least one subnet.
    - Internal LB: You'll use the same VNet and subnet, or a new one.
4. VMs for Backend Pool: You'll need at least two VMs for each load balancer type to demonstrate load balancing. These VMs should be in the same region and VNet/subnet as your load balancer. For testing, it's easiest if they run a simple web server like Nginx on Linux that shows which server is responding.

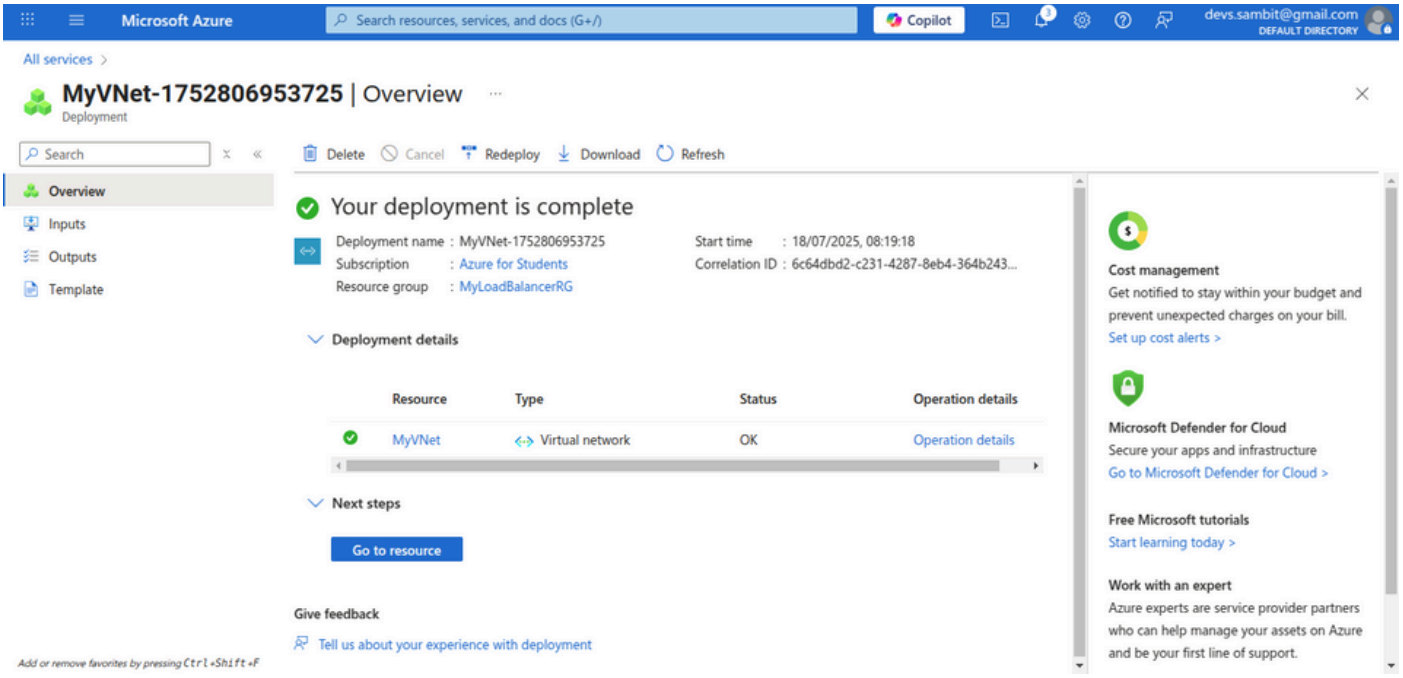
Step 1: Create a Resource Group, Virtual Network, and Subnet

Create a Resource Group:

- Go to Resource groups in the Azure portal.
- Click + Create.
- Subscription: Select your subscription.
- Resource group name: MyLoadBalancerRG.
- Region: Choose a region close to you (e.g., Central India). Remember this region for all subsequent resources.
- Click Review + create, then Create.

Create a Virtual Network and Subnet:

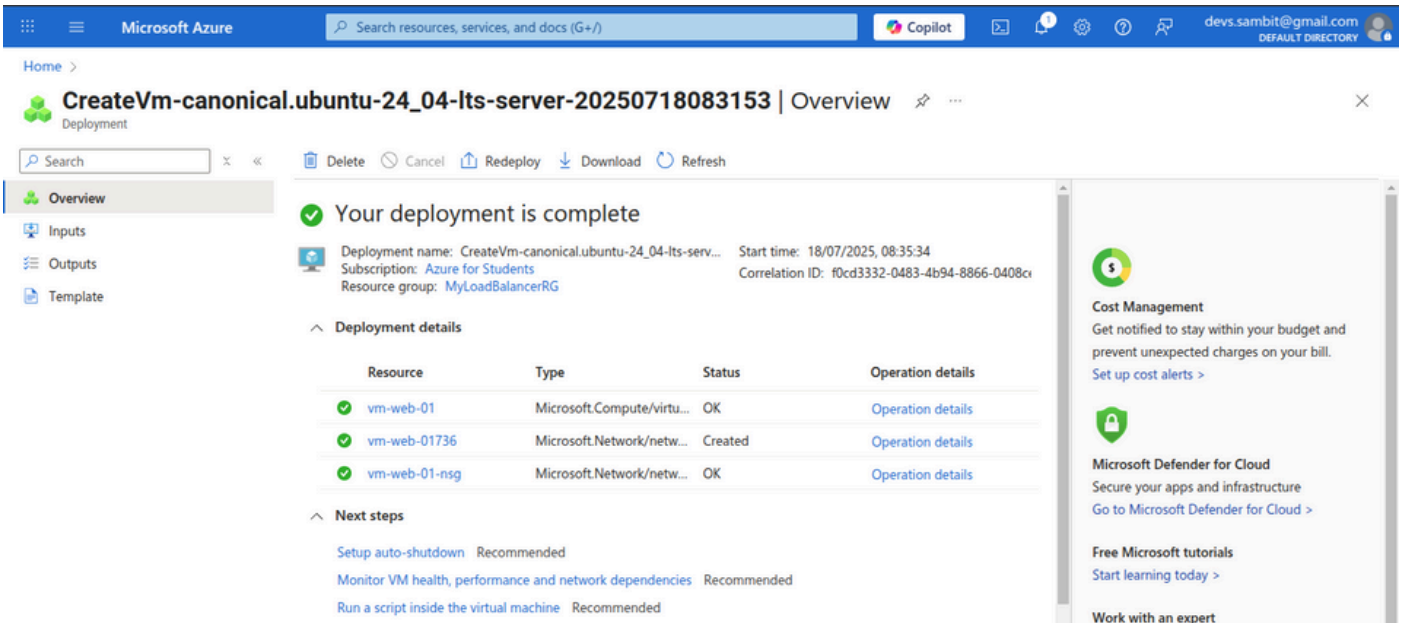
- Go to Virtual networks in the Azure portal.
- Click + Create.
- Basics tab:
  - Subscription: Select your subscription.
  - Resource Group: Choose MyLoadBalancerRG.
  - Name: MyVNet
  - Region: Select the same region as your resource group.
- IP Addresses tab:
  - IPv4 address space: 10.0.0.0/16.
  - + Add subnet:
    - Subnet name: BackendSubnet
    - Subnet address range: 10.0.0.0/24.
    - Click Add.
- Click Review + create, then Create.



Create Two Virtual Machines (VMs) for Backend Pool:

- These VMs will act as your web servers.
- Click + Create -> Azure virtual machine.
- Basics tab for vm-web-01:
  - Virtual machine name: vm-web-01
  - Image: Ubuntu Server 24.04 LTS - Gen2
  - Size: Choose a small, cheap size like Standard B1s.
  - Username: azureuser.
  - Public inbound ports: Select None (we'll use the LB for access).
- Networking tab:
  - Virtual network: MyVNet
  - Subnet: BackendSubnet
  - Public IP: None (Load Balancer will provide public access for external LB).
  - Click Review + create, then Create. Wait for deployment to complete.

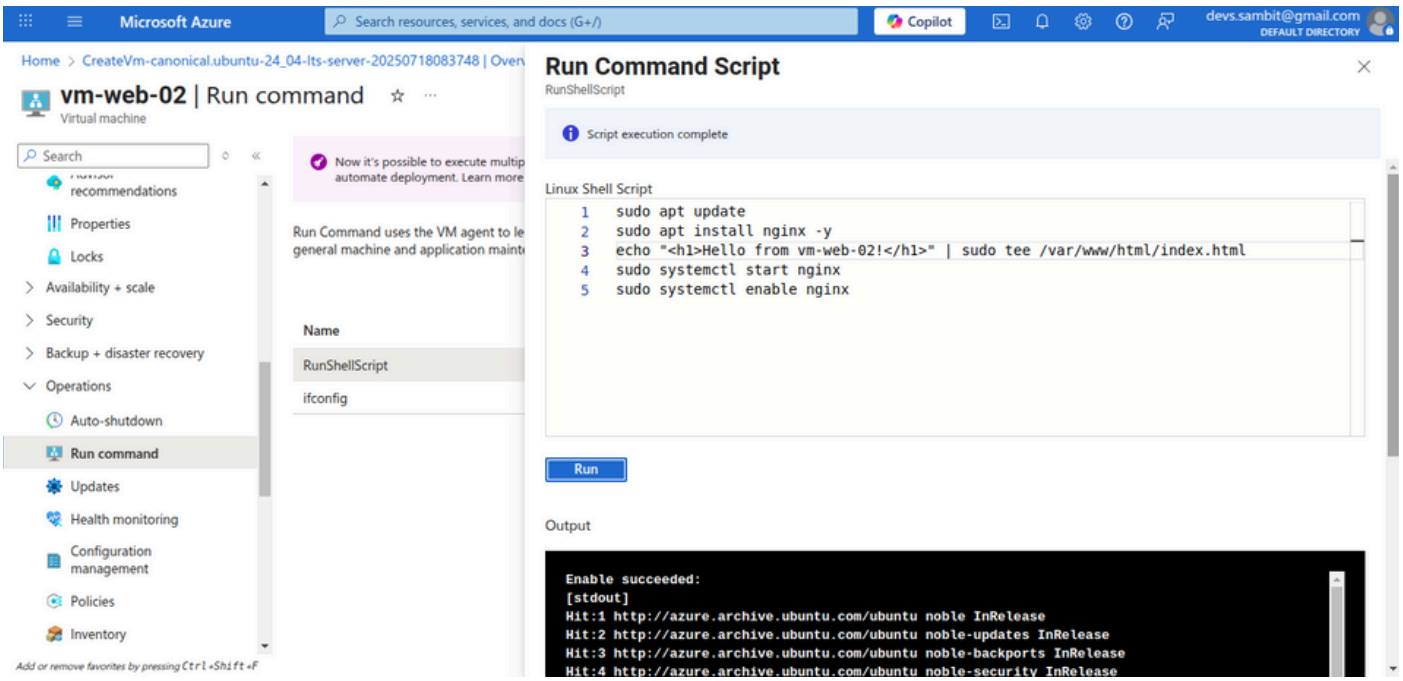
Repeat these steps to create vm-web-02 with identical settings.



Install Nginx on Both VMs:

- Once both VMs are deployed, navigate to vm-web-01 in the Azure portal.
- Under "Operations", click Run command and select RunShellScript.
- Enter the following script to install Nginx and create a custom index.html:
  - **sudo apt update**
  - **sudo apt install nginx -y**
  - **echo "<h1>Hello from vm-web-01!</h1>" | sudo tee /var/www/html/index.html**
  - **sudo systemctl start nginxNow you have the backend infrastructure ready!**
  - **sudo systemctl enable nginx**
- Click Run.
- Repeat this process for vm-web-02, changing the index.html content:
  - **echo "<h1>Hello from vm-web-02!</h1>" | sudo tee /var/www/html/index.html**

Now you have the backend infrastructure ready.



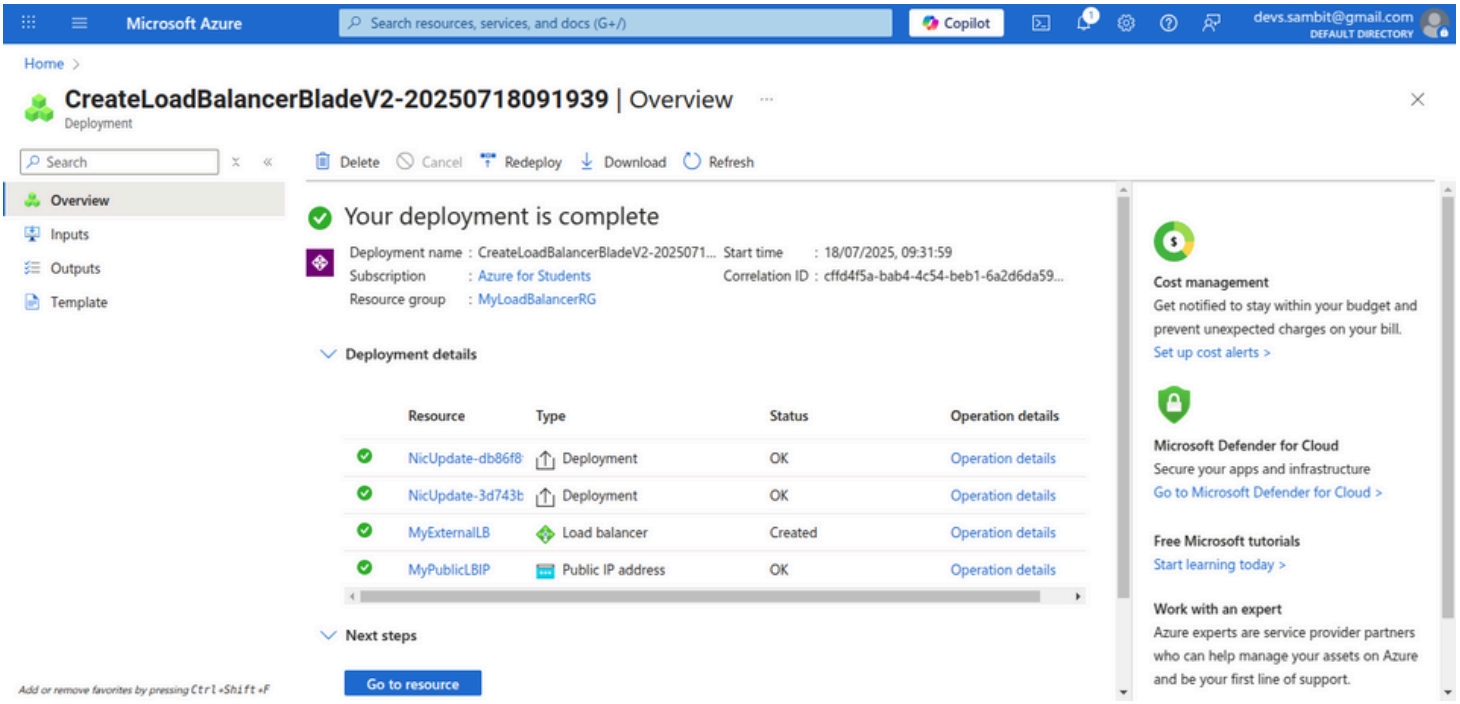
Part 1: Creating and Verifying an External (Public) Load Balancer:

This Load Balancer will expose your web servers to the internet.

Create the External Load Balancer:

- In the Azure portal search bar, type Load balancers and select it.
- Basics Tab:
  - Resource group: MyLoadBalancerRG
  - Name: MyExternalLB
  - SKU: Select Basic.
  - Type: Select Public.
  - Tier: Select Regional.
- Frontend IP Configuration:
  - Click + Add a frontend IP configuration.
  - Name: FrontEndPublicIP
  - IP version: IPv4
  - IP type: IP address
  - Public IP address: Click Create new.
    - Name: MyPublicLBIP
    - SKU: Basic.
    - Availability zone: No zone.
- Backend Pools:
  - Click + Add a backend pool.
  - Name: BackendPoolExternal
  - Backend Pool Configuration: Network Interface.
  - IP configurations: Click + Add.
  - Select the network interfaces for vm-web-01 and vm-web-02.

- Inbound Rules:
  - Click + Add a load balancing rule.
  - Name: HTTP_Rule
  - Frontend IP address: FrontEndPublicIP
  - Backend pool: BackendPoolExternal
  - Protocol: TCP
  - Port: 80 (HTTP traffic)
  - Backend port: 80
- Health probe: Click Create new.
  - Name: HTTP_Probe
  - Protocol: HTTP
  - Port: 80
  - Interval: 5 (seconds)
  - Click OK.
- Click Review + create.



Verifying the External Load Balancer:

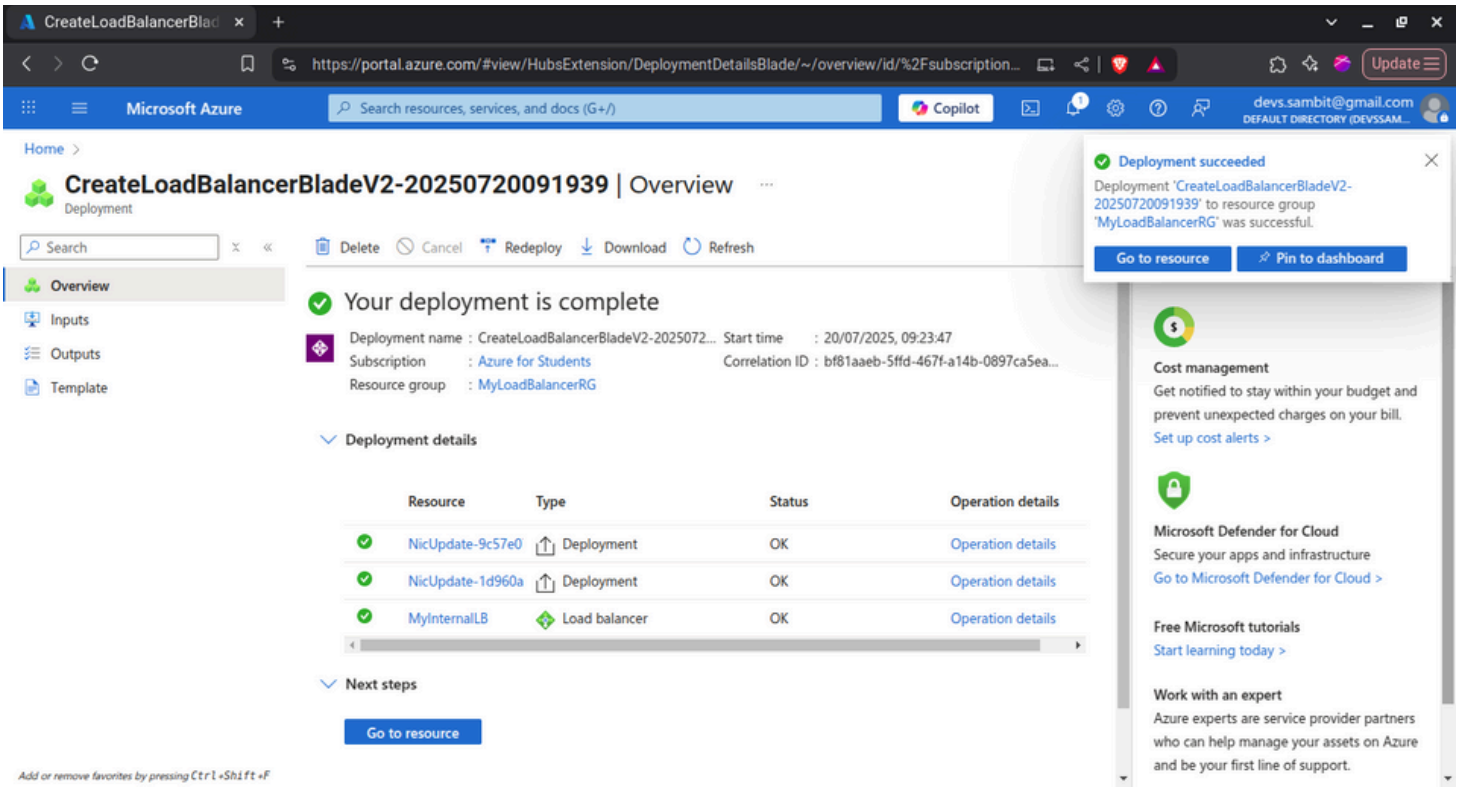
1. Get the Public IP:
   - Once the Load Balancer deployment is complete, go to the MyExternalLB resource in the Azure portal.
   - In the "Overview" section, find the Frontend IP configuration and note down the Public IP address.
2. Test from your Local Machine:
   - Open a web browser on your local computer.
   - Paste the Public IP address of your MyExternalLB into the address bar and press Enter.
   - You should see "Hello from vm-web-01!" or "Hello from vm-web-02!".
   - Refresh your browser multiple times. You should see the message alternate between "Hello from vm-web-01!" and "Hello from vm-web-02!", indicating that the load balancer is distributing traffic between your backend VMs.

Part 2: Creating and Verifying an Internal (Private) Load Balancer:

This Load Balancer will distribute traffic within your virtual network, not directly from the internet. Type Load balancers, select it and click + Create.

- Basics Tab:
  - Resource group: MyLoadBalancerRG
  - Name: MyInternalLB
  - SKU: Select Basic.
  - Type: Select Internal.
  - Tier: Select Regional.
- Frontend IP Configuration:
  - Click + Add a frontend IP configuration.
  - Name: FrontEndPrivateIP
  - IP version: IPv4
  - Virtual network: MyVNet
  - Subnet: BackendSubnet
  - Assignment: Dynamic
- Backend Pools:
  - Click **+ Add a backend pool`.
  - Name: BackendPoolInternal
  - Virtual network: MyVNet
  - Backend Pool Configuration: Network Interface (default).
  - IP configurations: Click + Add.
    - Select the network interfaces for vm-web-01 and vm-web-02. (Yes, the same VMs can be in multiple backend pools for different LBs, as long as the ports/protocols don't conflict).

- Inbound Rules (Load Balancing Rule):
  - Click **+ Add a load balancing rule`.
  - Name: Internal_HTTP_Rule
  - Frontend IP address: FrontEndPrivateIP
  - Backend pool: BackendPoolInternal
  - Protocol: TCP
  - Port: 80
  - Backend port: 80
  - Health probe: Select the existing HTTP_Probe
  - Click Add.
- Click Review + create.

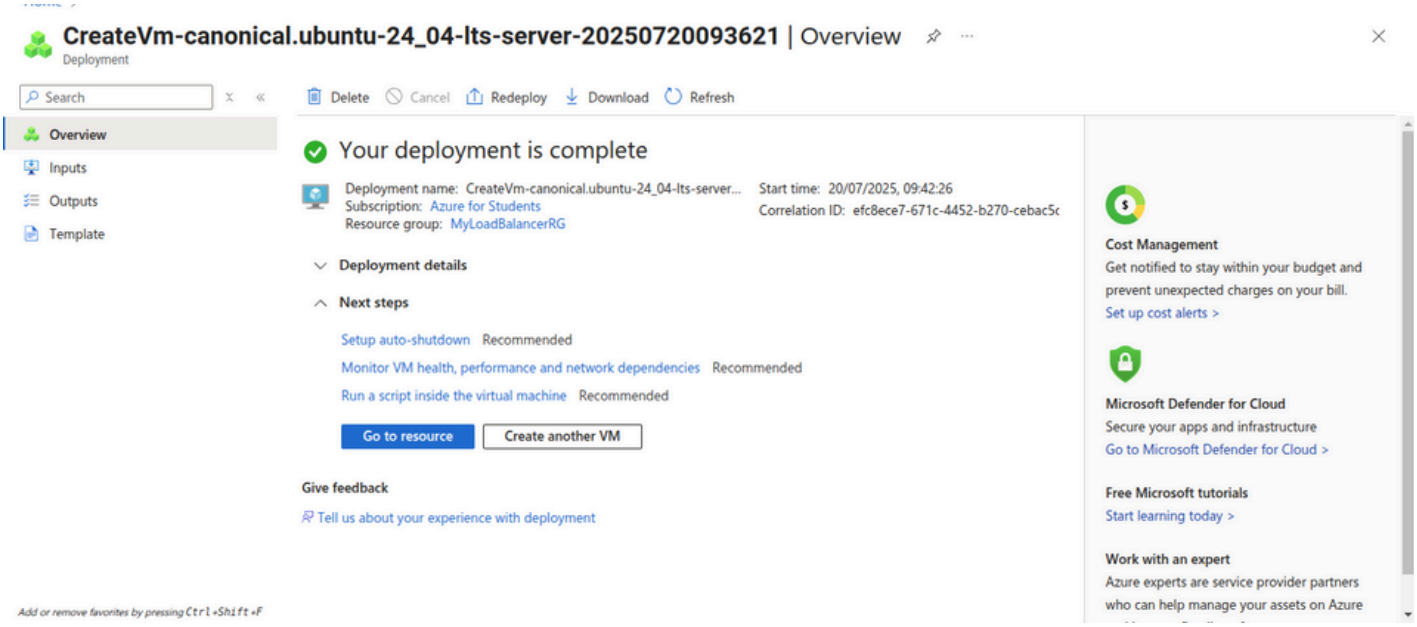


Verifying the Internal Load Balancer:

Since an internal load balancer uses a private IP, you cannot access it directly from your local machine (internet). You need a client VM within the same VNet to test it.

1. Create a Client VM:
    - Go to Virtual machines and create a new VM (e.g., vm-client).
    - Place it in the same Resource Group (MyLoadBalancerRG), Virtual Network (MyVNet), and Subnet (BackendSubnet) as your web servers.
    - Crucially, for this client VM, you will need a Public IP address and allow RDP (port 3389 for Windows) or SSH (port 22 for Linux) inbound rules in its NSG so you can connect to it from your local machine. This is temporary for testing.
    - Size: Standard B1s or B2s.
    - Once deployed, connect to vm-client via RDP/SSH.
2. Get the Internal LB's Private IP:
    - In MyInternalLB resource, find the Frontend IP configuration and note down its Private IP address.
3. Test from the Client VM:
    - From within your vm-client (connected via RDP/SSH):
    - If Linux: Open a terminal and use curl:
    - **curl http://<Private_IP_of_MyInternalLB>**

Run the curl command or refresh the browser multiple times. You should see the messages alternate between vm-web-01 and vm-web-02, confirming the internal load balancing.



CONCLUSION

- **LB Types:** Understood and implemented public (External) and private (Internal) load balancing.
- **Core Components:** Configured frontends, backend pools, health probes, and load balancing rules.
- **Networking Essentials:** Mastered NSG rules for LB traffic, health probes, and VM access.
- **Backend Readiness:** Ensured Nginx was running/listening and UFW wasn't blocking on web servers.
- **Troubleshooting Acumen:** Gained practical skills in diagnosing and resolving complex cloud networking issues.

Submitted by:

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References:

https://learn.microsoft.com/en-us/azure/load-balancer/load-balancer-overview
https://learn.microsoft.com/en-us/azure/load-balancer/quickstart-load-balancer-standard-public-portal
https://learn.microsoft.com/en-us/azure/load-balancer/quickstart-load-balancer-standard-internal-portal
https://learn.microsoft.com/en-us/azure/load-balancer/load-balancer-custom-probe-overview
https://www.digitalocean.com/community/tutorials/how-to-install-nginx-on-ubuntu-22-04
https://www.digitalocean.com/community/tutorials/how-to-set-up-a-firewall-with-ufw-on-ubuntu-22-04