

Lab 06 - Implement Network Traffic Management

Lab introduction

In this lab, you learn how to configure and test a public Load Balancer and an Application Gateway.

This lab requires an Azure subscription. Your subscription type may affect the availability of features in this lab. You may change the region, but the steps are written using **East US**.

Estimated timing: 50 minutes

Lab scenario

Your organization has a public website. You need to load balance incoming public requests across different virtual machines. You also need to provide images and videos from different virtual machines. You plan on implementing an Azure Load Balancer and an Azure Application Gateway. All resources are in the same region.

Job skills

- Task 1: Use a template to provision an infrastructure.
- Task 2: Configure an Azure Load Balancer.
- Task 3: Configure an Azure Application Gateway.

Task 1: Use a template to provision an infrastructure

In this task, you will use a template to deploy one virtual network, one network security group, and three virtual machines.

1. Download the **\Allfiles\Lab06** lab files (template and parameters).
2. Sign in to the **Azure portal** - `https://portal.azure.com` .
3. Search for and select `Deploy a custom template` .
4. On the custom deployment page, select **Build your own template in the editor**.
5. On the edit template page, select **Load file**.
6. Locate and select the **\Allfiles\Labs\06\az104-06-vms-template.json** file and select **Open**.
7. Select **Save**.
8. Select **Edit parameters** and load the **\Allfiles\Labs\06\az104-06-vms-parameters.json** file.
9. Select **Save**.
10. Use the following information to complete the fields on the custom deployment page, leaving all other fields with the default value.

Setting	Value
Subscription	your Azure subscription
Resource group	<code>az104-rg6</code> (If necessary, select Create new)
Password	Provide a secure password

! **Note:** If you receive an error that the VM size is unavailable, select a SKU that is available in your subscription and has at least 2 cores.

11. Select **Review + create** and then select **Create**.

! **Note:** Wait for the deployment to complete before moving to the next task. The deployment should take approximately 5 minutes.

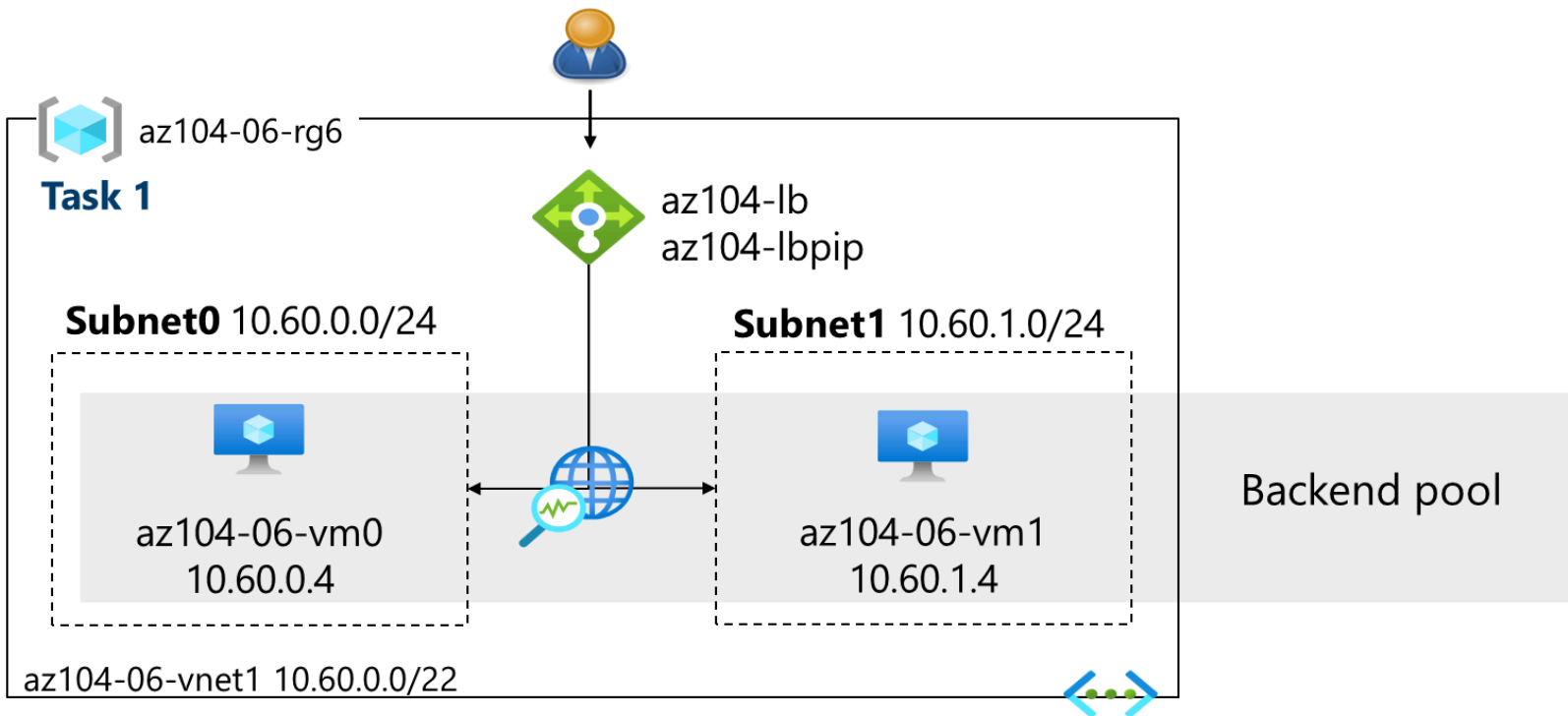
! **Note:** Review the resources being deployed. There will be one virtual network with three subnets. Each subnet will have a virtual machine.

Task 2: Configure an Azure Load Balancer

In this task, you implement an Azure Load Balancer in front of the two Azure virtual machines in the virtual network. Load Balancers in Azure provide layer 4 connectivity across resources, such as virtual machines. Load Balancer configuration includes a front-end IP address to accept connections, a backend pool, and rules that define how connections should traverse the load balancer.

Architecture diagram - Load Balancer

! **Note:** Notice the Load Balancer is distributing across two virtual machines in the same virtual network.



1. In the Azure portal, search for and select **Load balancers** and, on the **Load balancers** blade, click + **Create**.
2. Create a load balancer with the following settings (leave others with their default values) then click **Next : Frontend IP configuration**:

Setting	Value
Subscription	your Azure subscription
Resource group	az104-rg6
Name	az104-lb
Region	The same region that you deployed the VMs
SKU	Standard

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Setting	Value
Type	Public
Tier	Regional

[Home](#) > [Load balancing | Load Balancer](#) >

Create load balancer

Project details

Subscription *

Resource group *

az104-rg1

Create new

Instance details

Name *

Region *

SKU * ⓘ

Type * ⓘ

Tier *

az104-lb

East US

☒ Standard

☐ Gateway

☐ Basic

☒ Public

☐ Internal

☒ Regional

☐ Global

Review + create

< Previous

Next : Frontend IP configuration >

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3. On the **Frontend IP configuration** tab, click **Add a frontend IP configuration** and use the following settings:

Setting	Value
Name	az104-fe
IP type	IP address
Gateway Load balancer	None
Public IP address	Select Create new (use the instructions in the next step)

4. On the **Add a public IP address** popup, use the following settings before clicking **Save** twice. When completed click **Next : Backend pools** > .

Setting	Value
Name	az104-lbpip
SKU	Standard
Tier	Regional
Assignment	Static
Routing Preference	Microsoft network

Note: The Standard SKU provides a static IP address. Static IP addresses are assigned with the resource is created and released when the resource is deleted.

5. On the **Backend pools** tab, click **Add a backend pool** with the following settings (leave others with their default values). Click **Add** and then **Save**. Click **Next : Inbound rules** >.

Setting	Value
Name	az104-be
Virtual network	az104-06-vnet1 (az104-rg6)
Backend Pool Configuration	NIC
Click Add to add a virtual machine	
az104-06-vm0	check the box
az104-06-vm1	check the box

6. As you have time, review the other tabs, then click **Review + create**. Ensure there are no validation errors, then click **Create**.

7. Wait for the load balancer to deploy then click **Go to resource**.

Add a rule to determine how incoming traffic is distributed

1. In the **Settings** blade, select **Load balancing rules**.
2. Select **+ Add**. Add a load balancing rule with the following settings (leave others with their default values). As you configure the rule use the informational icons to learn about each setting. When finished click **Save**.

Setting	Value
Name	az104-lbrule
IP Version	IPv4
Frontend IP Address	az104-fe
Backend pool	az104-be
Protocol	TCP
Port	80
Backend port	80
Health probe	Create new
Name	az104-hp
Protocol	TCP
Port	80
Interval	5
Close the create health probe window	Save
Session persistence	None
Idle timeout (minutes)	4
Enable TCP reset	Disabled
Enable Floating IP	Disabled

Setting	Value
Outbound source network address translation (SNAT)	Recommended

3. Select **Frontend IP configuration** from the Load Balancer page. Copy the public IP address.
4. Open another browser tab and navigate to the IP address. Verify that the browser window displays the message **Hello World from az104-06-vm0** or **Hello World from az104-06-vm1**.
5. Refresh the window to verify the message changes to the other virtual machine. This demonstrates the load balancer rotating through the virtual machines.

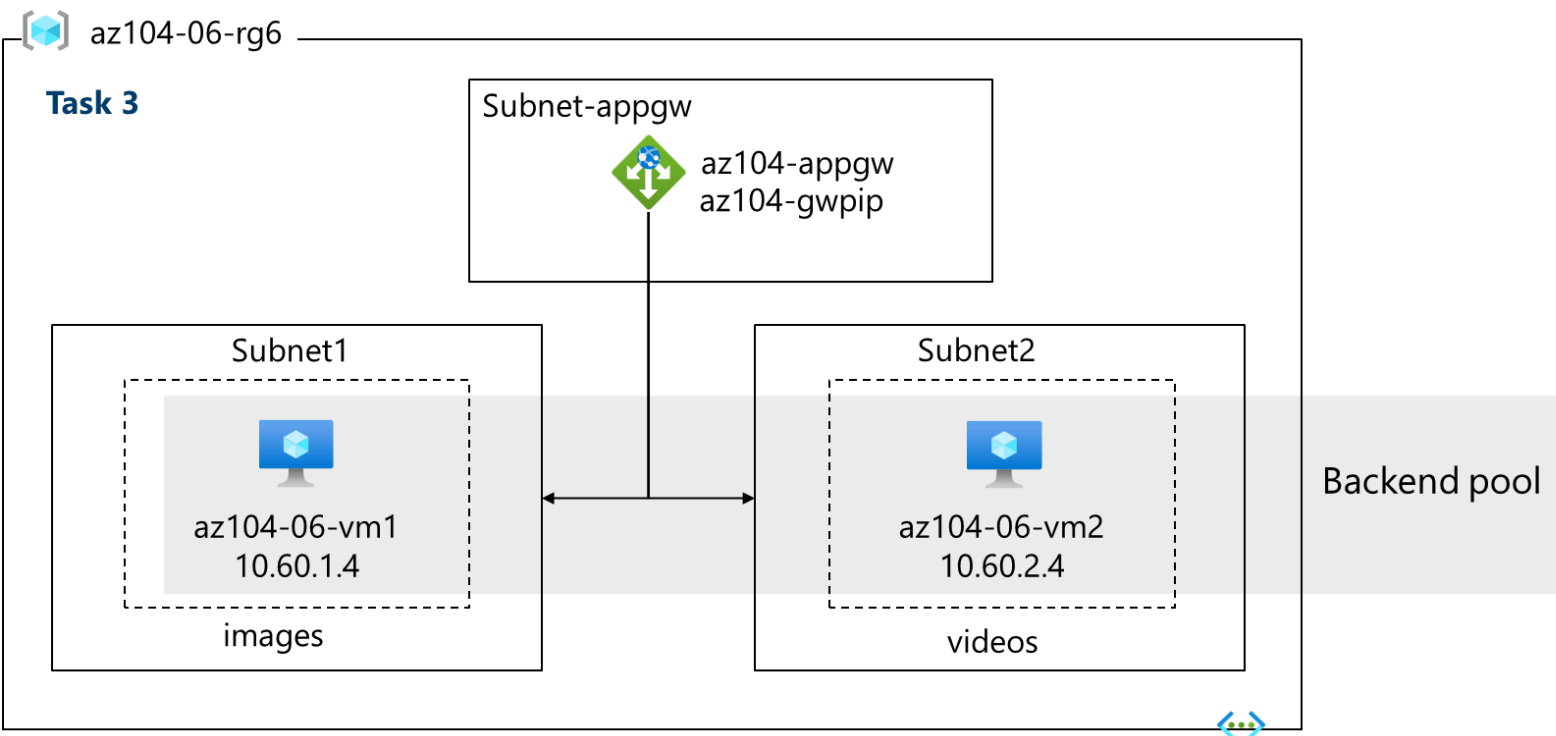
! **Note:** You may need to refresh more than once or open a new browser window in InPrivate mode.

Task 3: Configure an Azure Application Gateway

In this task, you implement an Azure Application Gateway in front of two Azure virtual machines. An Application Gateway provides layer 7 load balancing, Web Application Firewall (WAF), SSL termination, and end-to-end encryption to the resources defined in the backend pool. The Application Gateway routes images to one virtual machine and videos to the other virtual machine.

Architecture diagram - Application Gateway

! **Note:** This Application Gateway is working in the same virtual network as the Load Balancer. This may not be typical in a production environment.



1. In the Azure portal, search and select **Virtual networks**.
2. On the **Virtual networks** blade, in the list of virtual networks, click **az104-06-vnet1**.
3. On the **az104-06-vnet1** virtual network blade, in the **Settings** section, click **Subnets**, and then click **+ Subnet**.
4. Add a subnet with the following settings (leave others with their default values).

Setting	Value
Name	subnet-appgw
Starting address	10.60.3.224
Size	/27 - Ensure the starting address is still 10.60.3.224

5. Click **Add**

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Note: This subnet will be used by the Azure Application Gateway. The Application Gateway requires a dedicated subnet of /27 or larger size.

6. In the Azure portal, search and select `Application gateways` and, on the **Application gateways** blade, click **+ Create**.

7. On the **Basics** tab, specify the following settings (leave others with their default values):

Setting	Value
Subscription	your Azure subscription
Resource group	<code>az104-rg6</code>
Application gateway name	<code>az104-appgw</code>
Region	The same Azure region that you used in Task 1
Tier	Standard V2
Enable autoscaling	No
Instance count	<code>2</code>
HTTP2	Disabled
Virtual network	az104-06-vnet1
Subnet	subnet-appgw (10.60.3.224/27)

8. Click **Next : Frontends >** and specify the following settings (leave others with their default values). When complete, click **OK**.

Setting	Value
Frontend IP address type	Public
Public IP address	Add new
Name	<code>az104-gwpip</code>
Availability zone	1

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Note: The Application Gateway can have both a public and private IP address.

9. Click **Next : Backends >** and then **Add a backend pool**. Specify the following settings (leave others with their default values). When completed click **Add**.

Setting	Value
Name	<code>az104-appgwbe</code>
Add backend pool without targets	No
Virtual machine	az104-06-nic1 (10.60.1.4)
Virtual machine	az104-06-nic2 (10.60.2.4)

10. Click **Add a backend pool**. This is the backend pool for **images**. Specify the following settings (leave others with their default values). When completed click **Add**.

Setting	Value
Name	az104-imagebe
Add backend pool without targets	No
Virtual machine	az104-06-nic1 (10.60.1.4)

11. Click **Add a backend pool**. This is the backend pool for **video**. Specify the following settings (leave others with their default values). When completed click **Add**.


Setting	Value
Name	az104-videobe
Add backend pool without targets	No
Virtual machine	az104-06-nic2 (10.60.2.4)

12. Select **Next : Configuration >** and then **Add a routing rule**. Complete the information.

Setting	Value
Rule name	az104-gwrule
Priority	10
Listener name	az104-listener
Frontend IP	Public IPv4
Protocol	HTTP
Port	80
Listener type	Basic

13. Move to the **Backend targets** tab. Select **Add** after completing the basic information.

Setting	Value
Backend target	az104-appgwbe
Backend settings	az104-http (create new)

 **Note:** Take a minute to read the information about **Cookie-based affinity** and **Connection draining**.

14. In the **Path-based routing** section, select **Add multiple targets to create a path-based rule**. You will create two rules. Click **Add** after the first rule and then **Add** after the second rule.

Rule - routing to the images backend

Setting	Value
Path	/image/*
Target name	images
Backend settings	az104-http
Backend target	az104-imagebe

Rule - routing to the videos backend

Setting	Value
Path	<code>/video/*</code>
Target name	<code>videos</code>
Backend settings	az104-http
Backend target	<code>az104-videobe</code>

15. Be sure to check your changes, then select **Next : Tags >**. No changes are needed.
16. Select **Next : Review + create >** and then click **Create**.

! **Note:** Wait for the Application Gateway instance to be created. This will take approximately 5-10 minutes. While you wait consider reviewing some of the self-paced training links at the end of this page.

17. After the application gateway deploys, search for and select **az104-appgw**.
18. In the **Application gateway** resource, in the **Monitoring** section, select **Backend health**.
19. Ensure both servers in the backend pool display **Healthy**.
20. On the **Overview** blade, copy the value of the **Frontend public IP address**.
21. Start another browser window and test this URL - `http://<frontend ip address>/image/` .
22. Verify you are directed to the image server (vm1).
23. Start another browser window and test this URL - `http://<frontend ip address>/video/` .
24. Verify you are directed to the video server (vm2).

! **Note:** You may need to refresh more than once or open a new browser window in InPrivate mode.

Cleanup your resources

If you are working with **your own subscription** take a minute to delete the lab resources. This will ensure resources are freed up and cost is minimized. The easiest way to delete the lab resources is to delete the lab resource group.

- In the Azure portal, select the resource group, select **Delete the resource group, Enter resource group name**, and then click **Delete**.
- Using Azure PowerShell, `Remove-AzResourceGroup -Name resourceGroupName` .
- Using the CLI, `az group delete --name resourceGroupName` .

Extend your learning with Copilot

Copilot can assist you in learning how to use the Azure scripting tools. Copilot can also assist in areas not covered in the lab or where you need more information. Open an Edge browser and choose Copilot (top right) or navigate to *copilot.microsoft.com*. Take a few minutes to try these prompts.

- Compare and contrast the Azure Load Balancer with the Azure Application Gateway. Help me decide in which scenarios I should use each product.
- What tools are available to troubleshoot connections to an Azure Load Balancer?
- What are the basic steps for configuring the Azure Application Gateway? Provide a high-level checklist.
- Create a table highlighting three Azure load balancing solutions. For each solution show supported protocols, routing policies, session affinity, and TLS offloading.

Learn more with self-paced training

- [Improve application scalability and resiliency by using Azure Load Balancer](#). Discuss the different load balancers in Azure and how to choose the right Azure load balancer solution to meet your requirements.
- [Load balance your web service traffic with Application Gateway](#). Improve application resilience by distributing load across multiple servers and use path-based routing to direct web traffic.

Key takeaways

Congratulations on completing the lab. Here are the key points for this lab.

- Azure Load Balancer is an excellent choice for distributing network traffic across multiple virtual machines at the transport layer (OSI layer 4 - TCP and UDP).
- Public Load Balancers are used to load balance internet traffic to your VMs. An internal (or private) load balancer is used where private IPs are needed at the frontend only.
- The Basic load balancer is for small-scale applications that don't need high availability or redundancy. The Standard load balancer is for high performance and ultra-low latency.
- Azure Application Gateway is a web traffic (OSI layer 7) load balancer that enables you to manage traffic to your web applications.
- The Application Gateway Standard tier offers all the L7 functionality, including load balancing, The WAF tier adds a firewall to check for malicious traffic.
- An Application Gateway can make routing decisions based on additional attributes of an HTTP request, for example URI path or host headers.