Course: Cloud and Network Security
Name: Neville Ngothe Iregi
Student No.: CS-CNS10-25054
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Week 8 Assignment 2: Network Security Groups and Application Security Groups

Introduction

A Network Security Group (NSG) is a decentralized, basic firewall that controls inbound and outbound traffic to Azure resources. It contains zero or multiple inbound and outbound security rules that enable one to filter traffic to and from cloud resources. They specify five-tuple information i.e source port, source IP, destination IP, destination port, and the protocol. NSG can be associated with either a subnet or individual network interfaces. They are also stateless; traffic must be explicitly given permission unless there is a setting to automatically handle the traffic by rules set.

ASGs are used within a NSG to apply a network security rule to a specific workload or group of VMs — defined by ASG worked as being the “network object” & explicit IP addresses are added to this object. This provides the capability to group VMs into associated groups or workloads, simplifying the NSG rule definition process. Another great use of this is for scalability, creating the virtual machine and assigning the newly created virtual machine to its ASG will provide it with all the NSG rules in place for that specific ASG

Lab scenario

You have been asked to implement your organization's virtual networking infrastructure and test to ensure it is working correctly. In particular:

- The organization has two groups of servers: Web Servers and Management Servers.
- Each group of servers should be in its own Application Security Group.
- You should be able to RDP into the Management Servers, but not the Web Servers.
- The Web Servers should display the IIS web page when accessed from the internet.
- Network security group rules should be used to control network access.

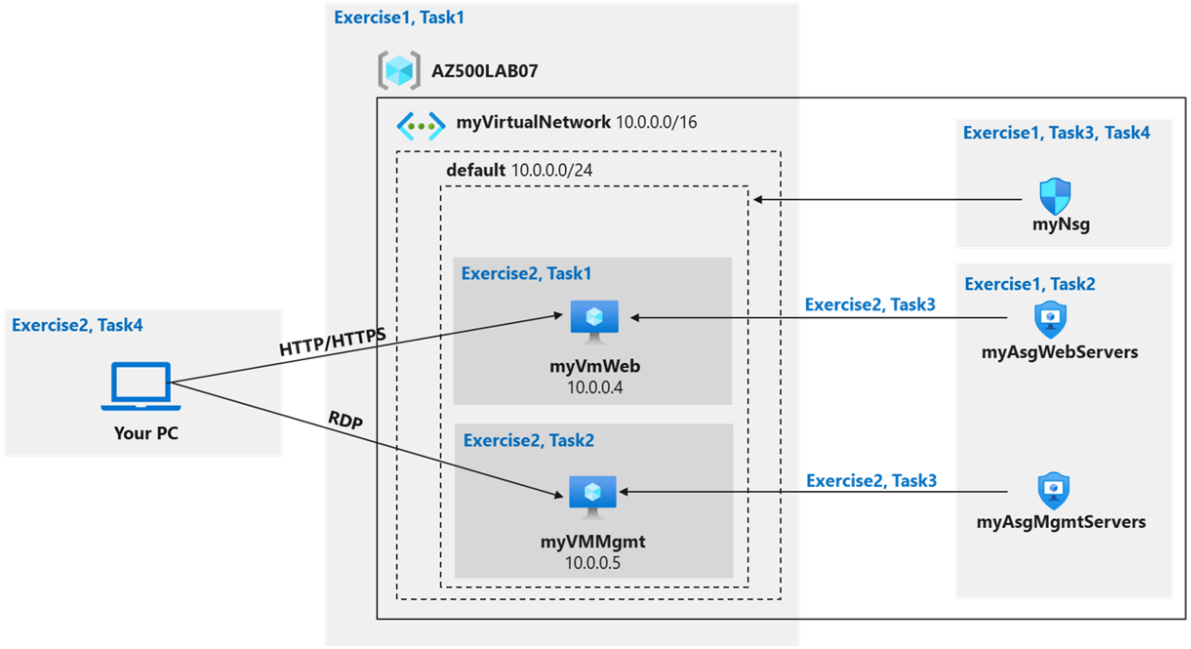
For all the resources in this lab, we are using the **East US** region. Verify with your instructor this is the region to use for class.

Lab objectives

In this lab, you will complete the following exercises:

- Exercise 1: Create the virtual networking infrastructure
- Exercise 2: Deploy virtual machines and test the network filters

Network and Application Security Groups diagram



Instructions

Exercise 1: Create the virtual networking infrastructure

Estimated timing: 20 minutes

For all the resources in this lab, we are using the **East (US)** region. Verify with your instructor this is the region to use for your class.

In this exercise, you will complete the following tasks:

- Task 1: Create a virtual network with one subnet.
- Task 2: Create two application security groups.
- Task 3: Create a network security group and associate it with the virtual network subnet.
- Task 4: Create inbound NSG security rules to all traffic to web servers and RDP to the management servers.

Task 1: Create a virtual network

A Virtual Network is the fundamental building block for private communications in Azure and it enables many types of Azure resources, such as Azure Virtual Machines (VM), to securely communicate with each other, the internet, and on-premises networks

In this task, you will create a virtual network to use with the network and application security groups.

1. Sign-in to the Azure portal **https://portal.azure.com/**.
   Sign in to the Azure portal using an account that has the Owner or Contributor role in the Azure subscription you are using for this lab. In this **Cloudslice** lab, this account is LabUser-57057525@LODSPRODMCA.onmicrosoft.com with TAP @E46$BH4.
2. In the Azure portal, in the **Search resources, services, and docs** text box at the top of the Azure portal page, type Virtual networks and press the **Enter** key.
3. On the **Virtual networks** blade, click **+ Create**.

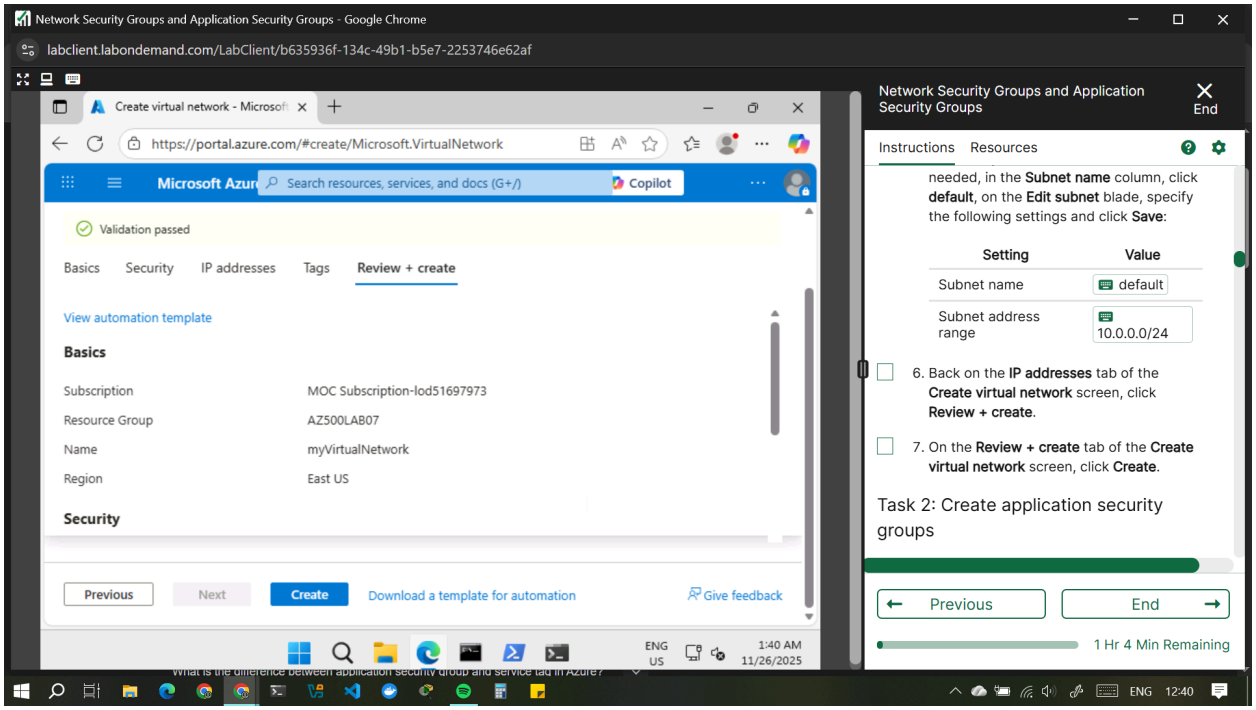
4. On the **Basics** tab of the **Create virtual network** blade, specify the following settings (leave others with their default values) and click **Next: IP Addresses**:

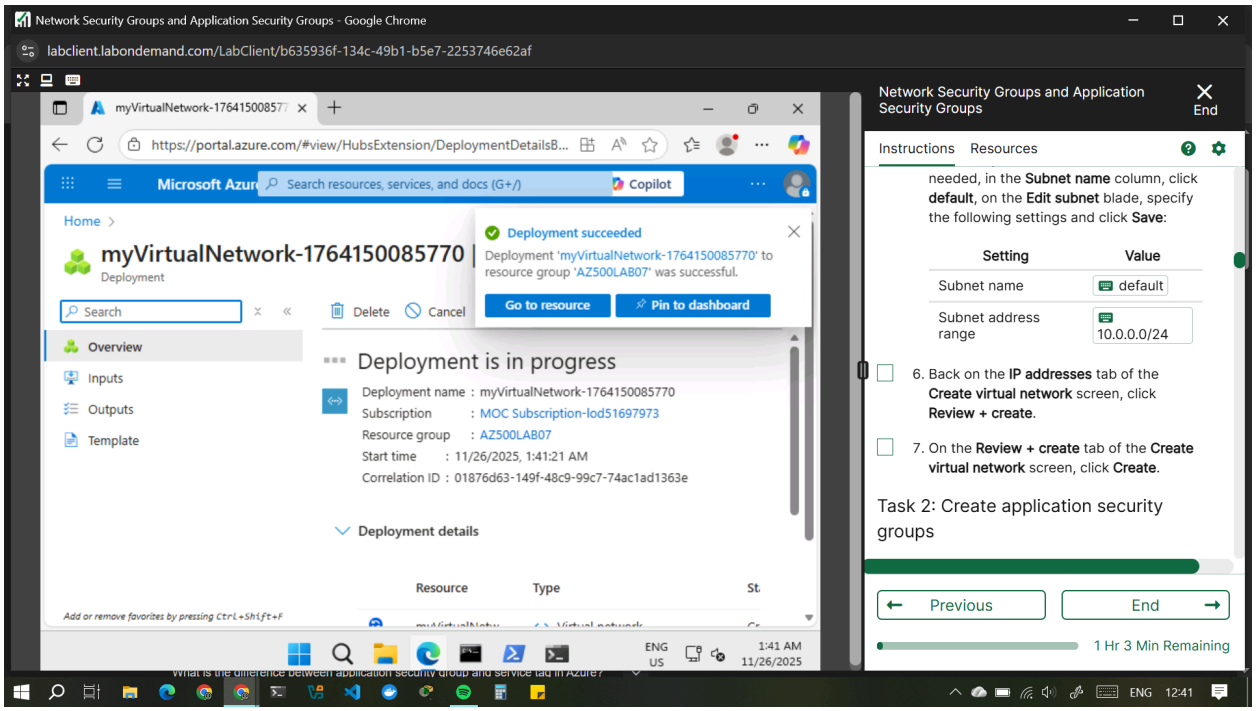
Setting	Value
Subscription	Name of the Azure subscription you are using in this lab
Resource group	Use the provided Resource Group named **AZ500LAB07**
Name	myVirtualNetwork
Region	**East US**

5. On the **IP addresses** tab of the **Create virtual network** blade, set the **IPv4 address space** to **10.0.0.0/16**, and, if needed, in the **Subnet name** column, click **default**, on the **Edit subnet** blade, specify the following settings and click **Save**:

Setting	Value
Subnet name	default
Subnet address range	10.0.0.0/24

6. Back on the **IP addresses** tab of the **Create virtual network** screen, click **Review + create**.
7. On the **Review + create** tab of the **Create virtual network** screen, click **Create**.





Task 2: Create application security groups

In this task, you will create an application security group.

1. In the Azure portal, in the **Search resources, services, and docs** text box at the top of the Azure portal page, type Application security groups and press the **Enter** key.
2. On the **Application security groups** blade, click **+ Create**.

3. On the **Basics** tab of the **Create an application security group** blade, specify the following settings:

Setting	Value
Resource group	**AZ500LAB07**
Name	myAsgWebServers
Region	**East US**

4. This group will be for the web servers.
5. Click **Review + create** and then click **Create**.
6. Navigate back to the **Application security groups** blade and click **+ Create**.

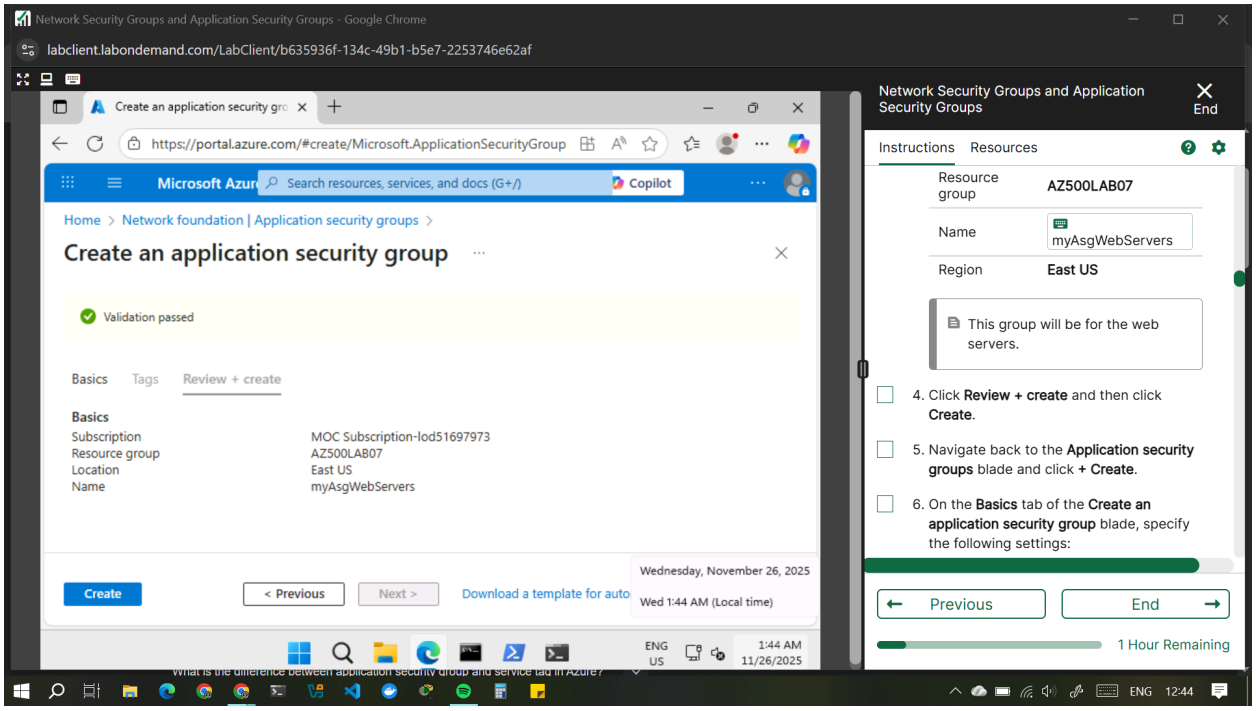
7. On the **Basics** tab of the **Create an application security group** blade, specify the following settings:

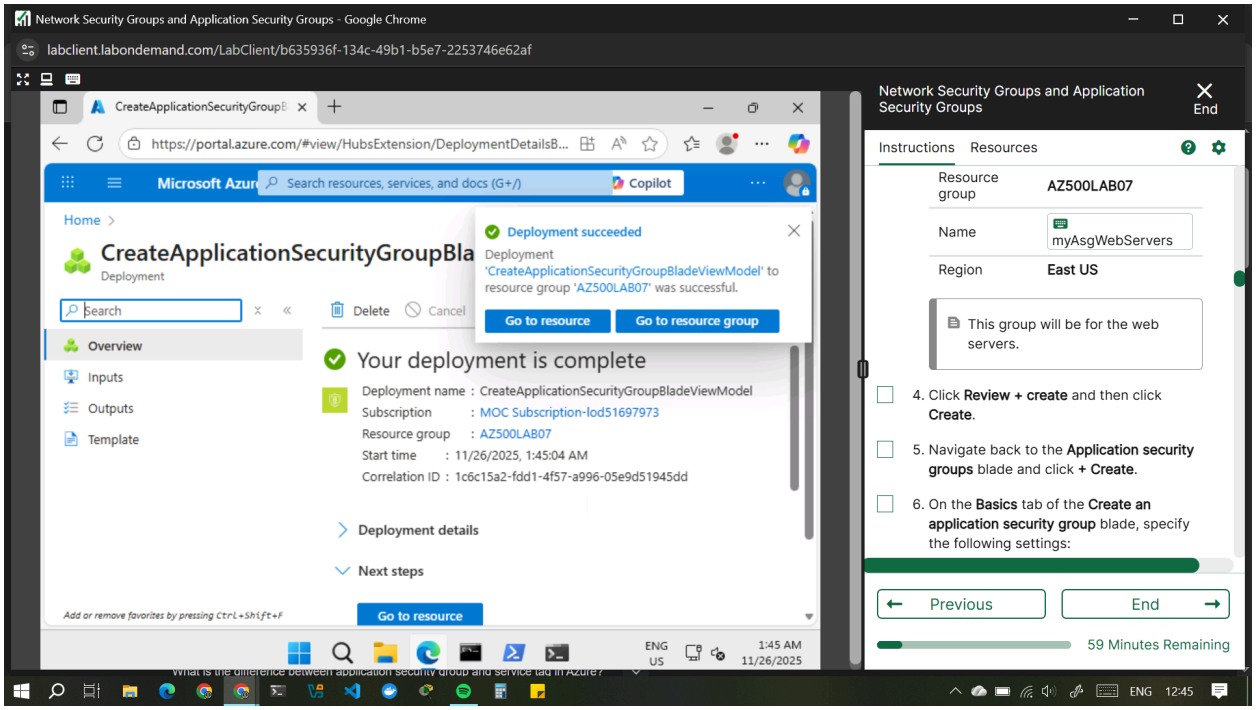
Setting	Value
Resource group	AZ500LAB07
Name	myAsgMgmtServers
Region	East US

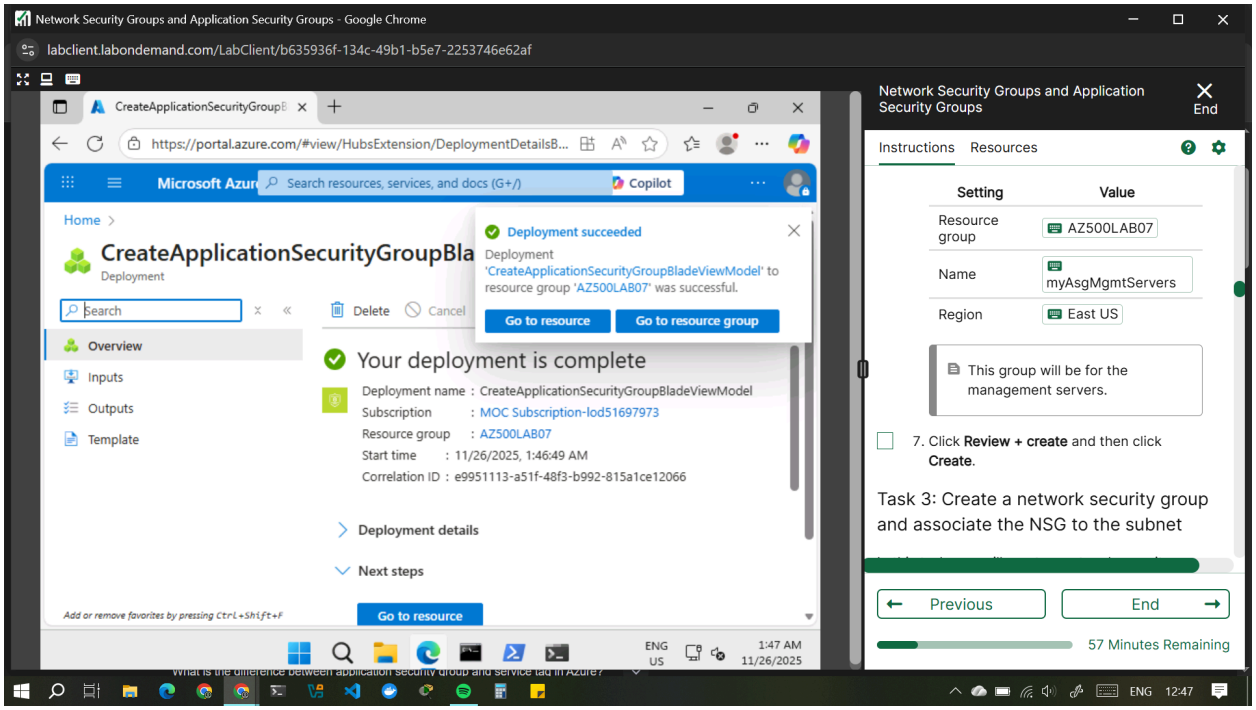
8.

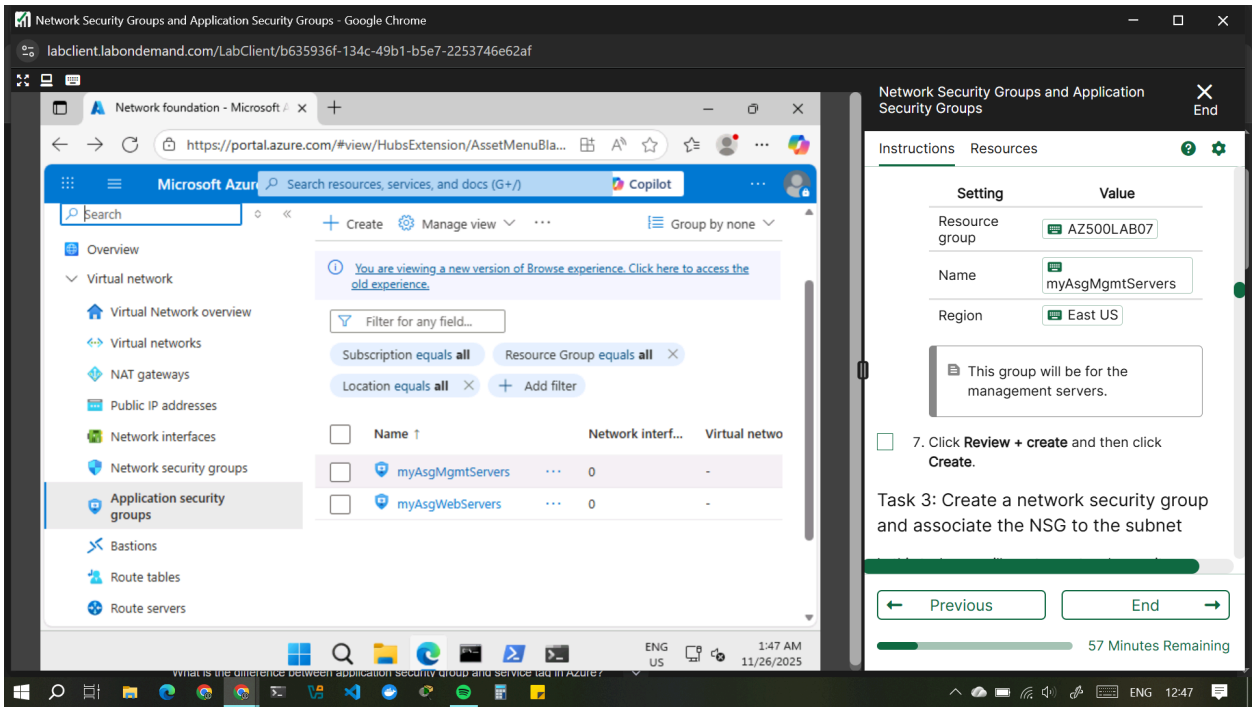
This group will be for the management servers.

9. Click **Review + create** and then click **Create**.









Task 3: Create a network security group and associate the NSG to the subnet

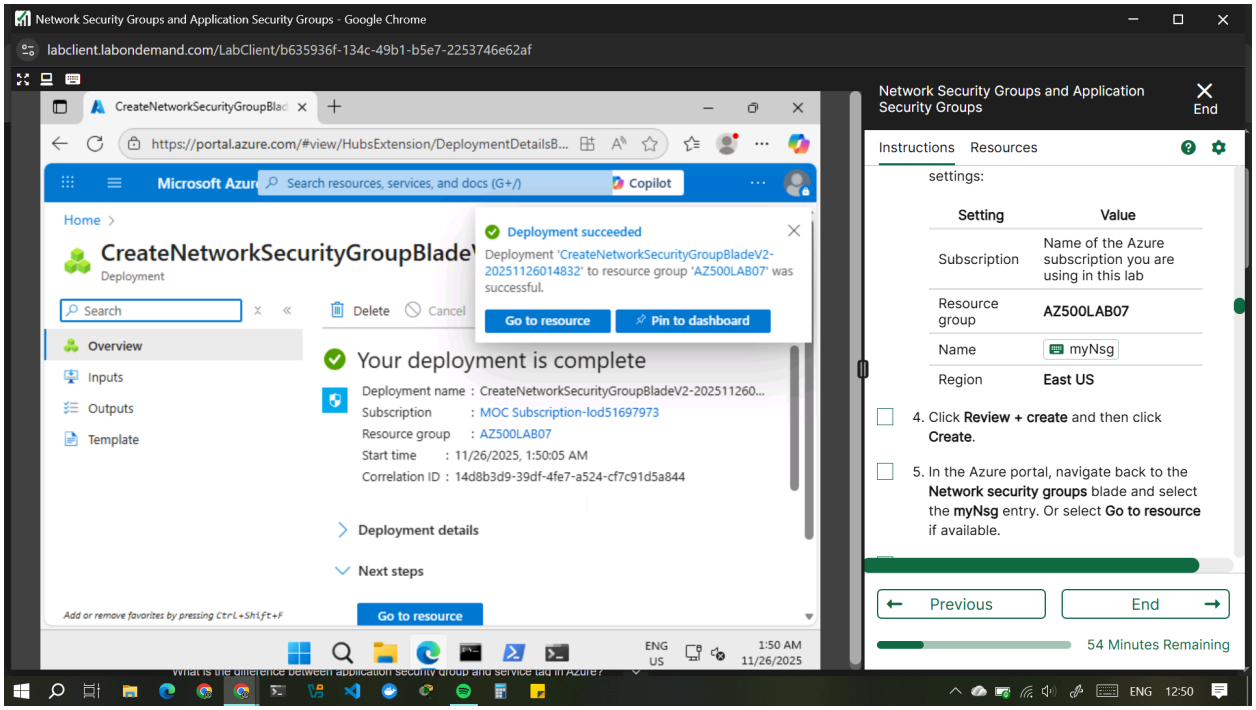
In this task, you will create a network security group.

1. In the Azure portal, in the **Search resources, services, and docs** text box at the top of the Azure portal page, type Network security groups and press the **Enter** key.
2. On the **Network security groups** blade, click **+ Create**.

3. On the **Basics** tab of the **Create network security group** blade, specify the following settings:

Setting	Value
Subscription	Name of the Azure subscription you are using in this lab
Resource group	**AZ500LAB07**
Name	myNsg
Region	**East US**

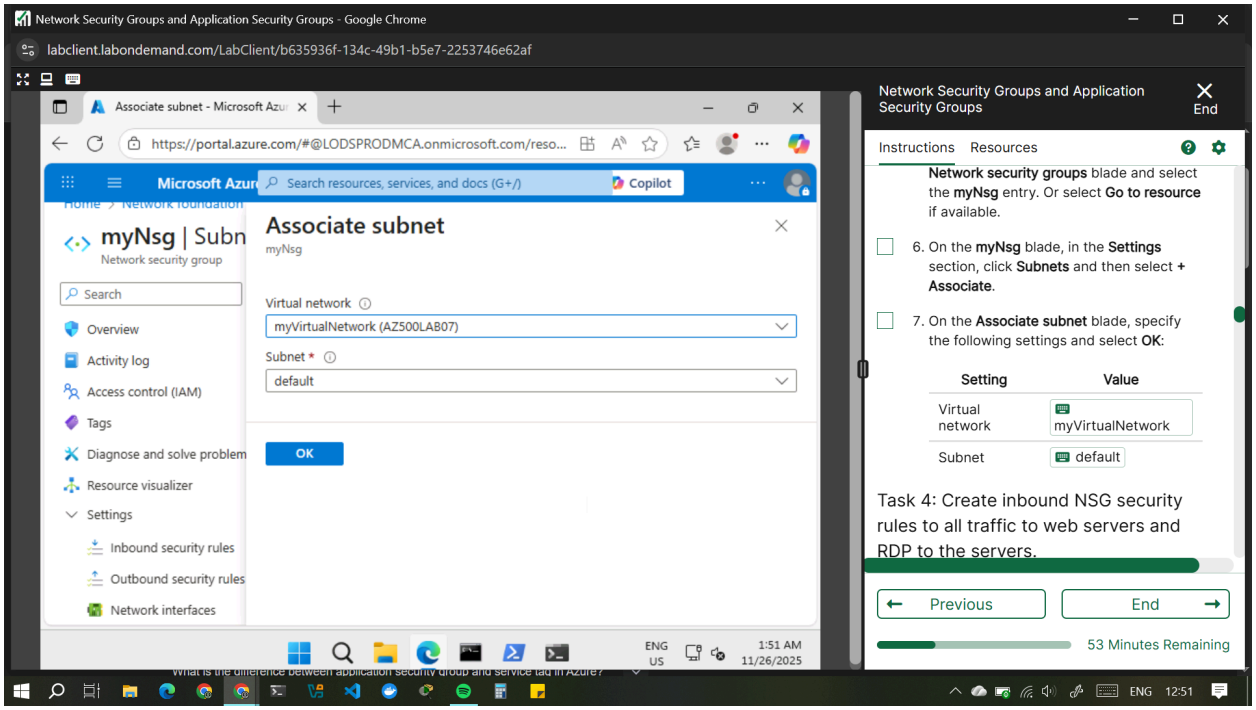
4. Click **Review + create** and then click **Create**.

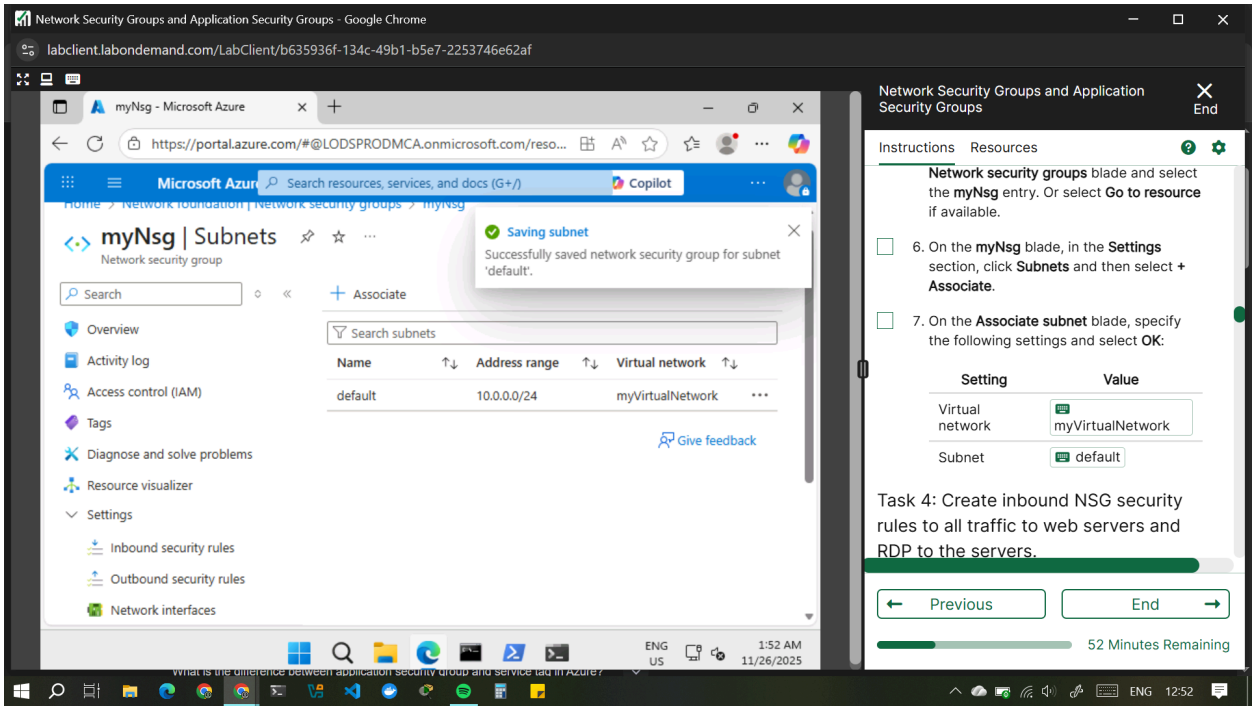


5. In the Azure portal, navigate back to the **Network security groups** blade and select the **myNsg** entry. Or select **Go to resource** if available.
6. On the **myNsg** blade, in the **Settings** section, click **Subnets** and then select **+ Associate**.

7. On the **Associate subnet** blade, specify the following settings and select **OK**:

Setting	Value
Virtual network	myVirtualNetwork
Subnet	default





Task 4: Create inbound NSG security rules to all traffic to web servers and RDP to the servers.

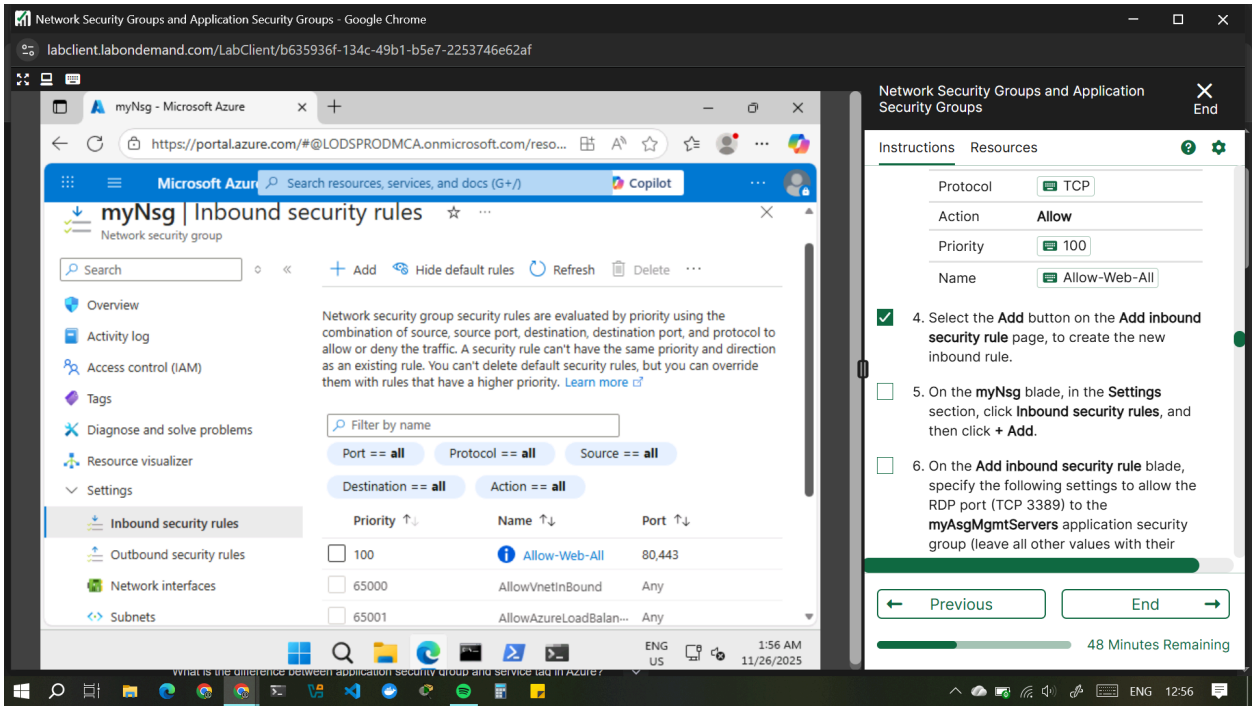
1. On the **myNsg** blade, in the **Settings** section, click **Inbound security rules**.

2. Review the default inbound security rules and then click **+ Add**.

3. On the **Add inbound security rule** blade, specify the following settings to allow TCP ports 80 and 443 to the **myAsgWebServers** application security group (leave all other values with their default values):

Setting	Value
Source	**Any**
Source port ranges	*
Destination	in the drop-down list, select **Application security group** and then click **myAsgWebServers**
Service	**Custom**
Destination port ranges	80,443
Protocol	TCP
Action	**Allow**
Priority	100
Name	Allow-Web-All

4. Select the **Add** button on the **Add inbound security rule** page, to create the new inbound rule.

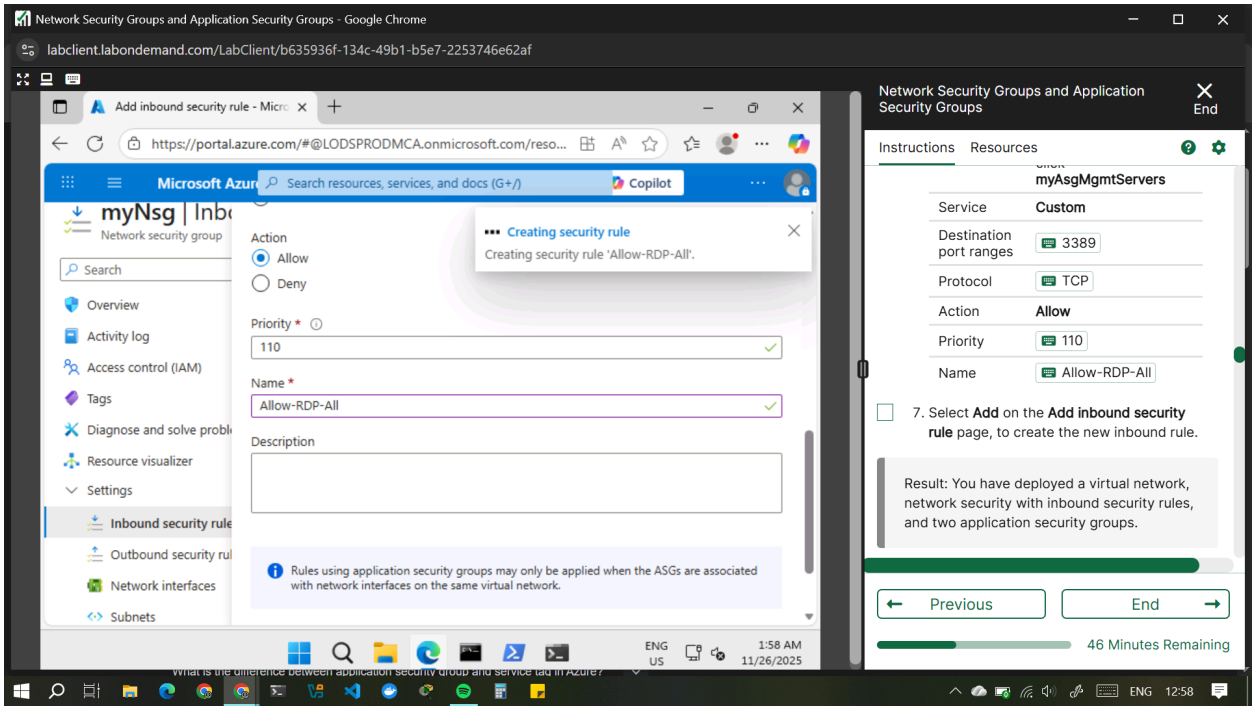


5. On the **myNsg** blade, in the **Settings** section, click **Inbound security rules**, and then click **+ Add**.
6. On the **Add inbound security rule** blade, specify the following settings to allow the RDP port (TCP 3389) to the **myAsgMgmtServers** application security group (leave all other values with their default values):

Setting	Value
Source	**Any**
Source port ranges	*
Destination	in the drop-down list, select **Application security group** and then click **myAsgMgmtServers**
Service	**Custom**

Destination port ranges	3389
Protocol	TCP
Action	**Allow**
Priority	110
Name	Allow-RDP-All

7. Select **Add** on the **Add inbound security rule** page, to create the new inbound rule.



Result: You have deployed a virtual network, network security with inbound security rules, and two application security groups.

Exercise 2: Deploy virtual machines and test network filters

Estimated timing: 25 minutes

In this exercise, you will complete the following tasks:

- Task 1: Create a virtual machine to use as a web server.
- Task 2: Create a virtual machine to use as a management server.
- Task 3: Associate each virtual machines network interface to it's application security group.
- Task 4: Test the network traffic filtering.

Task 1: Create a virtual machine to use as a web server

In this task, you will create a virtual machine to use as a web server.

1. In the Azure portal, in the **Search resources, services, and docs** text box at the top of the Azure portal page, type Virtual machines and press the **Enter** key.
2. On the **Virtual machines** blade, click **+ Create** and, in the dropdown list, click **Virtual machine**.

3. On the **Basics** tab of the **Create a virtual machine** blade, specify the following settings (leave others with their default values):

Setting	Value
Subscription	the name of the Azure subscription you will be using in this lab
Resource group	AZ500LAB07
Virtual machine name	myVmWeb

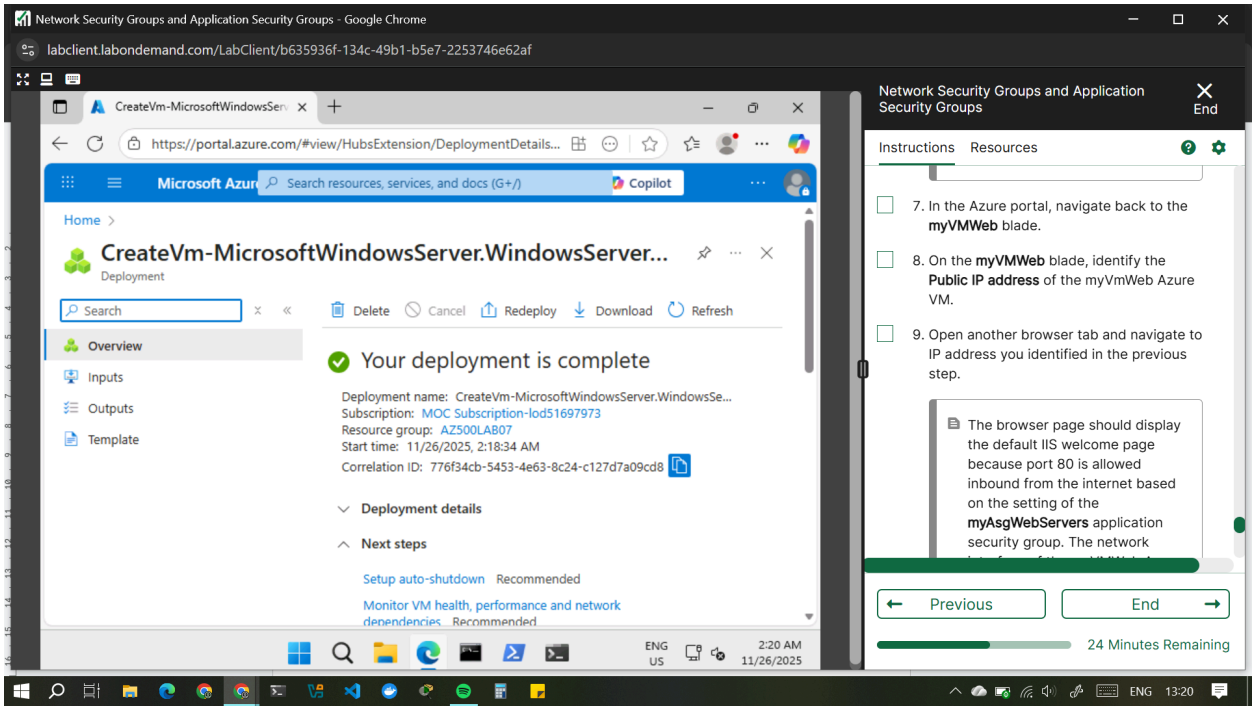
Region	**(US)East US**
Availability options	**No infrastructure redundancy required**
Security type	**Standard**
Image	Windows Server 2022 Datacenter: Azure Edition- x64 Gen2
Size	Standard D2s v3
Username	Student
Password	Please create your own password and record it for future reference in subsequent labs
Confirm password	Retype your password
Public inbound ports	None
Would you like to use an existing Windows Server License	No

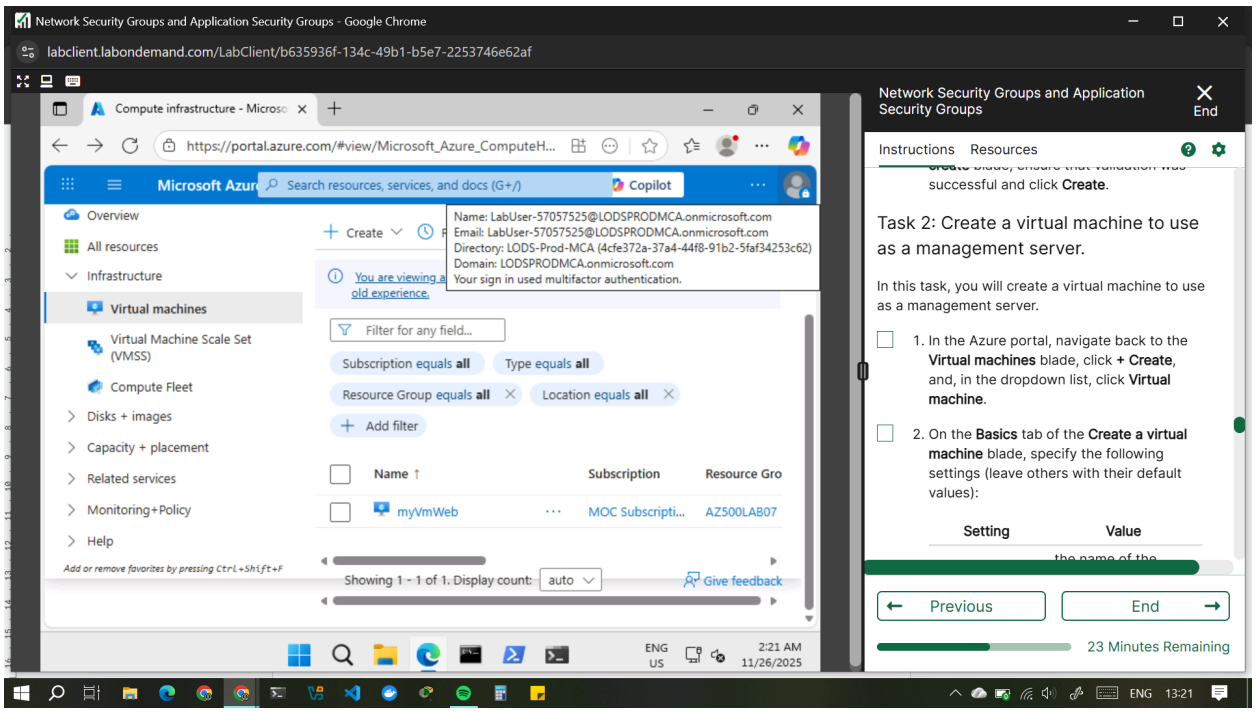
4. For public inbound ports, we will rely on the precreated NSG.
5. Click **Next: Disks >** and, on the **Disks** tab of the **Create a virtual machine** blade, set the **OS disk type** to **Standard HDD** and click **Next: Networking >**.
6. On the **Networking** tab of the **Create a virtual machine** blade, select the previously created network **myVirtualNetwork** and the **default (10.0.0.0/24)** subnet.
7. Under **NIC network security group** select **None**.

8. Click **Next: Management >**, then click **Next: Monitoring >**. On the **Monitoring** tab of the **Create a virtual machine** blade, verify the following setting:

Setting	Value
Boot diagnostics	Enabled with managed storage account (recommended)

9. Click **Review + create**, on the **Review + create** blade, ensure that validation was successful and click **Create**.





Task 2: Create a virtual machine to use as a management server.

In this task, you will create a virtual machine to use as a management server.

1. In the Azure portal, navigate back to the **Virtual machines** blade, click **+ Create**, and, in the dropdown list, click **Virtual machine**.

2. On the **Basics** tab of the **Create a virtual machine** blade, specify the following settings (leave others with their default values):

Setting	Value
Subscription	the name of the Azure subscription you will be using in this lab
Resource group	AZ500LAB07
Virtual machine name	myVMMgmt
Region	(US)East US
Availability options	**No infrastructure redundancy required**
Security type	**Standard**
Image	Windows Server 2022 Datacenter: Azure Edition - x64 Gen2
Size	Standard D2s v3
Username	Student
Password	Please use your personal password created in Lab 02 > Exercise 2 > Task 1 > Step 3.
Public inbound ports	None

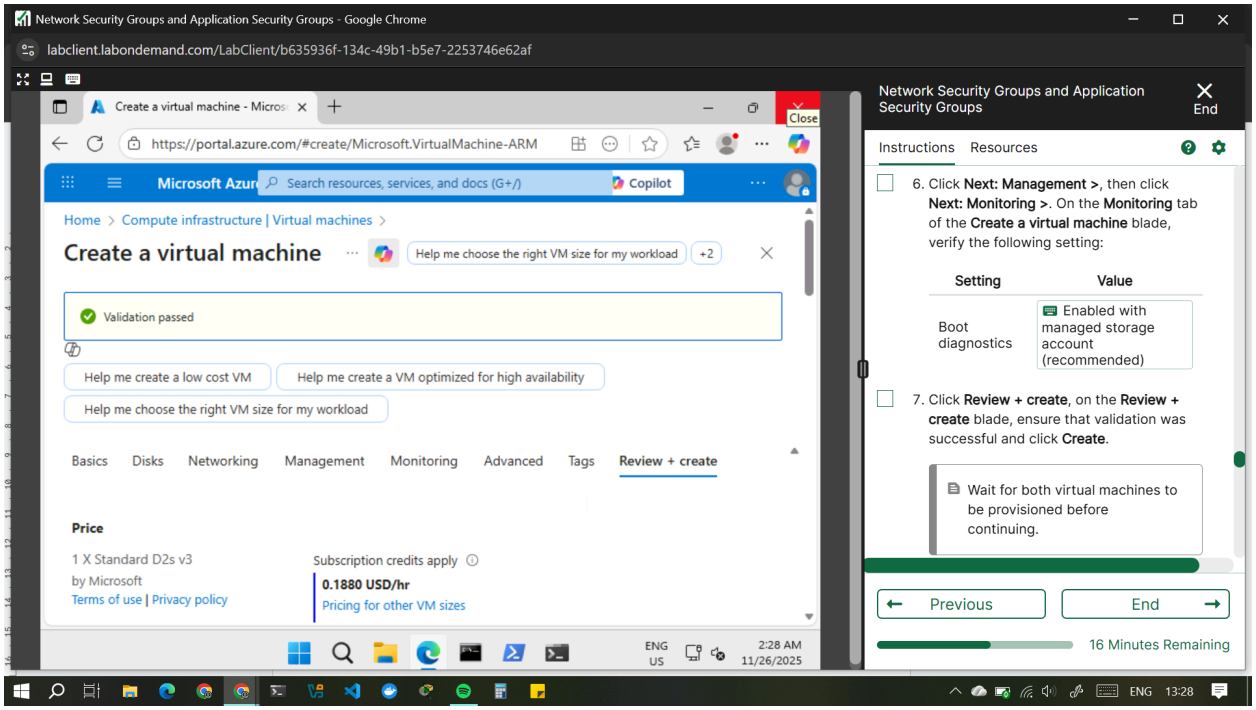
Already have a Windows Server license	No

3. For public inbound ports, we will rely on the precreated NSG.
4. Click **Next: Disks >** and, on the **Disks** tab of the **Create a virtual machine** blade, set the **OS disk type** to **Standard HDD** and click **Next: Networking >**.
5. On the **Networking** tab of the **Create a virtual machine** blade, select the previously created network **myVirtualNetwork** and the **default (10.0.0.0/24)** subnet.
6. Under **NIC network security group** select **None**.

7. Click **Next: Management >**, then click **Next: Monitoring >**. On the **Monitoring** tab of the **Create a virtual machine** blade, verify the following setting:

Setting	**Value**
Boot diagnostics	Enabled with managed storage account (recommended)

8. Click **Review + create**, on the **Review + create** blade, ensure that validation was successful and click **Create**.

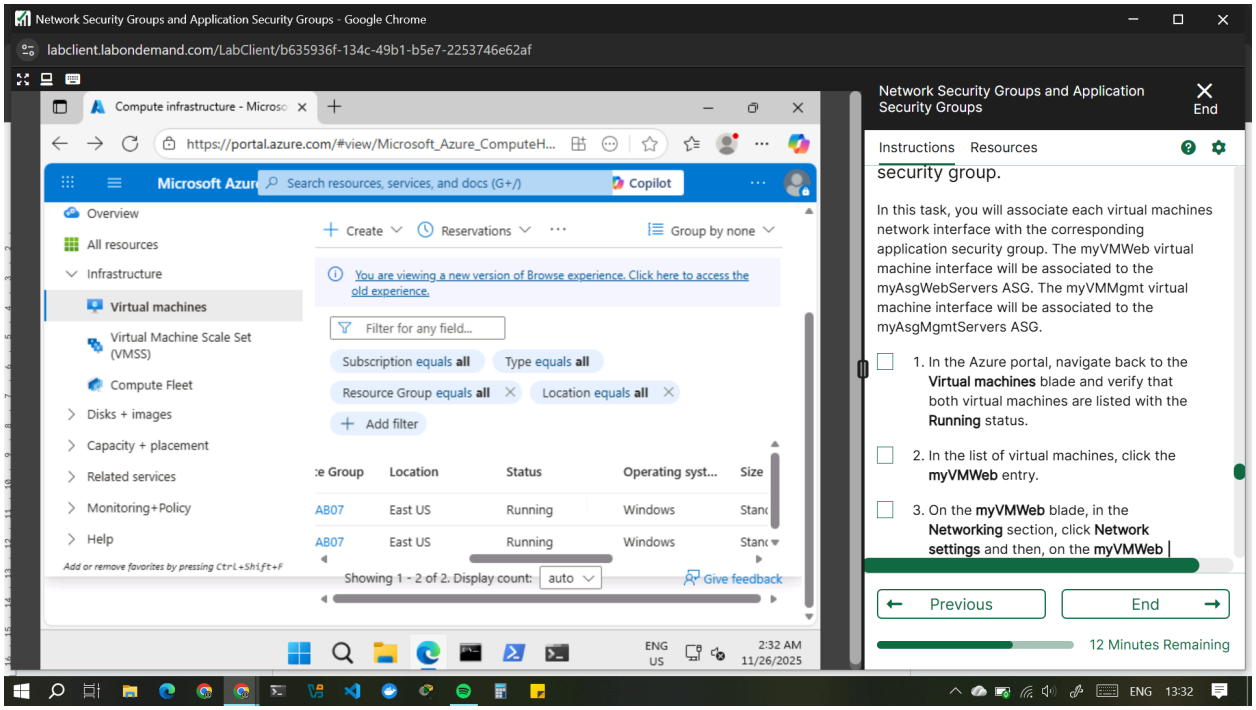


Wait for both virtual machines to be provisioned before continuing.

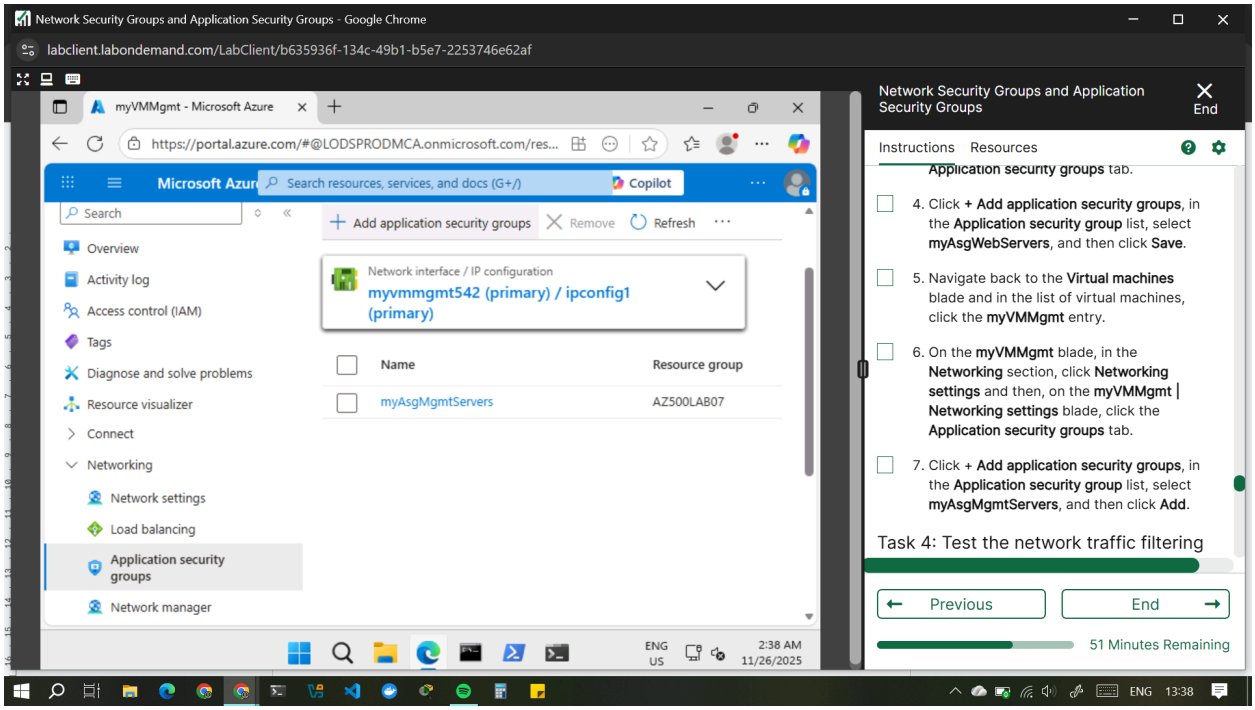
Task 3: Associate each virtual machine's network interface to its application security group.

In this task, you will associate each virtual machines network interface with the corresponding application security group. The myVMWeb virtual machine interface will be associated to the myAsgWebServers ASG. The myVMMgmt virtual machine interface will be associated to the myAsgMgmtServers ASG.

1. In the Azure portal, navigate back to the **Virtual machines** blade and verify that both virtual machines are listed with the **Running** status.



2. In the list of virtual machines, click the **myVMWeb** entry.
3. On the **myVMWeb** blade, in the **Networking** section, click **Network settings** and then, on the **myVMWeb | Networking settings** blade, click the **Application security groups** tab.
4. Click **+ Add application security groups**, in the **Application security group** list, select **myAsgWebServers**, and then click **Save**.
5. Navigate back to the **Virtual machines** blade and in the list of virtual machines, click the **myVMMgmt** entry.
6. On the **myVMMgmt** blade, in the **Networking** section, click **Networking settings** and then, on the **myVMMgmt | Networking settings** blade, click the **Application security groups** tab.
7. Click + **Add application security groups**, in the **Application security group** list, select **myAsgMgmtServers**, and then click **Add**.



Task 4: Test the network traffic filtering

In this task, you will test the network traffic filters. You should be able to RDP into the myVMMgmnt virtual machine. You should be able to connect from the internet to the myVMWeb virtual machine and view the default IIS web page.

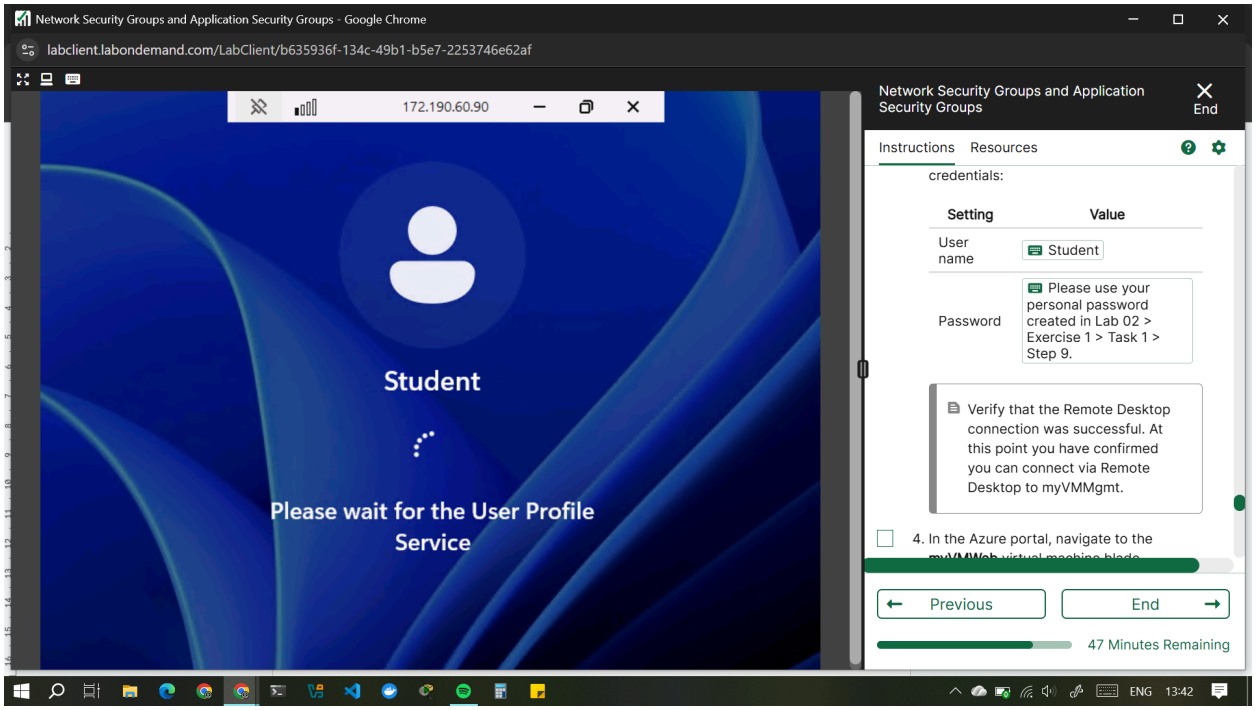
1. Navigate back to the **myVMMgmt** virtual machine blade.
2. On the **myVMMgmt** Overview blade, click **Connect** and, in the drop down menu, click **Connect**.

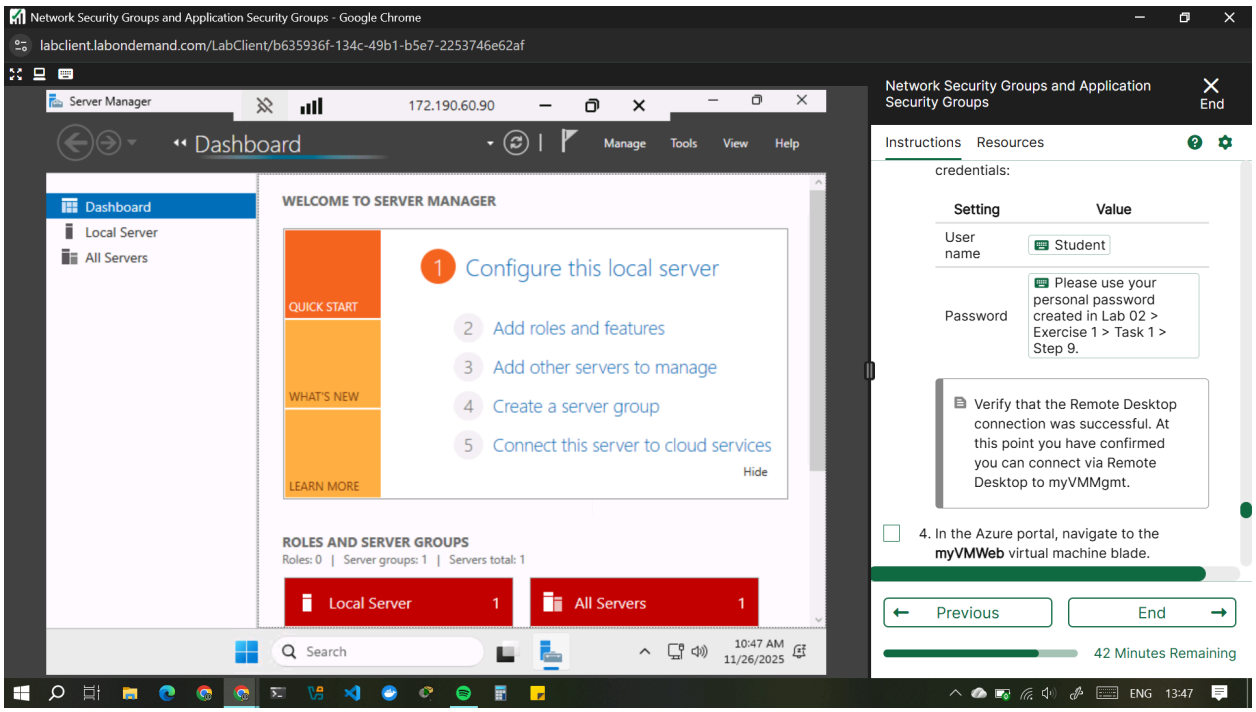
3. Download the RDP file and use it to connect to the **myVMMgmt** Azure VM via Remote Desktop. When prompted to authenticate, provide the following credentials:

Setting	Value
User name	Student

Password	Please use your personal password created in Lab 02 > Exercise 1 > Task 1 > Step 9.

4. Verify that the Remote Desktop connection was successful. At this point you have confirmed you can connect via Remote Desktop to myVMMgmt.

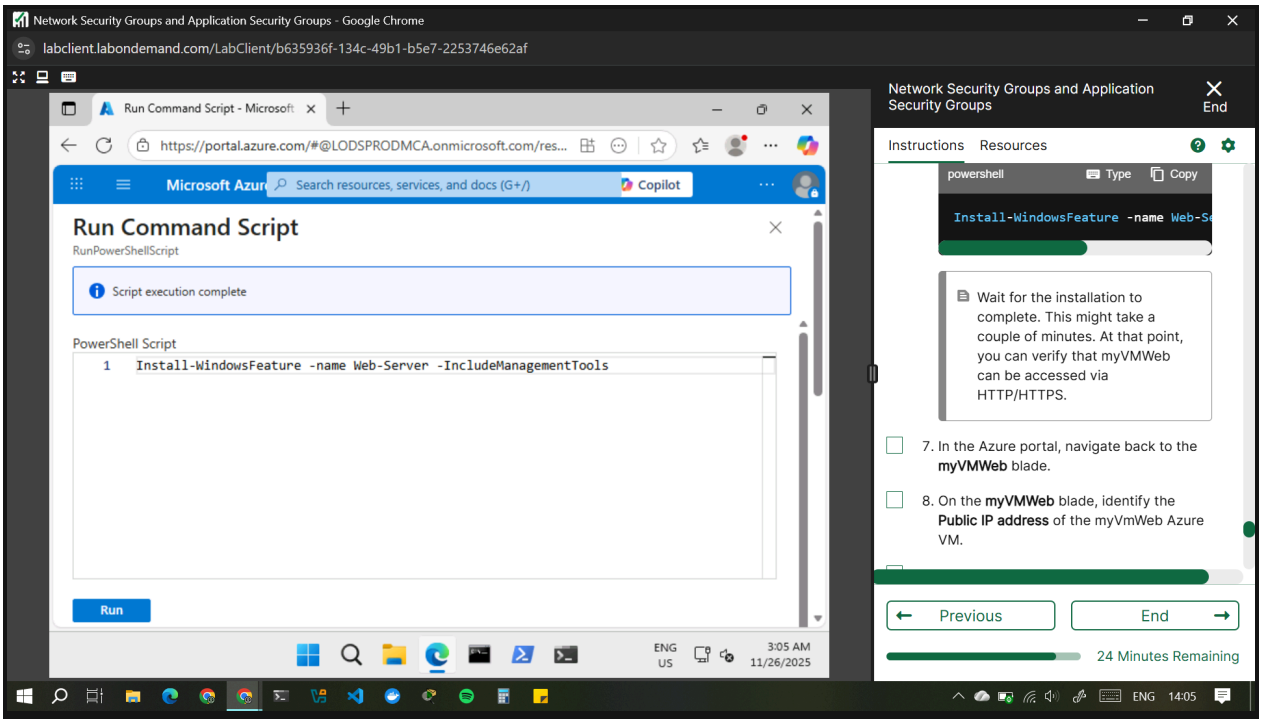


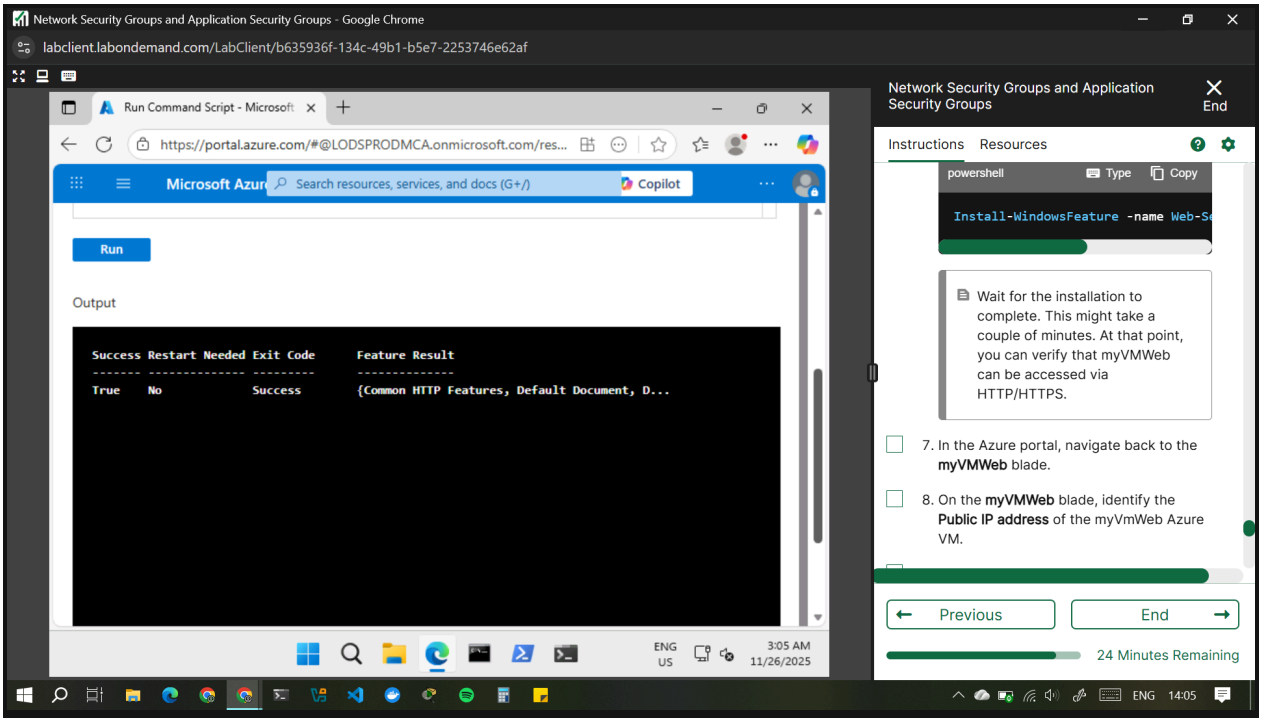


5. In the Azure portal, navigate to the **myVMWeb** virtual machine blade.
6. On the **myVMWeb** blade, in the **Operations** section, click **Run command** and then click **RunPowerShellScript**.

7. On the **Run Command Script** pane, run the following to install the Web server role on **myVmWeb**:

```
Install-WindowsFeature -name Web-Server
-IncludeManagementTools
```

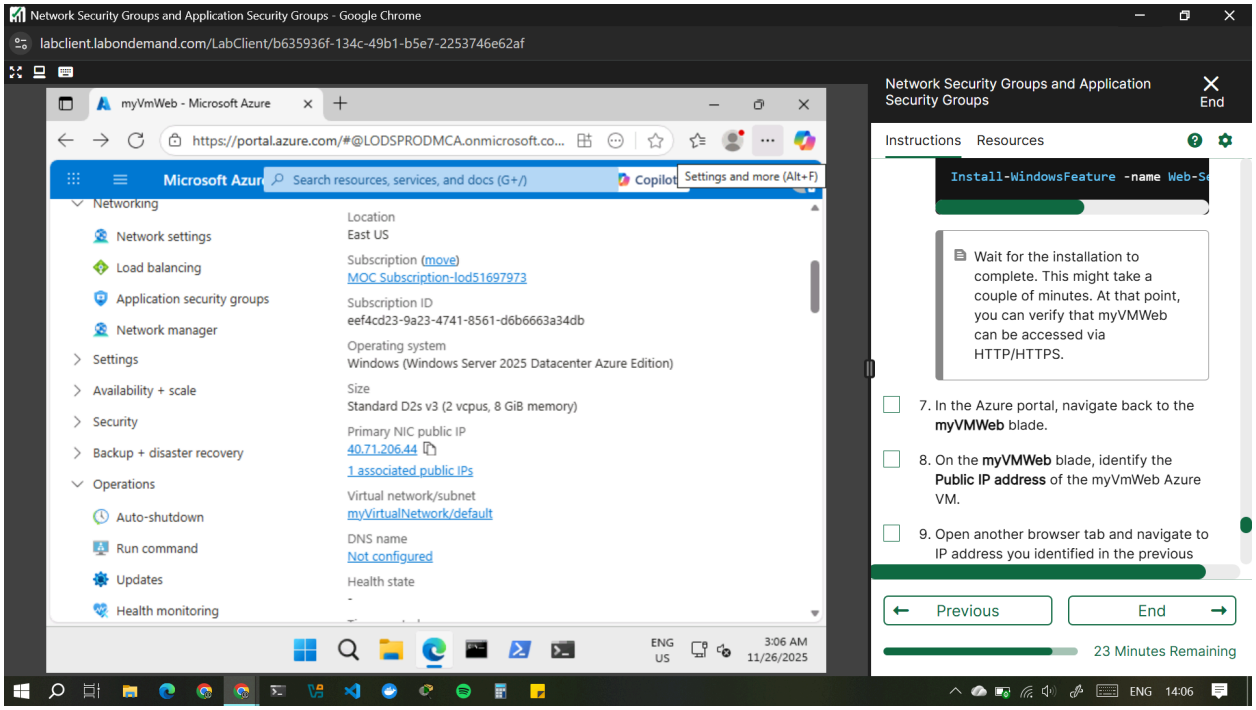


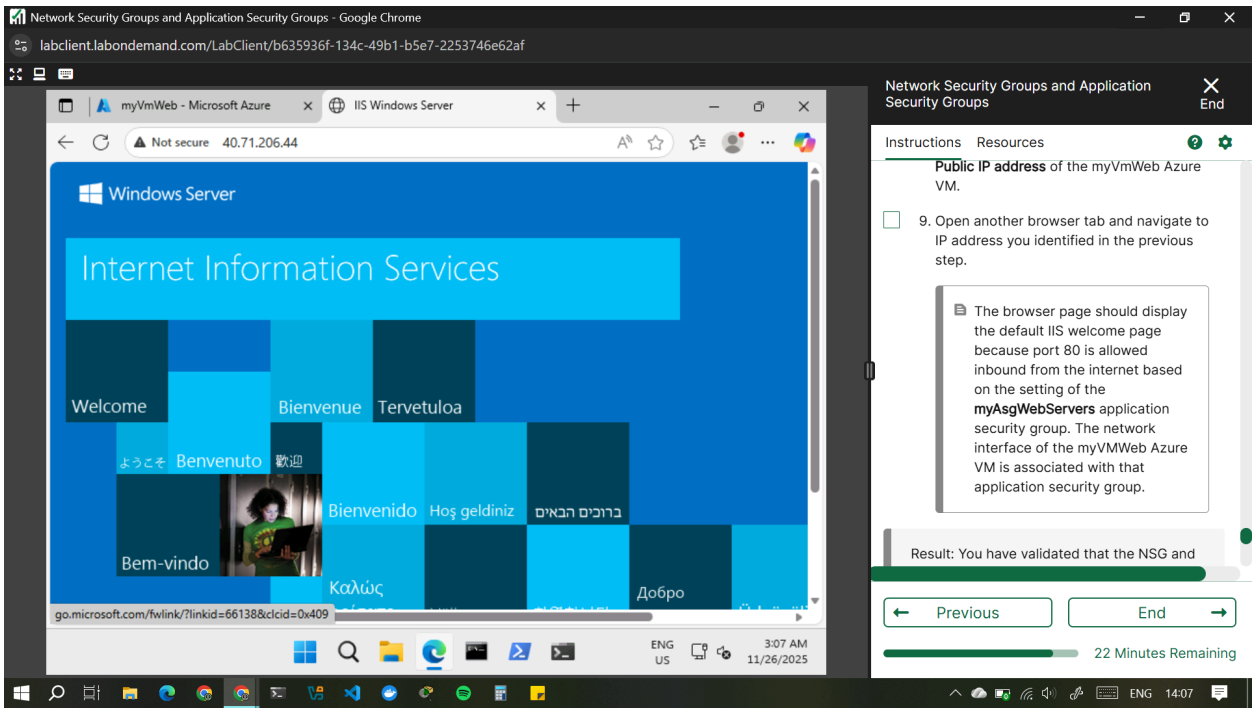


8. Wait for the installation to complete. This might take a couple of minutes. At that point, you can verify that myVMWeb can be accessed via HTTP/HTTPS.
9. In the Azure portal, navigate back to the **myVMWeb** blade.

10. On the **myVMWeb** blade, identify the **Public IP address** of the myVmWeb Azure VM.
11. Open another browser tab and navigate to IP address you identified in the previous step.

    The browser page should display the default IIS welcome page because port 80 is allowed inbound from the internet based on the setting of the **myAsgWebServers** application security group. The network interface of the myVMWeb Azure VM is associated with that application security group.



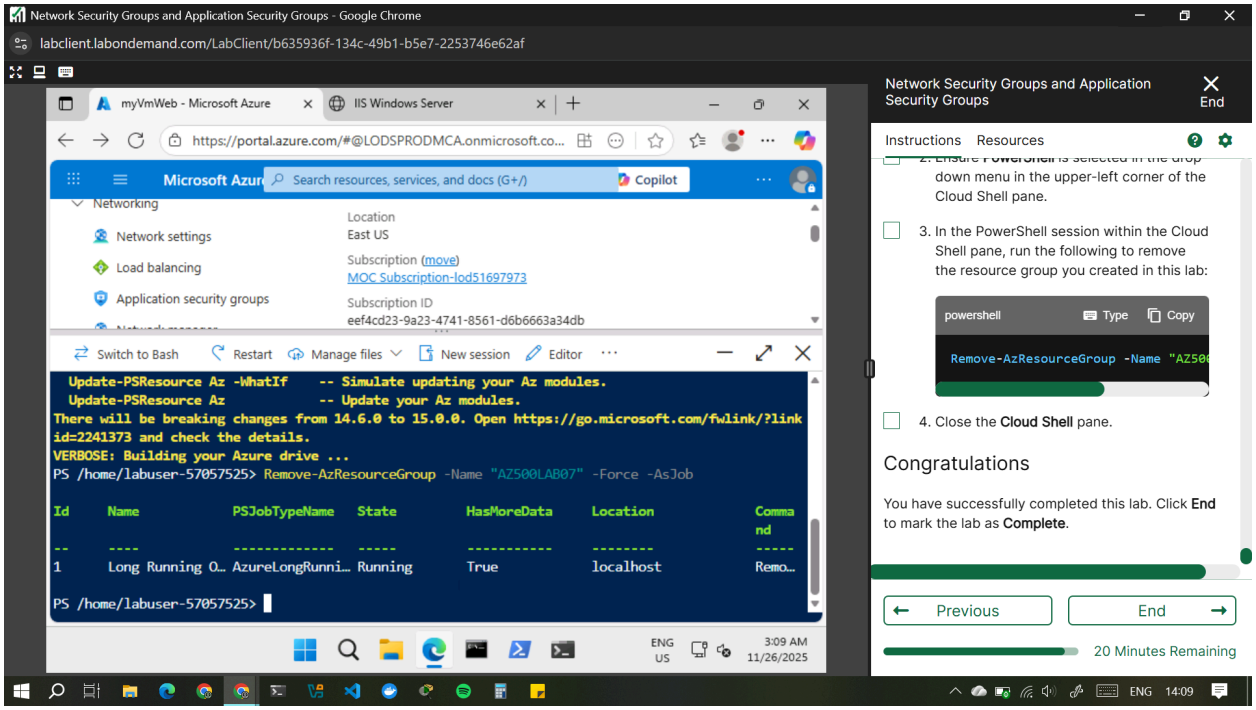


Result: You have validated that the NSG and ASG configuration is working and traffic is being correctly managed.

Clean up resources

Remember to remove any newly created Azure resources that you no longer use. Removing unused resources ensures you will not incur unexpected costs.

1. Open the Cloud Shell by clicking the first icon in the top right of the Azure Portal. If prompted, select **PowerShell** and **No storage account required**, select the name of your subscription, and then select **Apply**.
2. Ensure **PowerShell** is selected in the drop-down menu in the upper-left corner of the Cloud Shell pane.
3. In the PowerShell session within the Cloud Shell pane, run the following to remove the resource group you created in this lab:
4.
5. `Remove-AzResourceGroup -Name "AZ500LAB07" -Force -AsJob`
6. Close the **Cloud Shell** pane.



Conclusion

In this lab, I successfully designed, deployed, and tested a secure virtual networking environment in Azure using **Network Security Groups (NSGs)** and **Application Security Groups (ASGs)**. By creating a virtual network, defining ASGs for workload-based grouping, and applying NSG rules at the subnet level, I demonstrated how Azure enables granular control over inbound and outbound traffic. The deployment of two virtual machines—one acting as a web server and the other as a management server—allowed me to validate the effectiveness of the configured security rules.

I confirmed that **RDP access** was only permitted to the management server through the ASG-based filtering and that the **web server** was safely exposed to the internet through ports **80 and 443**. The successful display of the IIS welcome page verified correct configuration of web traffic rules. This exercise highlighted the importance of segmentation, least-privilege network access, and scalable security management in cloud environments. Overall, the lab demonstrated how NSGs and ASGs work together to provide structured, efficient, and secure network traffic control within Azure.