

Lab 06 - Implement Traffic Management

*For conciseness, *not every single* step of the assignment is included here*

Task 1: Provision the lab environment

1. Creating the resource group and the vnets with 4 VMs:

```
Microsoft Azure Cloud Shell
Search resources, services, and docs (G+/)

PowerShell | ? | [PowerShell Icon] | [Terminal Icon] | [File Explorer Icon] | [Help Icon] | [Logout Icon]

Requesting a Cloud Shell. Succeeded.
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

MOTD: Azure Cloud Shell now includes Predictive IntelliSense! Learn more: https://aka.ms/CloudShell/IntelliSense

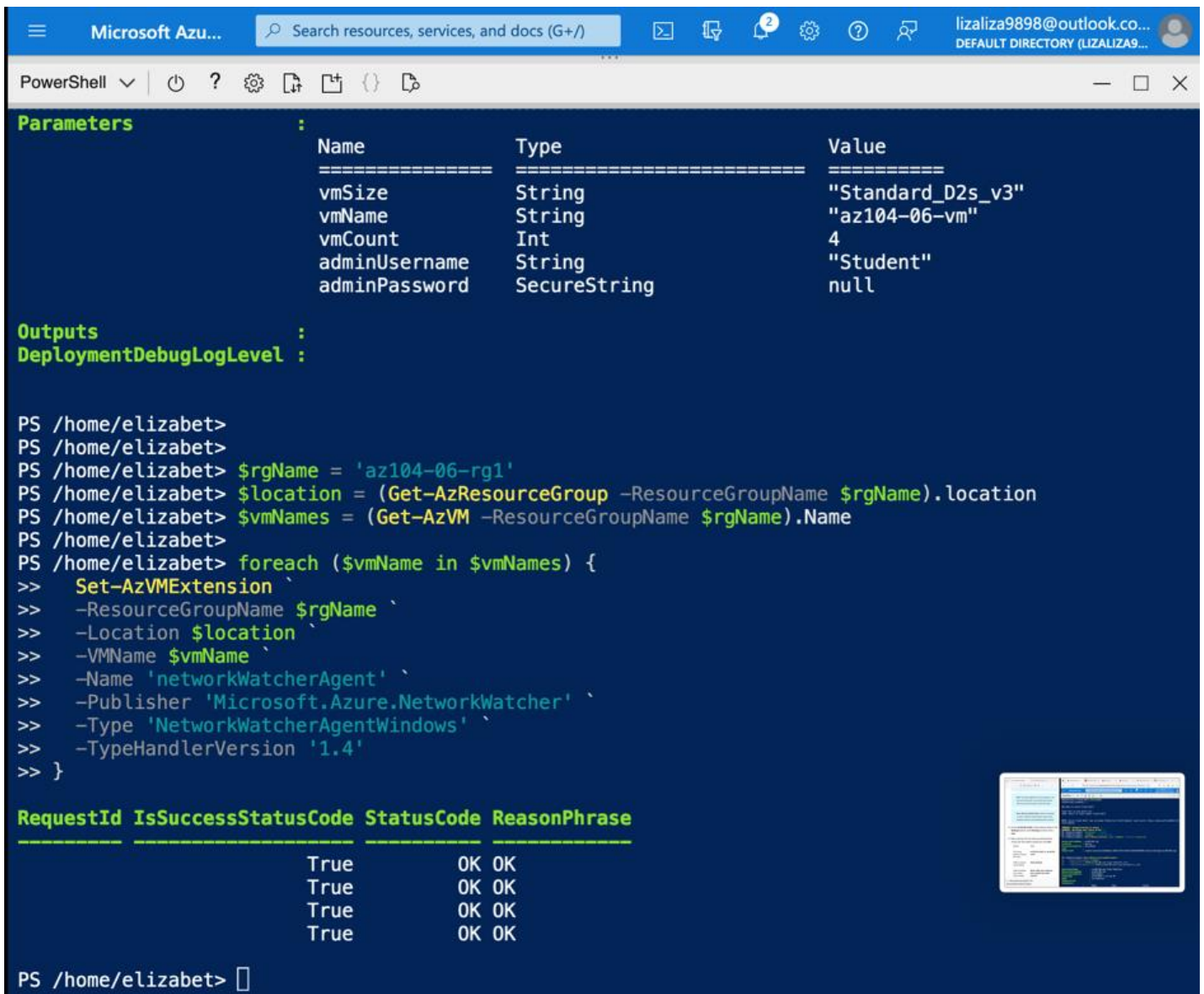
VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/elizabet> $location = 'eastus'
PS /home/elizabet> $rgName = 'az104-06-rg1'
PS /home/elizabet> New-AzResourceGroup -Name $rgName -Location $location

ResourceGroupName : az104-06-rg1
Location           : eastus
ProvisioningState   : Succeeded
Tags               :
ResourceId          : /subscriptions/e29abe6c-d392-4ef5-9c66-5d25436f0796/resourceGroups/az104-06-rg1

PS /home/elizabet> New-AzResourceGroupDeployment `
>> -ResourceGroupName $rgName `
>> -TemplateFile $HOME/az104-06-vms-loop-template.json `
>> -TemplateParameterFile $HOME/az104-06-vms-loop-parameters.json

DeploymentName      : az104-06-vms-loop-template
ResourceGroupName   : az104-06-rg1
ProvisioningState    : Succeeded
Timestamp          : 3/24/2023 7:17:18 PM
Mode                : Incremental
TemplateLink        :
Parameters          :
Name                Type                Value
```

2. Installing Network Watcher:



```
Microsoft Azure Portal
Search resources, services, and docs (G+/)
lializa9898@outlook.co...
DEFAULT DIRECTORY (LIZALIZA9...)


PowerShell
Parameters
:
Name Type Value
=====
vmSize String "Standard_D2s_v3"
vmName String "az104-06-vm"
vmCount Int 4
adminUsername String "Student"
adminPassword SecureString null

Outputs
DeploymentDebugLogLevel :

PS /home/elizabet>
PS /home/elizabet>
PS /home/elizabet> $rgName = 'az104-06-rg1'
PS /home/elizabet> $location = (Get-AzResourceGroup -ResourceGroupName $rgName).location
PS /home/elizabet> $vmNames = (Get-AzVM -ResourceGroupName $rgName).Name
PS /home/elizabet>
PS /home/elizabet> foreach ($vmName in $vmNames) {
>> Set-AzVMExtension `
>> -ResourceGroupName $rgName `
>> -Location $location `
>> -VMName $vmName `
>> -Name 'networkWatcherAgent' `
>> -Publisher 'Microsoft.Azure.NetworkWatcher' `
>> -Type 'NetworkWatcherAgentWindows' `
>> -TypeHandlerVersion '1.4'
>> }

RequestId IsSuccessStatusCode StatusCode ReasonPhrase
-----
True OK OK
True OK OK
True OK OK
True OK OK

PS /home/elizabet>
```



Task 2: Configure the hub and spoke network topology

- Peerings successfully added: **az104-06-vnet01_to_az104-06-vnet2** and **az104-06-vnet01_to_az104-06-vnet3**.

Microsoft Azure portal interface showing the configuration for virtual network **az104-06-vnet01**.

The page displays the **Peering** settings for the virtual network. The left sidebar lists various settings including Address space, Connected devices, Subnets, Bastion, DDoS protection, Firewall, Microsoft Defender for Cloud, Network manager, DNS servers, Peering (selected), Service endpoints, Private endpoints, Properties, Locks, Alerts, Metrics, and Diagnostic settings.

The main content area shows the **Peering** configuration. It includes a search bar, a filter by name dropdown, and a table of peering connections. The table shows two peering connections, both in a **Connected** state, linking to other virtual networks.

Name	Peering status	Peer	Gateway transit
az104-06-vnet01_to_az104-06-vnet2	Connected	az104-06-vnet2	Disabled
az104-06-vnet01_to_az104-06-vnet3	Connected	az104-06-vnet3	Disabled

Task 3: Test transitivity of virtual network peering

- Checking the connection for **10.62.0.4 (az104-06-vm2)** and **10.63.0.4 (az104-06-vm3)**. Here is how I did it:

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Home > Network Watcher

Network Watcher | Connection troubleshoot

Microsoft

Search

<<

Source
az104-06-vm0

Destination
10.63.0.4

Overview

Get started

Monitoring

Topology

Connection monitor (classic)

Connection monitor

Network Performance Monitor

Network diagnostic tools

IP flow verify

NSG diagnostics

Next hop

Effective security rules

VPN troubleshoot

Packet capture

Connection troubleshoot

Metrics

Usage + quotas

Logs

Flow logs

Diagnostic tests

Test	Status	Details	Suggestions
Connectivity Test	✓ Success	Probes Sent: 66 ,Probes Failed: 0 Avg Latency: 1 ms Min Latency: 1 ms Min Latency: 2 ms	None
NSG Outbound (fro...	✓ Success	Outbound communication from source is allowed	None
Next Hop (from sour...	✓ Success	Next Hop Type: VirtualNetworkPeering Route Table Id: System Route	None

Hop by hop details

Name	Status	IP address	Next hop	RTT
az104-06-vm0	✓ Success	10.60.0.4	10.63.0.4	2
az104-06-nic3	✓ Success	10.63.0.4	-	-

Topology view

5. With a view of the topology:

Topology view



 [Give feedback](#)

6. Checking the connection from **az104-06-vm2** to **az104-06-vm3**:

Microsoft Azure Network Watcher | Connection troubleshoot

Search resources, services, and docs (G+)

Home > Network Watcher

Search

Overview

Get started

Monitoring

Topology

Connection monitor (classic)

Connection monitor

Network Performance Monitor

Network diagnostic tools

IP flow verify

NSG diagnostics

Next hop

Effective security rules

VPN troubleshoot

Packet capture

Connection troubleshoot

Metrics

Usage + quotas

Logs

Flow logs

Connection diagnostic

D diagnostic tests * ⓘ

4 selected

Run diagnostic tests

D diagnostic details

Source: az104-06-vm2

Destination: 10.63.0.4

D diagnostic tests

Test	Status	Details	Suggestions
Connectivity Test	❌ Fail	Probes Sent: 0 ,Probes Failed: 0	-
NSG Outbound (fro...	❌ Fail	There are failed tests in the following NSGs: <ul style="list-style-type: none">• az104-06-nsg2	Go to VM > Update the networking rule Read docs
Next Hop (from sour...	✅ Success	Next Hop Type: None Route Table Id: System Route	None

Hop by hop details

Name	Status	IP address	Next hop	RTT
Hops data is not available				

[Give feedback](#)

➔ Connection failed because the two vnets are not peered.

Task 4: Configure routing in the hub and spoke topology

7. Enabling IP forwarding to allow **az104-06-vm0** to act as a router so it can route the traffic between the vnets.

The screenshot shows the Azure portal interface for configuring the **az104-06-nic0** network interface. The breadcrumb navigation indicates the path: Home > Virtual machines > az104-06-vm0 | Networking > az104-06-nic0. The page title is **az104-06-nic0 | IP configurations**, with a sub-header **Network interface**. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Settings, IP configurations (selected), DNS servers, Network security group, Properties, Locks, Monitoring, Insights, Alerts, Metrics, Diagnostic settings, Automation, Tasks (preview), Export template, and Help. The main content area shows the **IP forwarding settings** for the **az104-06-nic0** interface. The **IP forwarding** toggle is set to **Enabled**. The **Virtual network** is **az104-06-vnet01**. The **IP configurations** section shows a dropdown for **Subnet *** set to **subnet0**. Below this is a search bar for IP configurations and a table with the following data:

Name	IP Version	Type	Private IP address	Public IP address
ipconfig1	IPv4	Primary	10.60.0.4 (Dynamic)	-

8. Installing Remote Access Windows Server through the command script:

Microsoft Azure portal interface showing the 'Run Command Script' window for a virtual machine named 'az104'.

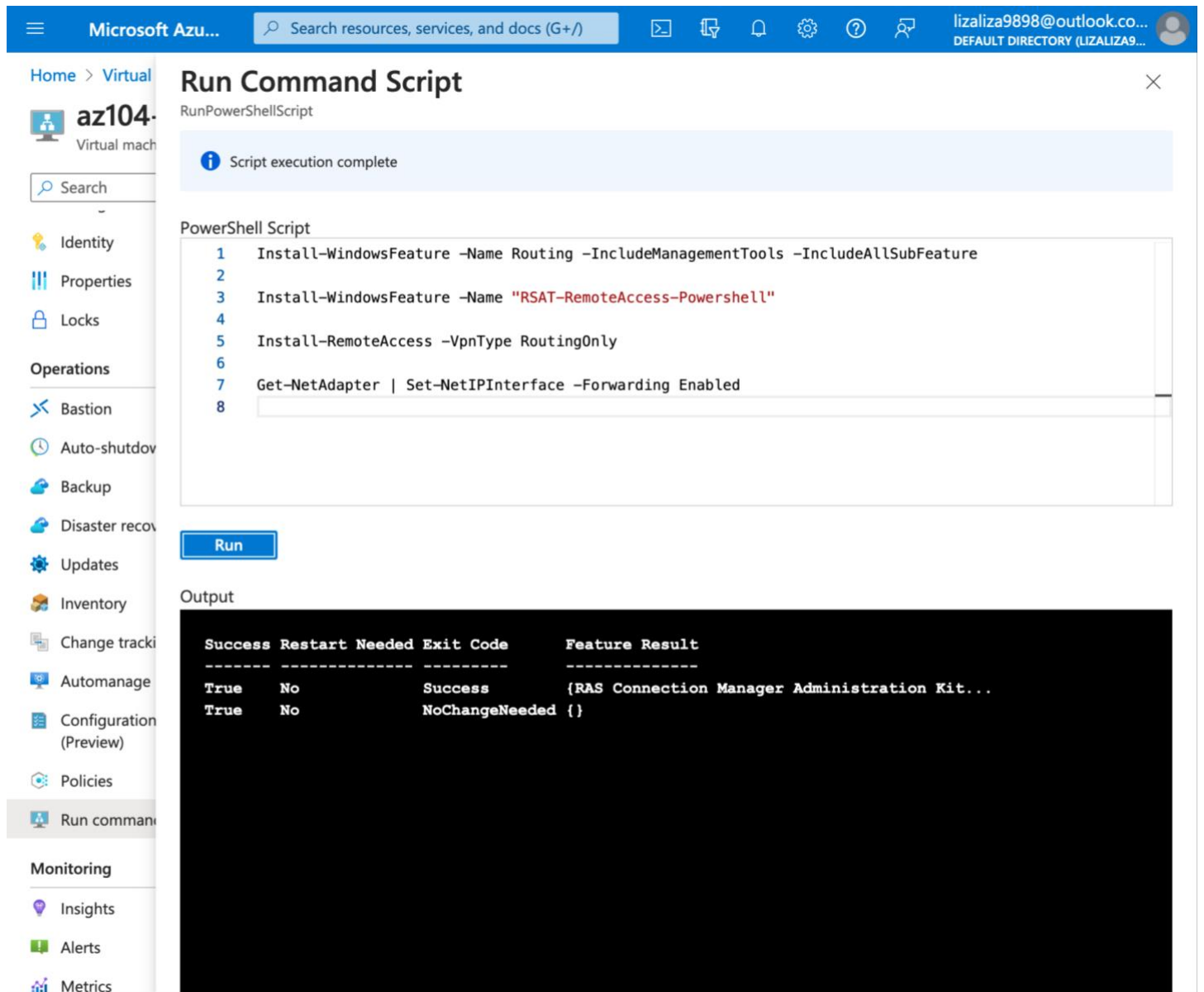
The script executed is:

```
1 Install-WindowsFeature RemoteAccess -IncludeManagementTools
2
```

The output shows the following results:

Success	Restart Needed	Exit Code	Feature	Result
True	No	Success	{Remote Access}	

9. Installing the Routing role service through the command script:



The screenshot displays the Microsoft Azure portal interface for a virtual machine named 'az104'. The 'Run Command Script' window is open, showing a PowerShell script to install the Routing role service. The script consists of seven lines of code. A status message at the top indicates 'Script execution complete'. Below the script, a 'Run' button is visible. The 'Output' section shows the results of the script execution in a table format.

Run Command Script

RunPowerShellScript

Script execution complete

PowerShell Script

```
1 Install-WindowsFeature -Name Routing -IncludeManagementTools -IncludeAllSubFeature
2
3 Install-WindowsFeature -Name "RSAT-RemoteAccess-Powershell"
4
5 Install-RemoteAccess -VpnType RoutingOnly
6
7 Get-NetAdapter | Set-NetIPInterface -Forwarding Enabled
8
```

Run

Output

Success	Restart Needed	Exit Code	Feature Result
True	No	Success	{RAS Connection Manager Administration Kit...
True	No	NoChangeNeeded	{}

10. After creating route table **az104-06-rt23**, I added the following route (and later a subnet, too):

(from **vnet2** to **vnet3**)

The screenshot displays the Microsoft Azure portal interface. The top navigation bar includes the 'Microsoft Azure' logo, a search bar, and user information for 'lizaliza9898@outlook.co...'. The left-hand navigation pane shows the 'Routes' section selected under the 'az104-06-rt23' route table. The main content area is titled 'Add route' and contains the following configuration fields:

- Route name ***: az104-06-route-vnet2-to-vnet3 (with a green checkmark)
- Destination address prefix ***: IP Addresses (with a dropdown arrow)
- Destination IP addresses/CIDR ranges ***: 10.63.0.0/20 (with a green checkmark)
- Next hop type ***: Virtual appliance (with a dropdown arrow)
- Next hop address ***: 10.60.0.4 (with a green checkmark)

Below the configuration fields, a blue information box states: 'Ensure you have IP forwarding enabled on your virtual appliance. You can enable this by navigating to the respective network interface's IP address settings.' At the bottom of the panel is a blue 'Add' button.

11. Next, after adding another route table - **az104-06-rt32** -, I added the following route from vnet3 to vnet2:

The screenshot displays the Microsoft Azure portal interface. The top navigation bar includes the 'Microsoft Azure' logo, a search bar, and user information for 'lizarda9898@outlook.co...'. The left-hand navigation pane lists various services, with 'Routes' selected under the 'Settings' section. The main content area is titled 'Add route' for the route table 'az104-06-rt32'. The configuration form includes the following fields:

- Route name ***: 'az104-06-route-vnet3-to-vnet2' (marked with a green checkmark).
- Destination address prefix ***: 'IP Addresses' (dropdown menu).
- Destination IP addresses/CIDR ranges ***: '10.62.0.0/20' (marked with a green checkmark).
- Next hop type ***: 'Virtual appliance' (dropdown menu).
- Next hop address ***: '10.60.0.4' (marked with a green checkmark).

A blue information icon and a note at the bottom of the form state: 'Ensure you have IP forwarding enabled on your virtual appliance. You can enable this by navigating to the respective network interface's IP address settings.' A blue 'Add' button is located at the bottom right of the configuration area.

12. Adding the new route table's subnet:

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5

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DEFAULT DIRECTORY (LIZALIZA9...

Home > Microsoft.RouteTable-20230324220430 | Overview > az104-06-rt32

az104-06-rt32 | Subnets

Route table

Search

« + Associate

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

Configuration

Routes

Subnets

Properties

Locks

Monitoring

Alerts

Automation

Tasks (preview)

Export template

Help

Effective routes

New Support Request

Search subnets

Name ↑↓	Address range ↑↓	Virtual network ↑↓	Security group ↑↓	
subnet0	10.63.0.0/24	az104-06-vnet3	-	...

Saved route table for subnet

Successfully saved route table for subnet 'subnet0'.

13. This is where I ran into a problem. When testing the connection from **az104-06-vm2** to **10.63.0.4**, the test kept failing. I tried stopping and restarting the **az104-06-vm0** as the task suggested, but it still would not work. I even went ahead and restarted all VMs, signed in and out of my account... still, the first test kept failing.

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Home > Network Watcher

Network Watcher | Connection troubleshoot

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Microsoft

Search

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Overview

Get started

Monitoring

Topology

Connection monitor (classic)

Connection monitor

Network Performance Monitor

Network diagnostic tools

IP flow verify

NSG diagnostics

Next hop

Effective security rules

VPN troubleshoot

Packet capture

Connection troubleshoot

Metrics

Usage + quotas

Logs

Flow logs

Connection diagnostic

Diagnostic tests * ⓘ

4 selected

Run diagnostic tests

Diagnostic details

SourceDestination
az104-06-vm210.63.0.4

Diagnostic tests

Test	Status	Details	Suggestions
Connectivity Test	❌ Fail	Probes Sent: 0 ,Probes Failed: 0	-
NSG Outbound (fro...	✅ Success	Outbound communication from source is allowed	None
Next Hop (from sour...	✅ Success	Next Hop Type: VirtualAppliance Next Hop IP: 10.60.0.4	None

Hop by hop details

Name	Status	IP address	Next hop	RTT
Hops data is not available				

Give feedback

14. At least the topology view became available after many attempts:

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Home > Network Watcher

Network Watcher | Connection troubleshoot

Microsoft

Search

Overview

Get started

Monitoring

Topology

Connection monitor (classic)

Connection monitor

Network Performance Monitor

Network diagnostic tools

IP flow verify

NSG diagnostics

Next hop

Effective security rules

VPN troubleshoot

Packet capture

Connection troubleshoot

Metrics

Usage + quotas

Logs

Flow logs

Connectivity Test Fail Probes Sent: 0 ,Probes Failed: 0 -

NSG Outbound (fro... Success Outbound communication from source is allowed None

Next Hop (from sour... Success Next Hop Type: VirtualAppliance
Next Hop IP: 10.60.0.4 None

Hop by hop details

Name	Status	IP address	Next hop	RTT
az104-06-vm2	Info	10.62.0.4	10.60.0.4	-
az104-06-nic0	Info	10.60.0.4	10.63.0.4	-
az104-06-nic3	Info	10.63.0.4	-	-

Topology view

```
graph LR; VM[az104-06-vm2  
10.62.0.4] --> NIC0[az104-06-nic0  
10.60.0.4]; NIC0 --> NIC3[az104-06  
10.63.0.4];
```

Task 5: Implement Azure Load Balancer

15. Creating and configuring a load balancer:

Microsoft Azure

Search resources, services, and docs (G+)

lizaliza9898@outlook.co...
DEFAULT DIRECTORY (LIZALIZA9...

Home > Load balancing | Load Balancer >

Create load balancer ...

Basics Frontend IP configuration Backend pools **Inbound rules** Outbound rules

Load balancing rule

A load balancing rule distributes incoming traffic that is sent to a selected IP address and port. A load balancing rule uses a health probe to determine which backend instances are eligible to receive traffic.

+ Add a load balancing rule

Name ↑↓	Frontend IP configuration ↑↓	Backend pool ↑↓	Health probe ↑↓
Add a rule to get started			

Inbound NAT rule

An inbound NAT rule forwards incoming traffic sent to a selected IP address and port combination to a selected backend IP address and port combination.

+ Add an inbound nat rule

Name ↑↓	Frontend IP configuration ↑↓	Service ↑↓
Add a rule to get started		

Add load balancing rule

Port * ①

80 ✓

Backend port * ①

80 ✓

Health probe * ①

(new) az104-06-lb4-hp1 ✓

Create new

Session persistence ①

None

Idle timeout (minutes) * ①

4

TCP reset

☒ Disabled

☐ Enabled

Floating IP ①

☒ Disabled

☐ Enabled

Outbound source network address translation (SNAT) ①

☒ (Recommended) Use outbound rules to provide backend pool members access to the internet. [Learn more](#)

☐ Use default outbound access. This is not recommended because it can cause SNAT port exhaustion. [Learn more](#)

Review + create

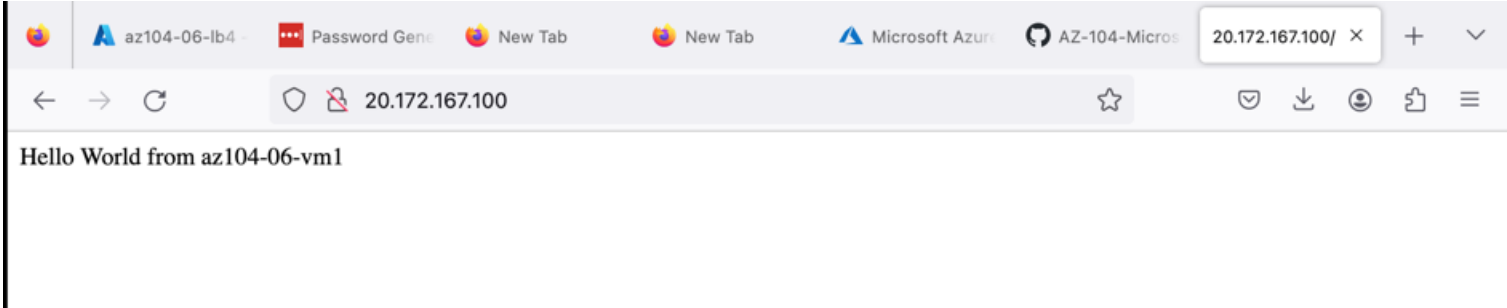
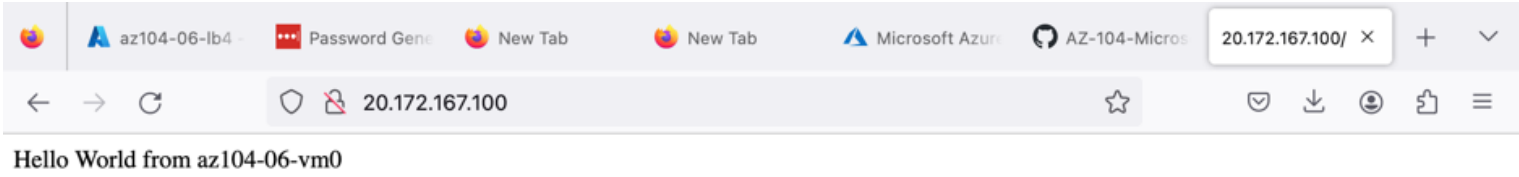
< Previous

Next : Outbound rule >

Download a template

Add

16. Ensuring that the load balancer works properly:



Task 6: Implement Azure Application Gateway

17. After setting up and creating the application gateway, the deployment is complete and now I only need to test it:

The screenshot displays the Microsoft Azure portal interface. At the top, the header bar includes the Microsoft Azure logo, a search bar, and user information for 'lizaliza9898@outlook.co...'. The main content area is titled 'Microsoft.ApplicationGateway-20230324223704 | Overview'. A left-hand navigation pane lists 'Overview', 'Inputs', 'Outputs', and 'Template'. The 'Overview' section shows a green checkmark icon and the text 'Your deployment is complete'. Below this, deployment details are listed: 'Deployment name: Micr...', 'Subscription: Azure Pass...', 'Resource group: az104-...', 'Start time: 3/24/2023, ...', and 'Correlation ID: 7bfa81b1'. A 'Go to resource group' button is present. The right-hand sidebar contains three sections: 'Cost Management' with a green circle icon and a link to 'Set up cost alerts >', 'Microsoft Defender for Cloud' with a green shield icon and a link to 'Go to Microsoft Defender for Cloud >', and 'Free Microsoft tutorials' with a link to 'Start learning today >'. At the bottom of the sidebar, there is a section for 'Work with an expert' with a link to 'Find an Azure expert >'.

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

Home >

Microsoft.ApplicationGateway-20230324223704 | Overview

Deployment

Search

Delete Cancel Redeploy Download Refresh

Overview

Inputs

Outputs

Template

✓ Your deployment is complete

Deployment name: Micr... Start time: 3/24/2023, ...
Subscription: Azure Pass... Correlation ID: 7bfa81b1
Resource group: az104-...

Deployment details

Next steps

Go to resource group

Give feedback

Tell us about your experience with deployment

Cost Management

Get notified to stay within your budget and prevent unexpected charges on your bill.
Set up cost alerts >

Microsoft Defender for Cloud

Secure your apps and infrastructure
Go to Microsoft Defender for Cloud >

Free Microsoft tutorials

Start learning today >

Work with an expert

Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.
Find an Azure expert >

18. Messages change each time the browser window is refreshed:

