



IT4090

Cloud Computing

4th Year, 1st Semester

Azure Lab 4

Practical Session

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1. Create NAT gateway

The screenshot shows the Microsoft Azure portal interface for creating a NAT gateway. The browser address bar displays `portal.azure.com/#create/Microsoft.NatGateway-ARM`. The page title is "Create network address translation (NAT) gateway". The "Basics" tab is selected, with other tabs being "Outbound IP", "Subnet", "Tags", and "Review + create".

Project details

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

Subscription *

Resource group * [Create new](#)

Instance details

NAT gateway name *

Region *

Availability zone

TCP idle timeout (minutes) * 4-120

At the bottom, there are navigation buttons: "Review + create", "< Previous", "Next : Outbound IP >", and a link "Download a template for automation".

Figure 1. 1: In the Basics tab of Create network address translation (NAT) gateway

The screenshot shows the Microsoft Azure portal interface for creating a NAT gateway, specifically the "Outbound IP" tab. The browser address bar displays `portal.azure.com/#create/Microsoft.NatGateway-ARM`. The page title is "Create network address translation (NAT) gateway". The "Outbound IP" tab is selected, with other tabs being "Basics", "Subnet", "Tags", and "Review + create".

Configure which public IP addresses and public IP prefixes to use. Each outbound IP address provides 64,000 SNAT ports for the NAT gateway resource to use. You can add up to 16 outbound IP addresses.

Note: While you do not have to complete this step to create a NAT gateway, the NAT gateway will not be functional and any subnet with this NAT gateway will not have outbound connectivity until you have added at least one public IP address or public IP prefix. You can also add and reconfigure which IP addresses are included after creating the NAT gateway.

Public IP addresses [Create a new public IP address](#)

Public IP Prefixes [Create a new public IP prefix](#)

At the bottom, there are navigation buttons: "Review + create", "< Previous", "Next : Subnet >", and a link "Download a template for automation".

Figure 1. 2: Create a new public IP address

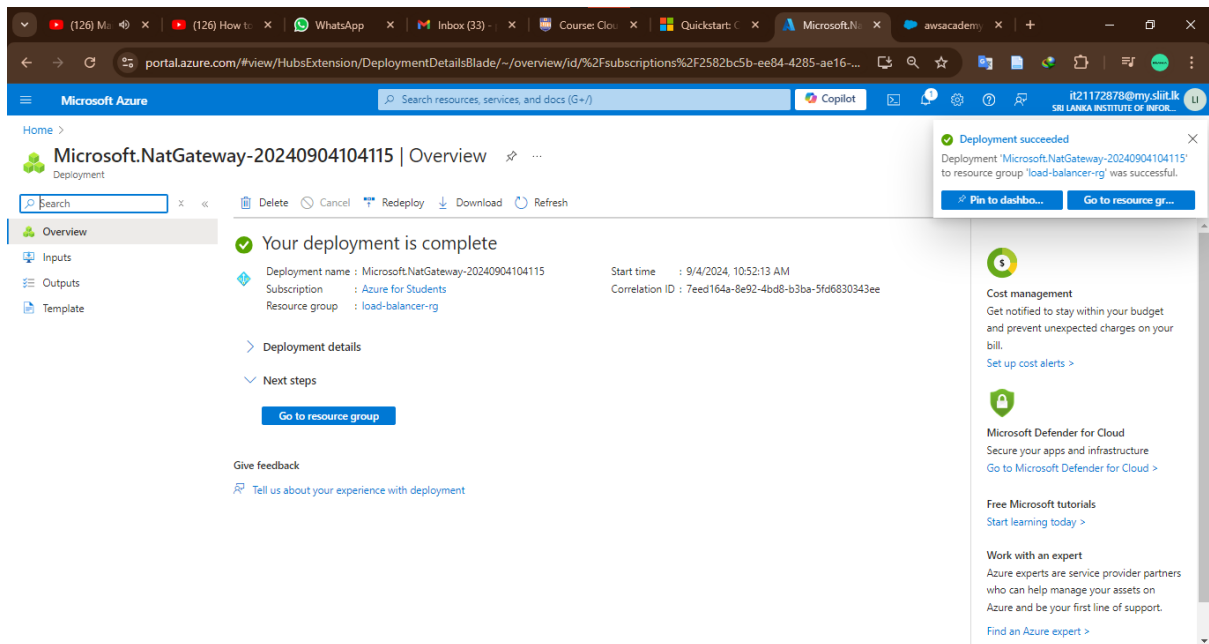


Figure 1. 3: NAT gateway deployment succeeded

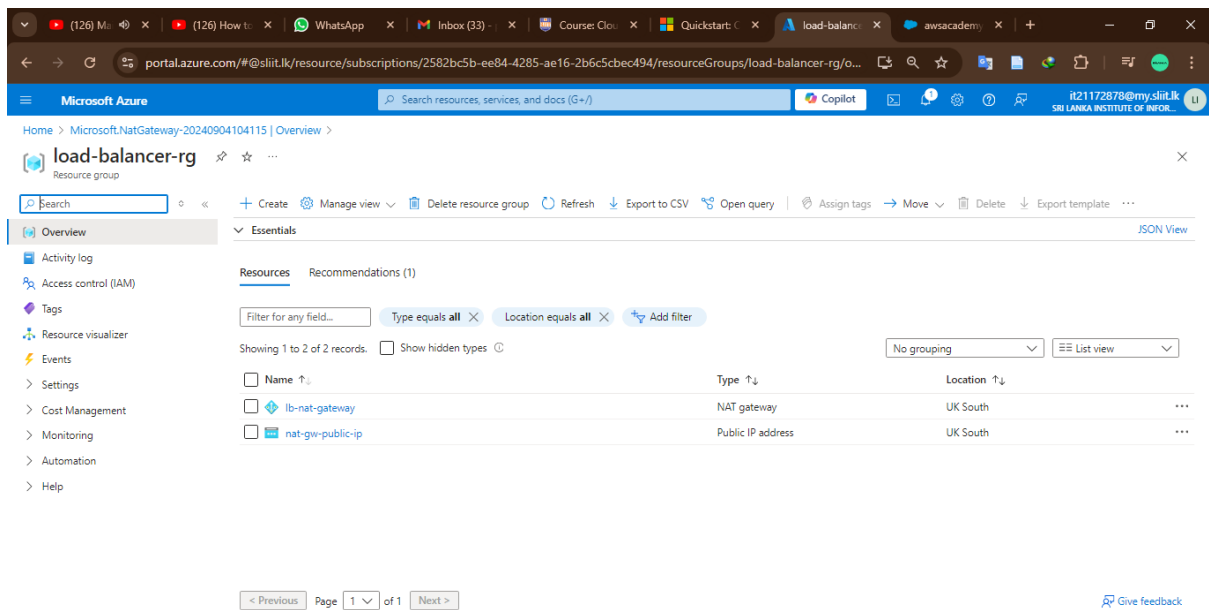


Figure 1. 4: Resource of NAT gateway

2. Create a virtual network and bastion host

The screenshot shows the 'Create virtual network' page in the Azure portal, specifically the 'Basics' tab. The page is titled 'Create virtual network' and has a breadcrumb trail 'Home > Virtual networks >'. Below the title are tabs for 'Basics', 'Security', 'IP addresses', 'Tags', and 'Review + create'. The 'Basics' tab is active. Under the 'Project details' section, there is a description: 'Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.' Below this are two dropdown menus: 'Subscription *' set to 'Azure for Students' and 'Resource group *' set to 'load-balancer-rg'. A link 'Create new' is visible below the resource group dropdown. Under the 'Instance details' section, there is a text input for 'Virtual network name *' containing 'lb-vnet' and a dropdown for 'Region *' set to '(Europe) UK South'. A link 'Deploy to an Azure Extended Zone' is visible below the region dropdown. At the bottom, there are three buttons: 'Previous', 'Next', and 'Review + create'. A 'Give feedback' link is also present.

Figure 2. 1: On the Basics tab of Create virtual network, enter that information

The screenshot shows the 'Create virtual network' page in the Azure portal, specifically the 'Security' tab. The page is titled 'Create virtual network' and has a breadcrumb trail 'Home > Virtual networks >'. Below the title are tabs for 'Basics', 'Security', 'IP addresses', 'Tags', and 'Review + create'. The 'Security' tab is active. Under the 'Azure Bastion' section, there is a description: 'Azure Bastion is a paid service that provides secure RDP/SSH connectivity to your virtual machines over TLS. When you connect via Azure Bastion, your virtual machines do not need a public IP address. [Learn more.](#)' Below this is a checkbox 'Enable Azure Bastion' which is checked. Under the 'Azure Firewall' section, there is a description: 'Azure Firewall is a managed cloud-based network security service that protects your Azure Virtual Network resources. [Learn more.](#)' Below this is a checkbox 'Enable Azure Firewall' which is unchecked. In the middle, there are two text input fields: 'Azure Bastion host name' containing 'lb-bastion' and 'Azure Bastion public IP address *' containing '(New) lb-bastion-ip'. A link 'Create a public IP address' is visible below the public IP address dropdown. At the bottom, there are three buttons: 'Previous', 'Next', and 'Review + create'. A 'Give feedback' link is also present.

Figure 2. 2: Create a public IP address

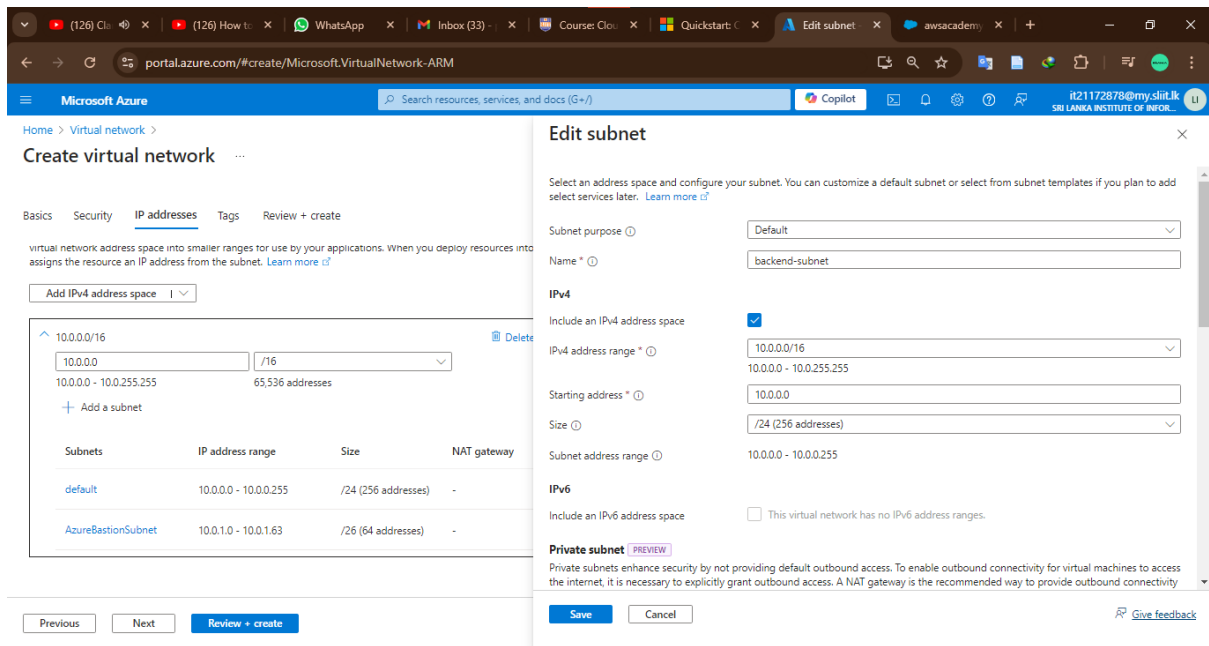


Figure 2. 3: Edit subnet name and Starting address

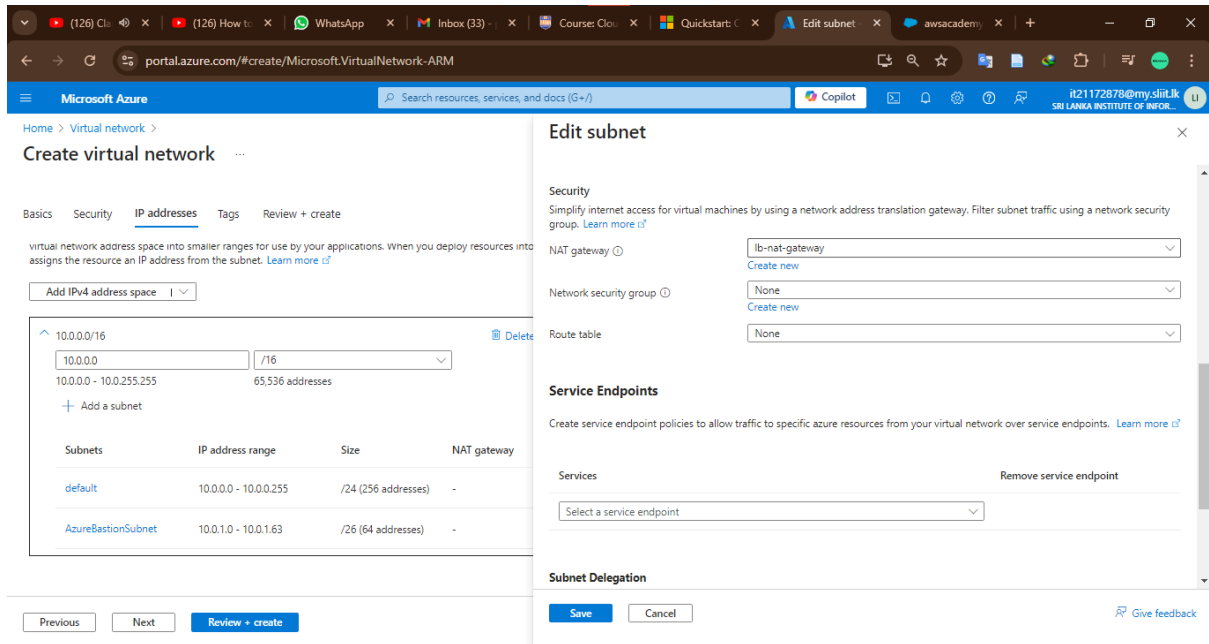


Figure 2. 4: Select NAT gateway

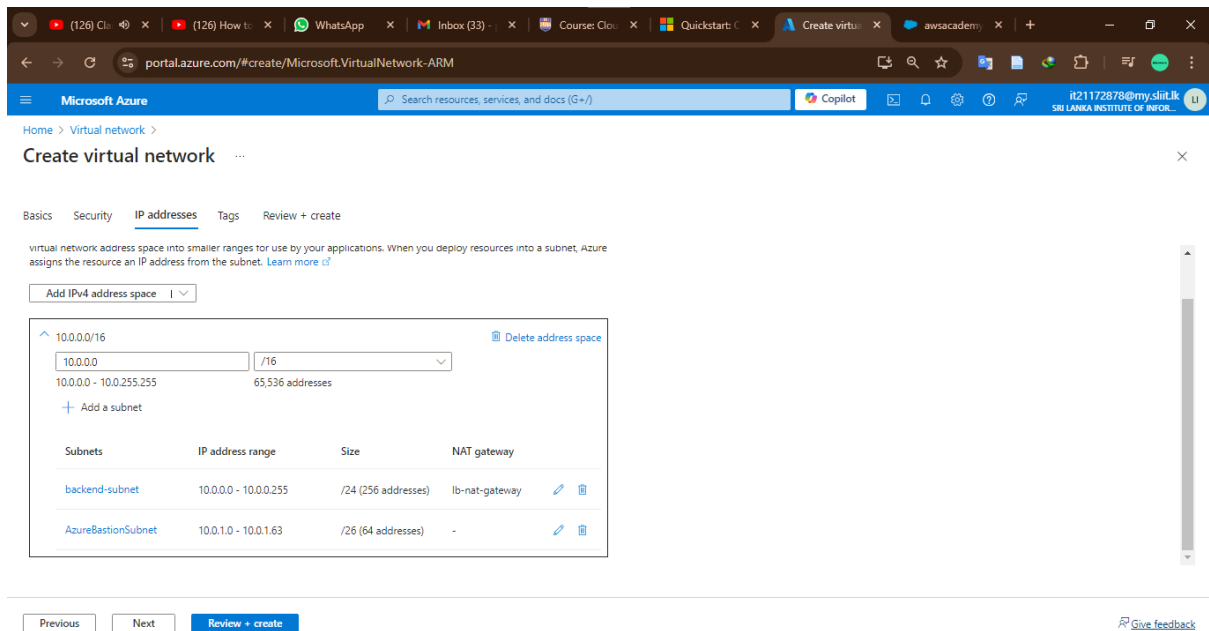


Figure 2. 5: Created subnet

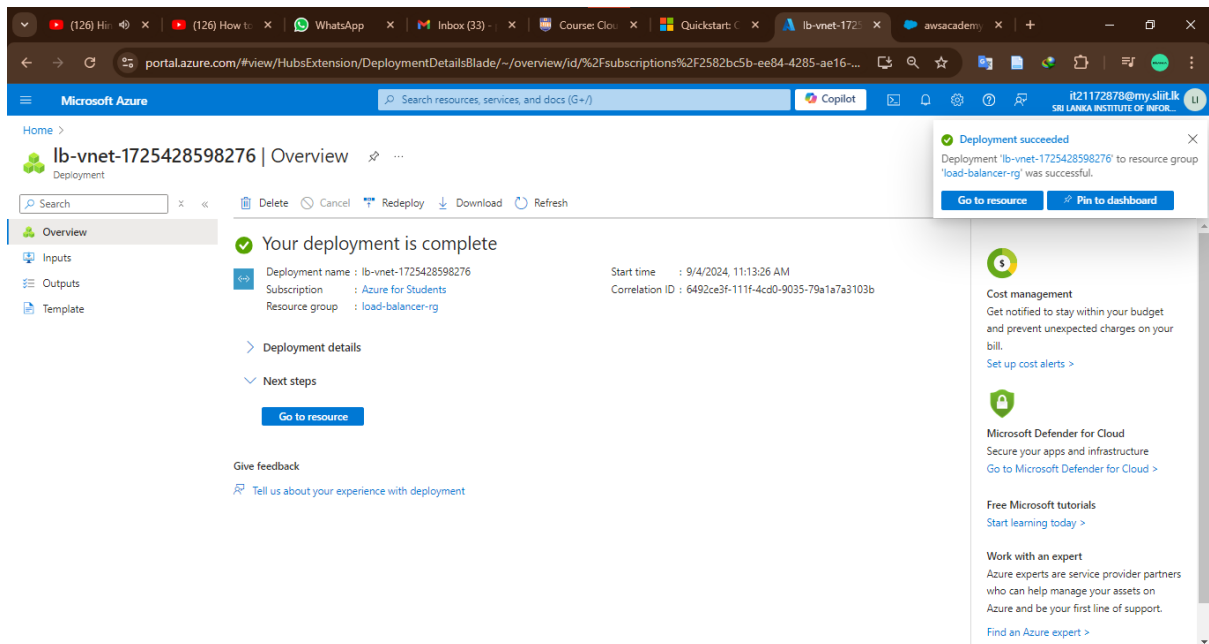


Figure 2. 6: Virtual network deployment succeeded

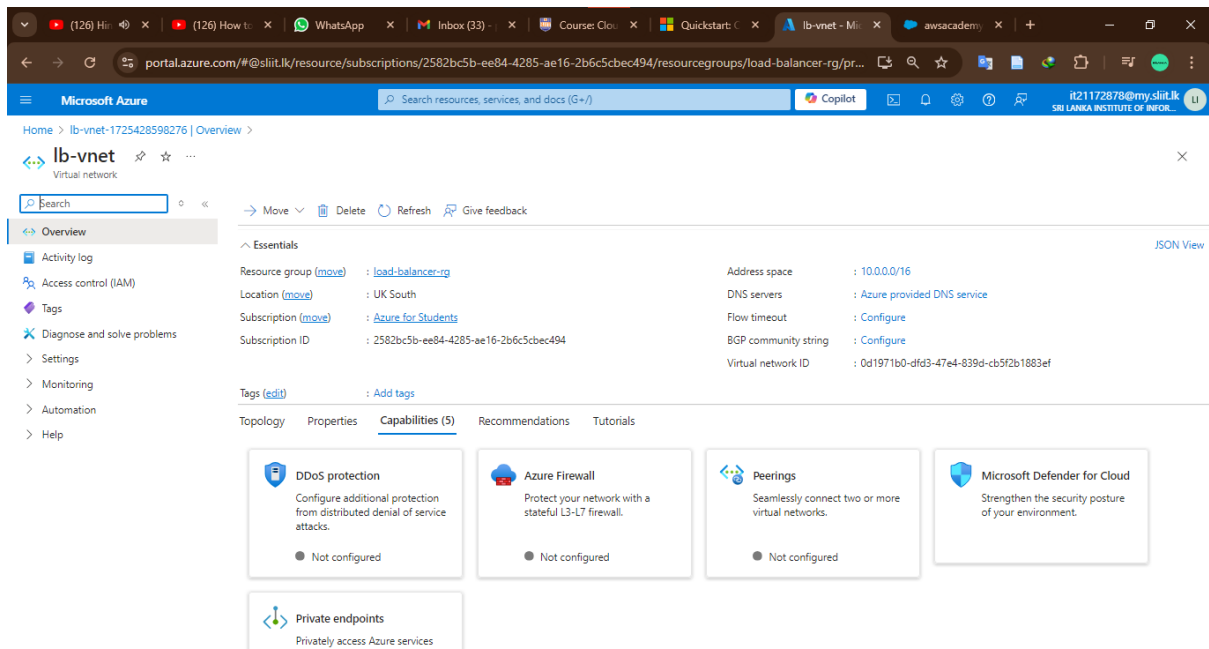
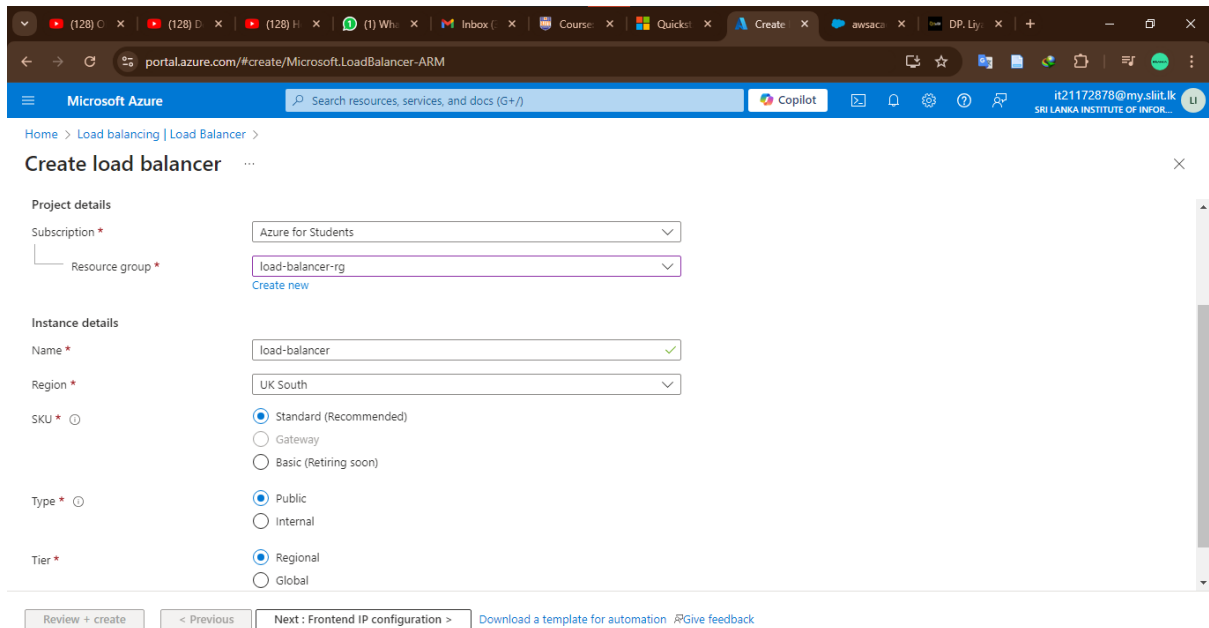


Figure 2. 7: Resource of Virtual Network

3. Create load balancer

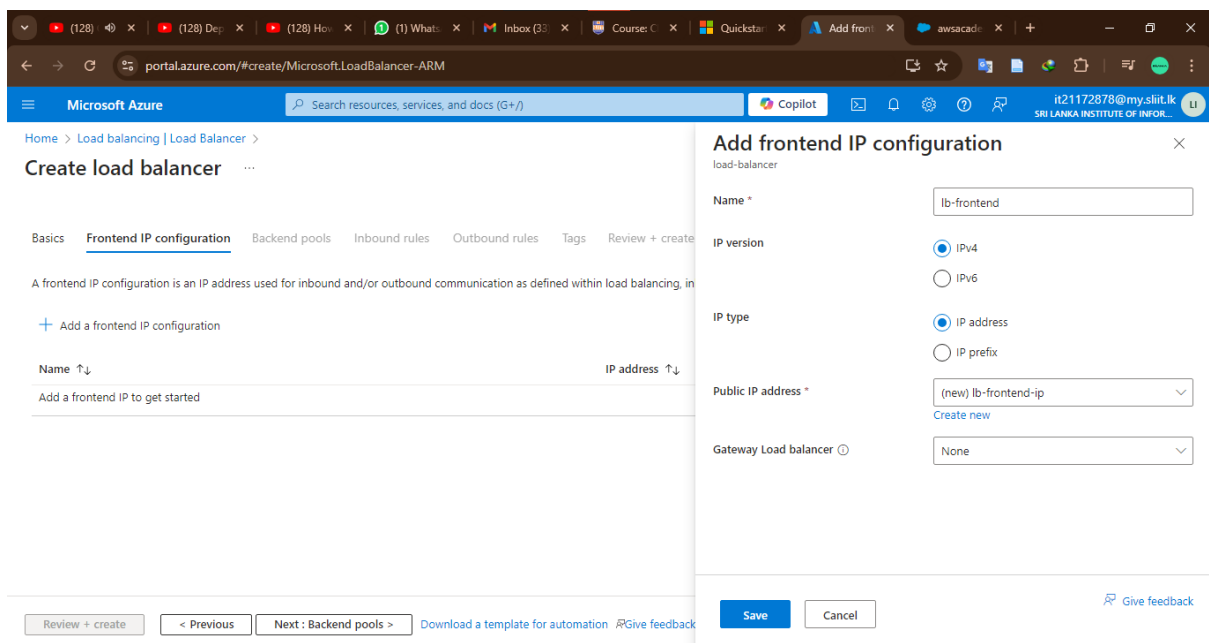


The screenshot shows the 'Create load balancer' page in the Microsoft Azure portal. The 'Basics' tab is selected. The form includes the following fields:

- Project details:**
 - Subscription: Azure for Students
 - Resource group: load-balancer-rg
- Instance details:**
 - Name: load-balancer
 - Region: UK South
 - SKU: Standard (Recommended)
 - Type: Public
 - Tier: Regional

Navigation buttons at the bottom include 'Review + create', '< Previous', 'Next: Frontend IP configuration >', and a link to 'Download a template for automation'.

Figure 3. 1: In the Basics tab, select Resource group and Name



The screenshot shows the 'Add frontend IP configuration' dialog box in the Microsoft Azure portal. The dialog is titled 'Add frontend IP configuration' and is for the 'load-balancer' resource. It includes the following fields:

- Name:** lb-frontend
- IP version:** IPv4
- IP type:** IP address
- Public IP address:** (new) lb-frontend-ip
- Gateway Load balancer:** None

Buttons at the bottom of the dialog include 'Save', 'Cancel', and a link to 'Give feedback'.

Figure 3. 2: Enter Name and create Public IP address

The screenshot shows the 'Create load balancer' page in the Microsoft Azure portal. The 'Frontend IP configuration' tab is selected. It explains that a frontend IP configuration is an IP address used for inbound and/or outbound communication. Below this, there is a table with two columns: 'Name' and 'IP address'. The first row shows 'lb-frontend' and '(new) lb-frontend-ip (To be created)'. At the bottom, there are navigation buttons: 'Review + create', '< Previous', 'Next : Backend pools >', and a link to 'Download a template for automation'. There is also a 'Give feedback' link.

Name ↑↓	IP address ↑↓
lb-frontend	(new) lb-frontend-ip (To be created)

Figure 3. 3: Frontend IP configuration

The screenshot shows the 'Add backend pool' page in the Microsoft Azure portal. The 'Name' field is set to 'lb-backend-pool'. The 'Virtual network' dropdown is set to 'lb-vnet (load-balancer-rg)'. Under 'Backend Pool Configuration', the 'IP address' radio button is selected. Below this, there is a section for 'IP addresses' with a warning icon and text: 'When a backend pool is configured by IP address, the backend instances are not secure by default and still use default outbound access. To secure your backend pool, please add a NAT Gateway to your subnet or leverage the private subnet parameter. Learn more'. At the bottom, there is a table with three columns: 'Backend Address Name', 'IP address', and 'Resource Name'. The first row shows 'b74ecec-bf1e-4fe1-98ec-31152...', a dropdown arrow, and an empty field. At the bottom, there are 'Save' and 'Cancel' buttons, and a 'Give feedback' link.

Backend Address Name	IP address	Resource Name
b74ecec-bf1e-4fe1-98ec-31152...	▼	

Figure 3. 4: Enter “lb-backend-pool” for Name and select Virtual Network

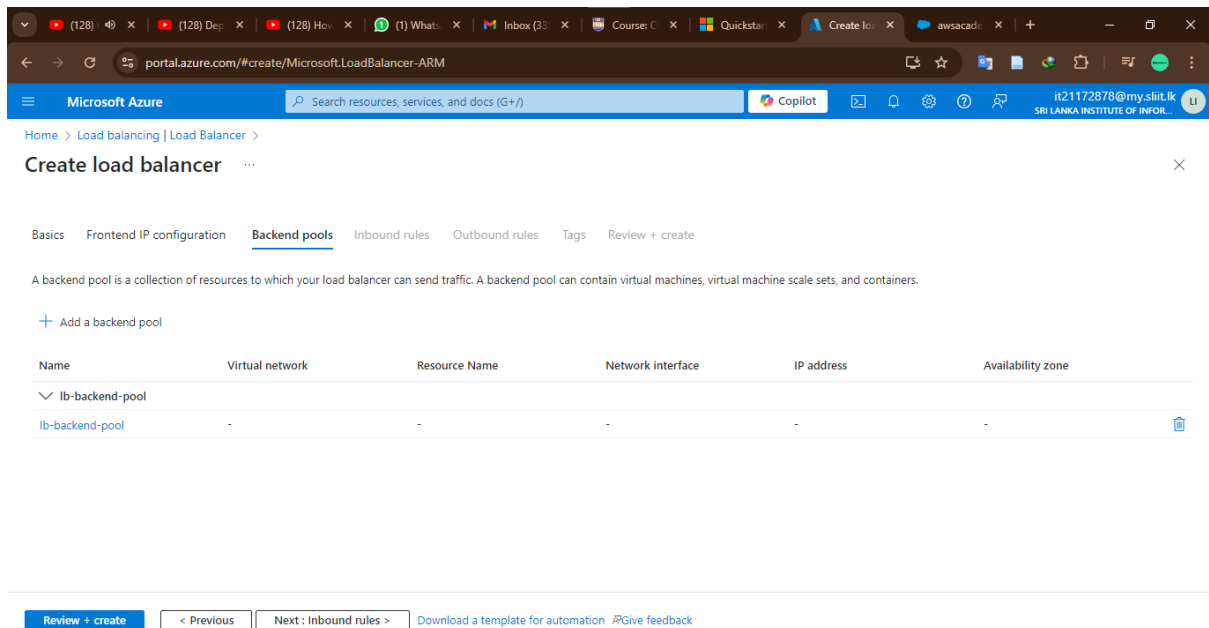


Figure 3. 5: Added backend pool

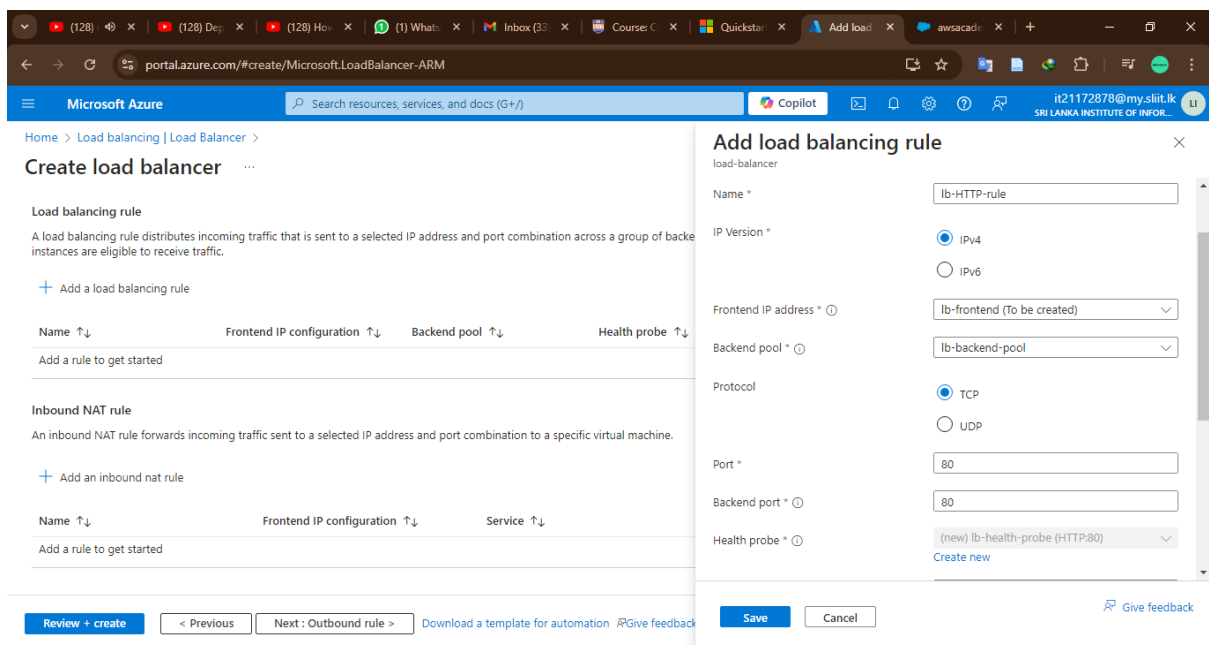


Figure 3. 6: Enter Name and select Frontend IP address and Backend pool

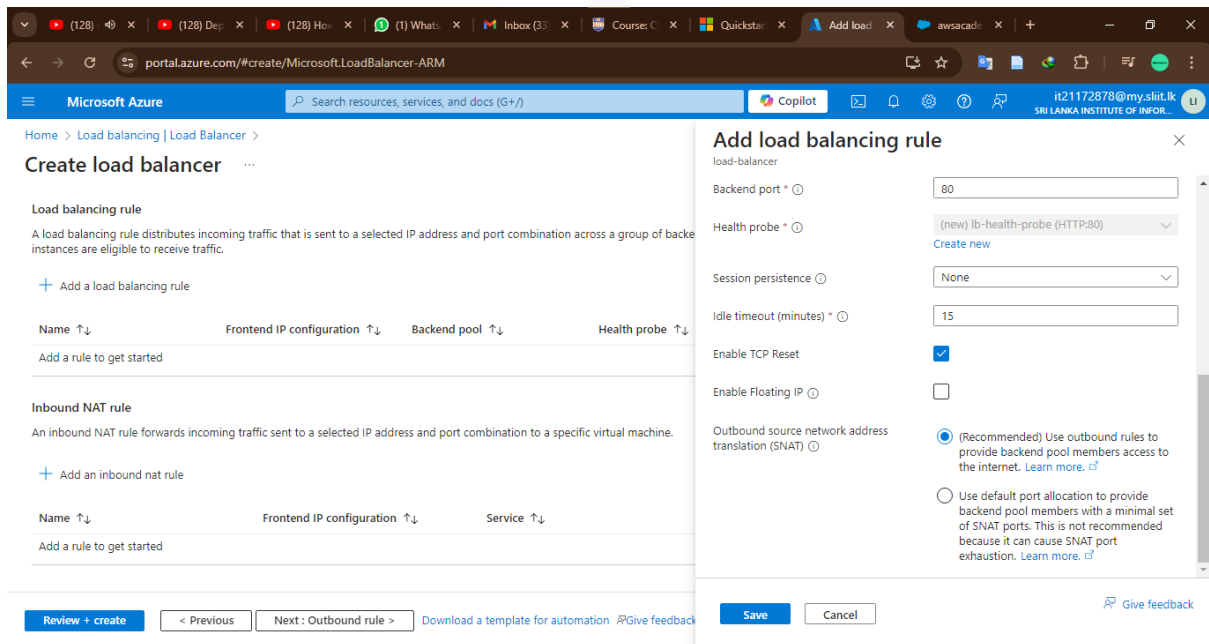


Figure 3. 7: Create new Health probe

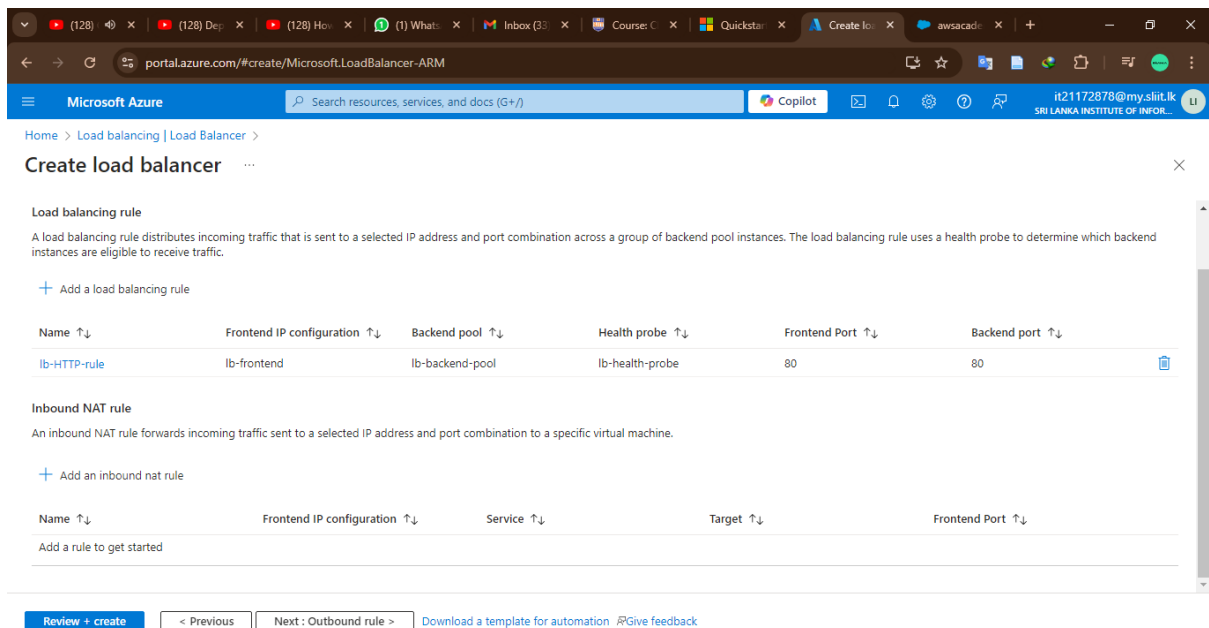


Figure 3. 8: Added load balancing rule

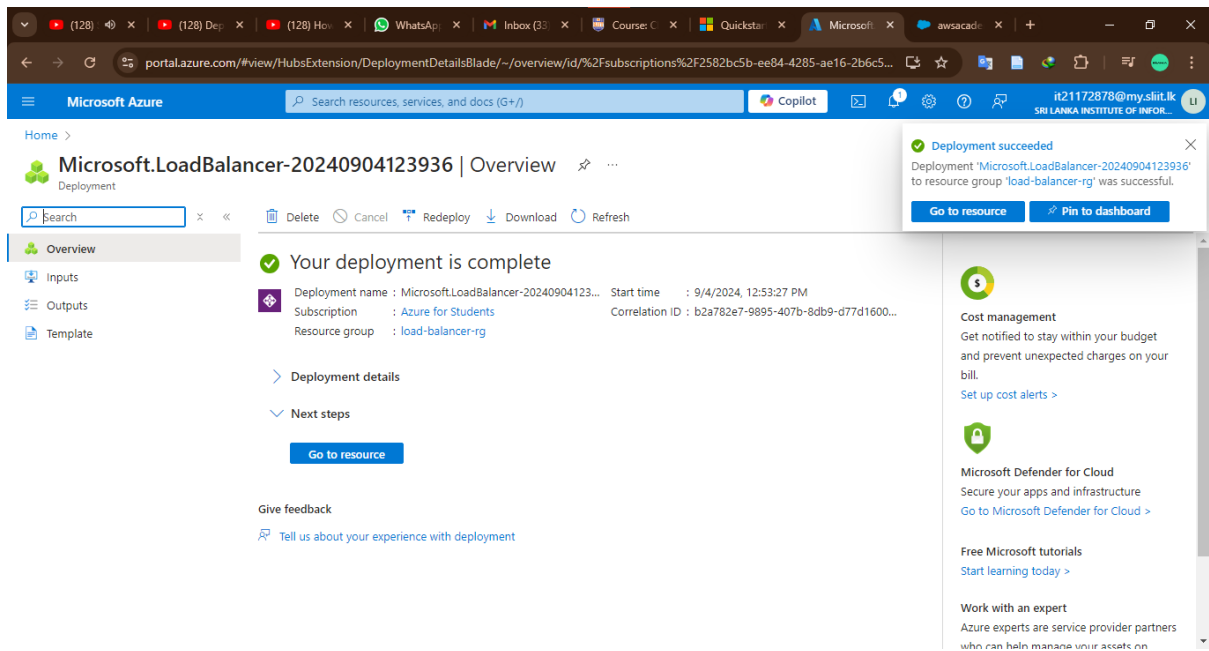


Figure 3. 9: Load balancer deployment succeeded

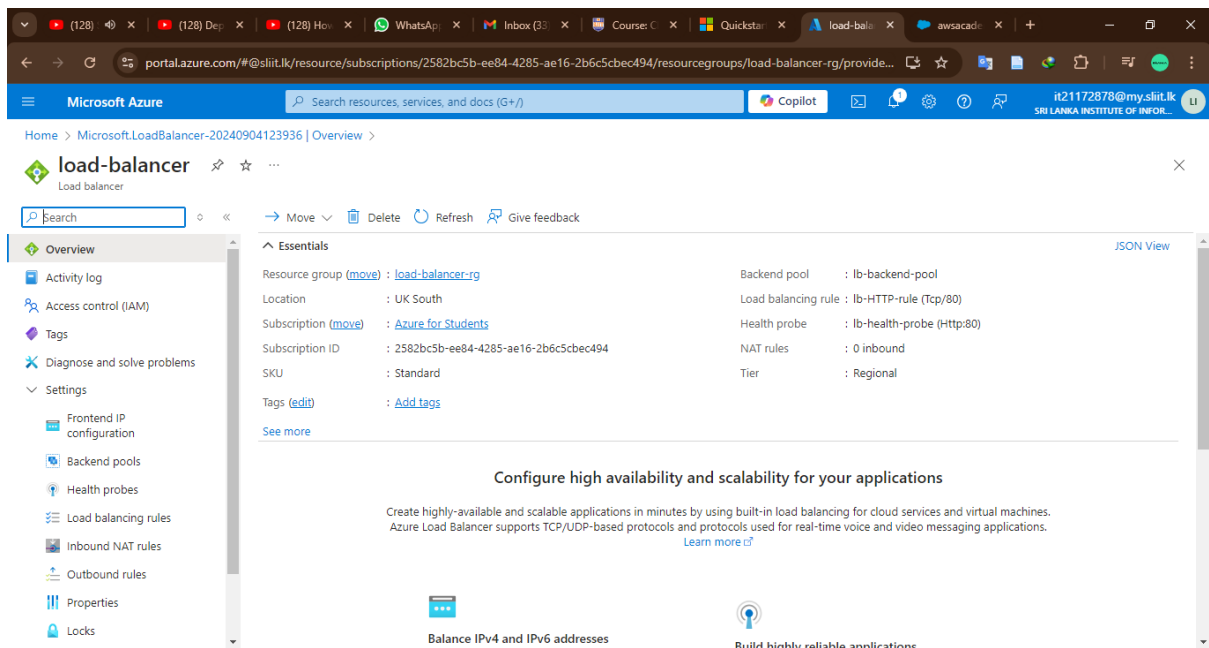


Figure 3. 10: Resource of Load balancer

4. Create virtual machines

4.1. Create first virtual machine

The screenshot shows the 'Create a virtual machine' wizard in the Azure portal. The browser address bar shows 'portal.azure.com/#create/Microsoft.VirtualMachine-ARM'. The page title is 'Create a virtual machine'. There are three tabs: 'Help me create a low cost VM', 'Help me create a VM optimized for high availability', and 'Help me choose the right VM size for my workload'. The 'Project details' section is active, showing 'Subscription' as 'Azure for Students' and 'Resource group' as 'load-balancer-rg'. The 'Instance details' section shows 'Virtual machine name' as 'lb-VM1', 'Region' as '(Europe) UK South', 'Availability options' as 'Availability zone', and 'Zone options' as 'Self-selected zone'. At the bottom, there are navigation buttons: '< Previous', 'Next: Disks >', and 'Review + create'. A 'Give feedback' link is also present.

Figure 4. 1. 1: Select Resource group and enter Name for VM

The screenshot shows the 'Create a virtual machine' wizard in the Azure portal, continuing from the previous step. The 'Availability zone' is set to 'Zone 1'. A message states: 'You can now select multiple zones. Selecting multiple zones will create one VM per zone. Learn more >'. The 'Security type' is set to 'Standard'. The 'Image' is set to 'Windows Server 2022 Datacenter: Azure Edition - x64 Gen2'. A message states: 'This image is compatible with additional security features. Click here to swao to the Trusted launch security type.' The 'VM architecture' is set to 'x64'. A message states: 'Arm64 is not supported with the selected image.' At the bottom, there are navigation buttons: '< Previous', 'Next: Disks >', and 'Review + create'. A 'Give feedback' link is also present.

Figure 4. 1. 2: Select Availability zone and Image

Home > Virtual machines >

Create a virtual machine

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

Size * [See all sizes](#)

Enable Hibernation ☐

Administrator account

Username * ✓

Password * ✓

Confirm password * ✓

Inbound port rules

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

Public inbound ports * ☒ None ☐ Allow selected ports

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

[Give feedback](#)

Figure 4. 1. 3: Enter Username and Password

Home > Virtual machines >

Create a virtual machine

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

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

Configure network security group * [Create new](#)

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

[Give feedback](#)

Figure 4. 1. 4: Select Virtual network and Subnet

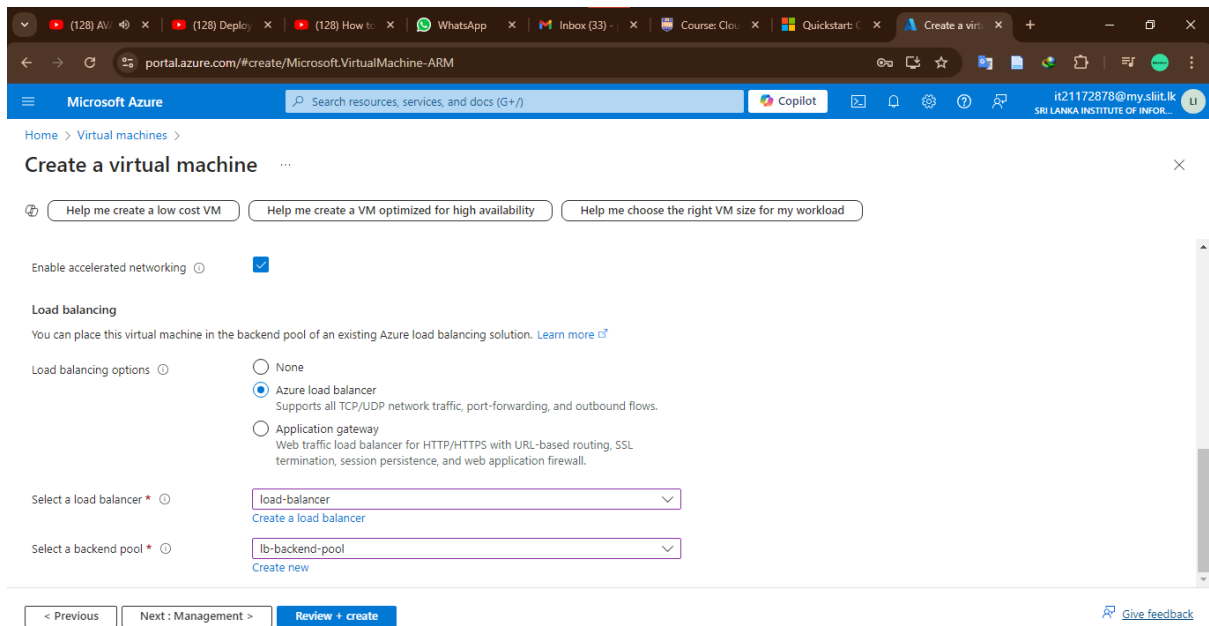


Figure 4. 1. 5: Select a Load balancer and Backend pool

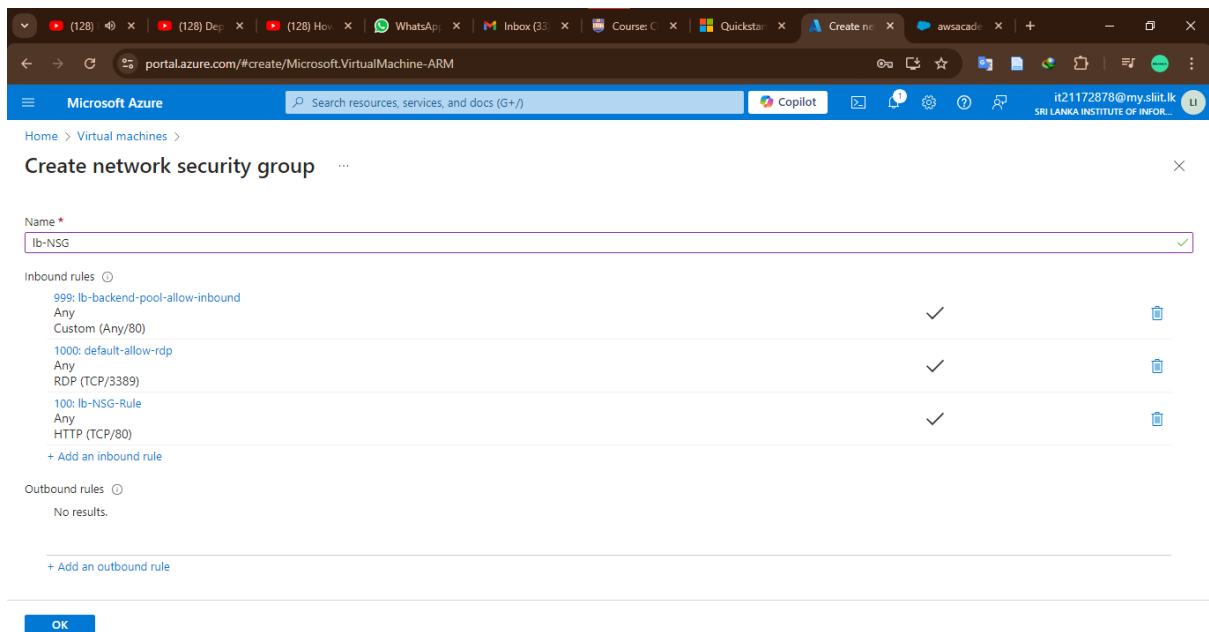


Figure 4. 1. 6: Configure network security group

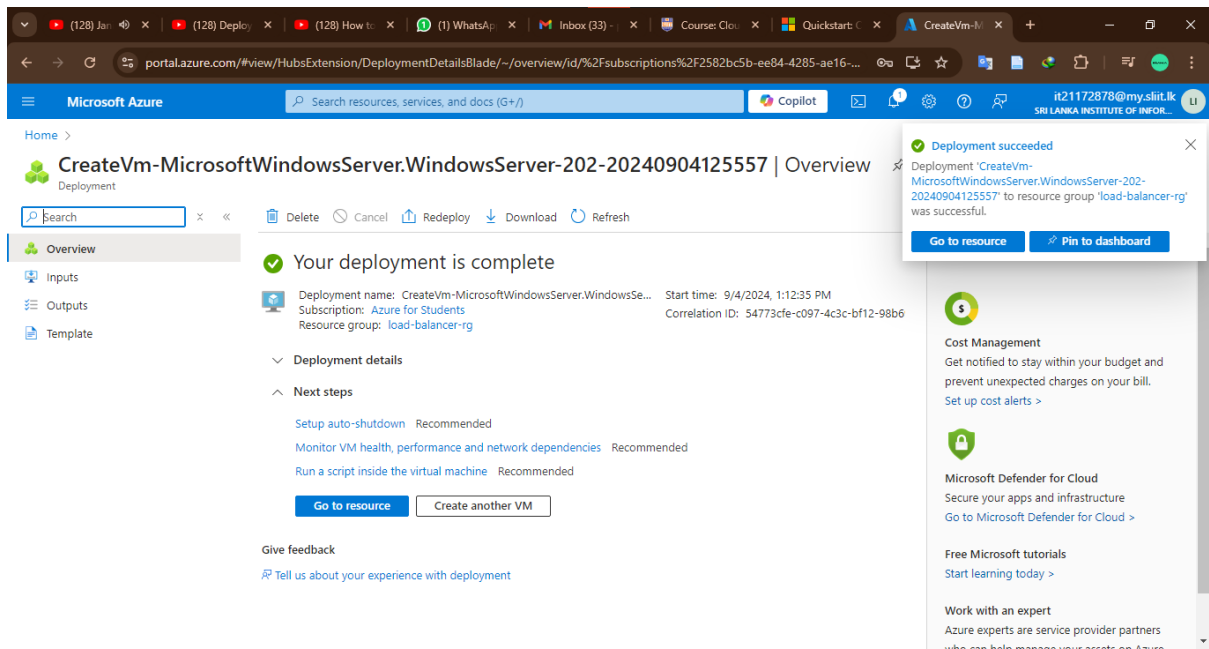


Figure 4. 1. 7: First virtual machine(lb-VM1) deployment succeeded

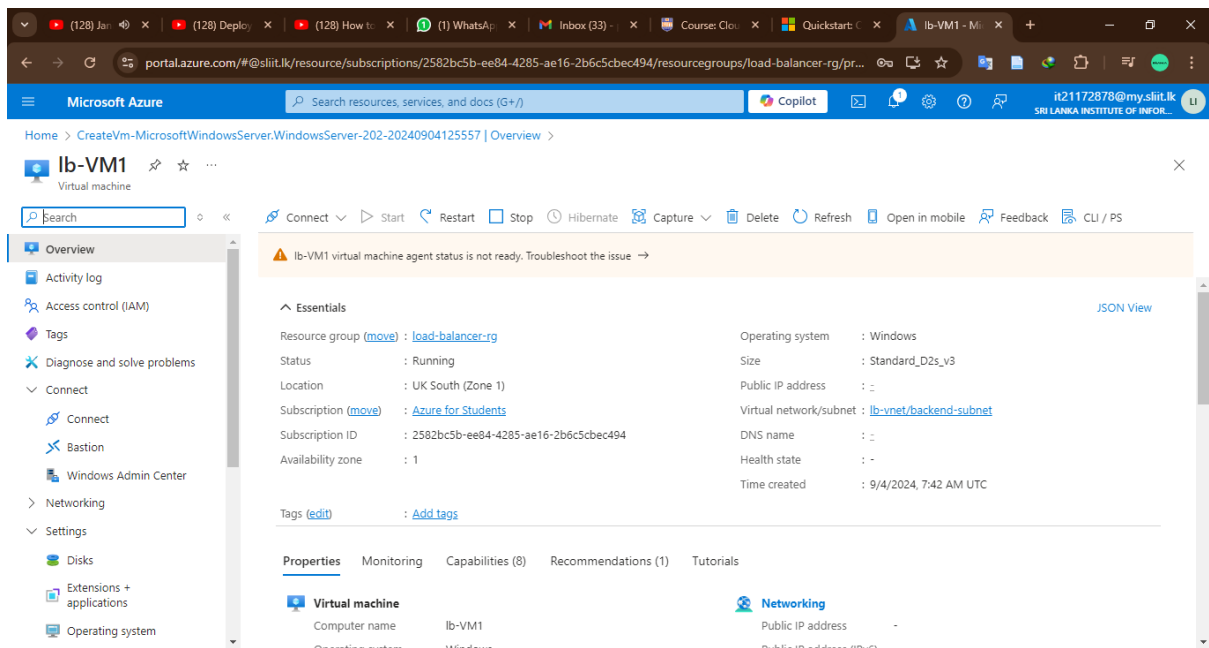


Figure 4. 1. 8: Resource of lb-VM1

4.2. Create second virtual machine

The screenshot shows the 'Create a virtual machine' wizard in the Microsoft Azure portal. The browser address bar shows 'portal.azure.com/#create/Microsoft.VirtualMachine-ARM'. The page has a blue header with the Microsoft Azure logo and a search bar. Below the header, there are three tabs: 'Help me create a low cost VM', 'Help me create a VM optimized for high availability', and 'Help me choose the right VM size for my workload'. The 'Project details' section is active, showing 'Subscription' as 'Azure for Students' and 'Resource group' as 'load-balancer-rg'. The 'Instance details' section shows 'Virtual machine name' as 'lb-VM2', 'Region' as '(Europe) UK South', and 'Availability options' as 'Availability zone'. The 'Zone options' section shows 'Self-selected zone' as the selected option. At the bottom, there are navigation buttons: '< Previous', 'Next: Disks >', and 'Review + create'. A 'Give feedback' link is also present.

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

it21172878@my.sliit.lk

Home > Virtual machines >

Create a virtual machine

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 *

Resource group * [Create new](#)

Instance details

Virtual machine name *

Region *

Availability options

Zone options ☒ Self-selected zone
Choose up to 3 availability zones, one VM per zone
☐ Azure-selected zone (Preview)

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

[Give feedback](#)

Figure 4. 2. 1: Select Resource group and enter Name for VM

The screenshot shows the 'Create a virtual machine' wizard in the Microsoft Azure portal, step 2. The 'Availability zone' is set to 'Zone 2'. A note indicates that multiple zones can be selected to create one VM per zone. The 'Security type' is set to 'Standard'. The 'Image' is set to 'Windows Server 2022 Datacenter: Azure Edition - x64 Gen2'. The 'VM architecture' is set to 'x64'. At the bottom, there are navigation buttons: '< Previous', 'Next: Disks >', and 'Review + create'. A 'Give feedback' link is also present.

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

it21172878@my.sliit.lk

Home > Virtual machines >

Create a virtual machine

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

Availability zone *
☒ You can now select multiple zones. Selecting multiple zones will create one VM per zone. [Learn more](#)

Security type

Image *
[See all images](#) | Configure VM generation

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

VM architecture ☐ Arm64
☒ x64
☐ Arm64 is not supported with the selected image.

Run with Azure Spot discount ☐

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

[Give feedback](#)

Figure 4. 2. 2: Select Availability zone and Image

Microsoft Azure

Home > Virtual machines >

Create a virtual machine

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

Size * [See all sizes](#)

Enable Hibernation ☐

Administrator account

Username *

Password *

Confirm password *

Inbound port rules

Select which virtual machine network ports are accessible from the public internet. You can specify more limited or granular network access on the Networking tab.

Public inbound ports * ☒ None ☐ Allow selected ports

< Previous | Next: Disks > | Review + create

[Give feedback](#)

Figure 4. 2. 3: Enter Username and Password

Microsoft Azure

Home > Virtual machines >

Create a virtual machine

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

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

Configure network security group * [Create new](#)

< Previous | Next: Management > | Review + create

[Give feedback](#)

Figure 4. 2. 4: Select Virtual network, Subnet and Network security group

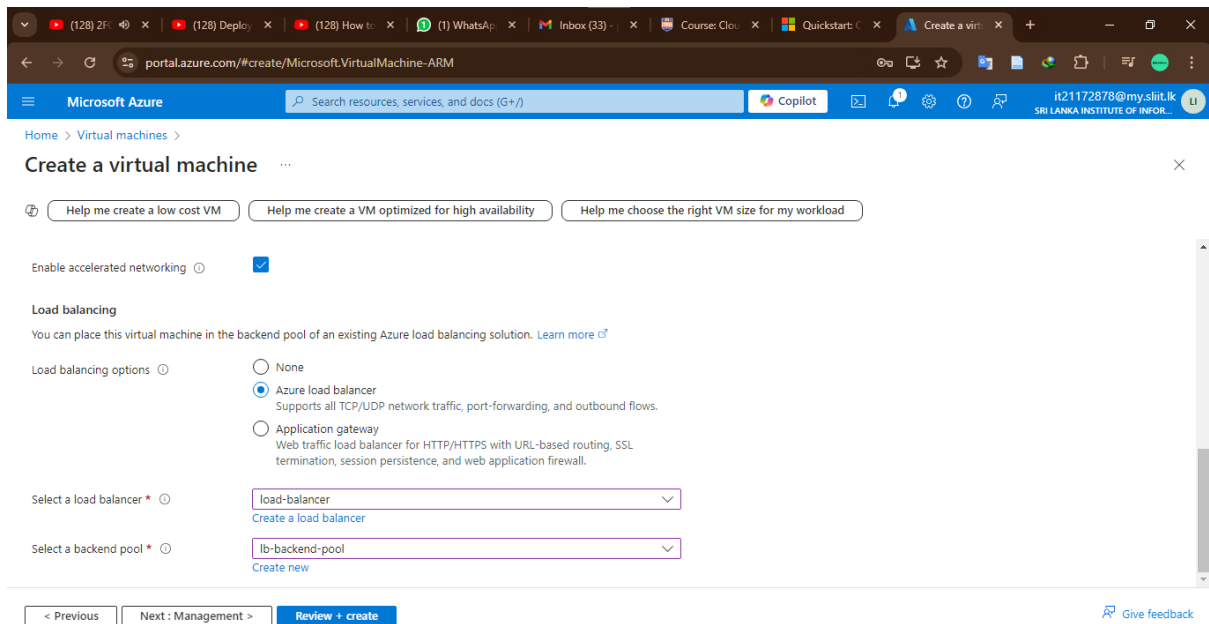


Figure 4. 2. 5: Select a Load balancer and Backend pool

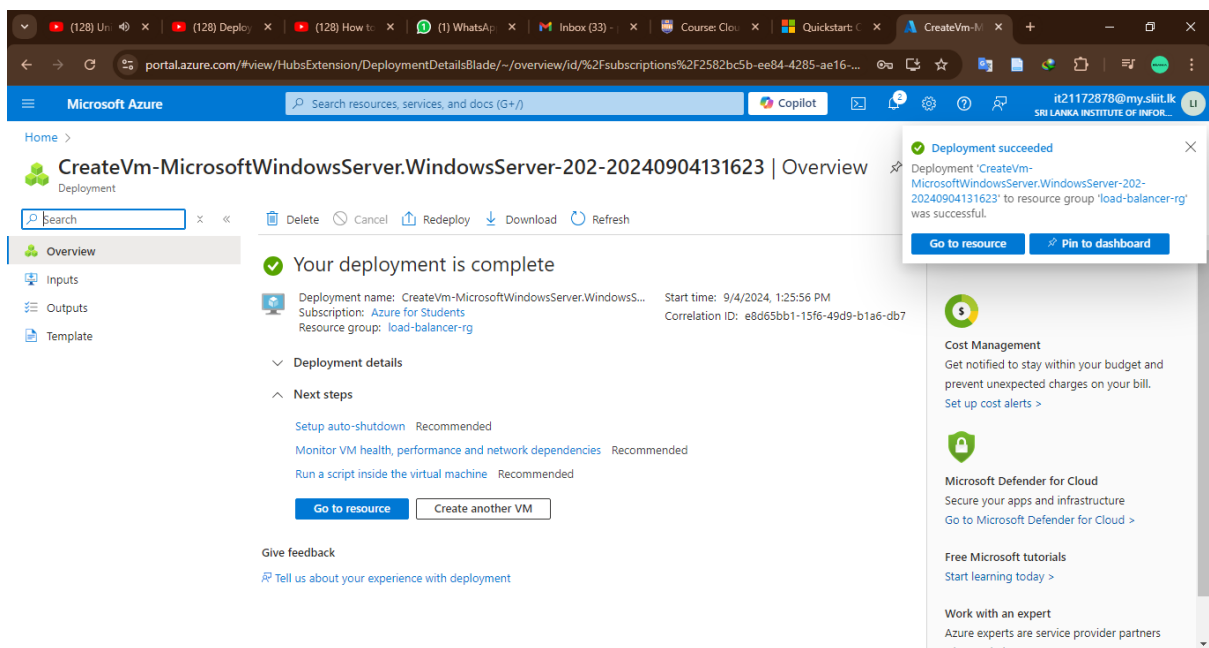


Figure 4. 2. 6: Second virtual machine(lb-VM2) deployment succeeded

The screenshot displays the Microsoft Azure portal interface. The top navigation bar shows the user is logged in as 'it21172878@mysliit.lk'. The main content area is titled 'lb-VM2' and 'Virtual machine'. A warning banner at the top indicates 'lb-VM2 virtual machine agent status is not ready. Troubleshoot the issue →'. Below this, the 'Essentials' section provides key details:

- Resource group: [load-balancer-rg](#)
- Status: Running
- Location: UK South (Zone 2)
- Subscription: [Azure for Students](#)
- Subscription ID: 2582bc5b-ee84-4285-ae16-2b6c5cbec494
- Availability zone: 2
- Operating system: Windows
- Size: Standard D2s v3 (2 vcpus, 8 GiB memory)
- Public IP address: [4.159.116.24](#)
- Virtual network/subnet: [lb-vnet/backend-subnet](#)
- DNS name: [Not configured](#)
- Health state: -
- Time created: 9/4/2024, 7:56 AM UTC

The 'Properties' tab is selected, showing details for the 'Virtual machine' and 'Networking' sections. The 'Virtual machine' section lists the computer name as 'lb-VM2' and the operating system as 'Windows'. The 'Networking' section shows the public IP address as '4.159.116.24 (Load balancer load-balancer)'.

Figure 4. 2. 7: Resource of lb-VM2

5. Install IIS

5.1. Install IIS server with lb-VM1

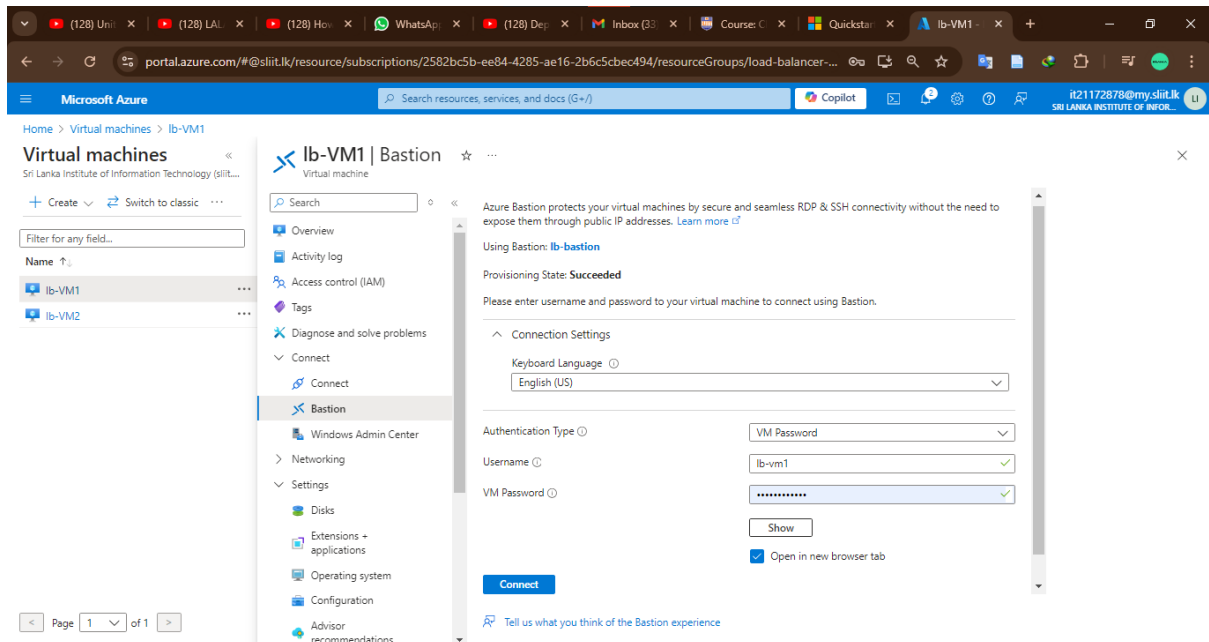


Figure 5. 1. 1: Enter the Username, VM Password and click Connect

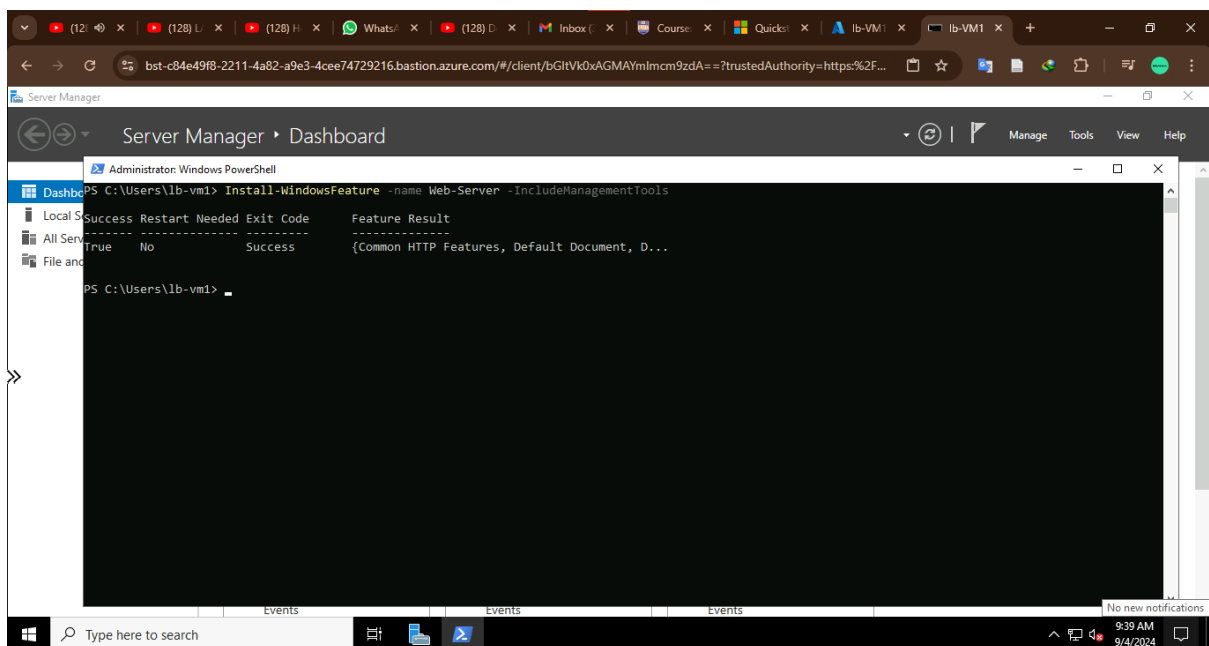


Figure 5. 1. 2: Install IIS server role

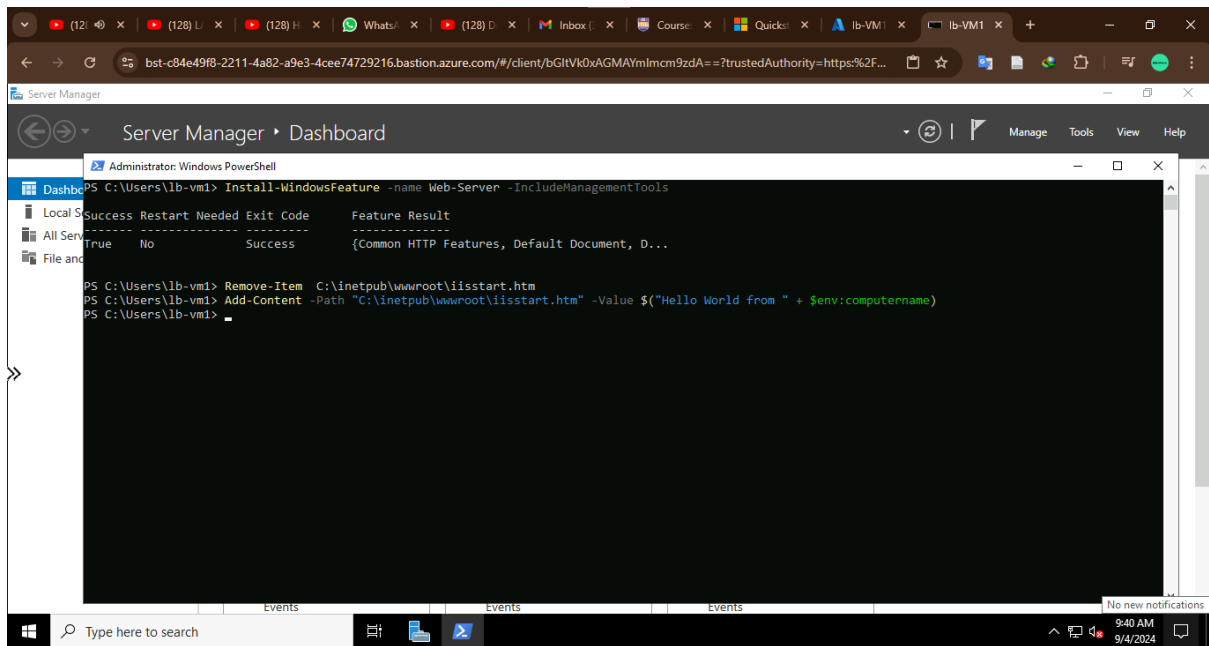


Figure 5. 1. 3: Remove default htm file and add a new htm file

5.2. Install IIS server with lb-VM2

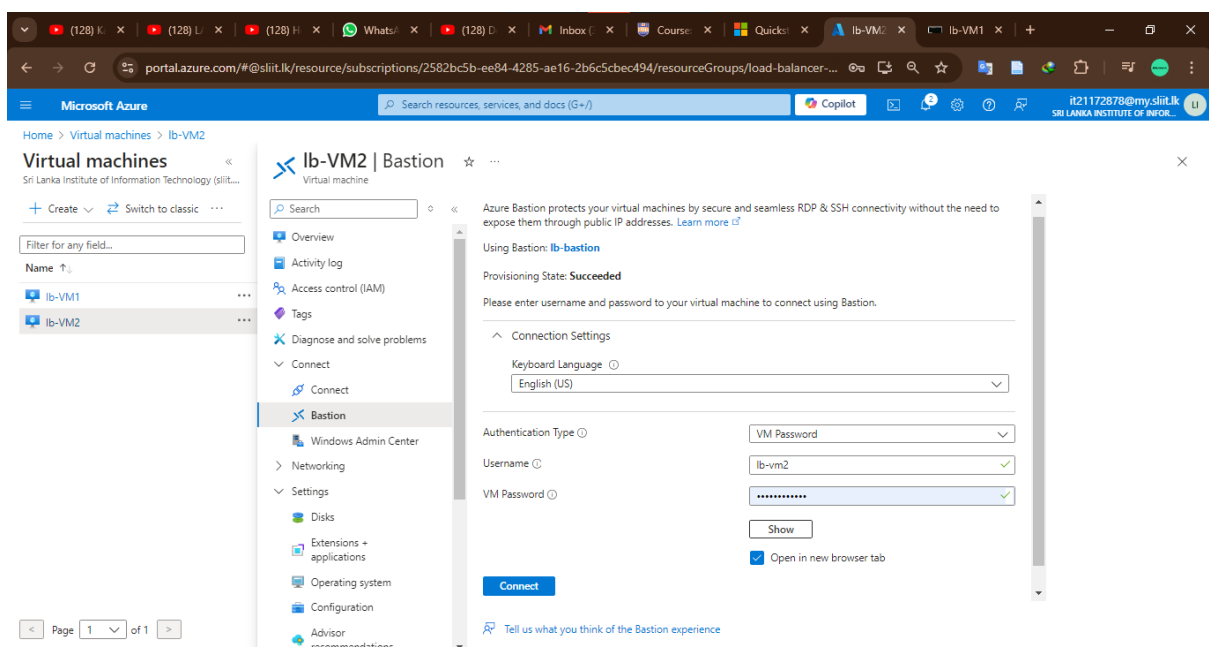


Figure 5. 2. 1: Enter the Username, VM Password and click Connect

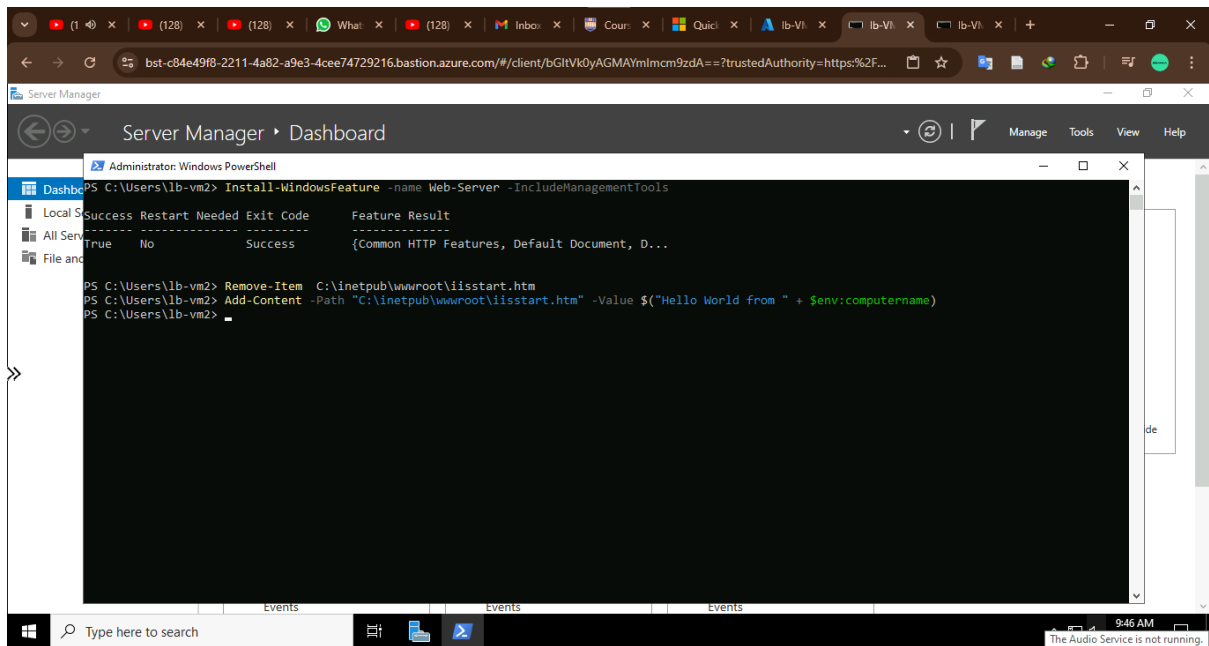


Figure 5. 2. 2: Install IIS server role, remove default htm file and add a new htm file

6. Test the load balancer

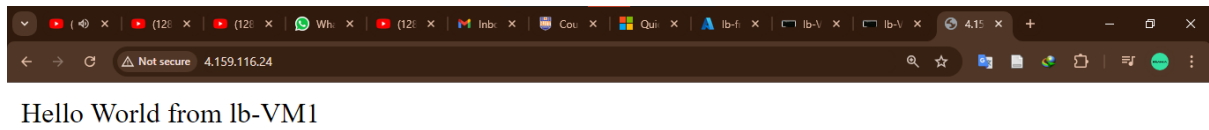


Figure 6. 1: Copy public IP from frontend-ip and paste it into the address bar of your browser

7. Clean up resources

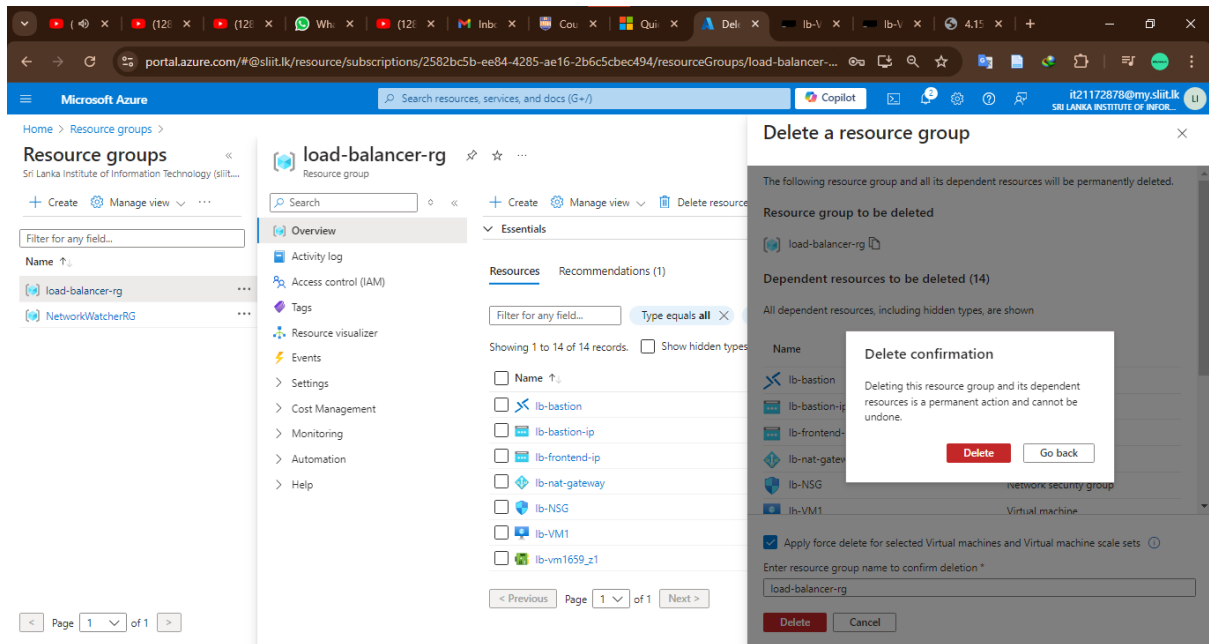


Figure 7. 1: Enter resource group name to confirm deletion

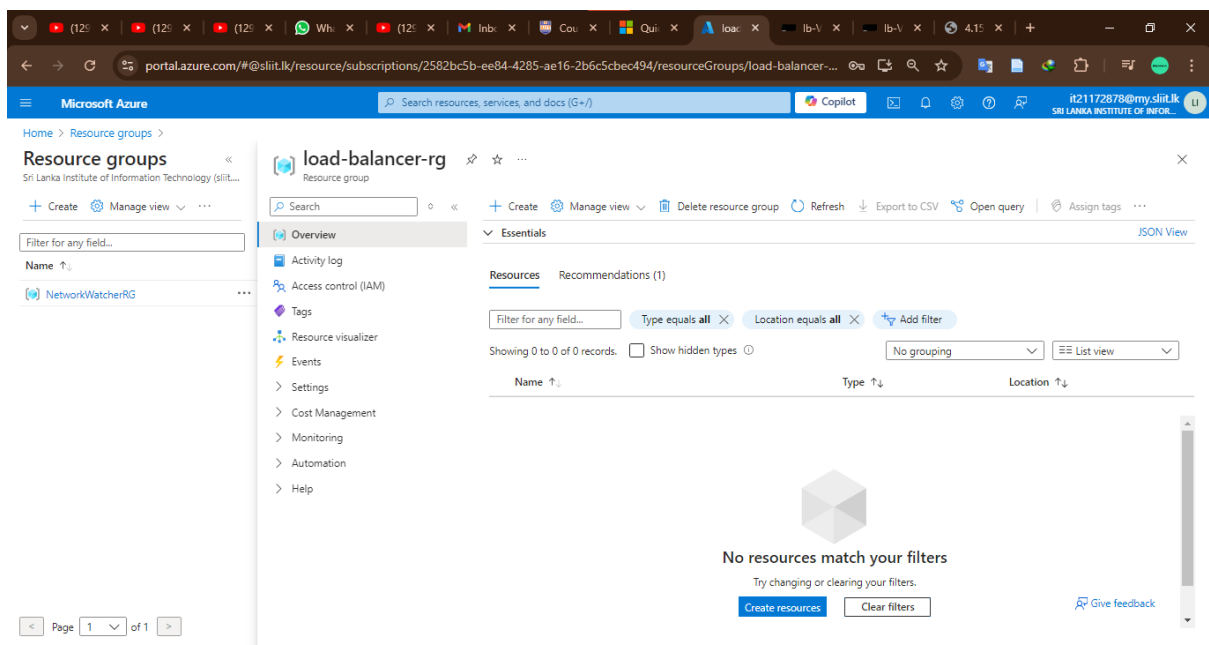


Figure 7. 2: Delete successfully resource group

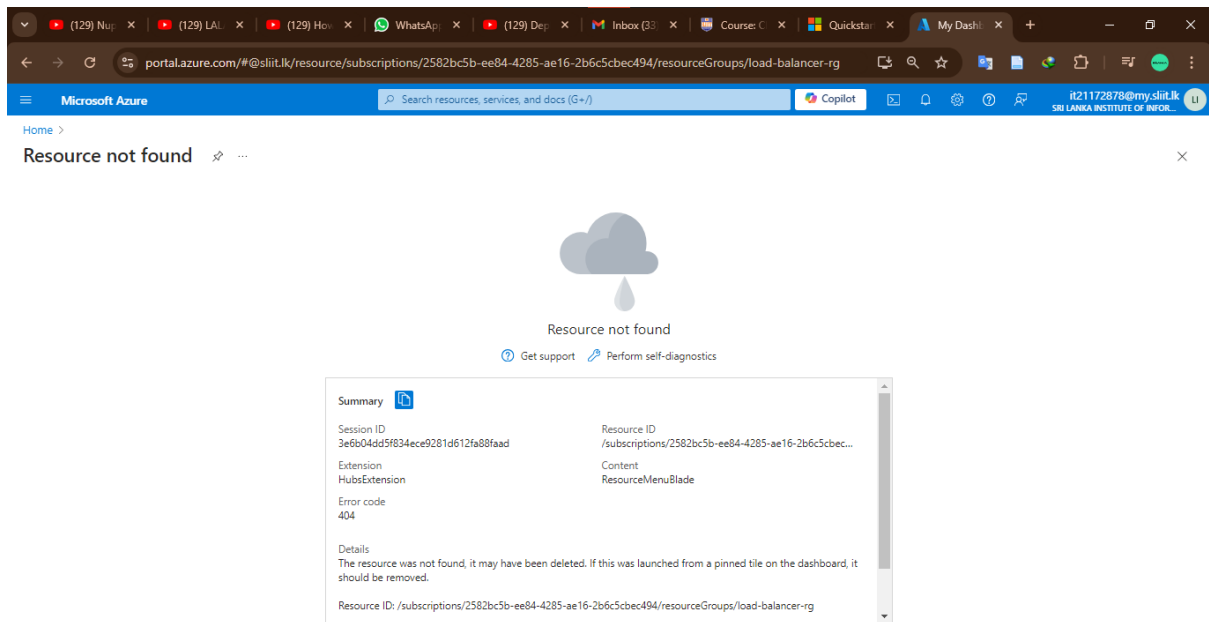


Figure 7. 3: After deleted other resource groups