

Lab 01 - Manage Microsoft Entra ID Identities

Task 1: Create and configure user accounts

The screenshot shows the Microsoft Azure portal with the URL https://portal.azure.com/#view/Microsoft_AAD_IAM/ActiveDirectoryMenuBlade/~/Overview?subscriptionId=ed7c320e-034e-4884-9f46-1216aa2f25b0. The page displays basic information about the 'Default Directory' tenant, including Name (Default Directory), Tenant ID (4a87d2f9-3ab7-47c8-aa15-688216f0893b), Primary domain (lindasphele1@gmail.onmicrosoft.com), License (Microsoft Entra ID Free), and User count (2). A warning message at the top right encourages migrating to converged authentication methods by September 2025. The bottom status bar shows the date as 2025/09/02 and the time as 08:43.

Task 2: Create groups and add members

The screenshot shows the Microsoft Azure portal with the URL https://portal.azure.com/#view/Microsoft_AAD_IAM/GroupDetailsMenuBlade/~/Overview/groupId/5819c003-605b-4ae6-b176-80b4ea9df53?subscriptionId=ed7c320e-034e-4884-9f46-1216aa2f25b0. The page displays details for the 'IT Lab Administrators' group, including Membership type (Cloud), Source (Cloud), Type (Security), Object ID (5819c003-605b-4ae6-b176-80b4ea9df53), and Created on (9/2/2025, 8:48 AM). It also shows group statistics: 2 total direct members, 2 users, 0 groups, 0 devices, and 0 others. The bottom status bar shows the date as 2025/09/02 and the time as 08:48.

Lab 02a - Manage Subscriptions and RBAC

Task 1: Implement Management Groups

The screenshot shows the Microsoft Azure Management groups interface. At the top, there are tabs for 'Personal Microsoft account' and '(44) WhatsApp'. Below that is the 'Microsoft Azure' header with a 'Upgrade' button. The main content area is titled 'Management groups' with a 'Default Directory' dropdown. A search bar and a 'Copilot' button are at the top right. The main table lists one subscription:

Name	Type	ID	Total subscriptions
Tenant Root Group	Management group	4a87d2f9-3ab7-47c8-aa15-688218f0893b	1
Azure subscription 1	Subscription	ed7c320e-034e-4884-9f46-1216aa2f25b0	

At the bottom right, there's a message: 'Activate Windows Go to Settings to activate Windows.' The taskbar at the bottom shows various pinned icons and the date/time: '18°C Sunny 08:53 2025/09/02'.

Task 2: Review and assign a built-in Azure role

The screenshot shows the Microsoft Azure Management groups interface. At the top, there are tabs for 'Personal Microsoft account' and '(44) WhatsApp'. Below that is the 'Microsoft Azure' header with a 'Upgrade' button. The main content area is titled 'Management groups' with a 'Default Directory' dropdown. A search bar and a 'Copilot' button are at the top right. The main table lists one subscription:

Name	Type	ID	Total subscriptions
Tenant Root Group	Management group	4a87d2f9-3ab7-47c8-aa15-688218f0893b	1
Azure subscription 1	Subscription	ed7c320e-034e-4884-9f46-1216aa2f25b0	

At the bottom right, there's a message: 'Activate Windows Go to Settings to activate Windows.' The taskbar at the bottom shows various pinned icons and the date/time: '19°C Sunny 08:54 2025/09/02'.

Task 3: Create a custom RBAC role

The screenshot shows the Microsoft Azure portal interface. The user is in the 'az104-mg1 | Access control (IAM)' section. The 'Check access' tab is active. Below it, there are four main options:

- Grant access to this resource**: Allows you to assign a role to resources.
- View access to this resource**: Shows the role assignments for this resource and others.
- View deny assignments**: Shows the role assignments that have been denied access to specific actions.
- Create a custom role**: Allows you to define a custom role for Azure resources.

At the bottom of the screen, the taskbar shows the Windows Start button, a search bar, and various pinned application icons. The system tray indicates it's 20°C, sunny, and shows battery and network status.

Task 4: Monitor role assignments with the Activity Log

The screenshot shows the 'Create a custom role' blade in the Microsoft Azure portal. The role name is 'Custom Support Request'. The blade contains the following information:

- Role description**: A custom contributor role for support requests.
- Permissions**: NotAction - Microsoft.Support/register/action
- Assignable Scopes**: Scope - /providers/Microsoft.Management/managementGroups/az104-mg1

At the bottom of the screen, the taskbar shows the Windows Start button, a search bar, and various pinned application icons. The system tray indicates it's 20°C, sunny, and shows battery and network status.

Lab 02b - Manage Governance via Azure Policy

Task 1: Assign tags via the Azure portal

You are viewing a new version of Browse experience. Click here to access the old experience.

Filter for any field... Subscription equals all Location equals all Add filter

Name	Subscription	Location
az104-rg2	Azure subscription 1	East US

Task 2: Enforce tagging via an Azure Policy

Require a tag and its value on resources

Policy definition

Assign policy Edit definition Duplicate definition Select version (preview) Delete definition

Essentials

Name	Description	Definition location
Require a tag and its value on resources	Enforces a required tag and its value. Does not apply to resource groups.	/providers/Microsoft.Authorization/policyDefinitions/1e30110a-5ceb-460c-a204-c1c3969c6d62/version/1.0.1/scopes/
Version (preview)	: 1.0.1	Type: Built-in
Description	: Deny	Mode: Indexed
Available Effects		
Category		

Definition Assignments (0) Parameters (2)

43

Task 3: Apply tagging via an Azure policy

Create a storage account

Validation failed. Required information is missing or not valid.

Basics

Subscription	Azure subscription 1
Resource group	az104-rg2
Location	East US
Storage account name	any globally unique combination of between 3 and 24 lower case letters and digits, starting with a letter
Preferred storage type	
Performance	Standard
Replication	Read-access geo-redundant storage (RA-GRS)

Advanced

Enable hierarchical namespace	Disabled
Enable SFTP	Disabled
Enable network file system v3	Disabled
Allow cross-tenant replication	Disabled
Access tier	Hot
Enable large file shares	Enabled

Activate Windows
Go to Settings to activate Windows.
Give feedback

Previous Next Create

Task 4: Configure and test resource locks

mthiyane_1756803685210 | Overview

Your deployment is complete

Deployment name: mthiyane_1756803685210
Subscription: Azure subscription 1
Resource group: az104-rg2

Start time: 9/2/2025, 11:02:22 AM
Correlation ID: 1804b5d-bc6-44a5-bb1e-f4279a1c1364

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Lab 03 - Manage Azure resources by using Azure Resource Manager Templates

Task 1: Create an Azure Resource Manager template

The screenshot shows the Microsoft Azure portal interface. The user is viewing the 'az104-rg2' resource group. On the left, there's a navigation menu with options like 'Create', 'Manage view', 'Activity log', 'Access control (IAM)', 'Tags', 'Resource visualizer', 'Events', 'Settings', 'Deployments', 'Security', 'Deployment stacks', 'Policies', 'Properties', 'Locks', 'Cost Management', 'Monitoring', 'Automation', and 'Help'. The main area shows a table of resources under the 'Resources' tab. One resource, 'mthiyane', is listed as a Storage account located in East US. There are filters at the top of the table. A message bar at the top right says 'Delete resource group az104-rg2 failed' with a note that it's locked and can't be deleted. The bottom of the screen shows the Windows taskbar with various pinned icons.

Task 2: Edit an Azure Resource Manager template and then redeploy the template

The screenshot shows the Microsoft Azure portal interface. The user is editing an ARM template for a disk resource. The left sidebar has options like 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Resource visualizer', 'Settings', 'Monitoring', 'Automation', 'CLI / PS', 'Tasks', 'Export template', and 'Help'. The main area shows an 'ARM Template' tab selected, displaying a JSON code editor. The code defines a 'Microsoft.Compute/disks' resource with properties like 'createOption': 'empty', 'diskSizeGB': 32, 'diskType': 'Standard_LRS', 'encryption': { 'type': 'EncryptionAtRestWithPlatformKey' }, 'networkAccessPolicy': 'AllowAll', 'publicNetworkAccess': 'Enabled', 'dataAccessAuthMode': 'None'. Below the code editor, there are sections for 'Parameters' and 'Variables'. A message bar at the bottom right says 'Activate Windows' with a link to settings.

Task 3: Configure the Cloud Shell and deploy a template with PowerShell

myDeploymentStack-25090209eu949 | Overview

Your deployment is complete

Deployment name : myDeploymentStack-25090209eu949
Subscription : Azure subscription 1
Resource group : az104-rg3

Start time : 9/2/2025, 11:50:46 AM
Correlation ID : cf5a247e-17e7-4df9-aft7-f42efb04edbf

Deployment details
Next steps

Go to resource

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Go to Settings to activate Windows.

Task 4: Deploy a template with the CLI

az104-rg3 | Deployments

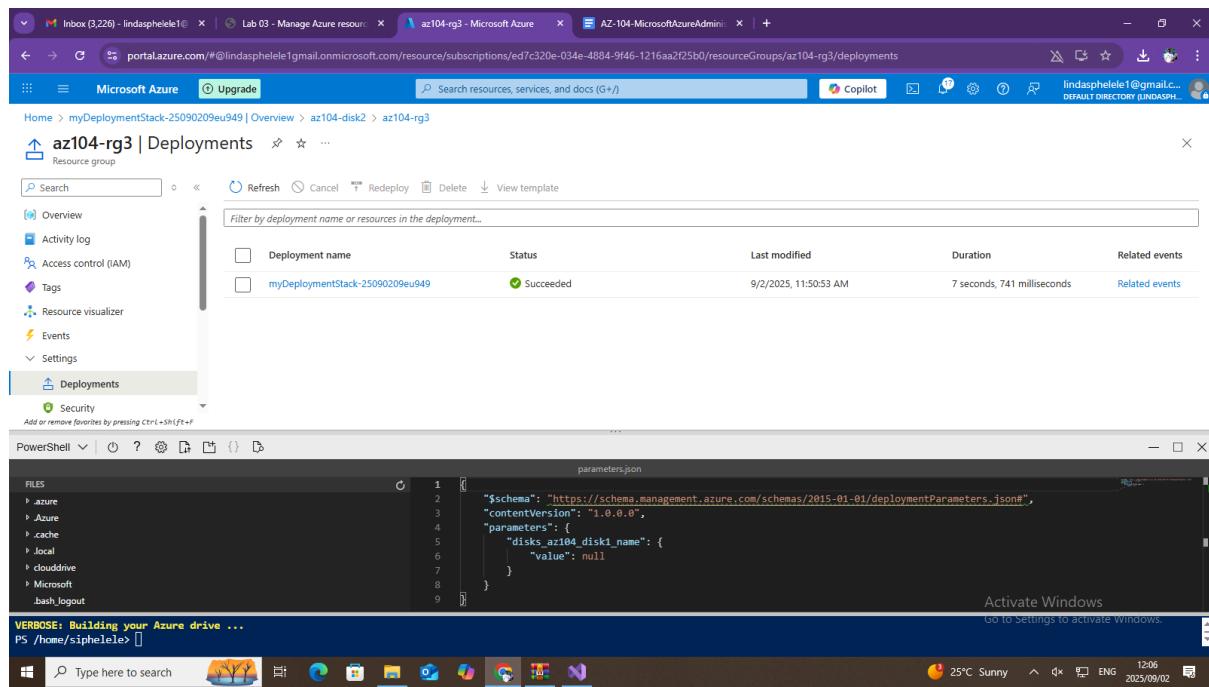
Deployment name: myDeploymentStack-25090209eu949, Status: Succeeded, Last modified: 9/2/2025, 11:50:53 AM, Duration: 7 seconds, 741 milliseconds, Related events

Deployments

Deployment name	Status	Last modified	Duration	Related events
myDeploymentStack-25090209eu949	Succeeded	9/2/2025, 11:50:53 AM	7 seconds, 741 milliseconds	Related events

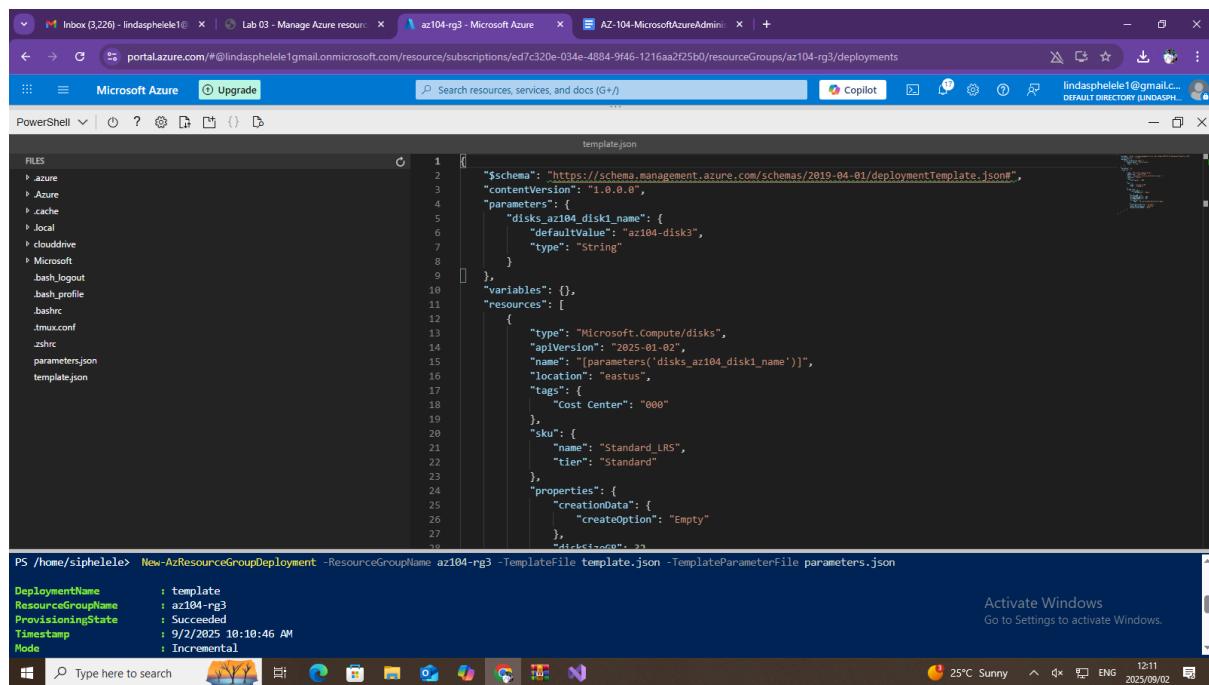
Activate Windows
Go to Settings to activate Windows.

Task 5: Deploy a resource by using Azure Bicep



Lab 04 - Implement Virtual Networking

Task 1: Create a virtual network with subnets using the portal



Task 2: Create a virtual network and subnets using a template

```

$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
contentVersion: "1.0.0.0",
parameters: {
  "disks_az104_disk1_name": {
    "defaultValue": "az104-disk3",
    "type": "String"
  }
},
variables: {},
resources: [
  {
    "type": "Microsoft.Compute/disks",
    "apiVersion": "2025-01-02",
    "name": "[parameters('disks_az104_disk1_name')]",
    "location": "eastus",
    "tags": {
      "Cost Center": "000"
    },
    "sku": {
      "name": "Standard_LRS",
      "tier": "Standard"
    },
    "properties": {
      "creationData": {
        "createOption": "Empty"
      }
    }
  }
]
  
```

Name	ResourceGroup	Location	Zones	Sku	SizeGB	ProvisioningState
az104-disk1	AZ104-RG2	eastus		Standard_LRS	32	Succeeded
az104-disk2	AZ104-RG3	eastus		Standard_LRS	32	Succeeded
az104-disk3	AZ104-RG3	eastus		Standard_LRS	32	Succeeded
az104-disk4	AZ104-RG3	eastus		Standard_LRS	32	Succeeded

Task 3: Create and configure communication between an Application Security Group and a Network Security Group

Deployment name	Status	Last modified	Duration	Related events
myDeploymentStack-25090209eu949	Succeeded	9/2/2025, 11:50:53 AM	7 seconds, 741 milliseconds	Related events

```

$schema: "https://schema.management.azure.com/schemas/2019-04-01/deploymentTemplate.json#",
contentVersion: "1.0.0.0",
parameters: {
  "disks_az104_disk1_name": {
    "defaultValue": "az104-disk3",
    "type": "String"
  }
}
  
```

Name	ResourceGroup	Location	Zones	Sku	SizeGB	ProvisioningState
az104-disk2	AZ104-RG3	eastus		Standard_LRS	32	Succeeded
az104-disk3	AZ104-RG3	eastus		Standard_LRS	32	Succeeded

Task 4: Configure public and private Azure DNS zones

```

    "parameters": {
        "virtualNetworks_CoreServicesVnet_name": {
            "defaultValue": "CoreServicesVnet",
            "type": "String"
        }
    },
    "variables": {},
    "resources": [
        {
            "type": "Microsoft.Network/virtualNetworks",
            "apiVersion": "2024-07-01",
            "name": "[parameters('virtualNetworks_CoreServicesVnet_name')]",
            "location": "eastus",
            "properties": {
                ...
            }
        }
    ]
}

```

The screenshot shows the Azure portal interface with the 'CoreServicesVnet' resource group selected. The 'Export template' blade is open, showing the ARM template code for creating a virtual network. The code includes parameters for the virtual network's name and location.

Lab 06 - Implement Network Traffic Management

Task 1: Use a template to provision an infrastructure

Deployment succeeded
Deployment 'Microsoft.Template-20250903120616' to resource group 'az104-rg6' was successful.

Deployment details	Start time	Correlation ID
Deployment name : Microsoft.Template-20250903120616	9/3/2025, 12:06:24 PM	f4eb0e75-4e46-4cdc-930c-0def23f3d80e
Subscription : Azure subscription 1		
Resource group : az104-rg6		

Next steps

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Activate Windows
Go to Settings to activate Windows.

Task 2: Configure an Azure Load Balancer

The screenshot shows the Azure portal interface with the URL portal.azure.com/#?cid=azurefreeaccount#/view/HubsExtension/DeploymentDetailsBlade/~/overview/id/%2fsubscriptions%2Fed7c320e-034e-4884-9f46-1216aa2f25b0%2fresourceGroups%2faz1.... The page displays the 'CreateLoadBalancerBladeV2-20250903120855' deployment overview. The 'Overview' tab is selected, showing a summary of the deployment status. Other tabs include 'Inputs', 'Outputs', and 'Template'. The bottom of the screen shows a Windows taskbar with various pinned icons and system status.

Task 3: Configure an Azure Application Gateway

The screenshot shows the Azure portal interface with the URL portal.azure.com/#?cid=azurefreeaccount#lindasphelele1@gmail.onmicrosoft.com/resource/subscriptions/ed7c320e-034e-4884-9f46-1216aa2f25b0/resourceGroups/az1104-gr4/providers/Microsoft.Network/virtualNetworks/CoreServicesVnet. The page displays the 'CoreServicesVnet' virtual network settings. The 'Subnets' tab is selected, showing two subnets: 'SharedServicesSubnet' (IPv4: 10.20.10.0/24, Available IPs: 251) and 'subnet-appgw' (IPv4: 10.20.9.224/27, Available IPs: 27). The left sidebar shows other virtual network settings like 'Address space', 'Connected devices', and 'Bastion'. The bottom of the screen shows a Windows taskbar with various pinned icons and system status.

Task 1: Create and configure a storage account.

Lifecycle management offers a rich, rule-based policy for general purpose v2 and blob storage accounts. Use the policy to transition your data to the appropriate access tiers or expire at the end of the data's lifecycle. A new or updated rule can take up to 24 hours to go into effect. [Learn more](#)

Name	Status	Blob type
Movetocool	Enabled	Block

Copy the file URL (Settings → Properties blade) and paste into a new Inprivate browsing window.

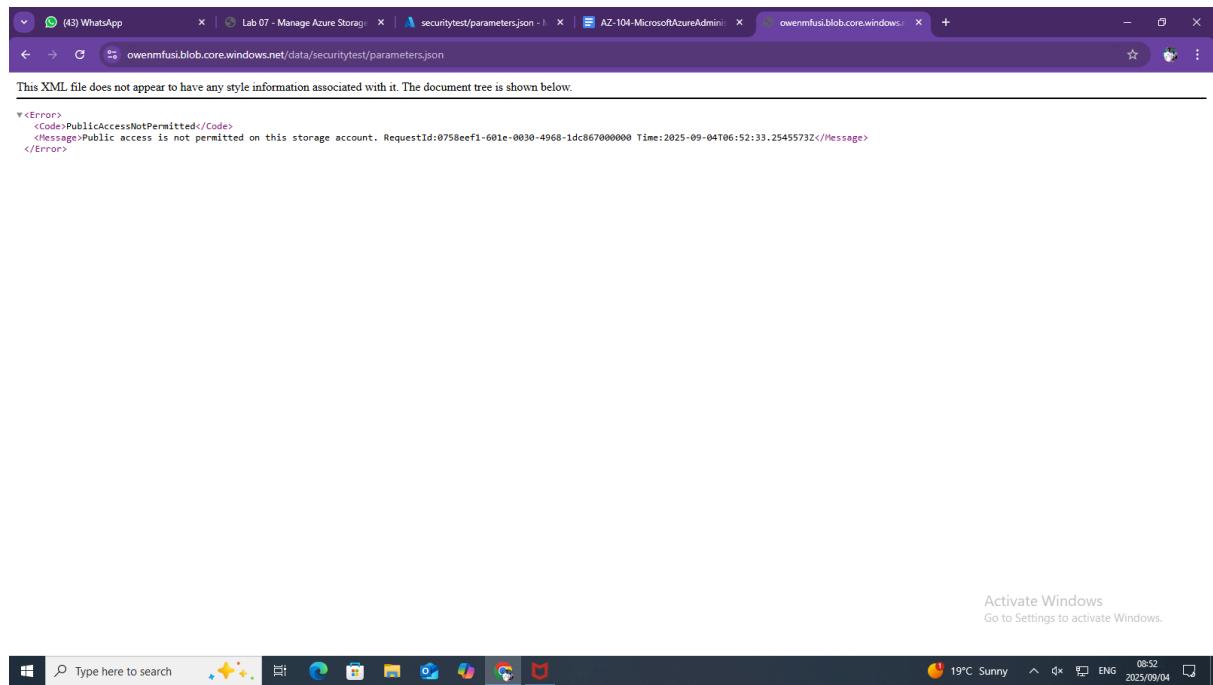
You should be presented with an XML-formatted message stating ResourceNotFound or PublicAccessNotPermitted.

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<Error>
<Code>PublicAccessNotPermitted</Code>
<Message>Public access is not permitted on this storage account. RequestId:0758eef1-601e-0030-4968-1dc867000000 Time:2025-09-04T06:52:33.2545573Z</Message>
</Error>
```

Copy the Blob SAS URL entry to the clipboard.

Open another InPrivate browser window and navigate to the Blob SAS URL you copied in the previous step.



Task 3: Create and configure an Azure File storage

The screenshot shows the Microsoft Azure Storage browser interface for a storage account named 'owenmfusi'. The left sidebar lists various storage services like Overview, Activity log, Tags, etc. The main area displays a summary of a failed operation with the message 'this request is not authorized to perform this operation.' A detailed error message follows:

```

Summary
Session ID: f56403510f5849888e016fb514856d3
Extension: Microsoft.Azure_Storage
Error code: 403
Storage Request ID: 1001dc33-501a-0066-6c6b-1d3988000000

Details


- This request is not authorized to perform this operation. RequestId:1001dc33-501a-0066-6c6b-1d3988000000 Time:2025-09-04T07:14:51.676427Z
- This storage account's 'Firewalls and virtual networks' settings may be blocking access to storage services. Try adding your client IP address ('197.245.161.230') to the firewall exceptions, or by allowing access from 'all networks' instead of 'selected networks'. Learn more

```

At the bottom right, there is an 'Activate Windows' link.

Lab 08 - Manage Virtual Machines

Task 1: Deploy zone-resilient Azure virtual machines by using the Azure portal

The screenshot shows the 'Create a virtual machine' wizard in the Microsoft Azure portal. The steps are as follows:

- Step 1: Create a virtual machine**: Shows basic configuration options like enabling hibernation (disabled), administrator account (username: azureuser, password: redacted), and inbound port rules (public inbound ports: RDP (3389)). A note says: "This will allow all IP addresses to access your virtual machine. This is only recommended for testing. Use the Advanced controls in the Networking tab to create rules to limit inbound traffic to known IP addresses."
- Step 2: Disks**: Shows options for selecting disks, with a note: "Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise."
- Step 3: Networking**: Shows network interface card selection and advanced networking controls.
- Step 4: Firewall**: Shows security group and port rules configuration.
- Step 5: Advanced controls**: Shows options for disk encryption, managed disk type, and other advanced settings.
- Step 6: Summary**: Shows the final configuration details before creation.

At the bottom, there are navigation buttons: < Previous, Next : Disks >, Review + create, and a Give feedback link. The status bar at the bottom right shows the date (2025/09/05), time (10:52), and weather (20°C Sunny).

Task 2: Manage compute and storage scaling for virtual machines

The screenshot shows the 'Virtual machines' section of the Azure portal. A specific virtual machine, 'az104-vm1', is selected. The 'Size' blade is open, showing a list of available VM sizes. The 'DS1_v2' size is highlighted. The blade also displays current usage statistics such as vCPUs, RAM (3.5 GiB), and data disks (4).

Task 3: Create and configure Azure Virtual Machine Scale Sets

The screenshot shows the 'Create a virtual machine scale set' blade in the Azure portal. It includes fields for 'Resource group' (set to 'az104-rg8'), 'Virtual machine scale set name' (set to 'vmss1'), 'Region' (set to '(US) East US'), and 'Availability zone' (set to 'Zones 1, 2, 3'). A note at the bottom encourages turning on Autoscaling.

Task 4: Scale Azure Virtual Machine Scale Sets

Task 5: Create a virtual machine using Azure PowerShell (option 1)

```

MOTD: SqlServer has been updated to Version 22!
VERBOSE: Authenticating to Azure ...
VERBOSE: Building your Azure drive ...
PS /home/siphelele> New-AzVM
>> -ResourceGroupName 'az104-rg8'
>> -Name "mySVN"
>> -Location "East US"
>> -Image "Windows2019Datacenter"
>> -Zone '1'
>> -Size 'Standard_D2s_v3'
>> -Credential (Get-Credential)

PowerShell credential request
Enter your credentials.
User: lindasphelele1@gmail.com
Password for user lindasphelele1@gmail.com: *****

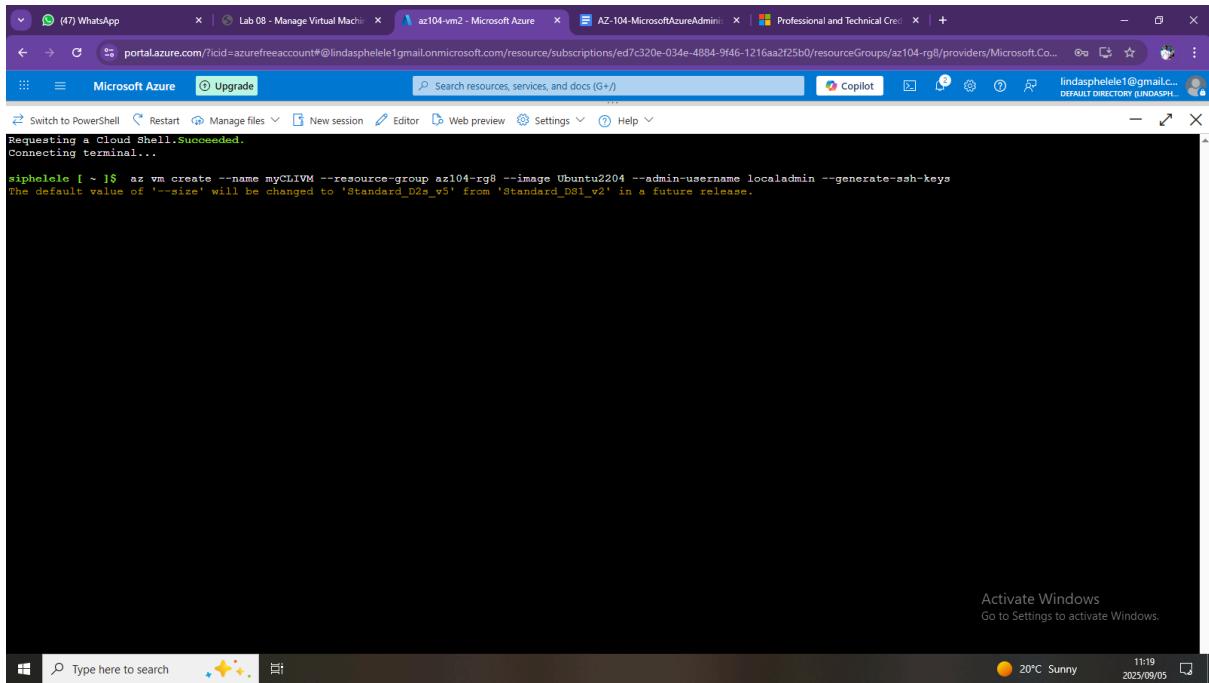
WARNING: Upcoming breaking changes in the cmdlet 'New-AzVM' :
The 'Default' VM size will change from 'Standard_D2s_v3' to 'Standard_D2s_v5'.
This change will take effect on 11/1/2025.
- The change is expected to take effect in Az version : '15.0.0'
- The change is expected to take effect in Az.Compute version : '11.0.0'
Note : Go to https://aka.ms/azps-changeswarnings for steps to suppress this breaking change warning, and other information on breaking changes in Azure PowerShell.
You can reference https://aka.ms/findImageBS on how to find VM Images using PowerShell.

New-AzVM: The requested VM size for resource 'Following SKUs have failed for Capacity Restrictions: Standard D2s v3' is currently not available in location 'eastus'. Please try another size or deploy to a different location or different zone. See https://aka.ms/azureskuunavailable for details.
PS /home/siphelele> Get-AzVM
>> -ResourceGroupName 'az104-rg8'
>> -Status
PS /home/siphelele> Stop-AzVM
>> -ResourceGroupName 'az104-rg8'
>> -Name "mySVN"

Virtual machine stopping operation
This cmdlet will stop the specified virtual machine. Do you want to continue?
(y) Yes [N] No [S] Suspend [(2) Help (Default) is "y"] . ■

```

Task 6: Create a virtual machine using the CLI (option 2)



```
siphelele [ ~ ]$ az vm create --name myCLIVM --resource-group az104-rg0 --image Ubuntu2204 --admin-username localadmin --generate-ssh-keys
The default value of '--size' will be changed to 'Standard_D2s_v5' from 'Standard_DS1_v2' in a future release.
```

Activate Windows
Go to Settings to activate Windows.

Windows Type here to search 20°C Sunny 11:19 2025/09/05

Lab 09a - Implement Web Apps

Task 1: Create and configure an Azure web app

Microsoft.Web-WebApp-Portal-9694c4db-8af4 | Overview

Your deployment is complete

Deployment name : Microsoft.Web-WebApp-Portal-9694c4db-8af4
Subscription : Azure subscription 1
Resource group : az104-rg9

Start time : 9/4/2025, 12:13:09 PM
Correlation ID : 4616ace4-fbac-4264-8ec0-9f45eeee3c7

Deployment details
Next steps

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Add or remove favorites by pressing Ctrl+Shift+F

Type here to search

25°C Sunny 12:14 2025/09/04

Lab 09b - Implement Azure Container Instances

Task 1: Deploy an Azure Container Instance using a Docker image

Microsoft.ContainerInstances-20250904145621 | Overview

Your deployment is complete

Deployment name : Microsoft.ContainerInstances-20250904145621
Subscription : Azure subscription 1
Resource group : az104-rg9

Start time : 9/4/2025, 2:59:59 PM
Correlation ID : a84092eb-5154-46fb-9891-1549643290b4

Deployment details
Next steps

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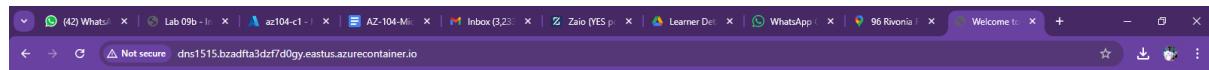
Activate Windows
Go to Settings to activate Windows.

Add or remove favorites by pressing Ctrl+Shift+F

Type here to search

26°C Sunny 15:01 2025/09/04

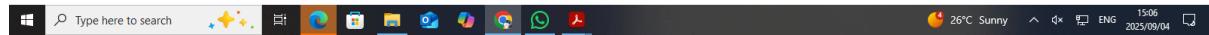
Task 2: Test and verify deployment of an Azure Container Instance



Welcome to Azure Container Instances!



Activate Windows
Go to Settings to activate Windows.



Name	Image	State	Previous state	Start time	Restart count
az104-c1	mcr.microsoft.com/azuredocs/aci-hello...	Running	-	2025-09-04T13:00:33.709Z	0

```

Listening on port 80
::ffff:10.92.0.10 - - [04/Sep/2025:13:04:40 +0000] "GET / HTTP/1.1" 200 1696 "-" "-"
::ffff:10.92.0.11 - - [04/Sep/2025:13:06:53 +0000] "GET / HTTP/1.1" 200 1696 "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/138.0.0.0 Safari/537.36"
::ffff:10.92.0.11 - - [04/Sep/2025:13:06:55 +0000] "GET /favicon.ico HTTP/1.1" 404 158 "http://dns1515.bzadfta3df7d0g.yeastus.azurecontainer.io/" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/138.0.0.0 Safari/537.36"

```

Activate Windows
Go to Settings to activate Windows.



Lab 09c - Implement Azure Container Apps

Task 1: Create and configure an Azure Container App and environment

The screenshot shows the Microsoft Azure portal with a deployment named 'Microsoft.App-ContainerApp-Portal-978c8433-90ff'. The deployment details table includes:

Resource	Type	Status	Operation details
workspaceaz104rg99ce5	Log Analytics workspace	Created	Operation details

On the right side of the portal, there are promotional banners for Microsoft Defender for Cloud, Free Microsoft tutorials, and Work with an expert.

At the bottom of the screen, the Windows taskbar shows the date and time as 2025/09/04 15:15, and the system status as 26°C Sunny.

Task 2: Test and verify deployment of the Azure Container App

The screenshot shows the Microsoft Azure portal with a deployed Container App named 'my-app'. The main message reads: 'Your container app is running with a Hello World image'.

Azure Container Apps is described as a serverless container solution for apps and microservices that helps you:

- Simplify your container deployments
- Manage less infrastructure
- Scale automatically on demand

[Learn more.](#)

Next steps

Explore sample templates you can leverage for your container apps. [Sample apps](#)

Follow our Quickstart guide and deploy your own app. [Quickstart](#)

At the bottom of the screen, the Windows taskbar shows the date and time as 2025/09/04 15:19, and the system status as 26°C Sunny.

Lab 10 - Implement Data Protection

Task 1: Use a template to provision an infrastructure

The screenshot shows the Microsoft Azure portal with a deployment named "Microsoft.Template-20250904152617" in the "Overview" tab. The deployment status is "Your deployment is complete". Deployment details include a name of "Microsoft.Template-20250904152617", a subscription of "Azure subscription 1", and a resource group of "az104-rg-region1". The deployment started at 9/4/2025, 3:26:28 PM. A Correlation ID is also provided. On the right side, there are promotional cards for Cost management, Microsoft Defender for Cloud, Free Microsoft tutorials, Work with an expert, and Activate Windows.

Task 2: Create and configure a Recovery Services vault

The screenshot shows the Microsoft Azure portal with a Recovery Services vault named "az104-rsv-region1" in the "Properties" tab. The vault is active and located in the East US region. It is associated with "Azure subscription 1". The "Subscription Id" is listed as "ed7c320e-034e-4884-9f46-1216aa2f25b0". The "Resource group" is "az104-rg-region1". Under the "Backup and Site Recovery" section, the "Backup Configuration" is set to "Update". A promotional card for "Activate Windows" is visible on the right.

Task 3: Configure Azure virtual machine-level backup

Configure backup

Policy sub type *

- Enhanced
 - Multiple backups per day
 - Up to 30 days operational tier retention
 - Support for Trusted Launch Azure VM
 - Support for VMs with Ultra Disks and Premium SSD v2
- Standard
 - Once-a-day backup
 - Up to 5 days operational tier retention

Backup policy *

- EnhancedPolicy
- [Create a new policy](#)

Protecting a VM with enhanced policy can incur additional snapshot charges. Please note that once you enable a VM backup with enhanced policy, changing to standard policy type is not possible. [Learn more.](#)

Policy details

Full backup

Backup frequency
Every 4 hour(s) starting 8:00 AM UTC for 12 Hour(s)

Instant restore
Retain instant recovery snapshot(s) for 2 day(s)

Retention of daily backup point
Retain backup taken every day for 30 Day(s)

Consistency type Application or file-system consistent

Virtual machines

Name	Resource group	Disks	Include future disks
			Activate Windows Go to Settings to activate Windows

[Enable backup](#) [Download a template for automation](#)

Give feedback

Task 4: Monitor Azure Backup

bhongobhongo_1756993782557 | Overview

Deployment

Your deployment is complete

Deployment name: bhongobhongo_1756993782557
Subscription: Azure subscription 1
Resource group: az104-rg-region1

Start time: 9/4/2025, 3:50:11 PM
Correlation ID: 848db223-4ffa-4296-8a90-a666c6113c28

[Go to resource](#) [Pin to dashboard](#)

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Get notified to stay within your budget and prevent unexpected charges on your bill.
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Lab 11 - Implement Monitoring

Task 1: Use a template to provision an infrastructure

The screenshot shows the Azure Monitor Virtual Machines blade. On the left, a navigation menu includes options like Overview, Activity log, Alerts, Metrics, Logs, Change Analysis, Service health, Workbooks, Dashboards with Grafana (preview), Insights, Applications, and Virtual Machines. The Virtual Machines section is currently selected. The main area displays a table with columns for Name, Status, and Monitor. Two rows are listed: 'az104-rg8' and 'az104-vm1'. Both rows show 'Not monitored' under the Status column. A callout box provides information about the map data set collected for VMs. On the right, there's a 'Get more visibility into the health and performance of your virtual machine' section with a cloud icon and a bell icon.

Task 2: Create an alert

The screenshot shows the 'Create an alert rule' blade. At the top, tabs include Scope, Condition, Actions, Details, Tags, and Review + create. The Scope tab is selected. It shows a dropdown for 'Signal name' with 'Delete Virtual Machine (Virtual Machines)' selected. Below it, a 'Chart period' dropdown is set to 'Over the last 6 hours'. A chart area displays 'No data available'. At the bottom, buttons for 'Review + create', 'Previous', and 'Next: Actions >' are visible.

Task 3: Configure action group notifications

The screenshot shows the Microsoft Azure Monitor Alerts interface. The left sidebar lists various monitoring categories like Metrics, Logs, Change Analysis, Service health, Workbooks, and Dashboards with Grafana (preview). The main area displays alert statistics: Total alerts (0), Critical (0), Error (0), Warning (0), Informational (0), and Verbose (0). Below this, a search bar and filter options are present, along with a time range selector set to 'Past 24 hours' and an alert condition of 'Fired'. A severity filter is set to 'all'. A large message bubble icon with an exclamation mark indicates 'No alerts found'. A note suggests changing the search or scope if alerts are not visible. A 'Clear filters' button is at the bottom. The status bar at the bottom right shows the date as 2025/09/05 and the time as 09:32.

Task 4: Trigger an alert and confirm it is working

The screenshot shows the Microsoft Azure Compute infrastructure Virtual machines page. The left sidebar includes Infrastructure, Virtual machines (selected), Virtual Machine Scale Set (VMSS), Compute Fleet, Disks + images, Capacity + placement, Related services, and Help. The main area displays a table of virtual machines. The columns include Name, Subscription, Resource Group, Location, Status, Operating system, Size, Public IP address, Disks, and Update status. Two entries are shown: 'az104-vm1' (Running) and 'az104-vm2' (Failed). A note at the top of the table area says, 'You are viewing a new version of Browse experience. Click here to access the old experience.' The status bar at the bottom right shows the date as 2025/09/05 and the time as 09:35.

Task 5: Configure an alert processing rule

The screenshot shows the Azure Monitor Alerts blade. The left sidebar includes options like Overview, Activity log, and Alerts (which is selected). The main area displays alert counts by severity: Critical (0), Error (0), Warning (0), Informational (0), and Verbose (0). A large exclamation mark icon indicates "No alerts found". Below it, a message says: "Try changing your search or choose a different scope level if you don't see what you're looking for." A "Clear filters" button is present. The top navigation bar shows tabs for WhatsApp, Lab 11 - Implement Monitoring, Monitor - Microsoft Azure, AZ-104-MicrosoftAzureAdmin, Pearson VUE - Select exam option, and portal.azure.com. The URL in the address bar is portal.azure.com/?cid=azurerefreaccount#view/Microsoft_Azure_Monitoring/AzureMonitoringBrowseBlade/-/alertsV2.

Task 6: Use Azure Monitor log queries

The screenshot shows the Azure Monitor Logs blade. The left sidebar includes Overview, Activity log, Alerts, Metrics (selected), and Logs. The main area features a "New Query 1" editor with the following KQL query:

```

1 InsightsMetrics
2 | where TimeGenerated > ago(1h)
3 | where Name == "UtilizationPercentage"
4 | summarize avg(vVal) by bin(TimeGenerated, 5m), Computer //split up by computer
5 | render timechart
    
```

The results section shows a line chart titled "az104-vm1" with the Y-axis labeled "avg(vVal)" ranging from 0 to 0.6. The X-axis is "TimeGenerated [UTC]" from 7:00 AM to 7:55 AM. The chart shows a flat line at approximately 0.05 until 7:50 AM, followed by a sharp rise to about 0.55 at 7:55 AM. The bottom of the screen shows a Windows taskbar with a search bar, date (2025/09/05), and time (10:01).

Task 1: Use the PowerShell CLI

Use the PowerShell Get-date command to get the current date and time.

The screenshot shows a Microsoft Learn page for a PowerShell exercise. On the left, there's a 'Tip' box stating: "You can tell you're in PowerShell mode by the PS before your directory on the command line." Below it, two code snippets are shown in a PowerShell window:

```
PowerShell
Get-date
```

and

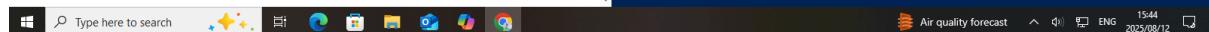
```
PowerShell
az version
```

To the right, the Azure Cloud Shell terminal window shows the output of the 'Get-date' command:

```
PS /home/lindasphelele1> Get-date
Tuesday, August 12, 2025 1:43:51 PM
```

Task 2: Use the BASH CLI

If you're more familiar with BASH, you can use BASH command instead by shifting to the BASH



Let's try an Azure command to check what version of the CLI you're using right now.

The screenshot shows a Microsoft Learn page for a PowerShell exercise. On the left, there's a note: "Most Azure specific commands will start with the letters az. The Get-date command you just ran is a PowerShell specific command. Let's try an Azure command to check what version of the CLI you're using right now." Below it, a code snippet is shown in a PowerShell window:

```
PowerShell
az version
```

To the right, the Azure Cloud Shell terminal window shows the output of the 'az version' command:

```
PS /home/lindasphelele1> az version
{
  "azure-cli": "2.75.0",
  "azure-cli-core": "2.75.0",
  "azure-cli-telemetry": "1.1.0",
  "extensions": {
    "ml": "2.37.2",
    "ssh": "2.0.6"
  }
}
```

Task 2: Use the BASH CLI

If you're more familiar with BASH, you can use BASH command instead by shifting to the BASH CLI.

Enter bash to switch to the BASH CLI.

```
PowerShell
bash
```

Task 2: Use the BASH CLI

Enter bash to switch to the BASH CLI.

Unit 4 of 9

PowerShell

```
az version
```

Ask Learn

Azure Cloud Shell

Switch to Bash | Restart | Manage files | New session | Editor

Requesting a Cloud Shell. **Succeeded.**

Connecting terminal...

MOTD: Azure Cloud Shell now includes Predictive IntelliSense! Learn more: <https://aka.ms/cloudShell/intellisense>.

VERBOSE: Authenticating to Azure ...

WARNING: You're using Az version 14.2.0. The latest version of Az is 14.3.0. Upgrade your Az modules using the following commands:

- Update-PSResource Az -Whatif -- Simulate updating your Az modules.
- Update-PSResource Az -- Update your Az modules.

VERBOSE: Building your Azure drive ...

PS /home/lindasphelele1> Get-date

Tuesday, August 12, 2025 10:15:10 AM

PS /home/lindasphelele1> az version

```
{
  "azuse-CLI": "2.75.0",
  "azuse-CLI-core": "2.75.0",
  "azuse-CLI-telemetry": "1.1.0",
  "extensions": [
    "mlt": "2.37.2",
    "ssh": "2.0.6"
  ]
}
```

PS /home/lindasphelele1>

Activate Windows
Go to Settings to activate Windows.

Windows Start Menu | Type here to search | Taskbar icons | System tray: 15°C Sunny, ENG, 12:15, 2025/08/12

Again, use the Get-date command to get the current date and time.

Unit 4 of 9

Azure CLI

```
Get-date
```

Ask Learn

Azure Cloud Shell

Switch to PowerShell | Restart | Manage files | New session | Editor

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

lindasphelele1 [~]\$ Get-date
bash: Get-date: command not found
lindasphelele1 [~]\$

Activate Windows
Go to Settings to activate Windows.

Windows Start Menu | Type here to search | Taskbar icons | System tray: 19°C Sunny, ENG, 15:50, 2025/08/12

Use the date command to get the current date and time.

Unit 4 of 9 | Ask Learn

Training Products Career Paths Browse all training Learn for Organizations Educator Center Student Hub FAQ & Help LEVEL 3 1925 /3699 XP

Use the date command to get the current date and time.

Azure CLI

date

Just like in the PowerShell mode of the CLI, you can use the letters az to start an Azure command in the BASH mode. Try to run an update to the CLI with az upgrade.

Azure CLI

az upgrade

You can change back to PowerShell mode by entering pwsh on the BASH command line.

Activate Windows Go to Settings to activate Windows.

Task 3: Use Azure CLI interactive mode

Another way to interact is using the Azure CLI interactive mode. This changes CLI behavior to more closely resemble an integrated development environment (IDE). Interactive mode provides

Just like in the PowerShell mode of the CLI, you can use the letters az to start an Azure command in the BASH mode. Try to run an update to the CLI with az upgrade.

Unit 4 of 9 | Ask Learn

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Use the date command to get the current date and time.

Azure CLI

date

Just like in the PowerShell mode of the CLI, you can use the letters az to start an Azure command in the BASH mode. Try to run an update to the CLI with az upgrade.

Azure CLI

az upgrade

You can change back to PowerShell mode by entering pwsh on the BASH command line.

Activate Windows Go to Settings to activate Windows.

Task 3: Use Azure CLI interactive mode

Another way to interact is using the Azure CLI interactive mode. This changes CLI behavior to more closely resemble an integrated development environment (IDE). Interactive mode provides autocomplete, command descriptions, and even examples. If you're unfamiliar with BASH and PowerShell, but want to use the command line, interactive mode may help you.

Enter az interactive to enter interactive mode.

Enter az interactive to enter interactive mode.

The screenshot shows a Microsoft Edge browser window with several tabs open. The main content area displays the Microsoft Learn website for training on Azure. A sub-section titled 'Unit 4 of 9' is shown, specifically about the Azure CLI. On the right, the 'Azure Cloud Shell' interface is active. The command line shows the user has typed 'az interactive'. A completion dropdown menu is open, listing various Azure services like account, acr, ad, advisor, afd, aks, ana, and az. Below the command line, the help documentation for 'az interactive' is visible, explaining its purpose and how to use it. The status bar at the bottom right shows system information including the date and time.

Try the upgrade or version commands again, but this time without az in front.

This screenshot shows the same Microsoft Learn environment and Azure Cloud Shell setup as the previous one. The user has now run the 'version' command, which outputs the Azure CLI version information. The command line also shows the user has run 'exit' to leave the interactive mode. The status bar at the bottom right indicates the date and time as 2025/08/12 15:57.

The commands should have worked the same as before, and given you the same results. Use the exit command to leave interactive mode.

The commands should have worked the same as before, and given you the same results. Use the exit command to leave interactive mode.

```

Azure CLI
version
Azure CLI
upgrade
The commands should have worked the same as before, and given you the same results. Use the exit command to leave interactive mode.

Azure CLI
exit

```

```

Loading command table... Expected time around 1 minute.
+-->> version
{
  "azure-cli": "2.75.0",
  "azure-cli-core": "2.75.0",
  "azure-cli-telemetry": "1.1.0",
  "extensions": [
    "interactive": "1.0.0b1",
    "ml": "2.37.2",
    "ssh": "2.0.6"
  ]
}
+-->> upgrade
This command is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
Your current Azure CLI version is 2.75.0. Latest version available is 2.76.0.
Please check the release notes first: https://learn.microsoft.com/cli/azure/release-notes-az-cli
Do you want to continue? (Y/n): y
Not able to upgrade automatically. Instructions can be found at https://aka.ms/doc/installAzureCLI
Cli upgrade failed or aborted.
+-->> exit
lindasphelele1 [ ~ ]$ 

```

Activate Windows
Go to Settings to activate Windows.

Task 4: Use the Azure portal

Deployment is in progress

Resource	Type	Status	Operation details
my-vm159	Microsoft.Network/networkInterfaces	OK	Operation details
my-VM-vnet	Microsoft.Network/virtualNetworks	OK	Operation details
my-VM-nsg	Microsoft.Network/networkSecurityGroups	OK	Operation details
my-VM-ip	Microsoft.Network/publicIPAddresses	OK	Operation details

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Activate Windows
Go to Settings to activate Windows.

Exercise - Create an Azure virtual machine

Task 1: Create a Linux virtual machine and install Nginx

From Cloud Shell, run the following `az vm create` command to create a Linux VM:

Task 1: Create a Linux virtual machine and install Nginx

Use the following Azure CLI commands to create a Linux VM and install Nginx. After your VM is created, you'll use the Custom Script Extension to install Nginx. The Custom Script Extension is an easy way to download and run scripts on your Azure VMs. It's just one of the many ways you can configure the system after your VM is up and running.

1. From Cloud Shell, run the following `az vm create` command to create a Linux VM:

```
az vm create \
--resource-group "learn-d0053838-fba1-4ee8-9a03-e2eabb694c7c" \
--name my-vm \
--public-ip-sku Standard \
--image Ubuntu2204 \
--admin-username azureuser \
--generate-ssh-keys
```

Run the following `az vm extension set` command to configure Nginx on your VM:

This command uses the Custom Script Extension to run a Bash script on your VM. The script is stored on GitHub. While the command runs, you can choose to [examine the Bash script](#) from a separate browser tab. To summarize, the script:

- Runs `apt-get update` to download the latest package information from the internet. This step helps ensure that the next command can locate the latest version of the Nginx package.
- Installs Nginx.
- Sets the home page, `/var/www/html/index.html`, to print a welcome message that includes your VM's host name.

Continue

This exercise is complete for now. The sandbox keeps running, and you come back to this point in a few units to update the network configuration so you can get to the website.

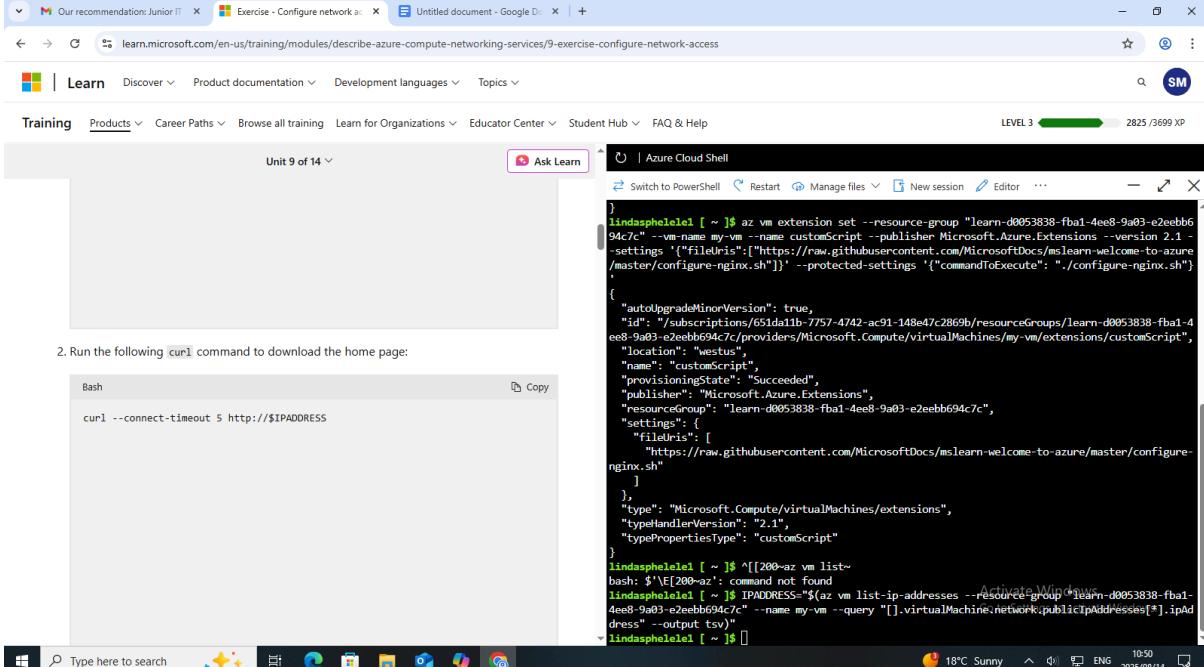
Next unit: Describe Azure virtual desktop

< Previous Next >

Exercise - Configure network access

Task 1: Access your web server

Run the following `az vm list-ip-addresses` command to get your VM's IP address and store the result as a Bash variable:



The screenshot shows a Microsoft Azure Cloud Shell interface. The command entered is:

```
lindasphelele1 [ ~ ]$ az vm list-ip-addresses --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eabb694c7c" --name my-vm --query "[].virtualMachine.network.publicIpAddresses[*].ipAddress" --output tsv
```

The output of the command is:

```
10.0.0.4
```

Run the following `curl` command to download the home page:

The `--connect-timeout` argument specifies to allow up to five seconds for the connection to occur. After five seconds, you see an error message that states that the connection timed out:

This message means that the VM wasn't accessible within the timeout period.

3. As an optional step, try to access the web server from a browser:

a. Run the following to print your VM's IP address to the console:

```
Bash
echo $IPADDRESS
```

The terminal output shows the command being run and its result:

```
lindasphelel1 [ ~ ]$ echo $IPADDRESS
10.10.255.25
```

Activate Windows

18°C Sunny 10:52 2025/08/14

As an optional step, try to access the web server from a browser:

a. Run the following to print your VM's IP address to the console:

You see an IP address, for example, 23.102.42.235.

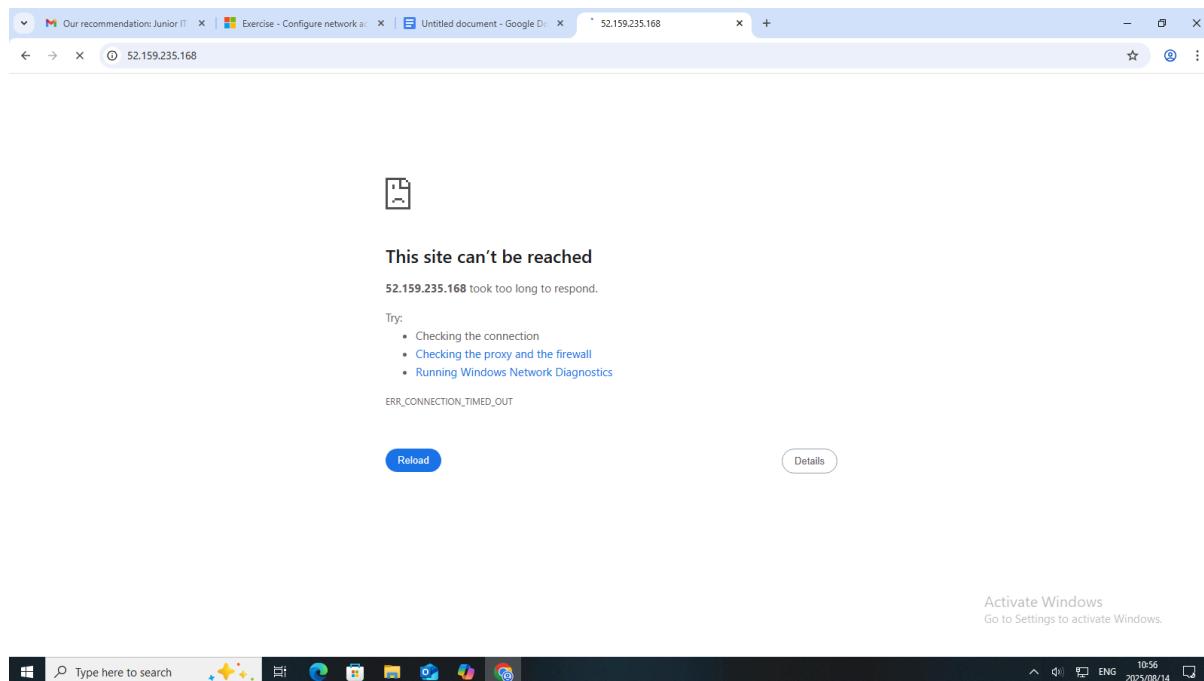
b. Copy the IP address that you see to the clipboard.

c. Open a new browser tab and go to your web server. After a few moments, you see that the connection isn't happening. If you wait for the browser to time out, you see something like this:

Activate Windows

19°C Sunny 10:54 2025/08/14

Open a new browser tab and go to your web server. After a few moments, you see that the connection isn't happening. If you wait for the browser to time out, you see something like this:



Activate Windows
Go to Settings to activate Windows.

Task 2: List the current network security group rules

Run the following `az network nsg list` command to list the network security groups that are associated with your VM:

```
az network nsg list \
--resource-group "learn-d0053838-fba1-4ee8-9a03-e2eabb694c7c" \
--query "[].name" \
--output tsv
```

```
my-vmNSG
```

Run the following `az network nsg rule list` command to list the rules associated with the NSG named my-vmNSG:

```
az network nsg rule list \
--resource-group "learn-d0053838-fba1-4ee8-9a03-e2eabb694c7c" \
--nsg-name my-vmNSG
```

Run the `az network nsg rule list` command a second time. This time, use the `--query` argument to retrieve only the name, priority, affected ports, and access (Allow or Deny) for each rule. The `--output` argument formats the output as a table so that it's easy to read.

```
az network nsg rule list \
--resource-group "learn-d0053838-fba1-4ee8-9a03-e2eabb694c7c" \
--nsg-name my-vmNSG \
--query '[].{Name:name, Priority:priority, Port:destinationPortRange, Access:access}' \
--output table
```

Name	Priority	Port	Access
default-allow-ssh	1000	22	Allow

Task 3: Create the network security rule

Run the following `az network nsg rule create` command to create a rule called `allow-http` that allows inbound access on port 80:

```

"destinationAddressPrefixes": [],
"destinationPortRange": "22",
"destinationPortRanges": [],
"direction": "Inbound",
"etag": "W/"4a96fdaf-cb31-47fb-870b-13bcc1c604c6\"",
"id": "/subscriptions/651da11b-7757-4742-ac91-148e47c2869b/resourceGroups/learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c/providers/Microsoft.Network/networkSecurityGroups/my-vmNSG/securityRules/default-allow-ssh",
"name": "default-allow-ssh",
"priority": 1000,
"protocol": "tcp",
"provisioningState": "Succeeded",
"resourceGroup": "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c",
"sourceAddressPrefix": "*",
"sourceAddressPrefixes": [],
"sourcePortRange": "*",
"sourcePortRanges": [],
"type": "Microsoft.Network/networkSecurityGroups/securityRules"
}

lindasphelel1 [ ~ $ az network nsg rule list --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --query '['.{Name:name, Priority:priority, Port:destinationPortRange, Access:access} --output table
Name          Priority  Port    Access
-----
default-allow-ssh 1000    22     Allow
lindasphelel1 [ ~ $ [[200-az network nsg rule create --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --name allow-http --protocol tcp --priority 100 --destination-port-range 80 --access Allow
bash: $'[200-az': command not found
lindasphelel1 [ ~ $ az network nsg rule list --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --query '['.{Name:name, Priority:priority, Port:destinationPortRange, Access:access}" --output table
Name          Priority  Port    Access
-----
default-allow-ssh 1000    22     Allow

```

To verify the configuration, run `az network nsg rule list` to see the updated list of rules:

```

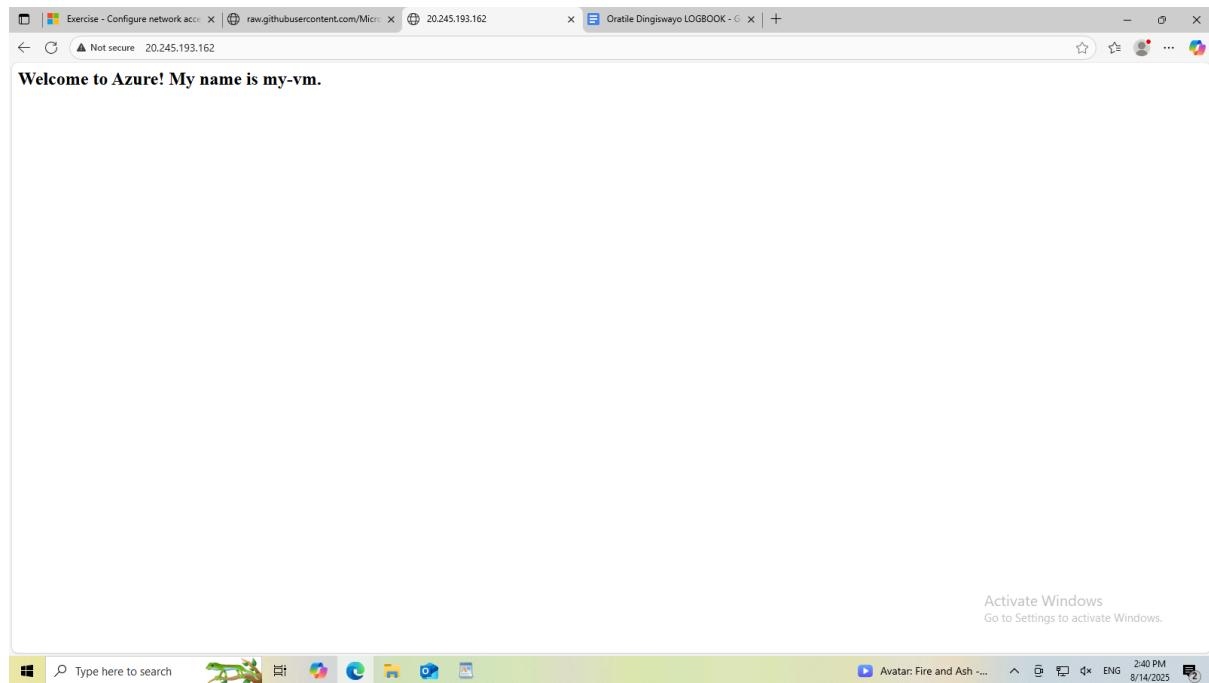
"destinationAddressPrefixes": [],
"destinationPortRange": "22",
"destinationPortRanges": [],
"direction": "Inbound",
"etag": "W/"4a96fdaf-cb31-47fb-870b-13bcc1c604c6\"",
"id": "/subscriptions/651da11b-7757-4742-ac91-148e47c2869b/resourceGroups/learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c/providers/Microsoft.Network/networkSecurityGroups/my-vmNSG/securityRules/default-allow-ssh",
"name": "default-allow-ssh",
"priority": 1000,
"protocol": "tcp",
"provisioningState": "Succeeded",
"resourceGroup": "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c",
"sourceAddressPrefix": "*",
"sourceAddressPrefixes": [],
"sourcePortRange": "*",
"sourcePortRanges": [],
"type": "Microsoft.Network/networkSecurityGroups/securityRules"
}

lindasphelel1 [ ~ $ az network nsg rule list --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --query '['.{Name:name, Priority:priority, Port:destinationPortRange, Access:access} --output table
Name          Priority  Port    Access
-----
default-allow-ssh 1000    22     Allow
lindasphelel1 [ ~ $ [[200-az network nsg rule create --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --name allow-http --protocol tcp --priority 100 --destination-port-range 80 --access Allow
bash: $'[200-az': command not found
lindasphelel1 [ ~ $ az network nsg rule list --resource-group "learn-d0053838-fba1-4ee8-9a03-e2eebb694c7c" --nsg-name my-vmNSG --query '['.{Name:name, Priority:priority, Port:destinationPortRange, Access:access}" --output table
Name          Priority  Port    Access
-----
default-allow-ssh 1000    22     Allow

```

Task 4: Access your web server again

As an optional step, refresh your browser tab that points to your web server. You see the home page:



Siphelele Mfusi

0104275728087

Siphelele Mfusi

0104275728087