VM Fleet Commander (Deploy and Manage Azure Compute Resources)

Manual

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Date: 5 August 2024

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GitHub: https://github.com/vivekvashisht04/Vm-Fleet-Commander

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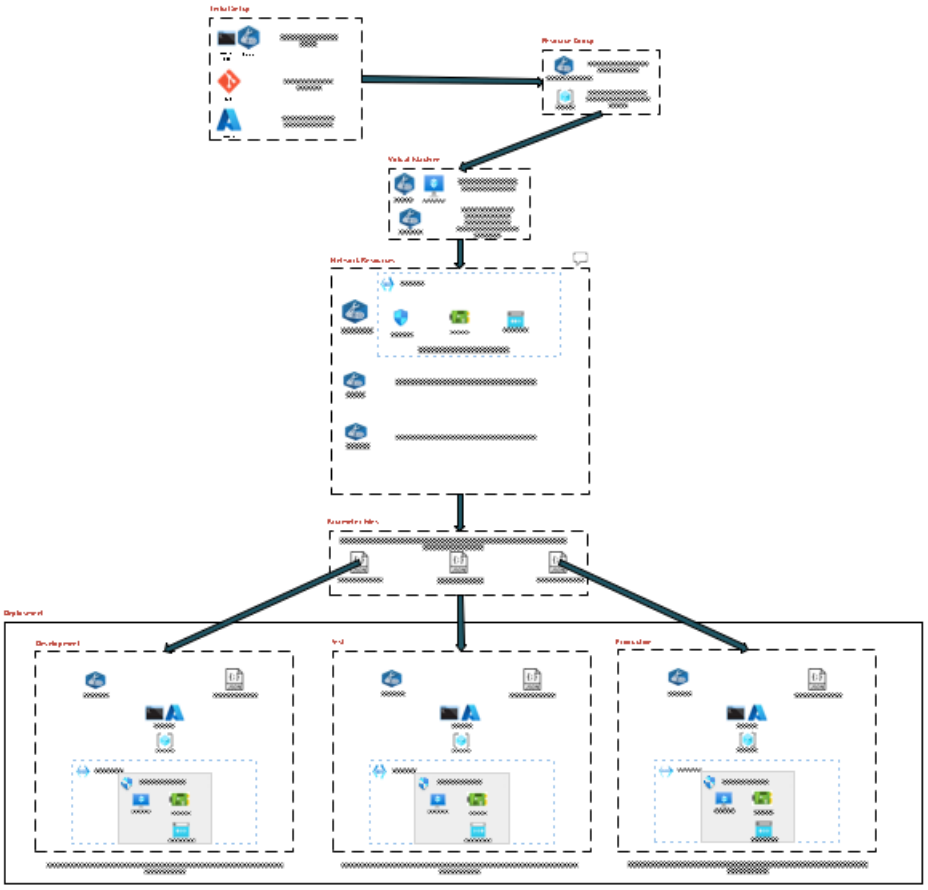
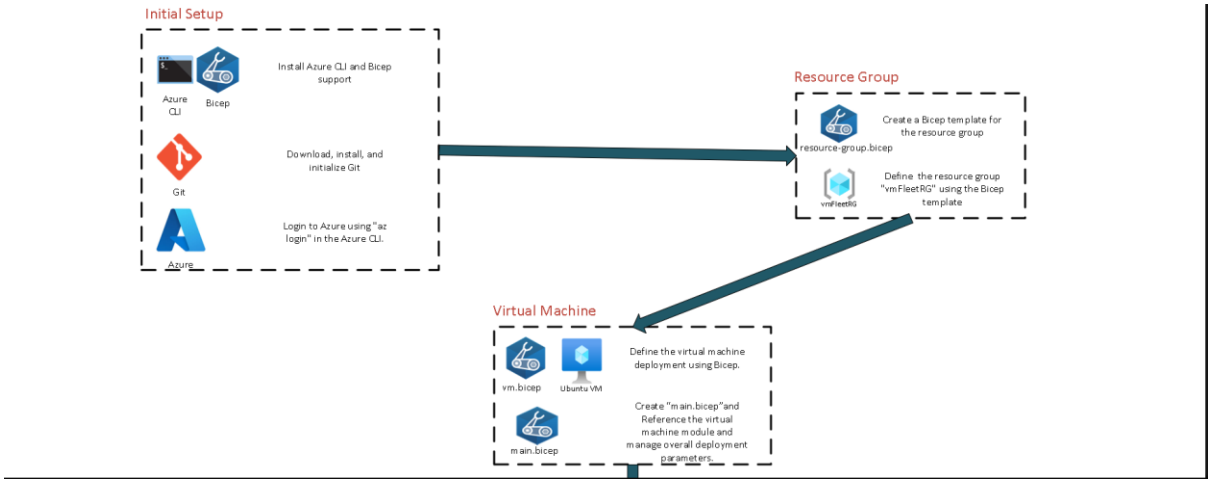
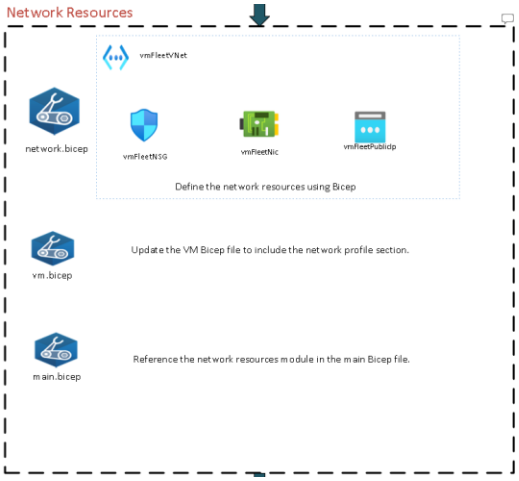
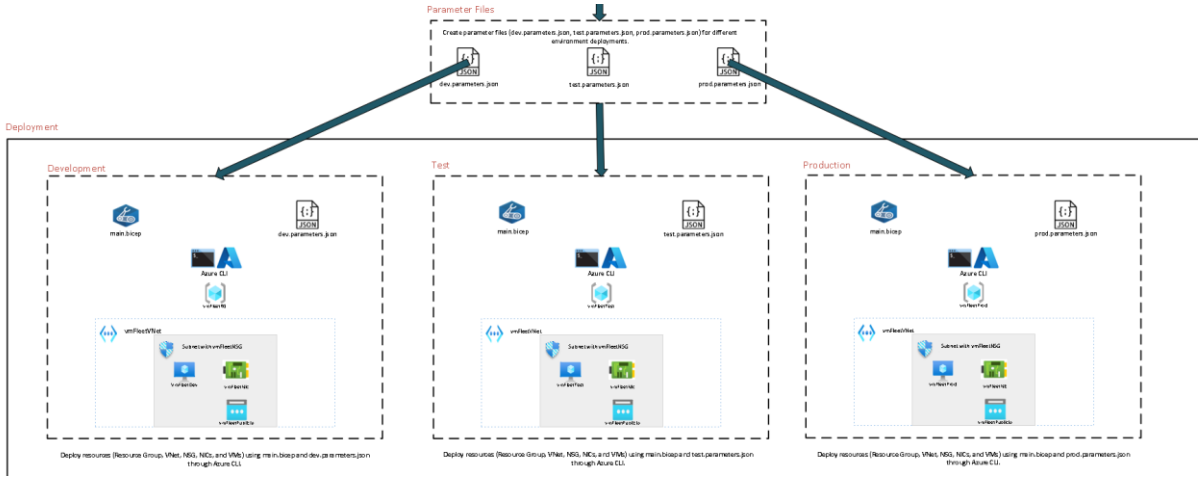








1. Introduction

Project Overview

The VM Fleet Commander project aims to implement an infrastructure-as-code approach to provision and manage virtual machines in Azure. This project uses ARM templates and Bicep to automate the deployment of Azure resources, providing hands-on experience in organizing and managing these resources efficiently.

Objective

The main objective of this project is to gain practical experience in:

- Automating the deployment of Azure resources using ARM templates and Bicep.
- Organizing resources efficiently.

- Understanding and applying infrastructure-as-code principles.

2.Initial Setup

I ensured I had Azure CLI installed with Bicep support. I confirmed this by running the following commands:

- `az`
- `az --version`
- `az bicep version`

Upon checking, I saw there was a new release available for Bicep, so I used the `az bicep upgrade` command in Azure CLI to upgrade to the latest version.

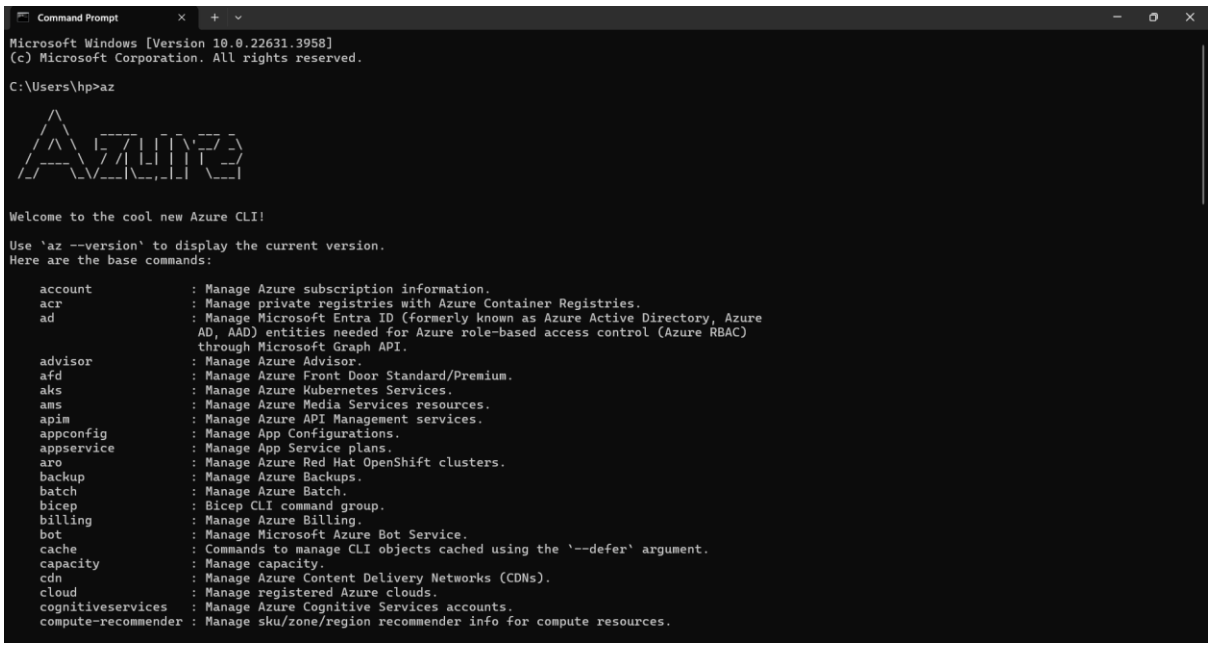
Next, I set up a version control system (Git) by downloading it from Git-scm.com. I downloaded the latest (2.46.0) 64-bit version of Git for Windows to track changes in my Bicep and ARM templates. After installation, I confirmed its installation by running the `git --version` command in Azure CLI.

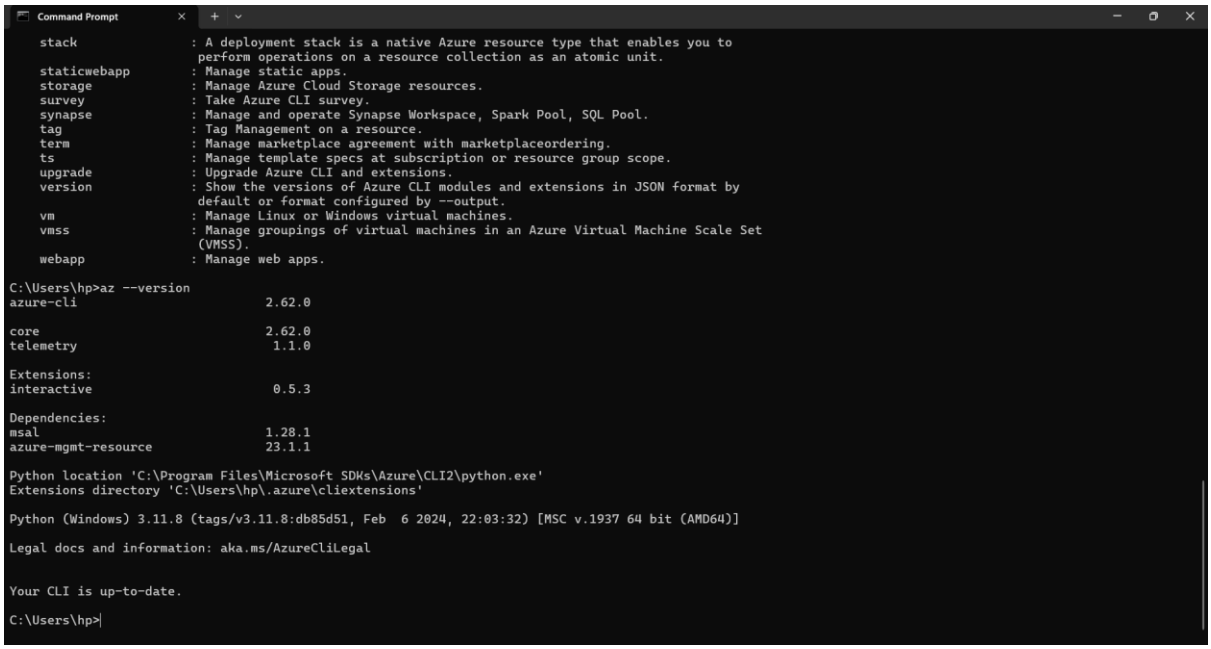
Then, I created a directory for my project and initialized a Git repository using the following commands in Azure CLI:

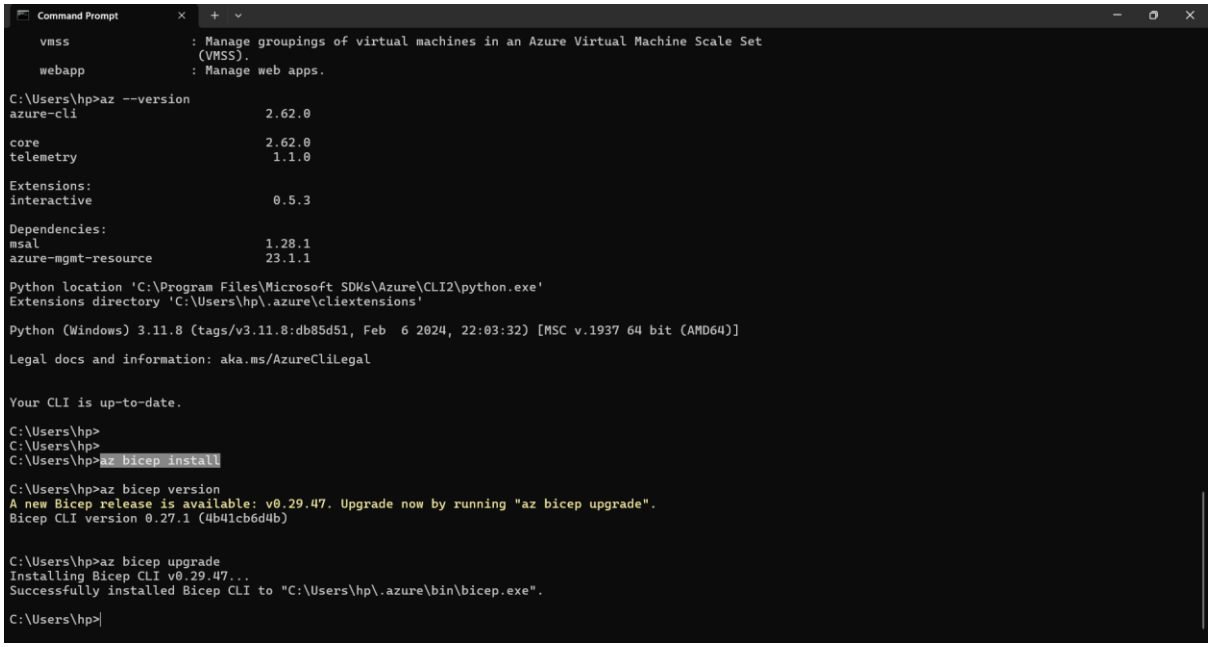
```
mkdir vm-fleet-commander
cd vm-fleet-commander
git init
```

Finally, I logged into my Azure account in Azure CLI using the `az login` command.

In this initial setup, I installed and verified Azure CLI and Bicep, set up Git for version control, created a project directory, initialized a Git repository, and logged into my Azure account. The screenshots below illustrate each step of the process.




Command Prompt
stack : A deployment stack is a native Azure resource type that enables you to perform operations on a resource collection as an atomic unit.
staticwebapp : Manage static apps.
storage : Manage Azure Cloud Storage resources.
survey : Take Azure CLI survey.
synapse : Manage and operate Synapse Workspace, Spark Pool, SQL Pool.
tag : Tag Management on a resource.
term : Manage marketplace agreement with marketplaceordering.
ts : Manage template specs at subscription or resource group scope.
upgrade : Upgrade Azure CLI and extensions.
version : Show the versions of Azure CLI modules and extensions in JSON format by default or format configured by --output.
vm : Manage Linux or Windows virtual machines.
vmss : Manage groupings of virtual machines in an Azure Virtual Machine Scale Set (VMSS).
webapp : Manage web apps.
C:\Users\hp>az --version
azure-cli 2.62.0
core 2.62.0
telemetry 1.1.0
Extensions:
interactive 0.5.3
Dependencies:
msal 1.28.1
azure-mgmt-resource 23.1.1
Python location 'C:\Program Files\Microsoft SDKs\Azure\CLI2\python.exe'
Extensions directory 'C:\Users\hp\.azure\cliextensions'
Python (Windows) 3.11.8 (tags/v3.11.8:db85d51, Feb 6 2024, 22:03:32) [MSC v.1937 64 bit (AMD64)]
Legal docs and information: aka.ms/AzureCliLegal
Your CLI is up-to-date.
C:\Users\hp>


Command Prompt
vmss : Manage groupings of virtual machines in an Azure Virtual Machine Scale Set (VMSS).
webapp : Manage web apps.
C:\Users\hp>az --version
azure-cli 2.62.0
core 2.62.0
telemetry 1.1.0
Extensions:
interactive 0.5.3
Dependencies:
msal 1.28.1
azure-mgmt-resource 23.1.1
Python location 'C:\Program Files\Microsoft SDKs\Azure\CLI2\python.exe'
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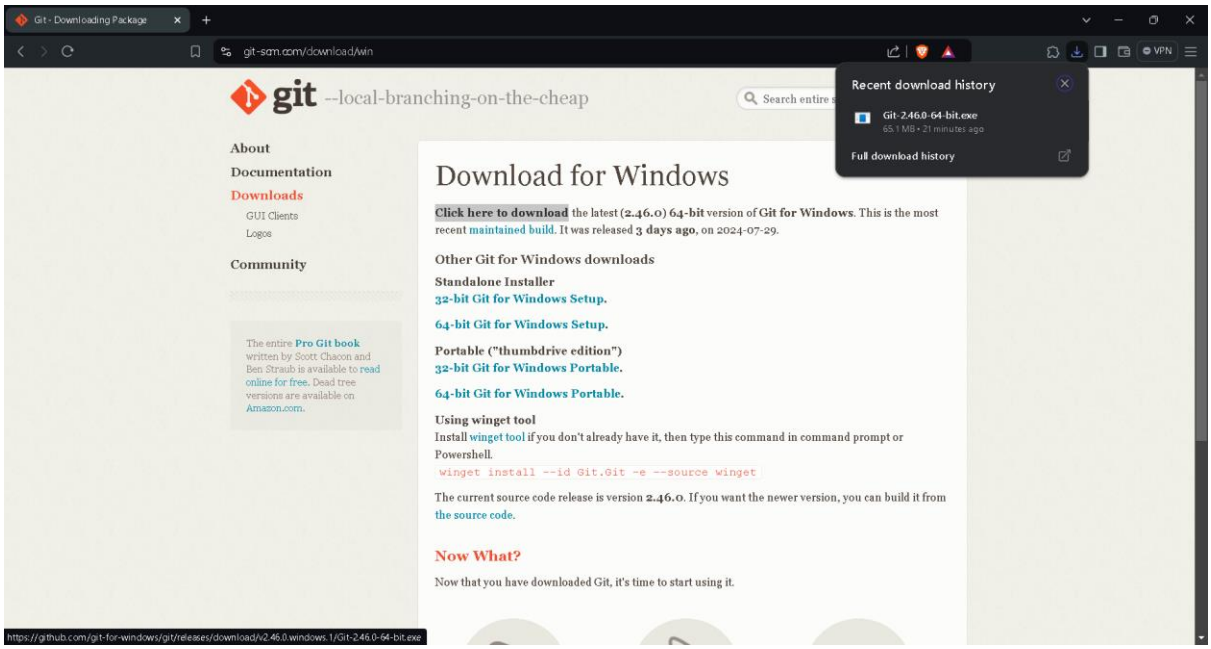
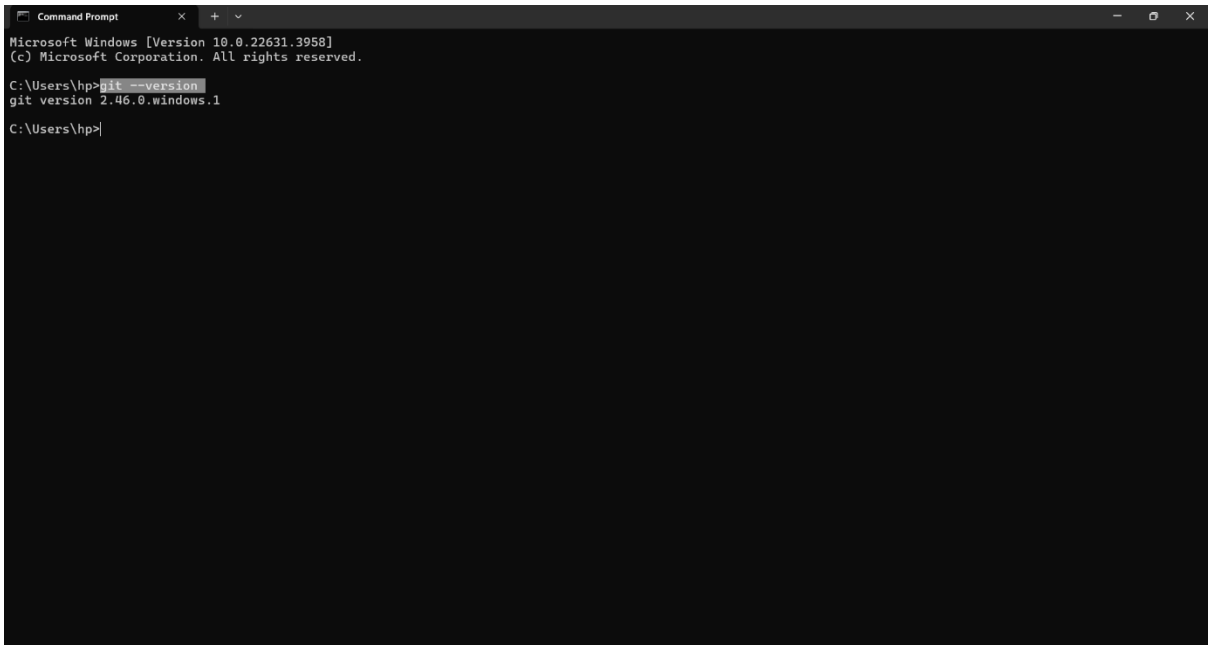
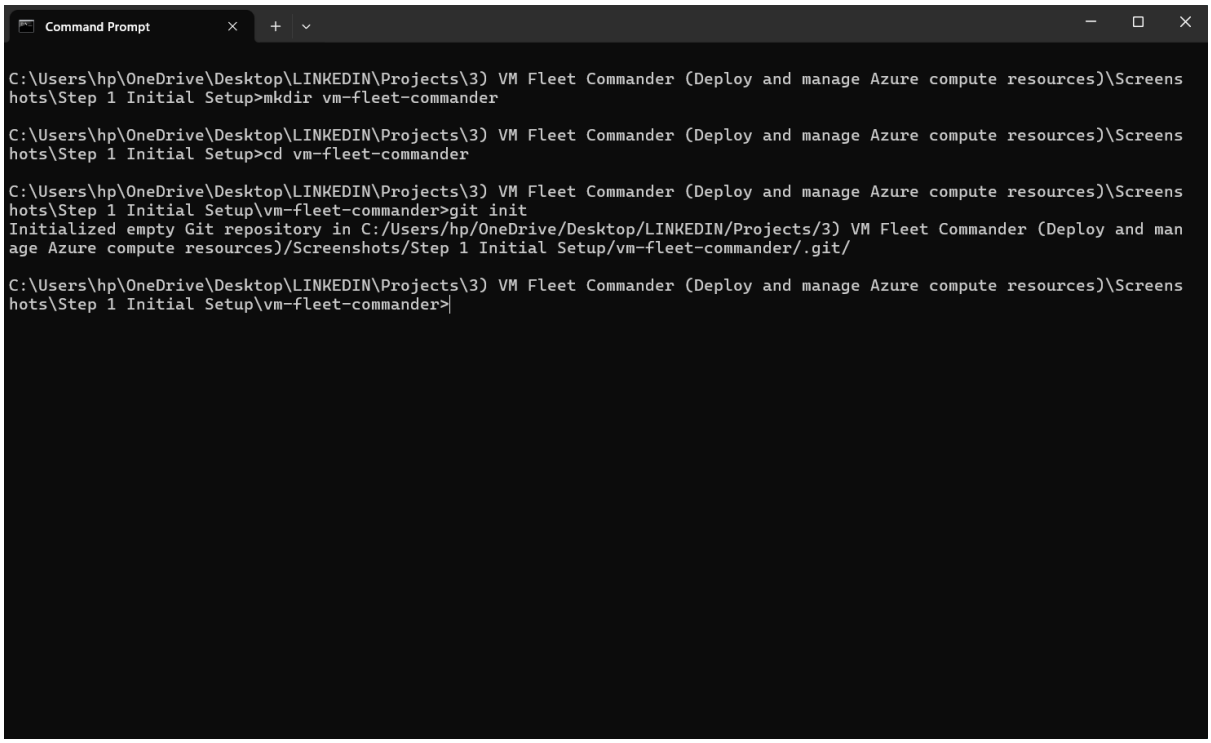
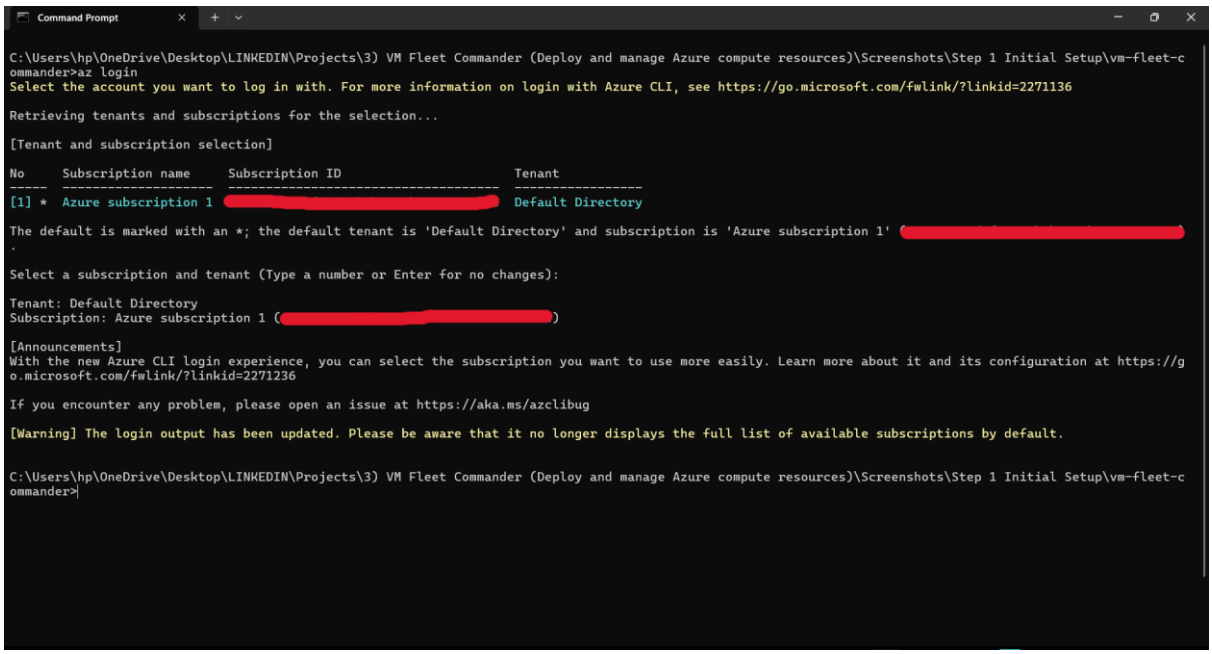
Python (Windows) 3.11.8 (tags/v3.11.8:db85d51, Feb 6 2024, 22:03:32) [MSC v.1937 64 bit (AMD64)]
Legal docs and information: aka.ms/AzureCliLegal
Your CLI is up-to-date.
C:\Users\hp>
C:\Users\hp>
C:\Users\hp>az bicep install
C:\Users\hp>az bicep version
A new Bicep release is available: v0.29.47. Upgrade now by running "az bicep upgrade".
Bicep CLI version 0.27.1 (4b41cb6d4b)
C:\Users\hp>az bicep upgrade
Installing Bicep CLI v0.29.47...
Successfully installed Bicep CLI to "C:\Users\hp\.azure\bin\bicep.exe".
C:\Users\hp>


Git - Downloading Package
git-scm.com/download/win
Recent download history
Git-2.46.0-64-bit.exe
65.1 MB • 21 minutes ago
Full download history
git --local-branching-on-the-cheap
About
Documentation
Downloads
GUI Clients
Logos
Community
The entire Pro Git book written by Scott Chacon and Ben Straub is available to read online for free. Dead tree versions are available on Amazon.com.
Download for Windows
Click here to download the latest (2.46.0) 64-bit version of Git for Windows. This is the most recent maintained build. It was released 3 days ago, on 2024-07-29.
Other Git for Windows downloads
Standalone Installer
32-bit Git for Windows Setup.
64-bit Git for Windows Setup.
Portable ("thumbdrive edition")
32-bit Git for Windows Portable.
64-bit Git for Windows Portable.
Using winget tool
Install winget tool if you don't already have it, then type this command in command prompt or Powershell.
winget install --id Git.Git -e --source winget
The current source code release is version 2.46.0. If you want the newer version, you can build it from the source code.
Now What?
Now that you have downloaded Git, it's time to start using it.
https://github.com/git-for-windows/git/releases/download/v2.46.0.windows.1/Git-2.46.0-64-bit.exe


Command Prompt
Microsoft Windows [Version 10.0.22631.3958]
(c) Microsoft Corporation. All rights reserved.
C:\Users\hp>git --version
git version 2.46.0.windows.1
C:\Users\hp>


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screens
hots\Step 1 Initial Setup>mkdir vm-fleet-commander
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screens
hots\Step 1 Initial Setup>cd vm-fleet-commander
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screens
hots\Step 1 Initial Setup\vm-fleet-commander>git init
Initialized empty Git repository in C:/Users/hp/OneDrive/Desktop/LINKEDIN/Projects/3) VM Fleet Commander (Deploy and man
age Azure compute resources)/Screenshots/Step 1 Initial Setup/vm-fleet-commander/.git/
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screens
hots\Step 1 Initial Setup\vm-fleet-commander>


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-c
ommander>az login
Select the account you want to log in with. For more information on login with Azure CLI, see https://go.microsoft.com/fwlink/?linkid=2271136
Retrieving tenants and subscriptions for the selection...
[Tenant and subscription selection]
No Subscription name Subscription ID Tenant
[1] * Azure subscription 1 [redacted] Default Directory
The default is marked with an *; the default tenant is 'Default Directory' and subscription is 'Azure subscription 1' [redacted]
.
Select a subscription and tenant (Type a number or Enter for no changes):
Tenant: Default Directory
Subscription: Azure subscription 1 ([redacted])
[Announcements]
With the new Azure CLI login experience, you can select the subscription you want to use more easily. Learn more about it and its configuration at https://g
o.microsoft.com/fwlink/?linkid=2271236
If you encounter any problem, please open an issue at https://aka.ms/azclibug
[Warning] The login output has been updated. Please be aware that it no longer displays the full list of available subscriptions by default.
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-c
ommander>

3. Bicep Basics

I already had experience working with Bicep and ARM templates when I was studying for my AZ-104 exam. For revision, I used the official Bicep documentation available here. Throughout this project, I referred to the Bicep documentation and used AI support in case of any doubts.

To practice, I revisited the process of converting a basic ARM template to Bicep. I used the following ARM template:

ARM Template: vm-template.json

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentTemplate.json#",
    "contentVersion": "1.0.0.0",
    "resources": [
      {
        "type": "Microsoft.Compute/virtualMachines",
        "apiVersion": "2021-03-01",
        "name": "myVM",
        "location": "[resourceGroup().location]",
        "properties": {
          "hardwareProfile": {
            "vmSize": "Standard_DS1_v2"
          },
          "osProfile": {
            "computerName": "myVM",
            "adminUsername": "xxxxxxxxxx",
            "adminPassword": "xxxxxxxxxx"
          }
        }
      }
    ]
}
```

Next, I used the command `az bicep decompile --file vm-template.json` in Azure CLI within the directory I created for practicing this conversion. This command generated a corresponding Bicep file.

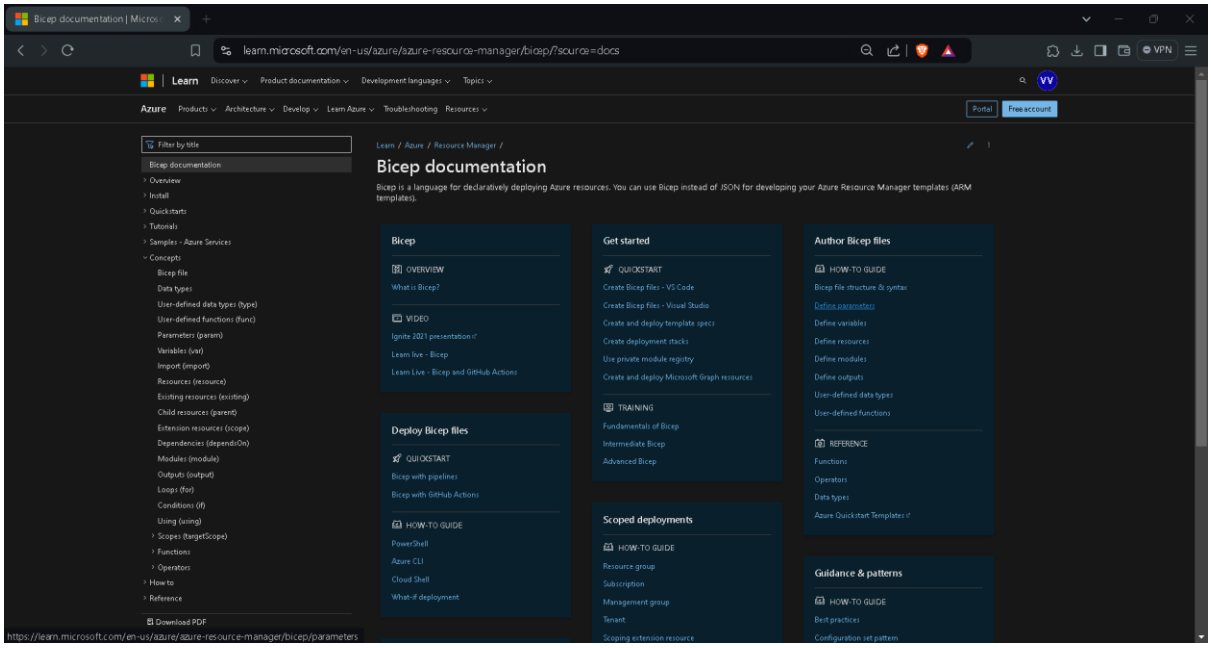
After running the command, the following Bicep file was created:

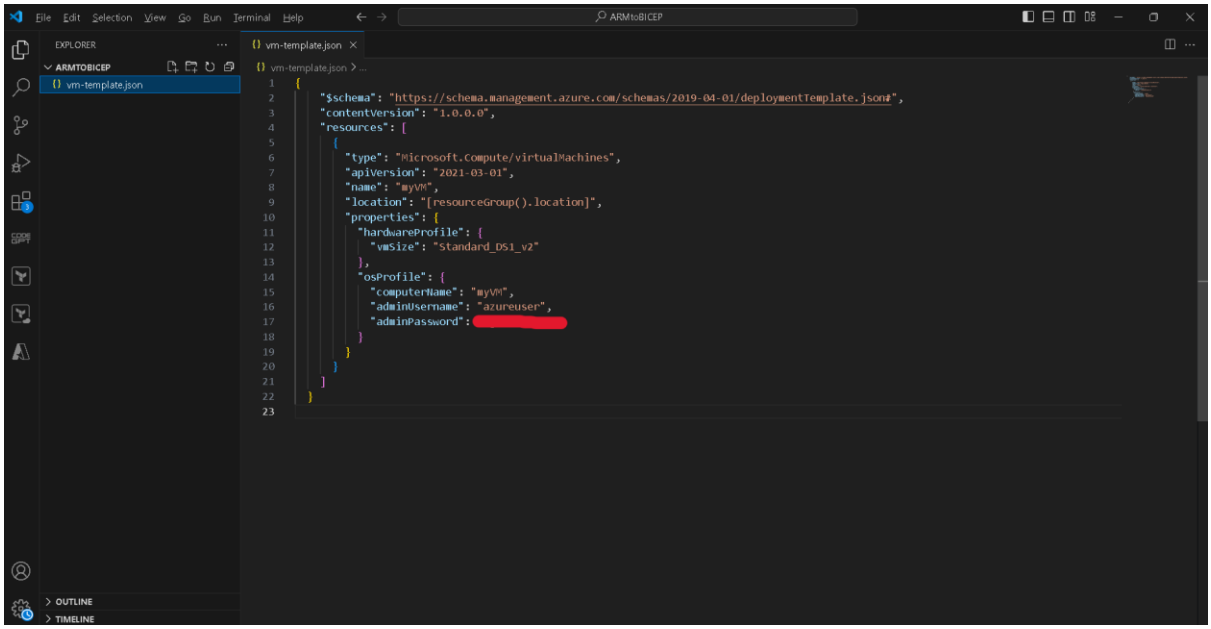
Bicep File: vm-template.bicep

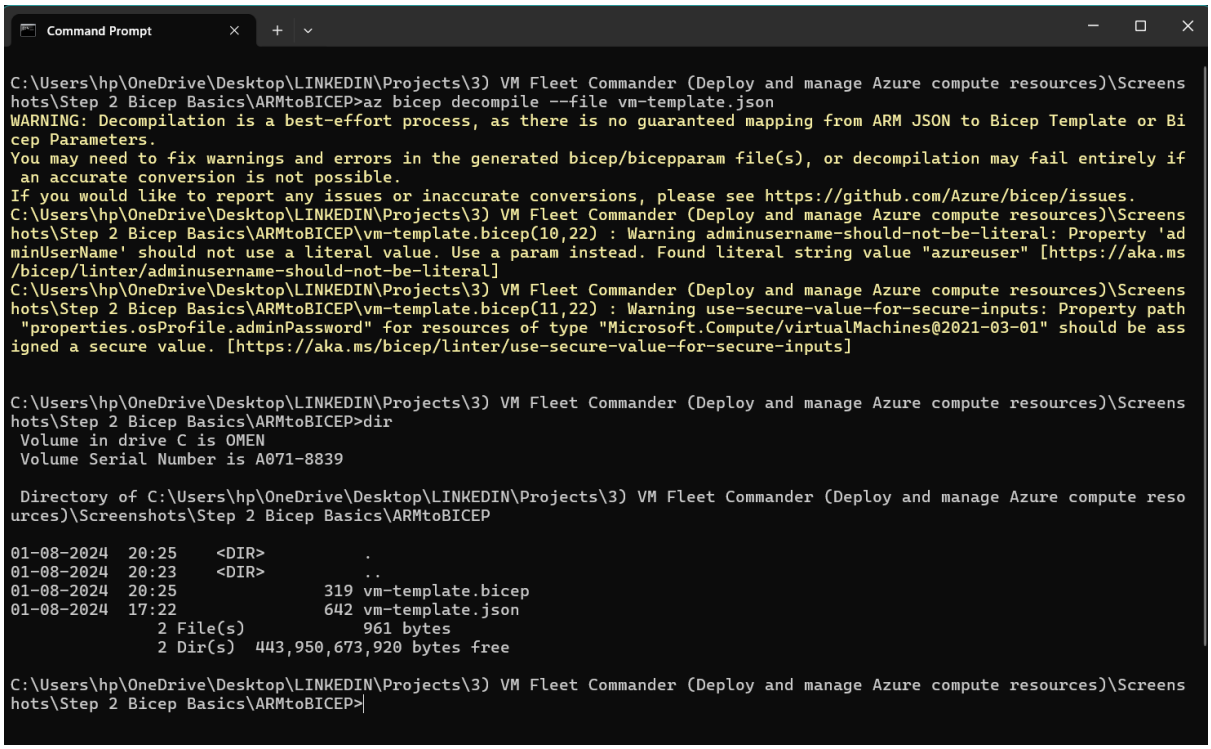
```
resource myVM 'Microsoft.Compute/virtualMachines@2021-03-01' = {
  name: 'myVM'
  location: resourceGroup().location
  properties: {
    hardwareProfile: {
      vmSize: 'Standard_DS1_v2'
    }
    osProfile: {
```

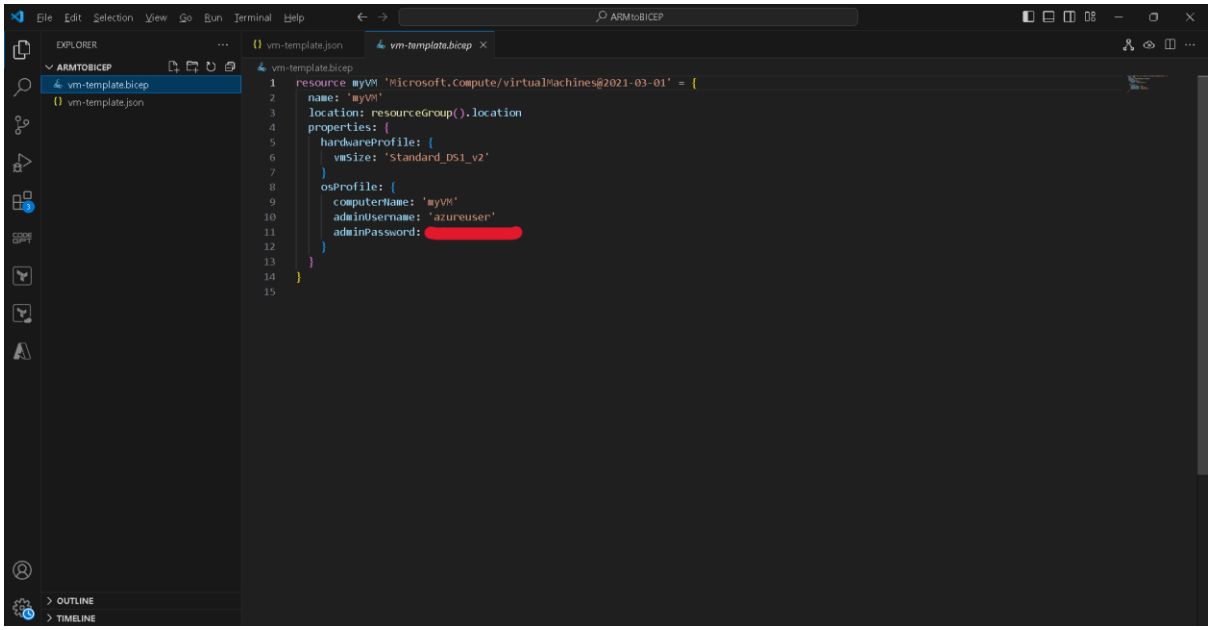
```
        computerName: 'myVM'
        adminUsername: 'xxxxxxxxxx'
        adminPassword: 'xxxxxxxxxx'
      }
    }
}
```

This practice helped me understand the differences between ARM and Bicep templates and reinforced my skills in using Bicep for Azure resource management.






Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP>az bicep decompile --file vm-template.json
WARNING: Decompilation is a best-effort process, as there is no guaranteed mapping from ARM JSON to Bicep Template or Bicep Parameters.
You may need to fix warnings and errors in the generated bicep/bicepparam file(s), or decompilation may fail entirely if an accurate conversion is not possible.
If you would like to report any issues or inaccurate conversions, please see https://github.com/Azure/bicep/issues.
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP\vm-template.bicep(10,22) : Warning adminusername-should-not-be-literal: Property 'adminUserName' should not use a literal value. Use a param instead. Found literal string value "azureuser" [https://aka.ms/bicep/linter/adminusername-should-not-be-literal]
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP\vm-template.bicep(11,22) : Warning use-secure-value-for-secure-inputs: Property path "properties.osProfile.adminPassword" for resources of type "Microsoft.Compute/virtualMachines@2021-03-01" should be assigned a secure value. [https://aka.ms/bicep/linter/use-secure-value-for-secure-inputs]
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP>dir
Volume in drive C is OMEN
Volume Serial Number is A071-8839
Directory of C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP
01-08-2024 20:25 <DIR> .
01-08-2024 20:23 <DIR> ..
01-08-2024 20:25 319 vm-template.bicep
01-08-2024 17:22 642 vm-template.json
2 File(s) 961 bytes
2 Dir(s) 443,950,673,920 bytes free
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 2 Bicep Basics\ARMtoBICEP>


File Edit Selection View Go Run Terminal Help
ARMtoBICEP
EXPLORER
ARMTOBICEP
vm-template.bicep
vm-template.json
vm-template.bicep
resource myVM 'Microsoft.Compute/virtualMachines@2021-03-01' = {
name: 'myVM'
location: resourceGroup().location
properties: {
hardwareProfile: {
vmSize: 'Standard_DS1_v2'
}
osProfile: {
computerName: 'myVM'
adminUsername: 'azureuser'
adminPassword:
}
}
}
OUTLINE
TIMELINE

4. Resource Group

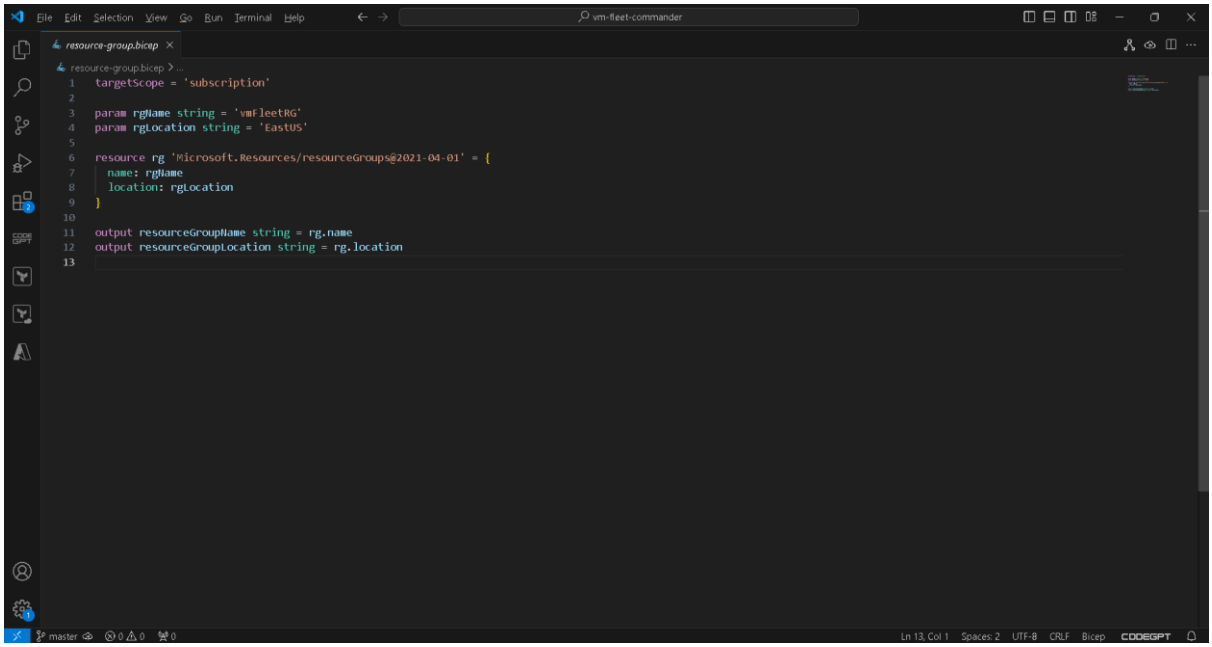
I defined a Bicep file named `resource-group.bicep` to create an Azure Resource Group for my VMs.

resource-group.bicep

```
targetScope = 'subscription'

param rgName string = 'vmFleetRG'
param rgLocation string = 'EastUS'

resource rg 'Microsoft.Resources/resourceGroups@2021-04-01' = {
  name: rgName
  location: rgLocation
}

output resourceGroupName string = rg.name
output resourceGroupLocation string = rg.location
```

This Bicep file defines the resource group with the name `vmFleetRG` in the `EastUS` location. The `targetScope` is set to `subscription`, indicating that this deployment targets the subscription level.

In this section, I ensured that the resource group is created correctly by defining the necessary parameters and resource configurations within the Bicep file.



5. Virtual Machine Provisioning

To provision virtual machines, I created a Bicep module in a file named `vm.bicep`. This module allows for parameterized input like VM size, name, and region. I used loops in Bicep to deploy multiple VM instances based on a specified count and implemented naming conventions using Bicep's string functions.

vm.bicep

```
param vmSize string
param vmNamePrefix string
param location string
param nicNamePrefix string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

@batchSize(1)
resource vm 'Microsoft.Compute/virtualMachines@2021-03-01' = [for i in
range(0, vmCount): {
  name: '${vmNamePrefix}-${i}'
  location: location
  properties: {
    hardwareProfile: {
      vmSize: vmSize
    }
    storageProfile: {
      osDisk: {
        createOption: 'FromImage'
        managedDisk: {
          storageAccountType: 'Standard_LRS'
        }
      }
      imageReference: {
        publisher: 'Canonical'
        offer: 'UbuntuServer'
        sku: '18.04-LTS'
        version: 'latest'
      }
    }
    osProfile: {
      computerName: '${vmNamePrefix}-${i}'
      adminUsername: adminUsername
      adminPassword: adminPassword
    }
    networkProfile: {
      networkInterfaces: [
        {
          id: resourceId('Microsoft.Network/networkInterfaces',
'${nicNamePrefix}-${i}')
        }
      ]
```

```
    }
  }
}]
```

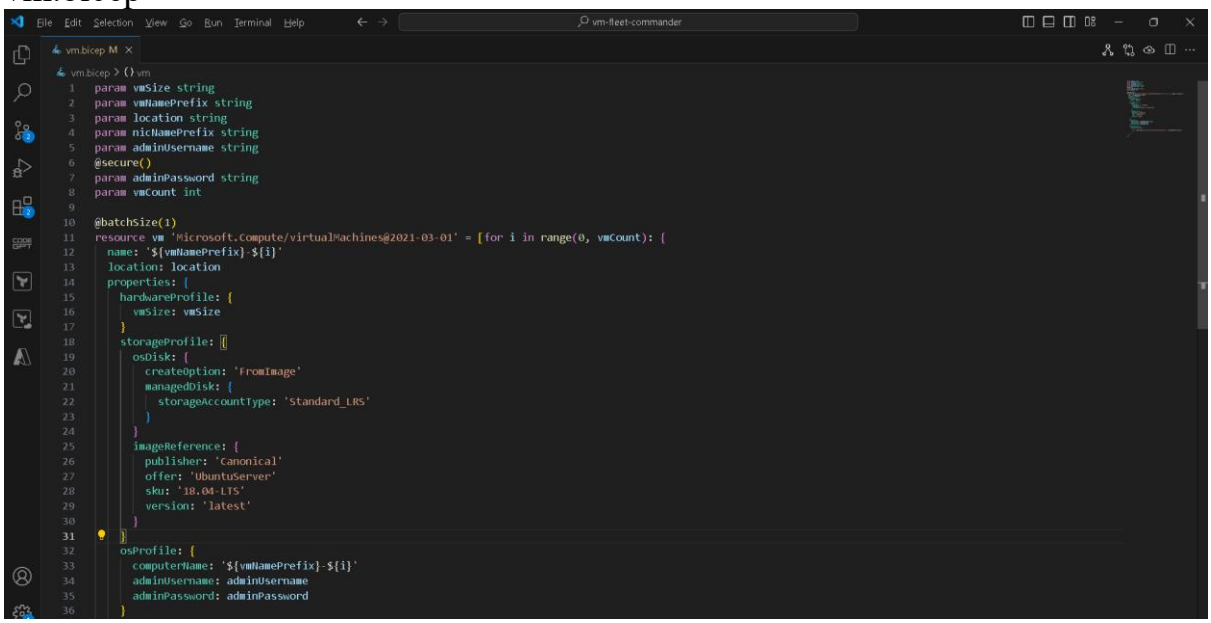
Next, I created a Bicep file named `main.bicep` to define parameters that allow customizable input values for the deployment, such as VM size, name prefix, location, admin credentials, and VM count. This file also references the `vm.bicep` module.

main.bicep

```
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

// Referencing the networking deployment module
module networkDeployment 'network.bicep' = {
  name: 'networkDeployment'
  scope: resourceGroup()
  params: {
    location: location
    vnetName: 'vmFleetVNet'
    subnetName: 'default'
    nsgName: 'vmFleetNSG'
    nicNamePrefix: 'vmFleetNic'
    publicIpNamePrefix: 'vmFleetPublicIp'
    vmCount: vmCount
  }
}

// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
  name: 'vmDeployment'
  scope: resourceGroup()
  dependsOn: [
    networkDeployment
  ]
  params: {
    vmSize: vmSize
    vmNamePrefix: vmNamePrefix
    location: location
    nicNamePrefix: 'vmFleetNic'
    adminUsername: adminUsername
    adminPassword: adminPassword
    vmCount: vmCount
  }
}
```

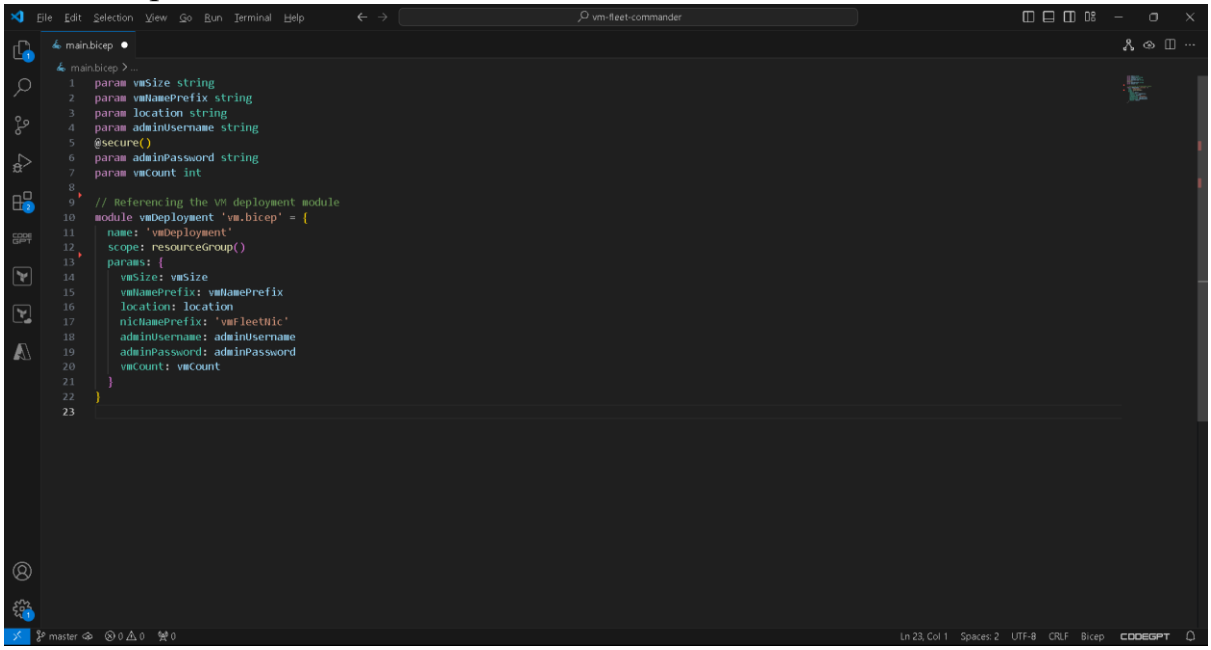
In this step, I successfully created and parameterized the Bicep files necessary for deploying multiple virtual machines with customizable input values, ensuring they are provisioned efficiently and according to best practices.

vm.bicep



```bicep
param vmSize string
param vmNamePrefix string
param location string
param nicNamePrefix string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

@batchSize(1)
resource vm 'Microsoft.Compute/virtualMachines@2021-03-01' = [for i in range(0, vmCount): {
  name: '${vmNamePrefix}-${i}'
  location: location
  properties: {
    hardwareProfile: {
      vmSize: vmSize
    }
    storageProfile: {
      osDisk: {
        createOption: 'FromImage'
        managedDisk: {
          storageAccountType: 'Standard_LRS'
        }
      }
      imageReference: {
        publisher: 'Canonical'
        offer: 'UbuntuServer'
        sku: '18.04-LTS'
        version: 'latest'
      }
    }
    osProfile: {
      computerName: '${vmNamePrefix}-${i}'
      adminUsername: adminUsername
      adminPassword: adminPassword
    }
```

main.bicep



```bicep
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
  name: 'vmDeployment'
  scope: resourceGroup()
  params: {
    vmSize: vmSize
    vmNamePrefix: vmNamePrefix
    location: location
    nicNamePrefix: 'vmFleetNic'
    adminUsername: adminUsername
    adminPassword: adminPassword
    vmCount: vmCount
  }
}
```

6. Network Resources

I designed a Bicep module named `network.bicep` for associated networking resources like Virtual Network, Subnet, Network Interface Card, Public IP, and Network Security Groups.

network.bicep

```
param location string = 'EastUS'
param vnetName string = 'vmFleetVNet'
param subnetName string = 'default'
param nsgName string = 'vmFleetNSG'
param nicNamePrefix string = 'vmFleetNic'
param publicIpNamePrefix string = 'vmFleetPublicIp'
param vmCount int

var subnetPrefix = '10.0.0.0/24'
var vnetPrefix = '10.0.0.0/16'

// Virtual Network
resource vnet 'Microsoft.Network/virtualNetworks@2021-02-01' = {
  name: vnetName
  location: location
  properties: {
    addressSpace: {
      addressPrefixes: [vnetPrefix]
    }
    subnets: [
      {
        name: subnetName
        properties: {
          addressPrefix: subnetPrefix
        }
      }
    ]
  }
}

// Network Security Group
resource nsg 'Microsoft.Network/networkSecurityGroups@2021-02-01' = {
  name: nsgName
  location: location
  properties: {
    securityRules: [
      {
        name: 'allowRDP'
        properties: {
          protocol: 'Tcp'
          sourcePortRange: '*'
          destinationPortRange: '3389'
          sourceAddressPrefix: '*'
          destinationAddressPrefix: '*'
          access: 'Allow'
          priority: 100
```

```
          direction: 'Inbound'
        }
      }
    ]
  }
}

// Public IP Address
resource publicIp 'Microsoft.Network/publicIPAddresses@2021-02-01' = [for i
in range(0, vmCount): {
  name: '${publicIpNamePrefix}-${i}'
  location: location
  properties: {
    publicIPAllocationMethod: 'Dynamic'
  }
}]

// Network Interface Card
resource nic 'Microsoft.Network/networkInterfaces@2021-02-01' = [for i in
range(0, vmCount): {
  name: '${nicNamePrefix}-${i}'
  location: location
  properties: {
    ipConfigurations: [
      {
        name: 'ipConfig1'
        properties: {
          privateIPAllocationMethod: 'Dynamic'
          publicIPAddress: {
            id: publicIp[i].id
          }
          subnet: {
            id: vnet.properties.subnets[0].id
          }
        }
      }
    ]
    networkSecurityGroup: {
      id: nsg.id
    }
  }
}]
```

Then, I updated the `vm.bicep` file to reference the network resources and ensure the VMs are provisioned within the designated VNet, NIC, Public IP, and have the necessary security rules applied.

vm.bicep (Updated)

```
param vmSize string
param vmNamePrefix string
param location string
param nicNamePrefix string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

@batchSize(1)
```

```
resource vm 'Microsoft.Compute/virtualMachines@2021-03-01' = [for i in
range(0, vmCount): {
  name: '${vmNamePrefix}-${i}'
  location: location
  properties: {
    hardwareProfile: {
      vmSize: vmSize
    }
    storageProfile: {
      osDisk: {
        createOption: 'FromImage'
        managedDisk: {
          storageAccountType: 'Standard_LRS'
        }
      }
      imageReference: {
        publisher: 'Canonical'
        offer: 'UbuntuServer'
        sku: '18.04-LTS'
        version: 'latest'
      }
    }
    osProfile: {
      computerName: '${vmNamePrefix}-${i}'
      adminUsername: adminUsername
      adminPassword: adminPassword
    }
    networkProfile: {
      networkInterfaces: [
        {
          id: resourceId('Microsoft.Network/networkInterfaces',
'${nicNamePrefix}-${i}')
        }
      ]
    }
  }
}]
```

Finally, I updated the `main.bicep` file to reference the `network.bicep` module, ensuring the networking resources are deployed before the VMs.

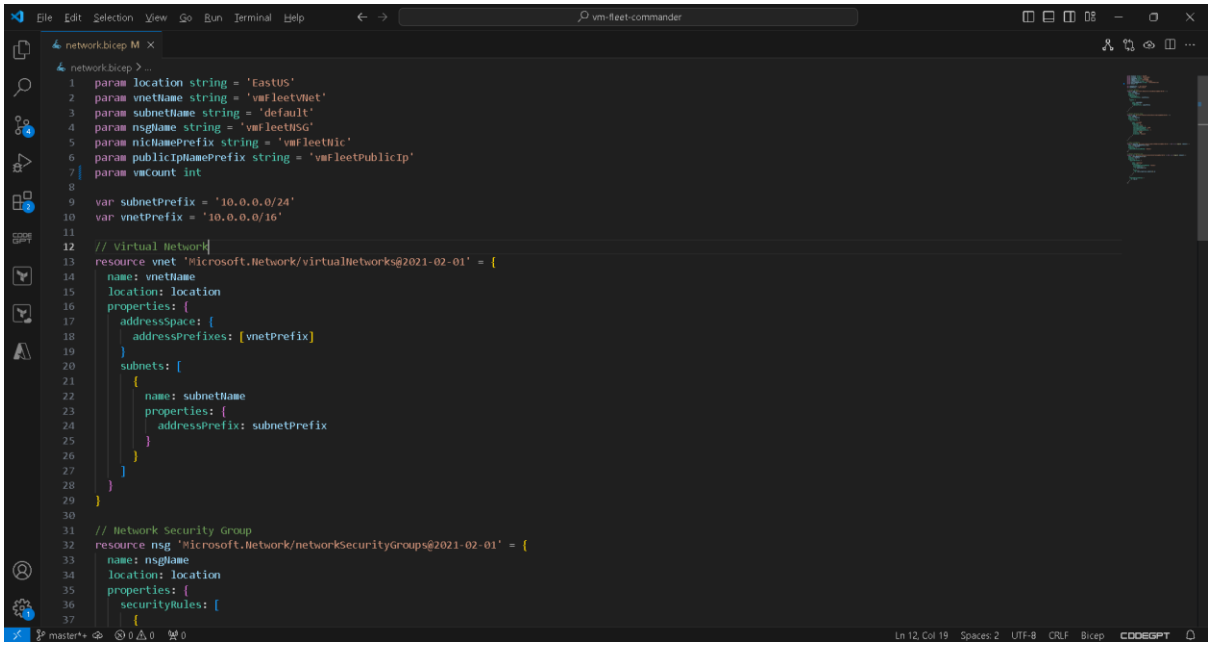
main.bicep (Updated)

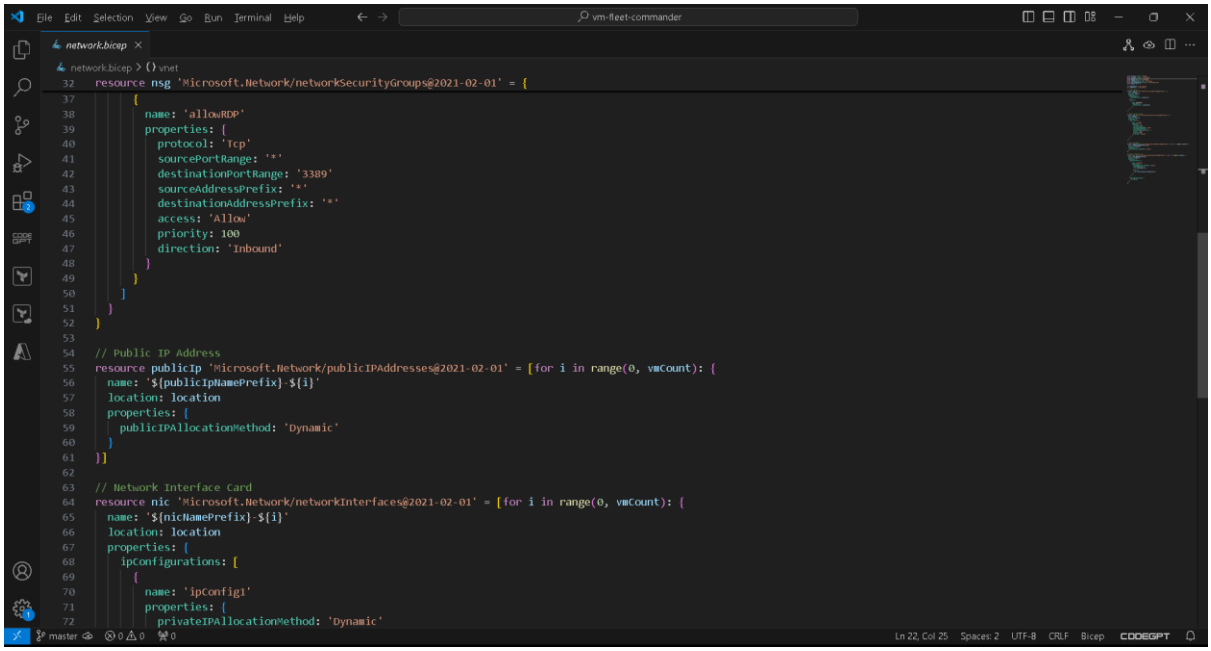
```
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int

// Referencing the networking deployment module
module networkDeployment 'network.bicep' = {
  name: 'networkDeployment'
  scope: resourceGroup()
  params: {
    location: location
    vnetName: 'vmFleetVNet'
    subnetName: 'default'
    nsgName: 'vmFleetNSG'
```

```
    nicNamePrefix: 'vmFleetNic'
    publicIpNamePrefix: 'vmFleetPublicIp'
    vmCount: vmCount
  }
}

// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
  name: 'vmDeployment'
  scope: resourceGroup()
  dependsOn: [
    networkDeployment
  ]
  params: {
    vmSize: vmSize
    vmNamePrefix: vmNamePrefix
    location: location
    nicNamePrefix: 'vmFleetNic'
    adminUsername: adminUsername
    adminPassword: adminPassword
    vmCount: vmCount
  }
}
```

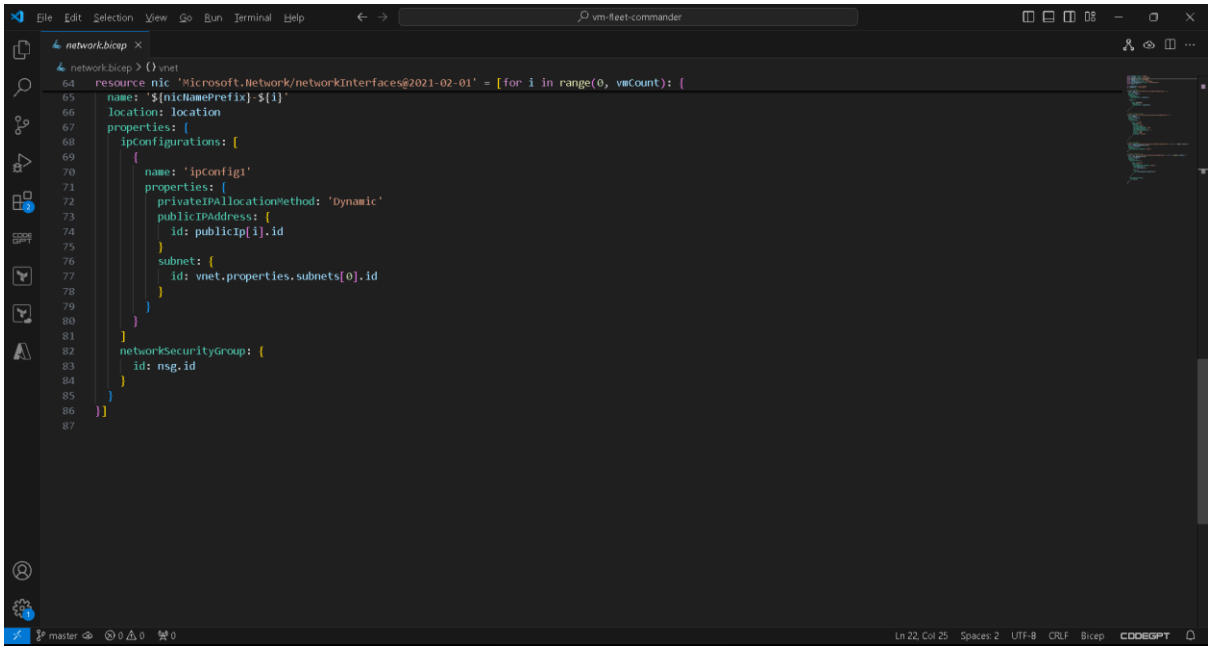
By doing this, I ensured that the VMs will be provisioned within the designated VNet, NIC, Public IP, and have the necessary security rules applied.

This step ensures that all network resources are properly configured and associated with the VMs, providing a secure and efficient deployment.

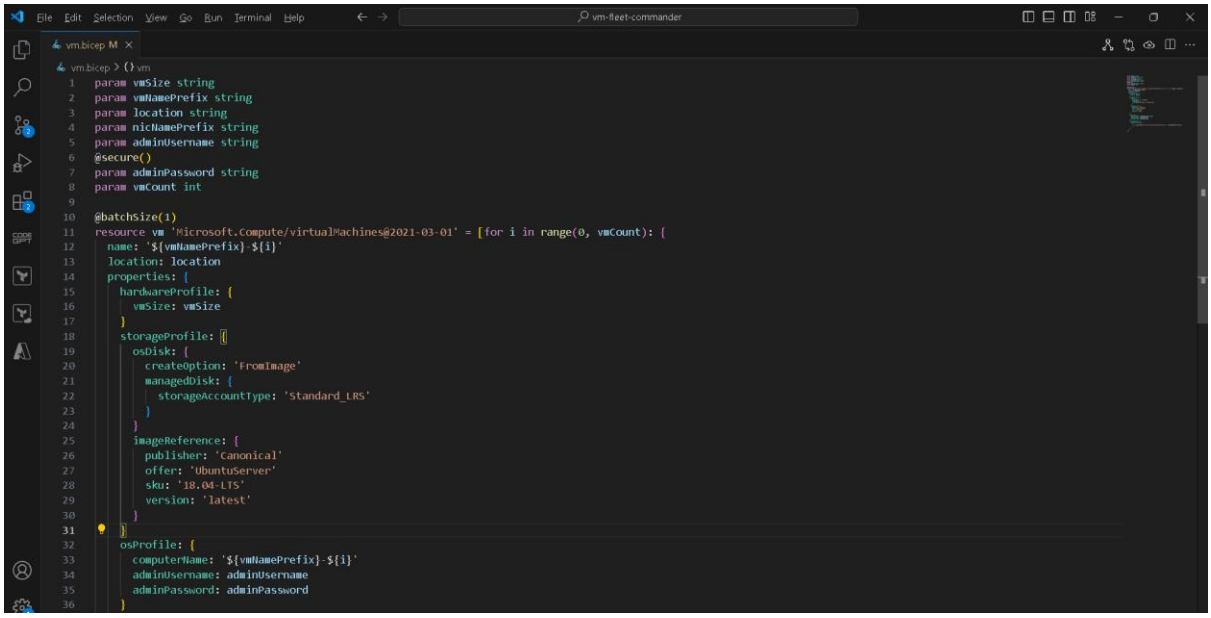


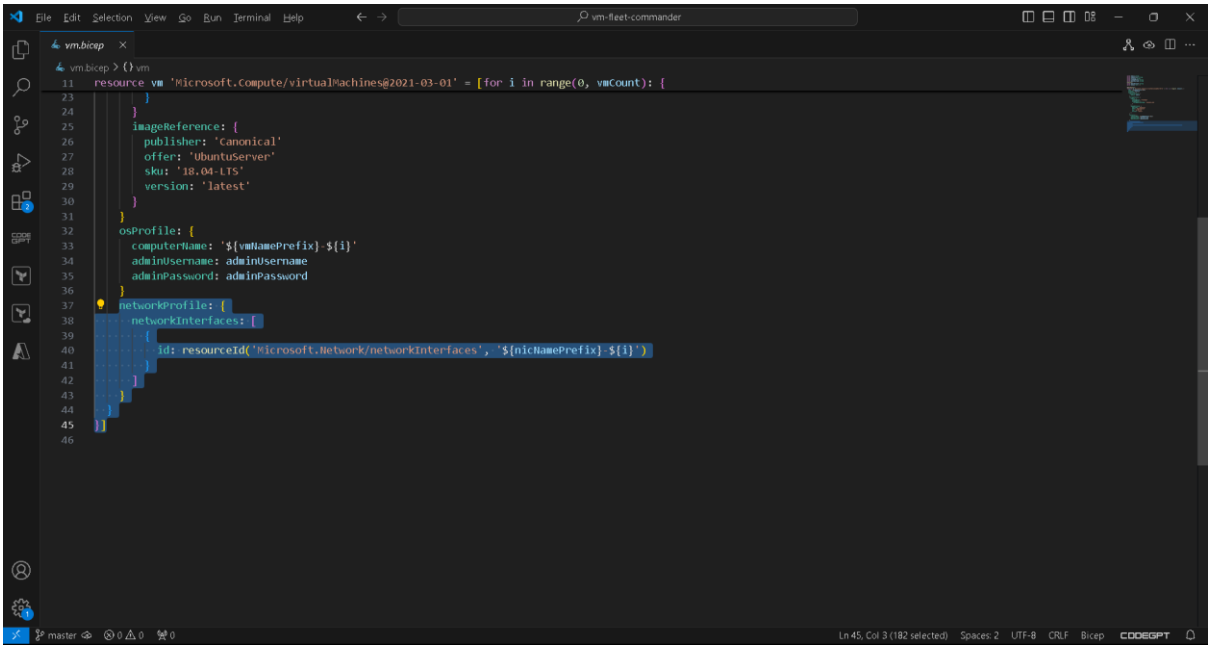


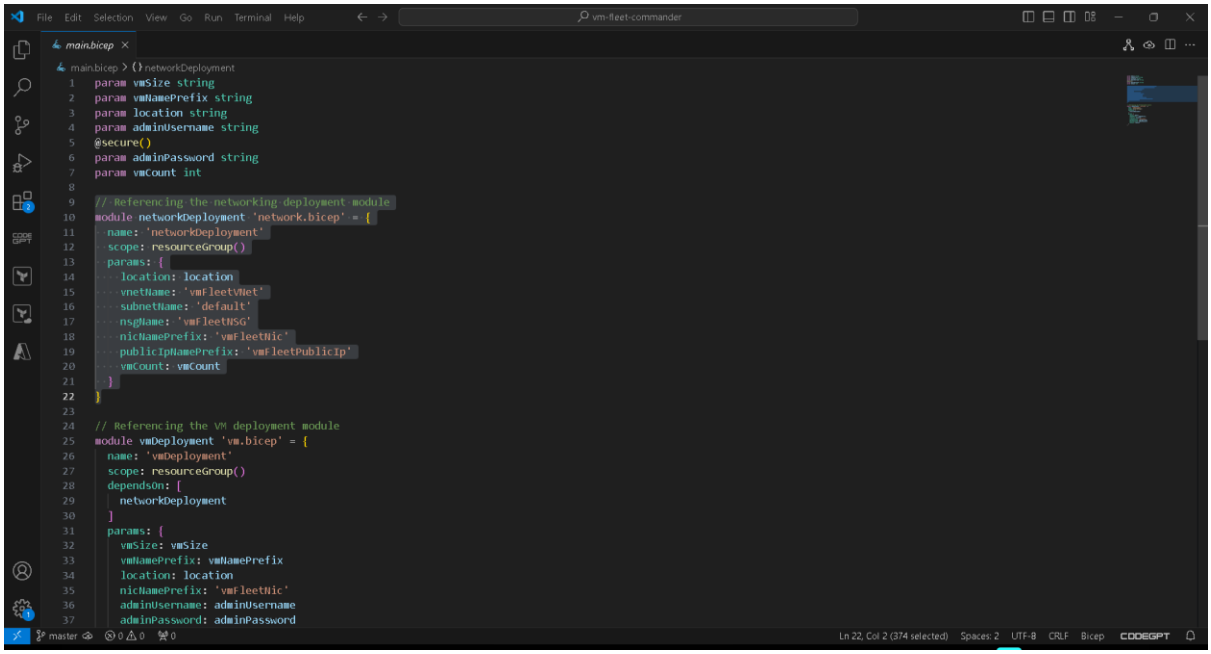
```
resource nsg 'Microsoft.Network/networkSecurityGroups@2021-02-01' = {
        {
          name: 'allowRDP'
          properties: {
            protocol: 'Tcp'
            sourcePortRange: '*'
            destinationPortRange: '3389'
            sourceAddressPrefix: '*'
            destinationAddressPrefix: '*'
            access: 'Allow'
            priority: 100
            direction: 'Inbound'
          }
        }
      ]
    }
  }

  // Public IP Address
  resource publicIp 'Microsoft.Network/publicIPAddresses@2021-02-01' = [for i in range(0, vmCount): {
    name: '${publicIpNamePrefix}-${i}'
    location: location
    properties: {
      publicIPAllocationMethod: 'Dynamic'
    }
  }]

  // Network Interface Card
  resource nic 'Microsoft.Network/networkInterfaces@2021-02-01' = [for i in range(0, vmCount): {
    name: '${nicNamePrefix}-${i}'
    location: location
    properties: {
      ipConfigurations: [
        {
          name: 'ipConfig1'
          properties: {
            privateIPAllocationMethod: 'Dynamic'
```



```
resource nic 'Microsoft.Network/networkInterfaces@2021-02-01' = [for i in range(0, vmCount): {
    name: '${nicNamePrefix}-${i}'
    location: location
    properties: {
      ipConfigurations: [
        {
          name: 'ipConfig1'
          properties: {
            privateIPAllocationMethod: 'Dynamic'
            publicIPAddress: {
              id: publicIp[i].id
            }
            subnet: {
              id: vnet.properties.subnets[0].id
            }
          }
        }
      ]
      networkSecurityGroup: {
        id: nsg.id
      }
    }
  }]
```


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
vm.bicep M
vm.bicep > () vm
param vmSize string
param vmNamePrefix string
param location string
param nicNamePrefix string
param adminUsername string
@secure()
param adminPassword string
param vmCount int
@batchSize(1)
resource vm 'Microsoft.Compute/virtualMachines@2021-03-01' = [for i in range(0, vmCount): {
name: '${vmNamePrefix}-${i}'
location: location
properties: {
hardwareProfile: {
vmSize: vmSize
}
storageProfile: {
osDisk: {
createOption: 'FromImage'
managedDisk: {
storageAccountType: 'Standard_LRS'
}
}
imageReference: {
publisher: 'Canonical'
offer: 'UbuntuServer'
sku: '18.04-LTS'
version: 'latest'
}
}
osProfile: {
computerName: '${vmNamePrefix}-${i}'
adminUsername: adminUsername
adminPassword: adminPassword
}


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
vm.bicep
vm.bicep > () vm
resource vm 'Microsoft.Compute/virtualMachines@2021-03-01' = [for i in range(0, vmCount): {
}
}
imageReference: {
publisher: 'Canonical'
offer: 'UbuntuServer'
sku: '18.04-LTS'
version: 'latest'
}
}
osProfile: {
computerName: '${vmNamePrefix}-${i}'
adminUsername: adminUsername
adminPassword: adminPassword
}
networkProfile: {
networkInterfaces: [
{
id: resourceId('Microsoft.Network/networkInterfaces', '${nicNamePrefix}-${i}')
}
]
}
}
]
master
Ln 45, Col 3 (182 selected)
Spaces: 2
UTF-8
CRLF
Bicep
CODEGPT



7. Parameter Files and Validation

I created separate parameter files for my Bicep templates, allowing for different environment deployments (dev, test, prod).

dev.parameters.json

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
      "vmSize": {
        "value": "Standard_DS1_v2"
      },
      "vmNamePrefix": {
        "value": "vmFleetDev"
      },
      "location": {
        "value": "EastUS"
      },
      "adminUsername": {
        "value": "dev.user"
      },
      "adminPassword": {
```

```
        "value": "P@ssw0rd1234"
      },
      "vmCount": {
        "value": 5
      }
    }
}
```

test.parameters.json

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
      "vmSize": {
        "value": "Standard_DS1_v2"
      },
      "vmNamePrefix": {
        "value": "vmFleetTest"
      },
      "location": {
        "value": "WestUS"
      },
      "adminUsername": {
        "value": "test.user"
      },
      "adminPassword": {
        "value": "P@ssw0rd1234"
      },
      "vmCount": {
        "value": 5
      }
    }
}
```

prod.parameters.json

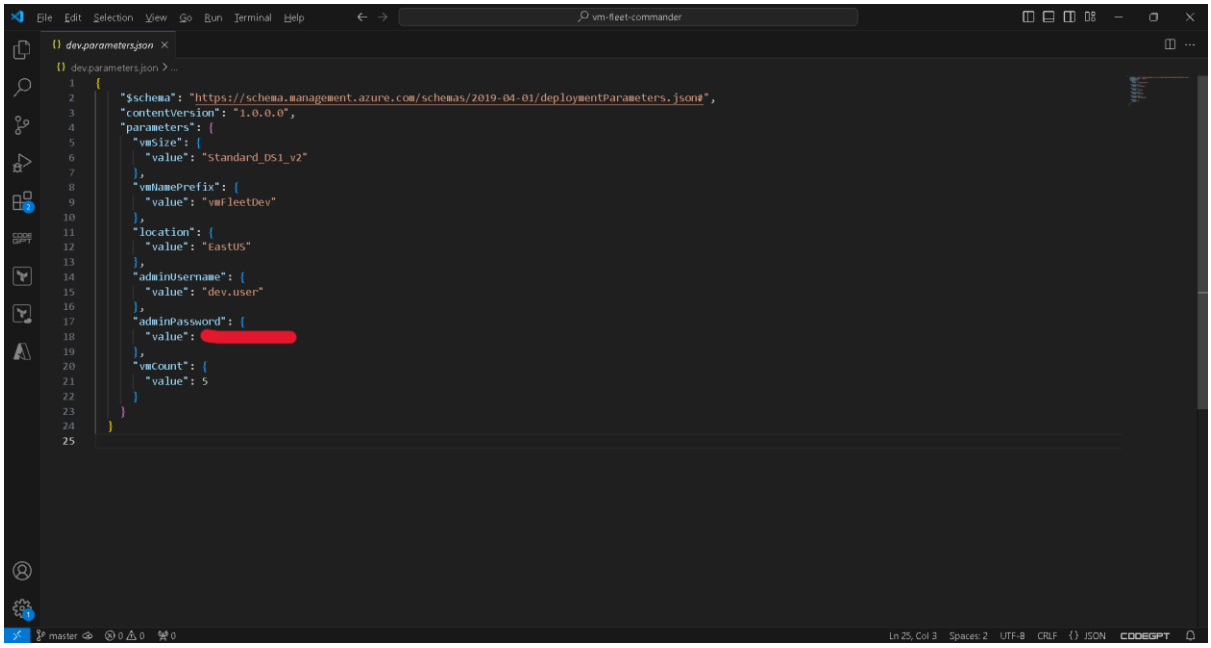
```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
      "vmSize": {
        "value": "Standard_DS2_v2"
      },
      "vmNamePrefix": {
        "value": "vmFleetProd"
      },
      "location": {
        "value": "Canada Central"
      },
      "adminUsername": {
        "value": "prod.user"
      },
      "adminPassword": {
        "value": "P@ssw0rd1234"
      },
      "vmCount": {
        "value": 5
```

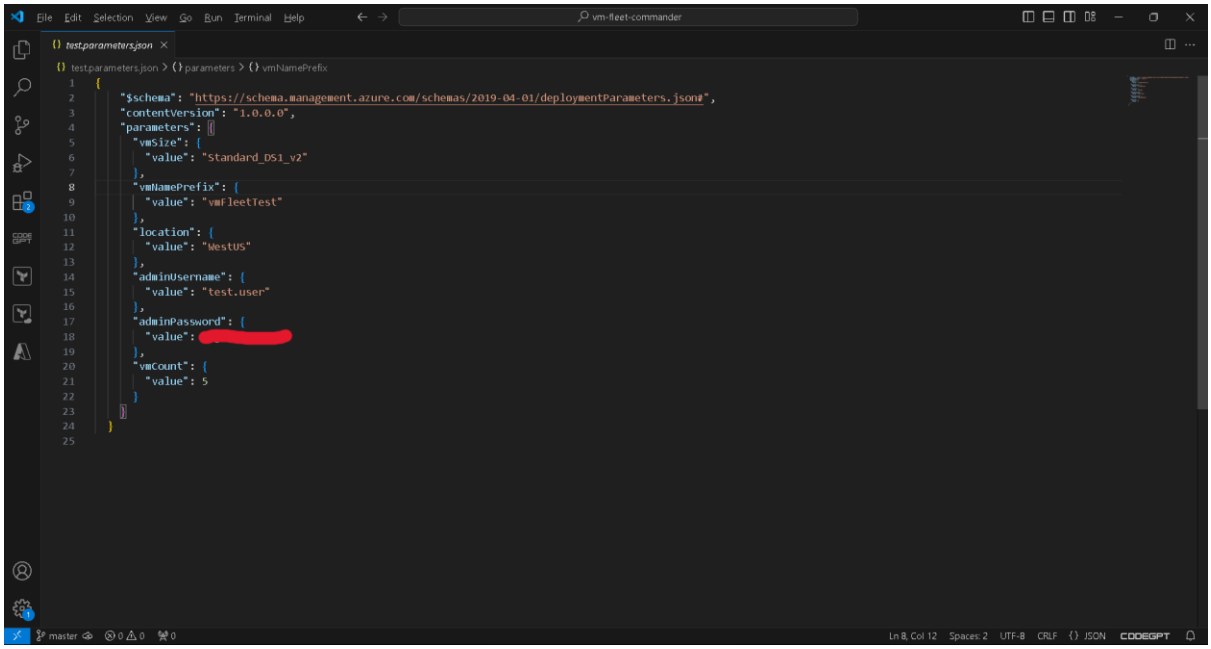
```
        }
    }
}
```

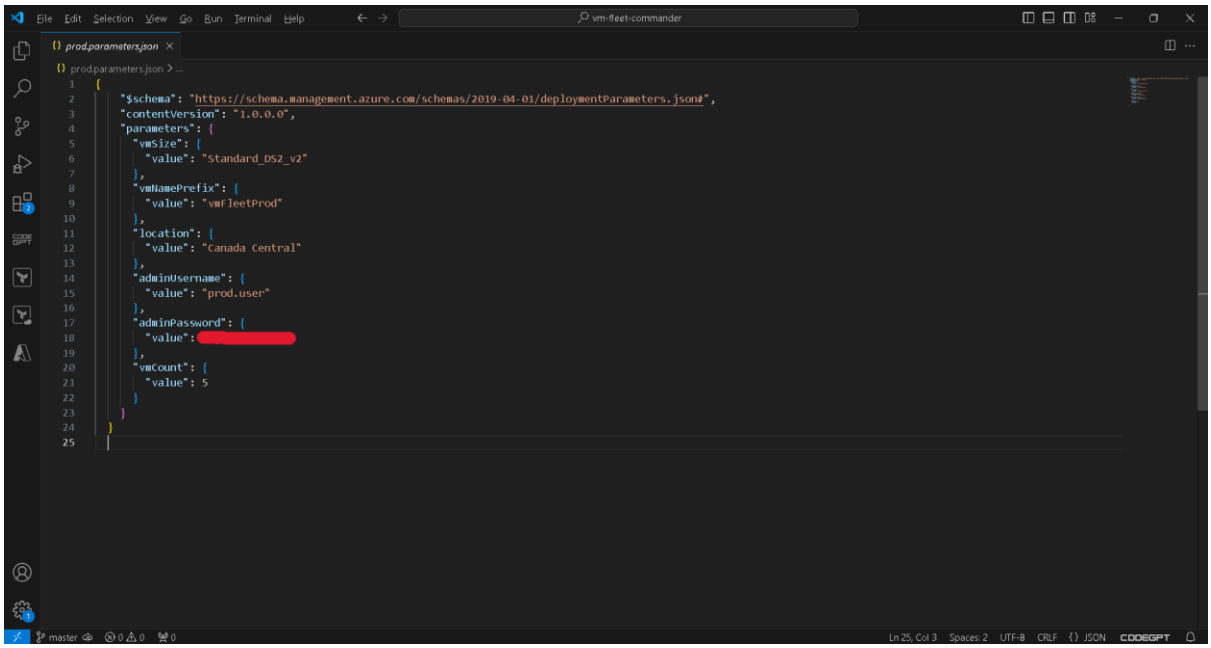
Next, I used these commands in Azure CLI to validate my Bicep files before deploying, catching any structural errors.

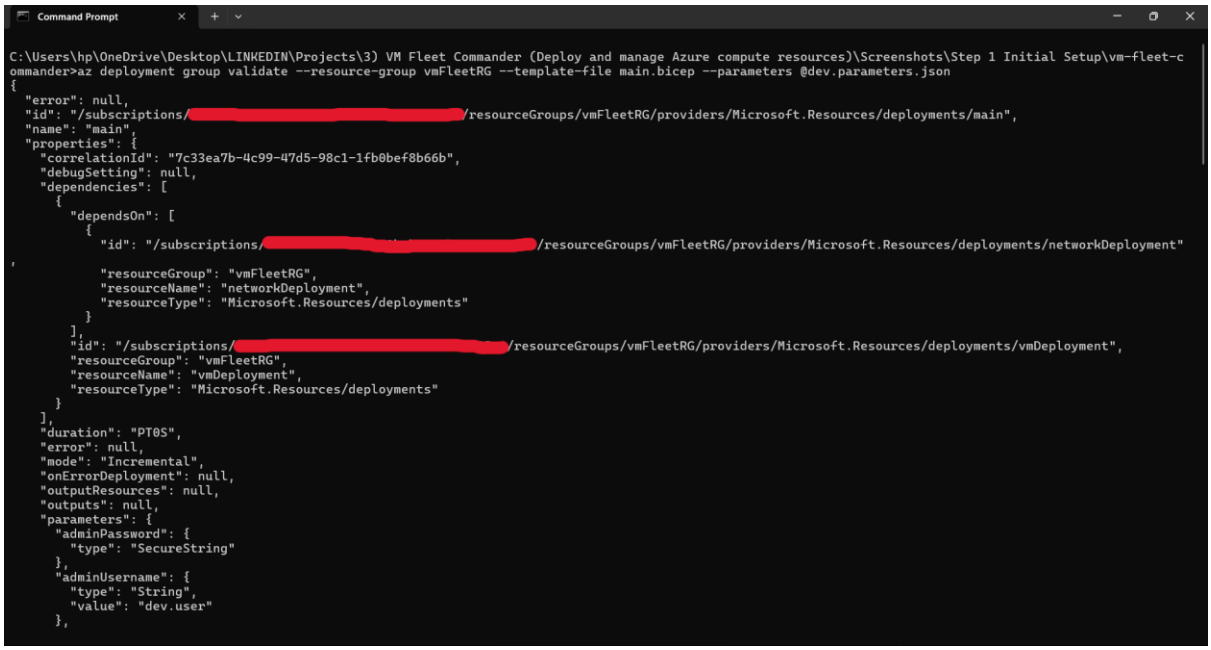
```
az deployment group validate --resource-group vmFleetRG --template-file
main.bicep --parameters @dev.parameters.json
az deployment group validate --resource-group vmFleetRG --template-file
main.bicep --parameters @test.parameters.json
az deployment group validate --resource-group vmFleetRG --template-file
main.bicep --parameters @prod.parameters.json
```

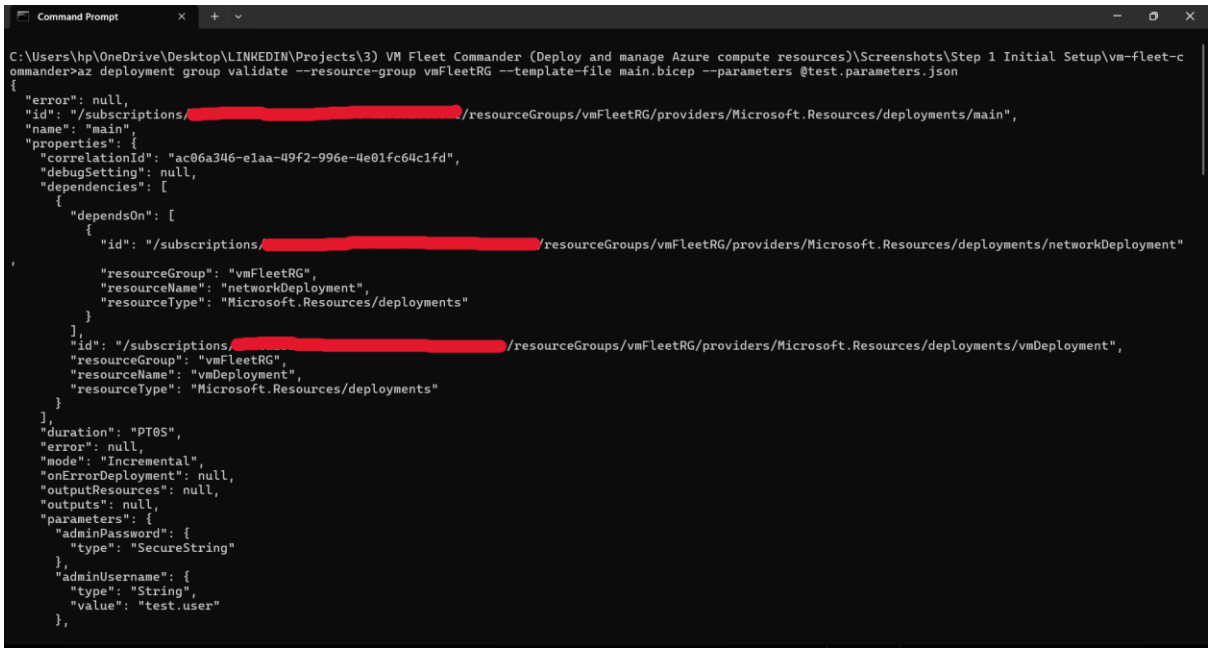
By running these validation commands, I ensured that the Bicep files were structurally sound and ready for deployment across different environments.

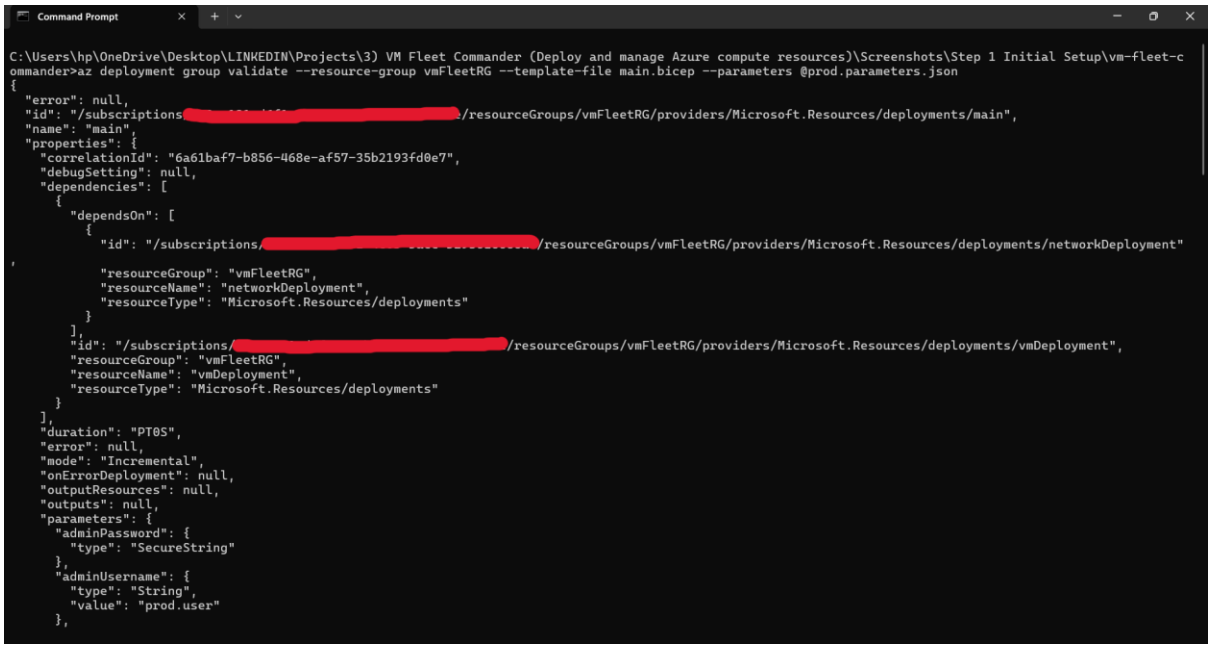





File Edit Selection View Go Run Terminal Help
vm-fleet-commander
prod.parameters.json
{
"$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
"contentVersion": "1.0.0.0",
"parameters": {
"vmSize": {
"value": "Standard_DS2_v2"
},
"vmNamePrefix": {
"value": "vmFleetProd"
},
"location": {
"value": "Canada Central"
},
"adminUsername": {
"value": "prod.user"
},
"adminPassword": {
"value":
},
"vmCount": {
"value": 5
}
}
}
master
Ln 25, Col 3
Spaces: 2
UTF-8
CRLF
{} JSON
CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group validate --resource-group vmFleetRG --template-file main.bicep --parameters @dev.parameters.json
{
"error": null,
"id": "/subscriptions/
/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/main",
"name": "main",
"properties": {
"correlationId": "7c33ea7b-4c99-47d5-98c1-1fb0bef8b66b",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/
/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/networkDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/
/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT0S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": null,
"outputs": null,
"parameters": {
"adminPassword": {
"type": "SecureString"
},
"adminUsername": {
"type": "String",
"value": "dev.user"
},


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group validate --resource-group vmFleetRG --template-file main.bicep --parameters @test.parameters.json
{
"error": null,
"id": "/subscriptions/[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/main",
"name": "main",
"properties": {
"correlationId": "ac06a346-e1aa-49f2-996e-4e01fc64c1fd",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/networkDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT0S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": null,
"outputs": null,
"parameters": {
"adminPassword": {
"type": "SecureString"
},
"adminUsername": {
"type": "String",
"value": "test.user"
},


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group validate --resource-group vmFleetRG --template-file main.bicep --parameters @prod.parameters.json
{
"error": null,
"id": "/subscriptions[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/main",
"name": "main",
"properties": {
"correlationId": "6a61baf7-b856-468e-af57-35b2193fd0e7",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/networkDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/[redacted]/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT0S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": null,
"outputs": null,
"parameters": {
"adminPassword": {
"type": "SecureString"
},
"adminUsername": {
"type": "String",
"value": "prod.user"
},

8. Deployment

I used the Azure CLI to deploy my Bicep templates, creating all designated resources.

Step 1: Create Resource Group

Firstly, I created the resource group for the resources using the following command:

```
az deployment sub create --location EastUS --template-file resource-
group.bicep
```

Step 2: Deploy Resources for Development Environment

I deployed the resources for the development environment using this command:

```
az deployment group create --resource-group vmFleetRG --template-file
main.bicep --parameters @dev.parameters.json
```

Step 3: Create Resource Group for Testing Environment

After deploying the development environment, I created another resource group named "vmFleetTest" using the modified `resource-group.bicep` file for the testing environment:

```
targetScope = 'subscription'

param rgName string = 'vmFleetTest'
param rgLocation string = 'EastUS'

resource rg 'Microsoft.Resources/resourceGroups@2021-04-01' = {
  name: rgName
  location: rgLocation
}

output resourceGroupName string = rg.name
output resourceGroupLocation string = rg.location
```

I then deployed the resources for the testing environment using this command:

```
az deployment group create --resource-group vmFleetTest --template-file
main.bicep --parameters @test.parameters.json
```

Step 4: Create Resource Group for Production Environment

After deploying the testing environment, I created another resource group named "vmFleetProd" using the modified `resource-group.bicep` file for the production environment:

```
targetScope = 'subscription'

param rgName string = 'vmFleetProd'
param rgLocation string = 'EastUS'
```

```
resource rg 'Microsoft.Resources/resourceGroups@2021-04-01' = {
  name: rgName
  location: rgLocation
}

output resourceGroupName string = rg.name
output resourceGroupLocation string = rg.location
```

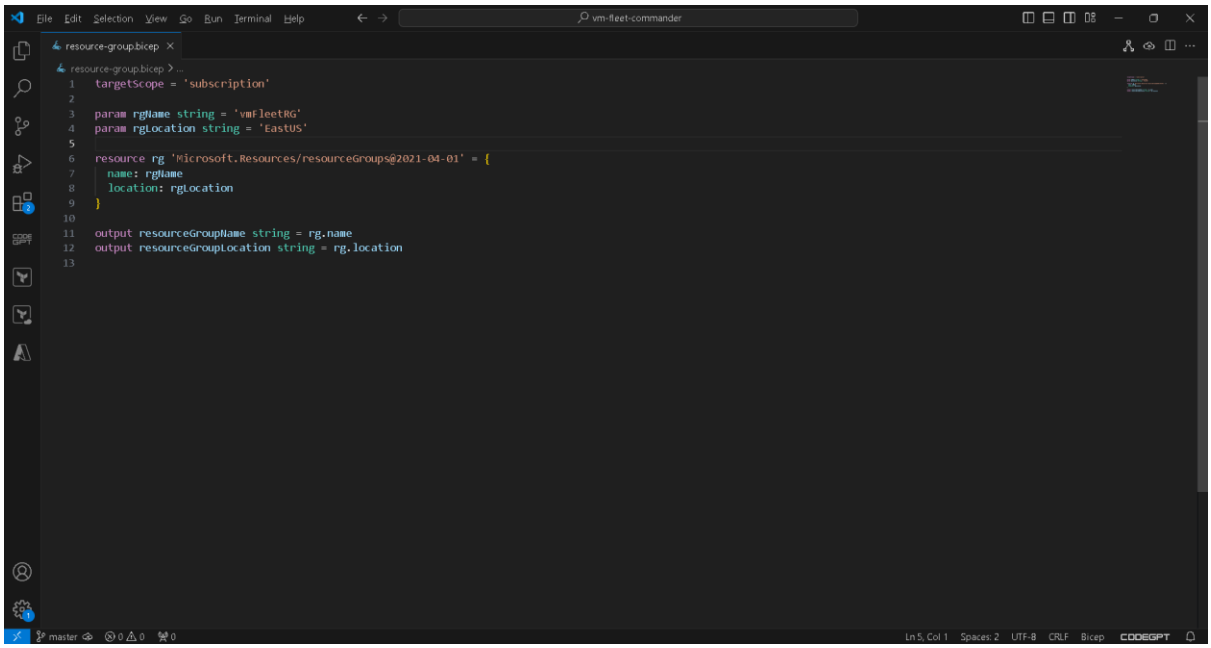
I then deployed the resources for the production environment using this command:

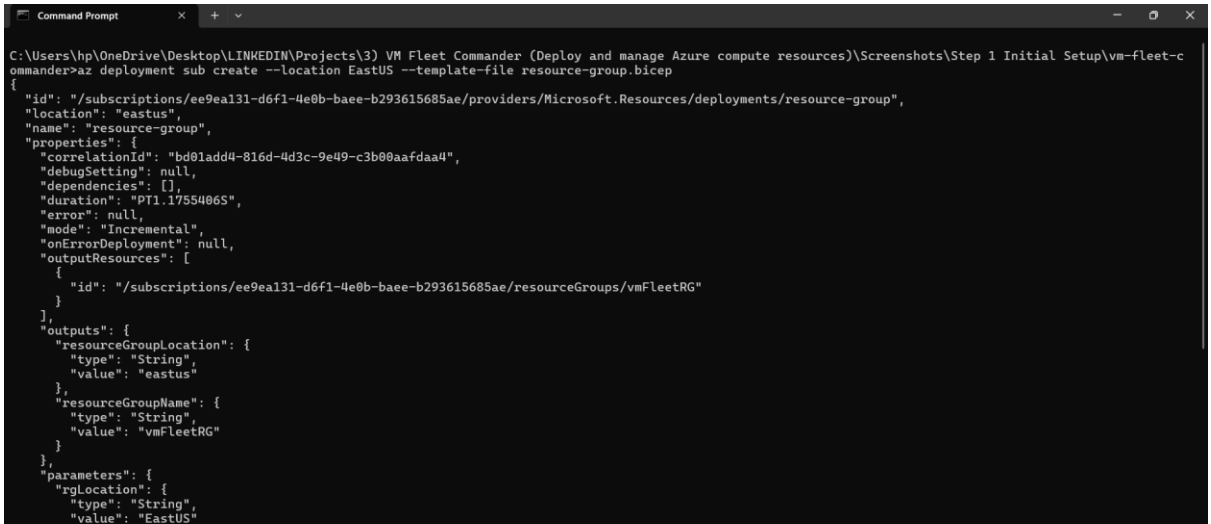
```
bash
Copy code
az deployment group create --resource-group vmFleetProd --template-file
main.bicep --parameters @prod.parameters.json
```

By doing this, I tested the reproducibility by deploying the infrastructure into different environments and to different regions and resource groups. Every deployment went well and was successful.

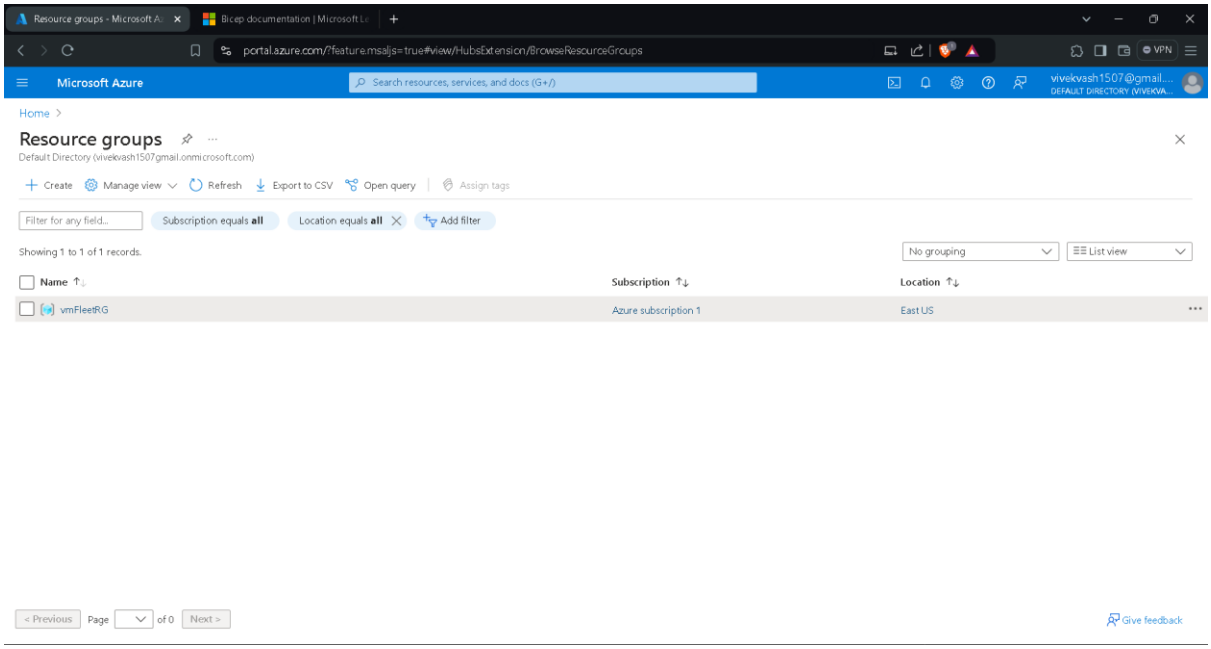
In this section, I successfully deployed the resources for development, testing, and production environments, ensuring that the infrastructure could be reproduced across different setups.

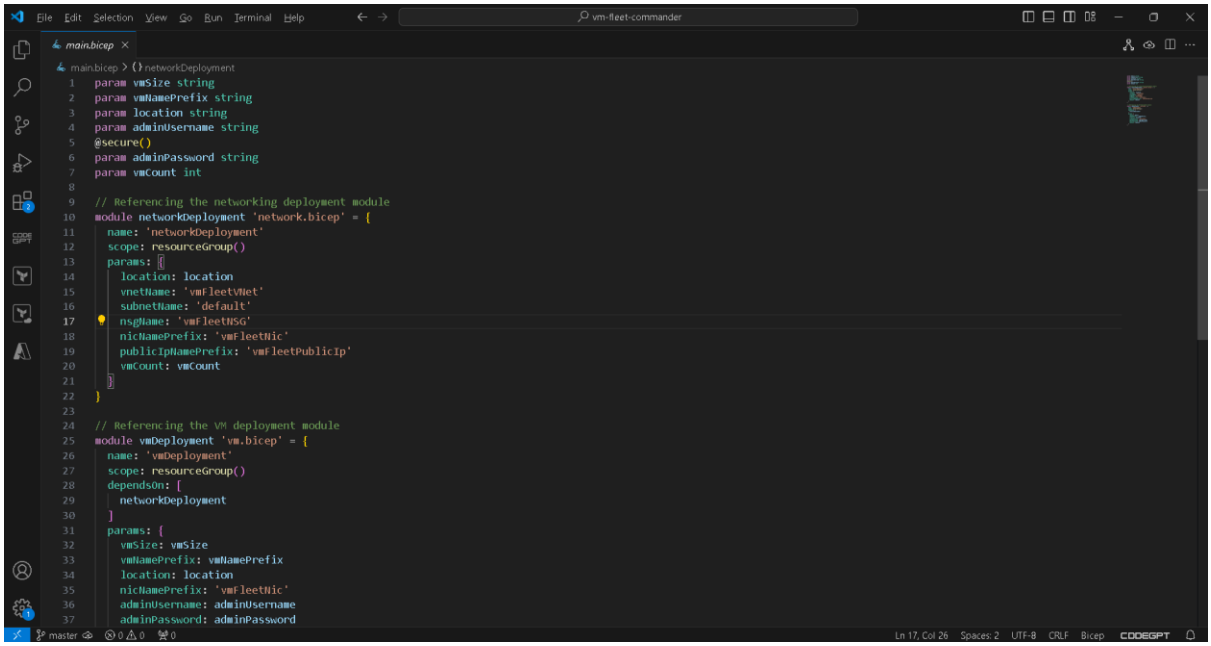
Dev

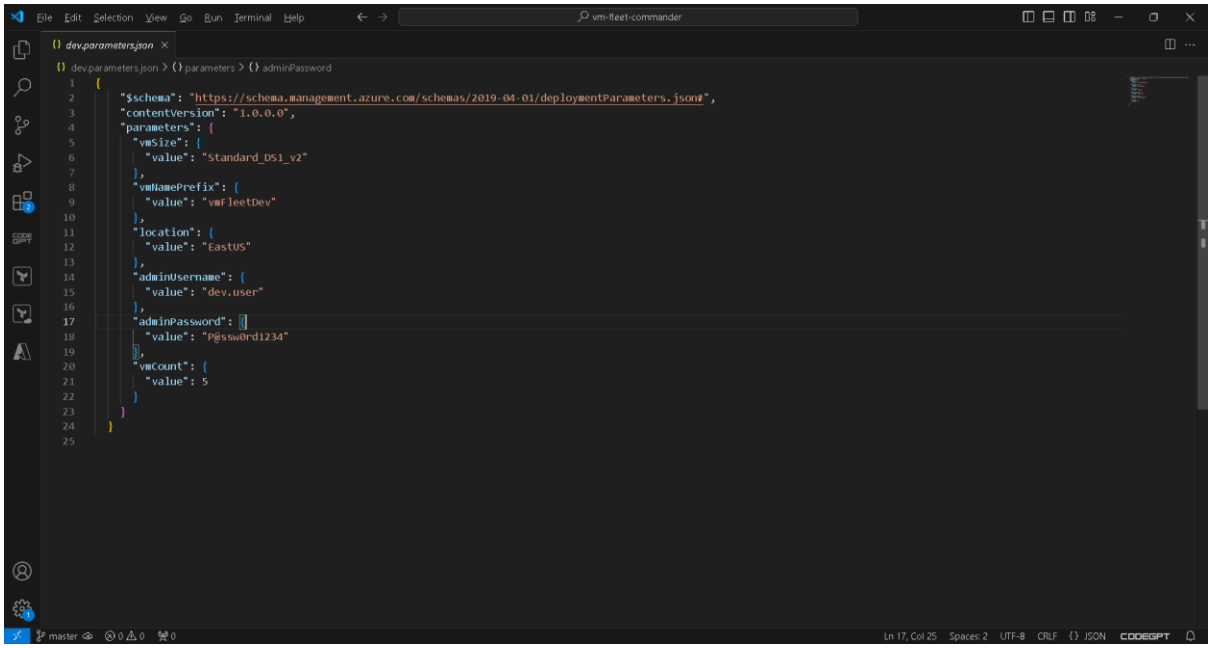


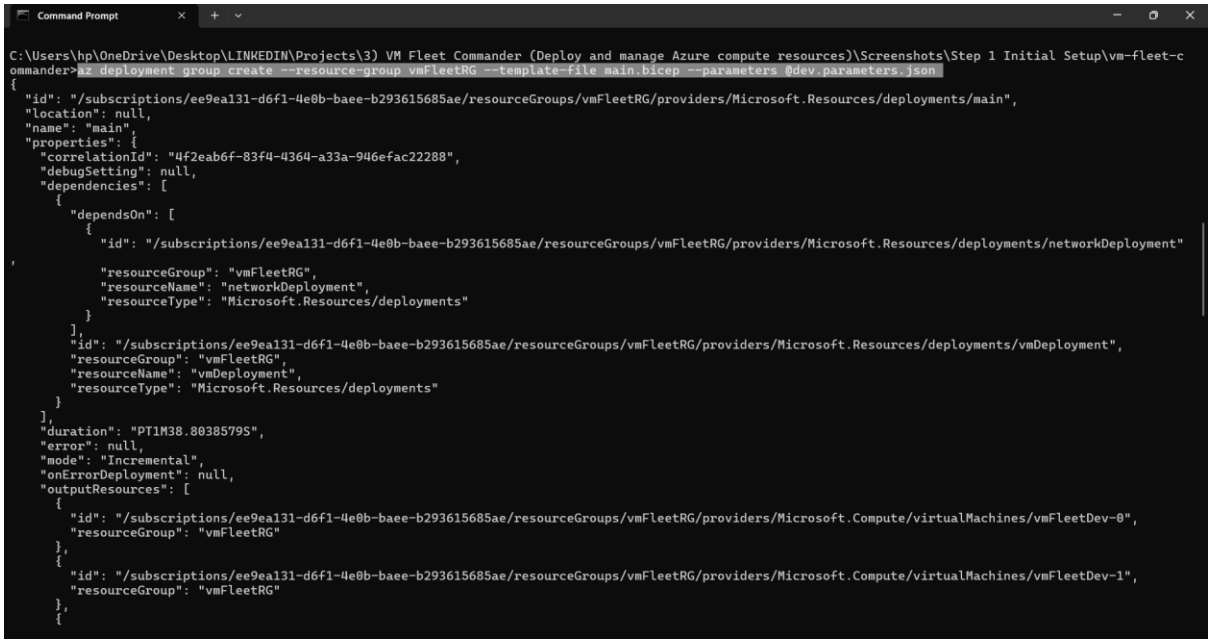


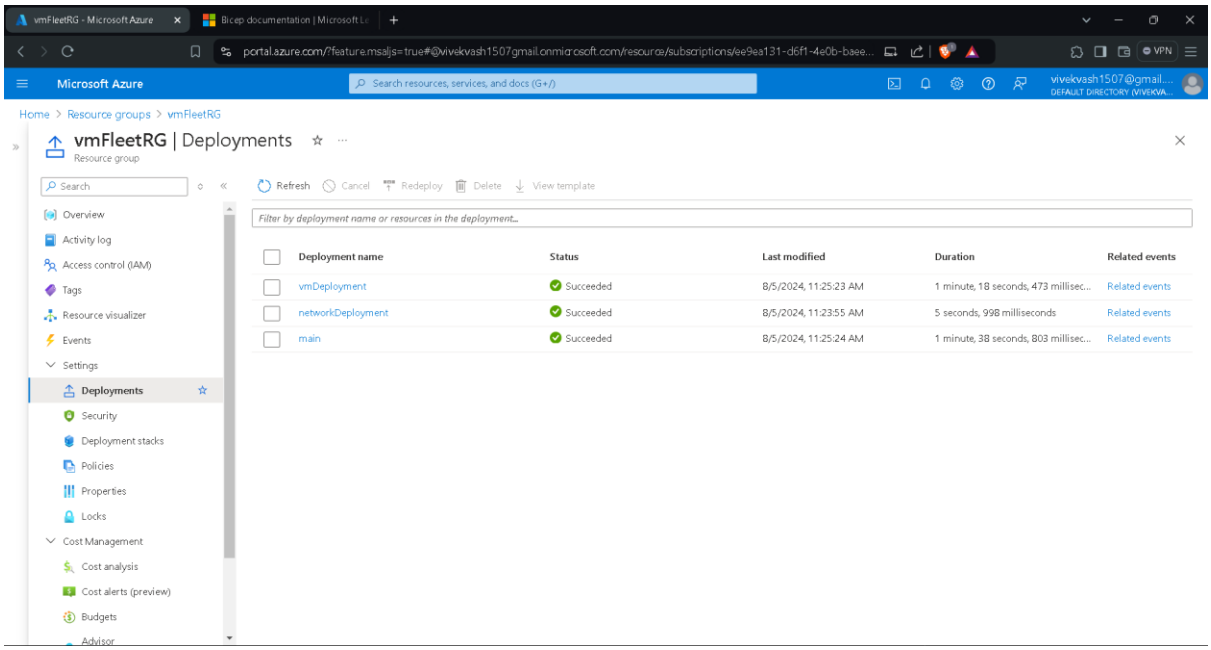

Command Prompt
"value": "vmFleetRG"
}
},
"parametersLink": null,
"providers": [
{
"id": null,
"namespace": "Microsoft.Resources",
"providerAuthorizationConsentState": null,
"registrationPolicy": null,
"registrationState": null,
"resourceTypes": [
{
"aliases": null,
"apiProfiles": null,
"apiVersions": null,
"capabilities": null,
"defaultApiVersion": null,
"locationMappings": null,
"locations": [
"eastus"
],
"properties": null,
"resourceType": "resourceGroups",
"zoneMappings": null
}
]
}
],
"provisioningState": "Succeeded",
"templateHash": "4798282571971436253",
"templateLink": null,
"timestamp": "2024-08-05T17:17:02.600791+00:00",
"validatedResources": null
},
"tags": null,
"type": "Microsoft.Resources/deployments"
}
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>


Resource groups - Microsoft A
Bicep documentation | Microsoft Le
portal.azure.com/?feature.msaljs=true#view/HubsExtension/BrowseResourceGroups
VPN
Microsoft Azure
Search resources, services, and docs (G+/)
vivekvash1507@gmail....
DEFAULT DIRECTORY (VIVEKVA...
Home
Resource groups
Default Directory (vivekvash1507gmail.onmicrosoft.com)
Create
Manage view
Refresh
Export to CSV
Open query
Assign tags
Filter for any field...
Subscription equals all
Location equals all
Add filter
Showing 1 to 1 of 1 records.
No grouping
List view
Name
Subscription
Location
vmFleetRG
Azure subscription 1
East US
< Previous
Page
of 0
Next >
Give feedback


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
main.bicep
main.bicep > networkDeployment
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int
// Referencing the networking deployment module
module networkDeployment 'network.bicep' = {
name: 'networkDeployment'
scope: resourceGroup()
params: {
location: location
vnetName: 'vmFleetVNet'
subnetName: 'default'
nsgName: 'vmFleetNSG'
nicNamePrefix: 'vmFleetNic'
publicIpNamePrefix: 'vmFleetPublicIp'
vmCount: vmCount
}
}
// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
name: 'vmDeployment'
scope: resourceGroup()
dependsOn: [
networkDeployment
]
params: {
vmSize: vmSize
vmNamePrefix: vmNamePrefix
location: location
nicNamePrefix: 'vmFleetNic'
adminUsername: adminUsername
adminPassword: adminPassword
master
Ln 17, Col 26
Spaces: 2
UTF-8
CRLF
Bicep
CODEGPT


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
dev.parameters.json
dev.parameters.json > parameters > adminPassword
{
"$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
"contentVersion": "1.0.0.0",
"parameters": {
"vmSize": {
"value": "Standard_DS1_v2"
},
"vmNamePrefix": {
"value": "vmFleetDev"
},
"location": {
"value": "EastUS"
},
"adminUsername": {
"value": "dev.user"
},
"adminPassword": {
"value": "P@ssw0rd1234"
},
"vmCount": {
"value": 5
}
}
}
master
Ln 17, Col 25
Spaces: 2
UTF-8
CRLF
JSON
CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group create --resource-group vmFleetRG --template-file main.bicep --parameters @dev.parameters.json
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/main",
"location": null,
"name": "main",
"properties": {
"correlationId": "4f2eab6f-83f4-4364-a33a-946efac22288",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/networkDeployment"
,
"resourceGroup": "vmFleetRG",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetRG/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetRG",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT1M38.8038579S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetRG/providers/Microsoft.Compute/virtualMachines/vmFleetDev-0",
"resourceGroup": "vmFleetRG"
},
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetRG/providers/Microsoft.Compute/virtualMachines/vmFleetDev-1",
"resourceGroup": "vmFleetRG"
},
{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Home > Resource groups > vmFleetRG
vmFleetRG | Deployments
Resource group
Search
Refresh
Cancel
Redeploy
Delete
View template
Filter by deployment name or resources in the deployment...
Overview
Activity log
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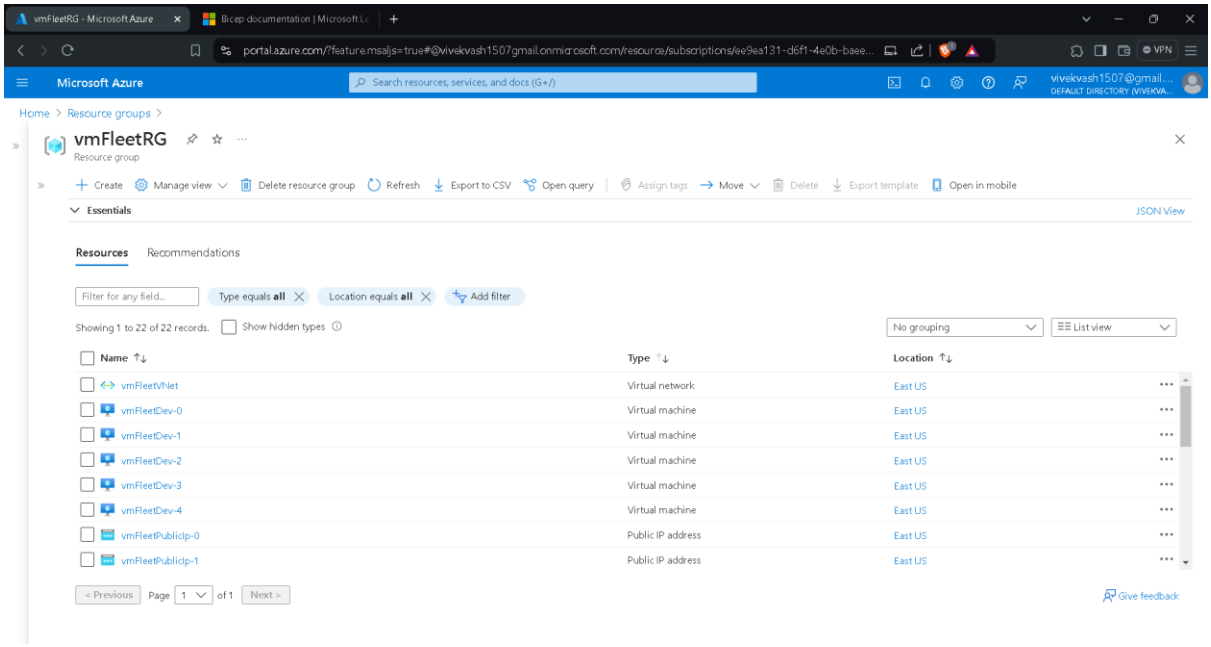
Deployment stacks
Policies
Properties
Locks
Cost Management
Cost analysis
Cost alerts (preview)
Budgets
Advisor
Deployment name
Status
Last modified
Duration
Related events
vmDeployment
Succeeded
8/5/2024, 11:25:23 AM
1 minute, 18 seconds, 473 millisec...
Related events
networkDeployment
Succeeded
8/5/2024, 11:23:55 AM
5 seconds, 998 milliseconds
Related events
main
Succeeded
8/5/2024, 11:25:24 AM
1 minute, 38 seconds, 803 millisec...
Related events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Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
List view
Name
Type
Location
vmFleetVNet
Virtual network
East US
vmFleetDev-0
Virtual machine
East US
vmFleetDev-1
Virtual machine
East US
vmFleetDev-2
Virtual machine
East US
vmFleetDev-3
Virtual machine
East US
vmFleetDev-4
Virtual machine
East US
vmFleetPublicIp-0
Public IP address
East US
vmFleetPublicIp-1
Public IP address
East US
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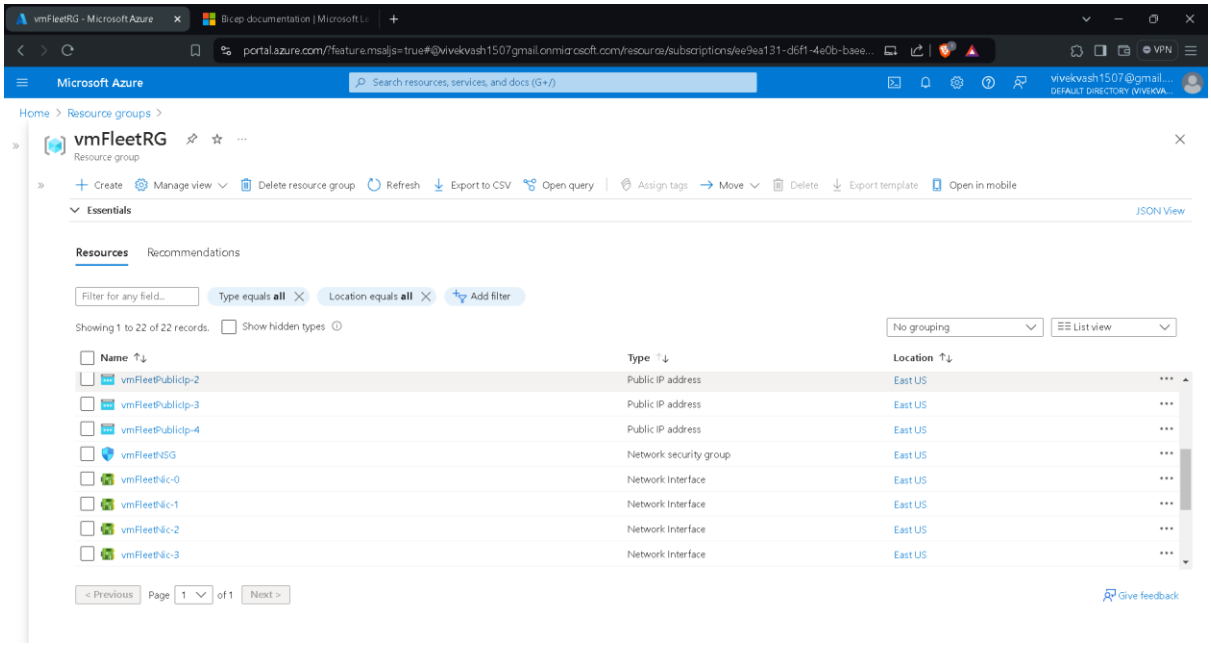
Give feedback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Filter for any field...
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Location equals all
Add filter
Showing 1 to 22 of 22 records.
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vmFleetPublicIp-2
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Public IP address
East US
vmFleetPublicIp-4
Public IP address
East US
vmFleetNSG
Network security group
East US
vmFleetNic-0
Network Interface
East US
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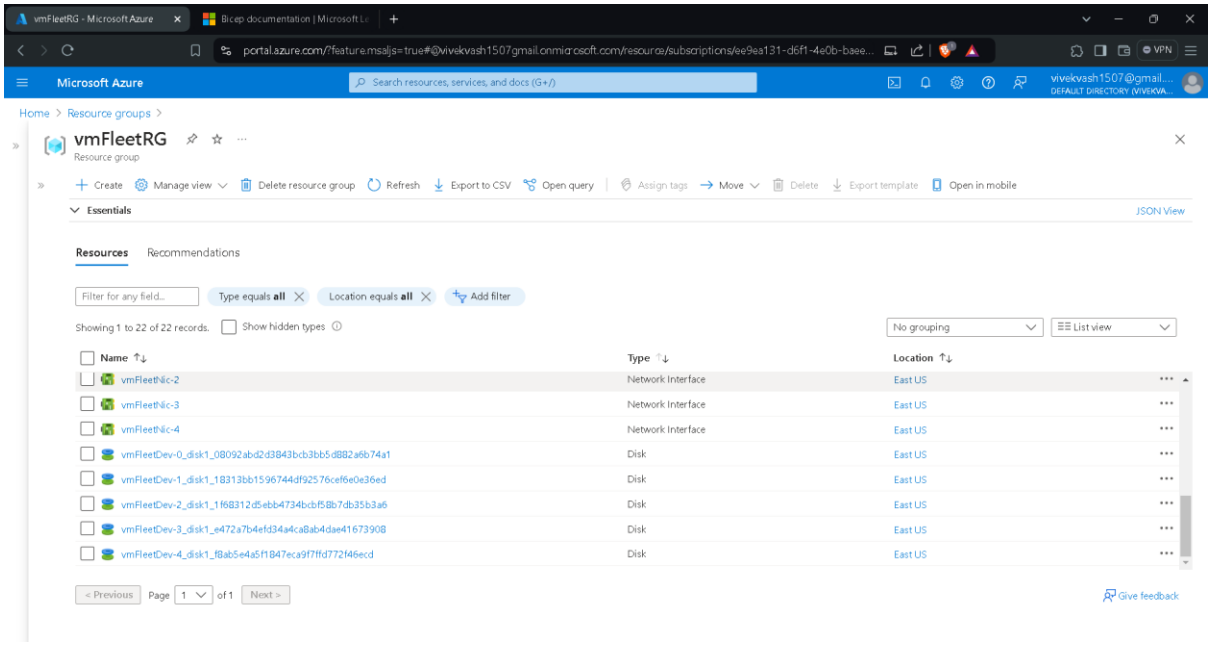
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Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
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Name
Type
Location
vmFleetNic-2 Network Interface East US
vmFleetNic-3 Network Interface East US
vmFleetNic-4 Network Interface East US
vmFleetDev-0_disk1_08092abd2d3843bcb3bb5d882a6b74a1 Disk East US
vmFleetDev-1_disk1_18313bb1596744df92576cef6e036ed Disk East US
vmFleetDev-2_disk1_1f68312d5ebb4734bcbf58b7db35b3a6 Disk East US
vmFleetDev-3_disk1_e472a7b4efd34a4ca8ab4dae41673908 Disk East US
vmFleetDev-4_disk1_f8ab5e4a5f1847eca9f7ffd772f46ecd Disk East US
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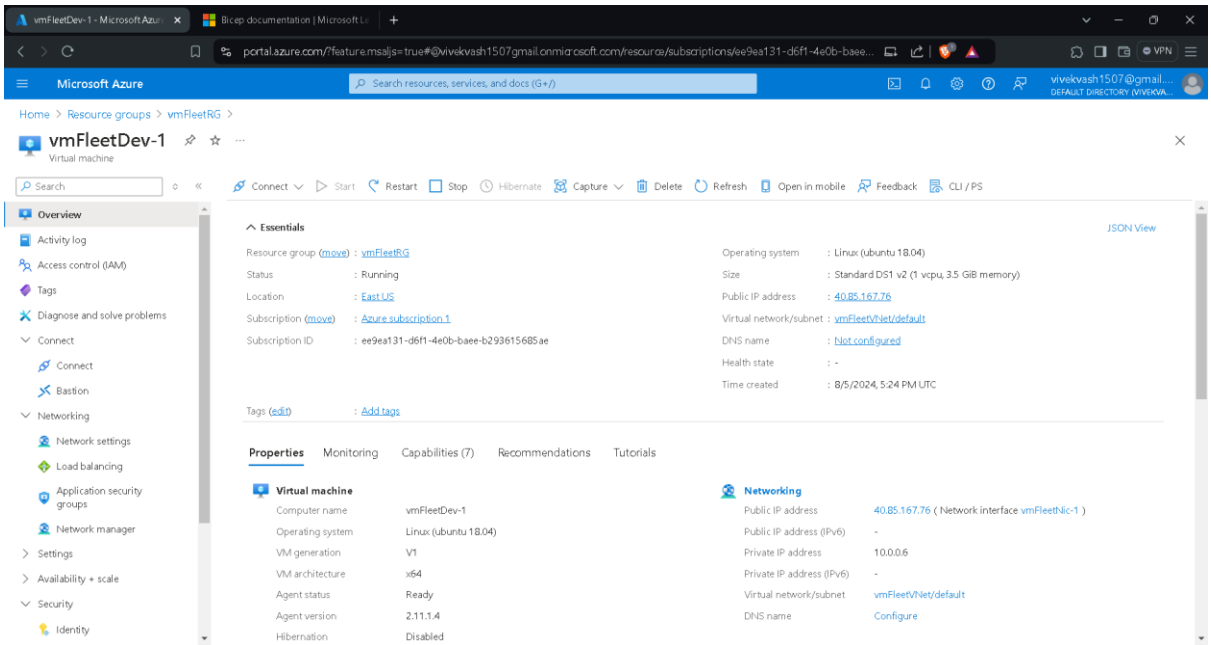
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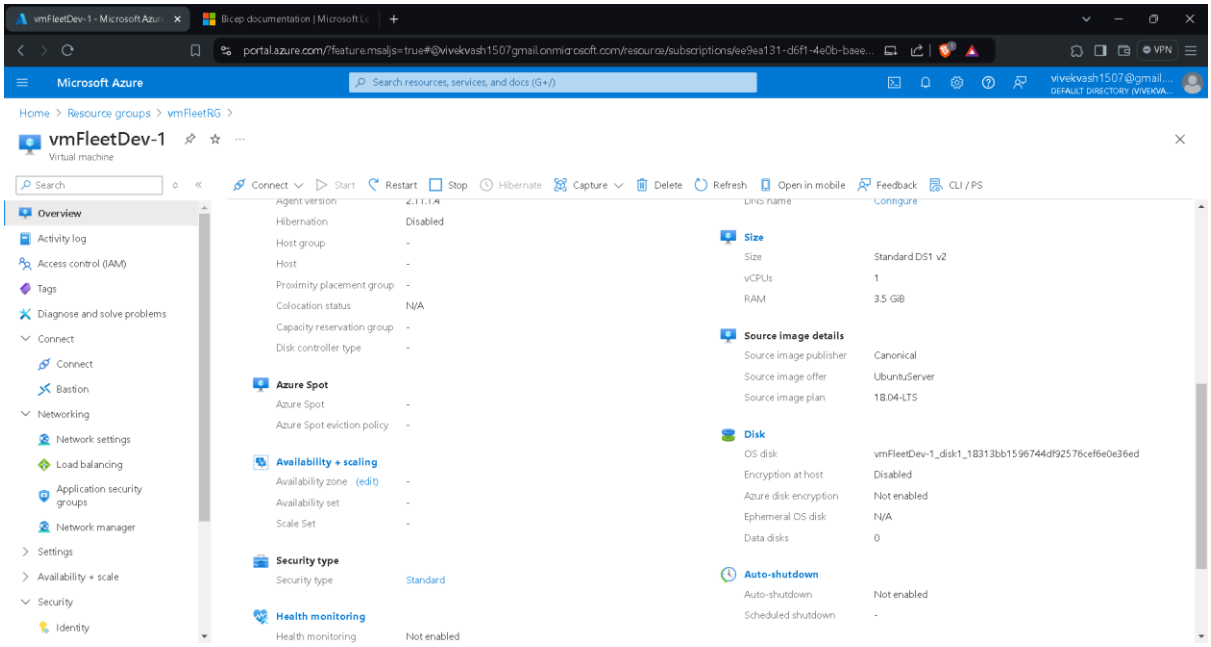
Resource group (move) : vmFleetRG
Status : Running
Location : East US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard DS1 v2 (1 vcpu, 3.5 GiB memory)
Public IP address : 40.85.167.76
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:24 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetDev-1
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 40.85.167.76 (Network interface vmFleetNic-1)
Public IP address (IPv6) -
Private IP address 10.0.0.6
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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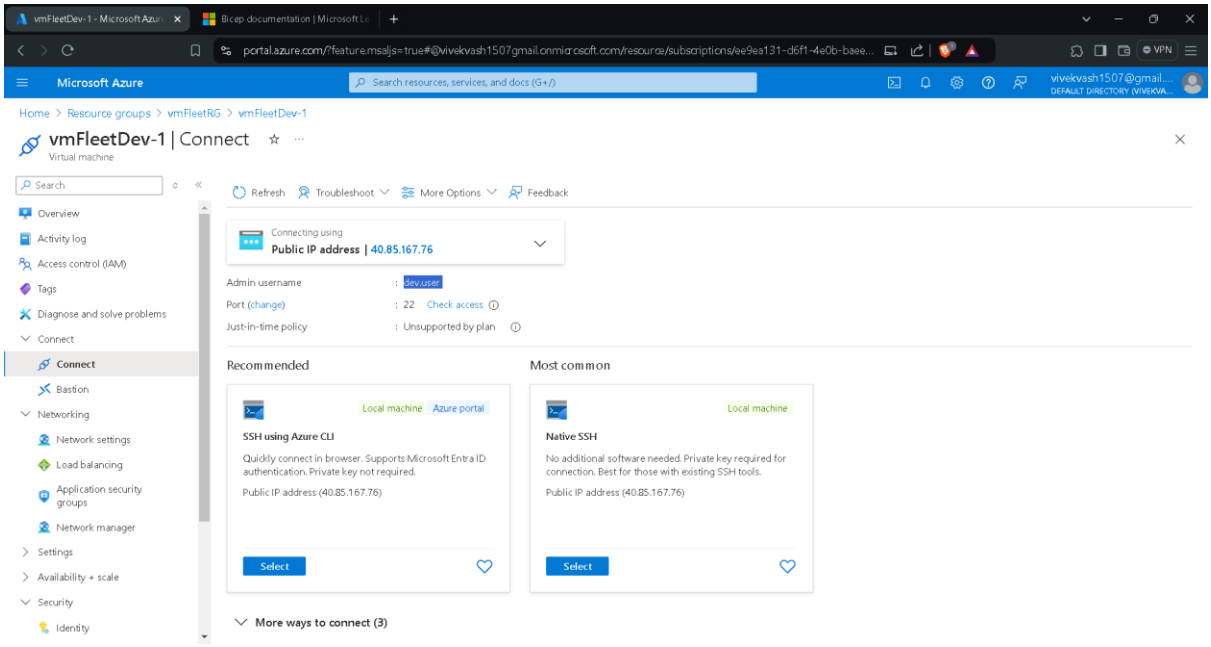
Hibernation Disabled
Host group -
Host -
Proximity placement group -
Colocation status N/A
Capacity reservation group -
Disk controller type -
Azure Spot
Azure Spot -
Azure Spot eviction policy -
Availability + scaling
Availability zone (edit) -
Availability set -
Scale Set -
Security type
Security type Standard
Health monitoring
Health monitoring Not enabled
Size
Size Standard DS1 v2
vCPUs 1
RAM 3.5 GiB
Source image details
Source image publisher Canonical
Source image offer UbuntuServer
Source image plan 18.04-LTS
Disk
OS disk vmFleetDev-1_disk1_1B313bb1596744df92576cef6e0e36ed
Encryption at host Disabled
Azure disk encryption Not enabled
Ephemeral OS disk N/A
Data disks 0
Auto-shutdown
Auto-shutdown Not enabled
Scheduled shutdown -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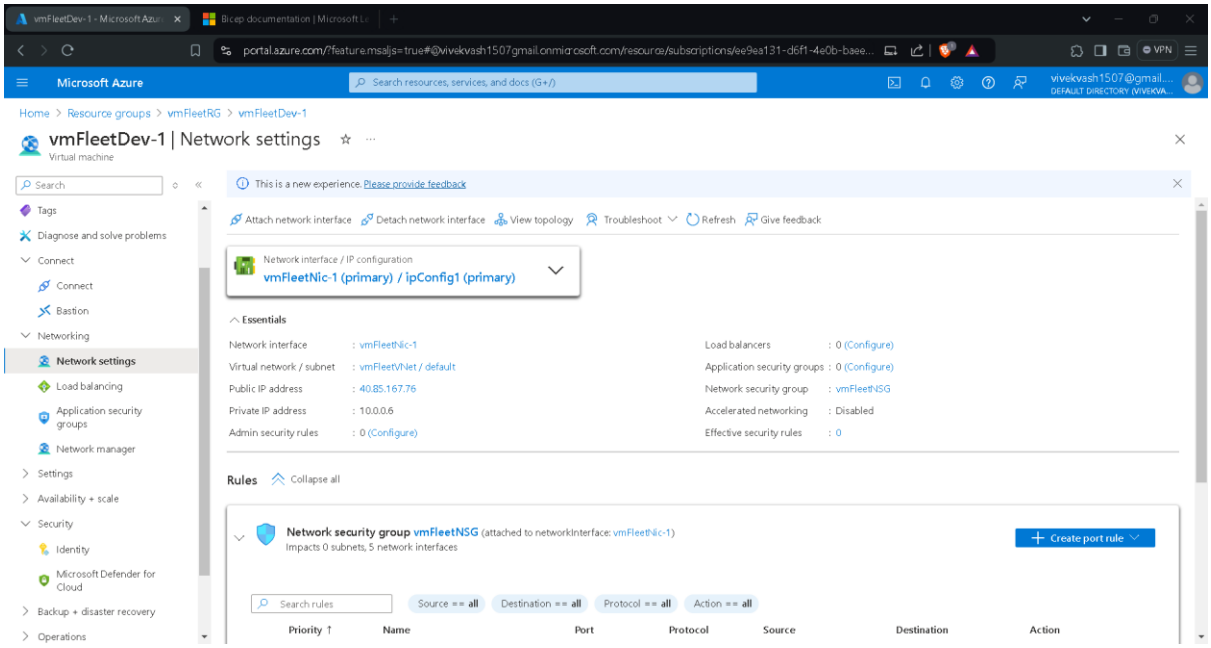
Availability + scale
Security
Identity
Connecting using
Public IP address | 40.85.167.76
Admin username : dev.user
Port (change) : 22 Check access
Just-in-time policy : Unsupported by plan
Recommended
Most common
Local machine Azure portal
SSH using Azure CLI
Quickly connect in browser. Supports Microsoft Entra ID authentication. Private key not required.
Public IP address (40.85.167.76)
Select
Local machine
Native SSH
No additional software needed. Private key required for connection. Best for those with existing SSH tools.
Public IP address (40.85.167.76)
Select
More ways to connect (3)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This is a new experience. Please provide feedback
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Detach network interface
View topology
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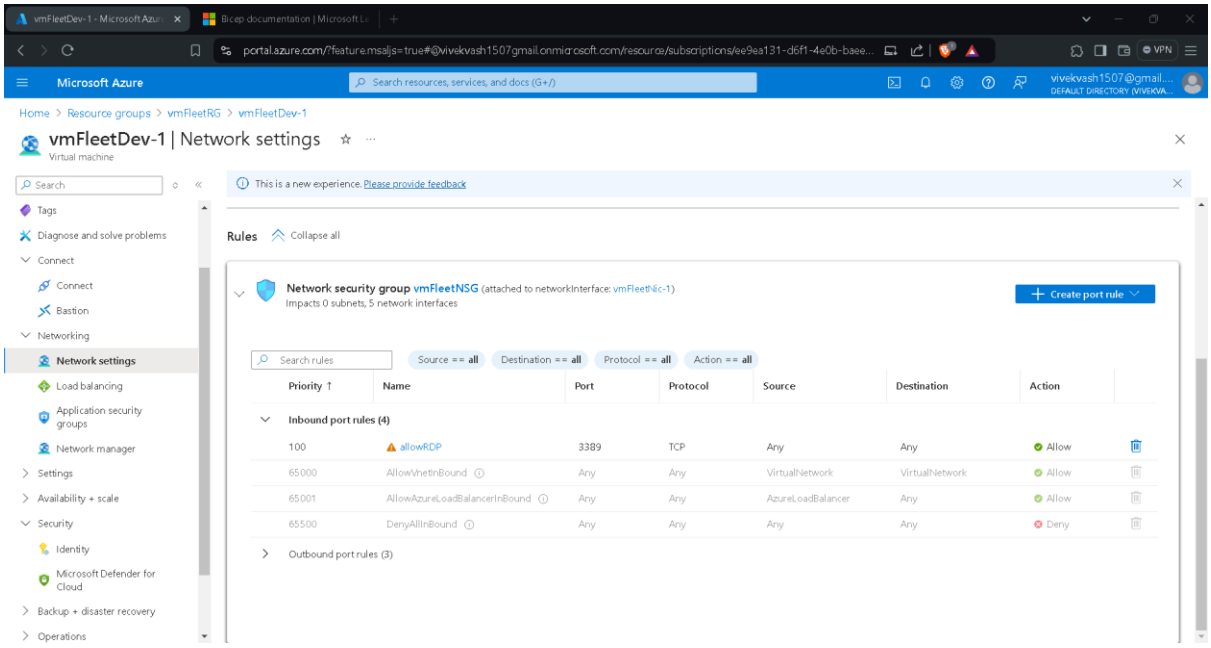
Microsoft Defender for Cloud
Backup + disaster recovery
Operations
Network interface / IP configuration
vmFleetNic-1 (primary) / ipConfig1 (primary)
Essentials
Network interface : vmFleetNic-1
Virtual network / subnet : vmFleetVNet / default
Public IP address : 40.85.167.76
Private IP address : 10.0.0.6
Admin security rules : 0 (Configure)
Load balancers : 0 (Configure)
Application security groups : 0 (Configure)
Network security group : vmFleetNSG
Accelerated networking : Disabled
Effective security rules : 0
Rules
Collapse all
Network security group vmFleetNSG (attached to networkInterface: vmFleetNic-1)
Impacts 0 subnets, 5 network interfaces
Create port rule
Search rules
Source == all
Destination == all
Protocol == all
Action == all
Priority
Name
Port
Protocol
Source
Destination
Action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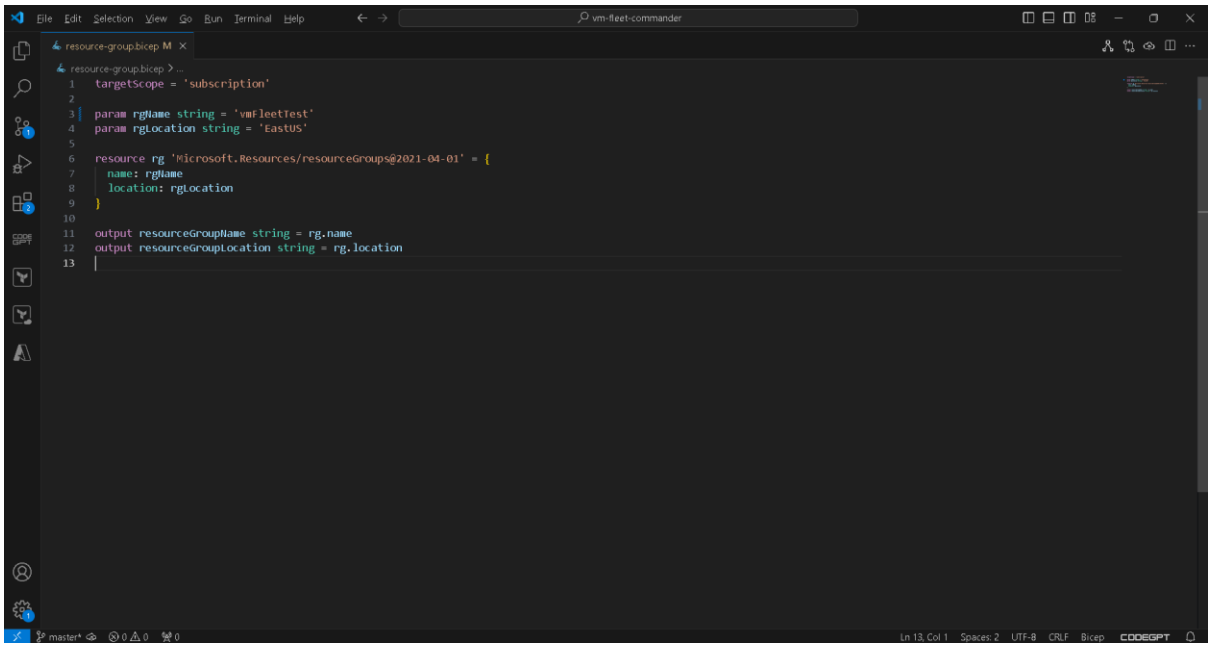
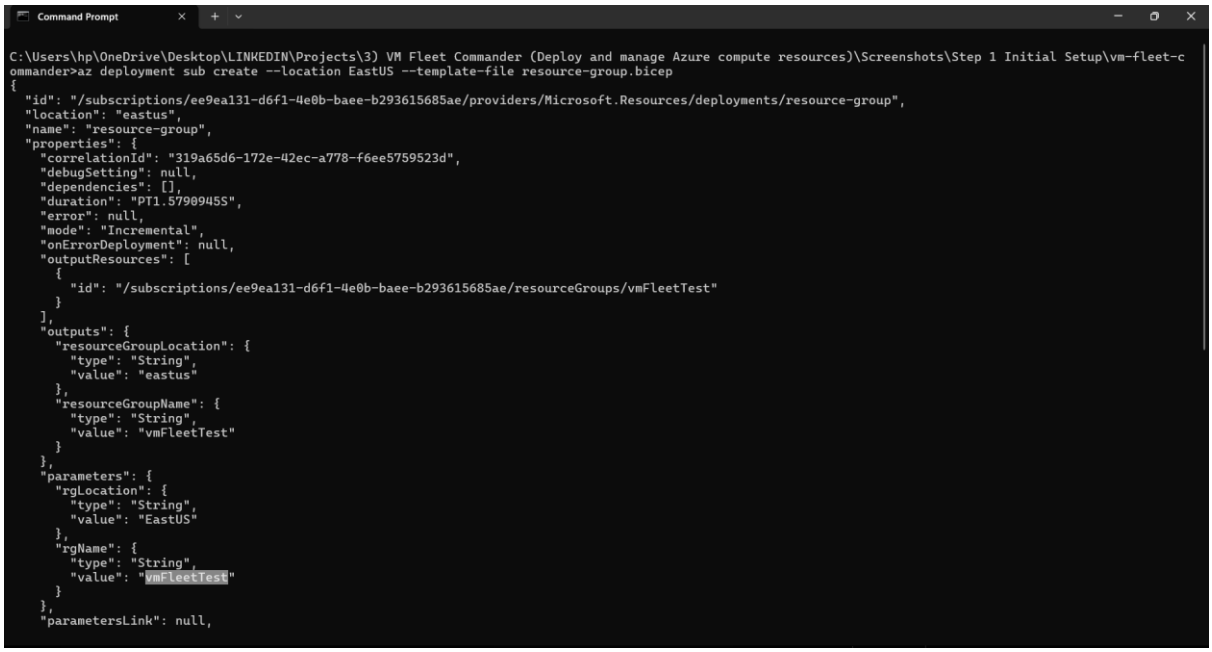
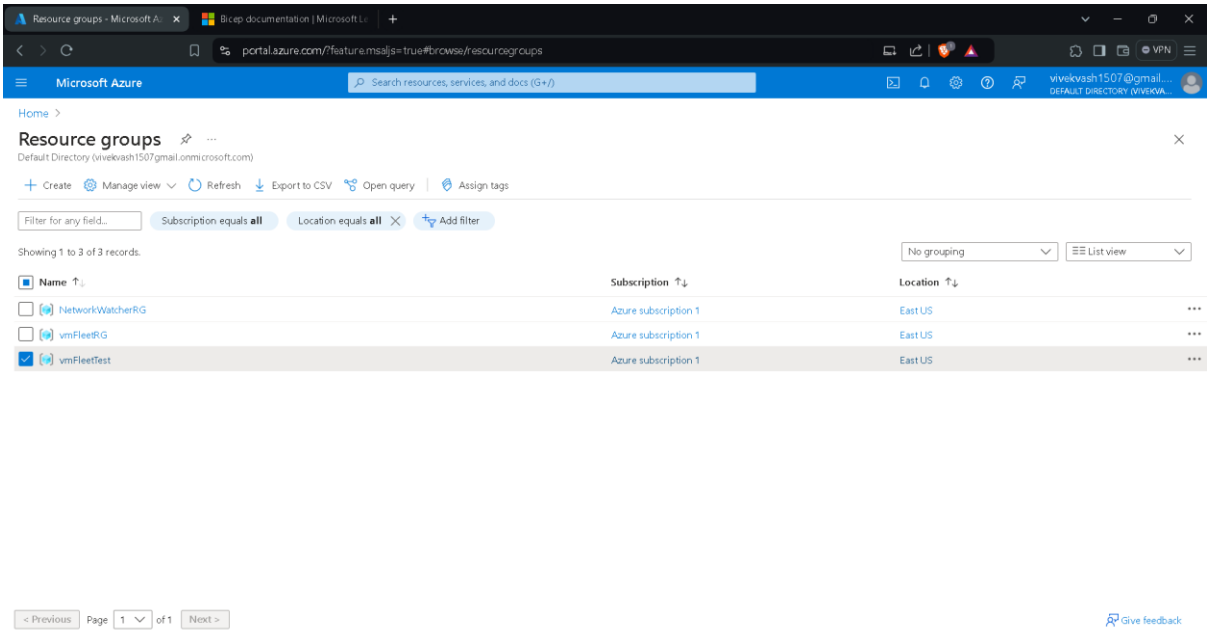
Rules
Collapse all
Network security group vmFleetNSG (attached to networkInterface: vmFleetNic-1)
Impacts 0 subnets, 5 network interfaces
Create port rule
Search rules
Source == all
Destination == all
Protocol == all
Action == all
Priority
Name
Port
Protocol
Source
Destination
Action
Inbound port rules (4)
100 allowRDP 3389 TCP Any Any Allow
65000 AllowVnetInBound Any Any VirtualNetwork VirtualNetwork Allow
65001 AllowAzureLoadBalancerInBound Any Any AzureLoadBalancer Any Allow
65500 DenyAllInBound Any Any Any Any Deny
Outbound port rules (3)

Test


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
resource-group.bicep M
resource-group.bicep > ...
1 targetScope = 'subscription'
2
3 param rgName string = 'vmFleetTest'
4 param rgLocation string = 'EastUS'
5
6 resource rg 'Microsoft.Resources/resourceGroups@2021-04-01' = {
7 name: rgName
8 location: rgLocation
9 }
10
11 output resourceGroupName string = rg.name
12 output resourceGroupLocation string = rg.location
13
master*
Ln 13, Col 1 Spaces: 2 UTF-8 CRLF Bicep CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment sub create --location EastUS --template-file resource-group.bicep
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/providers/Microsoft.Resources/deployments/resource-group",
"location": "eastus",
"name": "resource-group",
"properties": {
"correlationId": "319a65d6-172e-42ec-a778-f6ee5759523d",
"debugSetting": null,
"dependencies": [],
"duration": "PT1.5790945S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest"
}
],
"outputs": {
"resourceGroupLocation": {
"type": "String",
"value": "eastus"
},
"resourceGroupName": {
"type": "String",
"value": "vmFleetTest"
}
},
"parameters": {
"rgLocation": {
"type": "String",
"value": "EastUS"
},
"rgName": {
"type": "String",
"value": "vmFleetTest"
}
},
"parametersLink": null,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Open query
Assign tags
Filter for any field...
Subscription equals all
Location equals all
Add filter
Showing 1 to 3 of 3 records.
No grouping
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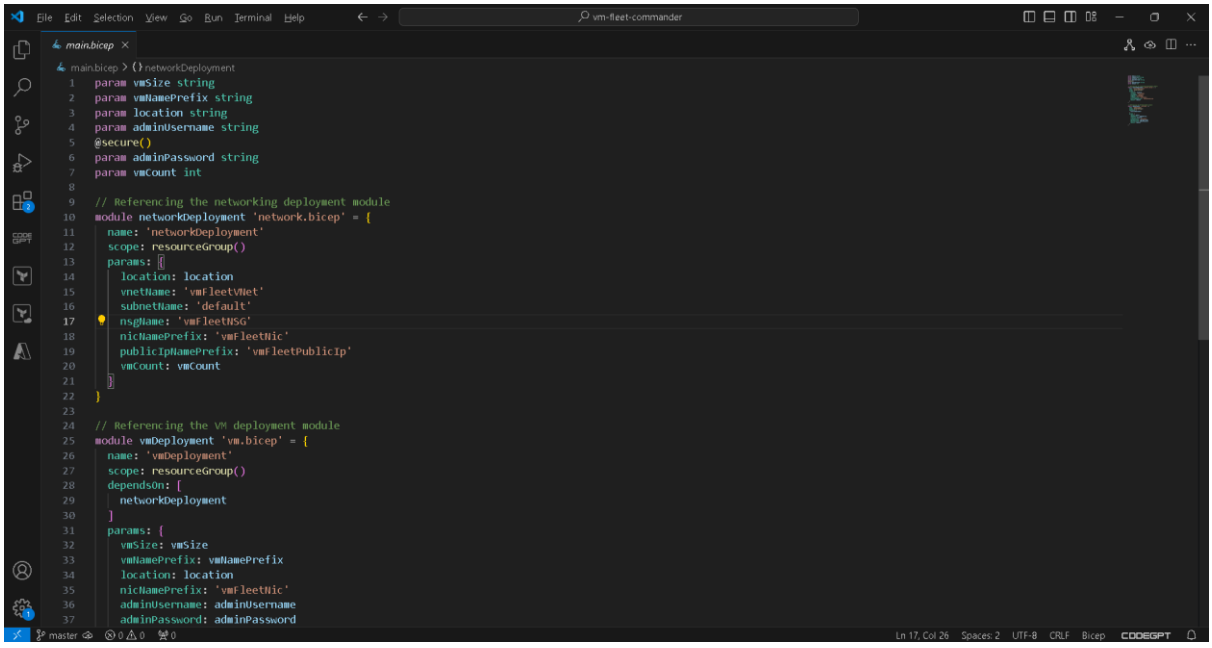
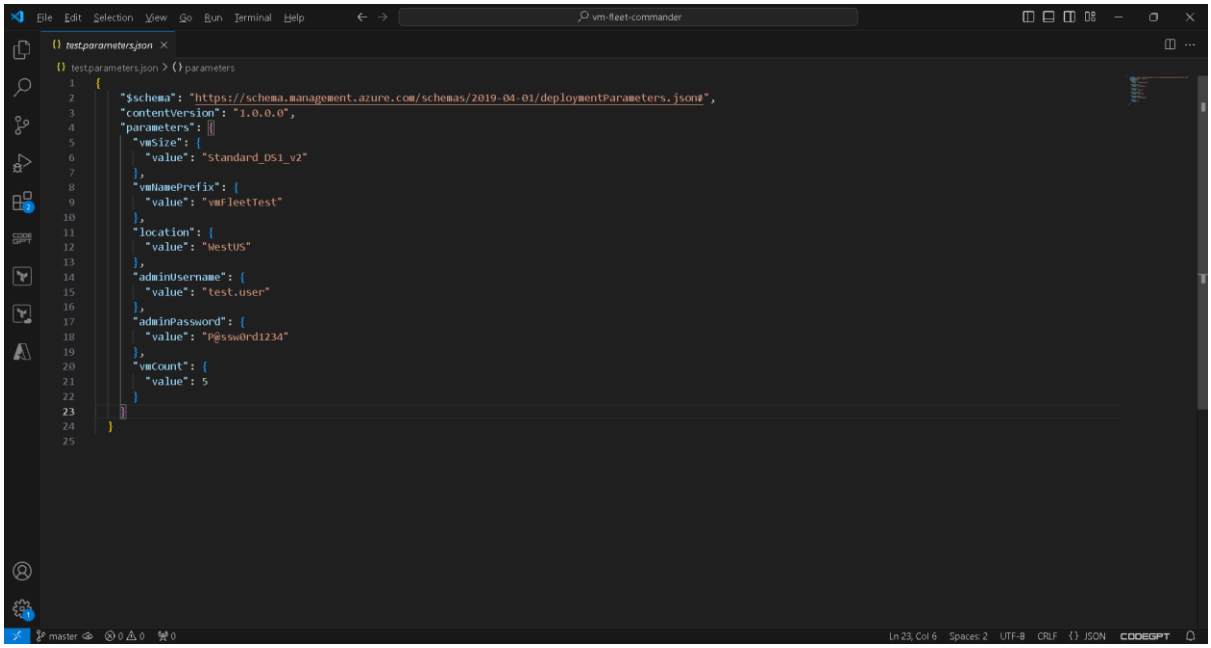
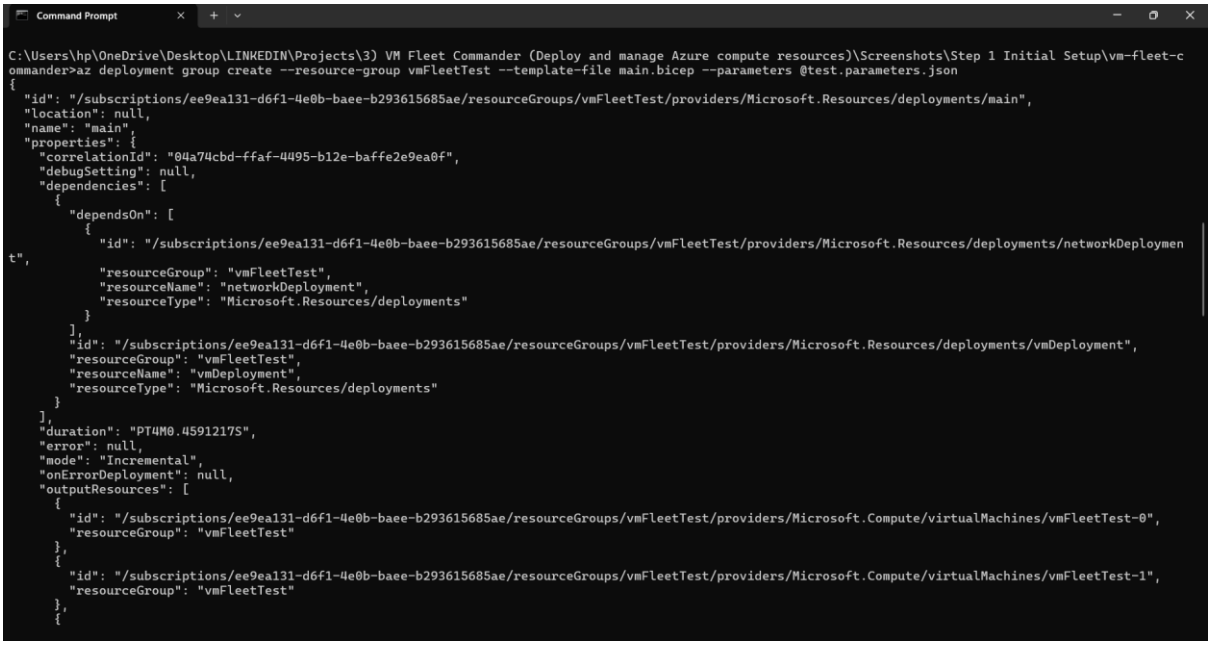
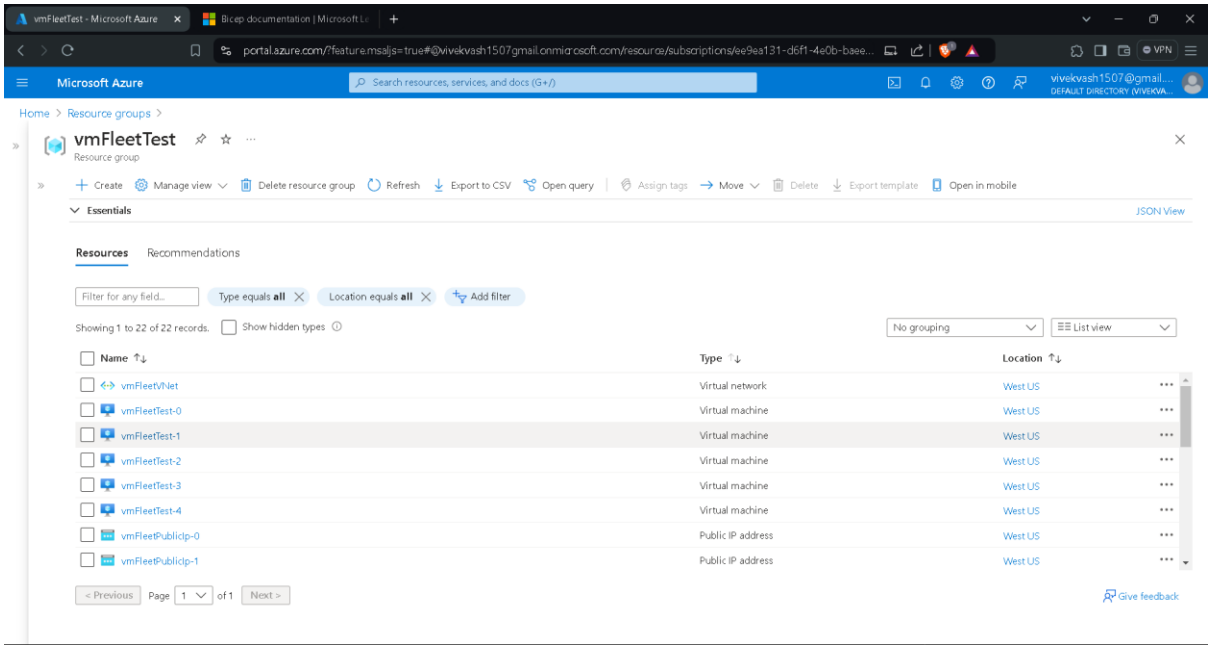

File Edit Selection View Go Run Terminal Help
vm-fleet-commander
main.bicep
main.bicep > networkDeployment
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int
// Referencing the networking deployment module
module networkDeployment 'network.bicep' = {
name: 'networkDeployment'
scope: resourceGroup()
params: {
location: location
vnetName: 'vmFleetVNet'
subnetName: 'default'
nsgName: 'vmFleetNSG'
nicNamePrefix: 'vmFleetNic'
publicIpNamePrefix: 'vmFleetPublicIp'
vmCount: vmCount
}
}
// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
name: 'vmDeployment'
scope: resourceGroup()
dependsOn: [
networkDeployment
]
params: {
vmSize: vmSize
vmNamePrefix: vmNamePrefix
location: location
nicNamePrefix: 'vmFleetNic'
adminUsername: adminUsername
adminPassword: adminPassword
master
Ln 17, Col 26
Spaces: 2
UTF-8
CRLF
Bicep
CODEGPT


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
test.parameters.json
test.parameters.json > parameters
{
"$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
"contentVersion": "1.0.0.0",
"parameters": {
"vmSize": {
"value": "Standard_DS1_v2"
},
"vmNamePrefix": {
"value": "vmFleetTest"
},
"location": {
"value": "WestUS"
},
"adminUsername": {
"value": "test.user"
},
"adminPassword": {
"value": "P@ssw0rd1234"
},
"vmCount": {
"value": 5
}
}
}
master
Ln 23, Col 6
Spaces: 2
UTF-8
CRLF
{} JSON
CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group create --resource-group vmFleetTest --template-file main.bicep --parameters @test.parameters.json
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest/providers/Microsoft.Resources/deployments/main",
"location": null,
"name": "main",
"properties": {
"correlationId": "04a74cbd-ffaf-4495-b12e-baffe2e9ea0f",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest/providers/Microsoft.Resources/deployments/networkDeployment",
"resourceGroup": "vmFleetTest",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetTest",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT4M0.4591217S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest/providers/Microsoft.Compute/virtualMachines/vmFleetTest-0",
"resourceGroup": "vmFleetTest"
},
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetTest/providers/Microsoft.Compute/virtualMachines/vmFleetTest-1",
"resourceGroup": "vmFleetTest"
},
{


vmFleetTest - Microsoft Azure
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DEFAULT DIRECTORY (VIVEKVA...
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Resource group
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Recommendations
Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
List view
Name
Type
Location
vmFleetVNet
Virtual network
West US
vmFleetTest-0
Virtual machine
West US
vmFleetTest-1
Virtual machine
West US
vmFleetTest-2
Virtual machine
West US
vmFleetTest-3
Virtual machine
West US
vmFleetTest-4
Virtual machine
West US
vmFleetPublicIp-0
Public IP address
West US
vmFleetPublicIp-1
Public IP address
West US
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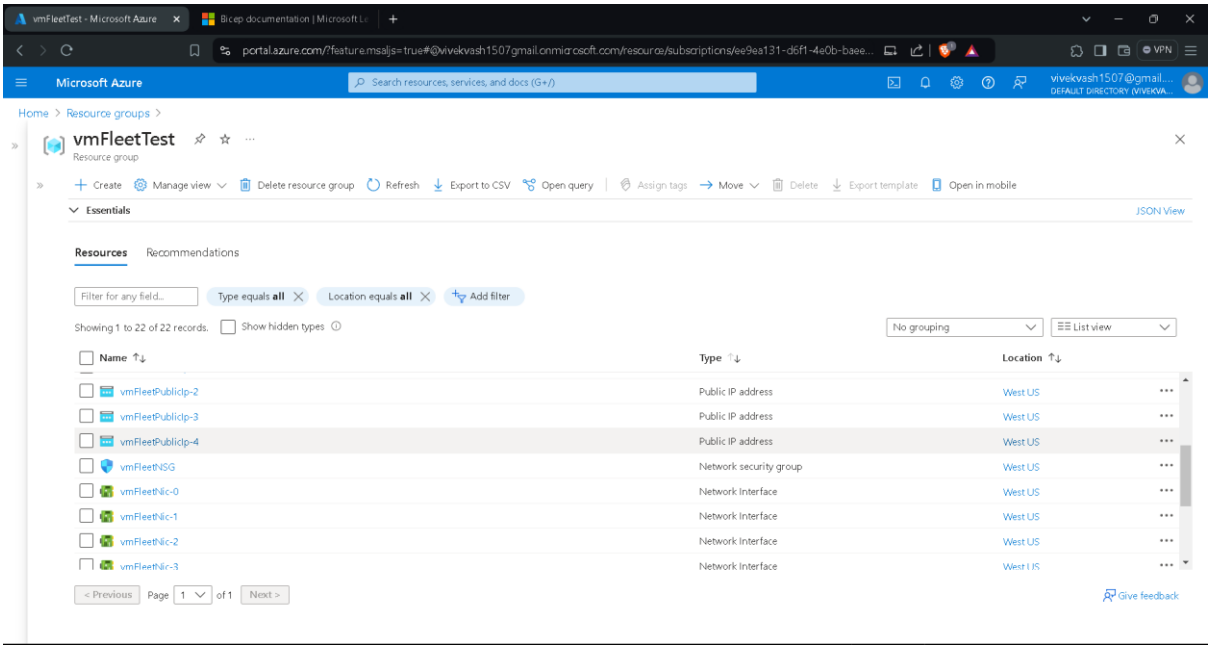
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Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
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vmFleetPublicIp-2
Public IP address
West US
vmFleetPublicIp-3
Public IP address
West US
vmFleetPublicIp-4
Public IP address
West US
vmFleetNSG
Network security group
West US
vmFleetNic-0
Network Interface
West US
vmFleetNic-1
Network Interface
West US
vmFleetNic-2
Network Interface
West US
vmFleetNic-3
Network Interface
West US
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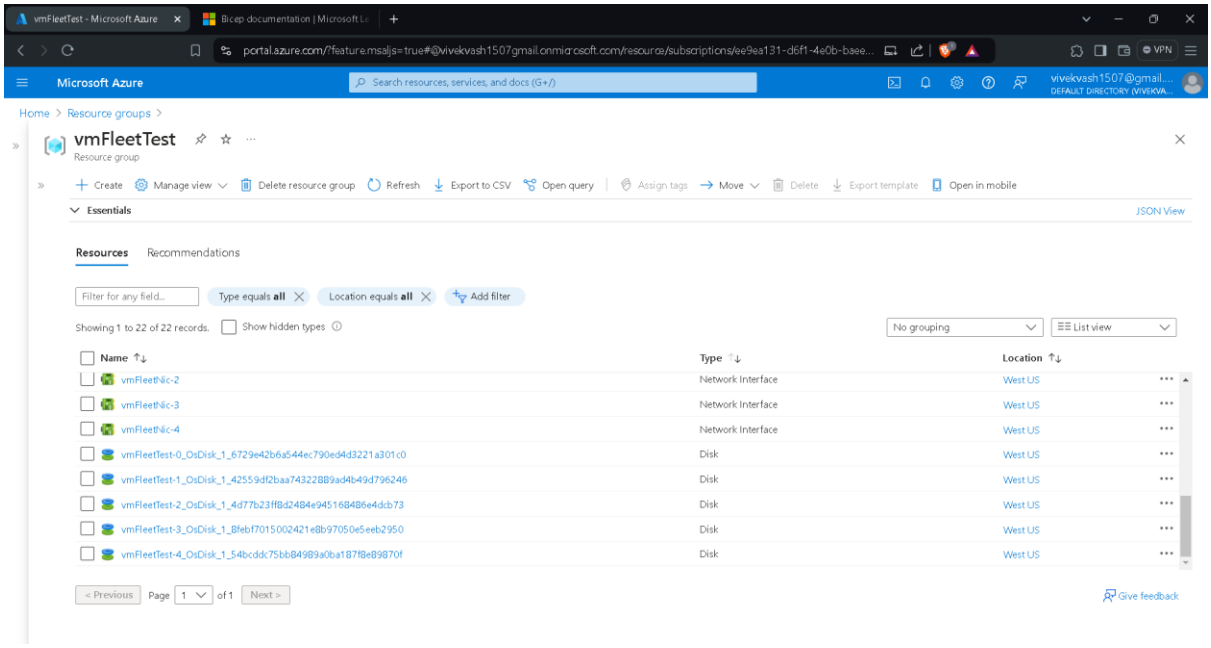
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Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
List view
Name
Type
Location
vmFleetNic-2 Network Interface West US
vmFleetNic-3 Network Interface West US
vmFleetNic-4 Network Interface West US
vmFleetTest-0_OsDisk_1_6729e42b6a544ec790ed4d3221a301c0 Disk West US
vmFleetTest-1_OsDisk_1_42559df2baa743228B9ad4b49d796246 Disk West US
vmFleetTest-2_OsDisk_1_4d77b23ff8d24B4e94516B4B6e4dcb73 Disk West US
vmFleetTest-3_OsDisk_1_Bfebf7015002421e8b97050e5eeb2950 Disk West US
vmFleetTest-4_OsDisk_1_54bcddc75bbB4989a0ba187f8eB9870f Disk West US
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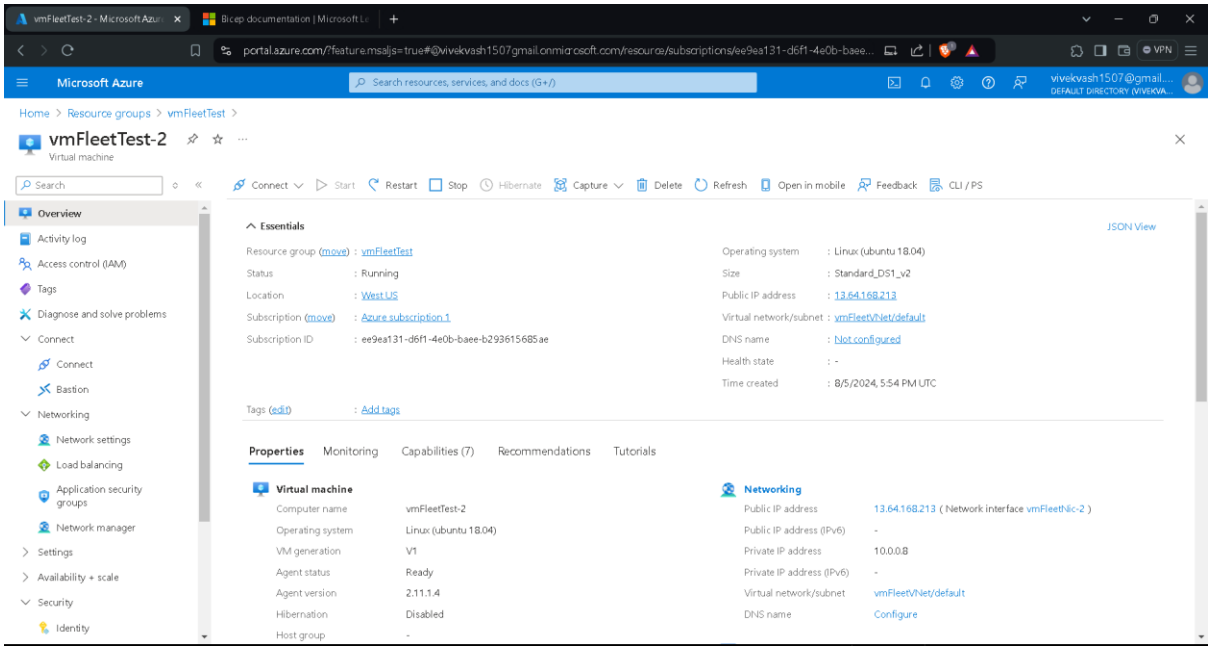
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Virtual machine
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Connect
Bastion
Networking
Network settings
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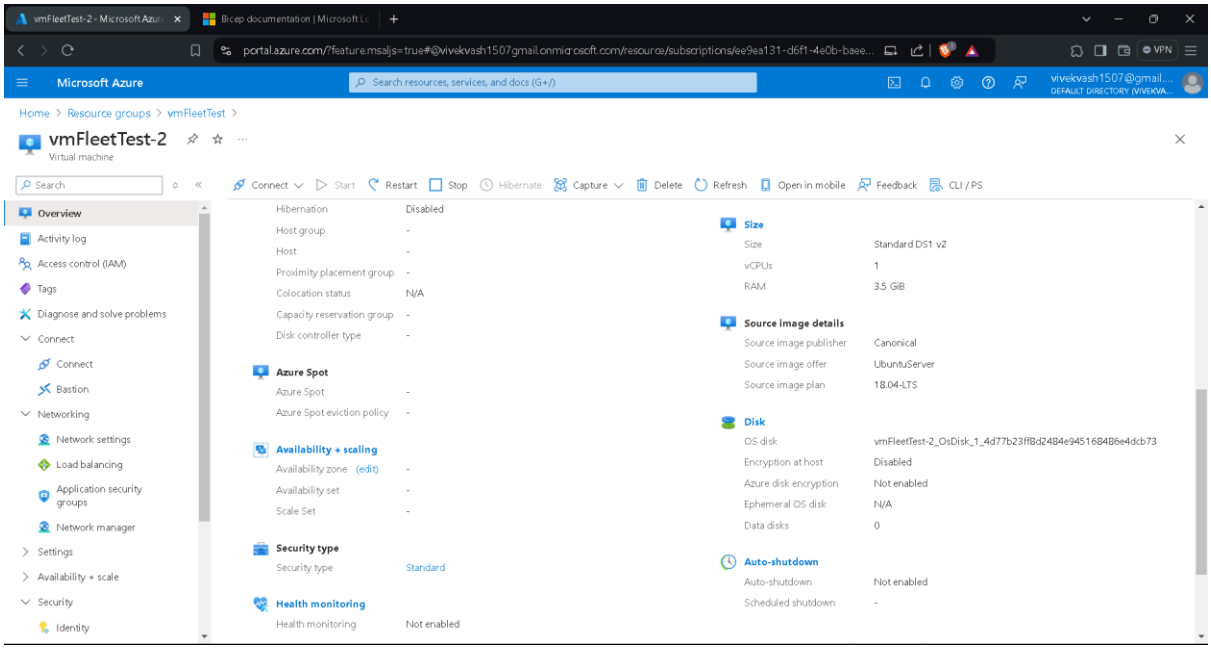
Application security groups
Network manager
Settings
Availability + scale
Security
Identity
Essentials
JSON View
Resource group (move) : vmFleetTest
Status : Running
Location : West US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard_DS1_v2
Public IP address : 13.64.168.213
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:54 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetTest-2
Operating system Linux (ubuntu 18.04)
VM generation V1
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Host group -
Networking
Public IP address 13.64.168.213 (Network interface vmFleetNic-2)
Public IP address (IPv6) -
Private IP address 10.0.0.8
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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Connect
Bastion
Networking
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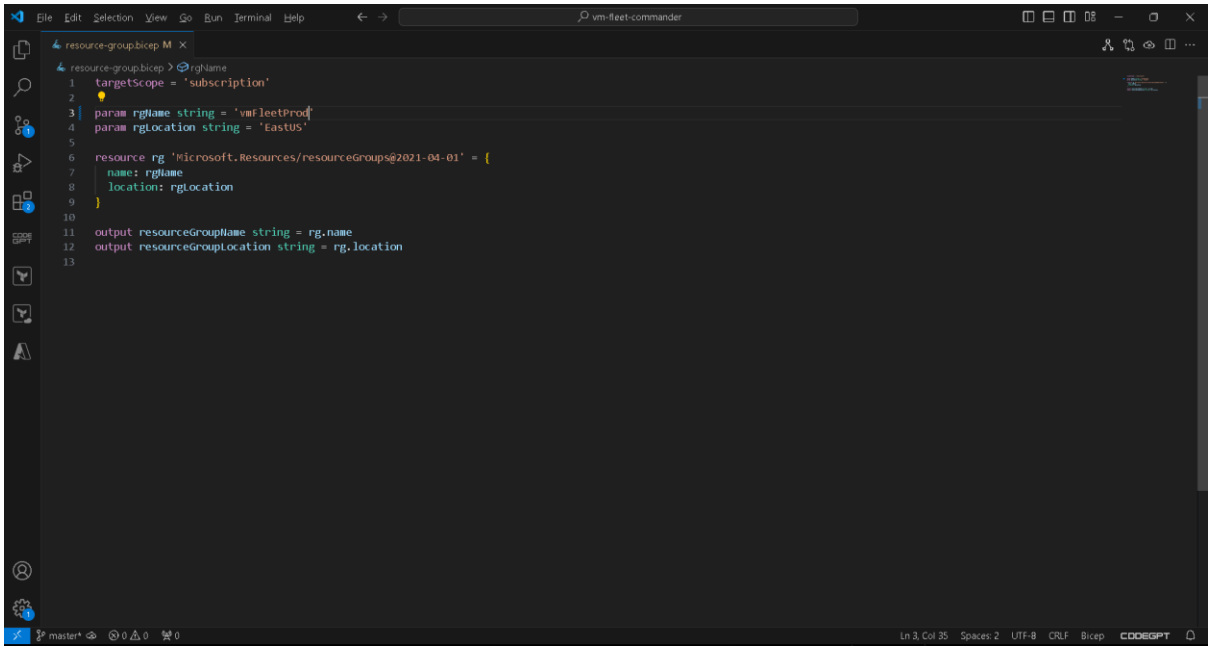
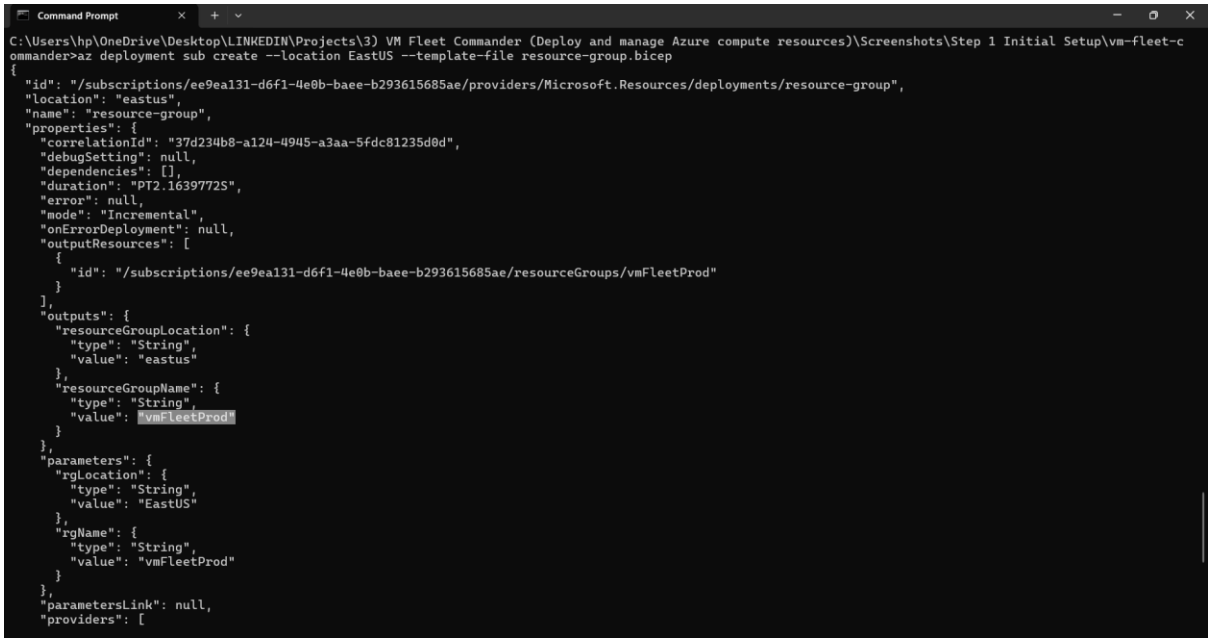
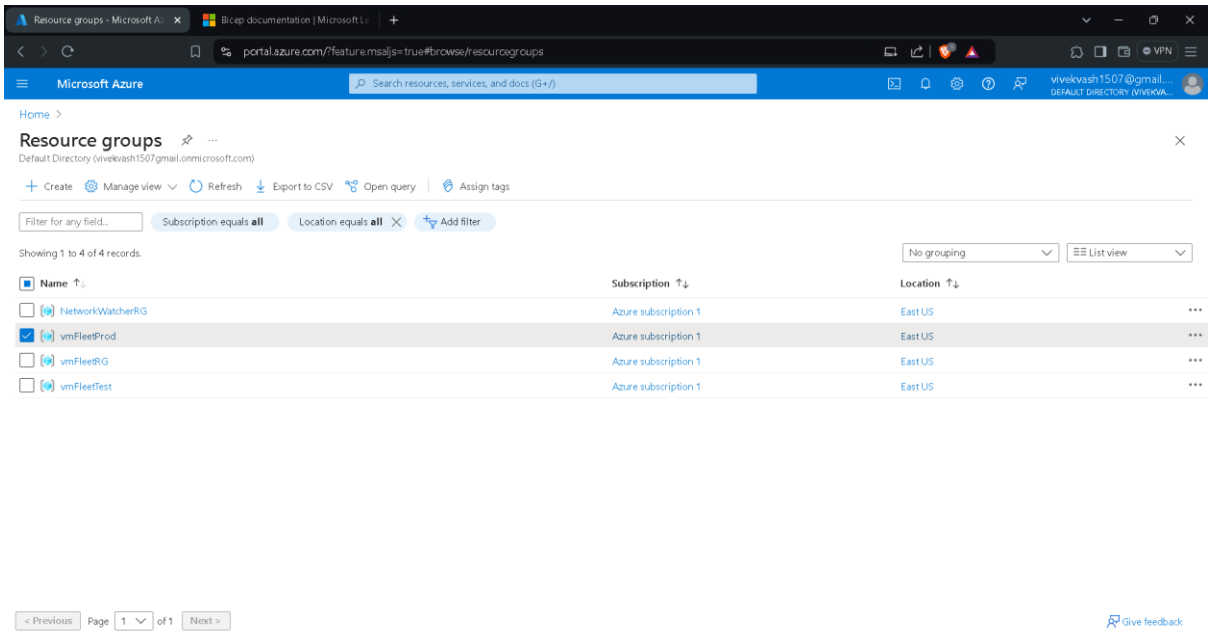
Load balancing
Application security groups
Network manager
Settings
Availability + scale
Security
Identity
Hibernation Disabled
Host group -
Host -
Proximity placement group -
Colocation status N/A
Capacity reservation group -
Disk controller type -
Azure Spot
Azure Spot -
Azure Spot eviction policy -
Availability + scaling
Availability zone (edit) -
Availability set -
Scale Set -
Security type
Security type Standard
Health monitoring
Health monitoring Not enabled
Size
Size Standard DS1 v2
vCPUs 1
RAM 3.5 GiB
Source image details
Source image publisher Canonical
Source image offer UbuntuServer
Source image plan 18.04-LTS
Disk
OS disk vmFleetTest-2_OsDisk_1_4d77b23ff8d2484e945168486e4dcb73
Encryption at host Disabled
Azure disk encryption Not enabled
Ephemeral OS disk N/A
Data disks 0
Auto-shutdown
Auto-shutdown Not enabled
Scheduled shutdown -

Prod


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
resource-group.bicep M
resource-group.bicep > rgName
targetScope = 'subscription'
param rgName string = 'vmFleetProd'
param rgLocation string = 'EastUS'
resource rg 'Microsoft.Resources/resourceGroups@2021-04-01' = {
name: rgName
location: rgLocation
}
output resourceGroupName string = rg.name
output resourceGroupLocation string = rg.location
master*
Ln 3, Col 35 Spaces: 2 UTF-8 CRLF Bicep CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment sub create --location EastUS --template-file resource-group.bicep
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/providers/Microsoft.Resources/deployments/resource-group",
"location": "eastus",
"name": "resource-group",
"properties": {
"correlationId": "37d234b8-a124-4945-a3aa-5fdc81235d0d",
"debugSetting": null,
"dependencies": [],
"duration": "PT2.1639772S",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd"
}
],
"outputs": {
"resourceGroupLocation": {
"type": "String",
"value": "eastus"
},
"resourceGroupName": {
"type": "String",
"value": "vmFleetProd"
}
},
"parameters": {
"rgLocation": {
"type": "String",
"value": "EastUS"
},
"rgName": {
"type": "String",
"value": "vmFleetProd"
}
},
"parametersLink": null,
"providers": [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DEFAULT DIRECTORY (VIVEKVA...
Home
Resource groups
Default Directory (vivekvash1507gmail.onmicrosoft.com)
Create
Manage view
Refresh
Export to CSV
Open query
Assign tags
Filter for any field...
Subscription equals all
Location equals all
Add filter
Showing 1 to 4 of 4 records.
No grouping
List view
Name
Subscription
Location
NetworkWatcherRG
Azure subscription 1
East US
vmFleetProd
Azure subscription 1
East US
vmFleetRG
Azure subscription 1
East US
vmFleetTest
Azure subscription 1
East US
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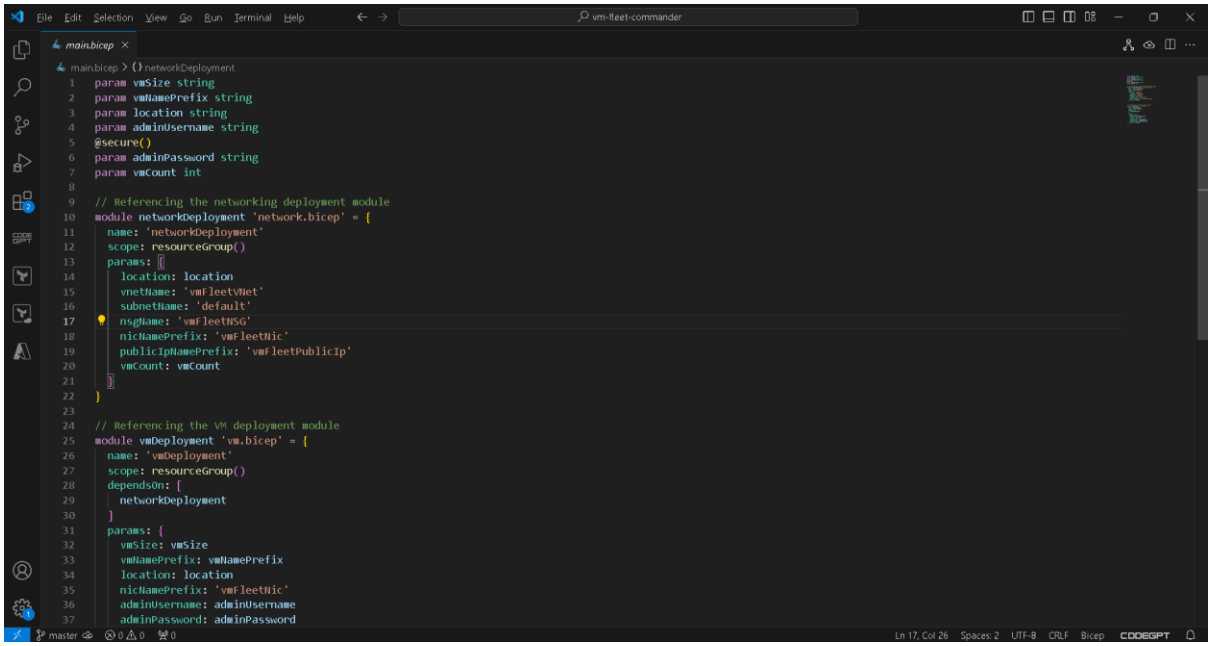
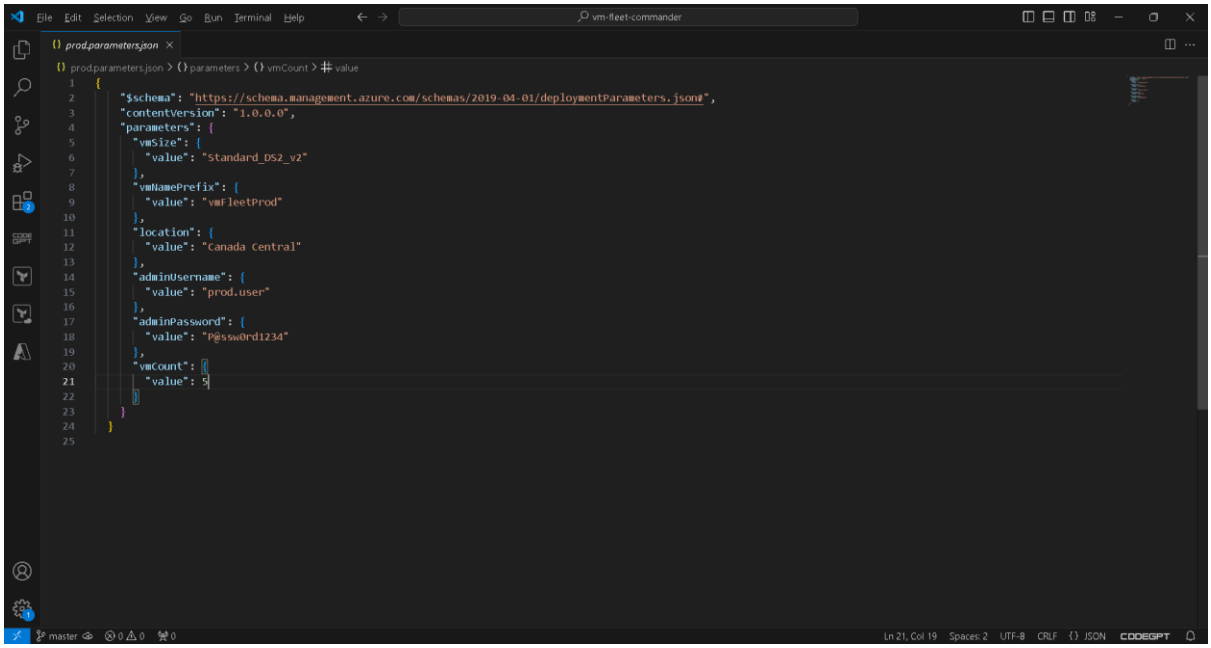
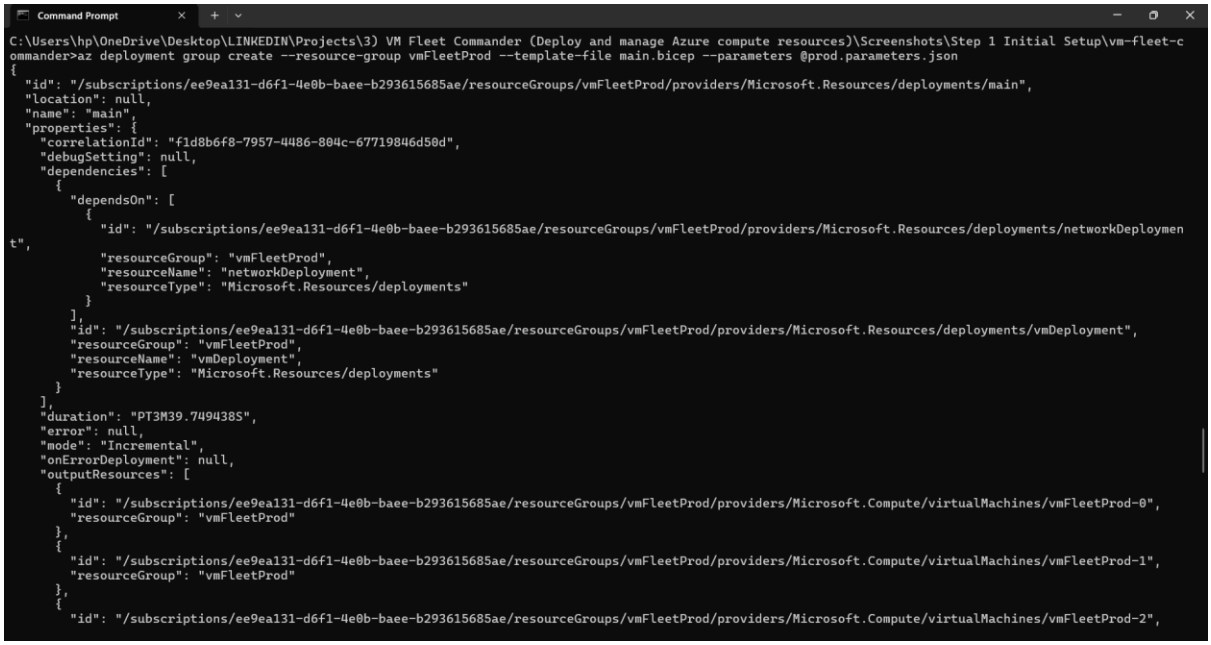
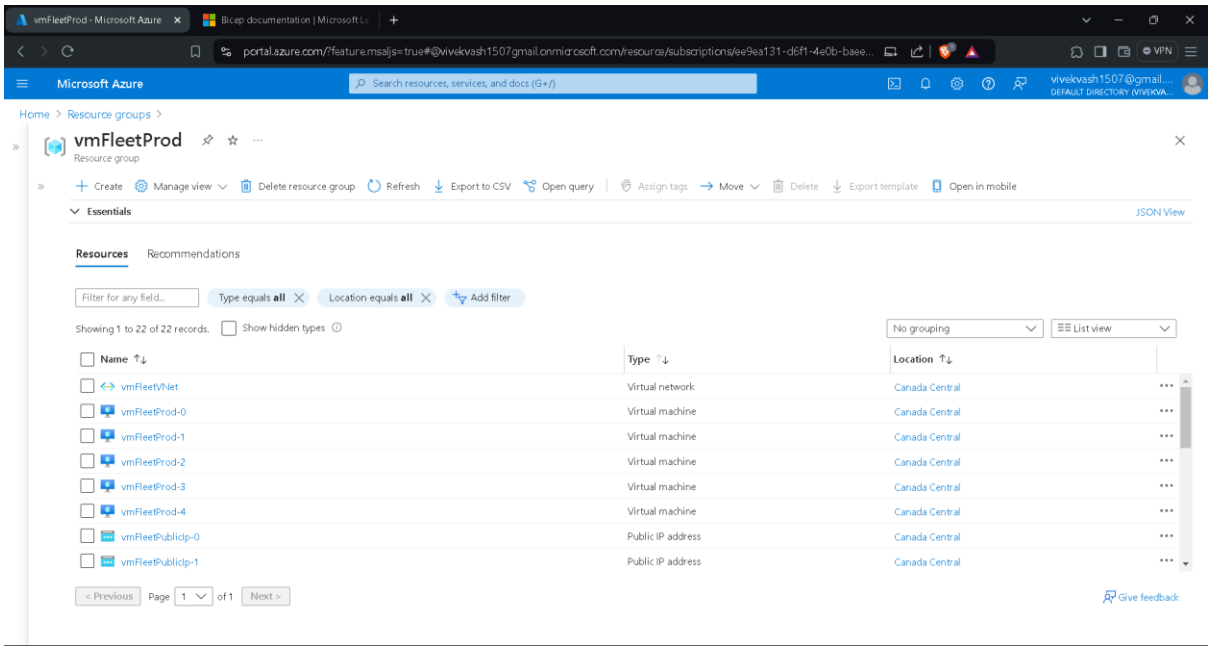

File Edit Selection View Go Run Terminal Help
vm-fleet-commander
main.bicep
main.bicep > networkDeployment
param vmSize string
param vmNamePrefix string
param location string
param adminUsername string
@secure()
param adminPassword string
param vmCount int
// Referencing the networking deployment module
module networkDeployment 'network.bicep' = {
name: 'networkDeployment'
scope: resourceGroup()
params: {
location: location
vnetName: 'vmFleetVNet'
subnetName: 'default'
nsgName: 'vmFleetNSG'
nicNamePrefix: 'vmFleetNic'
publicIpNamePrefix: 'vmFleetPublicIp'
vmCount: vmCount
}
}
// Referencing the VM deployment module
module vmDeployment 'vm.bicep' = {
name: 'vmDeployment'
scope: resourceGroup()
dependsOn: [
networkDeployment
]
params: {
vmSize: vmSize
vmNamePrefix: vmNamePrefix
location: location
nicNamePrefix: 'vmFleetNic'
adminUsername: adminUsername
adminPassword: adminPassword
master
Ln 17, Col 26
Spaces: 2
UTF-8
CRLF
Bicep
CODEGPT


File Edit Selection View Go Run Terminal Help
vm-fleet-commander
prod.parameters.json
prod.parameters.json > parameters > vmCount > value
{
"$schema": "https://schema.management.azure.com/schemas/2019-04-01/deploymentParameters.json#",
"contentVersion": "1.0.0.0",
"parameters": {
"vmSize": {
"value": "Standard_DS2_v2"
},
"vmNamePrefix": {
"value": "vmFleetProd"
},
"location": {
"value": "Canada Central"
},
"adminUsername": {
"value": "prod.user"
},
"adminPassword": {
"value": "P@ssw0rd1234"
},
"vmCount": {
"value": 5
}
}
}
master
Ln 21, Col 19
Spaces: 2
UTF-8
CRLF
{} JSON
CODEGPT


Command Prompt
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az deployment group create --resource-group vmFleetProd --template-file main.bicep --parameters @prod.parameters.json
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Resources/deployments/main",
"location": null,
"name": "main",
"properties": {
"correlationId": "f1d8b6f8-7957-4486-804c-67719846d50d",
"debugSetting": null,
"dependencies": [
{
"dependsOn": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Resources/deployments/networkDeployment",
"resourceGroup": "vmFleetProd",
"resourceName": "networkDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Resources/deployments/vmDeployment",
"resourceGroup": "vmFleetProd",
"resourceName": "vmDeployment",
"resourceType": "Microsoft.Resources/deployments"
}
],
"duration": "PT3M39.7494385",
"error": null,
"mode": "Incremental",
"onErrorDeployment": null,
"outputResources": [
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Compute/virtualMachines/vmFleetProd-0",
"resourceGroup": "vmFleetProd"
},
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Compute/virtualMachines/vmFleetProd-1",
"resourceGroup": "vmFleetProd"
},
{
"id": "/subscriptions/ee9ea131-d6f1-4e0b-baee-b293615685ae/resourceGroups/vmFleetProd/providers/Microsoft.Compute/virtualMachines/vmFleetProd-2",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Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
List view
Name
Type
Location
vmFleetVNet
Virtual network
Canada Central
vmFleetProd-0
Virtual machine
Canada Central
vmFleetProd-1
Virtual machine
Canada Central
vmFleetProd-2
Virtual machine
Canada Central
vmFleetProd-3
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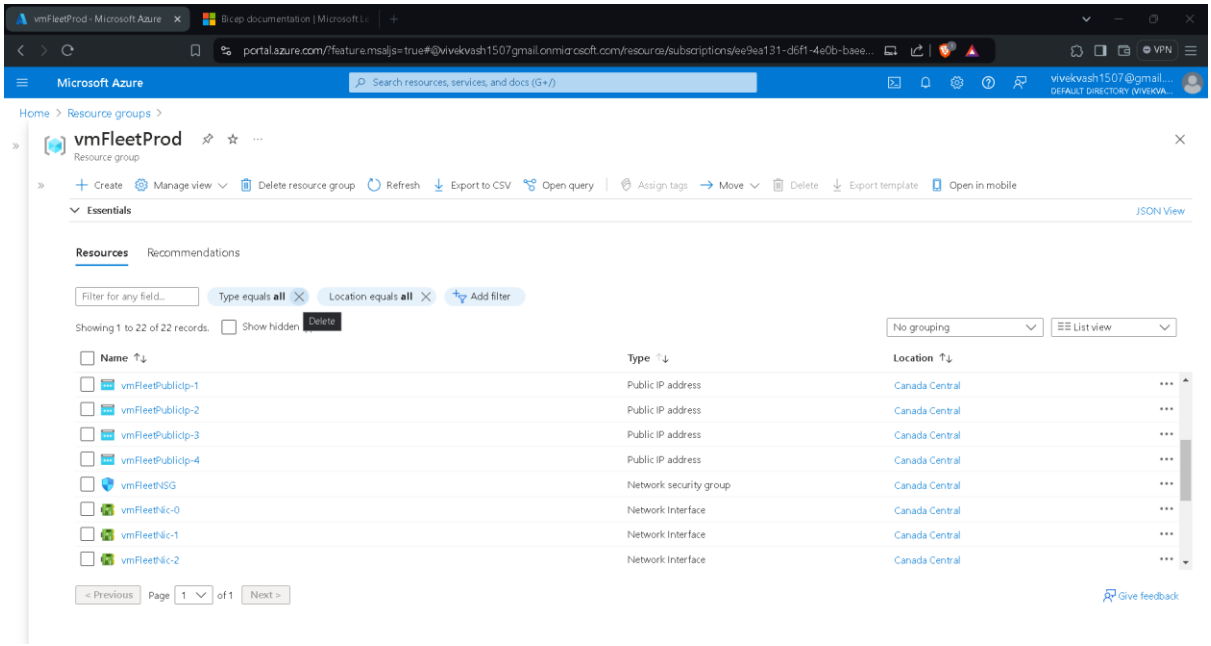
Next >
Give feedback


vmFleetProd - Microsoft Azure
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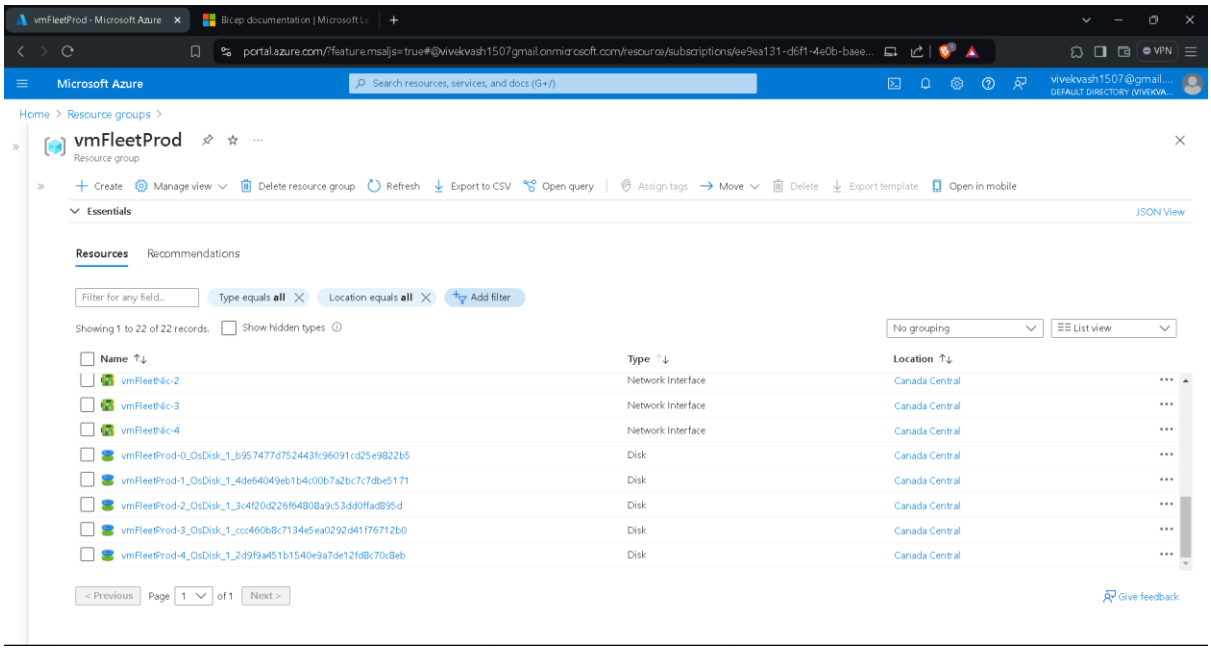
DEFAULT DIRECTORY (VIVEKVA...
Home > Resource groups >
vmFleetProd
Resource group
Create
Manage view
Delete resource group
Refresh
Export to CSV
Open query
Assign tags
Move
Delete
Export template
Open in mobile
Essentials
JSON View
Resources
Recommendations
Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden
Delete
No grouping
List view
Name
Type
Location
vmFleetPublicIp-1 Public IP address Canada Central
vmFleetPublicIp-2 Public IP address Canada Central
vmFleetPublicIp-3 Public IP address Canada Central
vmFleetPublicIp-4 Public IP address Canada Central
vmFleetNSG Network security group Canada Central
vmFleetNic-0 Network Interface Canada Central
vmFleetNic-1 Network Interface Canada Central
vmFleetNic-2 Network Interface Canada Central
< Previous
Page 1 of 1
Next >
Give feedback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Resource group
Create
Manage view
Delete resource group
Refresh
Export to CSV
Open query
Assign tags
Move
Delete
Export template
Open in mobile
Essentials
JSON View
Resources
Recommendations
Filter for any field...
Type equals all
Location equals all
Add filter
Showing 1 to 22 of 22 records.
Show hidden types
No grouping
List view
Name
Type
Location
vmFleetNic-2 Network Interface Canada Central
vmFleetNic-3 Network Interface Canada Central
vmFleetNic-4 Network Interface Canada Central
vmFleetProd-0_OsDisk_1_b957477d752443fc96091cd25e9822b5 Disk Canada Central
vmFleetProd-1_OsDisk_1_4de64049eb1b4c00b7a2bc7c7dbe5171 Disk Canada Central
vmFleetProd-2_OsDisk_1_3c4f20d226f64808a9c53dd0ffad895d Disk Canada Central
vmFleetProd-3_OsDisk_1_ccc460b8c7134e5ea0292d41f76712b0 Disk Canada Central
vmFleetProd-4_OsDisk_1_2d9f9a451b1540e9a7de12fd8c70c8eb Disk Canada Central
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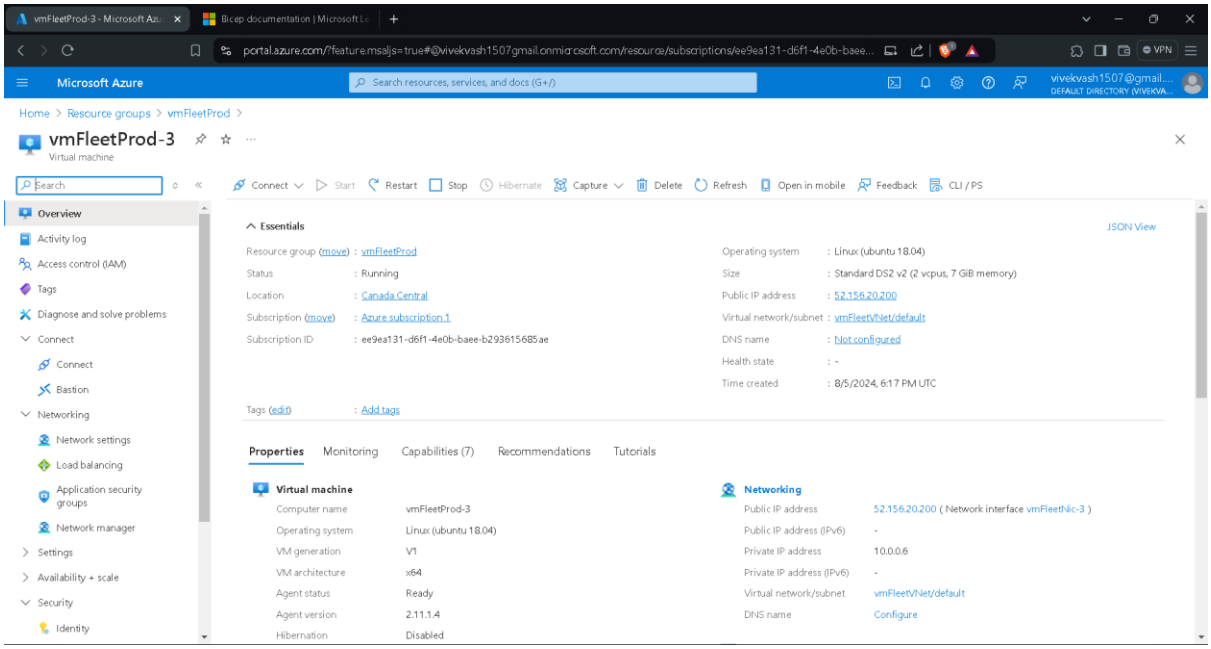
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Virtual machine
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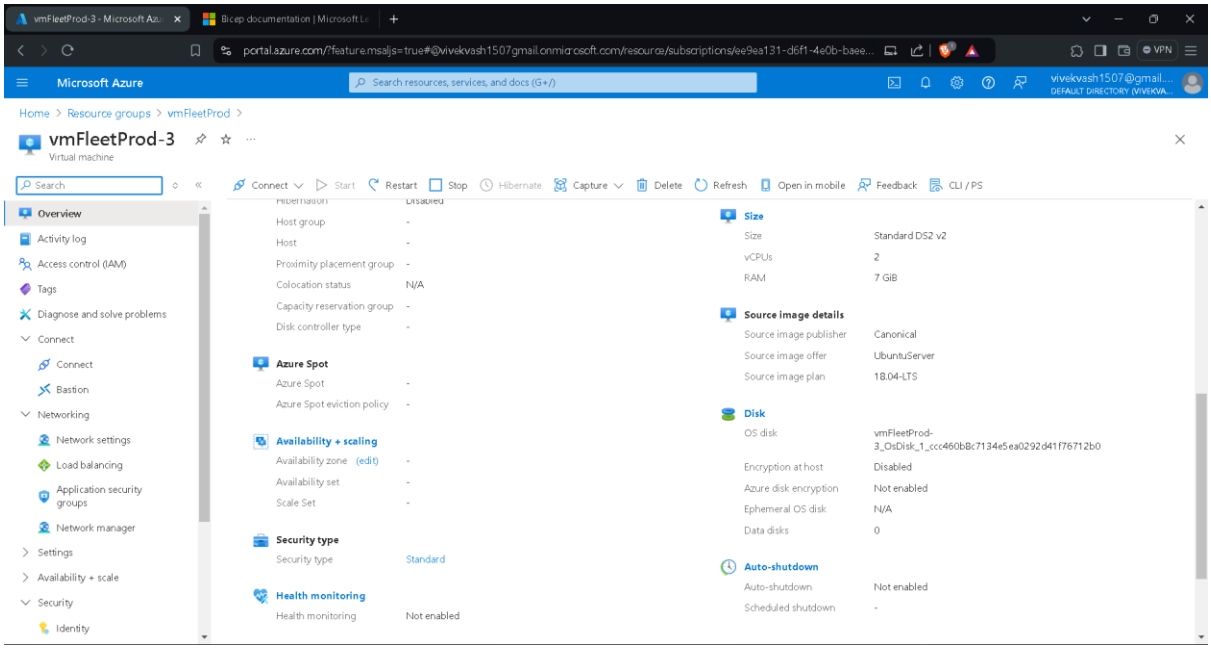
Bastion
Networking
Network settings
Load balancing
Application security groups
Network manager
Settings
Availability + scale
Security
Identity
Essentials
JSON View
Resource group (move) : vmFleetProd
Status : Running
Location : Canada Central
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard DS2 v2 (2 vcpus, 7 GiB memory)
Public IP address : 52.156.20.200
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 6:17 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetProd-3
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 52.156.20.200 (Network interface vmFleetNic-3)
Public IP address (IPv6) -
Private IP address 10.0.0.6
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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Hibernation Disabled
Host group -
Host -
Proximity placement group -
Colocation status N/A
Capacity reservation group -
Disk controller type -
Azure Spot
Azure Spot -
Azure Spot eviction policy -
Availability + scaling
Availability zone (edit) -
Availability set -
Scale Set -
Security type
Security type Standard
Health monitoring
Health monitoring Not enabled
Size
Size Standard DS2 v2
vCPUs 2
RAM 7 GiB
Source image details
Source image publisher Canonical
Source image offer UbuntuServer
Source image plan 18.04-LTS
Disk
OS disk vmFleetProd-3_OsDisk_1_ccc460b8c7134e5ea0292d41f76712b0
Encryption at host Disabled
Azure disk encryption Not enabled
Ephemeral OS disk N/A
Data disks 0
Auto-shutdown
Auto-shutdown Not enabled
Scheduled shutdown -

9. Maintenance & Updates

I made some changes to my `dev.parameters.json` file to update the VM size from "Standard_DS1_v2" to "Standard_B1s".

dev.parameters.json

```
{
    "$schema": "https://schema.management.azure.com/schemas/2019-04-
01/deploymentParameters.json#",
    "contentVersion": "1.0.0.0",
    "parameters": {
      "vmSize": {
        "value": "Standard_B1s"
      },
      "vmNamePrefix": {
        "value": "vmFleetDev"
      },
      "location": {
        "value": "EastUS"
      },
      "adminUsername": {
        "value": "dev.user"
      },
      "adminPassword": {
        "value": "P@ssw0rd1234"
      },
      "vmCount": {
        "value": 5
      }
    }
}
```

I then redeployed the resources using this command:

```
az deployment group create --resource-group vmFleetRG --template-file
main.bicep --parameters @dev.parameters.json
```

After the deployment, I checked the Azure portal and confirmed that the VM sizes were changed from "Standard_DS1_v2" to "Standard_B1s" for all the virtual machines.

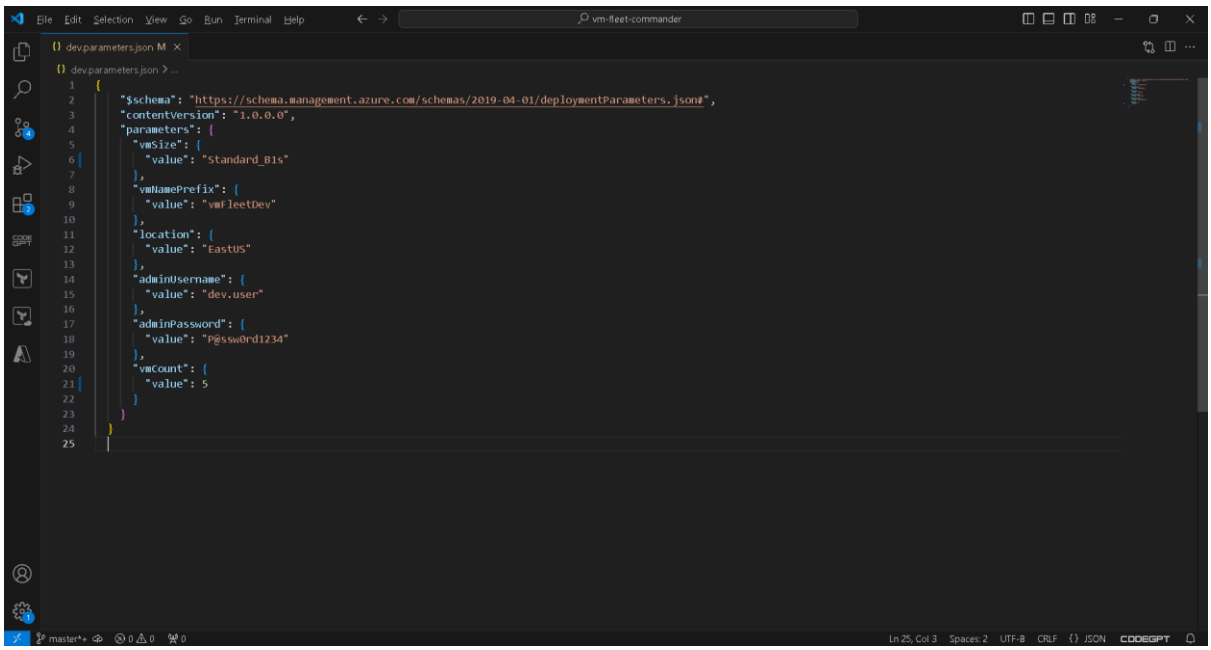
By doing this, I observed how Azure handles updates and maintains state.

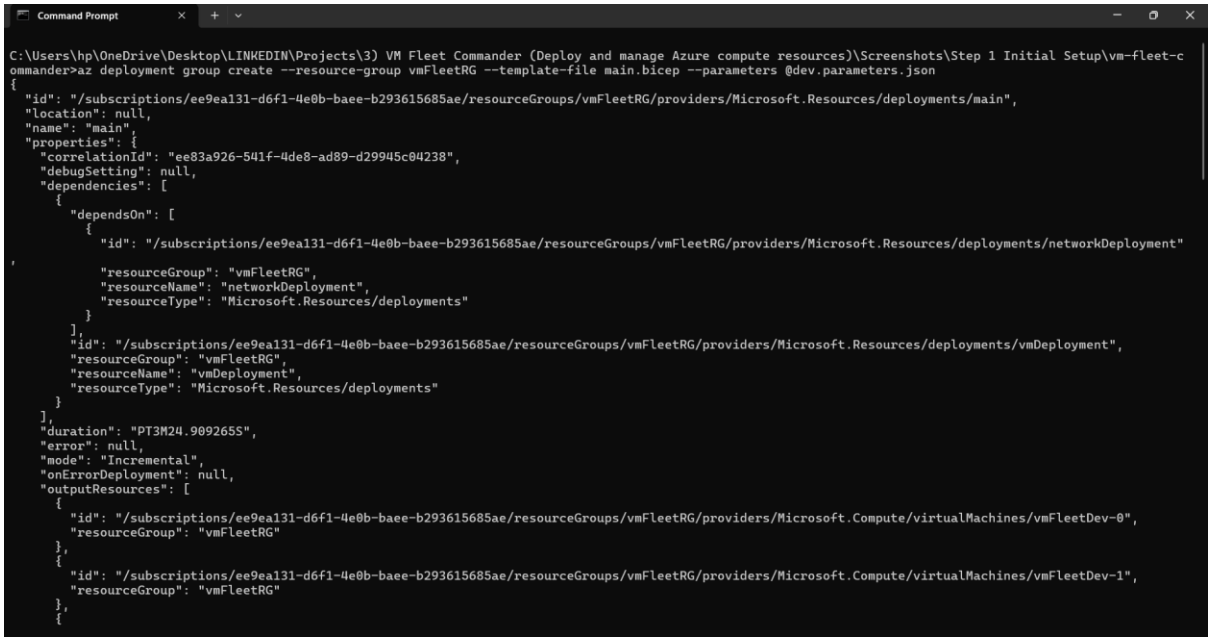
To ensure I stay updated with new features and improvements, I regularly pull updates to the Bicep language and Azure CLI using these commands:

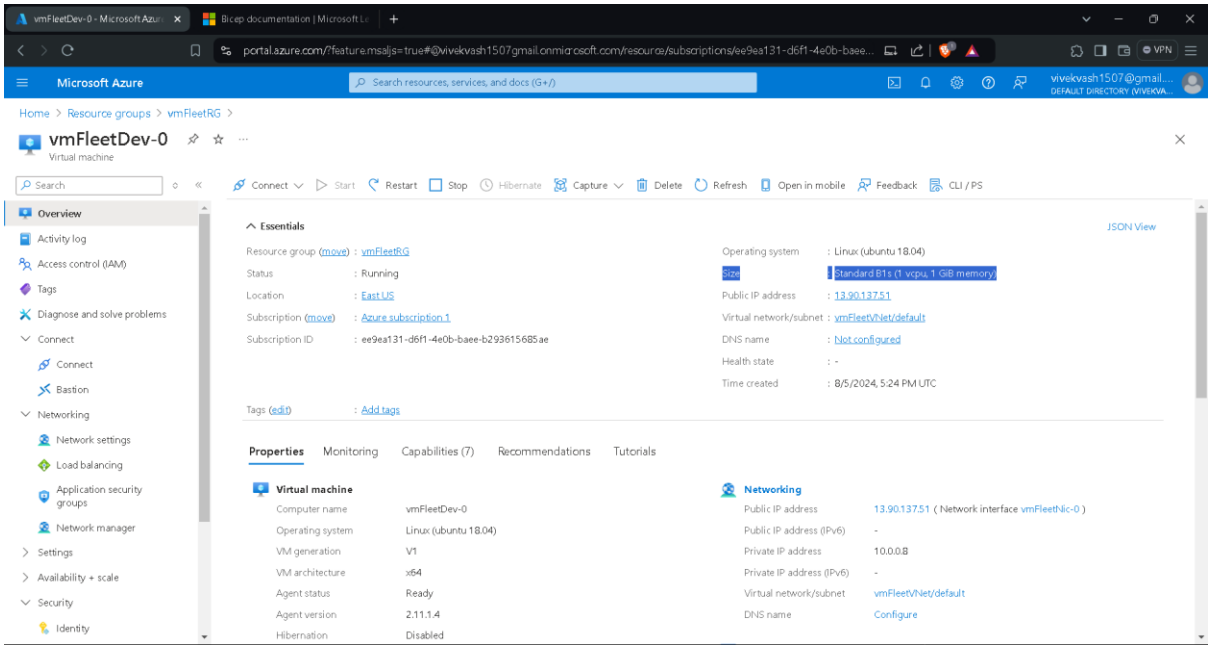
```
az upgrade
az bicep upgrade
```

In this section, I successfully updated the VM sizes by modifying the parameter file and redeploying the resources. I also ensured my tools remain up-to-date by regularly upgrading Azure CLI and Bicep.

Redeployments



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Application security groups
Network manager
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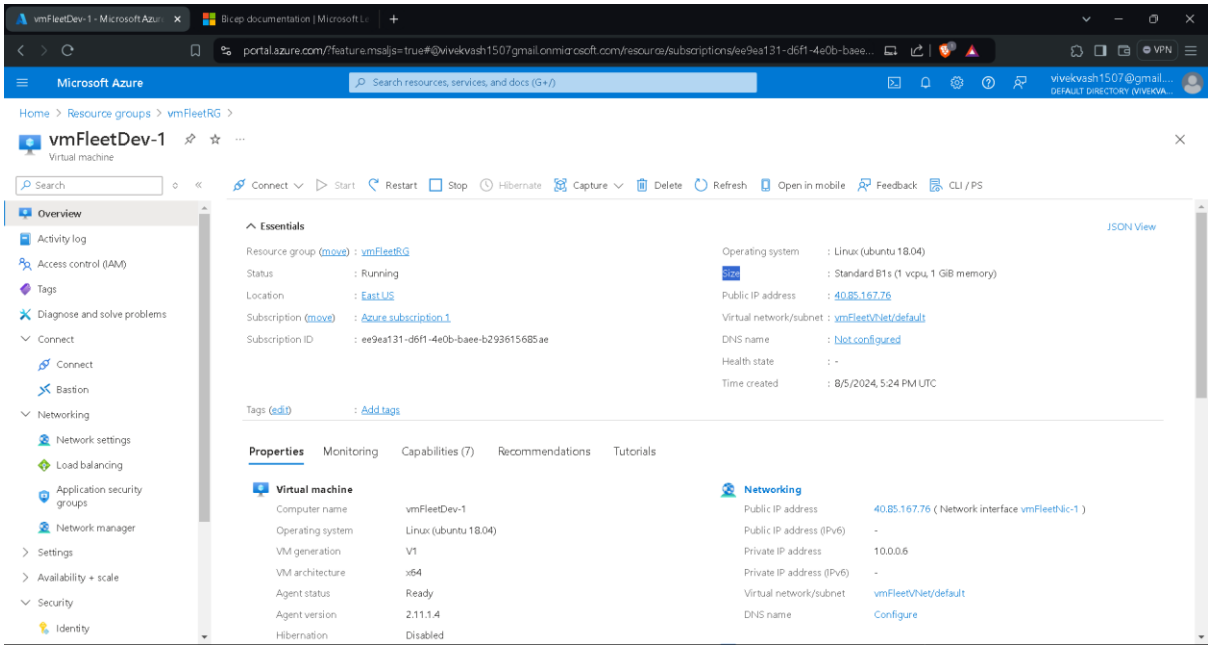
Availability + scale
Security
Identity
Essentials
JSON View
Resource group (move) : vmFleetRG
Status : Running
Location : East US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard B1s (1 vcpu, 1 GiB memory)
Public IP address : 13.90.137.51
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:24 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetDev-0
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 13.90.137.51 (Network interface vmFleetNic-0)
Public IP address (IPv6) -
Private IP address 10.0.0.8
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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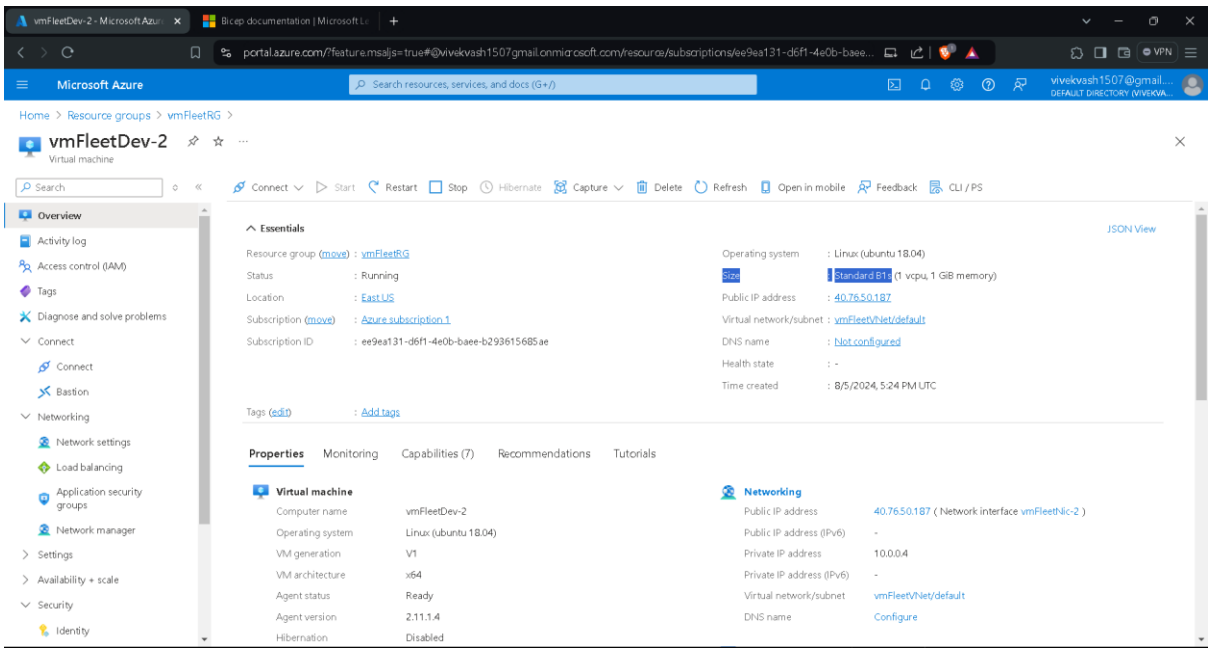
Essentials
JSON View
Resource group (move) : vmFleetRG
Status : Running
Location : East US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard B1s (1 vcpu, 1 GiB memory)
Public IP address : 40.85.167.76
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:24 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetDev-1
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 40.85.167.76 (Network interface vmFleetNic-1)
Public IP address (IPv6) -
Private IP address 10.0.0.6
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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Essentials
JSON View
Resource group (move) : vmFleetRG
Status : Running
Location : East US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard B1s (1 vcpu, 1 GiB memory)
Public IP address : 40.76.50.187
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:24 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetDev-2
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 40.76.50.187 (Network interface vmFleetNic-2)
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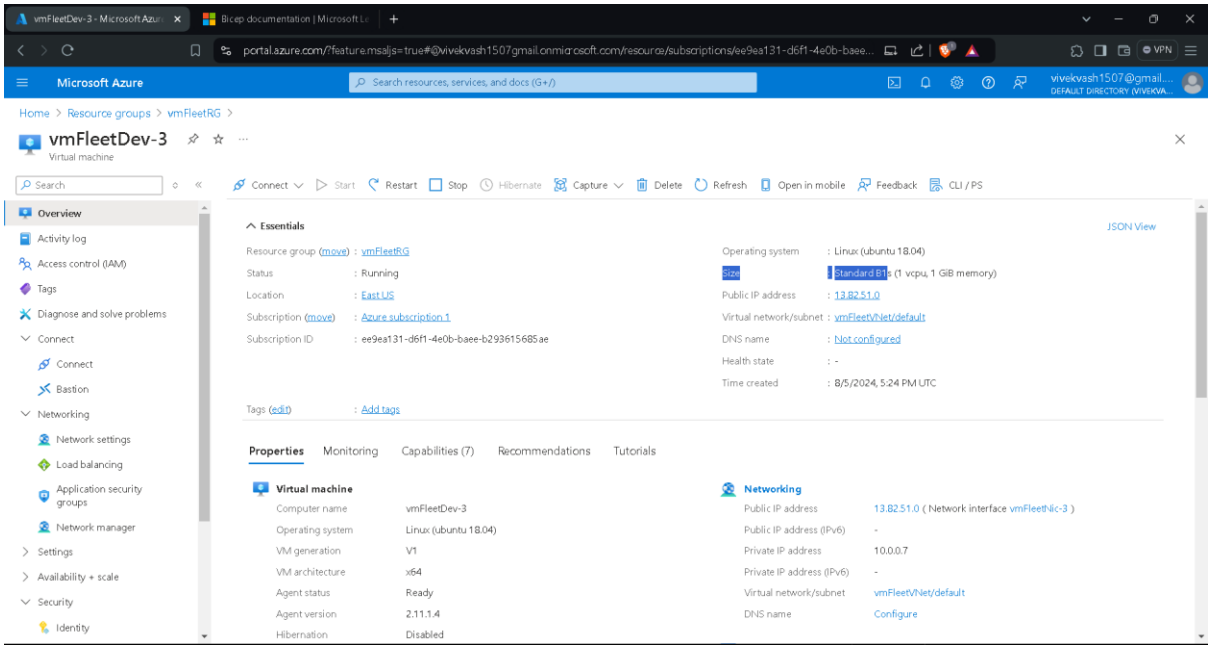
Private IP address 10.0.0.4
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure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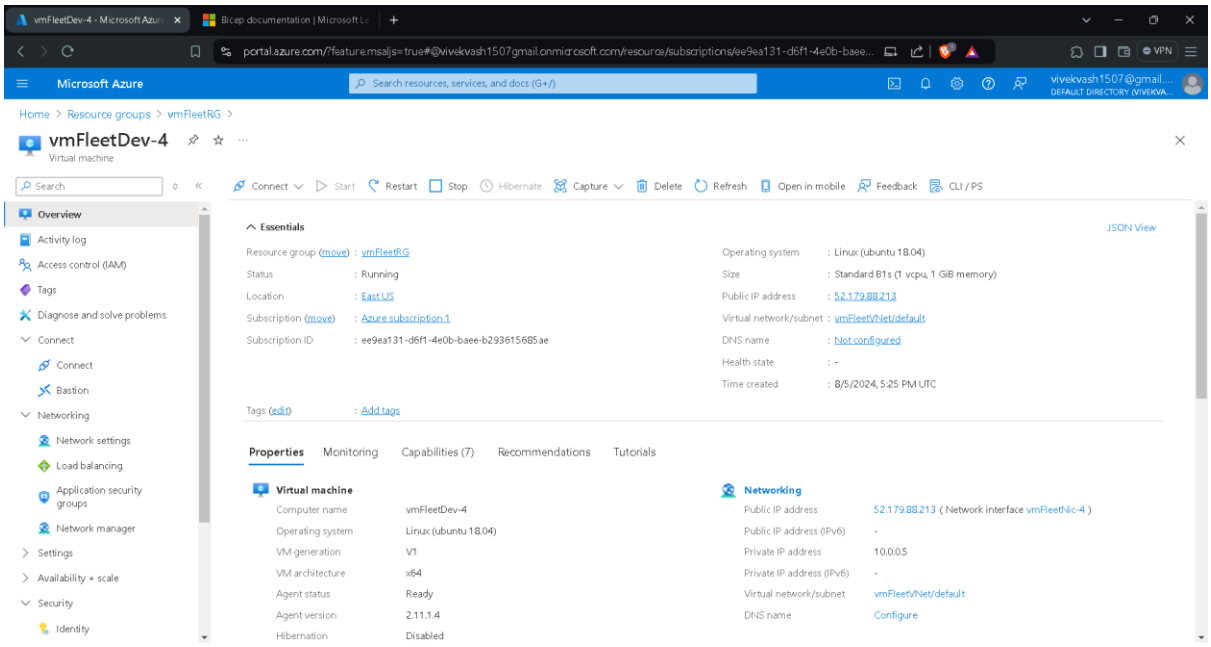
Resource group (move) : vmFleetRG
Status : Running
Location : East US
Subscription (move) : Azure subscription 1
Subscription ID : ee9ea131-d6f1-4e0b-baee-b293615685ae
Operating system : Linux (ubuntu 18.04)
Size : Standard B1s (1 vcpu, 1 GiB memory)
Public IP address : 13.82.51.0
Virtual network/subnet : vmFleetVNet/default
DNS name : Not configured
Health state : -
Time created : 8/5/2024, 5:24 PM UTC
Tags (edit) : Add tags
Properties
Monitoring
Capabilities (7)
Recommendations
Tutorials
Virtual machine
Computer name vmFleetDev-3
Operating system Linux (ubuntu 18.04)
VM generation V1
VM architecture x64
Agent status Ready
Agent version 2.11.1.4
Hibernation Disabled
Networking
Public IP address 13.82.51.0 (Network interface vmFleetNic-3)
Public IP address (IPv6) -
Private IP address 10.0.0.7
Private IP address (IPv6) -
Virtual network/subnet vmFleetVNet/default
DNS name Configure



Updates

```
Command Prompt

C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az upgrade
This command is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
You already have the latest azure-cli version: 2.62.0
Upgrading extensions
Default enabled including preview versions for extension installation now. Disabled in future release. Use '--allow-preview-extensions true' to enable it specifically if needed. Use '--allow-preview-extensions false' to install stable version only.
Checking update for interactive
Latest version of 'interactive' is already installed.

Use --debug for more information
Upgrade finished.You can enable auto-upgrade with 'az config set auto-upgrade.enable=yes'. More details in https://docs.microsoft.com/cli/azure/update-azure-cli#automatic-update
```

```
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az bicep upgrade

C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>
```

10. Cleanup

After testing, I ensured to delete the resource groups that contained all the resources deployed throughout the project to avoid incurring unnecessary costs.

I used the following commands:

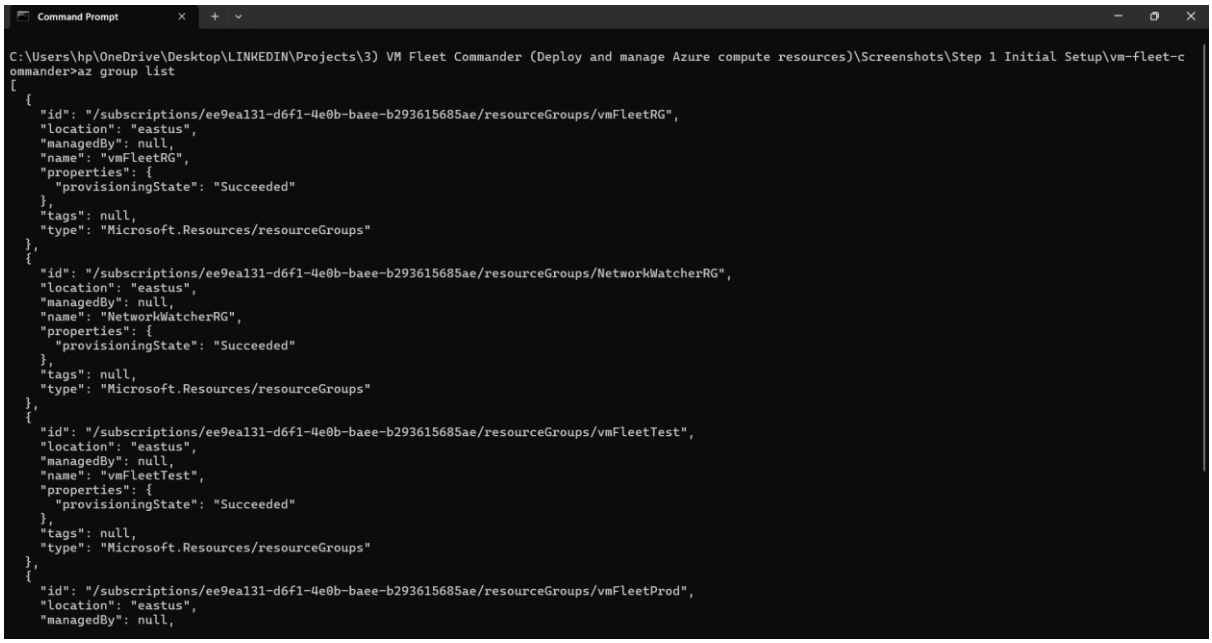
```
az group delete --resource-group vmFleetRG
az group delete --resource-group vmFleetTest
az group delete --resource-group vmFleetProd
az group delete --resource-group NetworkWatcherRG
```

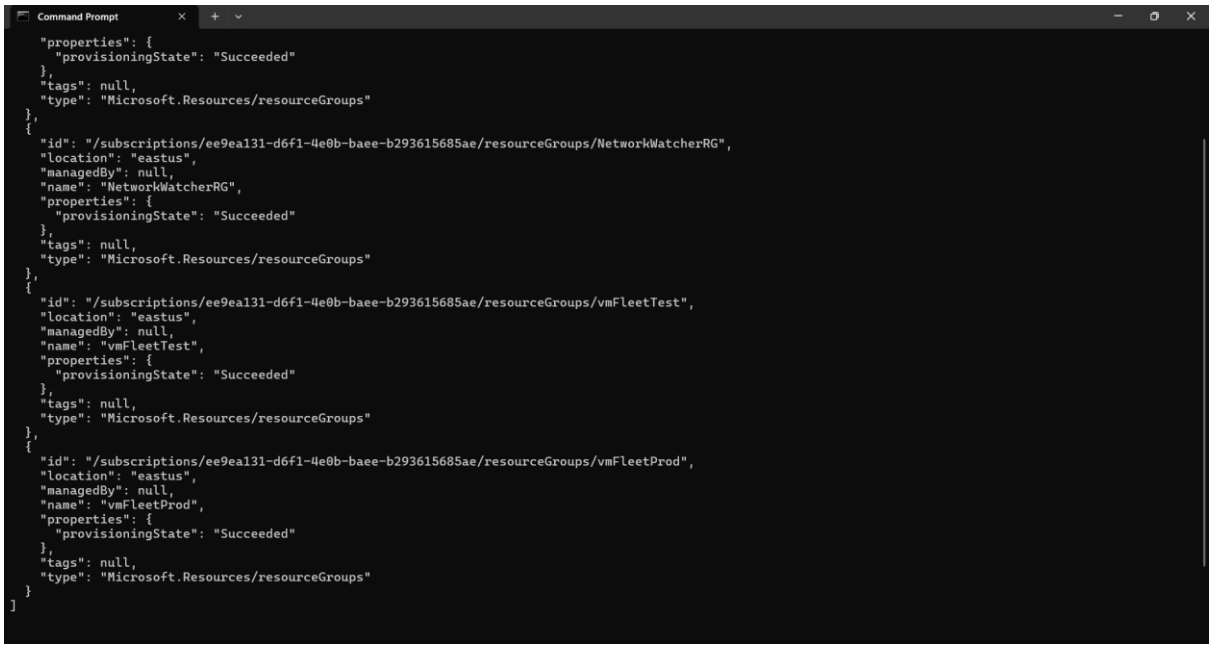
By using these commands, I ensured that every resource group containing all the resources deployed throughout the project is deleted.

The project is completed!!!

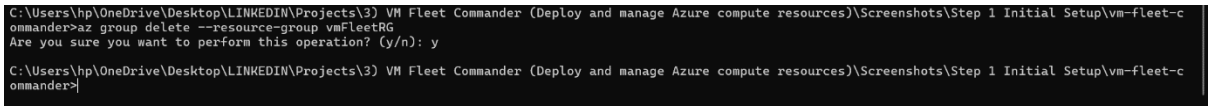
In this section, I completed the cleanup process by deleting all the resource groups to prevent unnecessary costs, marking the successful completion of the project.

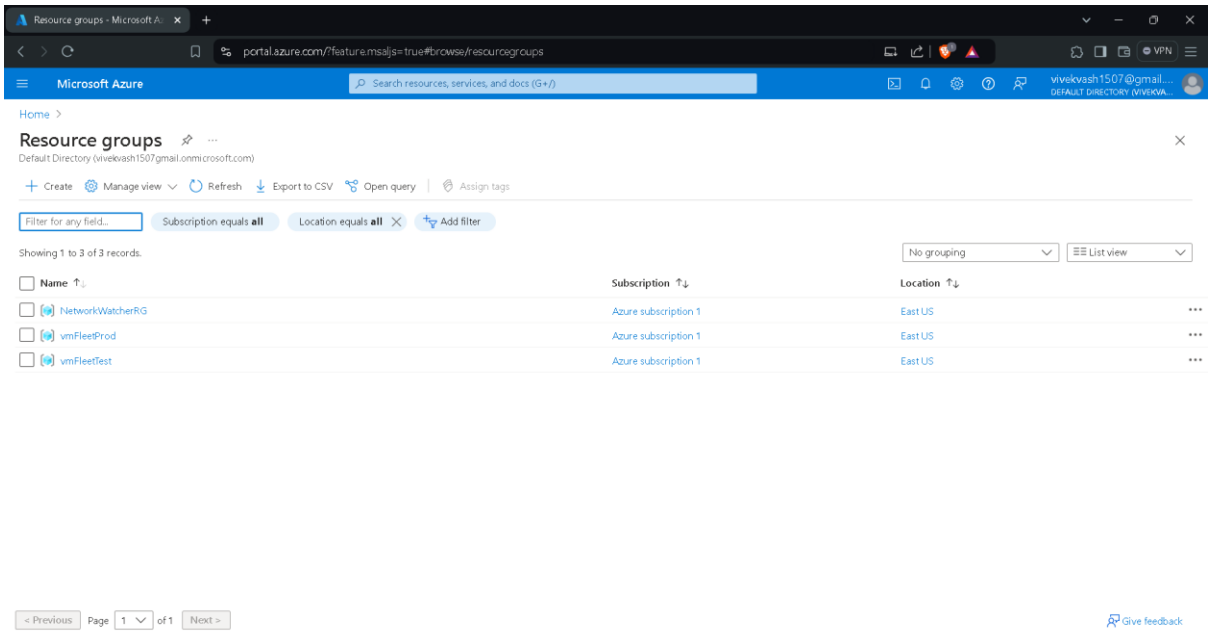
All Resource Groups





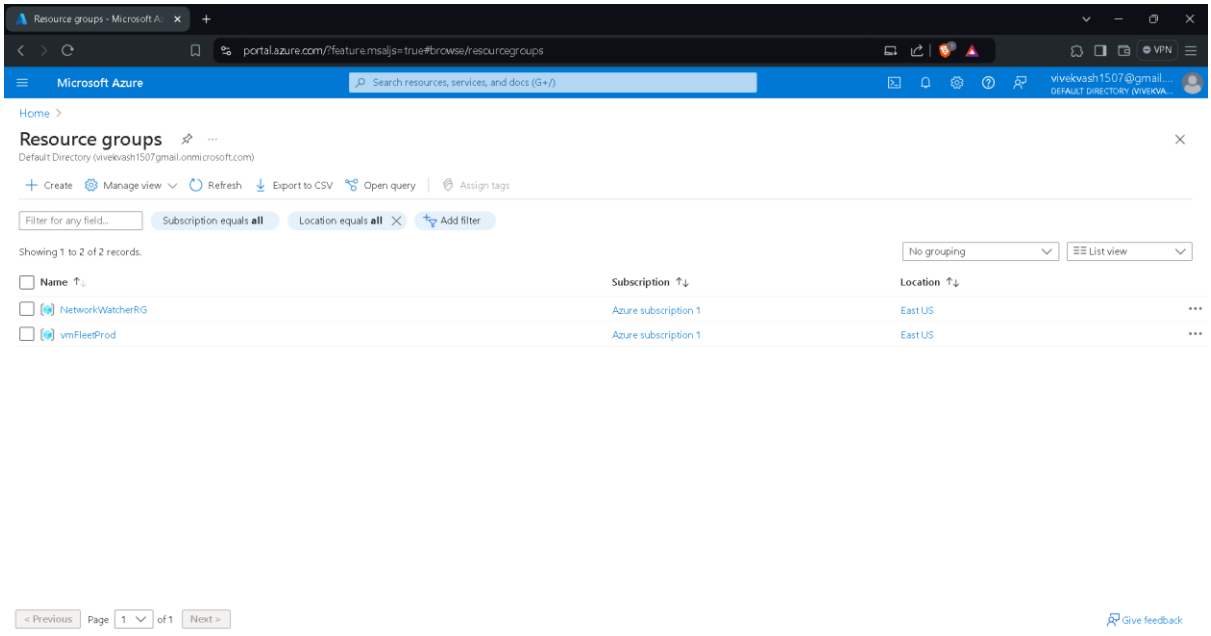
Cleanup (vmFleetRG)





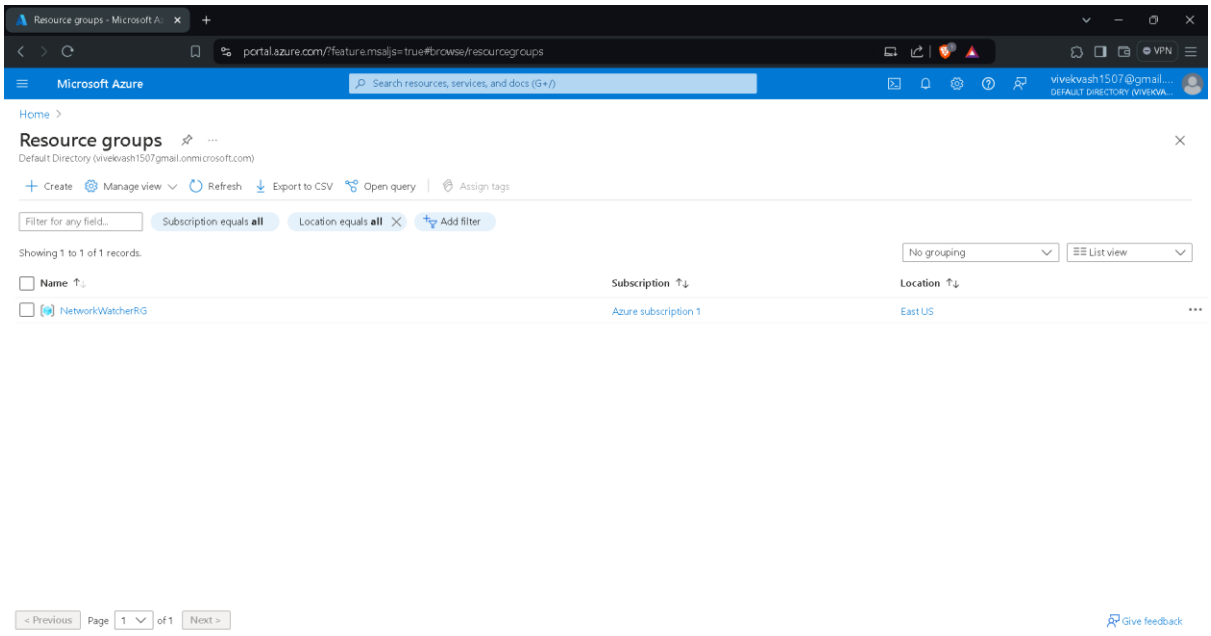
Cleanup (vmFleetTest)

```
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az group delete --resource-group vmFleetTest
Are you sure you want to perform this operation? (y/n): y

C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>
```

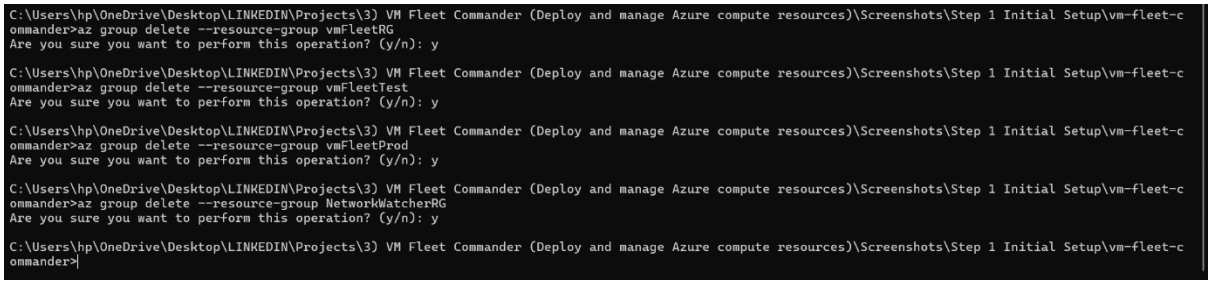


Cleanup (vmFleetProd)

```
C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>az group delete --resource-group vmFleetProd
Are you sure you want to perform this operation? (y/n): y

C:\Users\hp\OneDrive\Desktop\LINKEDIN\Projects\3) VM Fleet Commander (Deploy and manage Azure compute resources)\Screenshots\Step 1 Initial Setup\vm-fleet-commander>
```



Cleanup (Completed)



Conclusion

Summary of Steps

- Reviewed and set up Azure CLI, Bicep, and Git.
- Converted ARM templates to Bicep.
- Created parameterized Bicep modules for VMs and network resources.
- Deployed resources to multiple environments.
- Validated deployments and maintained the infrastructure.
- Cleaned up resources to prevent unnecessary costs.

Lessons Learned

- Importance of automation and parameterization in infrastructure deployment.
- Benefits of using infrastructure-as-code tools like Bicep and ARM templates.
- Effective use of Azure CLI for managing and deploying resources.

Skills Demonstrated

Through this project, the following skills were demonstrated:

1. **Infrastructure as Code (IaC)**:
    - Proficiency in using ARM templates and Bicep to define, deploy, and manage Azure resources.
    - Ability to convert ARM templates to Bicep, showcasing knowledge in both tools.
2. **Azure Resource Management**:
    - Experience in creating and managing Azure resources, including VMs, virtual networks, network security groups, and public IPs.
    - Skill in parameterizing deployments for flexibility and scalability across different environments (development, testing, production).
3. **Automation**:

    - Capability to automate resource provisioning and configuration using Bicep and Azure CLI.
    - Implementation of loops and parameterized inputs to streamline and simplify complex deployments.
4. **Version Control**:
    - Utilization of Git for version control to track changes and manage the project's codebase effectively.
5. **Deployment and Validation**:
    - Competence in deploying resources to Azure using Azure CLI commands.
    - Thorough validation of deployment templates to ensure error-free infrastructure setup.
6. **Maintenance and Updates**:
    - Experience in updating deployed resources and maintaining infrastructure state.
    - Regularly pulling updates for tools like Azure CLI and Bicep to leverage the latest features and improvements.
7. **Cost Management**:
    - Awareness of resource management and cost control by ensuring the deletion of unused resources post-testing.

And Strong **Hands-on** Capabilities in the

(Deploy and manage Azure compute resources)

Scope of **Microsoft Certified: Azure Administrator Associate (AZ-104)**