Azure Virtual Machine Provisioning using Pulumi

- We will provision the Azure Virtual Machine using Pulumi as an Infrastructure as Code.
- We will deploy it in a custom Virtual Network for isolation.
- We will SSH into the Virtual Machine, and install the docker.
- Then, we will deploy the Nginx Container and try accessing it on the Web Browser.

Prerequisites

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1. An Azure account.
2. Azure CLI installed and configured with the appropriate Azure User or Service Principal.
3. Pulumi Installed.
4. Kubectl Installed.

Write Pulumi Configuration files

First, we will initiate and edit Pulumi configuration files for Azure resources using predefined Pulumi Library available on the internet.

Steps

1. Create a Pulumi Project directory.
2. Open the PowerShell.
3. Change the directory to the above-created Pulumi Project.
4. Run the `pulumi new azure-python` command to initialize the *pulumi*.
5. Provide the appropriate values to prompts such as *project-name*, *project-description*, *stack-name*, *toolchain*, *region-name*, etc.
6. This will generate some Pulumi files in this directory.
7. Now we will install predefined Pulumi modules.
8. Activate the `venv` by running `venv\Scripts\activate`.
9. Run `pip install git+https://github.com/inflection-sahil/pulumi.git` to install the modules.
10. Deactivate the `venv` by running `deactivate`.
11. Now open the directory in the preferred IDE.
12. Create *commons* folder
13. Inside the folder create ***init****.py* file.
14. Import the following in the ***init****.py* file:
    - from inflection_zone_pulumi.modules.azure.resource_group import resource_group
    - from inflection_zone_pulumi.modules.azure.vnet import vnet
    - from inflection_zone_pulumi.modules.azure.virtual_machine import virtual_machine \15. Click code for reference.
15. Definition of ***init****.py* is complete.
16. Now create the *values.py* file in the root folder of the above-created project directory.

17. Define the following values:
    - resource_group_properties
    - vnet_properties
    - virtual_machine_properties
18. Click code for reference.
19. The definition of *values.py* is complete.
20. Now navigate to the ***main**.py* file present in the root folder of the above-created project directory.
21. Clear the sample code if present.
22. Import the following:
    - from commons import resource_group, vnet, virtual_machine
    - values
23. Define the following objects and pass the values & dependencies as an argument:
    - RESOURCE_GROUP
    - VNET
    - VM
24. Click code for reference.
25. Definition of ***main**.py* is complete.

Provisioning the Infrastructure

Now we will provision the infrastructure by applying the above-created configuration files.

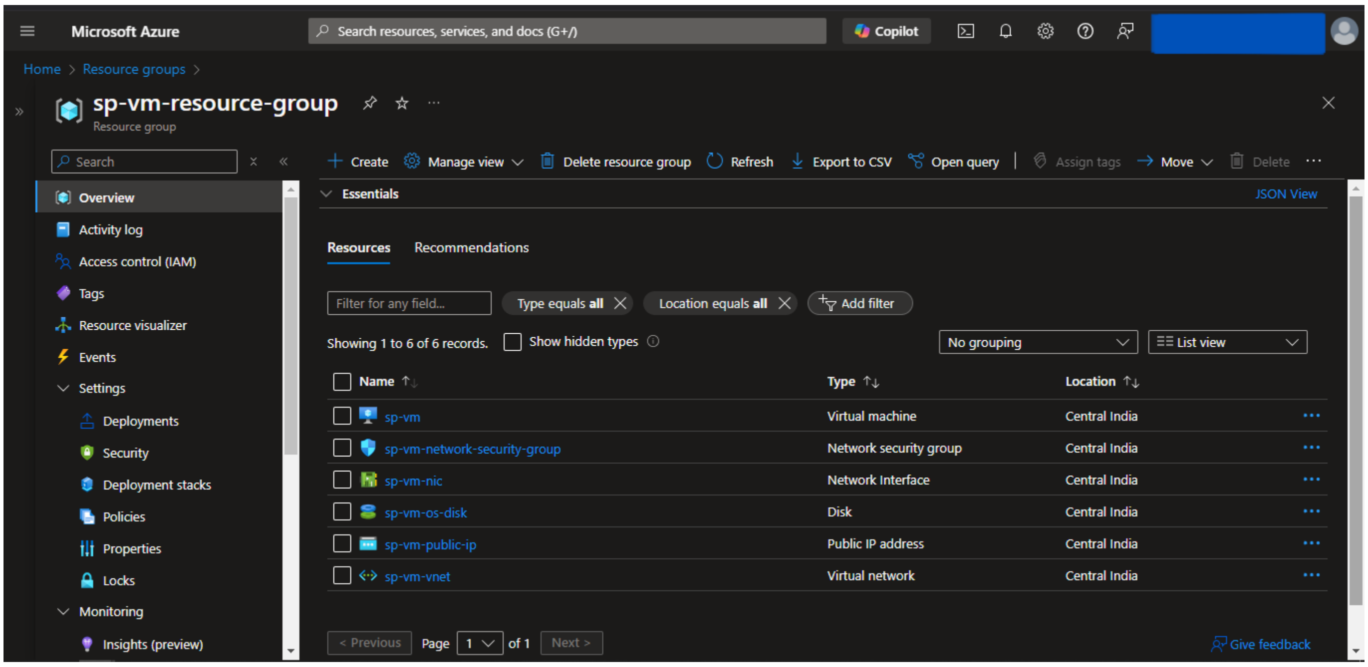
> Ensure Azure CLI is configured with the appropriate Azure User or Service Principal.

Steps:

1. Open the PowerShell.
2. Change the directory to the above-created Pulumi Project.
3. Run the `pulumi up` command and if prompted, select `yes` to provision the infrastructure onto the Azure Cloud.
4. Head to the Azure Console, and verify the created resources.

Screenshots of Provisioned Infrastructure

Resource Group Image



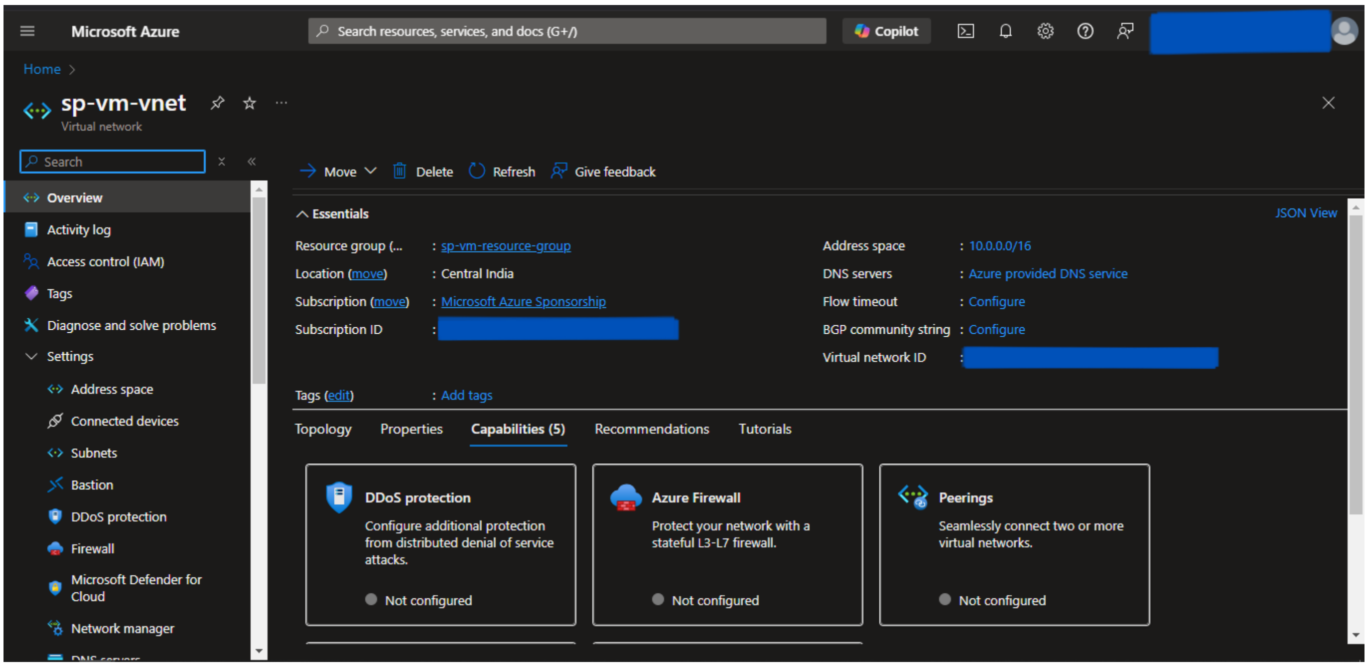
sp-vm-resource-group
Resource group

Essentials

Showing 1 to 6 of 6 records. Show hidden types

Name	Type	Location
sp-vm	Virtual machine	Central India
sp-vm-network-security-group	Network security group	Central India
sp-vm-nic	Network Interface	Central India
sp-vm-os-disk	Disk	Central India
sp-vm-public-ip	Public IP address	Central India
sp-vm-vnet	Virtual network	Central India

VNet Image



sp-vm-vnet
Virtual network

Essentials

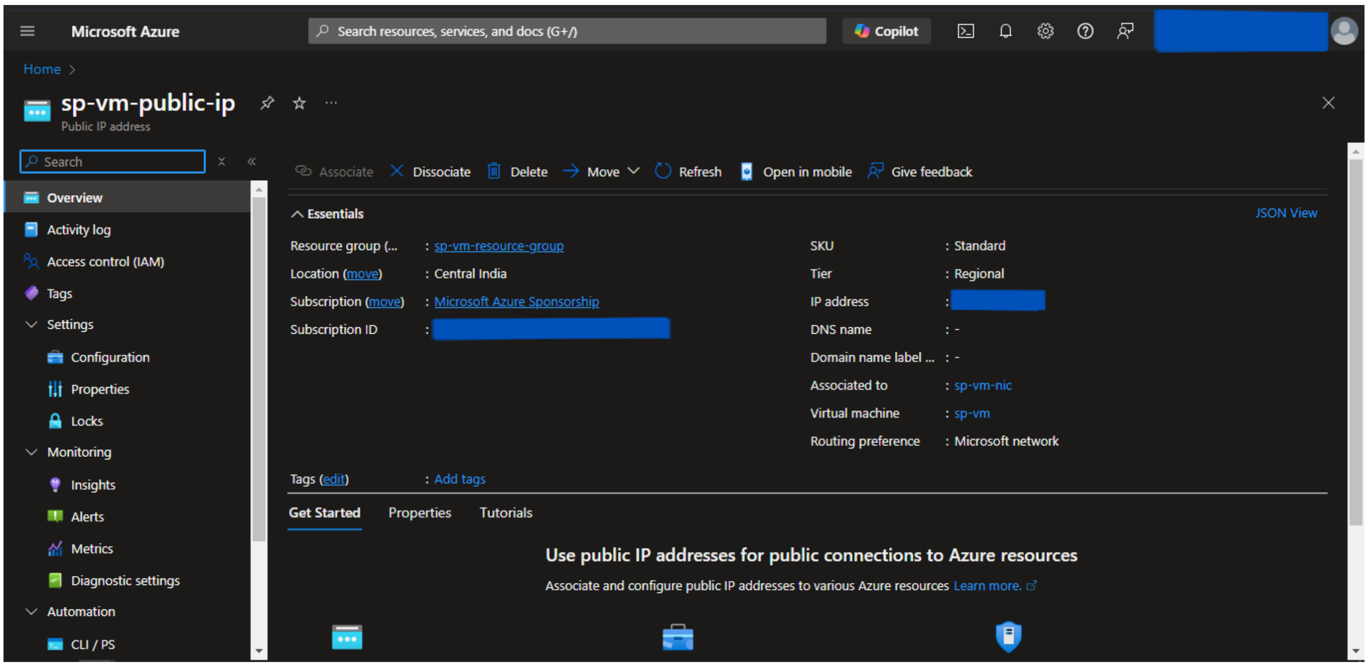
Resource group (...	: sp-vm-resource-group
Location (move)	: Central India
Subscription (move)	: Microsoft Azure Sponsorship
Subscription ID	: [redacted]
Address space	: 10.0.0.0/16
DNS servers	: Azure provided DNS service
Flow timeout	: Configure
BGP community string	: Configure
Virtual network ID	: [redacted]
Tags (edit)	: Add tags

DDoS protection
Configure additional protection from distributed denial of service attacks.
● Not configured

Azure Firewall
Protect your network with a stateful L3-L7 firewall.
● Not configured

Peerings
Seamlessly connect two or more virtual networks.
● Not configured

Public IP Image



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sp-vm-public-ip
Public IP address

Search

- Overview
- Activity log
- Access control (IAM)
- Tags
- Settings
  - Configuration
  - Properties
  - Locks
- Monitoring
  - Insights
  - Alerts
  - Metrics
  - Diagnostic settings
- Automation
  - CLI / PS

Associate | Dissociate | Delete | Move | Refresh | Open in mobile | Give feedback

Essentials — JSON View

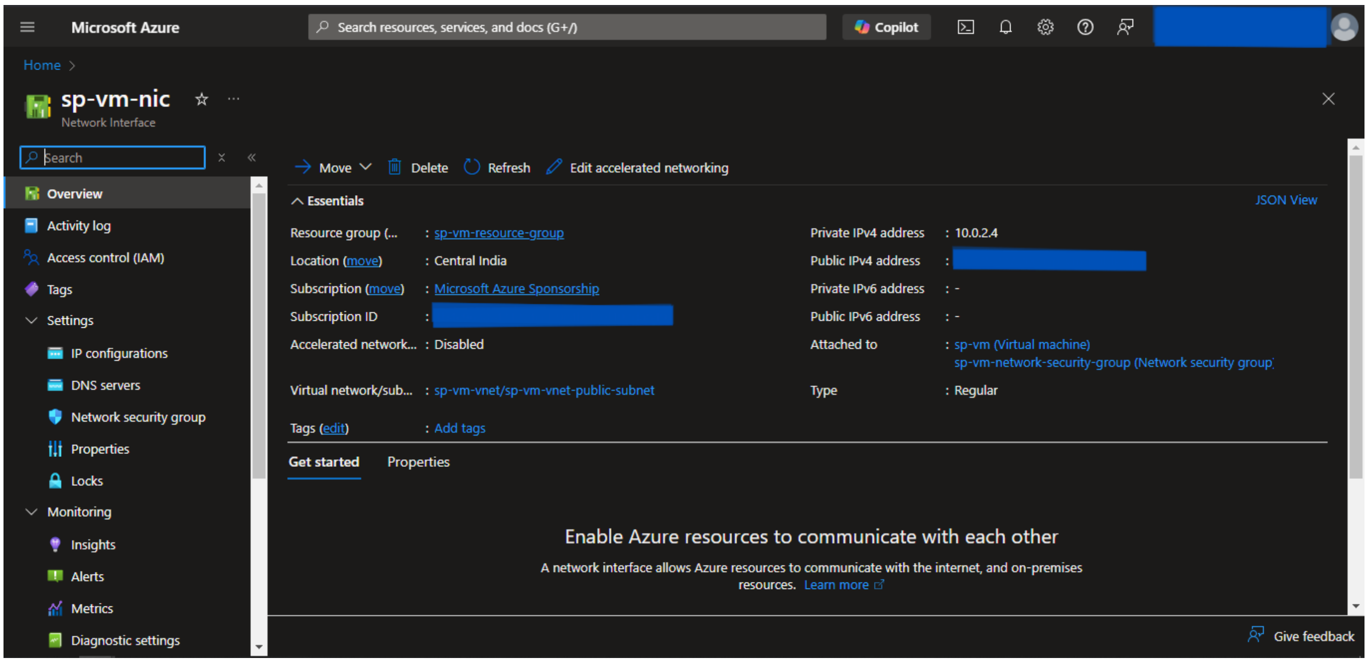
Resource group (...	: sp-vm-resource-group	SKU	: Standard
Location (move)	: Central India	Tier	: Regional
Subscription (move)	: Microsoft Azure Sponsorship	IP address	: [redacted]
Subscription ID	: [redacted]	DNS name	: -
		Domain name label ...	: -
		Associated to	: sp-vm-nic
		Virtual machine	: sp-vm
		Routing preference	: Microsoft network
Tags (edit)	: Add tags		

Get Started | Properties | Tutorials

Use public IP addresses for public connections to Azure resources

Associate and configure public IP addresses to various Azure resources Learn more.

Network Interface Card Image



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sp-vm-nic
Network Interface

Search

- Overview
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  - DNS servers
  - Network security group
  - Properties
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  - Diagnostic settings

Move | Delete | Refresh | Edit accelerated networking

Essentials — JSON View

Resource group (...	: sp-vm-resource-group	Private IPv4 address	: 10.0.2.4
Location (move)	: Central India	Public IPv4 address	: [redacted]
Subscription (move)	: Microsoft Azure Sponsorship	Private IPv6 address	: -
Subscription ID	: [redacted]	Public IPv6 address	: -
Accelerated network...	: Disabled	Attached to	: sp-vm (Virtual machine) sp-vm-network-security-group (Network security group)
Virtual network/sub...	: sp-vm-vnet/sp-vm-vnet-public-subnet	Type	: Regular
Tags (edit)	: Add tags		

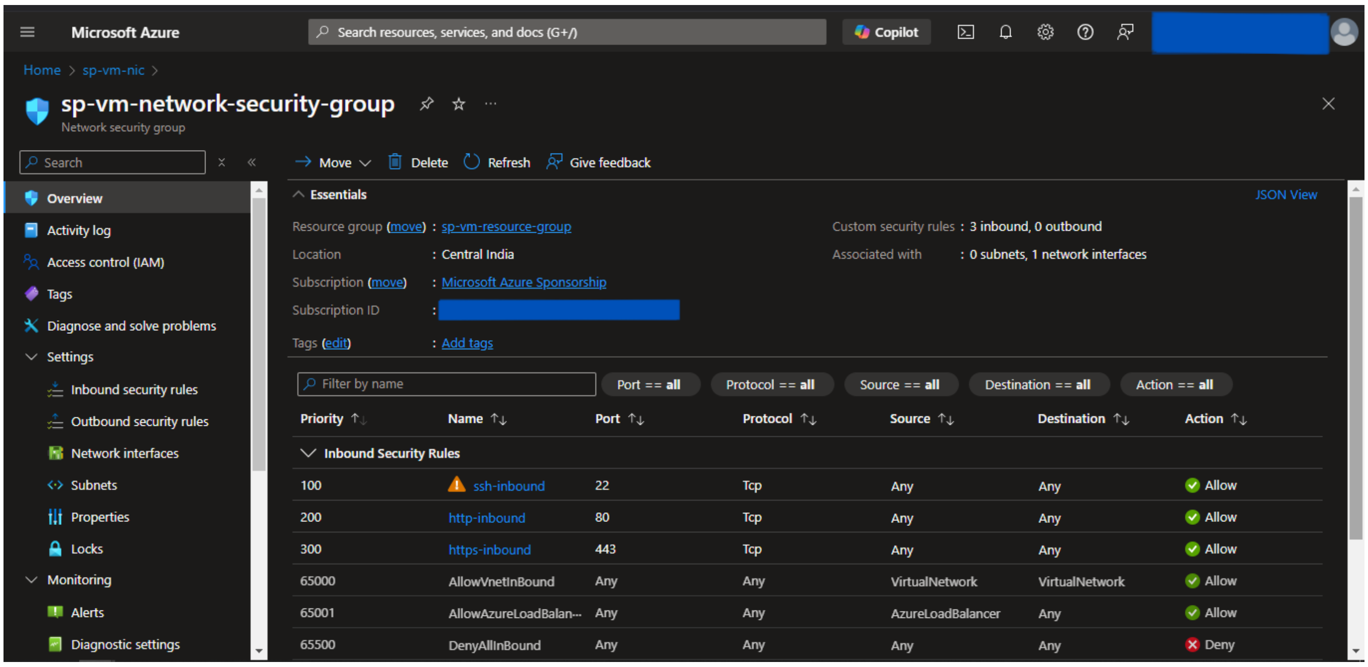
Get started | Properties

Enable Azure resources to communicate with each other

A network interface allows Azure resources to communicate with the internet, and on-premises resources. Learn more

Give feedback

Network Security Group Image



[redacted]

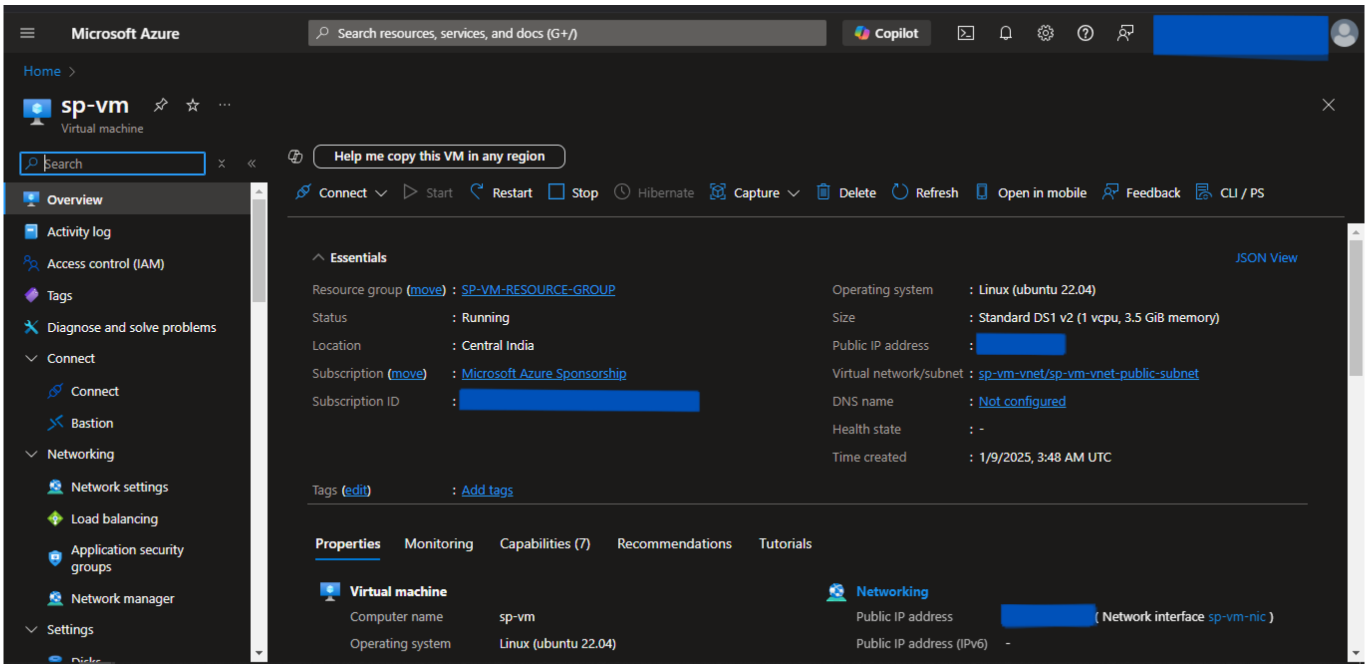
sp-vm-network-security-group
Network security group

Essentials

Resource group (move) : sp-vm-resource-group
Location : Central India
Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : [redacted]
Tags (edit) : Add tags
Custom security rules : 3 inbound, 0 outbound
Associated with : 0 subnets, 1 network interfaces

Priority	Name	Port	Protocol	Source	Destination	Action
Inbound Security Rules						
100	⚠ ssh-inbound	22	Tcp	Any	Any	✓ Allow
200	http-inbound	80	Tcp	Any	Any	✓ Allow
300	https-inbound	443	Tcp	Any	Any	✓ Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	✓ Allow
65001	AllowAzureLoadBalan...	Any	Any	AzureLoadBalancer	Any	✓ Allow
65500	DenyAllInBound	Any	Any	Any	Any	✗ Deny

Virtual Machine Image



[redacted]

sp-vm
Virtual machine

Essentials

Resource group (move) : SP-VM-RESOURCE-GROUP
Status : Running
Location : Central India
Subscription (move) : Microsoft Azure Sponsorship
Subscription ID : [redacted]
Tags (edit) : Add tags
Operating system : Linux (ubuntu 22.04)
Size : Standard DS1 v2 (1 vcpu, 3.5 GiB memory)
Public IP address : [redacted]
Virtual network/subnet : sp-vm-vnet/sp-vm-vnet-public-subnet
DNS name : Not configured
Health state : -
Time created : 1/9/2025, 3:48 AM UTC

Virtual machine
Computer name sp-vm
Operating system Linux (ubuntu 22.04)

Networking
Public IP address [redacted] (Network interface sp-vm-nic)
Public IP address (IPv6) -

SSH Into Azure VM

Now we will SSH into the Azure VM and configure it for Nginx container deployment.

Steps

1. Open the Powershell Window.
2. Run the following command to SSH into Azure VM and substitute the *<admin-username>* with the value provided in *values.py* file under *<virtual_machine_properties>* section and *<vm-public-ip>* with the Azure VM Public IP received from `pulumi stack output vm-public-ip` command:

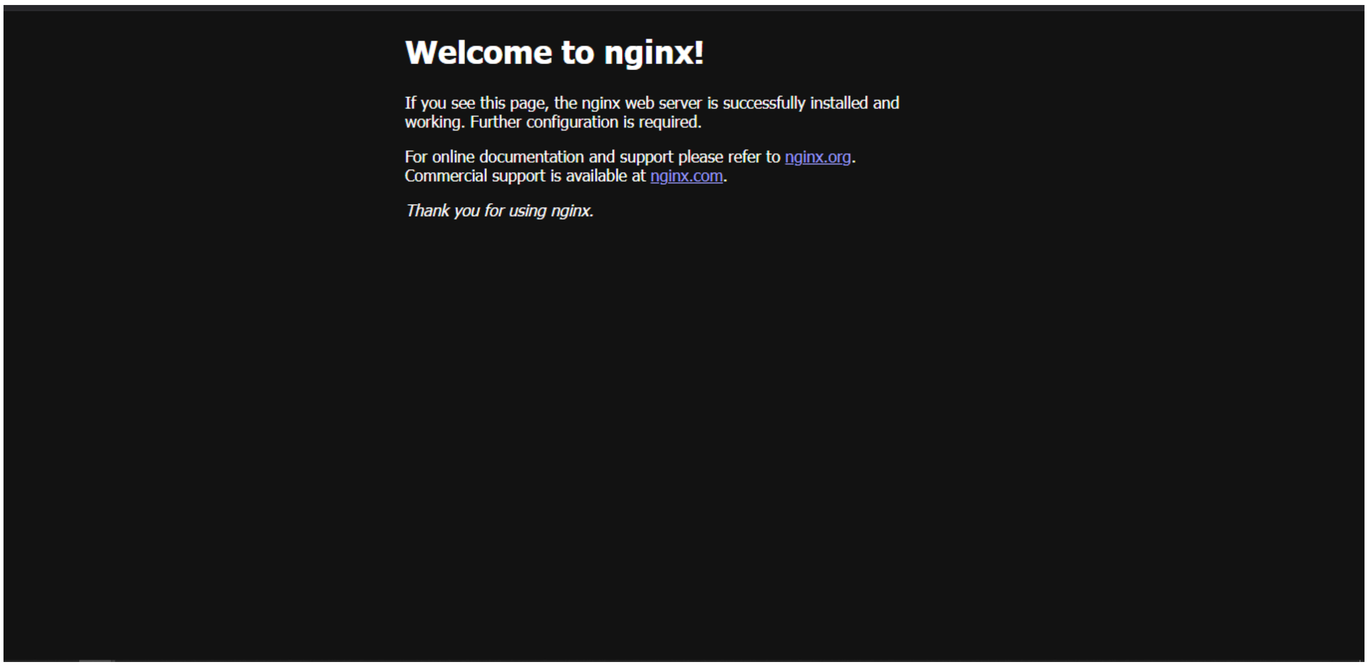
```
ssh -o StrictHostKeyChecking=no <admin-username>@<vm-public-ip>
```

3. It will promt for password, enter the *<admin-password>* provided in the *values.py* file under *<virtual_machine_properties>* section.
4. Once you enter the server, run the following commands to install the necessary dependencies for deployment and run the nginx container:

```
sudo apt update
sudo apt install -y docker.io
sudo docker run -d -p 80:80 nginx
```

9. Try accessing it on the browser using *<vm-public-ip>* received from `pulumi stack output vm-public-ip` command.

Nginx Image


Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

Destroy the provisioned infrastructure

Lastly, we will destroy the above-created resources.

Steps

1. To destroy infrastructure, open the Powershell Window and change the directory to the above-created Pulumi Project using the `cd` command.
2. Run **`pulumi destroy`** & if prompted, select **`yes`**.
3. Infrastructure will be destroyed.
