

Tasks during Azure MSSQL Training

Contents

| | |
|--|----|
| 22 Jan | 2 |
| Task1: Run 1 command simultaneously on 2 hosts..... | 2 |
| Task 2: Application Frontend | 2 |
| Task 3: Azure VM | 2 |
| 23 Jan | 4 |
| TASK 1: Azure SQL Database | 4 |
| 24 Jan | 10 |
| TASK 1: Docker Implementation | 10 |
| Task 2: Project Work: Finalised UI and frameworks to be used | 15 |
| 25 Jan | 15 |
| Task 1: Project Work: Worked on OTP functionality using Django..... | 15 |
| Task 2: Mid Assessment..... | 15 |
| 29 Jan | 15 |
| Task 1: Azure Load Balancer | 15 |
| 30 Jan | 29 |
| Task 1: Project Work continued using Flask and explored agile methodologies..... | 29 |
| 31 Jan | 30 |
| Task 1: Completed Version 1 and started working on Version 2 of the Project..... | 30 |
| Task 2: Explored Azure Services and Post Assessment..... | 30 |
| 2 Feb | 30 |
| TASK 1: Azure Data Factory..... | 30 |
| TASK 2: Azure Data factory | 39 |
| 3 Feb | 42 |
| Task 1: Vnet to Vnet connection..... | 42 |
| Task 2: PowerShell Basics..... | 50 |

22 Jan

Task1: Run 1 command simultaneously on 2 hosts

```
azureuser@vm1:~$ sudo apt-get update
Hit:1 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
azureuser@vm1:~$ sudo apt-get -y install pdsh
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  genders libgenders0
Suggested packages:
  rdist
The following NEW packages will be installed:
  genders libgenders0 pdsh
0 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 167 kB of archives.
After this operation, 519 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 libgenders0 amd64 1.22-1build2 [29.2 kB]
Get:2 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 genders amd64 1.22-1build2 [29.7 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu focal/universe amd64 pdsh amd64 2.31-1build2 [108 kB]
```

```
azureuser@vm1:~$ pdsh -w 172.210.32.27 azureuser -r
pdsh@vm1: 172.210.32.27: rcmd: socket: Permission denied
azureuser@vm1:~$ █
```

Task 2: Application Frontend**Application**

Login page: email and pass: 1st time send otp; use send grid to generate otp

Homepage: pop-up when user comes 1st time and asks fullname

Task 3: Azure VM**Subscription**

Azure Training

Subscription

Overview

Your free credit expires in 27 days. Upgrade to keep going with your account.

Subscription ID: b313aa48-c704-4982-98e9-285b3cd5bf2d

Subscription name: Azure Training

Directory: Incedo Technology Solutions Ltd. (incedoin.onmicrosoft.com)

Current billing period: 1/22/2024-2/21/2024

My role: Account admin

Currency: INR

Offer: Free Trial

Status: Active

Offer ID: MS-AZR-0044P

Secure Score: Not available

Parent management group: 667ede8d-b2c1-4471-88e7-8874a306811e

Resource Group

rg24jandocker

Resource group

Overview

Resources

| Name | Type | Location | Actions |
|---|------------------------|----------|---------|
| vm-24jan-pentaho | Virtual machine | East US | ... |
| vm-24jan-pentaho-ip | Public IP address | East US | ... |
| vm-24jan-pentaho-ns | Network security group | East US | ... |
| vm-24jan-pentaho-vnet | Virtual network | East US | ... |
| vm-24jan-pentaho127_z1 | Network Interface | East US | ... |
| vm-24jan-pentaho_disk1_f35c19cc4c2b40a4b3b1bb67101217f0 | Disk | East US | ... |

Virtual Machine

vm-24jan-pentaho - Microsoft

Overview

Essentials

- Resource group ([move](#)) **rg24jandocke**
- Status **Running**
- Location **East US (Zone 1)**
- Subscription ([move](#)) **Azure Training**
- Subscription ID **b313aa48-c704-4982-98e9-285b3cd5bf2d**
- Availability zone **1**
- Tags ([edit](#)) [Add tags](#)

Properties **Monitoring** **Capabilities (7)** **Recommendations** **Tutorials**

Type here to search

23 Jan

TASK 1: Azure SQL Database

Create Database and connect with DBeaver

Resource Group

rg23jandb - Microsoft

Overview

Essentials

Resources Recommendations

Showing 0 to 0 of 0 records. Show hidden types ⓘ

| Name ↑↓ | Type ↑↓ | Location ↑↓ |
|---------|---------|-------------|
| | | |

No resources match your filters.

Database Server

Select SQL deployment option

How do you plan to use the service?

- SQL databases**: Best for modern cloud applications. Hyperscale and serverless options are available.
Resource type: Single database
[Create](#) [Show details](#)
- SQL managed instances**: Best for most migrations to the cloud. Lift-and-shift ready.
Resource type: Single instance
[Create](#) [Show details](#)
- SQL virtual machines**: Best for migrations and applications requiring OS-level access. Lift-and-shift ready.
Image: [Create](#) [Show details](#) High availability

Create SQL Database Server

Server details

Enter required settings for this server, including providing a name and location. This server will be created in the same subscription and resource group as your database.

| | | |
|---------------|--------------|-----------------------|
| Server name * | deadmin | .database.windows.net |
| Location * | (US) East US | |

Authentication

Azure Active Directory (Azure AD) is now Microsoft Entra ID. [Learn more](#)

[OK](#)

Select your preferred authentication methods for accessing this server. Create a server admin login and password to access your server with SQL authentication, select only Microsoft Entra authentication [Learn more](#) using an existing Microsoft Entra user, group, or application as Microsoft Entra admin [Learn more](#), or select both SQL and Microsoft Entra authentication.

Authentication method

- Use Microsoft Entra-only authentication
- Use both SQL and Microsoft Entra authentication
- Use SQL authentication

Server admin login *

Password *

Confirm password *

>Password and confirm password must match.

OK

Database

Compute + storage *

General Purpose - Serverless
Standard-series (Gen5), 1 vCore, 32 GB storage, zone redundant disabled
[Configure database](#)

Backup storage redundancy

Choose how your PITR and LTR backups are replicated. Geo restore or ability to recover from regional outage is only available when geo-redundant storage is selected.

Backup storage redundancy

- Locally-redundant backup storage
- Zone-redundant backup storage
- Geo-redundant backup storage

⚠️ Selected value for backup storage redundancy is Geo-redundant backup storage. Database backups will be geo-replicated which might impact your data residency requirements. [Learn more](#)

Review + create Next : Networking >

Create SQL Database

Network connectivity

Choose an option for configuring connectivity to your server via public endpoint or private endpoint. Choosing no access creates with defaults and you can configure connection method after server creation. [Learn more](#)

Connectivity method *

- No access
- Public endpoint
- Private endpoint

Firewall rules

Setting 'Allow Azure services and resources to access this server' to Yes allows communications from all resources inside the Azure boundary, that may or may not be part of your subscription. [Learn more](#)

Setting 'Add current client IP address' to Yes will add an entry for your client IP address to the server firewall.

Allow Azure services and resources to access this server No Yes

Add current client IP address * No Yes

Cost summary

General Purpose (GP_S_Gen5_1)

| | |
|--------------------------------|--------------|
| Cost per GB (in INR) | 9.03 |
| Max storage selected (in GB) | x 41.6 |
| ESTIMATED STORAGE COST / MONTH | 375.71 INR |
| COMPUTE COST / VCORE SECOND | 0.011382 INR |

NOTES

1 Serverless databases are billed in vCore seconds based on a combination of CPU and memory utilization. [Learn more about serverless billing](#)

Review + create < Previous Next : Security >

db23jan (deadmin/db23jan)

SQL database

Overview

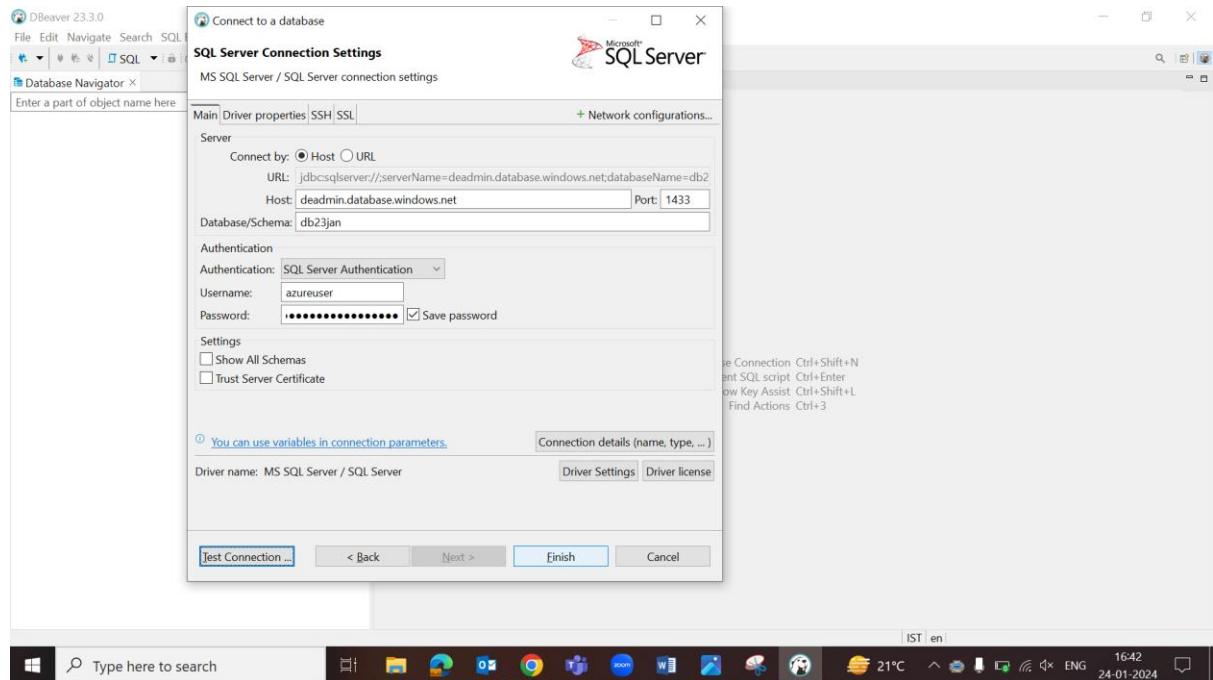
Essentials

- Resource group ([move](#)) rg23jandb
- Status Online
- Location East US
- Subscription ([move](#)) Azure Training
- Subscription ID b313aa48-c704-4982-98e9-285b3cd5bf2d
- Tags ([edit](#)) [Add tags](#)

Getting started

Monitoring Properties Features Notifications (0) Integrations Tutorials

DBeaver



Query Editor

```

CREATE TABLE Employee
(
    EmployeeID int,
    FirstName varchar(255),
    LastName varchar(255),
    Email varchar(255)
)

```

DBeaver 23.3.0 - dbo

File Edit Navigate Search SQL Editor Database Window Help

Database Navigator X Properties ER Diagram

Enter a part of object name here

Name: dbo
ID: 1
Schema database: db23jan
Schema description:

Tables External Tables Views Indexes Procedures Sequences Synonyms Triggers Data types DDL

No items

Schemas - Schemas

Type here to search

IST en 21°C 1643 24-01-2024

DBeaver 23.3.0 - Employee

File Edit Navigate Search SQL Editor Database Window Help

dbo db23jan Employee X Properties Data ER Diagram

Table Name: Employee ID: 1525580473
Object description (comment): Type: U

Columns Column Name # Type Length Scale Precision Not Null Identity Default Collation Description

| | | | | | | | |
|-------------|---|---------|-----|----|----|----|--------------------------|
| EmployeeID | 1 | int | 4 | 10 | [] | [] | SQL_Latin1_General_CI_AS |
| FirstName | 2 | varchar | 255 | | [] | [] | SQL_Latin1_General_CI_AS |
| LastName | 3 | varchar | 255 | | [] | [] | SQL_Latin1_General_CI_AS |
| Email | 4 | varchar | 255 | | [] | [] | SQL_Latin1_General_CI_AS |
| AddressLine | 5 | varchar | 255 | | [] | [] | SQL_Latin1_General_CI_AS |
| City | 6 | varchar | 255 | | [] | [] | SQL_Latin1_General_CI_AS |

Unique Keys Check constraints Foreign Keys Indexes References Triggers Extended Properties Statistics DDL Virtual

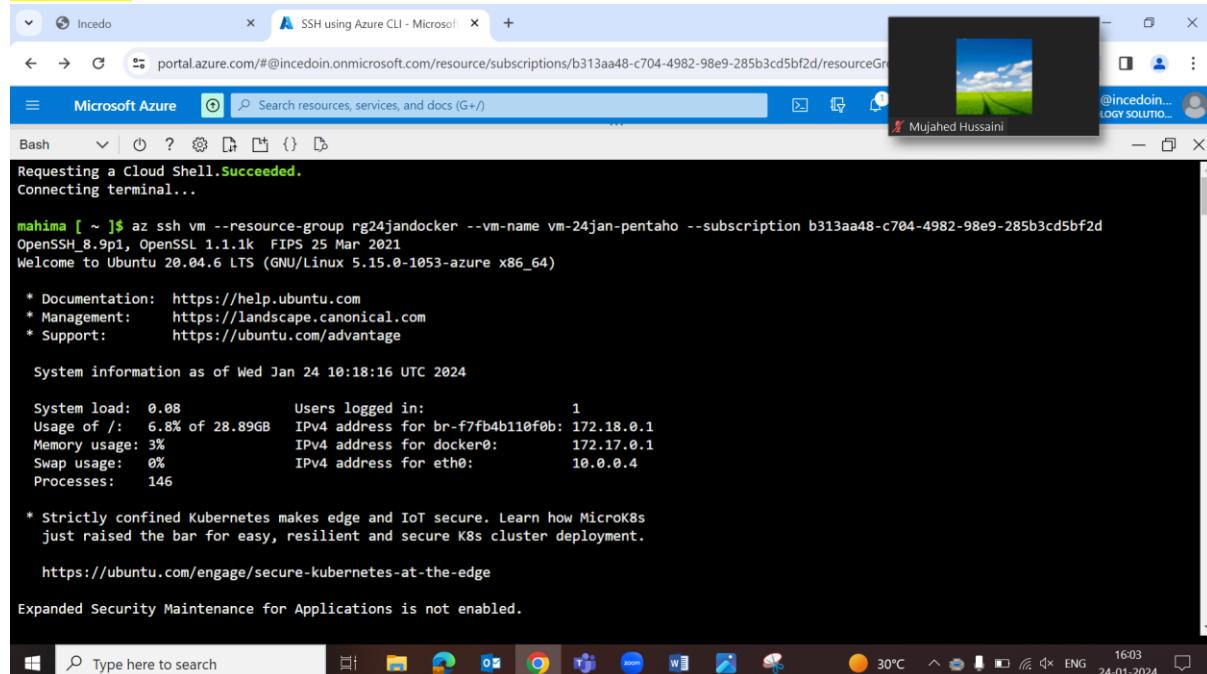
6 items

Type here to search

IST en 21°C 1656 24-01-2024

24 Jan

TASK 1: Docker Implementation



```

Incedo portal.azure.com/#@incedoin.onmicrosoft.com/resource/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/rg24jan/docker/providers/Microsoft.Compute/virtualMachines/24jan-pentaho
Microsoft Azure Search resources, services, and docs (G+)
Bash
Requesting a Cloud Shell.Succeeded.
Connecting terminal...
mahima [ ~ ]$ az ssh vm --resource-group rg24jan docker --vm-name vm-24jan-pentaho --subscription b313aa48-c704-4982-98e9-285b3cd5bf2d
OpenSSH_8.9p1, OpenSSL 1.1.1k FIPS 25 Mar 2021
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1053-azure x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

System information as of Wed Jan 24 10:18:16 UTC 2024

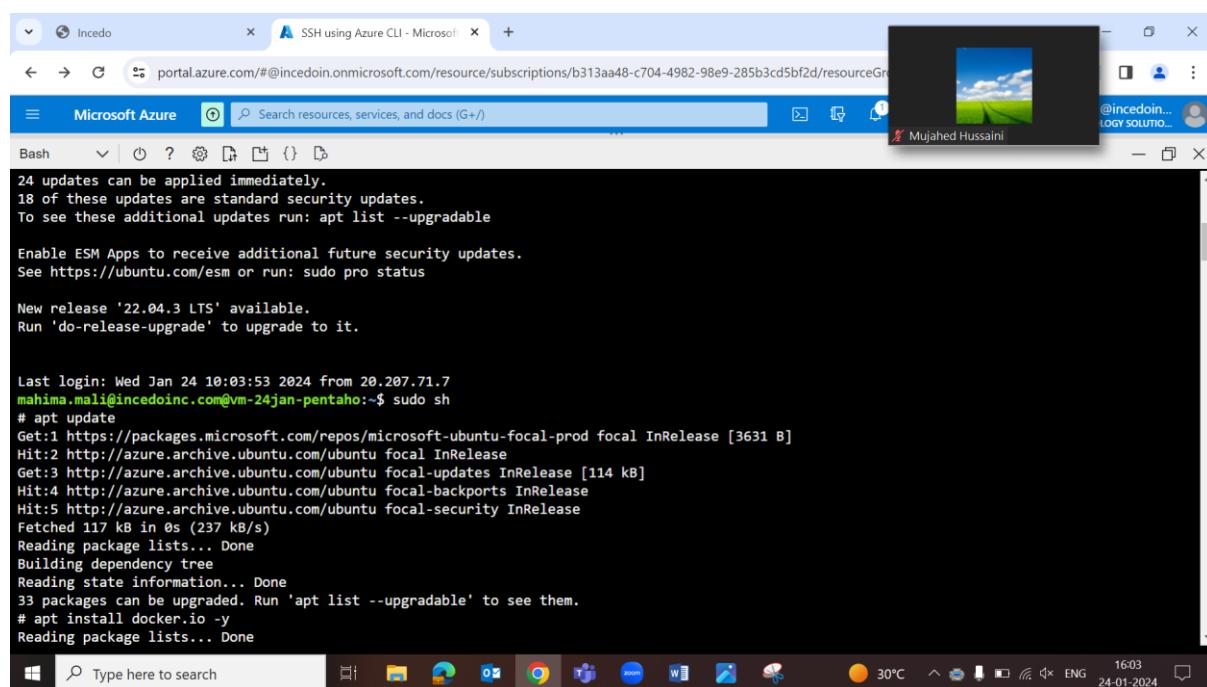
System load: 0.08      Users logged in:          1
Usage of /: 6.8% of 28.89GB  IPv4 address for br-f7fb4b110f0b: 172.18.0.1
Memory usage: 3%        IPv4 address for docker0:    172.17.0.1
Swap usage: 0%          IPv4 address for eth0:     10.0.0.4
Processes: 146

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.
https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

Type here to search
30°C 16:03 ENG 24-01-2024

```



```

Incedo portal.azure.com/#@incedoin.onmicrosoft.com/resource/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/rg24jan/docker/providers/Microsoft.Compute/virtualMachines/24jan-pentaho
Microsoft Azure Search resources, services, and docs (G+)
Bash
24 updates can be applied immediately.
18 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

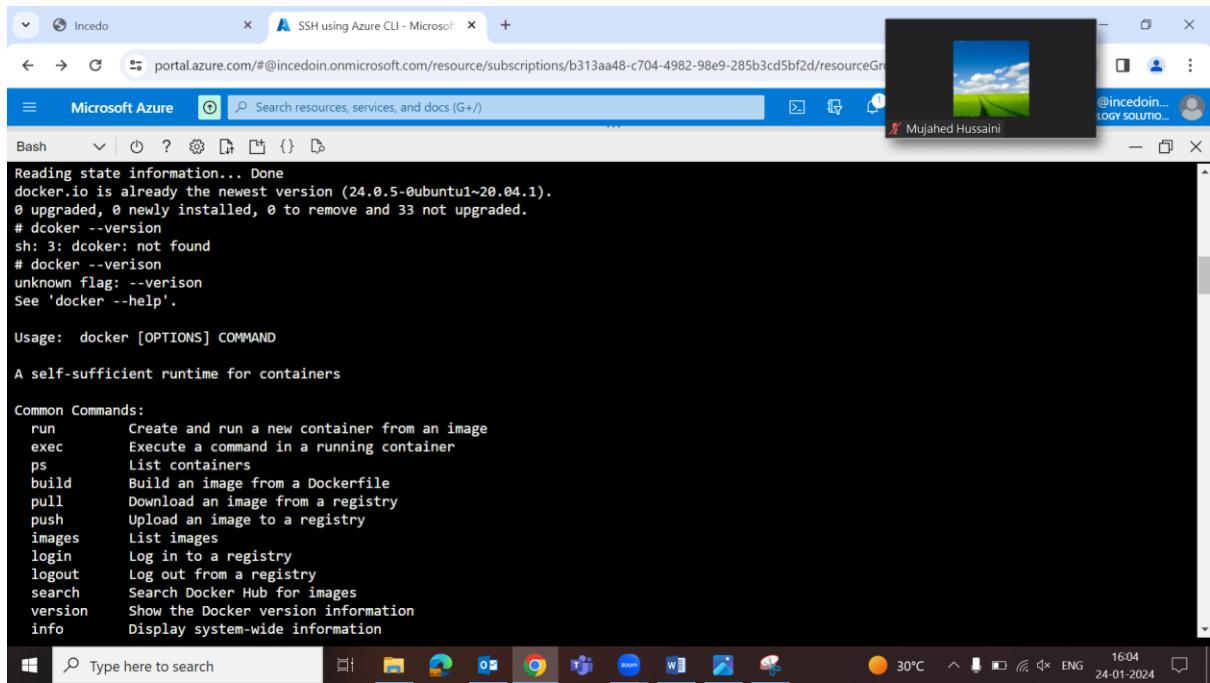
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

New release '22.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Wed Jan 24 10:03:53 2024 from 20.207.71.7
mahima.mali@vm-24jan-pentaho:~$ sudo sh
# apt update
Get:1 https://packages.microsoft.com/repos/microsoft-ubuntu-focal-prod focal InRelease [3631 B]
Hit:2 http://azure.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://azure.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:4 http://azure.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:5 http://azure.archive.ubuntu.com/ubuntu focal-security InRelease
Fetched 117 kB in 0s (237 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
33 packages can be upgraded. Run 'apt list --upgradable' to see them.
# apt install docker.io -y
Reading package lists... Done

Type here to search
30°C 16:03 ENG 24-01-2024

```



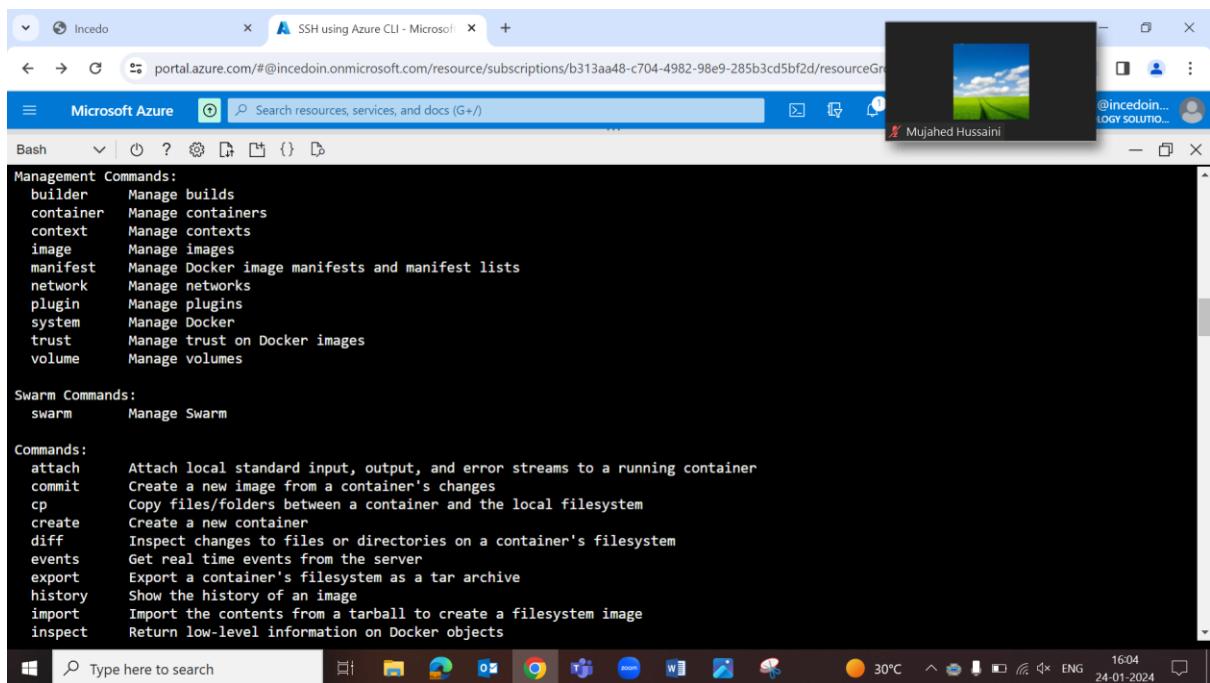
```

Inedo SSH using Azure CLI - Microsoft Azure
Reading state information... Done
docker.io is already the newest version (24.0.5-0ubuntu1~20.04.1).
0 upgraded, 0 newly installed, 0 to remove and 33 not upgraded.
# docker --version
sh: 3: docker: not found
# docker --verison
unknown flag: --verison
See 'docker --help'.

Usage: docker [OPTIONS] COMMAND
      A self-sufficient runtime for containers

Common Commands:
  run      Create and run a new container from an image
  exec     Execute a command in a running container
  ps       List containers
  build    Build an image from a Dockerfile
  pull     Download an image from a registry
  push     Upload an image to a registry
  images   List images
  login    Log in to a registry
  logout   Log out from a registry
  search   Search Docker Hub for images
  version  Show the Docker version information
  info     Display system-wide information

```



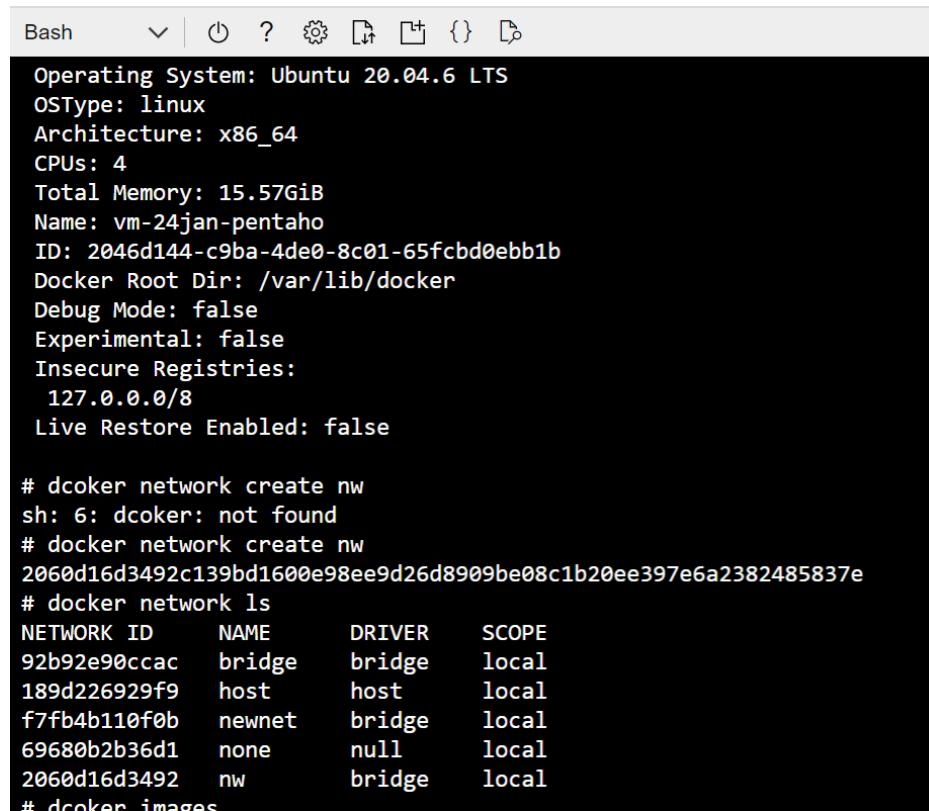
```

Management Commands:
  builder  Manage builds
  container  Manage containers
  context  Manage contexts
  image  Manage images
  manifest  Manage Docker image manifests and manifest lists
  network  Manage networks
  plugin  Manage plugins
  system  Manage Docker
  trust  Manage trust on Docker images
  volume  Manage volumes

Swarm Commands:
  swarm  Manage Swarm

Commands:
  attach  Attach local standard input, output, and error streams to a running container
  commit  Create a new image from a container's changes
  cp  Copy files/folders between a container and the local filesystem
  create  Create a new container
  diff  Inspect changes to files or directories on a container's filesystem
  events  Get real time events from the server
  export  Export a container's filesystem as a tar archive
  history  Show the history of an image
  import  Import the contents from a tarball to create a filesystem image
  inspect  Return low-level information on Docker objects

```

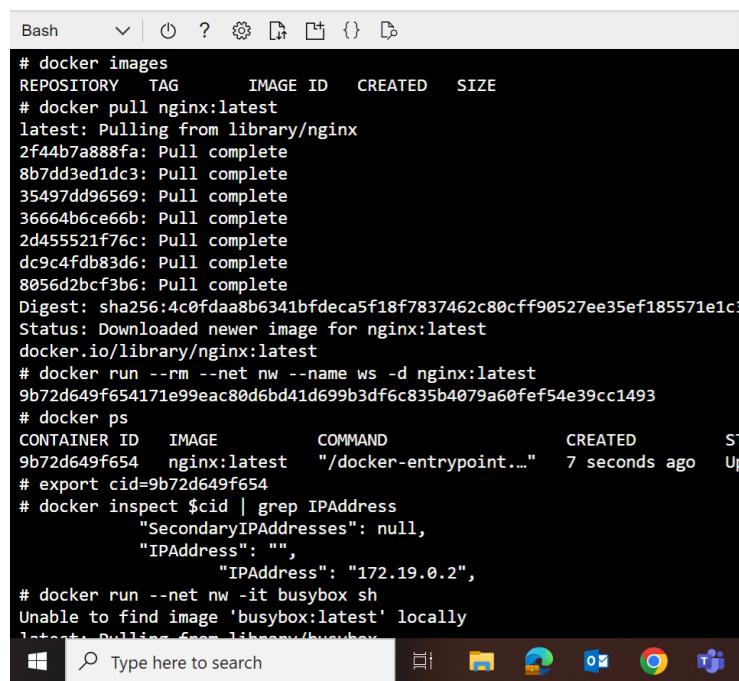


```

Operating System: Ubuntu 20.04.6 LTS
OSType: linux
Architecture: x86_64
CPUs: 4
Total Memory: 15.57GiB
Name: vm-24jan-pentaho
ID: 2046d144-c9ba-4de0-8c01-65fcbd0ebb1b
Docker Root Dir: /var/lib/docker
Debug Mode: false
Experimental: false
Insecure Registries:
  127.0.0.0/8
Live Restore Enabled: false

# dcoke network create nw
sh: 6: dcoke: not found
# docker network create nw
2060d16d3492c139bd1600e98ee9d26d8909be08c1b20ee397e6a2382485837e
# docker network ls
NETWORK ID      NAME      DRIVER      SCOPE
92b92e90ccac   bridge    bridge      local
189d226929f9   host      host      local
f7fb4b110f0b   newnet    bridge      local
69680b2b36d1   none      null      local
2060d16d3492   nw        bridge      local
# dcoke images

```



```

# docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
# docker pull nginx:latest
latest: Pulling from library/nginx
2f44b7a888fa: Pull complete
8b7dd3ed1dc3: Pull complete
35497dd96569: Pull complete
36664ab6ce66b: Pull complete
2d455521f76c: Pull complete
dc9c4fdb83d6: Pull complete
8056d2bcf3b6: Pull complete
Digest: sha256:4c0fd8aa8b6341bfdeca5f18f7837462c80cff90527ee35ef185571e1c3
Status: Downloaded newer image for nginx:latest
docker.io/library/nginx:latest
# docker run --rm --net nw --name ws -d nginx:latest
9b72d649f654171e99eac80d6bd41d699b3df6c835b4079a60fef54e39cc1493
# docker ps
CONTAINER ID      IMAGE      COMMAND      CREATED      STATUS
9b72d649f654      nginx:latest      "/docker-entrypoint..."      7 seconds ago      Up
# export cid=9b72d649f654
# docker inspect $cid | grep IPAddress
          "SecondaryIPAddresses": null,
          "IPAddress": "",
          "IPAddress": "172.19.0.2",
# docker run --net nw -it busybox sh
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox

```

```

latest: Pulling from library/busybox
9ad63333ebc9: Pull complete
Digest: sha256:6d9ac9237a84afe1516540f40a0fafdc86859b2141954b4d643af7066d598b74
Status: Downloaded newer image for busybox:latest
/ # wget -q -O /IPAddress
wget: bad address 'IPAddress'
/ # wget -q -O 172.19.0.2
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>
<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>
<p><em>Thank you for using nginx.</em></p>
</body>
</html>
/ #
/ #
/ #
/ #

```

```

# exit
mahima.mali@incedoinc.com@vm-24jan-pentaho:~$ sudo sh
# docker images
REPOSITORY      TAG          IMAGE ID       CREATED        SIZE
busybox         latest        3f57d9401f8d   6 days ago    4.26MB
nginx           latest        a8758716bb6a   3 months ago  187MB

```

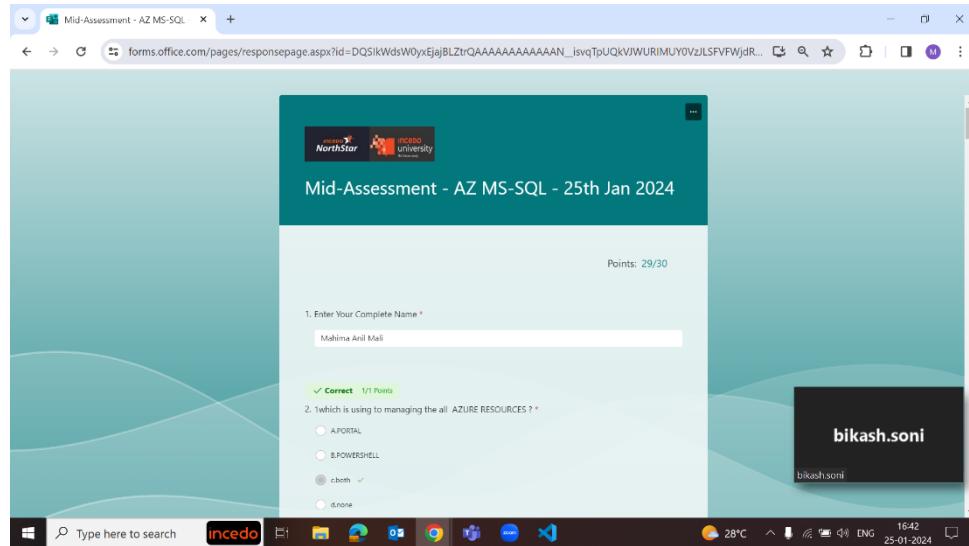
```
mahima.mali@incedoinc.com@vm-24jan-pentaho:~$ sudo sh
# docker images
REPOSITORY      TAG      IMAGE ID      CREATED      SIZE
busybox          latest   3f57d9401f8d  6 days ago   4.26MB
nginx            latest   a8758716bb6a  3 months ago  187MB
# docker rm $(docker ps -aq) --force
2849f3dab640
9b72d649f654
# docker rmi $(docker images -q) --force
Untagged: busybox:latest
Untagged: busybox@sha256:6d9ac9237a84afe1516540f40a0fafdc86859b2141954
4d643af7066d598b74
Deleted: sha256:3f57d9401f8d42f986df300f0c69192fc41da28ccc8d7978294677
0db3dd741
Deleted: sha256:2e112031b4b923a873c8b3d685d48037e4d5ccd967b658743d93a6
56c3064b9
Untagged: nginx:latest
Untagged: nginx@sha256:4c0fdcaa8b6341bfdeca5f18f7837462c80cff90527ee35e
185571e1c327beac
Deleted: sha256:a8758716bb6aa4d90071160d27028fe4eaee7ce8166221a97d3044
c8eac2be6
Deleted: sha256:8cdc90978fea2fcd2db1988760aff35f035a8a0324748925fe07e5
cd7804fb4
Deleted: sha256:fbece1a08d51bfad7eb10d215a16eba56ee8aefdfa8b1cf63d6a53
89b493642
Deleted: sha256:7a8ee37a0874b22baf2823702194110c05f0a0e6b927f03ea84fd4
```

Task 2: Project Work: Finalised UI and frameworks to be used

25 Jan

Task 1: Project Work: Worked on OTP functionality using Django

Task 2: Mid Assessment



29 Jan

Task 1: Azure Load Balancer

STEPS:

1. Subscription → Create RG
 - a. In Cloud Shell access azure cli if not already there then install it: az –verison
 - b. Login: az login: authenticate the login
 - c. Create RG: az group create --name CreatePubLBQS-rg --location eastus

```
mahima [ ~ ]$ az group create --name CreatePubLBQS-rg --location eastus
{
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg",
  "location": "eastus",
  "managedBy": null,
  "name": "CreatePubLBQS-rg",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
```

2. Create a Virtual network (VNet) → myPubIP (public address)

- a. Virtual network requires range for the IP ($10.1.0.0/16 = 65536$ IP i.e this much VM can be created)
- b. #az network vnet create –resource-group CreatePubLBQS-rg –location eastus –name myVNet –address-prefixes 10.1.0.0/16 –subnet-name myBackend Subnet –subnet-prefixes 10.1.0.0/24

```
2) VNet(10.1.0.0/16) → myPubIP
    # az network vnet create \
    --resource-group CreatePubLBQS-rg \
    --location eastus \
    --name myVNet \
    --address-prefixes 10.1.0.0/16 \
    --subnet-name myBackendSubnet \
    --subnet-prefixes 10.1.0.0/24

    Full CIDR Block: 10.1.0.0/26
    Network Type: 10.1.0.
    IPV4 : X.X.X.X = 8.8.8.8 = 32 - 26 = 2^6 = 64
    Start IP Address: 10.1.0.0
    End IP Address : 10.1.0.63

    Full CIDR Block: 10.1.0.0/28
    Network Type: 10.1.0.
    IPV4 : X.X.X.X = 8.8.8.8 = 32 - 28 = 2^4 = 16
    Start IP Address: 10.1.0.0
    End IP Address : 10.1.0.15
```

Full CIDR Block: 10.1.0.0/16
Network Type: 10.1.0.
IPV\$ X.X.X.X = 8.8.8.8 = 32-16 = 2^16 = 65536
Start IP: 10.1.0.0
End IP:

```
mahima [ ~ ]$ az network vnet create --resource-group CreatePubLBQS-rg --location eastus --name myVNet --address-prefixes 10.1.0.0/16 --subnet-name myBackendSubnet --subnet-prefixes 10.1.0.0/24
{
  "newVNet": {
    "addressSpace": {
      "addressPrefixes": [
        "10.1.0.0/16"
      ]
    },
    "enableEndsProtection": false,
    "etag": "W/"6e483720-74e2-4e6e-8c8c-8209c3fd247f"",
    "id": "/subscriptions/b313aa48-c704-4982-98e9-28b53cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet",
    "location": "eastus",
    "name": "myVNet",
    "provisioningState": "Succeeded",
    "resourceGroup": "CreatePubLBQS-rg",
    "resourceGuid": "0636b6ac-a0bf-46e4-87ea-3a63e0f3d590",
    "subnets": [
      {
        "addressPrefix": "10.1.0.0/24",
        "delegations": [],
        "etag": "W/"6e483720-74e2-4e6e-8c8c-8209c3fd247f"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-28b53cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/myBackendSubnet",
        "name": "myBackendSubnet",
        "privateEndpointNetworkPolicies": "Disabled",
        "privateLinkServiceNetworkPolicies": "Enabled",
        "provisioningState": "Succeeded",
        "resourceGroup": "CreatePubLBQS-rg",
        "type": "Microsoft.Network/virtualNetworks/subnets"
      }
    ],
    "type": "Microsoft.Network/virtualNetworks",
    "virtualNetworkPeerings": []
  }
}
```

- c. # az network public-ip create –resource-group CreatePubLBQS-rg –name myPublicIP –sku Standard –zone 1

```
mahima [ ~ ]$ az network public-ip create --resource-group CreatePubLBQS-rg --name myPublicIP --sku Standard --zone 1
{
  "publicIp": {
    "ddosSettings": {
      "protectionMode": "VirtualNetworkInherited"
    },
    "etag": "W/\"456c677b-e88d-4b86-afe9-cb7f580f1081\"",
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/publicIPAddresses/myPublicIP",
    "idleTimeoutInMinutes": 4,
    "ipAddress": "172.212.82.198",
    "ipTags": [],
    "location": "eastus",
    "name": "myPublicIP",
    "provisioningState": "Succeeded",
    "publicIPAddressVersion": "IPv4",
    "publicIPAllocationMethod": "Static",
    "resourceGroup": "CreatePubLBQS-rg",
    "resourceGuid": "742c2a43-1a4e-4829-a54e-3f04be822bcd",
    "sku": {
      "name": "Standard",
      "tier": "Regional"
    },
    "type": "Microsoft.Network/publicIPAddresses",
    "zones": [
      "1"
    ]
  }
}
```

3. Create LB → Health Probe (HP) → LB Route

- Create LB: `az network lb create --resource-group CreatePubLBQS-rg --name myLoadBalancer1 --sku Standard --public-ip-address myPublicIP --frontend-ip-name myFrontEnd --backend-pool-name myBackEndPool`

```
mahima [ ~ ]$ az network lb create --resource-group CreatePubLBQS-rg --name myLoadBalancer1 --sku standard --public-ip-address myPublicIP --frontend-ip-name myFrontEnd --backend-pool-name myBackEndPool
{
  "loadBalancer": {
    "backendAddressPools": [
      {
        "etag": "W/\"55fc7bc-82ef-4eda-abff-46ad5ba29432\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/backendAddressPools/myBackEndPool",
        "name": "myBackEndPool",
        "properties": {
          "loadBalancerBackendAddresses": [],
          "provisioningState": "Succeeded"
        },
        "resourceGroup": "CreatePubLBQS-rg",
        "type": "Microsoft.Network/loadBalancers/backendAddressPools"
      }
    ],
    "frontendIPConfigurations": [
      {
        "etag": "W/\"55fc7bc-82ef-4eda-abff-46ad5ba29432\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/frontendIPConfigurations/myFrontEnd",
        "name": "myFrontEnd",
        "properties": {
          "privateIPAllocationMethod": "Dynamic",
          "provisioningState": "Succeeded",
          "publicIPAddress": {
            "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/publicIPAddresses/myPublicIP",
            "resourceGroup": "CreatePubLBQS-rg"
          }
        },
        "resourceGroup": "CreatePubLBQS-rg",
        "type": "Microsoft.Network/loadBalancers/frontendIPConfigurations"
      }
    ],
    "inboundNatPools": [],
    "inboundNatRules": [],
    "loadBalancingRules": [],
    "outboundRules": [],
    "probes": [],
    "provisioningState": "Succeeded",
    "resourceGuid": "f33a4036-a558-44aa-b07f-1207df712919"
  }
}
```

- Create HP: `az network lb probe create --resource-group CreatePubLBQS-rg --lb-name myLoadBalancer --name myHealthProbe --protocol tcp --port 80`

```
mahima [ ~ ]$ az network lb probe create --resource-group CreatePubLBQS-rg --lb-name myLoadBalancer1 --name myHealthProbe --protocol tcp --port 80
{
  "etag": "W/\"c03d9de-3288-4d67-8d4f-9adc6ac8c1cd\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/probes/myHealthProbe",
  "intervalInSeconds": 15,
  "name": "myHealthProbe",
  "numberOfProbes": 2,
  "port": 80,
  "probeThreshold": 1,
  "protocol": "Tcp",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "type": "Microsoft.Network/loadBalancers/probes"
}
```

c. az network lb rule create \

```
--resource-group CreatePubLBQS-rg \
--lb-name myLBMujahed \
--name myHTTPRule \
--protocol tcp --frontend-port 80 \
--backend-port 80 \
--frontend-ip-name myFrontEnd \
--backend-pool-name myBackEndPool \
--probe-name myHealthProbe \
--disable-outbound-snat true \
--idle-timeout 15 --enable-tcp-reset true
```

```
mahima [ ~ ]$ az network lb rule create \
  --lb-name myLoadBalancer1 \
  --name myHTTPRule \
  --protocol tcp --frontend-port 80 \
  --backend-port 80 \
  --frontend-ip-name myFrontEnd \
  --backend-pool-name myBackEndPool \
  --probe-name myHealthProbe \
  --disable-outbound-snat true \
{
  "backendAddressPool": {
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/backendAddressPools/myBackEndPool",
    "resourceGroup": "CreatePubLBQS-rg"
  },
  "backendAddressPools": [
    {
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/backendAddressPools/myBackEndPool",
      "resourceGroup": "CreatePubLBQS-rg"
    }
  ],
  "backendPort": 80,
  "disableOutboundSnat": true,
  "enableFloatingIP": false,
  "enableICPReset": false,
  "etag": "W/\"bbaad4db-f9e0-4946-a1b1-4097dc3116f4\"",
  "frontendIPConfiguration": {
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/frontendIPConfigurations/myFrontEnd",
    "resourceGroup": "CreatePubLBQS-rg"
  },
  "frontendPort": 80,
  "idleTimeoutInMinutes": 4,
  "loadDistribution": "Default",
  "name": "myHTTPRule",
  "probe": {
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/probes/myHealthProbe",
    "resourceGroup": "CreatePubLBQS-rg"
  },
  "protocol": "Tcp",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "type": "Microsoft.Network/loadBalancers/loadBalancingRules"
```

4. Network Security Group (NSG) → NSG Rules

```
a. az network nsg create \
--resource-group CreatePubLBQS-rg \
--name myNSG
```

```
mahima [ ~ ]$ az network nsg create --resource-group CreatePubLBQS-rg --name myNSG
{
  "NewNSG": {
    "defaultSecurityRules": [
      {
        "access": "Allow",
        "description": "Allow inbound traffic from all VMs in VNET",
        "destinationAddressPrefix": "VirtualNetwork",
        "destinationAddressPrefixes": [],
        "destinationPortRange": "*",
        "destinationPortRanges": [],
        "direction": "Inbound",
        "etag": "W/"a5693f60-4423-460d-bdd9-bf66bbce5a53\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkSecurityGroups/myNSG/defaultSecurityRules/0",
        "name": "AllowVnetInBound",
        "priority": 65000,
        "protocol": "*",
        "provisioningState": "Succeeded",
        "resourceGroup": "CreatePubLBQS-rg",
        "sourceAddressPrefix": "VirtualNetwork",
        "sourceAddressPrefixes": [],
        "sourcePortRange": "*",
        "sourcePortRanges": [],
        "type": "Microsoft.Network/networkSecurityGroups/defaultSecurityRules"
      },
      {
        "access": "Allow",
        "description": "Allow inbound traffic from azure load balancer",
        "destinationAddressPrefix": "*",
        "destinationAddressPrefixes": [],
        "destinationPortRange": "*",
        "destinationPortRanges": [],
        "direction": "Inbound",
        "etag": "W/"a5693f60-4423-460d-bdd9-bf66bbce5a53\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkSecurityGroups/myNSG/defaultSecurityRules/1",
        "name": "AllowAzureLoadBalancerInBound",
        "priority": 65001,
        "protocol": "*",
        "provisioningState": "Succeeded",
        "resourceGroup": "CreatePubLBQS-rg",
        "sourceAddressPrefix": "AzureLoadBalancer",
        "sourceAddressPrefixes": []
      }
    ]
  }
}
```

```
b. az network nsg rule create \
--resource-group CreatePubLBQS-rg \
--nsg-name myNSG \
--name myNSGRuleHTTP \
--protocol '*' --direction inbound \
--source-address-prefix '*' \
--source-port-range '*' \
--destination-address-prefix '*' \
--destination-port-range 80 \
--access allow --priority 200
```

```
mahima [ ~ ]$ az network nsg rule create --resource-group CreatePubLBQS-rg --nsg-name myNSG --name myNSGRuleHTTP --protocol '*' --direction inbound --source-address-prefix '*' --source-port-range '*' --destination-address-prefix '*' --destination-port-range 80 --access allow --priority 200
{
  "access": "Allow",
  "destinationAddressPrefix": "*",
  "destinationAddressPrefixes": [],
  "destinationPortRange": "80",
  "destinationPortRanges": [],
  "direction": "Inbound",
  "etag": "W/"07fb311-2fa4-464b-82b0-f5629006e688\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkSecurityGroups/myNSG/securityRules/myNSGRuleHTTP",
  "name": "myNSGRuleHTTP",
  "priority": 200,
  "protocol": "*",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "sourceAddressPrefix": "*",
  "sourceAddressPrefixes": [],
  "sourcePortRange": "*",
  "sourcePortRanges": [],
  "type": "Microsoft.Network/networkSecurityGroups/securityRules"
}
```

5. Bastion host

a. Create Public IP address – myBastionIP

```
az network public-ip create --resource-group CreatePubLBQS-rg --name myBastionIP --sku Standard --zone 1 2 3
```

b. Create bastion subnet

```
az network vnet subnet create \
    --resource-group CreatePubLBQS-rg \
    --name AzureBastionSubnet \
    --vnet-name myVNet \
    --address-prefixes 10.1.1.0/27
```

```
mahima [ ~ ]$ az network vnet subnet create --resource-group CreatePubLBQS-rg --name AzureBastionSubnet --vnet-name myVNet --address-prefixes 10.1.1.0/27
{
  "addressPrefix": "10.1.1.0/27",
  "delegations": [],
  "etag": "W/\"277454b2-90cd-468d-bc3b-565a0129df9d\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/AzureBastionSubnet",
  "name": "AzureBastionSubnet",
  "privateEndpointNetworkPolicies": "Disabled",
  "privateLinkServiceNetworkPolicies": "Enabled",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "type": "Microsoft.Network/virtualNetworks/subnets"
}
```

c. Create bastion host

```
az network bastion create \
    --resource-group CreatePubLBQS-rg \
    --name myBastionHost \
    --public-ip-address myBastionIP \
    --vnet-name myVNet \
    --location eastus
```

```
mahima [ ~ ]$ az network bastion create --resource-group CreatePubLBQS-rg --name myBastionHost --public-ip-address myBastionIP --vnet-name myVNet --location eastus
This command is in preview and under development. Reference and support levels: https://aka.ms/CLI\_refstatus

{
  "disableCopyPaste": false,
  "dnsName": "bst-9d6f7529-652a-4872-9b01-4b382f4af9fe.bastion.azure.com",
  "enableIpConnect": false,
  "enableTunneling": false,
  "etag": "W/\"d7228ed0-1575-41c5-84f9-75241108bc30\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/bastionHosts/myBastionHost",
  "ipConfigurations": [
    {
      "etag": "W/\"d7228ed0-1575-41c5-84f9-75241108bc30\"",
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/bastionHosts/myBastionHost/bastionHostIpConfigurations/bastion_ip_config",
      "name": "bastion_ip_config",
      "privateIPAllocationMethod": "Dynamic",
      "provisioningState": "Succeeded",
      "publicIPAddress": {
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/publicIPAddresses/myBastionIP",
        "resourceGroup": "CreatePubLBQS-rg"
      },
      "resourceGroup": "CreatePubLBQS-rg",
      "subnet": {
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/AzureBastionSubnet",
        "resourceGroup": "CreatePubLBQS-rg"
      }
    }
  ]
}
```

6. Backend Subnet

NIC (network interface card): helps to establish communication with another machine; Loopback (lo) is one NIC which helps to test the data i.e. it bounces back what we send to test if the outgoing data is correct or not

- a. Create NIC with name as MyNicVM1; MyNicVM2

```
array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
    az network nic create \
        --resource-group CreatePubLBQS-rg \
        --name $vmnic \
        --vnet-name myVNet \
        --subnet myBackEndSubnet \
        --network-security-group myNSG
done
```

```
mahima [ ~ ]$ array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
    az network nic create \
        --resource-group CreatePubLBQS-rg \
        --name $vmnic \
        --vnet-name myVNet \
        --subnet myBackEndSubnet \
        --network-security-group myNSG
done
Command group 'az network' is in preview and under development. Reference and support levels: https://status.azure.com/
{
  "NewNIC": {
    "auxiliaryMode": "None",
    "auxiliarySku": "None",
    "disableTcpStateTracking": false,
    "dnsSettings": {
      "appliedDnsServers": [],
      "dnsServers": [],
      "internalDomainNameSuffix": "vs1dmvb5udsenb5khjr4b24vsd.bx.internal.cloudapp.net"
    },
    "enableAcceleratedNetworking": false,
    "enableIPForwarding": false,
    "etag": "W/\"799f92b7-3d58-49a0-8e75-68b65bdffd11\"",
    "hostedWorkloads": [],
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkInterfaces/myNicVM1",
    "ipConfigurations": [
      {
        "etag": "W/\"799f92b7-3d58-49a0-8e75-68b65bdffd11\"",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkInterfaces/myNicVM1/ipConfigurations/ipconfig1",
        "name": "ipconfig1",
        "primary": true
      }
    ]
  }
}
```

- b. Then create VM1, VM2
- c. VM1

```
az vm create \
    --resource-group CreatePubLBQS-rg \
    --name myVM1 \
```

```
--nics myNicVM1 \
--image win2019datacenter \
--admin-username azureuser \
--zone 1 --no-wait
```

Pass: Localhost@1234567

```
mahima [ ~ ]$ az vm create \
    --resource-group CreatePubLBQS-rg \
    --name myVM1 \
    --nics myNicVM1 \
    --image win2019datacenter \
    --admin-username azureuser \
    --zone 1 --no-wait
Admin Password:
Confirm Admin Password:
```

VM2

```
az vm create \
    --resource-group CreatePubLBQS-rg \
    --name myVM2 \
    --nics myNicVM2 \
    --image win2019datacenter \
    --admin-username azureuser \
    --zone 2 --no-wait
```

Pass: Localhost@1234567

```
mahima [ ~ ]$ az vm create --resource-group CreatePubLBQS-rg --name myVM2 --nics myNicVM2
--image win2019datacenter --admin-username azureuser --zone 2 --no-wait
Admin Password:
Confirm Admin Password:
```

- Attach LB ← VM1, VM2 ← MyNicVM1, MyNicVM2

```
array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
    az network nic ip-config address-pool add \
        --address-pool myBackendPool \
        --ip-config-name ipconfig1 \
        --nic-name $vmnic \
        --resource-group CreatePubLBQS-rg \
        --lb-name myLoadBalancer1
```

Done

```

mahima [ ~ ]$ array=(myNicVM1 myNicVM2)
for vmnic in "${array[@]}"
do
    az network nic ip-config address-pool add \
        --address-pool myBackendPool \
        --ip-config-name ipconfig1 \
        --nic-name $vmnic \
        --resource-group CreatePubLBQS-rg \
        --lb-name myLoadBalancer1
done
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI\_ref\_status
{
  "etag": "W/\"3de8b009-f796-48ae-bad8-110c65774b02\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/networkInterfaces/myNicVM1/ipConfigurations/ipconfig1",
  "loadBalancerBackendAddressPools": [
    {
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/loadBalancers/myLoadBalancer1/backendAddressPools/myBackEndPool",
      "resourceGroup": "CreatePubLBQS-rg"
    }
  ],
  "name": "ipconfig1",
  "primary": true,
  "privateIPAddress": "10.1.0.4",
  "privateIPAddressVersion": "IPv4",
  "privateIPAllocationMethod": "Dynamic",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "subnet": {
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/myBackEndSubnet",
    "resourceGroup": "CreatePubLBQS-rg"
  },
  "type": "Microsoft.Network/networkInterfaces/ipConfigurations"
}

```

7. NAT Gateway

a. Create MyNATGWIp

```

az network public-ip create \
    --resource-group CreatePubLBQS-rg \
    --name myNATgatewayIP \
    --sku Standard \
    --zone 1 2 3

```

```
mahima [ ~ ]$ az network public-ip create \
    --resource-group CreatePubLBQS-rg \
    --name myNATgatewayIP \
    --sku Standard \
    --zone 1 2 3
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI\_ref\_status
{
  "publicIp": {
    "ddosSettings": {
      "protectionMode": "VirtualNetworkInherited"
    },
    "etag": "W/\"8d9e3ef0-825e-4912-bdd2-6ee7e0669e92\"",
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/publicIPAddresses/myNATgatewayIP",
    "idleTimeoutInMinutes": 4,
    "ipAddress": "20.120.121.212",
    "ipTags": [],
    "location": "eastus",
    "name": "myNATgatewayIP",
    "provisioningState": "Succeeded",
    "publicIPAddressVersion": "IPv4",
    "publicIPAllocationMethod": "Static",
    "resourceGroup": "CreatePubLBQS-rg",
    "resourceGuid": "dad04b92-3249-4cbb-a0de-e0a52b4dbf3c",
    "sku": {
      "name": "Standard",
      "tier": "Regional"
    },
    "type": "Microsoft.Network/publicIPAddresses",
    "zones": [
      "1",
      "2",
      "3"
    ]
  }
}
```

b. Create MyNATGW

```
az network nat gateway create \
    --resource-group CreatePubLBQS-rg \
    --name myNATgateway \
    --public-ip-addresses myNATgatewayIP \
    --idle-timeout 10
```

```
mahima [ ~ ]$ az network nat gateway create \
    --resource-group CreatePubLBQS-rg \
    --name myNATgateway \
    --public-ip-addresses myNATgatewayIP \
    --idle-timeout 10
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "etag": "W/\"5cedab0a-c397-45da-be66-d0b927fcde64\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/natGateways/myNATgateway",
  "idleTimeoutInMinutes": 10,
  "location": "eastus",
  "name": "myNATgateway",
  "provisioningState": "Succeeded",
  "publicIpAddresses": [
    {
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/publicIPAddresses/myNATgatewayIP",
      "resourceGroup": "CreatePubLBQS-rg"
    }
  ],
  "resourceGroup": "CreatePubLBQS-rg",
  "resourceGuid": "febfb9285-f157-4021-b8e8-b20e4587ef13",
  "sku": {
    "name": "Standard"
  },
  "type": "Microsoft.Network/natGateways"
}
```

c. Update MyNATGW → BackendSubnet

```
az network vnet subnet update \
    --resource-group CreatePubLBQS-rg \
    --vnet-name myVNet \
    --name myBackendSubnet \
    --nat-gateway myNATgateway
```

```
mahima [ ~ ]$ az network vnet subnet update \
    --resource-group CreatePubLBQS-rg \
    --vnet-name myVNet \
    --name myBackendSubnet \
    --nat-gateway myNATgateway
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "addressPrefix": "10.1.0.0/24",
  "delegations": [],
  "etag": "W/\"25e0bdfc-c9a7-4bee-b36d-1fffeed3742\"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/virtualNetworks/myVNet/subnets/myBackendSubnet",
  "ipConfigurations": [
    {
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CREATEPUBLBQS-RG/providers/Microsoft.Network/networkInterfaces/MYNICVM1/ipConfigurations/IPCONFIG1",
      "resourceGroup": "CREATEPUBLBQS-RG"
    },
    {
      "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CREATEPUBLBQS-RG/providers/Microsoft.Network/networkInterfaces/MYNICVM2/ipConfigurations/IPCONFIG1",
      "resourceGroup": "CREATEPUBLBQS-RG"
    }
  ],
  "name": "myBackendSubnet",
  "natGateway": {
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Network/natGateways/myNATgateway",
    "resourceGroup": "CreatePubLBQS-rg"
  },
  "privateEndpointNetworkPolicies": "Disabled",
  "privateLinkServiceNetworkPolicies": "Enabled",
  "provisioningState": "Succeeded",
  "resourceGroup": "CreatePubLBQS-rg",
  "type": "Microsoft.Network/virtualNetworks/subnets"
}
```

8. WebServer (IIS) ← HelloWorld ← VM1, VM2

```
array=(myVM1 myVM2)
for vm in "${array[@]}"
do
  az vm extension set \
    --publisher Microsoft.Compute \
    --version 1.8 --name CustomScriptExtension \
```

```
--vm-name $vm --resource-group CreatePubLBQS-rg \
--settings '{"commandToExecute":"powershell Add-WindowsFeature Web-
Server; powershell Add-Content -Path \"C:\\inetpub\\wwwroot\\Default.htm\" -Value $($env:computername)"'
done
```

```
mahima [ ~ ]$ array=(myVM1 myVM2)
for vm in "${array[@]}"
do
    az vm extension set \
        --publisher Microsoft.Compute \
        --version 1.8 --name CustomScriptExtension \
        --vm-name $vm --resource-group CreatePubLBQS-rg \
        --settings '{"commandToExecute":"powershell Add-WindowsFeature Web-Server; powershell Add-Content -Path \"C:\\inetpub\\wwwroot\\Default.htm\" -Value $($env:computername)"'
done
{
    "autoUpgradeMinorVersion": true,
    "enableAutomaticUpgrade": null,
    "forcedUpdateTag": null,
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Compute/virtualMachines/myVM1/extensions/CustomScriptExtension",
    "instanceView": null,
    "location": "eastus",
    "name": "CustomScriptExtension",
    "protectedSettings": null,
    "protectedSettingsFromKeyVault": null,
    "provisionAfterExtensions": null,
    "provisioningState": "Succeeded",
    "publisher": "Microsoft.Compute",
    "resourceGroup": "CreatePubLBQS-rg",
    "settings": {
        "commandToExecute": "powershell Add-WindowsFeature Web-Server; powershell Add-Content -Path \"C:\\inetpub\\wwwroot\\Default.htm\" -Value $($env:computername)"
    },
    "suppressFailures": null,
    "tags": null,
    "type": "Microsoft.Compute/virtualMachines/extensions",
    "typeHandlerVersion": "1.8",
    "typePropertiesType": "CustomScriptExtension"
}
{
    "autoUpgradeMinorVersion": true,
    "enableAutomaticUpgrade": null,
    "forcedUpdateTag": null,
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/CreatePubLBQS-rg/providers/Microsoft.Compute/virtualMachines/myVM2/extensions/CustomScriptExtension",
    "instanceView": null,
    "location": "eastus",
    "name": "CustomScriptExtension",
    "protectedSettings": null,
    "protectedSettingsFromKeyVault": null,
    "provisionAfterExtensions": null
}
```

9. Test

```
az network public-ip show \
--resource-group CreatePubLBQS-rg \
--name myPublicIP \
--query ipAddress \
--output tsv
```

```
mahima [ ~ ]$ az network public-ip show \
--resource-group CreatePubLBQS-rg \
--name myPublicIP \
--query ipAddress \
--output tsv
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
172.212.82.198
```

← → ⌂ ⚠ Not secure 172.212.82.198

myVM2

Stop VM2 and check again

myVM2 Virtual machine

Essentials

- Resource group (move) : CreatePubLBQS-rg
- Status : Stopped (deallocated)
- Location : East US (Zone 2)
- Subscription (move) : Azure Training
- Subscription ID : b313aa48-c704-4982-98e9-285b3cd5bf2d
- Availability zone : 2
- Tags (edit) : Add tags

Properties Monitoring Capabilities (8) Recommendations Tutorials

Virtual machine

| | |
|------------------|---------------------------|
| Computer name | myVM2 |
| Operating system | Windows |
| Image publisher | MicrosoftWindowsServer |
| Image offer | WindowsServer |
| Image plan | 2019-datacenter-gensecond |
| VM generation | V2 |
| VM architecture | x64 |
| Hibernation | Disabled |
| Host group | - |
| Host | - |

Networking

| | |
|---------------------------|--|
| Public IP address | 172.212.82.198 (Load balancer myLoadBalancer1) |
| Private IP address (IPv6) | - |
| Private IP address (IPv4) | 10.1.0.5 |
| Virtual network/subnet | myVNet/myBackEndSubnet |
| DNS name | Configure |

Size

| | |
|-------|-----------------|
| Size | Standard DS1 v2 |
| vCPUs | 1 |
| RAM | 3.5 GiB |

← → C ⚠ Not secure 172.212.82.198

myVM1

10. Delete Resources

az group delete --name CreatePubLBQS-rg

Azure Screenshots

CreatePubLBQS-rg Resource group

Resources

| Name | Type | Location |
|-----------------|------------------------|----------|
| myBastionHost | Bastion | East US |
| myBastionIP | Public IP address | East US |
| myLoadBalancer1 | Load balancer | East US |
| myNATgateway | NAT gateway | East US |
| myNatGatewayIP | Public IP address | East US |
| myNICv1 | Network interface | East US |
| myNICv2 | Network interface | East US |
| myNSG | Network security group | East US |
| myPublicIP | Public IP address | East US |
| myVM1 | Virtual machine | East US |

myLoadBalancer1 Load balancer

Search | Move | Delete | Refresh | Give feedback

Overview

Resource group (move) : CreatePubLBQS-rg
Location : East US
Subscription (move) : Azure Training
Subscription ID : b313aa48-c704-4982-98e9-285b3cd5bf2d
SKU : Standard
Tags (edit) : Add tags

Essentials

Backend pool : myBackendPool (2 virtual machines)
Load balancing rule : myHTTPRule (Tcp:80)
Health probe : myHealthProbe (Tcp:80)
NAT rules : 0 inbound
Tier : Regional

Configure high availability and scalability for your applications

Create highly-available and scalable applications in minutes by using built-in load balancing for cloud services and virtual machines. Azure Load Balancer supports TCP/UDP-based protocols and protocols used for real-time voice and video messaging applications. [Learn more](#)

Balance IPv4 and IPv6 addresses
Native dual-stack endpoints help meet regulatory requirements and address the fast-growing number of devices in mobile and IoT. [Learn more](#)

Build highly reliable applications
Load Balancer improves application uptime by routing traffic to healthy nodes. [Learn more](#)

Secure your networks
Control network traffic and protect private networks using built-in network address translation (NAT). [Learn more](#)

See more

Frontend IP configuration
[View frontend IP configuration](#)

Backend pools
[View backend pools](#)

Health probes
[View health probes](#)

Load balancing rules
[View load balancing rules](#)

Inbound NAT rules
[View inbound NAT rules](#)

Home > myLoadBalancer1 | Health probes >

myHealthProbe

myLoadBalancer1

i Health probes are used to check the status of a backend pool instance. If the health probe fails to get a response from a backend instance then no new connections will be sent to that backend instance until the health probe succeeds again.

i Unhealthy threshold, otherwise known as the property `numberOfProbes`, is not respected. Load Balancer health probes will probe up/ down immediately after 1 probe regardless of the property's configured value. [Learn more](#)

| | |
|----------------------|---------------|
| Name * | myHealthProbe |
| Protocol * | TCP |
| Port * | 80 |
| Interval (seconds) * | 15 |
| Used by * | myHTTPRule |

myVM2 Virtual machine

Search | Connect | Start | Restart | Stop | Hibernate (preview) | Capture | Delete | Refresh | Open in mobile | Feedback | CLI / PS

Overview

Resource group (move) : CreatePubLBQS-rg
Status : Stopped (deallocated)
Location : East US (Zone 2)
Subscription (move) : Azure Training
Subscription ID : b313aa48-c704-4982-98e9-285b3cd5bf2d
Availability zone : 2
Tags (edit) : Add tags

Essentials

Operating system : Windows
Size : Standard DS1 v2 (1 vcpu, 3.5 GiB memory)
Public IP address : 172.212.82.198
Virtual network/subnet : myVNet/myBackendSubnet
DNS name : Not configured
Health state : -

Properties Monitoring Capabilities (8) Recommendations Tutorials

Virtual machine

| | |
|------------------|---------------------------|
| Computer name | myVM2 |
| Operating system | Windows |
| Image publisher | MicrosoftWindowsServer |
| Image offer | WindowsServer |
| Image plan | 2019-datacenter-gensecond |
| VM generation | V2 |
| VM architecture | x64 |
| Hibernation | Disabled |
| Host group | - |
| Host | - |

Networking

| | |
|---------------------------|--|
| Public IP address | 172.212.82.198 (Load balancer myLoadBalancer1) |
| Private IP address (IPv6) | - |
| Private IP address (IPv4) | 10.1.0.5 |
| Virtual network/subnet | myVNet/myBackendSubnet |
| DNS name | Configure |

Size

| | |
|-------|-----------------|
| Size | Standard DS1 v2 |
| vCPUs | 1 |
| RAM | 3.5 GiB |

The screenshot shows the Azure portal interface for managing a NAT gateway. Key details include:

- Resource group:** CreatePubLBQS-rg
- Location:** East US
- Subscription:** Azure Training
- Subscription ID:** b313aa48-c704-4982-98e9-285b3cd5bf2d
- Virtual network:** myVNet
- Subnets:** 1
- Public IP addresses:** 1
- Public IP prefixes:** 0

Github link

30 Jan

Task 1: Project Work continued using Flask and explored agile methodologies

- Trello, Asana (ticketing category tool) : Used to maintain tickets, burn down charts, deadline management
- Agile Methodology: JIRA (ticketing category tool)
- Source Code: GitHub Repository
- Output Repository: Artifact Repository
- Vulnerability Repository
- Central Repository
- Code Quality: Java code repository
- SAST and DAST: Explore these terms

```

Agile
Documentation: Confluence, Github pages
Ticketing Tool: Trello, Jira, Github Issue
Chat: Slack, Microsoft Team

Designing
Graphic: Corel, Photoshop, AI
Web/Mobile App: AdobeXD, Figma
Database: ER Diagram, Draw.io
Software: UML

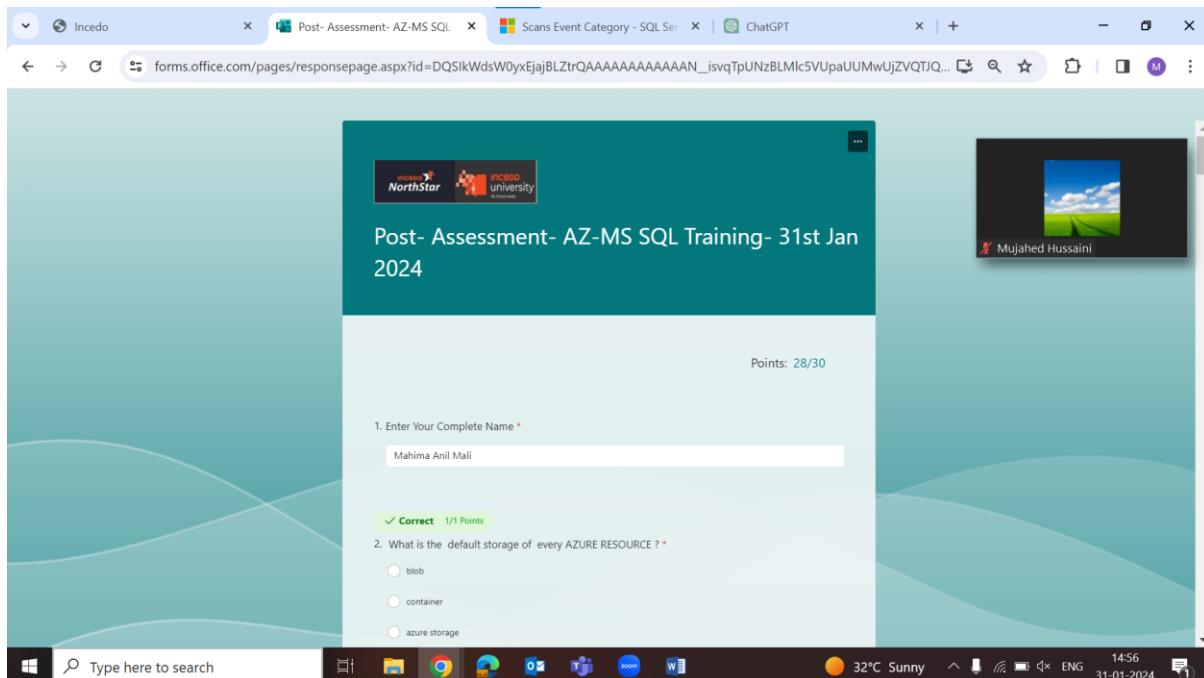
Development
Distributed VCS: Github, GitLab Repo, Bitbucket
Testing:
Automated Testing: Selenium, JUnit, TestNG,
Continues Testing: Jenkins, Github
Continues Integration: Jenkins, Github Action(Infra Automation), GitLab
Continues Deployment/Configuration/Delivery/Release:
Infra. Provisioning(IaaS): AzCLI//Terraform
Continues Deployment: Ansible/Jenkins/Docker
Configuration Mgt: Ansible

```

31 Jan

Task 1: Completed Version 1 and started working on Version 2 of the Project

Task 2: Explored Azure Services and Post Assessment

**2 Feb**

TASK 1: Azure Data Factory

Steps for Data Factory

1. Create Resource group
2. Create data factory
3. Create a storage account (enable hierarchical namespace)
4. Source: Gen2 source input
5. Destination: Gen2 destination output
6. Create 2 containers in storage account: input which will take and output which will display
 - a. Upload a file in input container
7. Use data factory to extract file from input container, add some flow rules and paste the output
8. Create Linked Service (will bring data from market to home): in manage section
 - a. Select Gen2
 - b. Create LSinput
 - c. Create LSoutput
9. Create Dataset: in author section
 - a. Create pipeline

- b. In factory resource select dataset
- c. Select gen2
- d. Select csv file
- e. Then dataset name
- f. Select from input the desired file and save it
- g. Repeat same with output

10. Create Activities

- a. Go to pipeline
- b. In activities do copy data
- c. Then do data flow
- d. Save and publish it

11. ADF: Azure data factory

1. Source(Storage Account --> Container= Input) = Test.csv
2. Sink(Storage Account --> Container = Output)
3. Create ADF Studio & Pipeline
 - a. Launch Studio
 - b. PIPE LINE
 - i. Manage --> Linked Service
 - ii. Author ---> Data Sets(Input & Output)
 - iii. Pipeline --> Activity(Copy) ---> Select Source & Sink
 - iv. Publish
 - v. Debug

Resource groups

| Name | Subscription | Location |
|----------------------------------|----------------|---------------|
| cloud-shell-storage-centralindia | Azure Training | Central India |
| NetworkWatcherRG | Azure Training | East US |
| rg2febd | Azure Training | East US |

sa2febdf - Microsoft Azure

Home > Resource groups > rg2febdf > sa2febdf

sa2febdf Storage account

Search

Upload Open in Explorer Delete Move Refresh Open in mobile CLI / PS Feedback JSON View

Overview

Activity log Tags Diagnose and solve problems Access Control (IAM) Data migration Events Storage browser

Data storage

Containers File shares Queues Tables

Resource group (move) rg2febdf Location eastus Subscription (move) Azure Training Subscription ID b313aa48-c704-4982-98e9-285b3cd5bf2d Disk state Available Tags (edit) Add tags

Properties Monitoring Capabilities (5) Recommendations (0) Tutorials Tools + SDKs

Type here to search

25°C 12:26 02-02-2024

sa2febdf - Microsoft Azure

Home > Resource groups > rg2febdf > sa2febdf

sa2febdf | Containers Storage account

Search

+ Container Change access level Restore containers Refresh Delete Give feedback

Search containers by prefix Show deleted containers

| Name | Last modified | Anonymous access level | Lease state |
|--------|-----------------------|------------------------|-------------|
| \$logs | 2/2/2024, 12:23:57 PM | Private | Available |

Type here to search

25°C 12:26 02-02-2024

sa2febdf - Microsoft Azure

portal.azure.com/#@incedoin.onmicrosoft.com/resource/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/rg2febdf...

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

Home > Resource groups > rg2febdf > sa2febdf

sa2febdf | Containers

Storage account

Search

+ Container Change access level Restore containers Refresh Delete Give feedback

Overview Activity log Tags Diagnose and solve problems Access Control (IAM) Data migration Events Storage browser

Data storage

- Containers
- File shares
- Queues
- Tables

Type here to search

25°C 12:27 02-02-2024

Successfully created storage container
Successfully created storage container 'output'.

| Name | Last modified | Anonymous access level | Lease state |
|--------|-----------------------|------------------------|-------------|
| \$logs | 2/2/2024, 12:23:57 PM | Private | Available |
| input | 2/2/2024, 12:27:06 PM | Private | Available |
| output | 2/2/2024, 12:27:18 PM | Private | Available |

Show deleted containers

input - Microsoft Azure

portal.azure.com/#view/Microsoft_Azure_Storage/ContainerMenuBlade/~/overview/storageAccountName%2Fb313aa48-...

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

Home > sa2febdf | Containers >

input Container

Search

Upload Add Directory Refresh Rename Delete Change tier Acquire lease Break lease Give feedback

Overview Diagnose and solve problems Access Control (IAM)

Authentication method: Access key (Switch to Microsoft Entra user account)
Location: input

Search blobs by prefix (case-sensitive)

Show deleted objects

| Name | Modified | Access tier | Archive status | Blob type | Size | Lease state |
|--------------|----------------------|----------------|----------------|------------|----------|-------------|
| Order_v3.csv | 2/2/2024, 1:47:05 PM | Hot (Inferred) | | Block blob | 45.56 KB | Available |

Show deleted objects

Settings Shared access tokens Manage ACL Access policy Properties Metadata

https://portal.azure.com/#

Type here to search

25°C 13:52 02-02-2024

TERMS

By clicking "Create", I (a) agree to the legal terms and privacy statement(s) associated with the Marketplace offering(s) listed above; (b) authorize Microsoft to bill my current payment method for the fees associated with the offering(s), with the same billing frequency as my Azure subscription; and (c) agree that Microsoft may share my contact, usage and transactional information with the provider(s) of the offering(s) for support, billing and other transactional activities. Microsoft does not provide rights for third-party offerings. See the [Azure Marketplace Terms](#) for additional details.

Basics

| | |
|----------------|----------------|
| Subscription | Azure Training |
| Resource group | rg2febd |
| Name | df2febd |
| Region | East US |
| Version | V2 |

Networking

| | |
|-------------|-----------------|
| Connect via | Public endpoint |
|-------------|-----------------|

Previous Next Create Give feedback

df2febd - Microsoft Azure

Azure Data Factory

df2febd Data factory (V2)

Overview

Essentials

- Resource group ([move](#)) : rg2febd
- Status : Succeeded
- Location : East US
- Subscription ([move](#)) : Azure Training
- Subscription ID : b313aa48-c704-4982-98e9-285b3cd5bf2d

Azure Data Factory Studio

Launch studio

Quick Starts Tutorials Template Gallery Training Modules

https://adf.azure.com/en/home?factory=%2fsubscriptions%2fb313aa48-c704-4982-98e9-285b3cd5bf2d%2fResourceGroups%2frg2febd%2fproviders%2fMicrosoft.DataFactory%2ffactories%2fdf2febd#loginHint=mahima.mali@inc...

Data factory
df2febdf

New

Ingest
Copy data at scale once or on a schedule.

Orchestrate
Code-free data pipelines.

Transform data
Transform your data using data flows.

Configure SSIS
Manage & run your SSIS packages in the cloud.

Recent resources

Type here to search

Linked services

Linked service defines the connection information to a data store

Name * inputLS

Description

Connect via integration runtime * AutoResolveIntegrationRuntime

Authentication type Account key

Account selection method Enter manually

URL * https://sa2febdf.dfs.core.windows.net/

Storage account key Azure Key Vault

Save Cancel Test connection

The screenshot shows the Microsoft Azure Data Factory interface. The left sidebar is titled 'Data Factory' and includes options like General, Factory settings, Connections, Linked services, Integration runtimes, Microsoft Purview, Source control, Author, Triggers, Global parameters, Data flow libraries, Security, and Credentials. The 'Connections' section is currently selected. The main area is titled 'Linked services' and contains a sub-section 'Azure Data Lake Storage Gen2'. A new linked service is being created with the name 'outputLS'. The 'Connect via integration runtime' dropdown is set to 'AutoResolveIntegrationRuntime'. The 'Authentication type' is set to 'Account key'. The 'Azure subscription' dropdown shows 'Azure Training (b313aa48-c704-4982-98e9-285b3cd5bf2d)'. A success message at the bottom indicates 'Connection successful'.

The screenshot shows the Microsoft Azure Data Factory interface after the linked service has been successfully created. The left sidebar is identical to the previous screenshot. The main area now displays a list of linked services. It shows two entries: 'inputLS' and 'outputLS', both of which are of type 'Azure Data Lake Storage Gen2'. A success message box is visible in the top right corner, stating 'Successfully created' and 'Successfully created outputLS (Linked service)'. The status bar at the bottom right shows the date and time as '02-02-2024 13:56'.

The screenshot shows the Azure Data Factory interface. On the left, the 'Factory Resources' sidebar lists 'Pipelines' (1 item), 'Datasets' (2 items: 'inputfile' and 'outputdataset'), 'Data flows' (0 items), and 'Power Query' (0 items). The main workspace displays three datasets: 'demopipeline', 'inputfile', and 'outputdataset'. The 'inputfile' dataset is selected, showing its details. The 'Connection' tab is active, displaying the following configuration:

- Linked service:** inputLS (selected)
- File path:** input / Directory / Order_v3.csv
- Compression type:** Select...
- Column delimiter:** Comma (,)
- Row delimiter:** Default (\r,\n, or \r\n)

The 'Schema' and 'Parameters' tabs are also visible below the connection settings.

This screenshot shows the same Azure Data Factory interface, but the 'outputdataset' dataset is now selected in the workspace. The 'Connection' tab is active, displaying the following configuration:

- Row delimiter:** Default (\r,\n, or \r\n)
- Encoding:** Default(UTF-8)
- Quote character:** Double quote (")
- Escape character:** Backslash (\)
- First row as header:** checked
- Null value:** (empty field)

The 'Schema' and 'Parameters' tabs are also visible below the connection settings.

The screenshot shows the Microsoft Azure Data Factory pipeline editor. On the left, the 'Factory Resources' sidebar lists 'Pipelines' (demopipeline), 'Datasets' (inputfile, outputdataset), and other components. The main workspace displays the 'Activities' section for the 'demopipeline'. A 'Copy data' activity named 'Copy data1' is selected. The 'Sink' tab is active, showing the 'Sink dataset' dropdown set to 'outputdataset'. Below it, 'Copy behavior' and 'Max concurrent connections' options are visible. The status bar at the bottom indicates a successful run.

This screenshot shows the same Azure Data Factory interface after the pipeline run has completed. The 'Output' tab is now active, displaying the 'Pipeline status' as 'Succeeded'. Below this, a table provides details of the run: there was 1 item, all activities succeeded, and the run started at 2/2/2024, 2:16:06 PM. The status bar at the bottom shows the run completed at 14:17 on 02-02-2024.

The screenshot shows the Microsoft Azure Data Factory interface. On the left, a sidebar lists various options like Dashboards, Runs, Pipeline runs, Trigger runs, Change Data, Runtimes & sessions, Integration runtime, Data flow definition, Notifications, and Alerts & metrics. The main area displays a 'Details' section for a copy activity. The activity has a status of 'Succeeded'. It shows the source as 'Azure Data Lake Storage Gen2' (Region: East US) and the target as 'Azure Data Lake Storage Gen2' (Region: East US). Key metrics listed include Data read: 46.65 KB, Files read: 1, Peak connections: 1, Data written: 46.65 KB, Files written: 1, and Peak connections: 1. Below this, it shows Copy duration: 00:00:09 and Throughput: 46.65 KB/s. A detailed view of the copy activity shows Start time: 2/2/2024, 2:16:06 PM and Used DIUs: 4. At the bottom, there's a satisfaction survey asking 'How satisfied or dissatisfied are you with the performance of this copy activity?'. The Windows taskbar at the bottom shows various pinned icons and the date/time as 02-02-2024.

TASK 2: Azure Data factory

Create SQL Database

Database Server: dbserverdf

Admin: azureuser

Localhost@1234567

Database: dbdf

The screenshot shows the Microsoft Azure Resource Groups page. The left sidebar lists 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Resource visualizer', and 'Events'. Under 'Settings', it shows 'Deployments', 'Security', 'Deployment stacks', 'Policies', 'Properties', and 'Locks'. The main area shows a resource group named 'rg2febdf'. The 'Essentials' tab is selected, displaying a table of resources. The table includes columns for Name, Type, and Location. The resources listed are: dbdf (dbserverdf/dbdf) (SQL database, East US), dbserverdf (SQL server, East US), df2febdf (Data factory (V2), East US), and sa2febdf (Storage account, East US). The Windows taskbar at the bottom shows various pinned icons and the date/time as 02-02-2024.

Launch Data Factory Studio

The screenshot shows the Azure Data Factory Overview page for a data factory named "df2febdf2". The left sidebar contains navigation links for Tags, Diagnose and solve problems, Settings (Networking, Managed identities, Properties, Locks), Getting started (Quick start), Monitoring (Alerts, Metrics, Diagnostic settings, Logs), and Automation. The main content area features a large blue factory icon and the text "Azure Data Factory Studio". A prominent blue button labeled "Launch studio" is centered. Below it are four cards: "Quick Starts" (with a cloud icon), "Tutorial 101" (with a book icon), "Template Gallery" (with a document icon), and "Training Module" (with a certificate icon). At the bottom of the screen, a dark taskbar displays the Windows Start button, weather information (27°C Sunny), system icons, and the date/time (02-02-2024, 14:26).

The screenshot shows the Azure Data Factory home page. At the top, there are two browser tabs: 'df2febdf2 - Microsoft' and 'df2febdf2 - Azure Data'. The main content area is titled 'df2febdf2' and features a large blue button labeled 'Set up code repository'. A tooltip for this button contains the text: 'Azure Data Factory allows you to configure a Git repository with either Azure DevOps or GitHub. Git is a version control system that allows for easier change tracking and collaboration.' Below this, there is a section titled 'Data factory' with the name 'df2febdf2'. A 'New' dropdown menu is visible. Two callout boxes provide information about the service's capabilities:

- Ingest**: Copy data at scale once or on a schedule.
- Orchestrate**: Code-free data pipelines.

The bottom of the screen shows a taskbar with icons for Microsoft Word, weather (27°C Sunny), battery (ENG), time (14:27), date (02-02-2024), and notifications (2).

The screenshot shows the Azure Data Factory pipeline run details for an activity run ID: b963c48d-9a56-4483-97c0-a709e80a0b77. The activity copied data from Azure Blob Storage (Region: East US) to Azure SQL Database (Region: East US). The status is 'Succeeded'. Key metrics include:

- Azure Blob Storage:** Data read: 40 bytes, Files read: 1, Rows read: 2, Peak connections: 1.
- Azure SQL Database:** Data written: 28 bytes, Rows written: 2, Peak connections: 2.
- Copy duration:** 00:00:11
- Throughput:** 13 bytes/s

The pipeline run details also show the start time as 2/2/2024, 5:27:51 PM. A satisfaction survey asks, "How satisfied or dissatisfied are you with the performance of this copy activity?"

Preview data

Linked service: AzureSqlDatabaseLinkedService

Object: dbo.emp

| ID | FirstName | LastName |
|----|-----------|----------|
| 1 | John | Doe |
| 2 | Jane | Doe |
| 3 | John | Doe |
| 4 | Jane | Doe |

3 Feb

Task 1: Vnet to Vnet connection

Create Resource Group

Rg=mahimarg4feb

Vnet1=mahimaVM1

Vnet2=mahimaVM2

```
az group create --name $Rg --location eastus
```

```
mahima [ ~ ]$ Rg=mahimarg4feb
mahima [ ~ ]$ Vnet1=mahimaVM1
mahima [ ~ ]$ Vnet2=mahimaVM2
mahima [ ~ ]$ az group create --name $Rg --location eastus
{
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb",
  "location": "eastus",
  "managedBy": null,
  "name": "mahimarg4feb",
  "properties": {
    "provisioningState": "Succeeded"
  },
  "tags": null,
  "type": "Microsoft.Resources/resourceGroups"
}
```

Create Virtual Networks

```
az network vnet create \
  --name $Vnet1 \
  --resource-group $Rg \
  --address-prefixes 10.0.0.0/16 \
  --subnet-name Subnet1 \
  --subnet-prefix 10.0.0.0/24
```

```
mahima [ ~ ]$ az network vnet create \
    --name $Vnet1 \
    --resource-group $Rg \
    --address-prefixes 10.0.0.0/16 \
    --subnet-name Subnet1 \
    --subnet-prefix 10.0.0.0/24
Command group 'az network' is in preview and under development. Reference and supp
{
  "newVNet": {
    "addressSpace": {
      "addressPrefixes": [
        "10.0.0.0/16"
      ]
    },
    "enableDdosProtection": false,
    "etag": "W/\"00b89e61-ae61-4eab-9af2-05185d4ddb94\"",
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahi
Networks/mahimaVM1",
    "location": "eastus",
    "name": "mahimaVM1",
    "provisioningState": "Succeeded",
    "resourceGroup": "mahimarg4feb",
    "resourceGuid": "5b16ab1b-da9f-4283-b0fd-369601ceda20",
    "subnets": [
      {
        "name": "Subnet1",
        "addressPrefix": "10.0.0.0/24",
        "cidr": "10.0.0.0/24",
        "dnsServers": [
          "10.0.0.1"
        ],
        "ipConfigurations": [
          {
            "name": "ipconfig1",
            "privateIpAddress": "10.0.0.2",
            "publicIpAddress": null,
            "subnet": {
              "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahi
Networks/mahimaVM1/subnets/Subnet1"
            }
          }
        ],
        "networkSecurityGroup": null
      }
    ]
  }
}

az network vnet create \
    --name $Vnet2 \
    --resource-group $Rg \
    --address-prefixes 10.1.0.0/16 \
    --subnet-name Subnet1 \
    --subnet-prefix 10.1.0.0/24
```

```
mahima [ ~ ]$ az network vnet create \
--name $Vnet2 \
--resource-group $Rg \
--address-prefixes 10.1.0.0/16 \
--subnet-name Subnet1 \
--subnet-prefix 10.1.0.0/24
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "newVNet": {
    "addressSpace": {
      "addressPrefixes": [
        "10.1.0.0/16"
      ]
    },
    "enableDdosProtection": false,
    "etag": "w/\\"285e4919-b5a3-4ef5-a40b-a40fab2cd8bb\\\"", 
    "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb/providers/Microsoft.Network/virtualNetworks/mahimaVM2",
    "location": "eastus",
    "name": "mahimaVM2",
    "provisioningState": "Succeeded",
    "resourceGroup": "mahimarg4feb",
    "resourceGuid": "ac0b6c59-756b-4558-836a-8ede041711a8",
    "subnets": [
      {
        "addressPrefix": "10.1.0.0/24",
        "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb/providers/Microsoft.Network/virtualNetworks/mahimaVM2/subnets/Subnet1",
        "name": "Subnet1",
        "resourceGroup": "mahimarg4feb"
      }
    ],
    "tags": {}
  }
}
```

Get the id for mahimaVM1

```
vNet1Id=$(az network vnet show \
--resource-group $Rg \
--name $Vnet1 \
--query id --out tsv)
```

Get the id for mahimaVM2

```
vNet2Id=$(az network vnet show \
--resource-group $Rg \
--name $Vnet2 \
--query id \
--out tsv)
```

```
mahima [ ~ ]$ vNet1Id=$(az network vnet show \
--resource-group $Rg \
--name $Vnet1 \
--query id --out tsv)
WARNING: Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
mahima [ ~ ]$ vNet2Id=$(az network vnet show \
--resource-group $Rg \
--name $Vnet2 \
--query id \
--out tsv)
WARNING: Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
```

VNet1 to Vent2

```
az network vnet peering create \
--name mahimaVM1-mahimaVM2 \
--resource-group $Rg \
```

```
--vnet-name $Vnet1 \
--remote-vnet $vNet2Id \
--allow-vnet-access
```

```
mahima [ ~ ]$ az network vnet peering create \
--name mahimaVM1-mahimaVM2 \
--resource-group $Rg \
--vnet-name $Vnet1 \
--remote-vnet $vNet2Id \
--allow-vnet-access
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "allowForwardedTraffic": false,
  "allowGatewayTransit": false,
  "allowVirtualNetworkAccess": true,
  "doNotVerifyRemoteGateways": false,
  "etag": "W/"fa293773-99d2-4ac1-ae38-647d6d48edc2"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb/providers/Microsoft.Network/virtualNetworks/mahimaVM1/virtualNetworkPeerings/mahimaVM1-mahimaVM2",
  "name": "mahimaVM1-mahimaVM2",
  "peeringState": "Initiated",
  "peeringSyncLevel": "RemoteNotInSync",
  "provisioningState": "Succeeded",
  "remoteAddressSpace": {
    "addressPrefixes": [
      "10.1.0.0/16"
    ]
  },
  "remoteVirtualNetwork": {
```

VNet2 to Vent1

```
az network vnet peering create \
--name mahimaVM2-mahimaVM1 \
--resource-group $Rg \
--vnet-name $Vnet2 \
--remote-vnet $vNet1Id \
--allow-vnet-access
```

```
mahima [ ~ ]$ az network vnet peering create \
--name mahimaVM2-mahimaVM1 \
--resource-group $Rg \
--vnet-name $Vnet2 \
--remote-vnet $vNet1Id \
--allow-vnet-access
Command group 'az network' is in preview and under development. Reference and support levels: https://aka.ms/CLI_refstatus
{
  "allowForwardedTraffic": false,
  "allowGatewayTransit": false,
  "allowVirtualNetworkAccess": true,
  "doNotVerifyRemoteGateways": false,
  "etag": "W/"942b96ef-4d93-4d93-acec-5d1ab8579ba3"",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb/providers/Microsoft.Network/virtualNetworks/mahimaVM2/virtualNetworkPeerings/mahimaVM2-mahimaVM1",
  "name": "mahimaVM2-mahimaVM1",
  "peeringState": "Connected",
  "peeringSyncLevel": "FullyInSync",
  "provisioningState": "Succeeded",
  "remoteAddressSpace": {
    "addressPrefixes": [
      "10.0.0.0/16"
    ]
  },
  "remoteVirtualNetwork": {
```

Establishing Connection

```
az network vnet peering show \
--name mahimaVM1-mahimaVM2 \
--resource-group $Rg \
--vnet-name $Vnet1 \
--query peeringState
```

```
mahima [ ~ ]$ az network vnet peering show \
--name mahimaVM1-mahimaVM2 \
--resource-group $Rg \
--vnet-name $Vnet1 \
--query peeringState
Command group 'az network' is in preview and under deve
"Connected"
```

Generate-ssh-keys

```
ssh-keygen -t rsa -b 2048 -f ~/.ssh/mahima_lock
```

```
mahima [ ~ ]$ ssh-keygen -t rsa -b 2048 -f ~/.ssh/mahima_lock
Generating public/private rsa key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/mahima/.ssh/mahima_lock
Your public key has been saved in /home/mahima/.ssh/mahima_lock.pub
The key fingerprint is:
SHA256:7cYbomBuJgmsbonrbV/G7Bi8TAl/080m9yoJAQhNLCM mahima@SandboxHost-638426141942405382
The key's randomart image is:
+---[RSA 2048]---+
|o+o
|E.o.
|.o .
|   . .
|   . . S .
|+  +.+ 00
|+...o*.Bo==
|..++=.0+++.o
|+o.=o=.0o+.
+---[SHA256]---+
```

```
az vm create \
--resource-group $Rg \
--name mahimaVm1 \
--image Ubuntu2204 \
--public-ip-sku Standard \
--vnet-name $Vnet1 \
--subnet Subnet1 \
--ssh-key-value ~/.ssh/mahima_lock.pub \
--no-wait
```

```
az vm create \
--resource-group $Rg \
--name mahimaVm2 \
--image Ubuntu2204 \
--public-ip-sku Standard \
--vnet-name $Vnet2 \
--subnet Subnet1 \
--ssh-key-value ~/.ssh/mahima_lock.pub
```

```
mahima [ ~ ]$ az vm create \
--resource-group $Rg \
--name mahimaVm2 \
--image Ubuntu2204 \
--public-ip-sku Standard \
--vnet-name $Vnet2 \
--subnet Subnet1 \
--ssh-key-value ~/.ssh/mahima_lock.pub
{
  "fqdns": "",
  "id": "/subscriptions/b313aa48-c704-4982-98e9-285b3cd5bf2d/resourceGroups/mahimarg4feb/providers/Microsoft.Compute/virtualMachines/mahimaVm2",
  "location": "eastus",
  "macAddress": "00-22-48-2B-7E-3E",
  "powerState": "VM running",
  "privateIpAddress": "10.1.0.4",
  "publicIpAddress": "20.232.203.140",
  "resourceGroup": "mahimarg4feb",
  "zones": ""
}
```

ssh <publicIpVM2Address>
ssh -i ~/.ssh/mahima_lock mahima@20.232.203.140

```

mahima [ ~ ]$ ssh -i ~/.ssh/mahima_lock mahima@20.232.203.140
The authenticity of host '20.232.203.140 (20.232.203.140)' can't be established.
ED25519 key fingerprint is SHA256:dTJL/p2rdlZTs2QpWlWAHhY9G71GZyejnI1LNsoCwkA.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '20.232.203.140' (ED25519) to the list of known hosts.
Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 6.2.0-1019-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

System information disabled due to load higher than 1.0

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

```

Ping to VM1 ip

ping 10.0.0.4 -c 4

```

mahima@mahimaVm2:~$ ping 10.0.0.4 -c 4
PING 10.0.0.4 (10.0.0.4) 56(84) bytes of data.
64 bytes from 10.0.0.4: icmp_seq=1 ttl=64 time=2.47 ms
64 bytes from 10.0.0.4: icmp_seq=2 ttl=64 time=1.26 ms
64 bytes from 10.0.0.4: icmp_seq=3 ttl=64 time=1.13 ms
64 bytes from 10.0.0.4: icmp_seq=4 ttl=64 time=1.52 ms

--- 10.0.0.4 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 1.134/1.595/2.468/0.522 ms

```

Connection disconnected

```
mahima@mahimaVm2:~$ exit
logout
Connection to 20.232.203.140 closed.
```

Delete RG

```
az group delete --name $Rg -yes
```

```
mahima [ ~ ]$ az group delete --name mahimarg4feb
Are you sure you want to perform this operation? (y/n): y
```

Task 2: PowerShell Basics

Hello World

```
Powerhsell_Examples_Mahima.ps1
1 Write-Host 'Hello, World!'
2 'Hello, World!' | Write-Host
PS C:\Users\mahima.mali> Write-Host 'Hello, World!'
'Hello, World!' | Write-Host
Hello, World!
Hello, World!
1 Write-Output 'Hello, World!'
2 'Hello, World!' | Write-Output
PS C:\Users\mahima.mali> Write-Output 'Hello, World!'
'Hello, World!' | Write-Output
Hello, World!
Hello, World!
1 $wh = 'Hello, World!' | Write-Host
2 $wo = 'Hello, World!' | Write-Output
3
4 Get-Variable wh
5
6 Get-Variable wo
```

| Name | Value |
|------|---------------|
| wh | Hello, World! |
| wo | Hello, World! |

Variables

```
$a = 1337
$b = "Swifty"
$c = 31337, "Swifty"
$d = Get-ChildItem C:\Windows
New-Variable -Name e -Value 1337

$d = Get-ChildItem C:\Windows
New-Variable -Name e -Value 1337
New-Variable : A variable with name 'e' already exists.
At line:5 char:1
+ New-Variable -Name e -Value 1337
+ ~~~~~
+ CategoryInfo          : ResourceExists: (e:String) [New-Variable], SessionStateException
+ FullyQualifiedErrorId : VariableAlreadyExists,Microsoft.PowerShell.Commands.NewVariableCommand
```

| | | |
|---|--------------------|---|
| 1 | \$number = "1337" | |
| 2 | \$number.GetType() | |
| | | IsPublic IsSerial Name ----- True True String |

```
1 [int]$number = 1337
2 $number = "One Thousand, Three Hundred and Thirty-Seven"
3

cannot convert value "One Thousand, Three Hundred and Thirty-Seven" to type
System.Int32". Error: "Input string was not in a correct format."
At line:2 char:1
+ $number = "One Thousand, Three Hundred and Thirty-Seven"
+ ~~~~~~
+ CategoryInfo          : MetadataError: () [], ArgumentTransformationMeta
dataException
+ FullyQualifiedErrorId : RuntimeException
```

Read- Only Variable

```
1 New-Variable -Name myVar -Value 1337 -Option ReadOnly
2 $myVar

PS C:\Users\mahima.mali> New-Variable -Name myVar -Value 1337 -Option ReadOnly
$myVar
1337

1 $myVar = 31337
2

Cannot overwrite variable myVar because it is read-only or constant.
At line:1 char:1
+ $myVar = 31337
+ ~~~~~~
+ CategoryInfo          : WriteError: (myVar:String) [], SessionStateUnauthorizedAccessException
+ FullyQualifiedErrorId : VariableNotWritable

1 $myvar
2 New-Variable -Name myVar -Value 31337 -Option ReadOnly -Force
3 $myVar

New-Variable -Name myVar -Value 31337 -Option ReadOnly -Force
$myVar
31337
31337
```

Constants

```
1 New-Variable -Name myConst -Value "This CANNOT be changed" -Option Constant
2 $myConst

PS C:\Users\mahima.mali> New-Variable -Name myConst -Value "This CANNOT be changed"
$myConst
This CANNOT be changed

1 New-Variable -Name myConst -Value "I'm going to change it" -Option Constant -
2

PS C:\Users\mahima.mali> New-Variable -Name myConst -Value "I'm going to change it"
New-Variable : Cannot overwrite variable myConst because it is read-only or
constant.
At line:1 char:1
+ New-Variable -Name myConst -Value "I'm going to change it" -Option Co ...
+ ~~~~~~
+ CategoryInfo          : WriteError: (myConst:String) [New-Variable], SessionStateUnauthorizedAccessException
+ FullyQualifiedErrorId : VariableNotWritable,Microsoft.PowerShell.Commands.NewVariableCommand
```

For

```
1 for ($i = 1; $i -le 5; $i++){
2     Write-Host $i
3 }
```

```
PS C:\Users\mahima.mali> for ($i = 1; $i -le 5; $i++){
    Write-Host $i
}
1
2
3
4
5
```

```
1 for ($i = '' ; $i.length -le 20; $i += '='){
2     Write-Host $i
3 }
```

For Each

```
1 $list = @('a', 'b', 'c', 'd');
2
3 foreach($item in $list){
4     Write-Host $item
5 }
```

a
b
c
d

```
1 $list = @('a', 'b', 'c', 'd');
2
3 $list | ForEach-Object { Write-Host $_ }
```

a
b
c
d

```
1 Get-Help ForEach-Object
```

NAME
ForEach-Object

SYNTAX

```
ForEach-Object [-Process] <scriptblock[]> [-InputObject <psobject>] [-Begin <scriptblock>] [-End <scriptblock>] [-RemainingScripts <scriptblock[]>] [-WhatIf] [-Confirm] [<CommonParameters>]
```

```
ForEach-Object [-MemberName] <string> [-InputObject <psobject>] [-ArgumentList <Object[]>] [-WhatIf] [-Confirm] [<CommonParameters>]
```

ALIASES
foreach
%

REMARKS

```
Get-Help cannot find the Help files for this cmdlet on this computer. It is displaying only partial help.  
-- To download and install Help files for the module that includes this cmdlet, use Update-Help.  
-- To view the Help topic for this cmdlet online, type: "Get-Help ForEach-Object -Online" or go to https://go.microsoft.com/fwlink/?LinkId=113300.
```

If/ Else

```
1 $value = 5
2
3 if ($value -gt 1) {
4     Write-Host "value is greater than 1"
5 }
```

value is greater than 1

```
1 $value = 5
2
3 if ($value -gt 10) {
4     Write-Host "value is greater than 10"
5 }
6 else {
7     Write-Host "value is $value"
8 }
9
10 if ($value -gt 10) {
11     Write-Host "value is greater than 10"
12 }
13 elseif ($value -lt 10) {
14     Write-Host "value is less than 10"
15 }
16 else {
17     Write-Host "value is 10"
18 }
19
Write-Host "value is 10"
}
value is 5
value is less than 10
```

Switch

```
1 $month = 7
2 switch ($month) {
3     1 { Write-Host "January" }
4     2 { Write-Host "February" }
5     3 { Write-Host "March" }
6     4 { Write-Host "April" }
7     5 { Write-Host "May" }
8     6 { Write-Host "June" }
9     7 { Write-Host "July" }
10    8 { Write-Host "August" }
11    9 { Write-Host "September" }
12    10 { Write-Host "October" }
13    11 { Write-Host "November" }
14    12 { Write-Host "December" }
15    default { Write-Host "Invalid month" }
}
```

July

Wildcards

```

1 # Using the -Wildcard parameter
2 $msg = "Warning, the action failed"
3 switch -Wildcard ($msg) {
4     "Error*" { "Action error" }
5     "Warning*" { "Action warning" }
6     "Successful*" { "Action succesfull" }
7 }
8
9 ## Or use it in the conditions
10 $msg = "Successful, the action failed"
11 switch ($msg) {
12     { $_ -like "Error*" } { "Action error" }
13     { $_ -like "Warning*" } { "Action warning" }
14     { $_ -like "Successful*" } { "Action succesfull" }
15 }

```

Multiple conditions

```

1 switch ((Get-Date).Day) {
2     { $_ -le 10 } { "Day of the month is lower than 10" }
3     { $_ -gt 10 -and $_ -le 25 } { "Day of the month is between 10 and 25" }
4     { $_ -gt 25 } { "Day of the month is greater than 25" }
5 }

```

Arrays

Creating Arrays

```

1 $values = @("One", "Two", "Three", "Four", "Five")
2 $values
3 $values.GetType()

```

```

1 $values = "Six", "Seven", "Eight", "Nine", "10"
2 $values
3

```

```

1 [int[]]$values = 6, 7, 8, 9, 10
2 $values
3

```

```

151 [array]$values = 11, 12, 13, 14, 15
152 $values
153

```

Adding and changing values in array

```

155 $values = @("One", "Two", "Three")
156 $values
157 # Counting the items in the array using the Count property
158 Write-Host "Items in array $($values.Count)"
159 # Add a value to the array using the + operator
160 $values += "Four"
161 $values
162 Write-Host "Items in array $($values.Count)"
163
164 # Change a value in the array using the index
165 $values[0] = "Three"
166 $values
167

```

```

One
Two
Three
Items in array 3
One
Two
Three
Four
Items in array 4
Three
Two
Three
Four

```

Accessing array

```

168 [array]$values = 1, 2, 3, 4, 5
169 Write-Host "Item at index 2: $($values[2])"
170

```

```

Write-Host "Item at index 2: $($values[2])"
Item at index 2: 3

```

Looping through arrays

```

171 $nameArray = @("Erik", "Penny", "Randy", "Sandy")
172 for ($i = 0; $i -lt $nameArray.Length; $i++) {
173     Write-Host $nameArray[$i]
174 }
175

```

```

}
Erik
Penny
Randy
Sandy
Toby
Uma
Vicky
Will
Xavier
Yvette
Zach

```

Multidimensional arrays

Jagged Arrays

```

178 #Multidimensional Arrays
179 $array = @(1, 2, (1, 2, 3), 3, 4, (10, 11, 12), 5)
180 $array[0]
181 $array[1]
182 $array[2]
183 $array[2][0]
184 $array[2][1]
185 $array[5]
186
187

```

```

$array[5]
1
2
1
2
3
1
2
10
11
12

```

```
-->
188 $array = New-Object 'object[,]' 5,8
189 $array[2,5] = 'Hello'
190 $array[3,7] = 'World!'
191 $array
```

```
$array[5,7] = 'world'
$array
Hello
World!
```

Hash tables

```
-->
196 $employees = @{}
197 # Adding values using integers
198 $employees.Add(1, "John")
199 $employees.Add(2, "Mary")
200 $employees.Add(3, "Bob")
201 $employees.Add(4, "Sam")
202
203 $address = @{}
204
205 # Adding values using strings
206 $address.Add("John", "123 Main Street")
207 $address.Add("Mary", "456 North Street")
208 $address.Add("Bob", "789 West Street")
209 $address.Add("Sam", "321 South Street")
210
211 # Creating the hashtable in one go with values
212 $zipCodes = @{
213     "John" = "12345"
214     "Mary" = "54321"
215     "Bob" = "98765"
216     "Sam" = "32145"
217 }
218
219 $employees[4]
220 $address["Mary"]
221 $zipCodes.Sam
```

```
$zipCodes.Sam
Sam
456 North Street
32145
```

```
-->
223 $employees.keys | Sort-Object $_ | ForEach-Object {
224     Write-Host "Employee ID $($_) : $($employees[$_])"
225 }
226
227 foreach ($key in $address.Keys) {
228     Write-Host "$($key) lives at $($address[$key])"
229 }
```

```
-->
    Write-Host "$($key) lives at $($address[$key])"
}
Employee ID 1 : John
Employee ID 2 : Mary
Employee ID 3 : Bob
Employee ID 4 : Sam
Bob lives at 789 West Street
John lives at 123 Main Street
Sam lives at 321 South Street
Mary lives at 456 North Street
```

```

232 $EmployeeAddress = @{
233     Name      = "Mary"
234     Address   = "456 North Street"
235     Zipcode   = "54321"
236 }
237
238 $EmployeeAddress

```

| \$EmployeeAddress | |
|-------------------|------------------|
| Name | Value |
| --- | ---- |
| Name | Mary |
| Zipcode | 54321 |
| Address | 456 North Street |


```

240 $EmployeeAddress = @{
241     Name      = "Mary"
242     Address   = "456 North Street"
243     Zipcode   = "54321"
244 }
245
246 $EmployeeAddress.Remove("Zipcode")
247
248 $EmployeeAddress

```

| Name | Value |
|---------|------------------|
| --- | ---- |
| Name | Mary |
| Address | 456 North Street |


```

250 $Addresses = @()
251
252 $Addresses += [ordered]@{Name = "John"; Address = "123 Main Street" }
253 $Addresses += [ordered]@{Name = "Sam"; Address = "321 South Street" }
254
255 $Addresses += @{Name = "Mary"; Address = "456 North Street" }
256 $Addresses += @{Name = "Bob"; Address = "789 West Street" }
257
258 $Addresses

```

| Name | Value |
|---------|------------------|
| --- | ---- |
| Name | John |
| Address | 123 Main Street |
| Name | Sam |
| Address | 321 South Street |
| Name | Mary |
| Address | 456 North Street |
| Name | Bob |
| Address | 789 West Street |

Functions

```

276 #Functions
277 function writeHelloWorld() {
278     Write-Host "Hello World!"
279 }
280
281 writeHelloWorld

```

| writeHelloWorld | Hello World! |
|-----------------|--------------|

```

285 function writeMessage {
286     param(
287         [string]$Message
288     )
289     Write-Host "Message: $Message"
290 }
291
292 writeMessage "Hello World!"
293 writeMessage -message "Who is there?"
```

writeMessage "Hello World!"
 writeMessage -message "Who is there?"
 Message: Hello World!
 Message: Who is there?

```

297 function writeMessage {
298     param(
299         [Parameter(Mandatory = $true, Position = 1,
300         [string]$Message
301     )
302     process {
303         Write-Host "Message: $message"
304     }
305 }
306
307 writeMessage "Hello World!"
308 writeMessage
```

)
 process {
 Write-Host "Message: \$message"
 }
}

writeMessage "Hello World!"
 writeMessage
 Message: Hello World!
 cmdlet writeMessage at command pipeline position 1
 Supply values for the following parameters:
 (Type !? for Help.)
 Message: writeMessage: C:\temp\temp.ps1:14:1
 Message: writeMessage: C:\temp\temp.ps1:14:1

```

312 function writeMessage {
313     [CmdletBinding()]
314     param(
315         [Parameter(Mandatory = $true, Position = 1, HelpMessage =
316         [string]$Message
317     )
318     begin {
319         Write-Verbose "Beginning of script"
320         if (($null -eq $Message) -or ($Message -eq "")) {
321             throw "Message cannot be empty";
322         }
323     }
324     process {
325         Write-Host "Message: $message"
326     }
327     end {
328         Write-Host "End of script"
329     }
330 }
331
332 writeMessage "Hello World!" -Verbose
```

}
 writeMessage "Hello World!" -Verbose
 VERBOSE: Beginning of script
 Message: Hello World!
 End of script

Scopes

```

341 #Scopes
342 $var = "bla"
343 $var
344
345

bla

346 $global:varOne = "bla"
347
348 Write-Host "Variable One:" $global:varOne
349
350 # Function to demonstrate local and global scope
351 function MyFunc() {
352     $global:varOne = "bla bla"
353     $varTwo = "boo"
354     return $varTwo
355 }
356
357 Write-Host "Variable Two:" $varTwo
358
359 $varTwo = MyFunc
360 Write-Host "Variable One:" $varOne
361
362 Write-Host "Variable Two:" $varTwo
363

Variable One: bla
Variable Two:
Variable One: bla bla
Variable Two: boo

366 Remove-Variable -Name var1 -ErrorAction SilentlyContinue
367
368 $var1 = "This is a variable"
369
370 Write-Host "var1 = '$var1'"
371
372 function test1 {
373     Write-Host "Inside function, var1 = $var1"
374 }
375
376 test1
377
378 # Now let's do it privately
379 Remove-Variable -Name var1 -ErrorAction SilentlyContinue
380
381 $Private:var1 = "This is a variable"
382
383 function test2 {
384     Write-Host "Inside function with private, var1 = $var1"
385 }
386
387 test2

test2
var1 = 'This is a variable'
Inside function, var1 = This is a variable
Inside function with private, var1 =

391 function myFunc {
392     $Script:VarOne = "Script Scoped"
393     $Var2 = "Function Scoped"
394 }
395
396 myFunc
397 Write-Host "Var 1: $VarOne"
398 Write-Host "Var 2: $Var2"
399

myFunc
Write-Host "Var 1: $VarOne"
Write-Host "Var 2: $Var2"
Var 1: Script Scoped
Var 2:

```

Strings

```

403 #strings
404 $var = "Hello World!"
405
406 "Lorem ipsum dolor sit amet..."
407 $value1 = "Ut enim ad minim veniam... $var"
408 $value2 = 'Duis aute irure dolor in... $var'
409 [string]$value3 = "Excepteur sint occaecat cupidatat non proident..."
410
411 $value1, $value2, $value3
412 write-host $value1, $value2, $value3
413 write-host $value1 $value2 $value3

```

```

write-host $value1 $value2 $value3
Lorem ipsum dolor sit amet...
Ut enim ad minim veniam... Hello World!
Duis aute irure dolor in... $var
Excepteur sint occaecat cupidatat non proident...
Ut enim ad minim veniam... Hello World! Duis aute irure dolor in... $var Excepteur sint occaecat cupidatat non proident...
Ut enim ad minim veniam... Hello World! Duis aute irure dolor in... $var Excepteur sint occaecat cupidatat non proident...

```

Error Actions

```

417 Clear-Host
418
419 $items = @()
420
421 # Generate more items
422 $items += for ($i = 0; $i -le 3; $i++) {
423     "$($env:TEMP)\$($Get-Process -Id $pid)-$($i).txt"
424 }
425
426 # Let's generate some errors
427 $items | ForEach-Object {
428     Get-Item -Path $_ -ErrorAction Inquire
429 }
430

```

```

Get-Item : Cannot find path
'C:\Users\MAHIMA-1.MAL\AppData\Local\Temp\System.Diagnostics.Process
(powershell_ise)-2.txt' because it does not exist.
At line:12 char:5
+     Get-Item -Path $_ -ErrorAction Inquire
+
+ CategoryInfo          : ObjectNotFound: (C:\Users\MAHIMA...hell_ise)-2.t
xt:String) [Get-Item], ItemNotFoundException
+ FullyQualifiedErrorId : PathNotFound,Microsoft.PowerShell.Commands.GetIt
emCommand

Get-Item : Cannot find path
'C:\Users\MAHIMA-1.MAL\AppData\Local\Temp\System.Diagnostics.Process
(powershell_ise)-3.txt' because it does not exist.
At line:12 char:5
+     Get-Item -Path $_ -ErrorAction Inquire
+
+ CategoryInfo          : ObjectNotFound: (C:\Users\MAHIMA...hell_ise)-3.t
xt:String) [Get-Item], ItemNotFoundException
+ FullyQualifiedErrorId : PathNotFound,Microsoft.PowerShell.Commands.GetIt
emCommand

```

Error Handling

```

434 try {
435     # This will generate an error
436     1/0
437     Write-Host "This is executed after the error"
438 } catch [System.DivideByZeroException] {
439     # Catch all errors
440     Write-Host "Divide by zero error occurred.`n$_"
441 } catch {
442     # Catch all errors
443     Write-Host "Oh oh! Another error occurred.`n$_"
444 } finally {
445     Write-Host "Finally!"
446 }

```

```

Divide by zero error occurred.
Attempted to divide by zero.
Finally!

```

Reading Files

```

451 $url = "https://gist.githubusercontent.com/sanderstad/7b9593f7f30abb9f17f9026
452 $filePath = Join-Path -Path $env:temp -ChildPath "samplefile1.txt"
453
454 Invoke-WebRequest -Uri $url -OutFile $filePath
455
456 $url = "https://gist.githubusercontent.com/sanderstad/f59996889fc3ec794d325ad
457 $filePath = Join-Path -Path $env:temp -ChildPath "samplefile2.txt"
458
459 Invoke-WebRequest -Uri $url -OutFile $filePath
460
461 Get-Content -Path (Join-Path -Path $env:temp -ChildPath "samplefile1.txt")
462

```

The screenshot shows a PowerShell window with the following content:

```

$url = "https://gist.githubusercontent.com/sanderstad/7b9593f7f30abb9f17f9026
$filePath = Join-Path -Path $env:temp -ChildPath "samplefile1.txt"
Invoke-WebRequest -Uri $url -OutFile $filePath

$url = "https://gist.githubusercontent.com/sanderstad/f59996889fc3ec794d325ad
$filePath = Join-Path -Path $env:temp -ChildPath "samplefile2.txt"
Invoke-WebRequest -Uri $url -OutFile $filePath

PS C:\Users\mahima.mali>
Get-Content -Path (Join-Path -Path $env:temp -ChildPath "samplefile1.txt")
Utilitatis causa amicitia est quae sit.
Lorem ipsum dolor sit amet, consectetur adipiscitur elit. Collatio igitur ista te
nihil iuvat. Honesta oratio, Socratica, Platonis etiam. Primum in nostrane potest
ate est, quid meminerimus? Duo Reges: constructio interrete. Quid, si etiam iucun
da memoria est praeteritorum malorum? Si quidem, inquit, tollerem, sed relinquo.
An nisi populari fama?

Quamquam id quidem licebit iis existimare, qui tegerint. Summum a vobis bonum vol
uptas dicitur. At hoc in eo M. Refert tamen, quo modo, quid sequatur, quid repugn
et, vident. Iam id ipsum absurdum, maximum malum neglegi.

```

Writing Files

```

464 #Writing Files
465 Add-Content -Path (Join-Path -Path $env:TEMP -ChildPath "test1.txt") -val
466 Add-Content -Path (Join-Path -Path $env:TEMP -ChildPath "test1.txt") -val
467 Get-Content (Join-Path -Path $env:TEMP -ChildPath "test1.txt")

```

The screenshot shows a PowerShell window with the following content:

```

This is just another test
This is just a test
This is just another test
This is just a test
This is just another test
This is just a test
This is just another test

```

Time and Date

```

468 #Time and Date
470
471 Get-Date
472

```

The screenshot shows a PowerShell window with the following content:

```

Get-Date
05 February 2024 11:44:52

```

Sorting

```

473 #Sorting
474
475 $names = @("Muffin", "Romeo", "Noodle", "
476
477
478 $names | Sort-Object -Descending

```

PS C:\Users\mahima.mali> \$names = @("Muffin", "Romeo", "Noodle", "Peanut", "mittens", "Luna", "Jake", "Jack", "Harley", "Gracie")

```

$names | Sort-Object -Descending
Zoe
Romeo
Phoebe
Peanut
Noodle
Muffin
mittens
Luna
Jake
Jack
Harley
Gracie

```

Custom Objects

```

491 #New way
492 $object2 = [PSCustomObject]@{
493     prop1 = "value1"
494     prop2 = "value2"
495 }
496
497 $object2

```

\$object2

| | |
|--------|--------|
| prop1 | prop2 |
| ----- | ----- |
| value1 | value2 |

Splatting

```

499 #Splatting
500
501 Get-ChildItem -Path Env:TEMP -Include "*.txt" -Depth 2 -Recurse
502 $params = @{
503     Path = $Env:TEMP
504     Include = "*.txt"
505     Depth = 2
506     Recurse = $true
507 }
508 Get-ChildItem @params

```

Mode LastWriteTime Length Name
---- -- -- -- --
08-01-2024 12:40 83726 Prof_001_OUTLOOK_2c7c_wsde Before_2024_01.08.07.10.35
08-01-2024 12:40 83782 Prof_002_OUTLOOK_2c7c_wsde After_2024_01.08.10.35.

Directory: C:\Users\mahima.mali\AppData\Local\Temp

| | | | |
|-------|------------------|--------|---------------------------|
| Mode | LastWriteTime | Length | Name |
| a---- | 05-02-2024 11:41 | 607 | samplefile1.txt |
| a---- | 05-02-2024 11:41 | 500 | samplefile2.txt |
| -a--- | 20-01-2024 12:52 | 825681 | Setup Log 2024-01-20 #001 |
| -a--- | 20-01-2024 12:58 | 826134 | Setup Log 2024-01-20 #002 |
| -a--- | 04-02-2024 23:58 | 826134 | Setup Log 2024-02-04 #001 |
| -a--- | 05-02-2024 11:43 | 240 | test1.txt |
| -a--- | 05-02-2024 11:43 | 17 | test2.txt |

Classes

```

513 class Tree {
514     [int]$Height
515     [int]$Age
516     [string]$Color
517
518     # Initialize the tree by setting default values
519     Tree() {
520         $this.Height = 1
521         $this.Age = 0
522         $this.Color = "Green"

```

\$tree = [Tree]::New()

Let the tree grow for 10 years
for (\$i = 0; \$i -lt 10; \$i++) {
 \$tree.Grow()
 \$tree
}

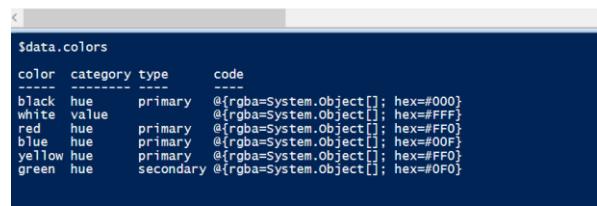
| Height | Age | Color |
|--------|-----|-------|
| 4 | 1 | Green |
| 7 | 2 | Green |
| 10 | 3 | Green |
| 13 | 4 | Green |
| 17 | 5 | Green |
| 19 | 6 | Green |
| 23 | 7 | Green |
| 27 | 8 | Green |
| 28 | 9 | Green |
| 30 | 10 | Green |

JSON

```

549 #JSON
550
551 $url = "https://gist.githubusercontent.com/sanderstad/1c47c1add7476945e"
552 $json = (New-Object System.Net.WebClient).DownloadString($url)
553
554 $data = $json | ConvertFrom-Json
555
556 $data.colors

```



```

$data.colors

color category type      code
----  -----
black  hue     primary  @[{r=0;g=0;b=0}; hex=#000]
white  value   primary  @[{r=255;g=255;b=255}; hex=#FFF]
red    hue     primary  @[{r=255;g=0;b=0}; hex=#FF0]
blue   hue     primary  @[{r=0;g=0;b=255}; hex=#00F]
yellow hue     primary  @[{r=255;g=255;b=0}; hex=#FF0]
green  hue     secondary@[{r=0;g=255;b=0}; hex=#0F0]

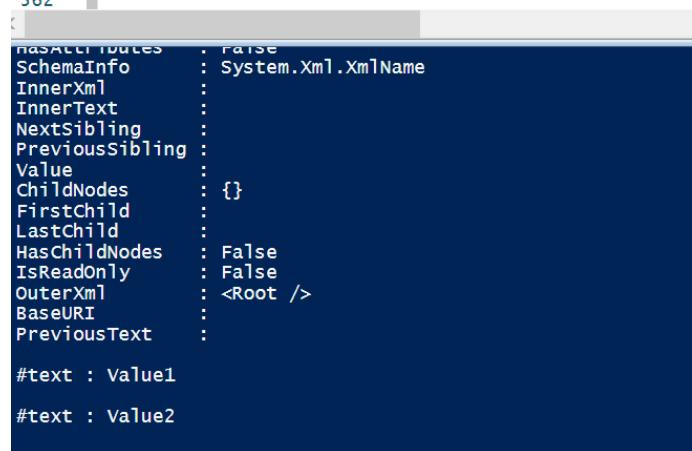
```

XML

```

560 # Creating a simple XML document
561 $xmlDocument = New-Object System.Xml.XmlDocument
562

```



```

Name          : raise
SchemaInfo    : System.Xml.XmlName
InnerXml      :
InnerText     :
NextSibling   :
PreviousSibling:
Value         :
ChildNodes   : {}
FirstChild   :
LastChild    :
HasChildNodes: False
IsReadOnly    : False
OuterXml     : <Root />
BaseURI       :
PreviousText  :

#text : Value1
#text : Value2

```