

Introduction to Cloud Computing

LAB 08

Name: Muhammad Yahya

ID: 2280155

BS-SE 7B

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

- Search for and select **Virtual machines**. Click **Create**.

The screenshot shows the 'Create a virtual machine' wizard in the Azure portal. The 'Basics' tab is selected. The page includes a search bar at the top, a user profile dropdown on the right, and a navigation pane on the left. The main content area contains the following sections:

- Help me choose the right VM size for my workload**, **Help me create a low cost VM**, and **Help me create a VM optimized for high availability** buttons.
- Basics** tab: Includes a note about availability zones, a 'Help me create a low cost VM' button, and a 'Help me create a VM optimized for high availability' button.
- Project details**: Includes a 'Subscription' dropdown set to 'Azure for Students' and a 'Resource group' dropdown set to '(New) az104-rg8'.
- Instance details**: Includes a 'Virtual machine names' field with the value 'az104-vm1, az104-vm2'.

At the bottom, there are navigation buttons: '< Previous', 'Next : Disks >', and 'Review + create'. A 'Give feedback' link is also present.

The screenshot shows the 'Create a virtual machine' wizard in the Azure portal, specifically the 'OS disk' tab. The page includes a search bar at the top, a user profile dropdown on the right, and a navigation pane on the left. The main content area contains the following sections:

- Help me choose the right VM size for my workload**, **Help me create a low cost VM**, and **Help me create a VM optimized for high availability** buttons.
- OS disk**: Includes a 'default when persisting it to the cloud.' checkbox, an 'Encryption at host' checkbox, and a note: 'Encryption at host is not registered for the selected subscription. Learn more >'. Below this are dropdowns for 'OS disk size' (Image default), 'OS disk type' (Premium SSD (locally-redundant storage)), 'Delete with VM' (checked), and 'Key management' (Platform-managed key).
- Data disks for az104-vm1**: Includes a note: 'You can add and configure additional data disks for your virtual machine or attach existing disks. This VM also comes with a temporary disk.'

At the bottom, there are navigation buttons: '< Previous', 'Next : Networking >', and 'Review + create'. A 'Give feedback' link is also present.

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

bsse2280155@szabist.pk
DEFAULT DIRECTORY (BSSE22801...

Home > Compute infrastructure > Virtual machines >

Create a virtual machine

Help me choose the right VM size for my workloadHelp me create a low cost VMHelp me create a VM optimized for high availability

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VMHelp me create a VM optimized for high availabilityHelp me choose the right VM size for my workload

Select inbound ports

Select one or more ports

All traffic from the internet will be blocked by default. You will be able to change inbound port rules in the VM > Networking page.

Delete public IP and NIC when VM is deleted

Enable accelerated networking

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

Load balancing options

☒ None

☐ Azure load balancer

Supports all TCP/UDP network traffic, port-forwarding, and outbound flows.

☐ Application gateway

Web traffic load balancer for HTTP/HTTPS with URL-based routing, SSL termination, session persistence, and web application firewall.

< PreviousNext : Management >Review + create

Give feedback

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

bsse2280155@szabist.pk
DEFAULT DIRECTORY (BSSE22801...

Home > Compute infrastructure > Virtual machines >

Create a virtual machine

Help me choose the right VM size for my workloadHelp me create a low cost VMHelp me create a VM optimized for high availability

Based on the number of availability zones selected, 2 virtual machines will be created. The following settings will be applied to each virtual machine unless specified otherwise.

Help me create a low cost VMHelp me create a VM optimized for high availabilityHelp me choose the right VM size for my workload

BasicsDisksNetworkingManagementMonitoringAdvancedTagsReview + create

Configure monitoring options for your VM.

Alerts

Enable recommended alert rules

Diagnostics

Boot diagnostics

☐ Enable with managed storage account (recommended)

☐ Enable with custom storage account

☒ Disable

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

bsse2280155@szabist.pk
DEFAULT DIRECTORY (BSSE22801...

Home >

CreateVm-MicrosoftWindowsServer.WindowsServer-202-20260108131902 | Overview

Deployment

Search

DeleteCancelRedeployDownloadRefresh

Overview

Inputs

Outputs

Template

Your deployment is complete

Deployment name: CreateVm-MicrosoftWindowsServer.WindowsSe... Start time: 1/8/2026, 2:02:18 PM

Subscription: Azure for Students Correlation ID: 09a9fcee-ce7b-4d70-a229-37e164369eb0

Resource group: az104-rg8

Deployment details

Next steps

Setup auto-shutdown Recommended

Monitor VM health, performance and network dependencies Recommended

Run a script inside the virtual machine Recommended

Go to resourceCreate another VM

Give feedback

Tell us about your experience with deployment

Deployment succeeded

Deployment 'CreateVm-MicrosoftWindowsServer.WindowsServer-202-20260108131902' to resource group 'az104-rg8' was successful.

Go to resourcePin to dashboard

Cost Management

Get notified to stay within your budget and prevent unexpected charges on your bill.

Set up cost alerts >

Microsoft Defender for Cloud

Secure your apps and infrastructure

Go to Microsoft Defender for Cloud >

Free Microsoft tutorials

Start learning today >

Work with an expert

Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.

Find an Azure expert >

Task 2: Manage compute and storage scaling for virtual machines

- On the **az104-vm1** virtual machine, in the **Availability + scale** blade, select **Size**.
- Set the virtual machine size to **D2ds_v4** and click **Resize**.

Microsoft Azure

Home > CreateVm-MicrosoftWindowsServer.WindowsServer-202-20260108131902 | Overview > az104-vm1

az104-vm1 | Size

Virtual machine

Search

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Resource visualizer

Connect

Networking

Settings

Availability + scale

Size

Availability + scaling

Security

Backup + disaster recovery

Operations

Monitoring

Automation

Add or remove favorites by pressing Ctrl+Shift+F

If the virtual machine is currently running, changing its size will cause it to be restarted. Stopping the virtual machine may reveal additional sizes. →

Search by VM size...

Display cost: Monthly

vCPUs: All

RAM (GiB): All

Add filter

Showing 441 VM sizes. | Subscription: Azure for Students | Region: Central India | Current size: Standard_D2ds_v4 | Learn more about VM sizes

Group by series

VM Size	Type	vCPUs	RAM (GiB)	Data disks	Max IOPS	Local storage (GiB)
The 4th generation D family sizes for your general purpose needs						
D2as_v4	General purpose	2	8	4	3200	16 (SCSI)
D2ds_v4	General purpose	2	8	4	3200	75 (SCSI)
D4as_v4	General purpose	4	16	8	6400	32 (SCSI)
D4ds_v4	General purpose	4	16	8	6400	150 (SCSI)
The 3rd generation D family sizes for your general purpose needs						
D2s_v3	General purpose	2	8	4	3200	16 (SCSI)
The 4th generation E family sizes for your high memory needs						
The 3rd generation E family sizes for your high memory needs						
Up to 2X performance boost for vector processing workloads						

Resize

Prices presented are estimates in USD that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Final charges will appear in your local currency in cost analysis and billing views. View Azure pricing calculator.

Give feedback

✓ Resized virtual machine

Successfully resized virtual machine 'az104-vm1' to size 'Standard D2ds v4'.

a few seconds ago

- In the **Settings** area, select **Disks**.
- Under **Data disks** select **Create and attach a new disk**.

Home > az104-vm1

az104-vm1 | Disks ☆ ...

Virtual machine

Search

Refresh | Additional settings | Feedback | Troubleshoot

The configuration of this virtual machine and its attached disk(s) may not allow for the disk(s) to utilize their full throughput performance. The current virtual machine size supports 48 MBps. The total for disk(s) attached to virtual machine 'az104-vm1' is 160 MBps. You can change the virtual machine size to support additional disk(s) throughput. [Learn more](#)

Ask Copilot

OS disk

Swap OS disk

Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption	Host caching
az104-vm1_OsDisk_1_2a9fbd6a8a946fe	Premium SSD LRS	127	500	100	SSE with PMK	Read/write

Data disks

Filter by name

Showing 1 of 1 attached data disks

+ Create and attach a new disk | Attach existing disks

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption	Host caching
0	vm1-disk1	Standard HDD (...)	32	500	60	Platform-managed ...	Read-only

Apply | Discard changes

Add or remove favorites by pressing Ctrl+Shift+F

- Click **Apply**.
- After the disk has been created, click **Detach**.

Refresh | Additional settings | Feedback | Troubleshoot

OS disk

Swap OS disk

Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption	Host caching
az104-vm1_OsDisk_1_2a9fbd6a8a946fe	Premium SSD LRS	127	500	100	SSE with PMK	Read/write

Data disks

Filter by name

Showing 0 of 0 attached data disks

+ Create and attach a new disk | Attach existing disks

LUN	Disk name	Storage type	Size (GiB)	Max IOPS	Max throughput (...)	Encryption	Host caching
No data disks attached							

- Search for and select **Disks**.
- In the **Settings** blade, select **Size + performance**.

The screenshot shows the Microsoft Azure portal interface. On the left, the 'Storage center | Azure Disks' page is visible, with a search bar and a list of storage resources. The 'vm1-disk1' resource is selected. The main pane shows the 'Size + performance' settings for the disk. The storage type is 'Standard SSD (locally-redundant storage)'. A table lists various disk sizes and their performance characteristics.

Size	Disk tier	Provisioned IOPS	Provisioned thro...	Max S
4 GiB	E1	500	100	3
8 GiB	E2	500	100	3
16 GiB	E3	500	100	3
32 GiB	E4	500	100	3
64 GiB	E6	500	100	3
128 GiB	E10	500	100	3
256 GiB	E15	500	100	3
512 GiB	E20	500	100	3
1024 GiB	E30	500	100	5
2048 GiB	E40	500	100	5
4096 GiB	E50	500	100	5
8192 GiB	E60	2000	400	10

Task 3: Create and configure Azure Virtual Machine Scale Sets

- Search for and select **Virtual machine scale sets** and, on the **Virtual machine scale sets** blade, click **Create**.

The screenshot shows the 'Create a Virtual Machine Scale Set (VMSS)' wizard in the Microsoft Azure portal. The 'Basics' tab is selected. The wizard prompts the user to select a subscription, resource group, virtual machine scale set name, region, and availability zone. The 'Autoscaling' option is checked.

Project details

Subscription: Azure for Students

Resource group: az104-rg8

Scale set details

Virtual machine scale set name: vmss1

Region: (Asia Pacific) Central India

Availability zone: Zones 1, 3

Autoscaling can help you respond to an outage by scaling out new instances in another zone.

- Selecting only zones 1 & 3, as zone coverage is limited in some regions for **Azure Student Subscription**.

- On the **Networking** page, select **Edit virtual network link**.

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

Home > Compute infrastructure | Virtual Machine Scale Set (VMSS) > Create a Virtual Machine Scale Set (VMSS) >

vnet-centralindia

Name *

Define the address space of your virtual network with one or more IPv4 or IPv6 address ranges. Create subnets to segment the virtual network address space into smaller ranges for use by your applications. When you deploy resources into a subnet, Azure assigns the resource an IP address from the subnet. [Learn more](#)

+ Add a subnet

Subnets	IP address range	Size	NAT gateway
	10.82.0.0 /20	4,096 addresses	

Add IPv4 address space

You must add at least one subnet to the virtual network.

Save Cancel

Add a subnet

Select an address space and configure your subnet. You can customize a default subnet or select from subnet templates if you plan to add select services later. [Learn more](#)

Subnet purpose

Name *

IPv4

Include an IPv4 address space ☒

IPv4 address range

10.82.0.0 - 10.82.15.255

Starting address *

Size

Subnet address range

IPv6

Include an IPv6 address space ☐ This virtual network has no IPv6 address ranges.

Private subnet

Private subnets enhance security by not providing default outbound access. To enable outbound connectivity for virtual machines to access the internet, it is necessary to explicitly grant outbound access. A NAT gateway is the recommended way to provide outbound

Add Cancel Give feedback

- In the **Networking** tab, click the **Edit network interface**.

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

Home > Virtual machine scale set >

Create a Virtual Machine Scale Set (VMSS)

Basics Spot Disks **Networking** Management Health Advanced Tags Review + create

Define network connectivity for your virtual machine by configuring network interface card (NIC) settings. You can control ports, inbound and outbound connectivity with security group rules, or place behind an existing load balancing solution. [Learn more about VMSS networking](#)

Virtual network configuration

Azure Virtual Network (VNet) enables many types of Azure resources to securely communicate with each other, the internet, and on-premises networks. [Learn more about VNets](#)

Virtual network

Subnet *

10.82.0.0 - 10.82.0.255 (256 addresses)

Network interface

A network interface enables an Azure virtual machine to communicate with internet, Azure, and on-premises resources. A VM can have one or more network interfaces.

+ Create new nic Delete

NAME	CREATE PUBL...	SUBNET	NETWORK SECU...	ACCELERATED N...
<input type="checkbox"/> vmss-vnet-nic01	No	subnet0 (10.82.0.0/24)	Basic	On

< Previous Next : Management > Review + create Give feedback

- Select **Advanced** and then click **Create new** under the **Configure network security group** drop-down list.

Microsoft Azure

Home > Virtual machine scale set > Create a Virtual Machine Scale Set (VMSS) >

Edit network interface

Network interface

Name *
vmss-vnet-nic0

Virtual network ⓘ
vmss-vnet

Subnet ⓘ
subnet0 (10.82.0.0/24)

NIC network security group ⓘ
☐ None
☒ Basic
☐ Advanced

Public inbound ports * ⓘ
☒ None
☐ Allow selected ports

Select inbound ports
 Select one or more ports

ⓘ All traffic from the internet will be blocked by default. You will be able to choose inbound and outbound rules in the NSG - Network security group.

OK Cancel Give feedback

- Click **Add an inbound rule** and add an inbound security rule.

Microsoft Azure

Home > Virtual machine scale set > Create a Virtual Machine Scale Set (VMSS) >

Create network security group

Name *
vmss1-nsg

Inbound rules ⓘ
 1000: default-allow-ssh
 Any
 SSH (TCP/22)
 + Add an inbound rule

Outbound rules ⓘ
 No results.
 + Add an outbound rule

Add inbound security rule

vmss1-nsg

Source ⓘ
Any

Source port ranges * ⓘ
*

Destination ⓘ
Any

Service ⓘ
HTTP

Destination port ranges ⓘ
80

Protocol
☐ Any
☒ TCP
☐ UDP
☐ ICMPv4
☐ ICMPv6

Action
☒ Allow
☐ Deny

Add Cancel Give feedback

OK

- Click **Add** and, back on the **Create network security group** blade, click **OK**.

- In the **Edit network interface** blade, in the **Public IP address** section, click **Enabled**.

Microsoft Azure

Home > Virtual machine scale set > Create a Virtual Machine Scale Set (VMSS) >

Edit network interface

Network interface

Name *
vmss-vnet-nic01

Virtual network
vmss-vnet

Subnet *
subnet0 (10.82.0.0/24)

NIC network security group
☐ None
☐ Basic
☒ Advanced

Configure network security group *
(new) vmss1-nsg
[Create new](#)

Public IP address

Public IP addresses have a nominal charge. [Estimate price](#)

Accelerated networking

[OK](#) [Cancel](#) [Give feedback](#)

- In the ****Networking**** tab, **Create a load balancer**.

Microsoft Azure

Home > Virtual machine scale set >

Create a Virtual Machine Scale Set (VMSS)

can have one or more network interfaces.

[+ Create new nic](#) [Delete](#)

<input type="checkbox"/>	NAME	CREATE PUBL...	SUBNET	NETWORK SECU...	ACCELERATED N...
<input type="checkbox"/>	vmss-vnet-nic01	Yes	subnet0 (10.82.0.0/24)	Advanced	On

Load balancing

You can place this virtual machine in the backend pool of an existing Azure load balancing solution. [Learn more](#)

Load balancing options
☐ None
☒ **Azure load balancer**
 Supports all TCP/UDP network traffic, port-forwarding, and outbound flows.
☐ **Application gateway**
 Web traffic load balancer for HTTP/HTTPS with URL-based routing, SSL termination, session persistence, and web application firewall.

⚠ To allow traffic from your load balancing product, please update the appropriate port configuration on your network security group associated with your network interface.

Select a load balancer *
 No existing load balancers in current subscription and location.
[Create a load balancer](#)

[< Previous](#) [Next : Management >](#) [Review + create](#)

Create a load balancer

Details such as subscription and resource group will be inherited from the virtual machine that you're creating. A default IP, backend pool, and load balancer rule will be created on your behalf, though certain configurations can be changed if desired.

Load balancer name *
vmss-lb

Type *
☒ **Public**
 Provides outbound connections for virtual machines inside your virtual network using public load balancers.
☐ **Internal**
 Used to load balance traffic inside a virtual network. A load balancer frontend can be accessed from an on-premises network in a hybrid scenario.

Protocol *
☒ **TCP**
☐ UDP

Rules
☒ Load balancer rule
☒ Inbound NAT rule

[Create](#) [Cancel](#)

- On the **Review + create** tab, ensure that the validation passed and click **Create**.

Microsoft Azure

Search resources, services, and docs (G+)

Copilot

bsse2280155@szabist.pk
DEFAULT DIRECTORY (BSSE22801...

Home > Virtual machine scale set >


Create a Virtual Machine Scale Set (VMSS)

Microsoft Defender for Cloud


Microsoft Defender for Cloud provides unified security management and advanced threat protection across hybrid cloud workloads. [Learn more](#)


✓ Your subscription is protected by Foundational Cloud Security Posture Management Free Plan.


Upgrade policy

Upgrade mode  Manual - Existing instances must be manually upgraded

Monitoring

Boot diagnostics  ☐ Enable with managed storage account (recommended)
☐ Enable with custom storage account
☒ Disable

Enable notifications for instance termination  ☐

Enable notifications for OS image upgrades or re-image  ☐

LAB_08-Managed_Virtual_Machines - Notepad

Identity

There are two types of managed identity: system-assigned and user-assigned. System-assigned identities are directly linked to a

< Previous Next: Health > Review + create

[Give feedback](#)

Microsoft Azure

Search resources, services, and docs (G+)







Copilot

bsse2280155@szabist.pk
DEFAULT DIRECTORY (BSSE22801...

Home >

CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20260108160526 | Overview

Deployment

Search  <<  Delete  Cancel  Redeploy  Download  Refresh

Overview

Inputs

Outputs

Template

✓ Your deployment is complete

Deployment name : CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20260108160526 Start time : 1/8/2026, 4:28:27 PM
Subscription : Azure for Students Correlation ID : b417dd18-2c25-4162-b8d9-02fa88d2a2eb
Resource group : az104-rg8

> Deployment details

Next steps

[Go to resource](#)

Give feedback

[Tell us about your experience with deployment](#)

Cost management

Get notified to stay within your budget and prevent unexpected charges on your bill. [Set up cost alerts >](#)

Microsoft Defender for Cloud

Secure your apps and infrastructure [Go to Microsoft Defender for Cloud >](#)

Free Microsoft tutorials

[Start learning today >](#)

Work with an expert

Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support. [Find an Azure expert >](#)

Task 4: Scale Azure Virtual Machine Scale Sets

- Select **Go to resource** or search for and select the **vmss1** scale set.
- Choose **Availability + Scale** from the left side menu, then choose **Scaling**.

Microsoft Azure

Home > CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20260108160526 | Overview > vmss1

vmss1 | Scaling

Virtual machine scale set

Search

Save Discard Refresh Logs Feedback

Overview Activity log Access control (IAM) Tags Diagnose and solve problems Instances Resource visualizer Networking Settings Availability + scale

Scaling

Availability Size Security Operations Monitoring Automation

Configure Scale-In Policy Predictive charts Run history JSON Notify Diagnostic settings

Autoscale is a built-in feature that helps applications perform their best when demand changes. You can choose to scale your resource manually to a specific instance count, or via a custom Autoscale policy that scales based on metric(s) thresholds, or schedule instance count which scales during designated time windows. Autoscale enables your resource to be performant and cost effective by adding and removing instances based on demand. [Learn more about Azure Autoscale](#) or [view the how-to videos](#).

Choose how to scale your resource

Manual scale Custom autoscale

Manual scale

Override condition

Instance count 1

- Select **Add a rule**.

Microsoft Azure

Home > CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20260108160526 | Overview > vmss1

vmss1 | Scaling

Virtual machine scale set

Search

Save Discard Refresh Logs Feedback

Overview Activity log Access control (IAM) Tags Diagnose and solve problems Instances Resource visualizer Networking Settings Availability + scale

Scaling

Availability Size Security Operations Monitoring Automation

Scale rule

Autoscale setting name * vmss1-Autoscale-748

Resource group az104-rg8

Predictive autoscale Mode Disabled Pre-launch setup of instance

Enable Forecast only or Predictive autoscale. [Learn more about Predictive autoscale](#)

Default * Auto created default scale condition

Delete warning The very last or default recurrence rule cannot be deleted. Instead, off autoscale.

Scale mode Scale based on a metric Scale to a specific instance count

Rules Scale is based on metric trigger rules but no rule(s) is defined; click example: 'Add a rule that increases instance count by 1 when CPU rules is defined, the resource will be set to default instance count.

Instance limits Minimum * 1 Maximum * 1

Schedule This scale condition is executed when none of the other scale conditions are

Percentage CPU (Average) 61.14 %

Operator * Greater than Metric threshold to trigger scale action * 70 %

Duration (minutes) * 10 Time grain (minutes) 1

Time grain statistic * Average Time aggregation * Average

Action Operation * Increase percent by Cool down (minutes) * 5

Percentage * 50

Add

- Create a rule that decreases the number of VM instances in a scale set. Select **Add a rule**.

The screenshot shows the Azure portal interface for configuring a scale rule for a virtual machine scale set named 'vmss1'. The 'Scale rule' dialog is open, displaying a line graph of CPU usage over time. The configuration for the rule is as follows:

- Resource group:** az104-rg8
- Predictive autoscale:** Mode is set to 'Disabled'.
- Scale mode:** 'Scale based on a metric' is selected.
- Rules:**
 - Scale out:** When 'vmss1' (Average) Percentage CPU > 70, Increase percent by 50.
 - Scale in:** When 'vmss1' (Average) Percentage CPU < 30, Decrease percent by 50.
- Instance limits:** Minimum is 2, Maximum is 10, and Default is 2.
- Schedule:** This scale condition is executed when none of the other scale condition(s) match.

- Set the instance limits

The screenshot shows the 'vmss1 | Scaling' page in the Azure portal, focusing on the 'Instance limits' section. The configuration is as follows:

- Instance limits:**
 - Minimum:** 2
 - Maximum:** 10
 - Default:** 2
- Scale in rule:** When 'vmss1' (Average) Percentage CPU < 30, Decrease percent by 50.

- Save your changes.