

CSI ASSIGNMENT 6

DEPLOYING 3TIER ARCHITECTURE

Objective

The objective of this assignment is to simulate a real-world cloud-based deployment architecture using Microsoft Azure. The architecture will be composed of three distinct tiers, each representing a functional layer in a typical enterprise application stack:

- **Web Tier:** This tier will handle incoming traffic from the internet. It will host public-facing services, such as a web server.
- **App Tier:** This tier will serve as the intermediary between the front-end web servers and the back-end databases. It processes business logic.
- **DB Tier:** This tier will securely store and manage the application's data.

Each tier will be deployed in its own subnet within a Virtual Network (VNet) and will be secured with Network Security Groups (NSGs) to restrict traffic flow. The configuration must ensure that:

- The **Web Tier** can access the **App Tier** and the Internet.
- The **App Tier** can access both the **Web Tier** and the **DB Tier**.
- The **DB Tier** is isolated from both the **Web Tier** and the **App Tier**.
- Only the **Web Tier** is allowed to access the Internet.

Each tier will host two Virtual Machines (VMs): one running **Linux (Apache Web Server)** and one running **Windows (IIS Web Server)**.

1. Prerequisites

Before starting this assignment, ensure you have the following:

- An active **Microsoft Azure subscription**.
- Basic understanding of Azure Portal navigation.
- SSH client installed (for Linux VM access).
- Remote Desktop Client (RDP) installed (for Windows VM access).
- Basic knowledge of networking and HTTP services (Apache/IIS).

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In enterprise applications, tiered architecture is a common design pattern. Here's how our system will be structured:

- **Web Tier:** Acts as a reverse proxy or user interface. Hosts Apache/IIS web servers. Exposed to the internet.
- **App Tier:** Handles logic processing. Not exposed to the internet.
- **DB Tier:** Manages data persistence. Completely isolated.

2. Step 1: Creating the Virtual Network (VNet)

1. Go to the **Azure Portal**:
2. In the left menu, select **Virtual networks > + Create**.
3. Under the **Basics** tab:
 - Subscription: Choose your subscription
 - Resource Group: Create a new one
 - Name: myvnet
 - Region: Select a region (e.g., East US)
4. Click **Next: IP Addresses**:
 - Address space: 10.0.0.0/16 (this gives us space for multiple subnets)
5. Click **Next** until **Review + Create**, then click **Create**.

The screenshot shows the 'Create virtual network' page in the Azure Portal, specifically the 'Basics' tab. The page is titled 'Create virtual network' and has a breadcrumb trail: 'Home > Network foundation | Virtual networks >'. Below the title, there are tabs for 'Basics', 'Security', 'IP addresses', 'Tags', and 'Review + create'. The 'Basics' tab is active. Under the heading 'your resources.', there are two dropdown menus: 'Subscription' (set to 'Azure for Students') and 'Resource group' (set to 'NNet1_group'). Below these, there is a link 'Create new'. Under the heading 'Instance details', there are two input fields: 'Virtual network name' (containing 'MyVnet') and 'Region' (set to '(US) East US'). At the bottom of the page, there are three buttons: 'Previous', 'Next', and 'Review + create'. The 'Review + create' button is highlighted. In the bottom right corner, there is a link 'Give feedback'.

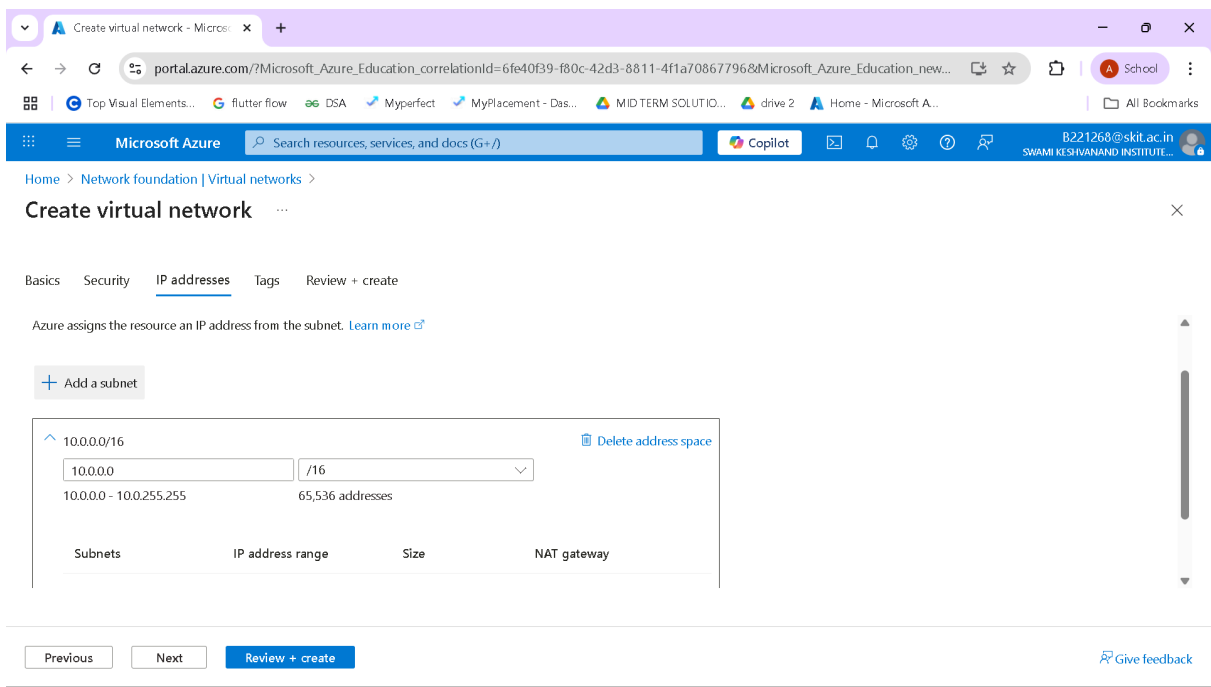
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Step 2: Creating Subnets

- 1. After the VNet is created, go to it → **Subnets** > **+ Subnet**.
- 2. Create the following subnets:

Subnet Name	Address Range
WebSubnet	10.0.1.0/24
AppSubnet	10.0.2.0/24
DBSubnet	10.0.3.0/24

Repeat for each subnet from add a subnet .



Step 3: Creating Network Security Groups (NSGs)

Each subnet will be protected by its own NSG to enforce access rules.

Create NSG for Web Tier (WebNSG)

- Go to **Network Security Groups > + Create**
- Name:webnsg
- Add the following inbound rules:
 - Allow **HTTP (Port 80)** from Internet (Priority: 100)
 - Allow **SSH (Port 22)** from your IP (Priority: 110)
 - Allow **RDP (Port 3389)** from your IP (Priority: 120)
 - Allow traffic from **AppSubnet** (Priority: 130)

Create NSG for App Tier (AppNSG)

- Allow traffic from **WebSubnet** (Priority: 100)
- Allow traffic to/from **DBSubnet** (Priority: 110)

Create NSG for DB Tier (DBNSG)

- No inbound or outbound rules (Azure blocks all by default)
- This ensures DB is isolated

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Step 4: Deploying Virtual Machines

The screenshot displays the Microsoft Azure portal interface for a virtual machine named 'web-linux-vm'. The page is titled 'web-linux-vm' and 'Virtual machine'. The left sidebar contains a navigation menu with options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Connect, Networking, Settings, Availability + scale, Security, Backup + disaster recovery, Operations, Monitoring, Automation, and Help. The main content area shows the 'Overview' tab selected. At the top, there's a search bar and a 'Copilot' button. Below the search bar, there's a section for 'Essentials' with various actions like Connect, Start, Restart, Stop, Hibernate, Capture, Delete, Refresh, Open in mobile, Feedback, and CLI / PS. The 'Essentials' section lists key details: Resource group (rg-3tier-arch), Status (Running), Location (Central India (Zone 1)), Subscription (Azure for Students), Subscription ID (2ff64d01-4ca7-4b1f-91ae-237551bc34dc), Availability zone (1), Operating system (Linux (ubuntu 24.04)), Size (Standard B1s (1 vcpu, 1 GiB memory)), Public IP address, Virtual network/subnet, DNS name, Health state, and Time created (13/7/2025, 7:04 pm UTC). Below this, there's a 'Properties' tab with a table showing details for the 'Virtual machine': Computer name (web-linux-vm), Operating system (Linux (ubuntu 24.04)), VM generation (V2), VM architecture (x64), and Agent status (Ready). To the right of the 'Properties' tab, there's a 'Networking' section with details for Public IP address, Private IP address, and Virtual network/subnet. A 'JSON View' link is also present.

The screenshot displays the Microsoft Azure portal interface for a virtual machine named 'app-linux-vm'. The page is titled 'app-linux-vm' and 'Virtual machine'. The left sidebar contains a navigation menu with options like Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Resource visualizer, Connect, Networking, Settings, Availability + scale, Security, Backup + disaster recovery, Operations, Monitoring, Automation, and Help. The main content area shows the 'Overview' tab selected. At the top, there's a search bar and a 'Copilot' button. Below the search bar, there's a section for 'Essentials' with various actions like Connect, Start, Restart, Stop, Hibernate, Capture, Delete, Refresh, Open in mobile, Feedback, and CLI / PS. The 'Essentials' section lists key details: Resource group (rg-3tier-arch), Status (Running), Location (Central India (Zone 1)), Subscription (Azure for Students), Subscription ID (2ff64d01-4ca7-4b1f-91ae-237551bc34dc), Availability zone (1), Operating system (Linux (ubuntu 24.04)), Size (Standard B1s (1 vcpu, 1 GiB memory)), Public IP address, Virtual network/subnet, DNS name, Health state, and Time created (13/7/2025, 7:12 pm UTC). Below this, there's a 'Properties' tab with a table showing details for the 'Virtual machine': Computer name (app-linux-vm), Operating system (Linux (ubuntu 24.04)), VM generation (V2), VM architecture (x64), and Agent status (Ready). To the right of the 'Properties' tab, there's a 'Networking' section with details for Public IP address, Private IP address, and Virtual network/subnet. A 'JSON View' link is also present.

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The screenshot displays the Azure portal interface for a virtual machine named 'db-linux-vm'. The left sidebar shows the navigation menu with 'Overview' selected. The main content area is divided into two sections: 'Essentials' and 'Properties'. The 'Essentials' section provides a quick overview of the VM's status and location. The 'Properties' section is further divided into 'Virtual machine' and 'Networking' tabs. The 'Virtual machine' tab shows details such as the computer name, operating system, VM generation, and agent status. The 'Networking' tab shows the public and private IP addresses, DNS name, and virtual network/subnet.

Property	Value
Resource group	rg-3tier-arch
Status	Running
Location	Central India (Zone 1)
Subscription	Azure for Students
Subscription ID	2ff64d01-4ca7-4b1f-91ae-237551bc34dc
Availability zone	1
Operating system	Linux (ubuntu 24.04)
Size	Standard B1s (1 vcpu, 1 GiB memory)
Public IP address	-
Virtual network/subnet	MyVNet/db-subnet
DNS name	-
Health state	-
Time created	13/7/2025, 7:15 pm UTC

Property	Value
Computer name	db-linux-vm
Operating system	Linux (ubuntu 24.04)
VM generation	V2
VM architecture	x64
Agent status	Ready
Agent version	2.140.1

Property	Value
Public IP address	-
Public IP address (IPv6)	-
Private IP address	10.0.3.4
Private IP address (IPv6)	-
Virtual network/subnet	MyVNet/db-subnet
DNS name	-

The screenshot displays the Azure portal interface for a virtual machine named 'web-win-vm'. The left sidebar shows the navigation menu with 'Overview' selected. The main content area is divided into two sections: 'Essentials' and 'Properties'. The 'Essentials' section provides a quick overview of the VM's status and location. The 'Properties' section is further divided into 'Virtual machine' and 'Networking' tabs. The 'Virtual machine' tab shows details such as the computer name, operating system, VM generation, and agent status. The 'Networking' tab shows the public and private IP addresses, DNS name, and virtual network/subnet.

Property	Value
Resource group	rg-3tier-arch
Status	Running
Location	Central India (Zone 1)
Subscription	Azure for Students
Subscription ID	2ff64d01-4ca7-4b1f-91ae-237551bc34dc
Availability zone	1
Operating system	Windows (Windows Server 2022 Datacenter Azure Edition)
Size	Standard B1s (1 vcpu, 1 GiB memory)
Public IP address	20.244.35.67
Virtual network/subnet	MyVNet/web-subnet
DNS name	Not configured
Health state	-
Time created	13/7/2025, 7:34 pm UTC

Property	Value
Computer name	web-win-vm
Operating system	Windows (Windows Server 2022 Datacenter Azure Edition)
VM generation	V2
VM architecture	x64
Agent status	Ready
Agent version	2.7.41491.1149
Hibernation	Disabled

Property	Value
Public IP address	20.244.35.67 (Network interface web-win-vm631_x1)
Public IP address (IPv6)	-
Private IP address	10.0.1.5
Private IP address (IPv6)	-
Virtual network/subnet	MyVNet/web-subnet
DNS name	Configure

Common Settings:

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- Resource Group: threetierrg
- Size: Use B1s (for cost-saving)
- Region: Same as VNet

Linux VM (Ubuntu Server)

1. VM Name: e.g., weblinuxvm
2. Image: Ubuntu 20.04 LTS
3. Authentication: SSH Public Key
4. Networking:
 - VNet: myvnet
 - Subnet: websubnet (or as required)
 - NSG: webbnsg

Windows VM (Windows Server 2019)

1. VM Name:
2. Image: Windows Server 2019 Datacenter
3. Authentication: Password
4. Networking: Same as Linux VM (choose appropriate subnet & NSG)

Create the following VMs:

Tier	Linux VM	Windows VM
web	Web-Linux-VM	Web-Windows-VM
App	App-Linux-VM	App-Windows-VM
DB	DB-Linux-VM	DB-Windows-VM

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Microsoft Azure portal screenshot showing the Virtual machines page. The page displays a list of virtual machines with columns: Name, Subscription, Resource Group, Location, Status, Operating system, Size, Public IP address, and Disks. The machines listed are:

Name	Subscription	Resource Group	Location	Status	Operating system	Size	Public IP address	Disks
app-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	4.240.106.111	1
db-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	-	1
Linux-VM	Azure for Stude...	RG-VNet-PeerD...	East US	Running	Linux	Standard_B1s	20.119.80.219	1
web-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	98.70.48.167	1
web-win-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Windows	Standard_B1s	20.244.35.67	1
Windows-VM	Azure for Stude...	Windows-VM_...	East US	Running	Windows	Standard_B1s	20.55.52.72	1

Showing 1 - 6 of 6. Display count: 10

Step 5: Configuring IIS on Windows VMs

1. RDP into the VM using public IP
2. Open **Server Manager**
3. Click **Add roles and features**
4. Select **Web Server (IIS)**
5. Click **Next**
6. Test access and your 3 tier architecture is successfully launched.

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Subscription equals all
Type equals all
Resource Group equals all
Location equals all
Add filter

Name	Subscription	Resource Group	Location	Status	Operating syst...	Size	Public IP addr...	Dis...
app-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	4.240.106.111	1
db-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	-	1
Linux-VM	Azure for Stude...	RG-VNet-PeerD...	East US	Running	Linux	Standard_B1s	20.119.80.219	1
web-linux-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Linux	Standard_B1s	98.70.48.167	1
web-win-vm	Azure for Stude...	rg-3tier-arch	Central India	Running	Windows	Standard_B1s	20.244.35.67	1
Windows-VM	Azure for Stude...	Windows-VM...	East US	Running	Windows	Standard_B1s	20.55.52.72	1

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web-win-vm	Virtual machine	8 minutes ago
rg-3tier-arch	Resource group	9 minutes ago
app-linux-vm	Virtual machine	34 minutes ago
web-linux-vm	Virtual machine	38 minutes ago
MyVNet	Virtual network	39 minutes ago
db-nsg	Network security group	an hour ago
app-nsg	Network security group	an hour ago
web-nsg	Network security group	an hour ago
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