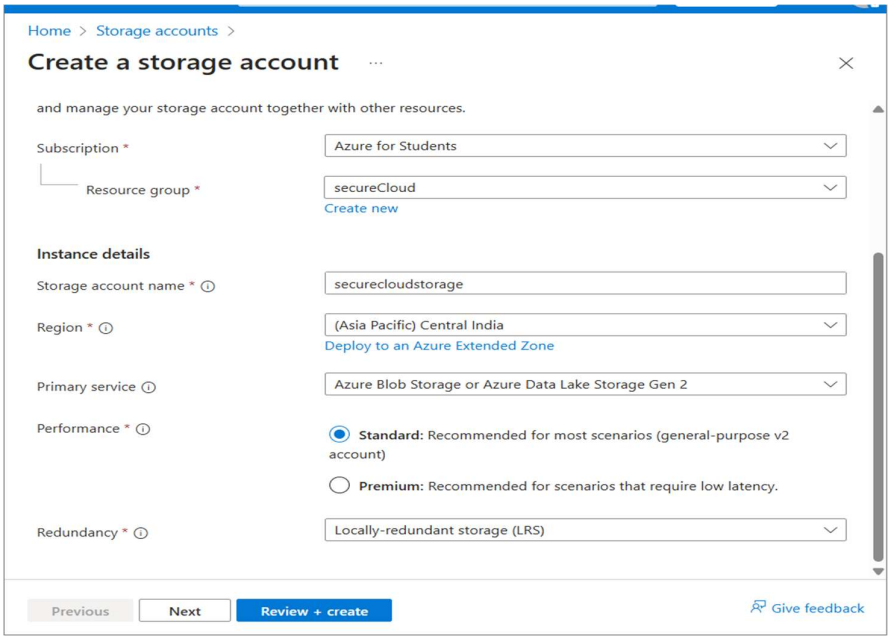
Experiment - 4

1. Create an Azure Storage Account

1. **Open Azure Portal → Navigate to Storage Accounts → Click + Create.**
2. **Set the following configurations:**
    - **Resource Group: secureCloud**
    - **Storage Account Name: securecloudstorage2025**
    - **Region: Central India**
    - **Performance: Standard**
    - **Replication: Locally Redundant Storage (LRS)**
3. **Click Review + Create → Click Create.**



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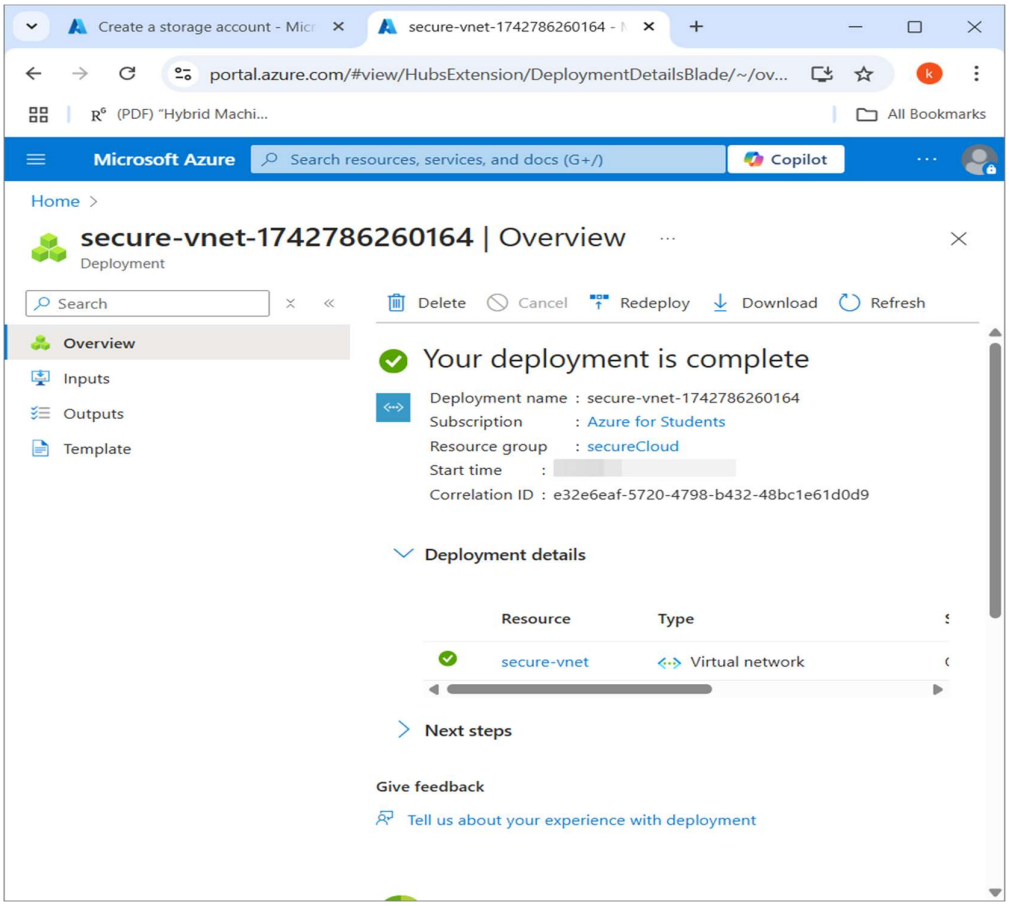
2. Configure a Private Endpoint (VNet & Subnet)

1. **Go to Virtual Networks → Click + Create.**
2. **Set the following configurations:**
    - **Name: secureVNet**
    - **Region: Central India**
    - **Subnet Name: private-subnet**
3. **Click Create.**



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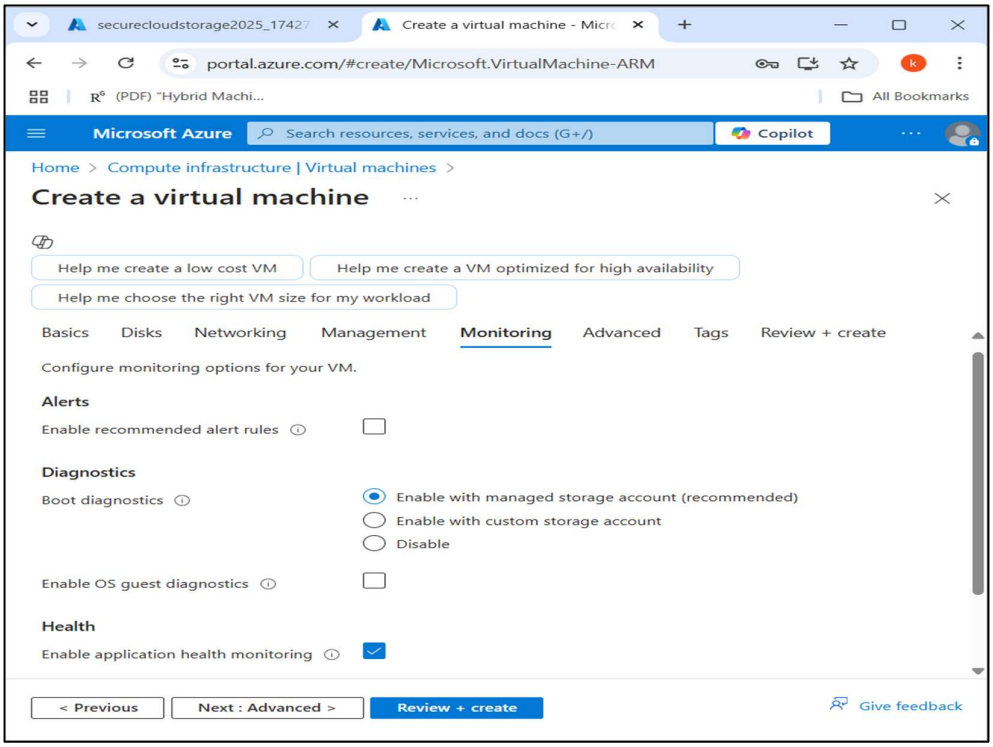
3. Deploy a Virtual Machine (VM) and Configure S

1. **Go to Azure Portal → Click + Create a resource → Select Virtual Machine.**
2. **Configure:**
   - **Resource Group: secureCloud**
   - **VM Name: secureVM**
   - **Region: Central India**
   - **Image: Ubuntu 22.04**
   - **Authentication: S Key**
3. **Click Review + Create → Click Create.**



Generate S Key and Connect

1. **Open Powerell/CLI and run:**

   s-keygen -t rsa -b 4096 -f securecloud-key

2. **Copy the public key to Azure VM during setup.**
3. **Find Public IP of VM:**

   az vm list-ip-addresses --resource-group secureCloud --name secureVM --output table

4. **Connect via S:**

   s -i C:\Users\KRISHNA\.s\id_rsa azureuser@<VM_Public_IP>

Edit S Config for Passwordless Login

1. **Edit S config:**

sudo nano /etc/s/sd_config

2. **Save & restart S:**

sudo systemctl restart s

```
azureuser@secure-vm:~$ sudo nano /etc/ssh/sshd_config
azureuser@secure-vm:~$ sudo systemctl restart ssh
azureuser@secure-vm:~$ sudo ufw allow OpenSSH
sudo ufw enable
sudo ufw status
Rules updated
Rules updated (v6)
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
Status: active

To                         Action      From
--                         ------      ----
OpenSSH                    ALLOW       Anywhere
OpenSSH (v6)               ALLOW       Anywhere (v6)
```

---

4. Configure Network Security Group (NSG) and S Rule

1. **Go to Azure Portal → Search Network Security Groups (NSG) → Click + Create.**
2. **Configure:**
    - **Name: secure-vm-nsg**
    - **Resource Group: secureCloud**
    - **Region: Central India**
3. **Click Create.**

Create an NSG Rule to Allow S

Run in Powerell/CLI:

az network nsg rule create --resource-group secureCloud --nsg-name secure-vm-nsg --name S-Rule --priority 1000 --access Allow --direction Inbound --protocol Tcp --source-address-prefixes <YOUR_PUBLIC_IP> --source-port-ranges "*" --destination-address-prefixes "*" --destination-port-ranges 22

```
PS C:\Users\KRISHNA> az network nsg rule create --resource-group secureCloud --nsg-name secure-vmNSG --name SSH-Rule --priority 1100 --access Allow --direction Inbound --protocol Tcp --source-address-prefixes 203.197.213.4 --source-port-ranges "*" --destination-address-prefixes "*" --destination-port-ranges 22
{
  "access": "Allow",
  "destinationAddressPrefix": "*",
  "destinationAddressPrefixes": [],
  "destinationPortRange": "22",
  "destinationPortRanges": [],
  "direction": "Inbound",
  "etag": "W/\"153580c1-2a41-4072-81c4-d9f7ddfd1b41\"",
  "id": "/subscriptions/3b5ad032-42d7-4c96-9ca9-ddc07d08b8c5/resourceGroups/secureCloud/providers/Microsoft.Network/networkSecurityGroups/secure-vmNSG/securityRules/SSH-Rule",
  "name": "SSH-Rule",
  "priority": 1100,
  "protocol": "Tcp",
  "provisioningState": "Succeeded",
  "resourceGroup": "secureCloud",
  "sourceAddressPrefix": "203.197.213.4",
  "sourceAddressPrefixes": [],
  "sourcePortRange": "*",
  "sourcePortRanges": [],
  "type": "Microsoft.Network/networkSecurityGroups/securityRules"
}
```

---

5. Configure Encryption for Cloud Storage

1. **Go to Storage Account → Click Encryption.**
2. **Select Customer Managed Keys (CMK).**
3. **Create a Key Vault:**

az keyvault create --name secureCloudVault --resource-group secureCloud --location centralindia

4. **Generate a Key:**

az keyvault key create --vault-name secureCloudVault --name secureStorageKey --protection software

5. **Attach Key to Storage Account under Encryption Settings.**

---

6. Implement Role-Based Access Control (RBAC)

Assign "Reader" Role to a User

1. **Run:**

az role assignment create --assignee <YOUR_OBJECT_ID> --role "Reader" --scope "/subscriptions/3b5ad032-42d7-4c96-9ca9-ddc07d08b8c5/resourceGroups/secureCloud/providers/Microsoft.Storage/storageAccounts/securecloudstorage2025"

---

7. Create a Test User for Intrusion Detection

1. **Create a test user:**

az ad user create --display-name "TestUser" --user-principal-name testuser@kpolaswargmail.onmicrosoft.com --password "Test@12345"

```
PS C:\Users\KRISHNA> az ad user create --display-name "TestUser" --user-principal-name testuser@kpola
swargmail.onmicrosoft.com --password "Test@12345"
{
  "@odata.context": "https://graph.microsoft.com/v1.0/$metadata#users/$entity",
  "businessPhones": [],
  "displayName": "TestUser",
  "givenName": null,
  "id": "d772e77a-8294-477a-a5ea-c4baa5e6ae9b",
  "jobTitle": null,
  "mail": null,
  "mobilePhone": null,
  "officeLocation": null,
  "preferredLanguage": null,
  "surname": null,
  "userPrincipalName": "testuser@kpolaswargmail.onmicrosoft.com"
}
```

2. **Assign Reader role:**

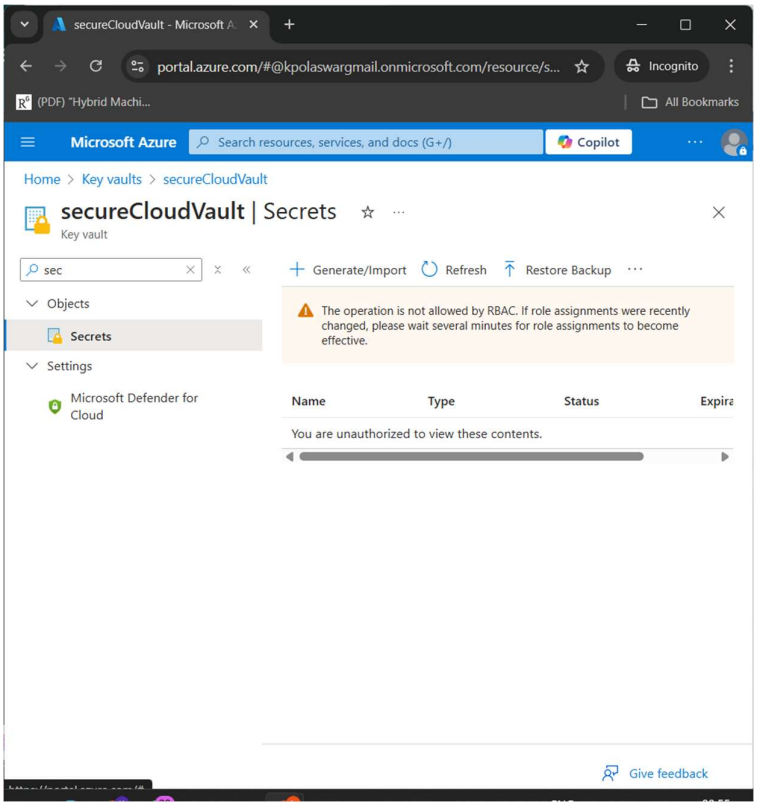
az role assignment create --assignee testuser@kpolaswargmail.onmicrosoft.com --role "Reader" --scope "/subscriptions/3b5ad032-42d7-4c96-9ca9-ddc07d08b8c5"

---

9. Login as TestUser and Attempt Unauthorized Actions

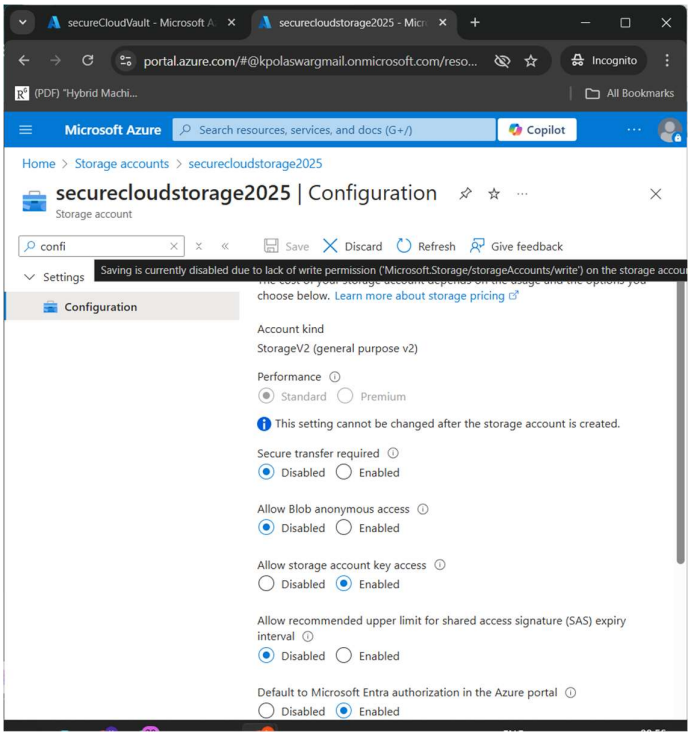
(A) Try Accessing Key Vault

Run:



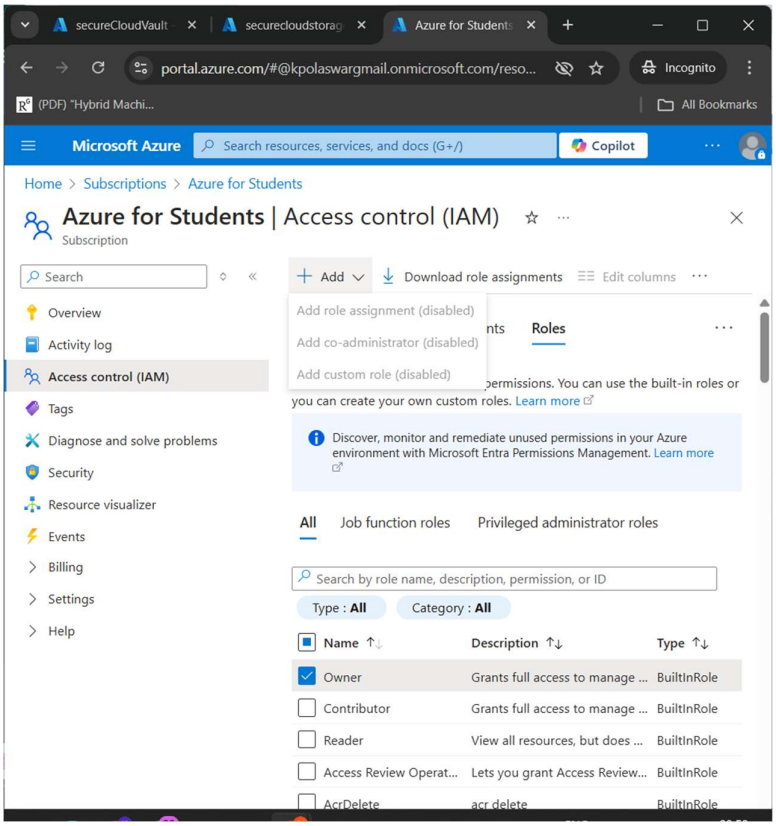
❌ **Expected Error: Access Denied**

(B) Try Modifying Storage Account Settings



❌ **Expected Error: Authorization Failed**

(C) Try Assigning a Role



❌ **Expected Error: Permission Denied**

🔟 Monitor Logs & Security Alerts

1. Go to Azure Portal → Search "Azure Monitor".
2. Click Logs → Select Activity Logs.
3. Verify Unauthorized Access Attempts by TestUser.

✅ Final Step: ut Down VM to Save Credits

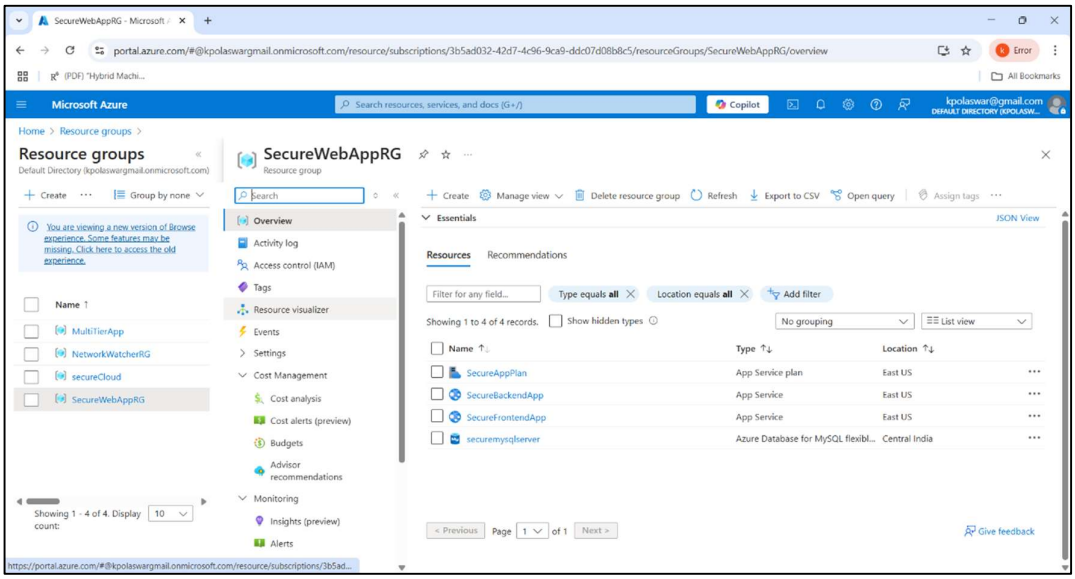
az vm deallocate --resource-group secureCloud --name secureVM

Experiment-03

Deploy a multi-tier web application with a secure architecture on a cloud platform like AWS or Azure. Configure firewalls, access controls, and encryption to protect the application and its data.

Step 1: Create a Resource Group
A resource group is required to manage all Azure resources.
Command:

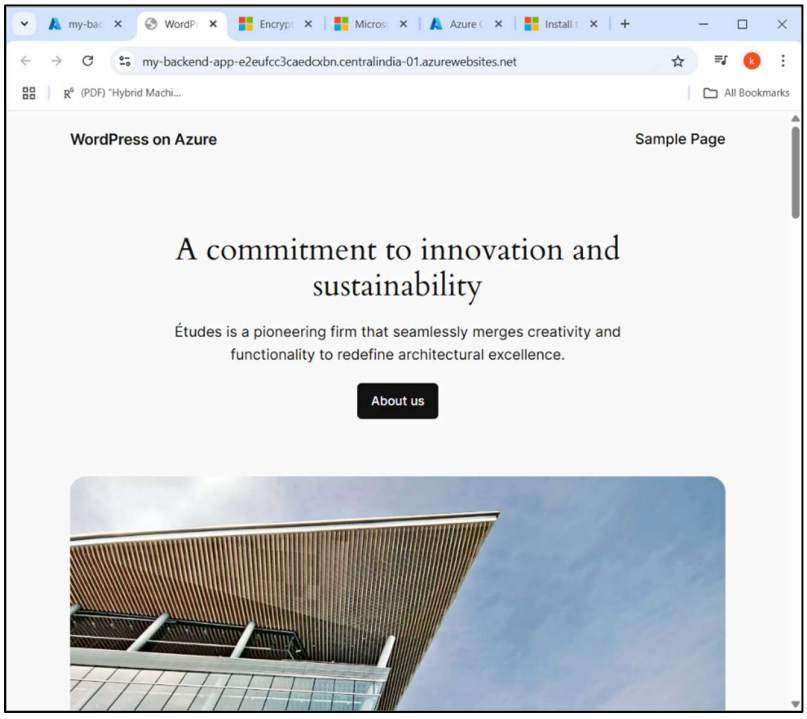
az group create --name SecureWebAppRG --location centralindia



Step 2: Deploy WordPress Template (Optional for CMS-Based App)
If using a WordPress-based frontend, deploy the WordPress template.

Command:

az webapp create --resource-group SecureWebAppRG --name SecureFrontendApp --plan SecureAppPlan --runtime "PHP:8.0"



Step 3: Create an App Service Plan
This step sets up a scalable hosting environment for the backend.

Command:

az appservice plan create --name SecureAppPlan --resource-group SecureWebAppRG --sku F1 --is-linux

```
C:\Users\KRISHNA>az appservice plan create --name SecureAppPlan --resource-group SecureWebAppRG --sku F1
{
  "elasticScaleEnabled": false,
  "extendedLocation": null,
  "freeOfferExpirationTime": null,
  "geoRegion": "East US",
  "hostingEnvironmentProfile": null,
  "hyperV": false,
  "id": "/subscriptions/3b5ad032-42d7-4c96-9ca9-ddc07d08b8c5/resourceGroups/SecureWebAppRG/providers/Microsoft.Web/serverfarms/SecureAppPlan",
  "isSpot": false,
  "isXenon": false,
  "kind": "app",
  "kubeEnvironmentProfile": null,
  "location": "eastus",
  "maximumElasticWorkerCount": 1,
  "maximumNumberOfWorkers": 0,
  "name": "SecureAppPlan",
  "numberOfSites": 0,
  "numberOfWorkers": 0,
  "perSiteScaling": false,
  "provisioningState": "Succeeded",
  "reserved": false,
  "resourceGroup": "SecureWebAppRG",
  "sku": {
    "capabilities": null,
    "capacity": 0,
    "family": "F",
    "locations": null,
    "name": "F1",
    "size": "F1",
    "skuCapacity": null,
```

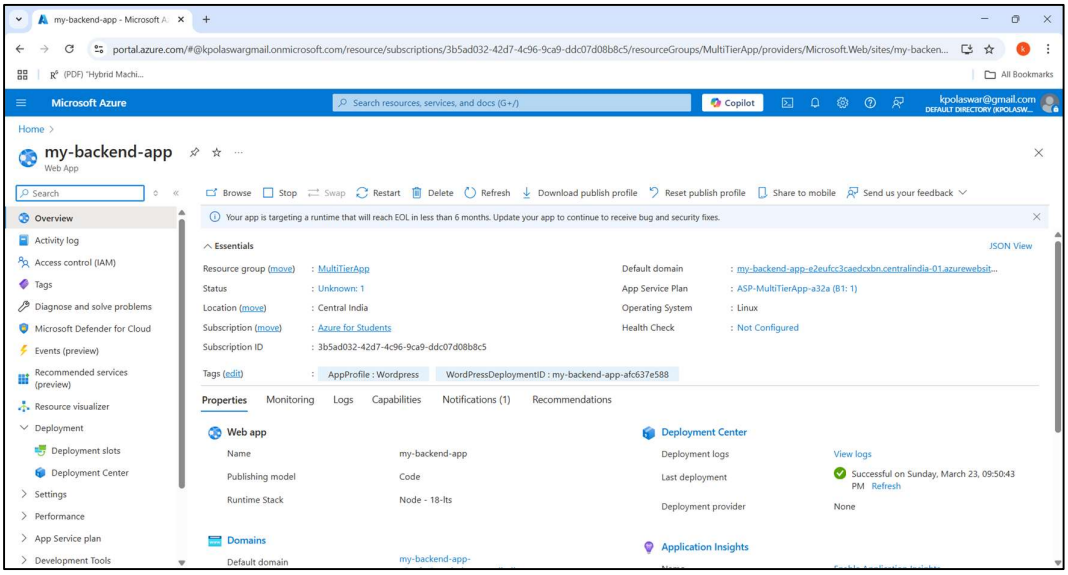
Step 4: Deploy Backend (Node.js App)
Deploy the backend API that interacts with the MySQL database.

1. Create Backend Web App:

az webapp create --name SecureBackendApp --resource-group SecureWebAppRG --plan SecureAppPlan --runtime "NODE:18-lts"

2. Configure Environment Variables:

az webapp config appsettings set --resource-group SecureWebAppRG --name SecureBackendApp --settings DB_HOST="securemysqlserver.mysql.database.azure.com" DB_USER="azureuser" DB_PASSWORD="MySecureP@ssw0rd" DB_NAME="flexibleserverdb"



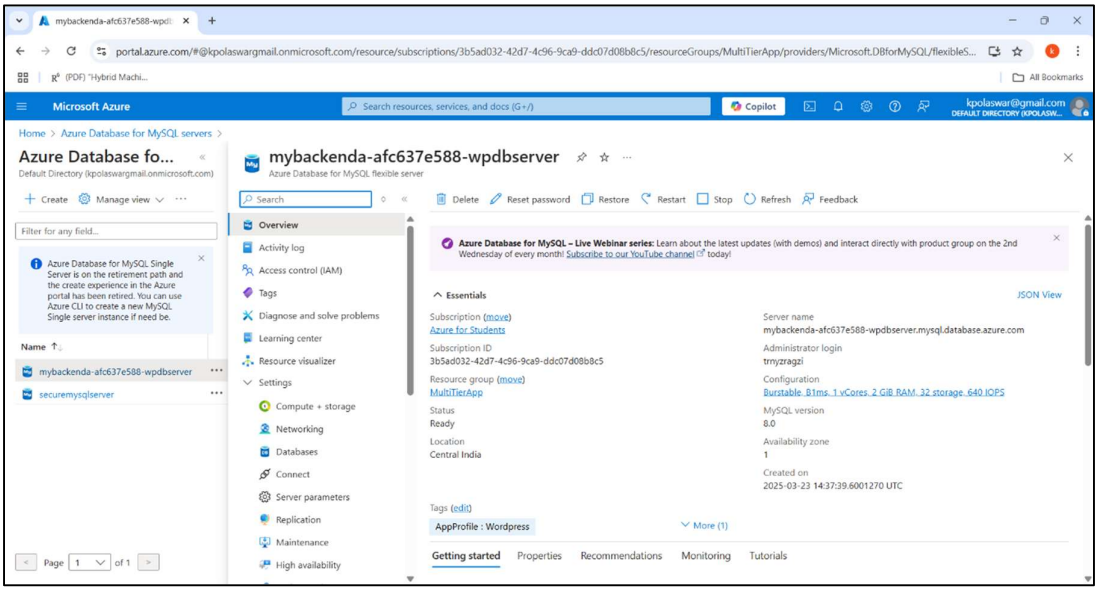
Step 5: Deploy and Configure MySQL Database

1. Create MySQL Flexible Server:

az mysql flexible-server create --resource-group SecureWebAppRG --name SecureMySQLServer --admin-user azureuser --admin-password MySecureP@ssw0rd --sku-name Standard_B1ms --location centralindia

2. Allow Public IP Access:

az mysql flexible-server firewall-rule create --resource-group SecureWebAppRG --server-name SecureMySQLServer --name AllowAllIPs --start-ip-address 0.0.0.0 --end-ip-address 255.255.255.255



Step 6: Deploy Frontend (Custom HTML/CSS/JS)

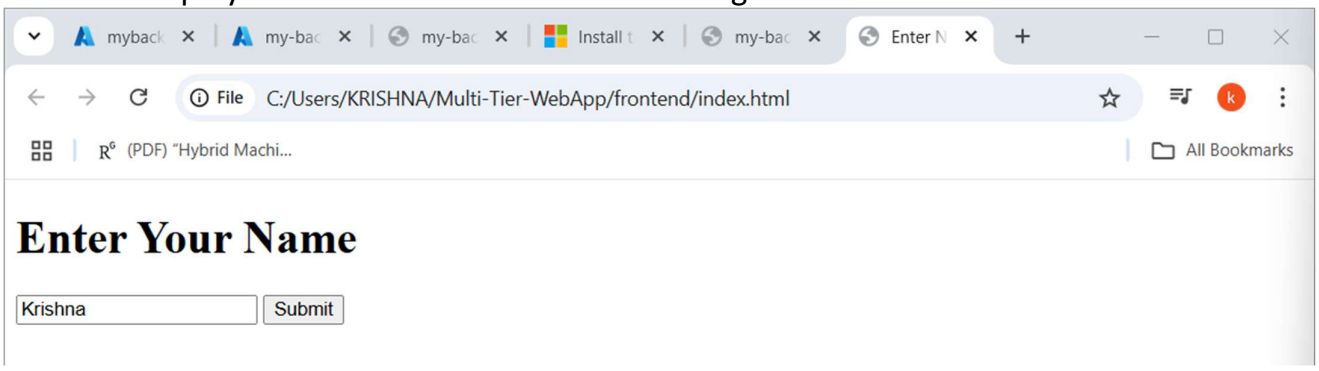
1. Create the Frontend Web App:

az webapp create --resource-group SecureWebAppRG --name SecureFrontendApp --plan SecureAppPlan --runtime "PHP:8.0"

2. Deploy Static Frontend Files:
   Ensure your frontend code (HTML, CSS, JS) is in a zip file named frontend.zip.

az webapp deploy --resource-group SecureWebAppRG --name SecureFrontendApp --src-path frontend.zip --type static --target-path /

Frontend Deployment Successful with backend integrated:



Our Multi-Tier Web App has been deployed successfully.

1. Check Backend API Status:
   curl https://securebackendapp.azurewebsites.net/
2. Check Frontend Status:
   Visit https://securefrontendapp.azurewebsites.net/