ASSIGNMENT 41

Automate the Book Review Application with Terraform, Ansible, and Azure DevOps

This assignment focuses on automating the deployment of the Book Review Application using Terraform, Ansible, and Azure DevOps. It combines infrastructure provisioning and application configuration into a seamless CI/CD workflow. This approach is highly useful because it ensures consistent, repeatable deployments, reduces manual errors, and speeds up delivery. By integrating Terraform and Ansible within Azure DevOps pipelines, teams can achieve full end-to-end automation — from setting up servers to deploying and updating the application with minimal effort.

Objective
Reproduce an end-to-end automation, using two repositories and two Azure DevOps pipelines to deploy the Book Review App:

- Infra repository (Terraform): provisions the infrastructure (resource group/VNet/2 VMs/MySQL).
- App repository (Book Review App + Ansible): configures frontend and backend VMs and deploys the application.

Application repo to deploy: https://github.com/pravinmishraaws/book-review-app

Note everything was done in my agent machine

Step 1: The Build

Repositories

1. Book-review-infra https://github.com/pravinmishraaws/book-review-infra
   ➔ Terraform code to provision:
   - 1 frontend VM (Ubuntu)
   - 1 backend VM (Ubuntu)
   - VNet / subnet
   - MySQL (Azure MySQL or VM-based; follow the video)

   ➔ Terraform outputs:
   - frontend_public_ip
   - backend_public_ip
   - mysql_fqdn (or endpoint)

2. Book-review-app https://github.com/pravinmishraaws/book-review-app
   ➔ App source code (frontend + backend)
   ➔ Ansible playbooks to:
   - configure common packages
   - configure backend (API, DB connection)
   - configure frontend (points to backend)
   - restart services / Nginx

Pipelines

1. Infra pipeline (Azure Pipelines):
   - Source: *book-review-infra* (in GitHub or Azure Repos)
   - Install Terraform
   - Authenticate using Azure Resource Manager service connection (SPN)
   - *terraform init/plan/apply*
   - Print/log Terraform outputs (frontend IP, backend IP, DB FQDN)
   - This is the *"platform / infra"* pipeline

2. App pipeline (Azure Pipelines):
   - Source: *book-review-app* repo
   - Install Ansible
   - Download SSH private key from Secure Files
   - Update Ansible inventory and vars manually with values from the infra pipeline
   - Run Ansible playbook to configure both VMs and deploy the app
   - This is the "*application / Dev*" pipeline

Step 2: Background Setup:

1. Install terraform

```
sudo apt update && sudo apt install -y wget curl unzip
```

```
sudo apt-get update && sudo apt-get install -y gnupg software-properties-common
```

```
wget -O- https://apt.releases.hashicorp.com/gpg | gpg --dearmor | sudo tee /usr/share/keyrings/hashicorp-archive-keyring.gpg
```

```
echo "deb [signed-by=/usr/share/keyrings/hashicorp-archive-keyring.gpg] https://apt.releases.hashicorp.com $(lsb_release -cs) main" | sudo tee /etc/apt/sources.list.d/hashicorp.list
```

```
sudo apt update
```

```
sudo apt install terraform
```

```
terraform -version
```

2. Download AZ in linux

```
curl -sL https://aka.ms/InstallAzureCLIDeb | sudo bash
```

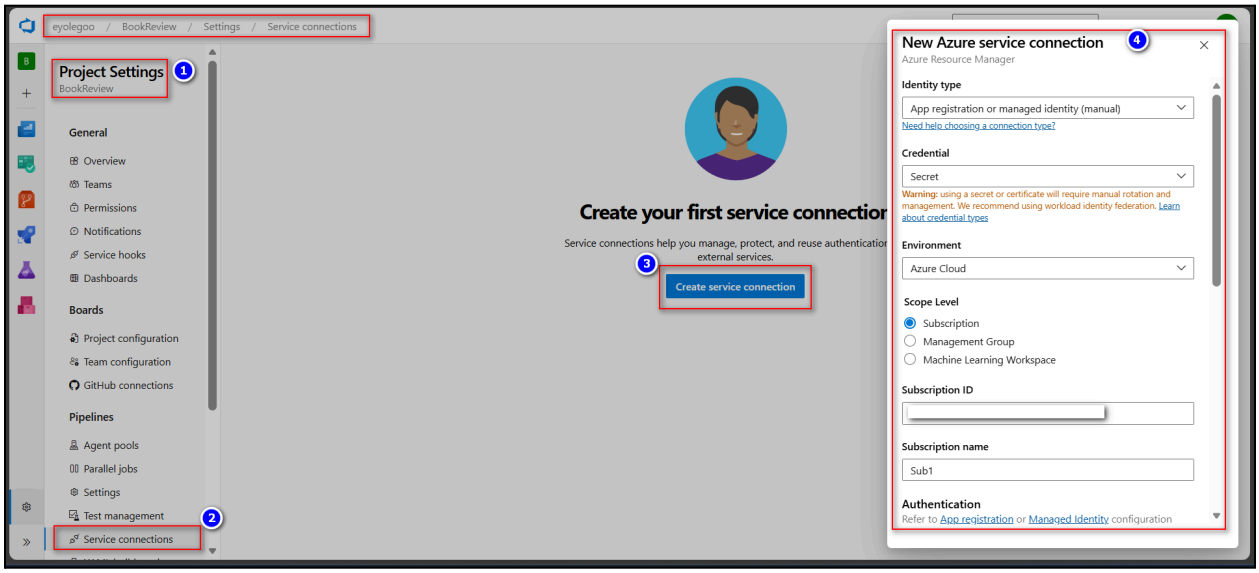
3. az login

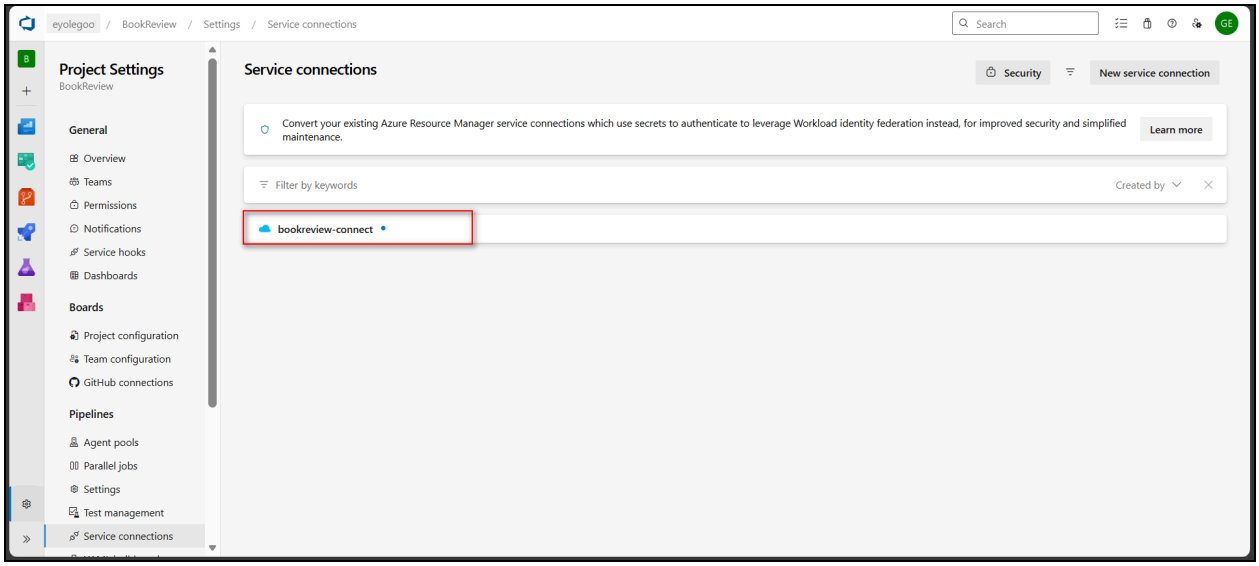
4 Create Service Principle

5. Azure Resource Manager

Create an Azure Resource Manager service connection using the SPN/App Registration

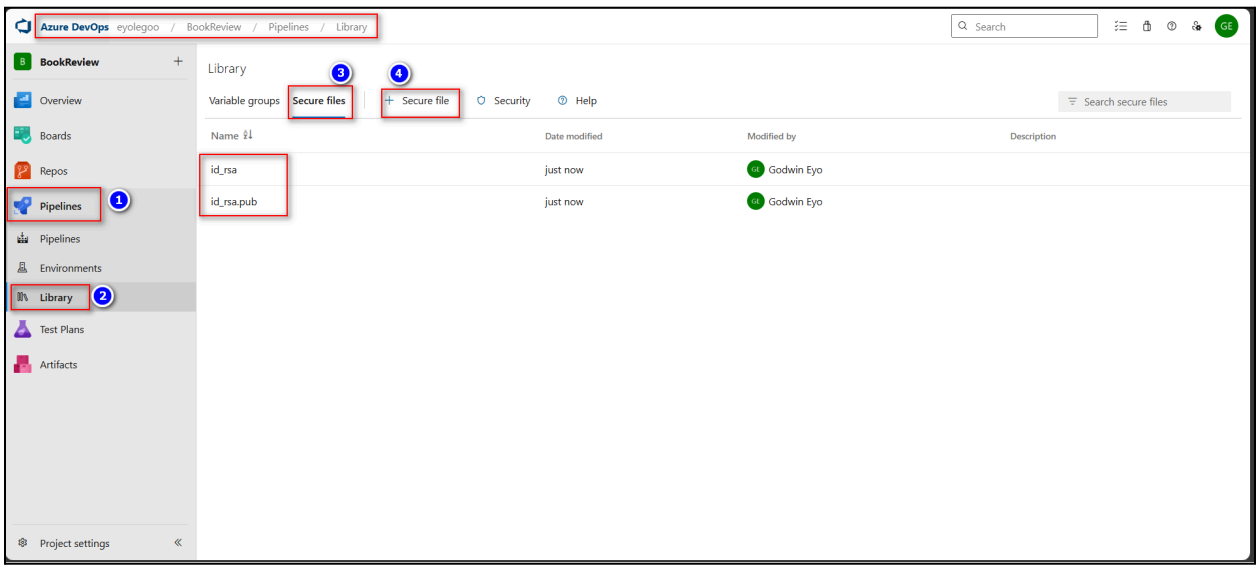
In azure DevOps, go to book review project settings, create service connections. Don't use SSH. Use Azure Resource





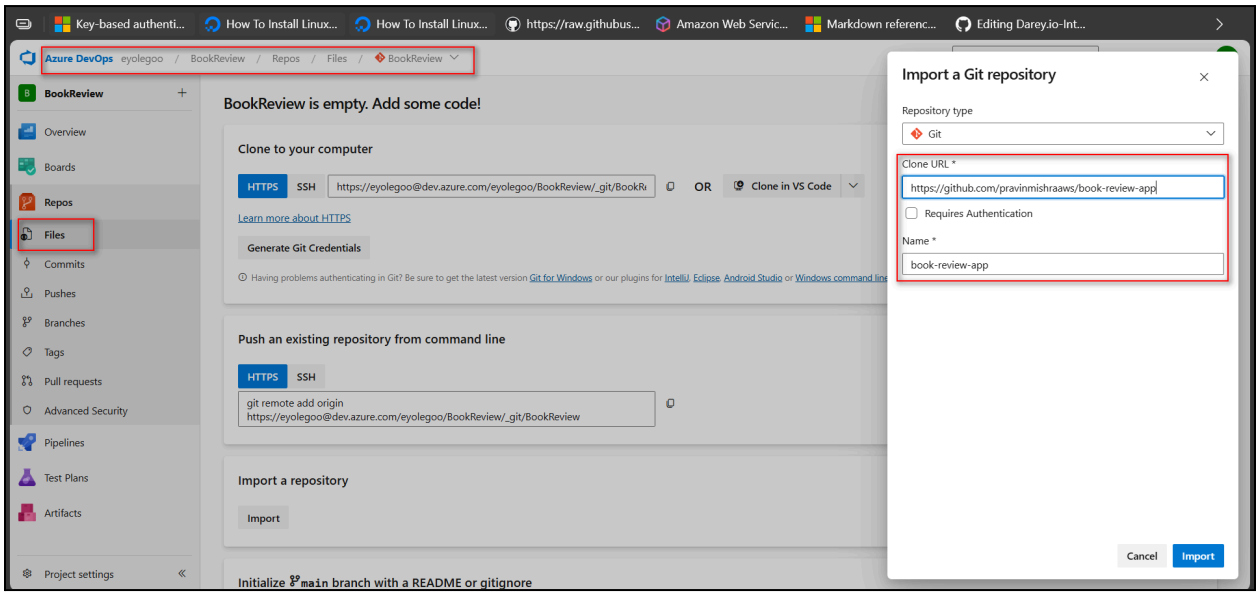
6 Keygen

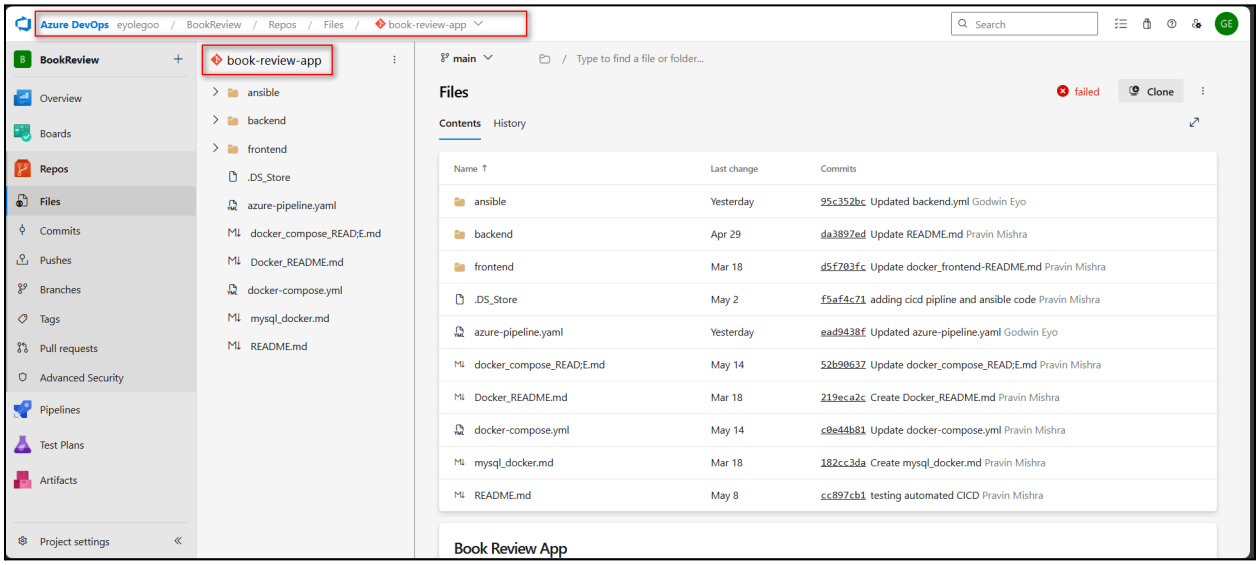
Upload your keygen (both private and public) to Azure DevOps-Pipeline-Library.



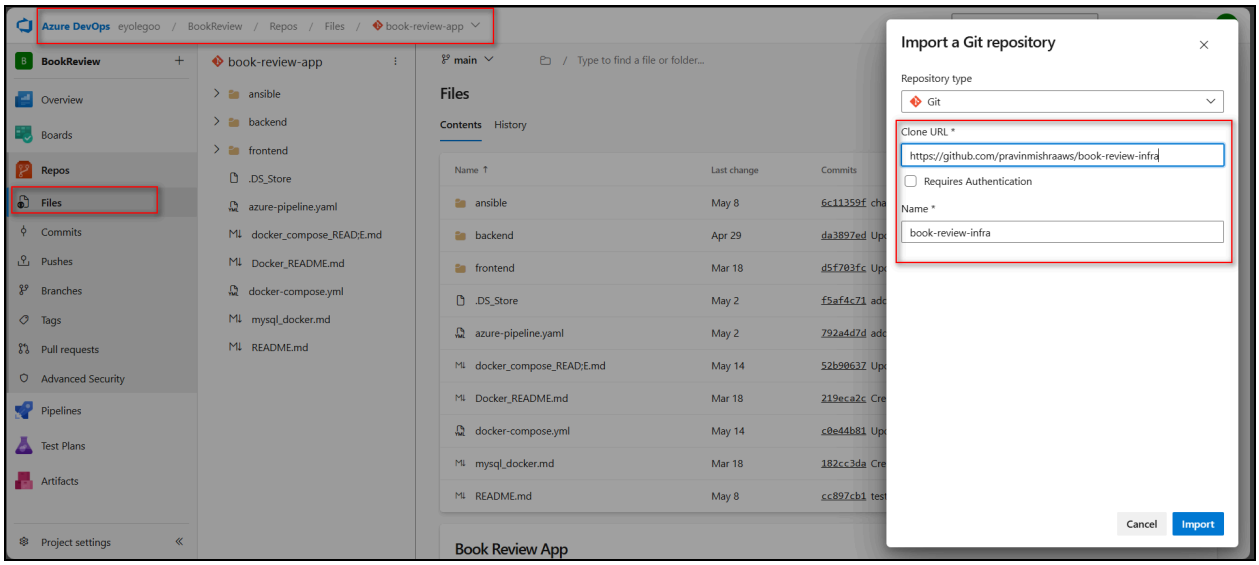
Step 3: App Repository, Infra Repository and Pipeline

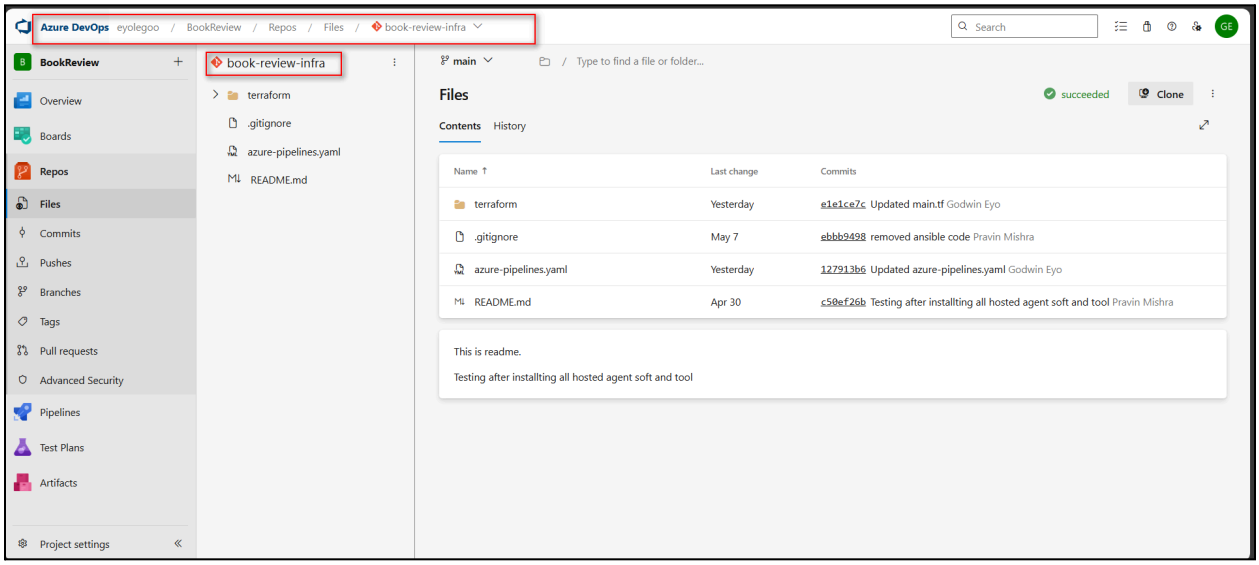
1. Clone/import the *book-review-app*

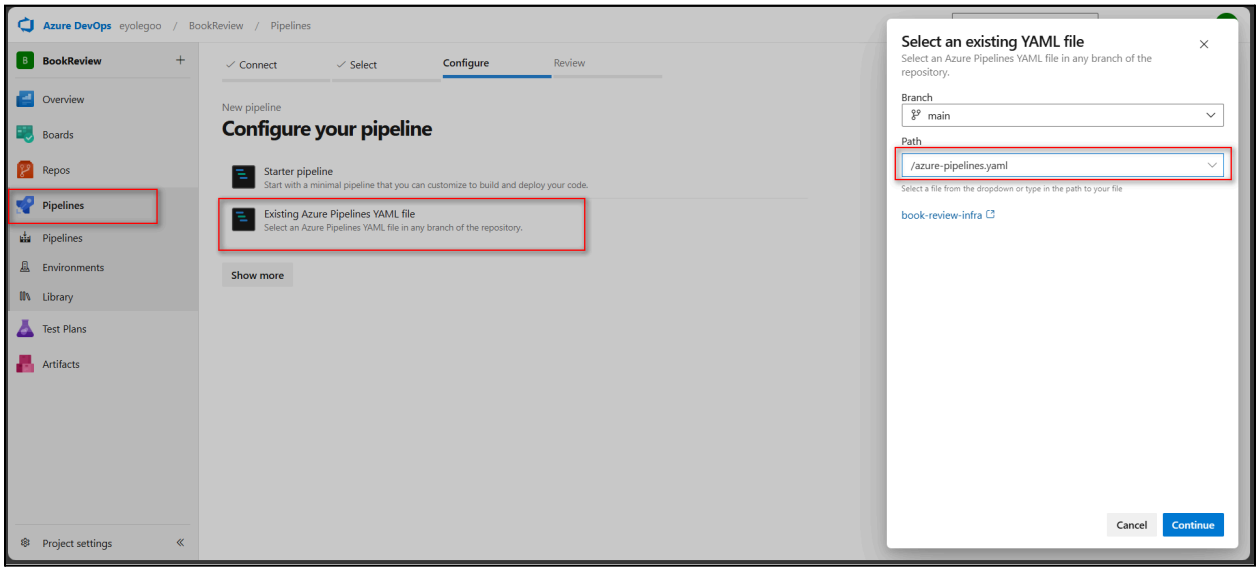


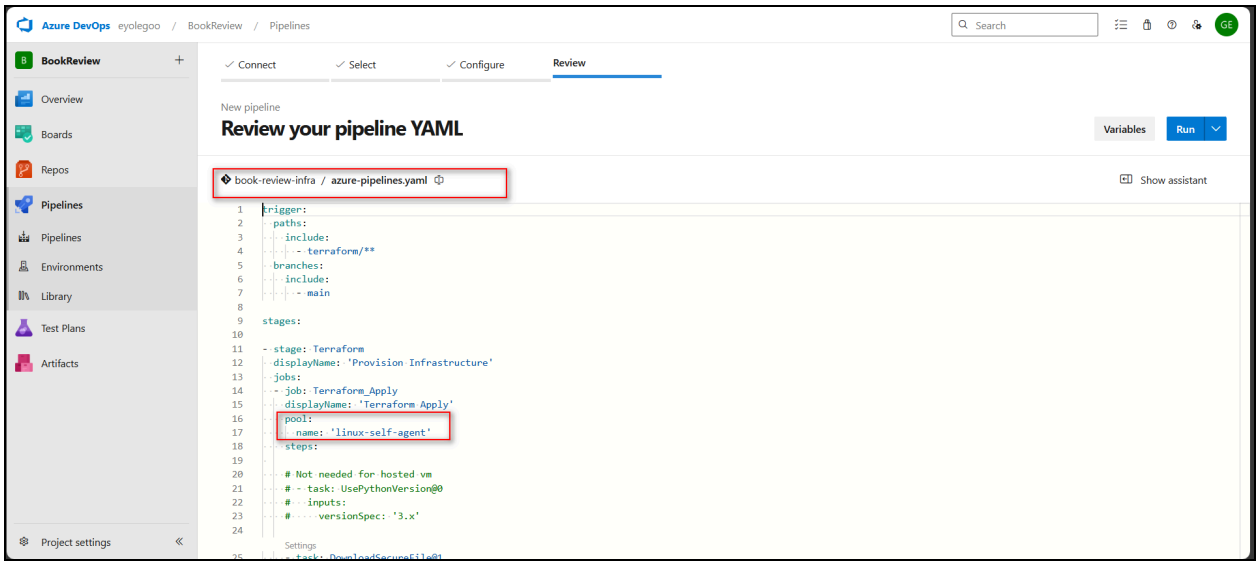


2. Clone/import *book-review-infra* and place the Terraform code (modules for network, compute, database; separate env folders).
3. Create an Azure Pipeline (YAML) in Azure DevOps for this repo:
   - Use self-hosted agent (preferred)
   - Install Terraform
   - Download SSH public key from Secure Files and place it where Terraform expects it
   - Run *terraform init, terraform plan, and terraform apply*


Azure DevOps eyolegoo / BookReview / Repos / Files / book-review-app
BookReview
Overview
Boards
Repos
Files
Commits
Pushes
Branches
Tags
Pull requests
Advanced Security
Pipelines
Test Plans
Artifacts
Project settings
book-review-app
ansible
backend
frontend
.DS_Store
azure-pipeline.yaml
docker_compose_READ;E.md
Docker_README.md
docker-compose.yml
mysql_docker.md
README.md
main
Type to find a file or folder...
Files
Contents
History
Name
Last change
Commits
May 8
Apr 29
Mar 18
May 2
May 14
Book Review App
Import a Git repository
Repository type
Git
Clone URL *
https://github.com/pravinmishraaws/book-review-infra
Requires Authentication
Name *
book-review-infra
Cancel
Import

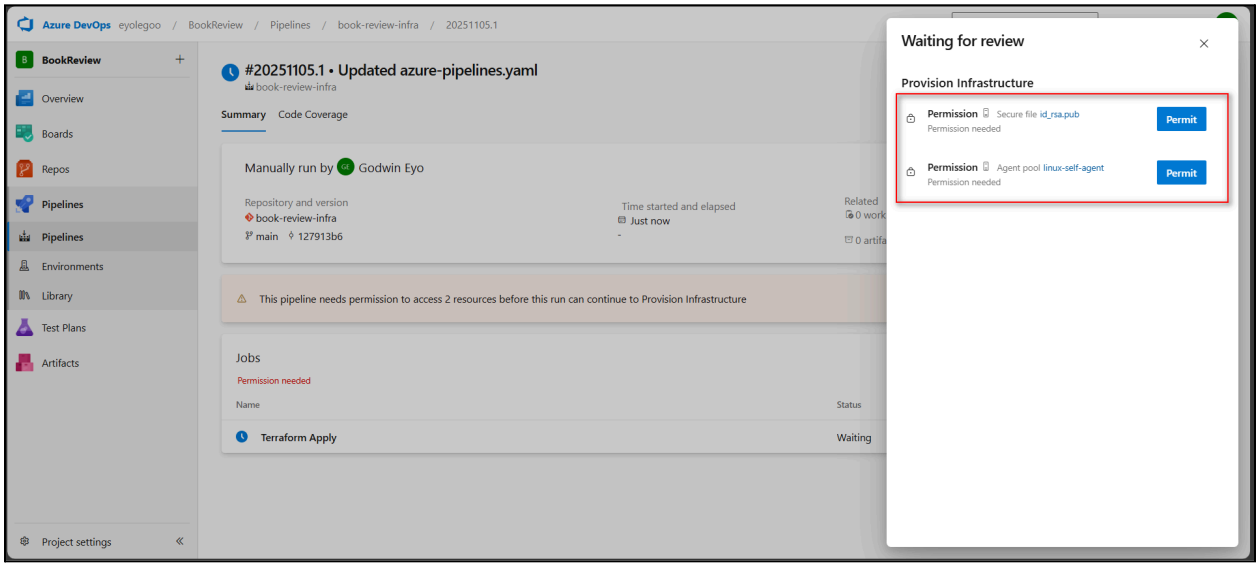

Azure DevOps eyolegoo / BookReview / Repos / Files / book-review-infra
Search
BookReview
Overview
Boards
Repos
Files
Commits
Pushes
Branches
Tags
Pull requests
Advanced Security
Pipelines
Test Plans
Artifacts
Project settings
book-review-infra
terraform
.gitignore
azure-pipelines.yaml
README.md
main
Type to find a file or folder...
Files
succeeded
Clone
Contents
History
Name
Last change
Commits
terraform
Yesterday
e1e1ce7c Updated main.tf Godwin Eyo
.gitignore
May 7
ebbb9498 removed ansible code Pravin Mishra
azure-pipelines.yaml
Yesterday
127913b6 Updated azure-pipelines.yaml Godwin Eyo
README.md
Apr 30
c50ef26b Testing after installting all hosted agent soft and tool Pravin Mishra
This is readme.
Testing after installting all hosted agent soft and tool

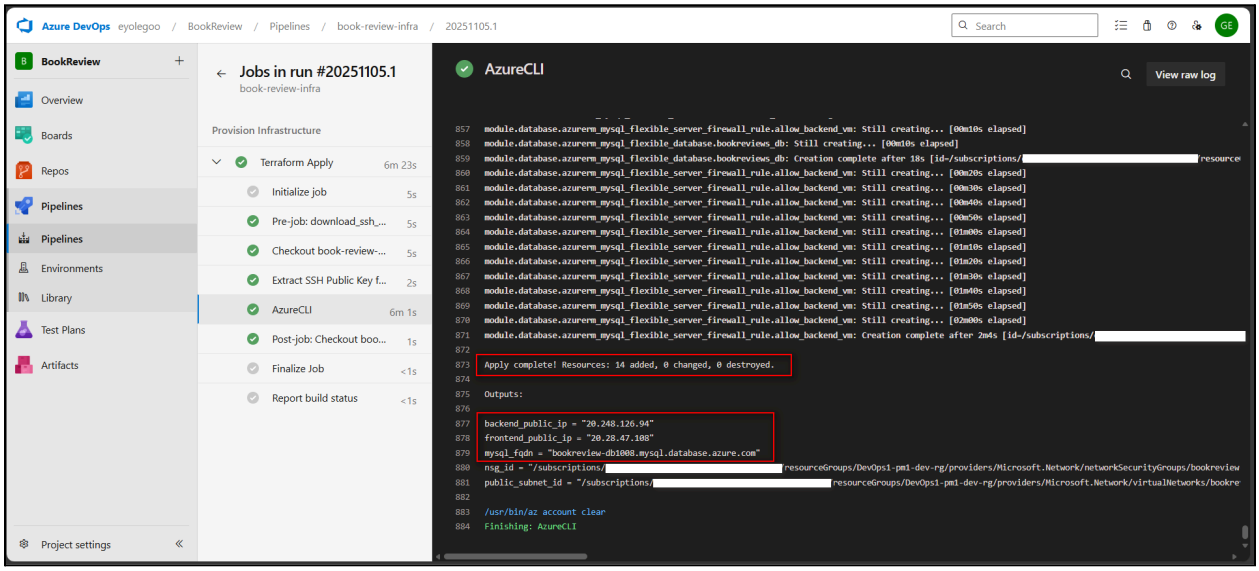

Azure DevOps eyolegoo / BookReview / Pipelines
BookReview
Overview
Boards
Repos
Pipelines
Pipelines
Environments
Library
Test Plans
Artifacts
Project settings
Connect
Select
Configure
Review
New pipeline
Configure your pipeline
Starter pipeline
Start with a minimal pipeline that you can customize to build and deploy your code.
Existing Azure Pipelines YAML file
Select an Azure Pipelines YAML file in any branch of the repository.
Show more
Select an existing YAML file
Select an Azure Pipelines YAML file in any branch of the repository.
Branch
main
Path
/azure-pipelines.yaml
Select a file from the dropdown or type in the path to your file
book-review-infra
Cancel
Continue




```yaml
trigger:
  paths:
    include:
      - terraform/**
  branches:
    include:
      - main

stages:

- stage: Terraform
  displayName: 'Provision Infrastructure'
  jobs:
  - job: Terraform_Apply
    displayName: 'Terraform Apply'
    pool:
      name: 'linux-self-agent'
    steps:

    # Not needed for hosted vm
    # - task: UsePythonVersion@0
    #   inputs:
    #     versionSpec: '3.x'

    - task: DownloadSecureFile@1
      name: download_ssh_key
      inputs:
        secureFile: 'id_rsa.pub'

    - script: |
        echo "Copying SSH public key into Terraform module"

        mkdir -p ~/.ssh
        cp $(download_ssh_key.secureFilePath) ~/.ssh/id_rsa.pub

        # Now copy into Terraform module path
        cp $(download_ssh_key.secureFilePath) terraform/modules/compute/id_rsa.pub

        echo "Listing contents of terraform/modules/compute/"
        ls -al terraform/modules/compute/
      displayName: 'Extract SSH Public Key for Terraform'

    - task: AzureCLI@2
```

```yaml
inputs:
  azureSubscription: 'bookreview-connect'
  scriptType: bash
  scriptLocation: inlineScript
  workingDirectory: $(System.DefaultWorkingDirectory)/terraform
  inlineScript: |
    echo "##[group]Terraform Init/Plan/Apply"
    cd terraform
    terraform init -input=false
    terraform plan -input=false -var-file="envs/dev.tfvars"
    terraform apply -input=false -auto-approve -var-file="envs/dev.tfvars"
    echo "##[endgroup]"
```

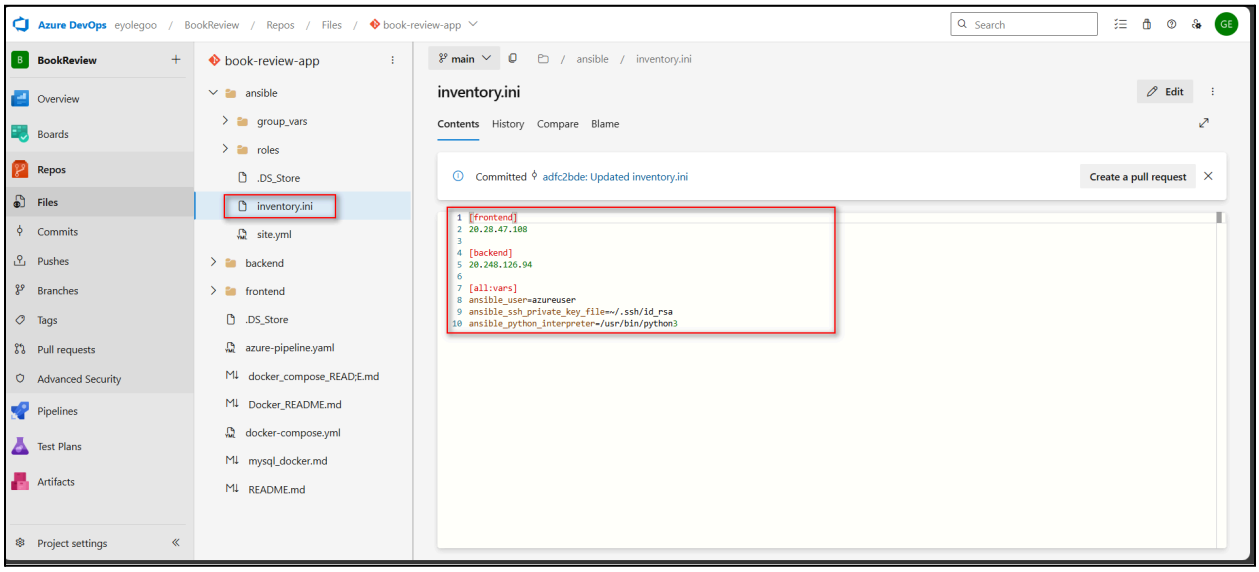


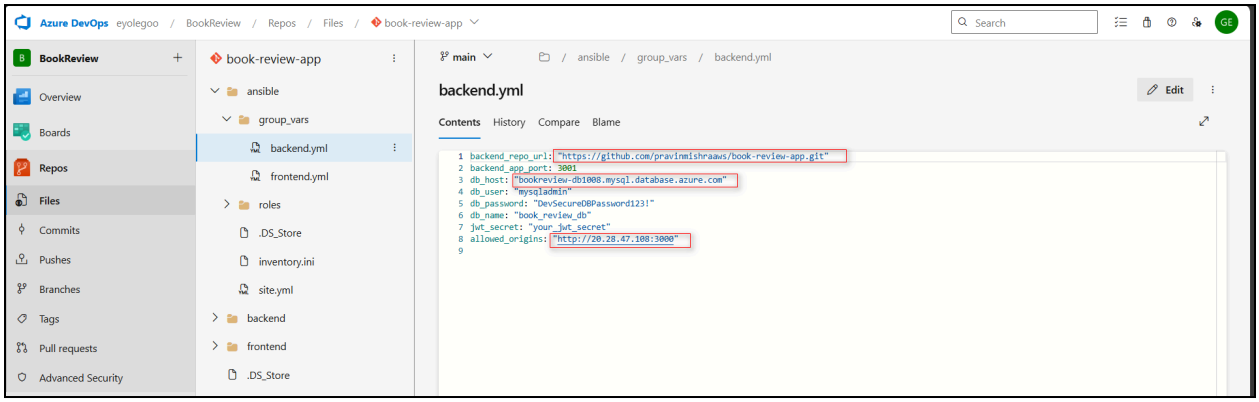


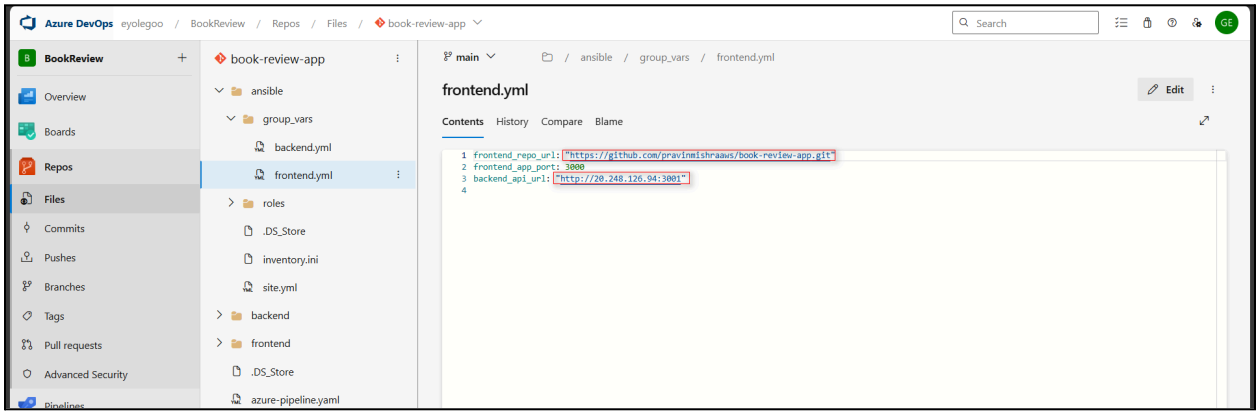

```
backend_public_ip = "20.248.126.94"
frontend_public_ip = "20.28.47.108"
mysql_fqdn = "bookreview-db1008.mysql.database.azure.com"
```

Step 4: Manual handoff

1. From the pipeline logs of the Infra pipeline, copy:
   - Frontend public IP
   - Backend public IP
   - MySQL FQDN / endpoint
2. Open the *book-review-app* repo
3. Update the following files (names may differ depending on your structure):
   - ansible/inventory.ini → set frontend and backend hosts to the new IPs
   - ansible/group_vars/backend.yml (or similar) → set DB host / FQDN
   - ansible/group_vars/frontend.yml (or similar) → set backend API URL

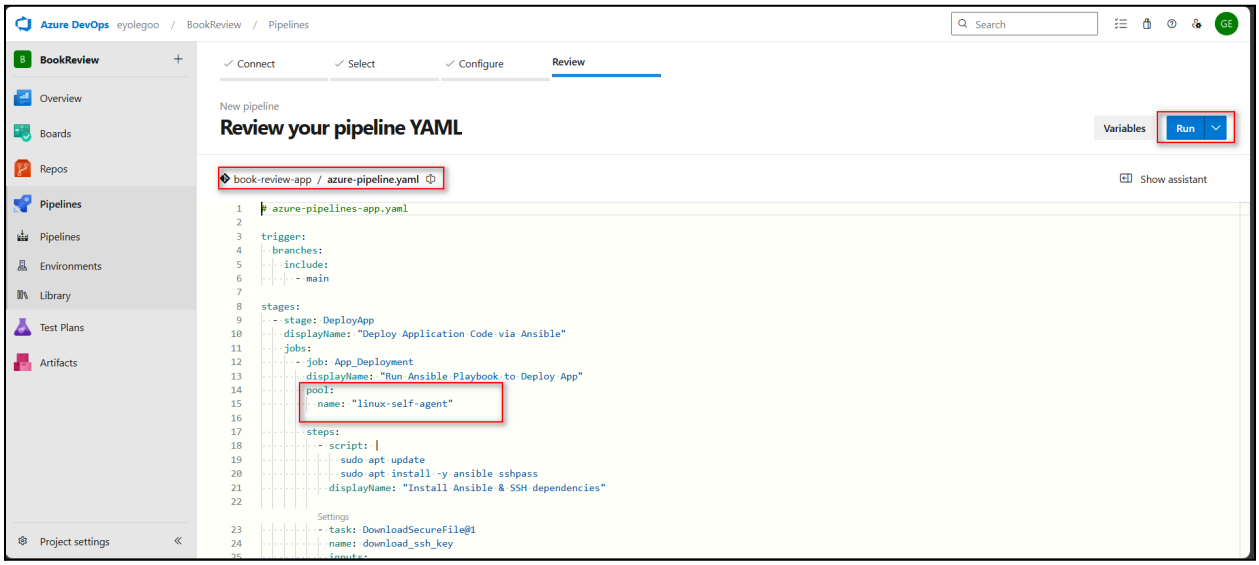






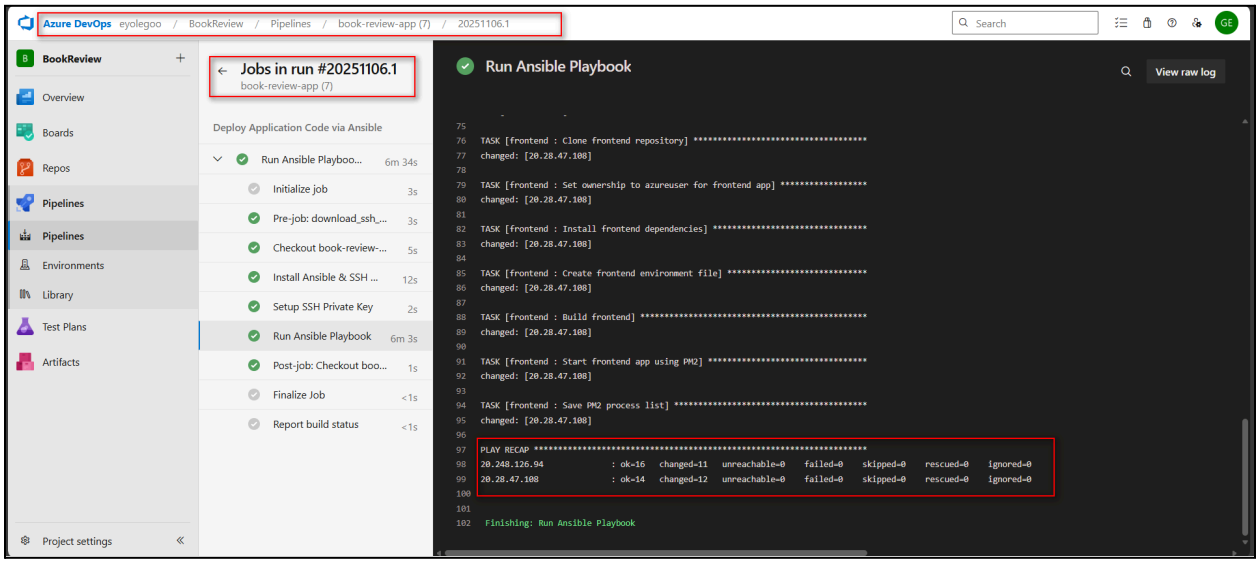
Step 5: App Repository Pipeline

1. In Azure DevOps, create a second pipeline, this time pointing to the book-review-app repo.
2. In the pipeline:
    - Install Ansible
    - Download SSH private key from Secure Files
    - Set correct permissions on the key
    - Run the main Ansible playbook that:
        - runs common role on both VMs
        - configures backend VM (app + DB connection)
        - configures frontend VM (Nginx + UI)
3. Run the pipeline and ensure all Ansible tasks succeed.

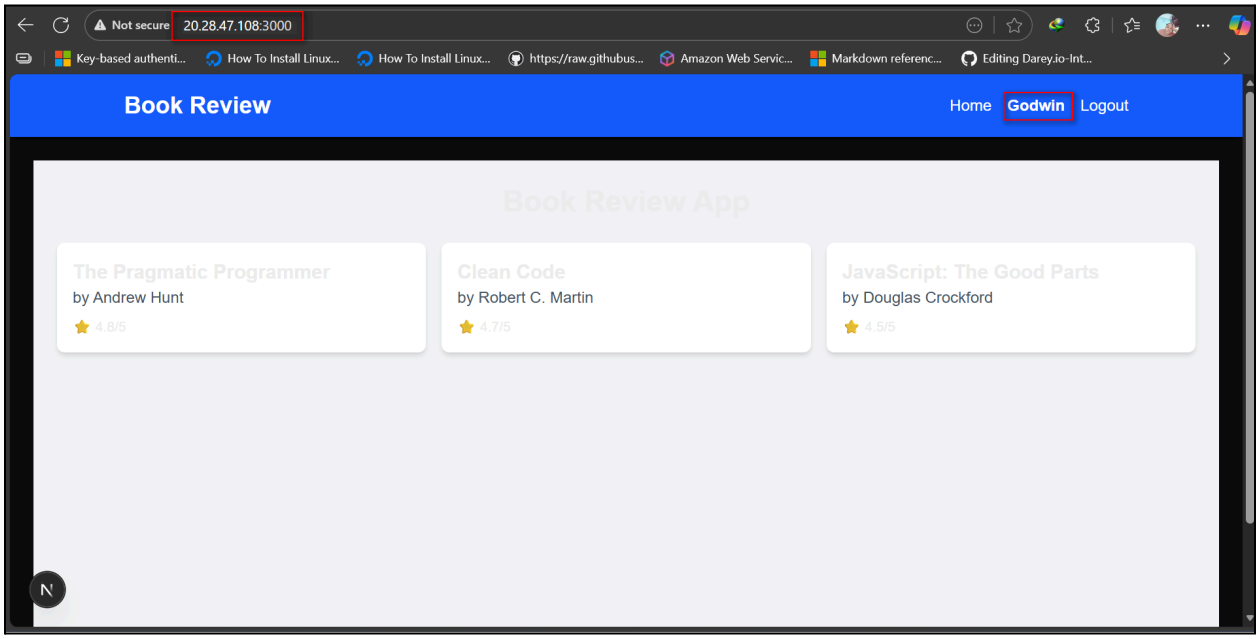


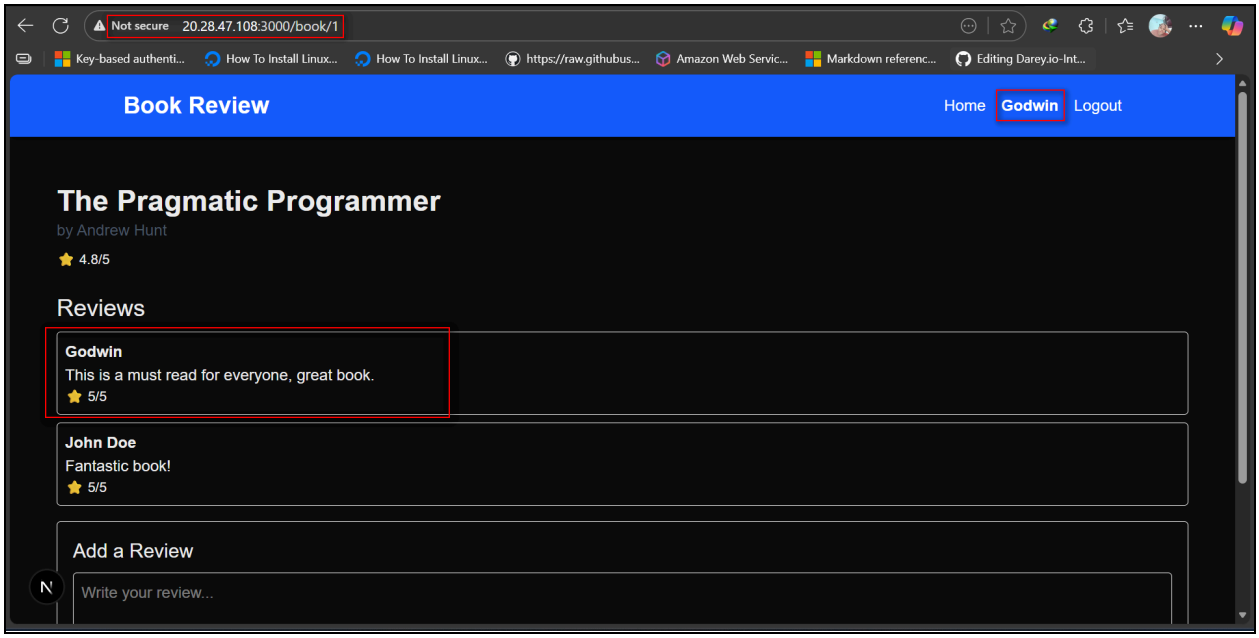

```yaml
# azure-pipelines-app.yaml

trigger:
  branches:
    include:
      - main

stages:
  - stage: DeployApp
    displayName: "Deploy Application Code via Ansible"
    jobs:
      - job: App_Deployment
        displayName: "Run Ansible Playbook to Deploy App"
        pool:
          name: "linux-self-agent"

        steps:
          - script: |
              sudo apt update
              sudo apt install -y ansible sshpass
            displayName: "Install Ansible & SSH dependencies"
```

```
    - task: DownloadSecureFile@1
      name: download_ssh_key
      inputs:
        secureFile: "id_rsa"

    - script: |
        mkdir -p ~/.ssh
        cp $(download_ssh_key.secureFilePath) ~/.ssh/id_rsa
        chmod 600 ~/.ssh/id_rsa
        echo "StrictHostKeyChecking no" > ~/.ssh/config
      displayName: "Setup SSH Private Key"

    - script: |
        cd ansible
        ansible-playbook -i inventory.ini site.yml --ssh-extra-args "-o StrictHostKeyChecking=no -o
UserKnownHostsFile=/dev/null"
      displayName: "Run Ansible Playbook"
      env:
        ANSIBLE_HOST_KEY_CHECKING: "False"
```

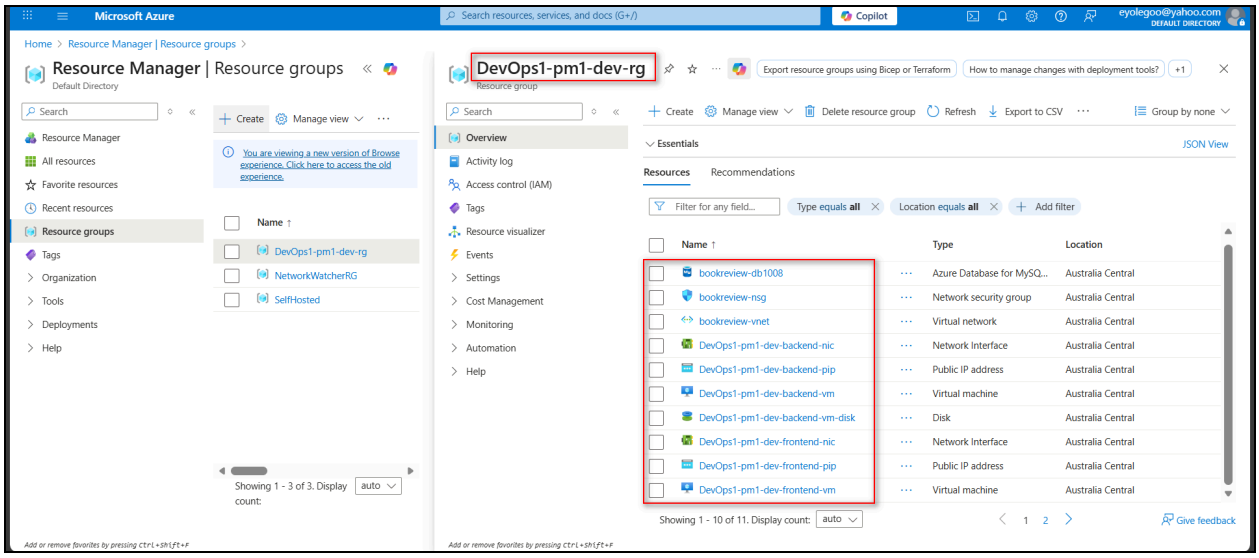


Now I tested the VM IP on the web browser





Created resources on azure portal



Step 5.1: Reflection

The infrastructure pipeline took the most time since setting up Terraform modules, configuring the service connection, and verifying Azure resources required careful testing. Once the infrastructure was ready, the application pipeline was smoother, though fine-tuning Ansible roles took some effort. In the next version, I'd automate the handoff by feeding Terraform outputs directly into the Ansible pipeline using artifacts or variable groups, removing manual edits entirely.