EASWARI ENGINEERING COLLEGE

(Autonomous)

Internship Report

Submitted in Partial Fulfilment of for the award of degree of

BACHELOR OF ENGINEERING

In

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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EASWARI Engineering College, Chennai

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ABSTRACT

In today's software development landscape, Continuous Integration (CI) and Continuous Delivery (CD) have become essential practices for maintaining the quality and efficiency of software projects. Docker containers offer a standardized and efficient way to package applications and their dependencies, while Azure App Service provides a scalable and reliable platform for hosting web applications. This internship project aims to enhance the CI/CD pipeline in Azure DevOps for deploying Docker images to Azure App Service, thereby automating the deployment process and ensuring rapid, reliable, and consistent application delivery.

1. OBJECTIVE OF THE PROJECT

In today's modern software development landscape, our goal is to establish an agile and efficient CI/CD pipeline. Leveraging Azure DevOps and Azure Container Registry, we aim to seamlessly deploy Docker images to an Azure App Service. This approach not only enhances our development workflow but also ensures scalability and security. With automation at the core, we're poised to accelerate innovation and maintain a competitive edge in the ever-evolving tech industry.

2. NECESSITY

The necessity for this project is driven by the imperative need for efficiency and agility in today's software development ecosystem. Modern software development demands streamlined CI/CD pipelines to accelerate software delivery, respond to market dynamics, and maintain a competitive edge. By integrating Azure DevOps and Azure Container Registry, we meet this demand by automating deployment, ensuring scalability, and fortifying security measures. This approach aligns us with contemporary industry standards and fosters innovation in our software development processes

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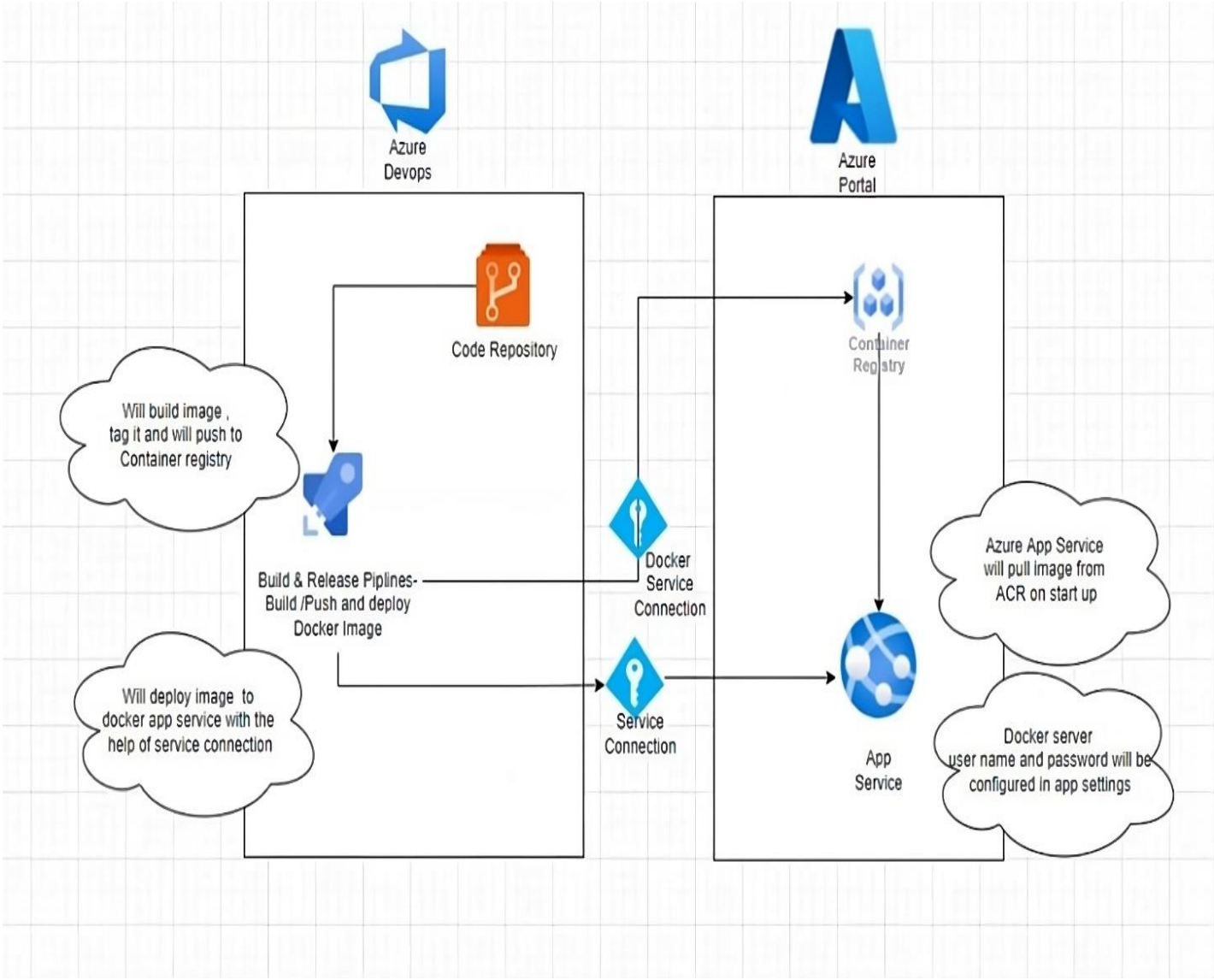
3. PROJECT OVERVIEW

Our project's core objective is to modernize our software development process with a strong focus on efficiency and agility. We'll achieve this by implementing a streamlined CI/CD pipeline using Azure DevOps and Azure Container Registry. This initiative will automate Docker image deployments to an Azure App Service, leading to faster software delivery, enhanced collaboration, and improved reliability. By embracing these modern technologies, we're poised to respond swiftly to market changes and maintain a secure and competitive edge.

4. PROJECT WORK FLOW DIAGRAM



5. RESOURCES & USE

5.1 AZURE CONTAINER REGISTRY (ACR)

- ACR is a fundamental component for storing Docker images securely within the Azure ecosystem.
- It serves as a centralized repository where Docker images are stored and versioned, ensuring easy access and management.
- ACR provides robust security features, such as access control and image scanning, to safeguard the container images.

- It allows for image replication across Azure regions, enhancing redundancy and global accessibility.
- ACR ensures the reliability and availability of container images for deployment, making it a critical part of a containerized application workflow.

5.2 AZURE APP SERVICE

- Azure App Service is a fully managed platform-as-a-service (PaaS) offering that simplifies the deployment and management of web applications.
- It supports hosting containerized applications, making it an ideal target for deploying Docker images.
- Azure App Service offers features like automatic scaling, load balancing, and integration with Azure services, reducing operational overhead.
- It supports various programming languages and frameworks, allowing developers to choose the most suitable environment for their applications.
- With built-in monitoring and diagnostics tools, Azure App Service enhances the management and monitoring of containerized application

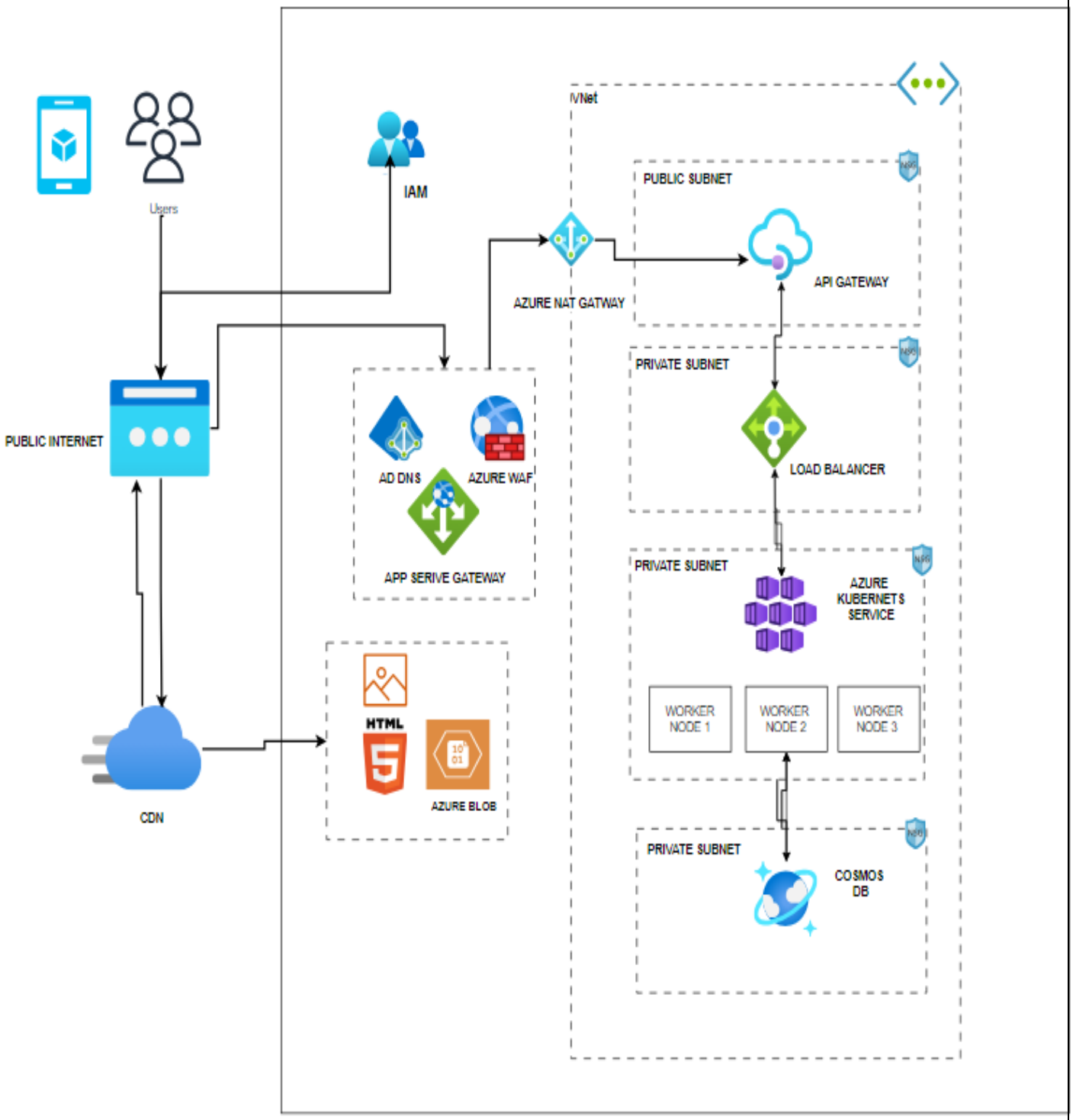
5.3 AZURE DEVOPS BUILD PIPELINE

- **T**he build pipeline automates the process of creating Docker images from source code and Docker files.
- It integrates seamlessly with source code repositories like GitHub or Azure Repos, enabling continuous integration.
- By automating image building, it ensures consistency and repeatability in the creation of container images.
- The build pipeline can also execute tests and validation steps before packaging the application into a Docker image.
- This component plays a pivotal role in preparing container images for deployment, maintaining code quality, and streamlining the development workflow.

5.4 AZURE DEVOPS RELEASE PIPELINE

- The release pipeline orchestrates the deployment of Docker images from Azure Container Registry to Azure App Service.
- It automates the entire deployment process, from image retrieval to application launch, ensuring consistency and reliability.
- The release pipeline supports continuous integration and delivery (CI/CD) workflows, enabling rapid and frequent deployments.
- It can trigger deployments automatically when new images become available in the container registry.
- By automating the deployment process, it reduces the risk of human errors and accelerates the delivery of new application features and updates.

6. SYSTEM ARCHITECTURE AND RESOURCE USED



AKS (Azure Kubernetes Service)

- Orchestrates and manages container deployments.
- Provides scalability and container orchestration capabilities.

Cosmos DB

- A globally distributed database for storing data generated by containers.
- Ensures data availability and scalability.

VNet (Virtual Network)

- Offers network isolation for secure communication between containers and resources.
- Controls and secures network traffic.

API Gateway

- Exposes containerized services securely to external clients.
- Provides features like authentication, rate limiting, and API management.

Load Balancer

- Distributes traffic evenly among container instances.
- Ensures high availability and reliability of container deployments.

Azure Blob Storage

- Stores container images, configuration files, and data.
- Essential for managing data within containerized applications.

Azure WAF (Web Application Firewall)

- Enhances security for containerized web applications.
- Protects against security threats and attack

NAT Gateway (Network Address Translation)

- Allows secure outbound internet access for containers.
- Hides internal IP addresses.

Active Directory DNS

- Provides authentication and authorization for containerized applications.

- Enhances security by controlling access.

IAM (Identity and Access Management)

- Controls permissions and access to container resources.
- Ensures secure authentication and authorization.

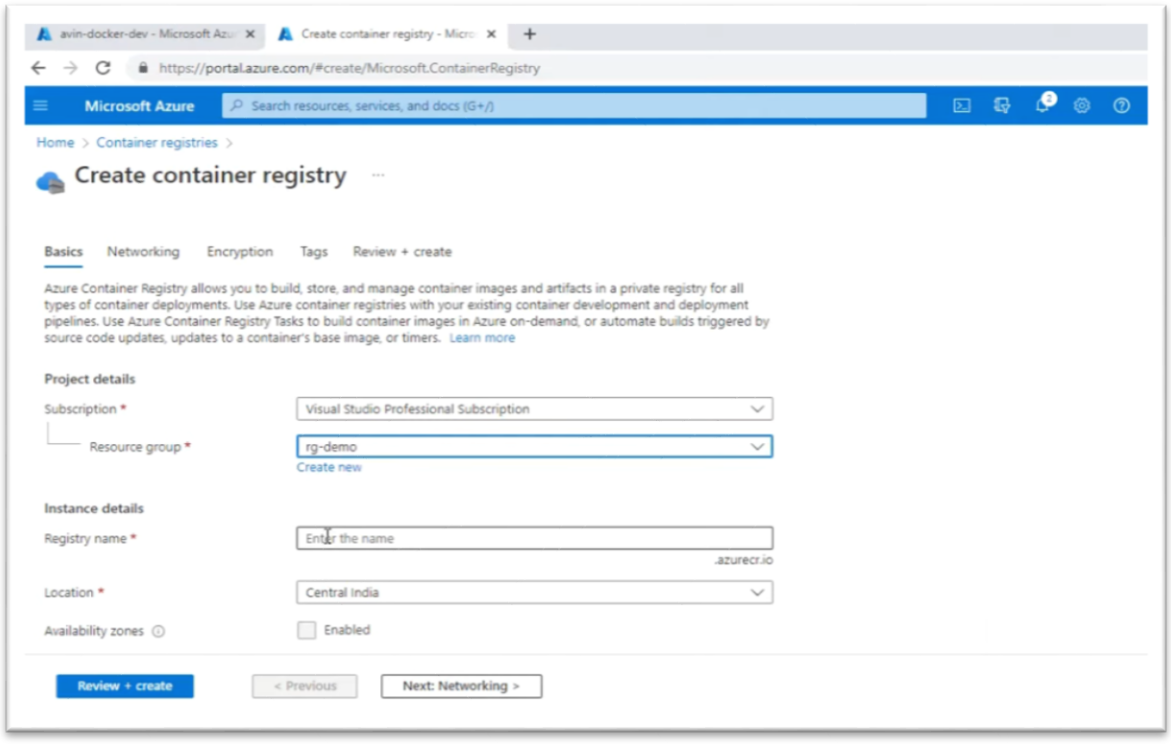
CDN (Content Delivery Network)

- Accelerates content delivery for containerized applications.
- Improves performance and user experience by caching and serving content efficiently

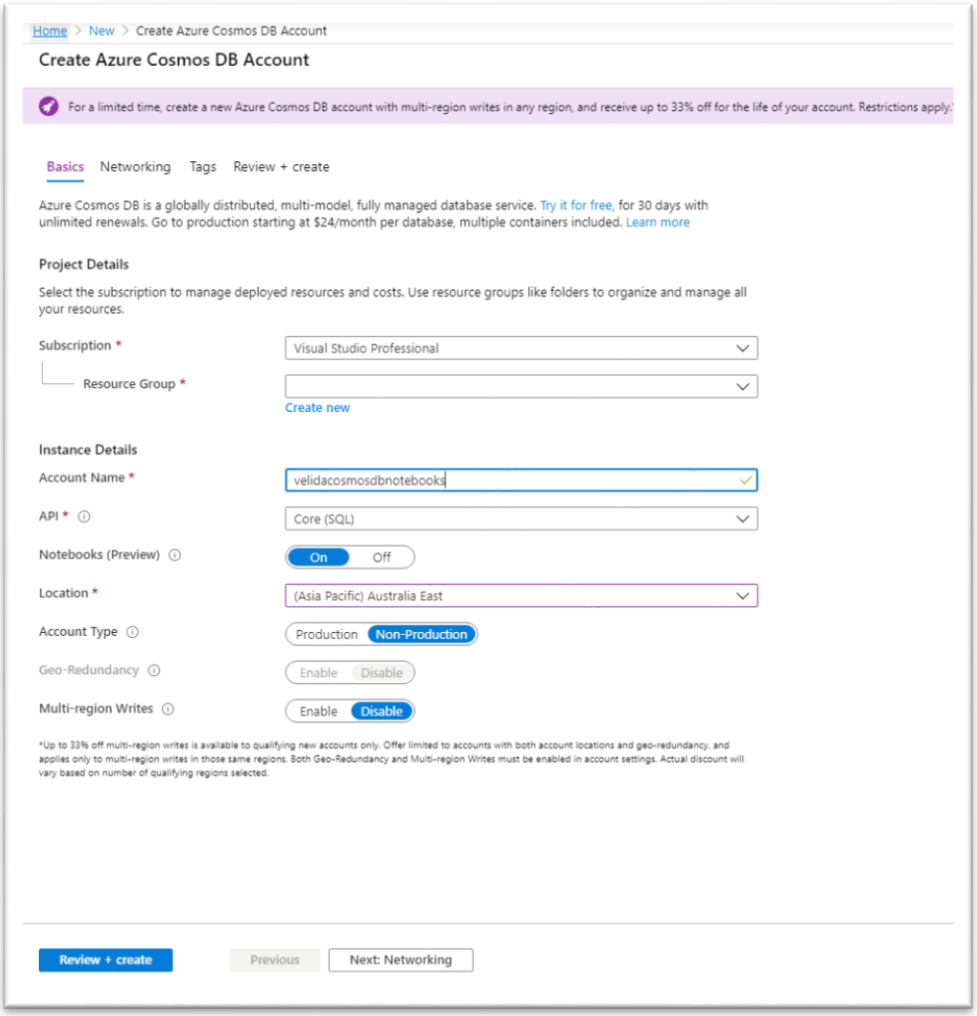
7. STEPS:

7.1 CREATE CONTAINER REGISTRY & COSMOS DB

- Open Azure Portal
- Search for “Container Registry” in Azure home
- Now configure The Container Registry

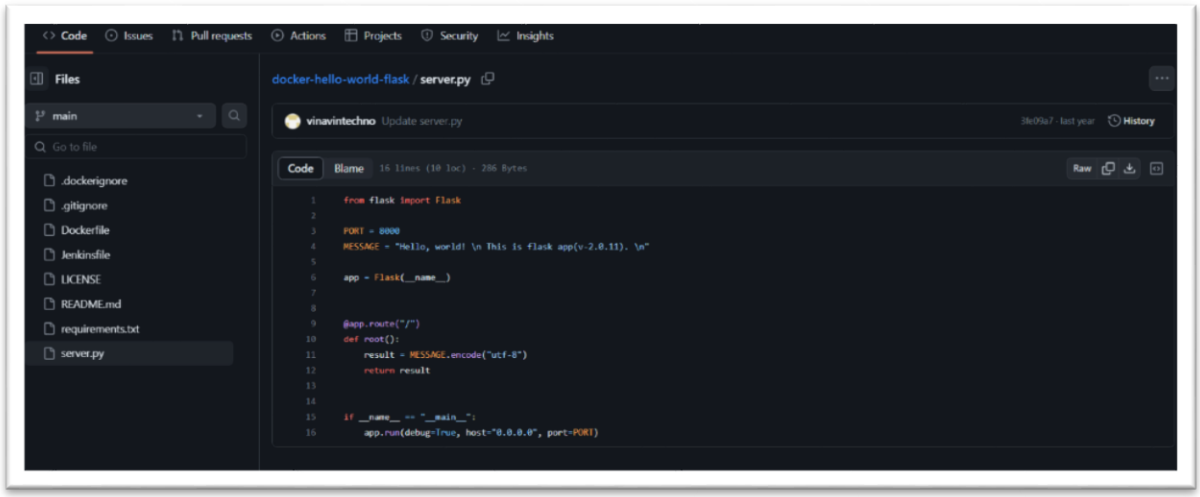


- Search for “Cosmos DB” in Azure home
- Now configure The Cosmos DB

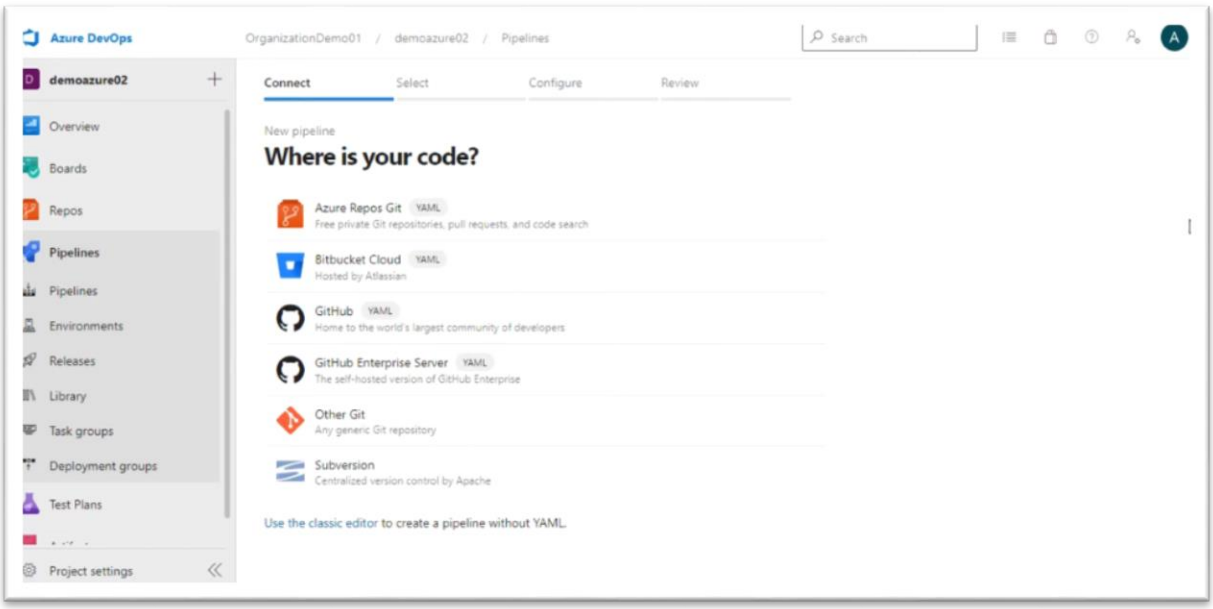


7.2 MOVE CODE TO AZURE REPO

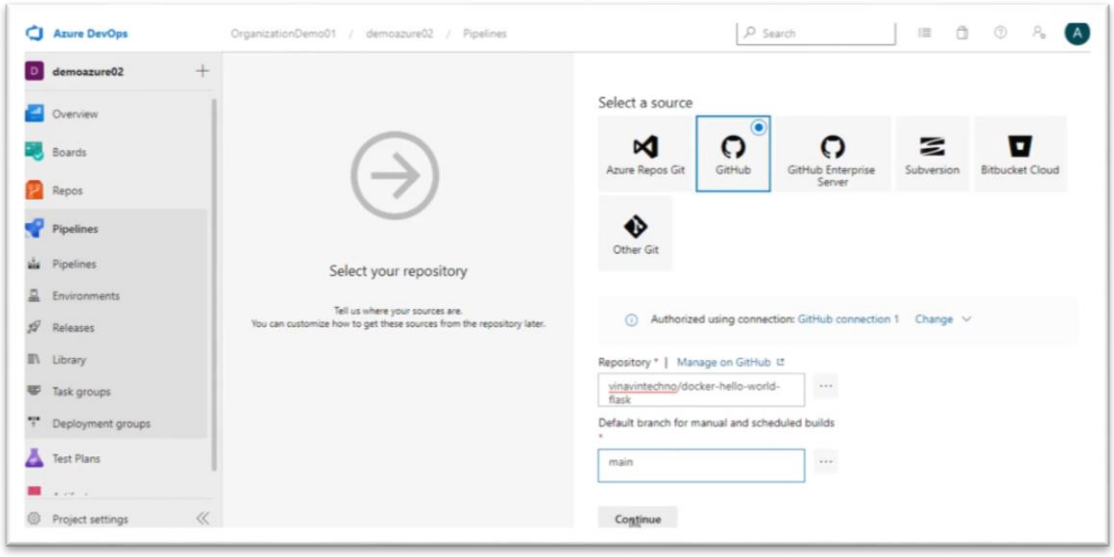
- Add the program to GITHUB repository
- To make it easy to access code by azure pipeline



- Go to Azure DevOps
- Click pipeline and create new pipeline
- And choose classic editor to code without YAML

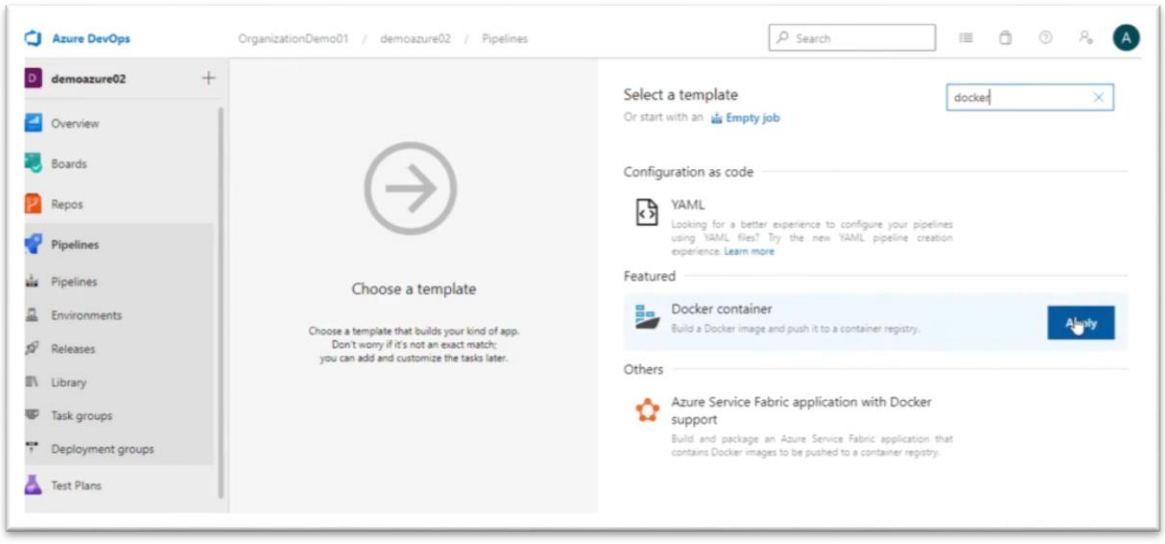


- Select GITHUB and fill the details required

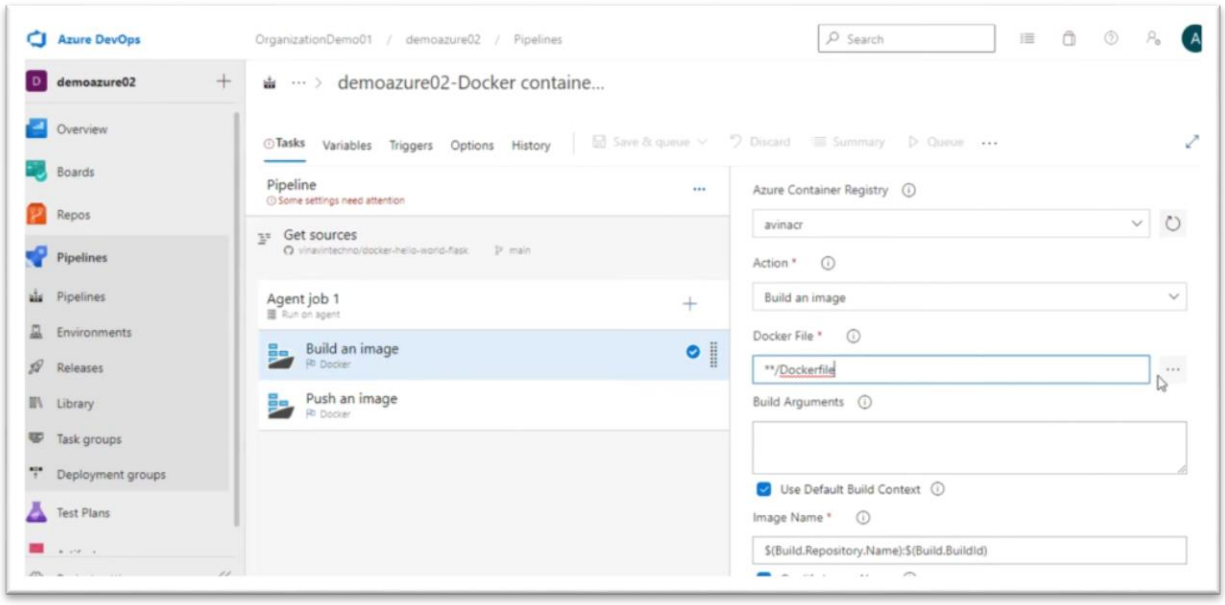


7.3 BUILDING AND PUSHING THE IMAGE TO AZURE APP SERVICE

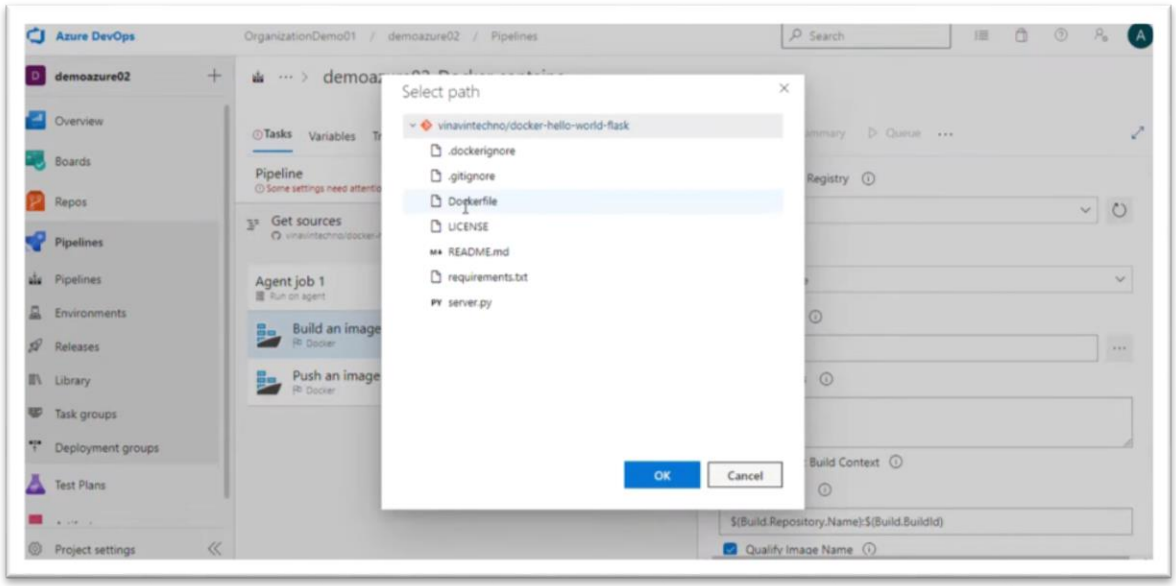
- Choose Docker Container as template



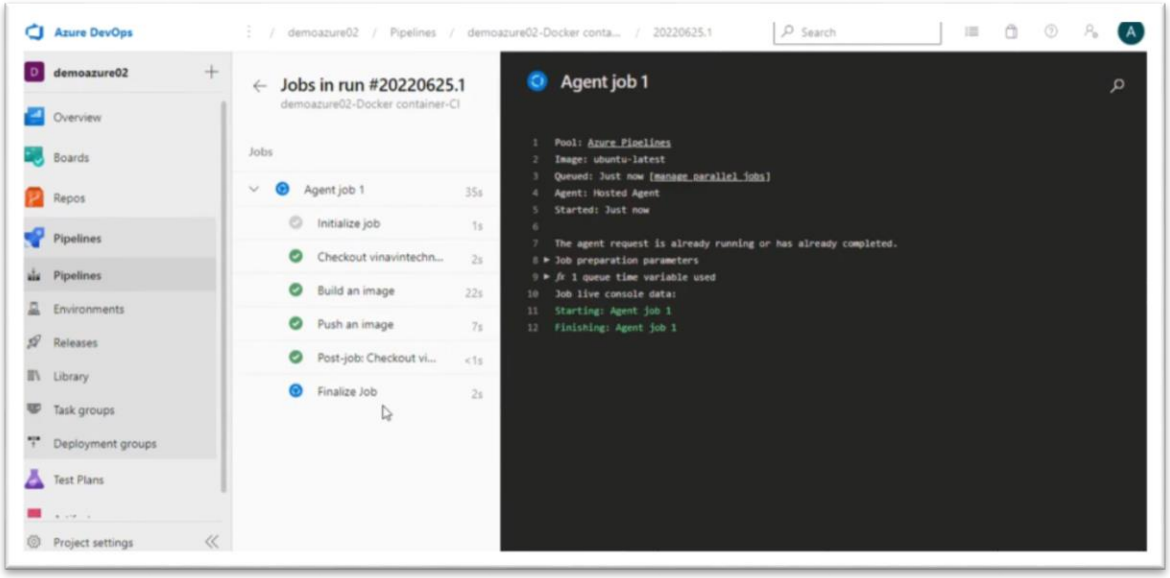
- Fill the details in the docker container
- There are two action settings Build and Push
- 1st lets configure Build Action



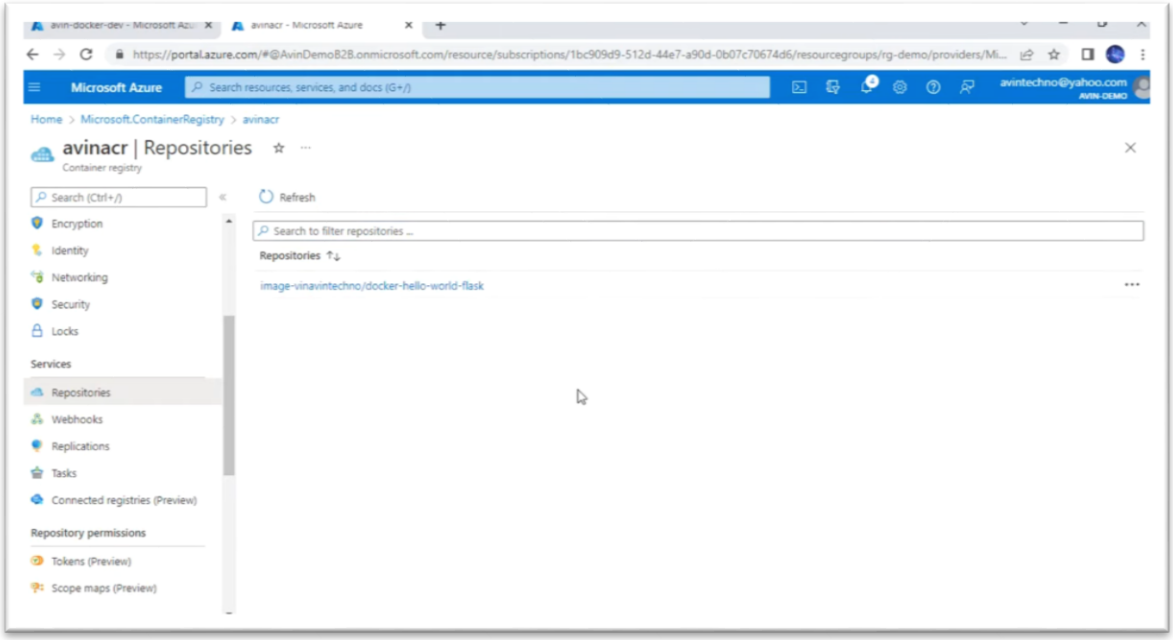
- Select the docker file from the GITHUB repository



- Configure Push Action settings next
- Fill same details as build action settings in the push action details
- After configuration, save & queue
- The task starts build and pushing process

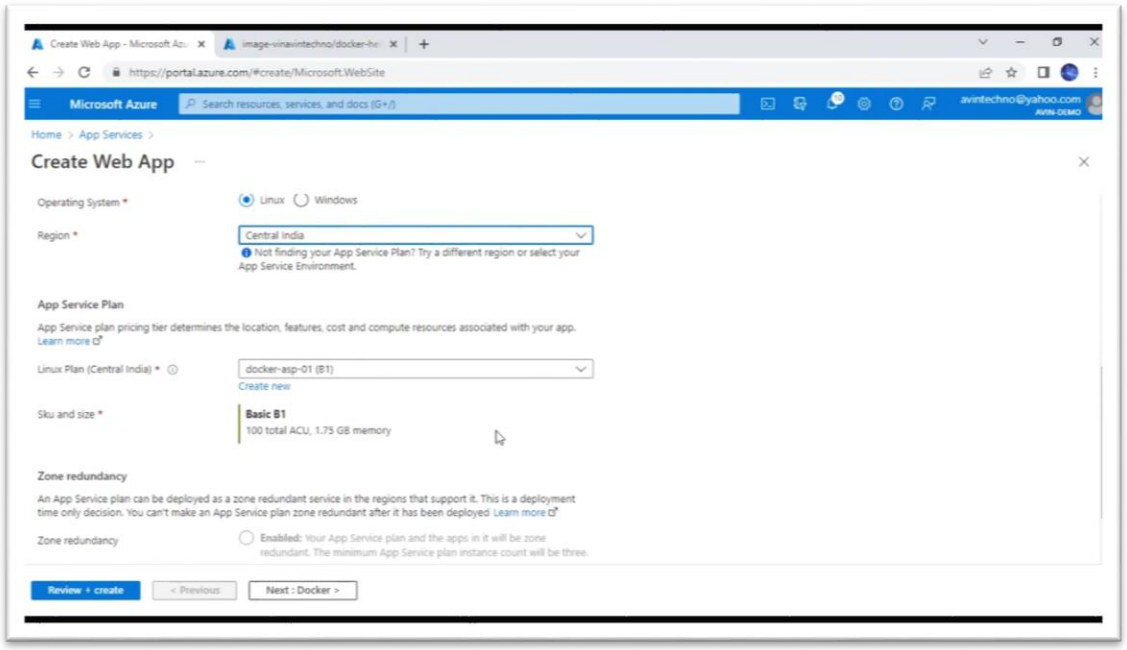


- Check the repositories in the container registry to verify that image is pushed

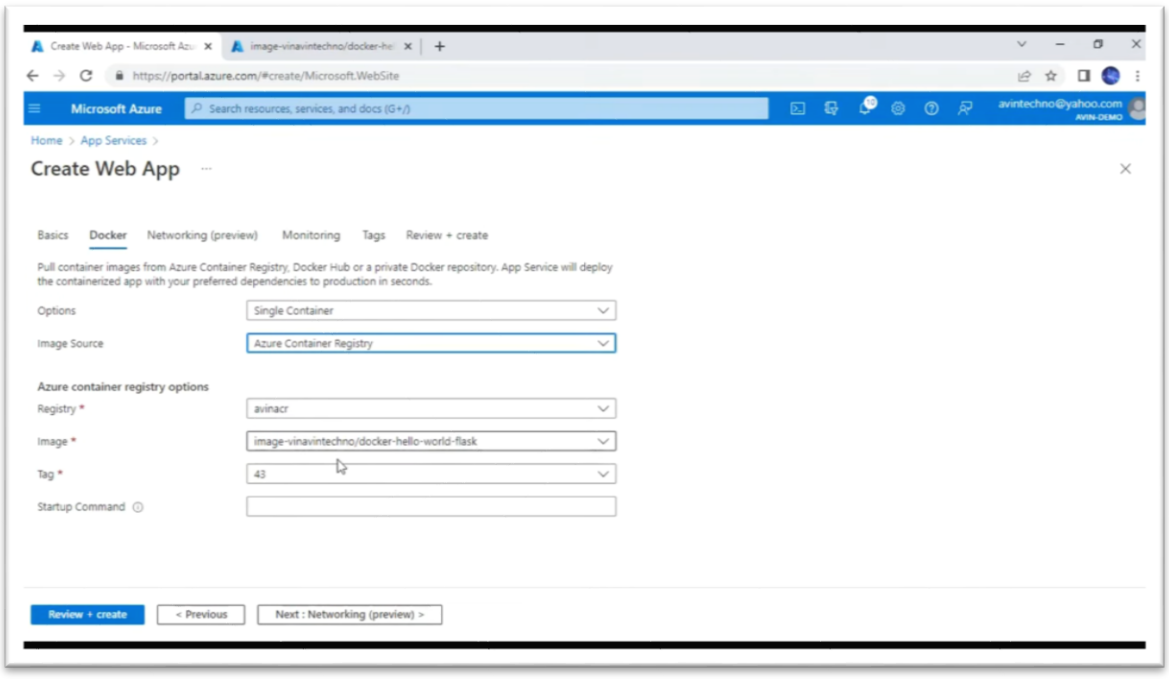


7.4 CREATING AND DEPLOYING WEB APP IN AZURE APP SERVICE

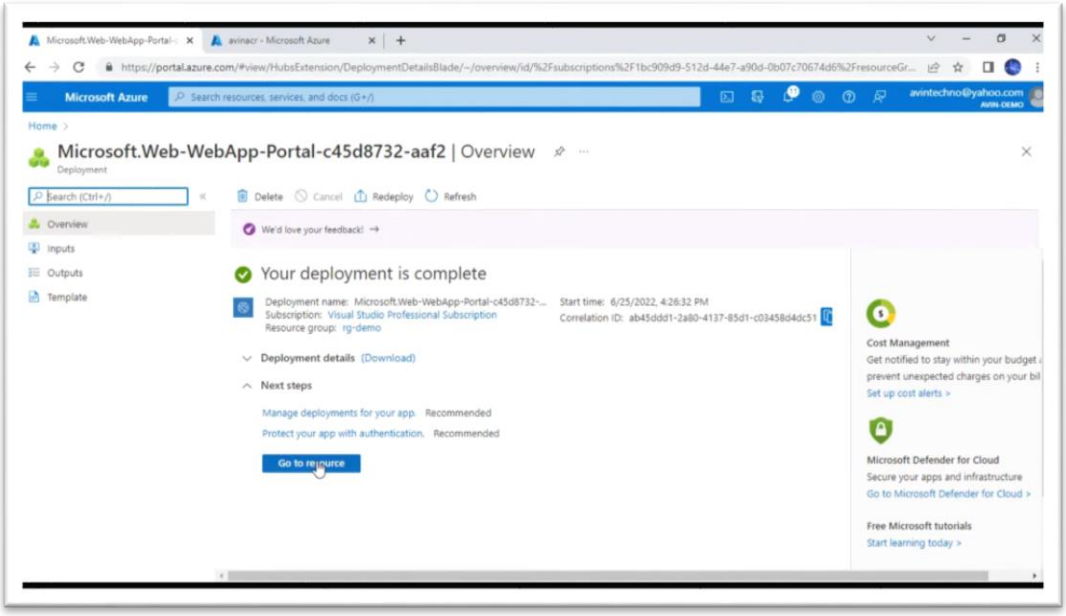
- Create Web App in Azure App Service



- Configure the Docker information into Web App

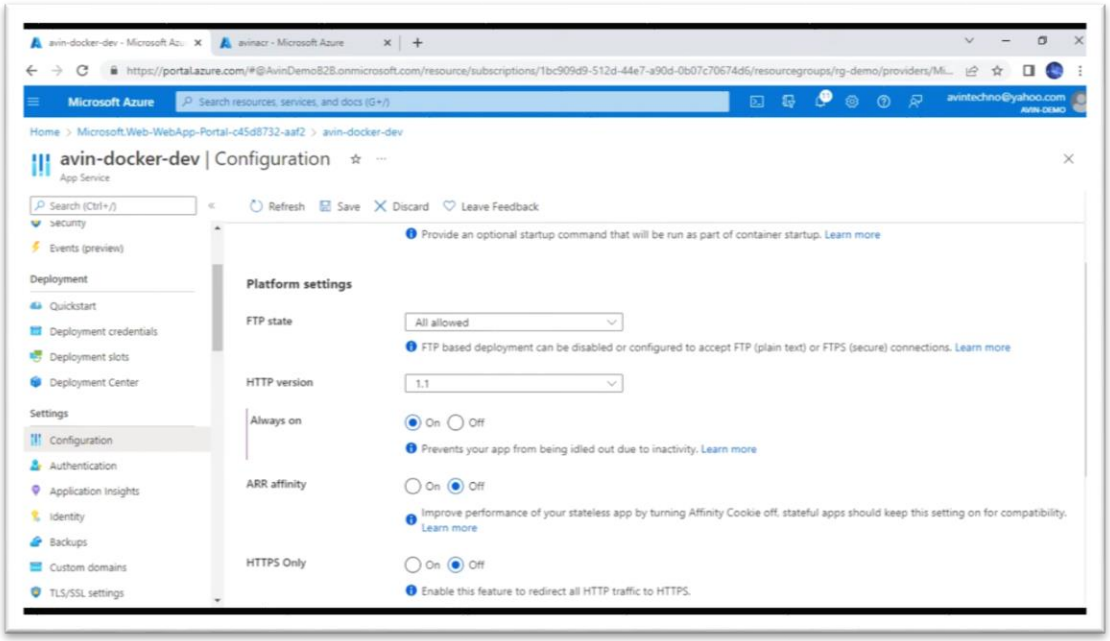


- Deploy after completing the configuration

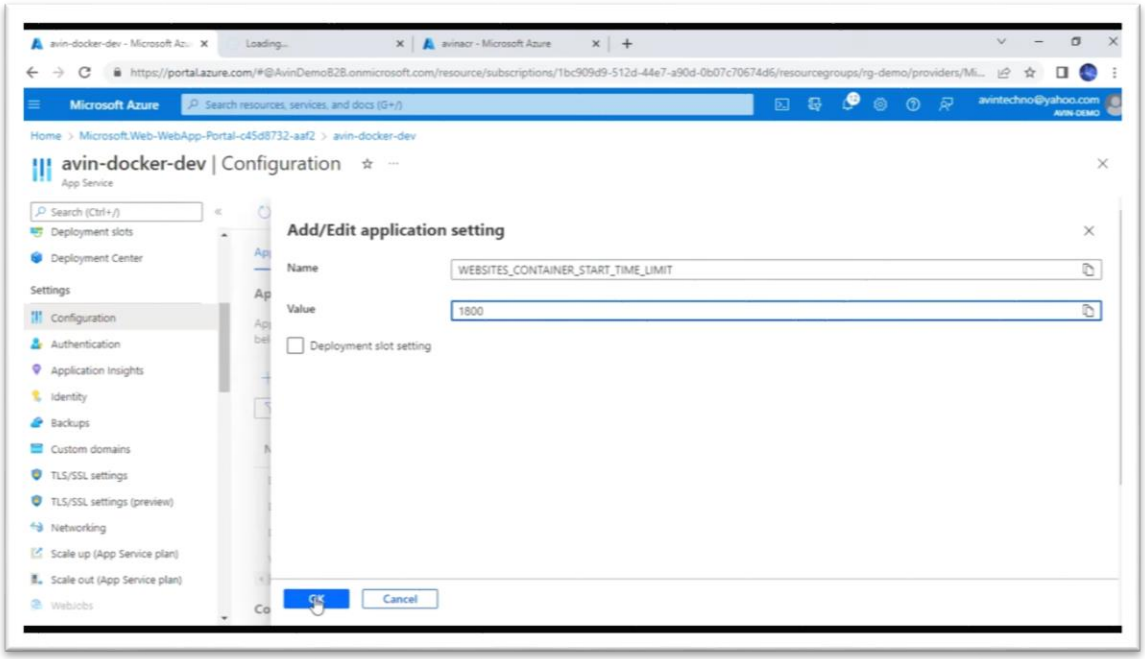


7.5 CONFIGURING THE AZURE APP SERVICE

- Configure the Web App using “Configuration” in App Service
- Visit General Settings and Turn On “Always On” under HTTP version

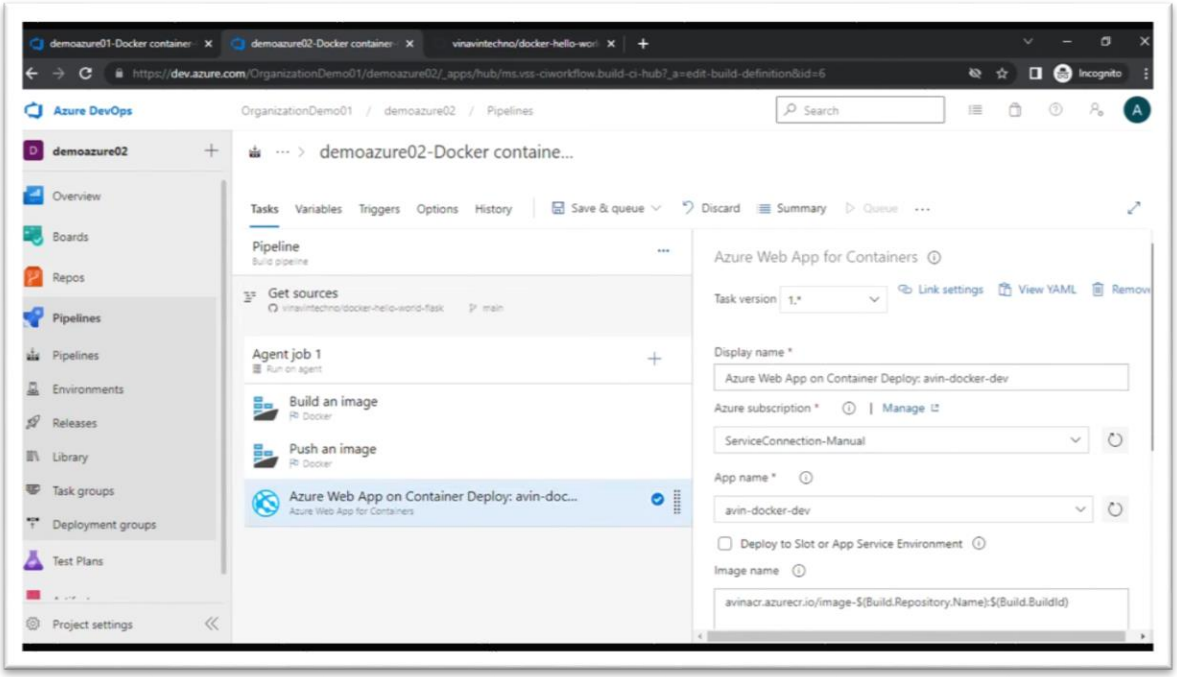


- In Application settings add new settings and also add `COSMOS_DB_CONNECTION_STRING` to link Cosmos DB to Azure App Service.

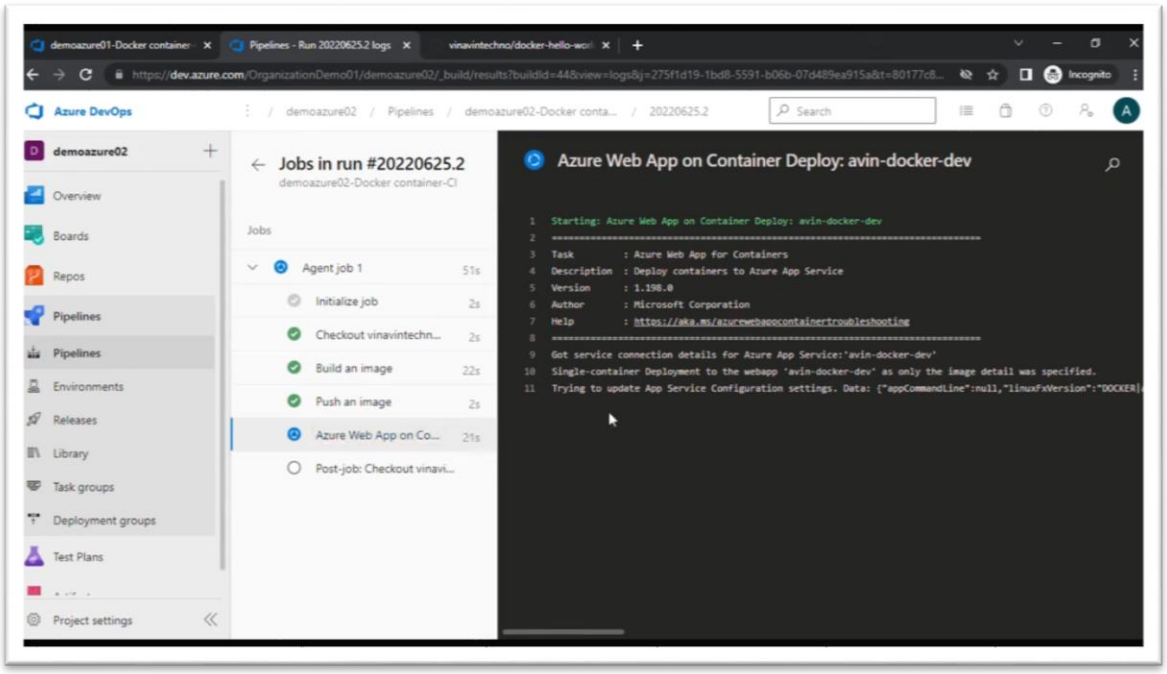


7.6 ADD AZURE WEB APP CONFIGURATION INTO AZURE DEVOPS

- Add “Azure Web App on Container Deploy “action in the Azure DevOps pipeline



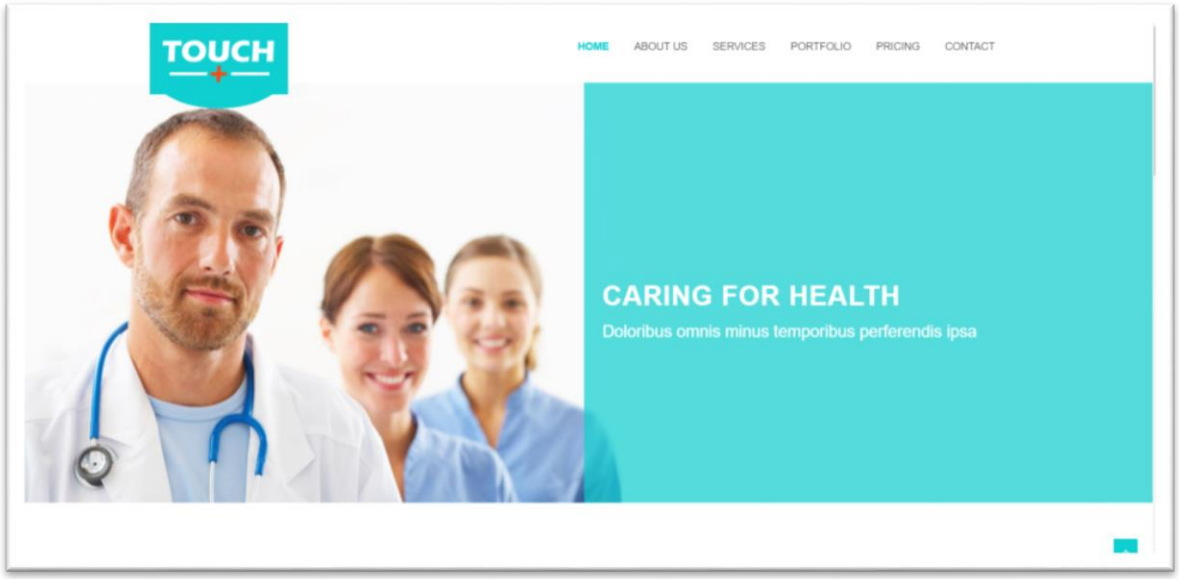
- Run the pipeline to see the new setting activate



7.7 DEPLOYMENT OF THE WEB PAGE

- Click on the default domain in the web app overview to view the web page hosted

DEMO PAGE



7.8 ADDING NETWORK RESTRICTION

- After Deploying Web page, we can use Networking option in webpage overview.
- We can configure Networking tool to restrict access based on IP address.

SUMMARY

In today's modern DevOps landscape, deploying a Docker image to Azure App Service using Azure DevOps involves creating a robust Build pipeline that efficiently containerizes and pushes the application to Azure Container Registry (ACR), all while adhering to Infrastructure as Code (IaaC) principles, typically with tools like Azure Resource Manager (ARM) templates or terraform for streamlined resource management and scalability. To elevate the application's capabilities, integrating Cosmos DB, a cutting-edge NoSQL database solution, is essential. Cosmos DB offers global distribution, elastic scalability, and low-latency data access, aligning perfectly with the demands of contemporary cloud-native applications and positioning them to excel in the ever-evolving technology landscape

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