

Dojo App Deployment to ECS Using TF Advanced

Overview

This App consists of two components. Frontend and Backend.

A React-based frontend for the DevOps Learning Platform. This application provides an interactive interface for learning DevOps concepts and taking quizzes.

A Flask-based REST API backend for the DevOps Learning Platform. This application provides endpoints for managing DevOps topics and quizzes.

Terraform:

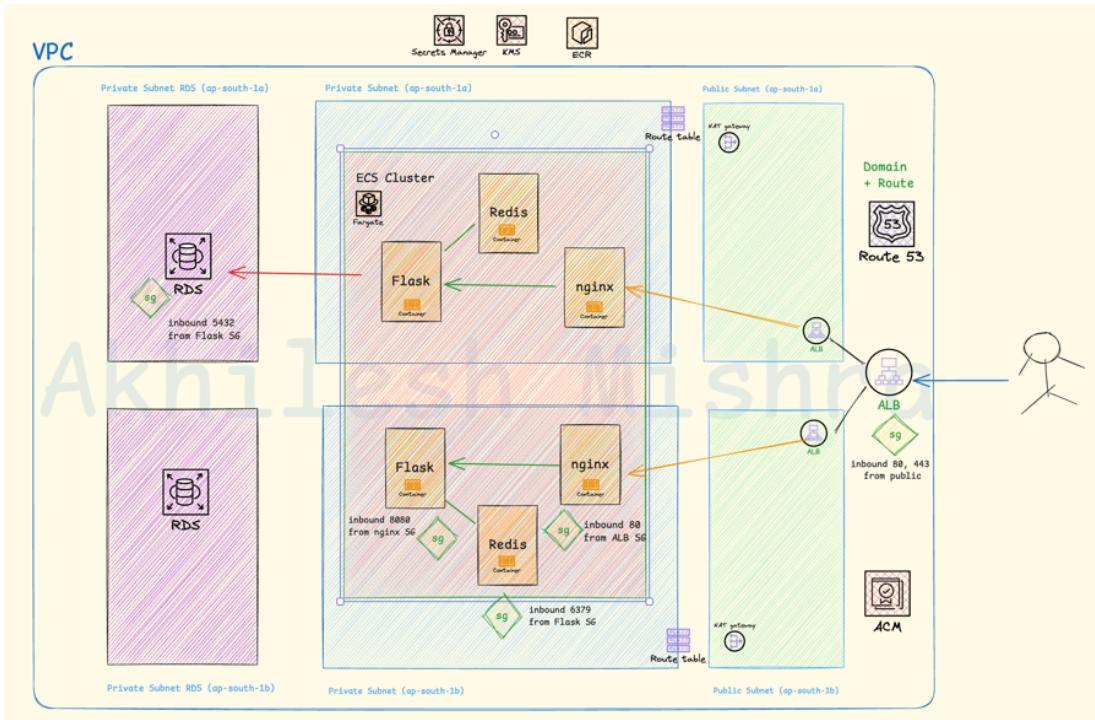
Infrastructure Deployment with Terraform

<https://github.com/rajeshchandranaws3/bootcamp-august-rajesh/tree/main/class14-assignment/infra>

Purpose:

The Terraform code is used to create aws vpc, public subnets, private subnets, igw, nat, rds, ecs, alb etc..

Architecture Diagram



Code Structure

└ infra
> .terraform
> task-definitions
> vars
≡ .terraform.lock.hcl
└ alb.tf
└ cloudwatch.tf
└ data.tf
└ ecr.tf
└ ecs.tf
└ iam.tf
└ locals.tf
└ network.tf
└ output.tf
└ providers.tf
└ rds.tf
ⓘ readme.md
└ route53.tf
≡ service_auto_scaling._.tf
└ sg.tf
└ variables.tf
└ ecs-implementation-prod.png
\$ first-deployment-images.sh

AWS Resources:

S3 Backend

The screenshot shows the AWS S3 console interface. The navigation bar at the top shows 'Buckets' > 'state-bucket-307946636515' > 'class14/' > 'dev/'. The main view displays the 'Objects' tab under the 'dev/' prefix. A single object, 'terraform.tfstate', is listed. The object has a type of 'tfstate'. There are buttons for 'Copy S3 URI' and a 'Find objects by prefix' search bar.

Network:

The screenshot shows the AWS VPC Resource Map. At the top, there is a summary card for 'vpc-01edfed02bc7b7e65' with details like 'acl-0348daa3998ec2395', 'IPv6 CIDR (Network border group)', 'No Network Address Usage metrics', '10.0.0.0/16', 'Route 53 Resolver DNS Firewall rule groups', and 'Owner ID: 307946636515'. Below this, the 'Resource map' tab is selected, showing a diagram of network components:

- VPC:** Your AWS virtual network (dev-vpc)
- Subnets (6):** Subnets within this VPC
 - us-east-1a: ECS Fargate Public Subnet 0, RDS Private Subnet 0, ECS Fargate Private Subnet 0
 - us-east-1b: ECS Fargate Public Subnet 1, RDS Private Subnet 1, ECS Fargate Private Subnet 1
- Route tables (3):** Route network traffic to resources
 - ECS EC2 Private Route Table 1, rtb-0821ad7c2e9ceddba
 - ECS EC2 Private Route Table 0
- Network Connections (3):** Connections to other networks
 - igw-0ce5ee5c203cf8400
 - nat-08a5919fd4507a217
 - nat-0e7b4b6e1ba05274a

Security Groups:

SG for ALB:

sg-0ee8096b1a316ea45 - dev-lb-sg

Details		Description	VPC ID																													
Security group name dev-lb-sg	Security group ID sg-0ee8096b1a316ea45	Description Controls access to the Application Load Balancer (ALB)	vpc-01edfed02bc7b7e65																													
Owner 307946636515	Inbound rules count 2 Permission entries	Outbound rules count 1 Permission entry																														
Inbound rules Outbound rules Sharing - new VPC associations - new Tags																																
Inbound rules (2) <table border="1"><thead><tr><th colspan="2">Search</th><th colspan="6"></th></tr><tr><th>Name</th><th>Security group rule ID</th><th>IP version</th><th>Type</th><th>Protocol</th><th>Port range</th><th>Source</th></tr></thead><tbody><tr><td>-</td><td>sgr-07ed821e632c3d34b</td><td>IPv4</td><td>HTTP</td><td>TCP</td><td>80</td><td>0.0.0.0/0</td></tr><tr><td>-</td><td>sgr-0a6995d0e42859b3d</td><td>IPv4</td><td>HTTPS</td><td>TCP</td><td>443</td><td>0.0.0.0/0</td></tr></tbody></table>				Search								Name	Security group rule ID	IP version	Type	Protocol	Port range	Source	-	sgr-07ed821e632c3d34b	IPv4	HTTP	TCP	80	0.0.0.0/0	-	sgr-0a6995d0e42859b3d	IPv4	HTTPS	TCP	443	0.0.0.0/0
Search																																
Name	Security group rule ID	IP version	Type	Protocol	Port range	Source																										
-	sgr-07ed821e632c3d34b	IPv4	HTTP	TCP	80	0.0.0.0/0																										
-	sgr-0a6995d0e42859b3d	IPv4	HTTPS	TCP	443	0.0.0.0/0																										

SG for Frontend (React.js):

sg-0b93f7000469bec42 - dev-ecs-tasks-react-sg

Details		Description	VPC ID																						
Security group name dev-ecs-tasks-react-sg	Security group ID sg-0b93f7000469bec42	Description Allow inbound access from the ALB only	vpc-01edfed02bc7b7e65																						
Owner 307946636515	Inbound rules count 1 Permission entry	Outbound rules count 1 Permission entry																							
Inbound rules Outbound rules Sharing - new VPC associations - new Tags																									
Inbound rules (1) <table border="1"><thead><tr><th colspan="2">Search</th><th colspan="6"></th></tr><tr><th>Name</th><th>Security group rule ID</th><th>IP version</th><th>Type</th><th>Protocol</th><th>Port range</th><th>Source</th></tr></thead><tbody><tr><td>-</td><td>sgr-0f3f1d7533f662466</td><td>-</td><td>HTTP</td><td>TCP</td><td>80</td><td>sg-0ee8096b1a316ea45 / dev-lb-sg</td></tr></tbody></table>				Search								Name	Security group rule ID	IP version	Type	Protocol	Port range	Source	-	sgr-0f3f1d7533f662466	-	HTTP	TCP	80	sg-0ee8096b1a316ea45 / dev-lb-sg
Search																									
Name	Security group rule ID	IP version	Type	Protocol	Port range	Source																			
-	sgr-0f3f1d7533f662466	-	HTTP	TCP	80	sg-0ee8096b1a316ea45 / dev-lb-sg																			

SG for Backend (Flask App):

sg-0b007ca84e785256a - dev-ecs-tasks-flask-sg

Details		Description	VPC ID																						
Security group name dev-ecs-tasks-flask-sg	Security group ID sg-0b007ca84e785256a	Description Allow inbound access from the ALB only	vpc-01edfed02bc7b7e65																						
Owner 307946636515	Inbound rules count 1 Permission entry	Outbound rules count 1 Permission entry																							
Inbound rules Outbound rules Sharing - new VPC associations - new Tags																									
Inbound rules (1) <table border="1"><thead><tr><th colspan="2">Search</th><th colspan="6"></th></tr><tr><th>Name</th><th>Security group rule ID</th><th>IP version</th><th>Type</th><th>Protocol</th><th>Port range</th><th>Source</th></tr></thead><tbody><tr><td>-</td><td>sgr-0cb76e687da2b9774</td><td>-</td><td>Custom TCP</td><td>TCP</td><td>8000</td><td>sg-0b93f7000469bec42 / dev-ecs-tasks-react-sg</td></tr></tbody></table>				Search								Name	Security group rule ID	IP version	Type	Protocol	Port range	Source	-	sgr-0cb76e687da2b9774	-	Custom TCP	TCP	8000	sg-0b93f7000469bec42 / dev-ecs-tasks-react-sg
Search																									
Name	Security group rule ID	IP version	Type	Protocol	Port range	Source																			
-	sgr-0cb76e687da2b9774	-	Custom TCP	TCP	8000	sg-0b93f7000469bec42 / dev-ecs-tasks-react-sg																			

SG for RDS (Postgresql):

sg-0d66f2a3607a8b9c1 - dev-rds-sg

Details	Security group name dev-rds-sg	Security group ID sg-0d66f2a3607a8b9c1	Description allow inbound access from the ECS only	VPC ID vpc-01edfed02bc7b7e65
Owner 307946636515	Inbound rules count 2 Permission entries	Outbound rules count 1 Permission entry		

Inbound rules | Outbound rules | Sharing - new | VPC associations - new | Tags

Inbound rules (2)

Name	Security group rule ID	IP version	Type	Protocol	Port range	Source
-	sgr-0e3c0dfd4583eb786	-	PostgreSQL	TCP	5432	sg-0b007ca84e785256a / dev-ecs-tasks-flask-sg

Database:

dev-app-db

Summary

DB identifier dev-app-db	Status Available	Role Instance	Engine PostgreSQL
CPU 6.98%	Class db.t3.small	Current activity 0 Connections	Region & AZ us-east-1a

Connectivity & security | Monitoring | Logs & events | Configuration | Zero-ETL integrations | Maintenance

Connectivity & security

Endpoint & port

Endpoint dev-app-db.cizic4iqc955.us-east-1.rds.amazonaws.com
--

Networking

Availability Zone us-east-1a
VPC dev-vpc (vpc-01edfed02bc7b7e65)
Subnet group dev-app-db-subnet-group

Security

VPC security groups dev-rds-sg (sg-0d66f2a3607a8b9c1)
Active
Publicly accessible No
Certificate authority Info

Connectivity & security	Monitoring	Logs & events	Configuration	Zero-ETL integrations	Maintenance & backups	Data migrations	T
Instance							
Configuration <p>DB instance ID dev-app-db</p> <p>Engine version 14.17</p> <p>RDS Extended Support Enabled</p> <p>DB name mydb</p> <p>License model Postgresql License</p> <p>Option groups default:postgres-14 (2) In sync</p> <p>Amazon Resource Name (ARN) arn:aws:rds:us-east-1:307946636515:db:dev-app-db</p>		Instance class Instance class db.t3.small	Primary storage Encryption Enabled	Monitoring Monitoring type Database Insights - Standard			
		Availability vCPU 2	AWS KMS key dev-rds-kms-key ?	Storage type General Purpose SSD (gp3)	Performance Insights Disabled	Enhanced Monitoring Disabled	
		RAM 2 GB	Master username postgres	Storage 30 GiB	Logs published to Cloudwatch PostgreSQL log ? Upgrade log ?		
		Multi-AZ No	Master password *****	Provisioned IOPS 3000 IOPS			
			IAM DB authentication Not enabled	Storage throughput 125 MiBps			
				Storage autoscaling Enabled			
				Maximum storage threshold 100 GiB			

ECR

	Repository name	▲	URI
<input type="radio"/>	dev-app-flask		307946636515.dkr.ecr.us-east-1.amazonaws.com/dev-app-flask
<input type="radio"/>	dev-app-react		307946636515.dkr.ecr.us-east-1.amazonaws.com/dev-app-react

Images:

Execute the [first-image-deployment.sh](#) to update the images into ecr.

```

class14-assignment > $ first-deployment-images.sh
4  AWS_REGION="us-east-1"
5  AWS_ACCOUNT_ID="307946636515"
6  environment="dev"
7  app_name="app"
8  REPOSITORY_NAME_APP="${environment}-${app_name}-flask"
9  REPOSITORY_NAME_FRONTEND="${environment}-${app_name}-react"
10
11 # Login to ECR
12 aws ecr get-login-password --region $AWS_REGION | docker login --username AWS --password-stdin $AWS_ACCOUNT_ID.dkr.ecr.$AWS_REGION.amazonaws.com
13
14 # Function to build and push Docker images
15 build_and_push() {
16     local dockerfile_path=$1
17     echo "Dockerfile path: $dockerfile_path"
18     local ecr_repository=$2
19     echo "ECR Repository: $ecr_repository"
20     local ecr_base_url=$AWS_ACCOUNT_ID.dkr.ecr.$AWS_REGION.amazonaws.com
21     echo "ECR Base URL: $ecr_base_url"
22     local tag="latest"
23     local image_final_path=$ecr_base_url/$ecr_repository:$tag
24     echo "Final image path: $image_final_path"
25
26
27     echo "Building $service image..."
28     docker buildx build --platform linux/amd64 -t $image_final_path $dockerfile_path
29     if [ $? -ne 0 ]; then
30         echo "Docker build failed for $dockerfile_path"
31         exit 1
32     fi
33
34     echo "Pushing $dockerfile_path image to ECR..."
35     docker push $image_final_path
36     if [ $? -ne 0 ]; then
37         echo "Docker push failed for $image_final_path"
38         exit 1
39     else
40         echo "Successfully pushed $image_final_path"
41     fi
42 }
43
44 # Build and push images
45 build_and_push "app/backend" $REPOSITORY_NAME_APP
46 build_and_push "app/frontend" $REPOSITORY_NAME_FRONTEND
47
48 echo "All images have been built and pushed successfully."

```

ECS:

Cluster:

Last updated November 1, 2025, 13:14 (UTC+5:30)

dev-app-cluster

Cluster overview		CloudWatch monitoring		Registered container instances	
ARN arn:aws:ecs:us-east-1:307946636515:cluster/dev-app-cluster	Status Active	CloudWatch monitoring Default	Registered container instances -		
Services		Tasks			
Draining -	Active 2	Pending -	Running 4		

Task Definition:

Task definition		Status of last revision
<input type="radio"/>	dev-app-flask	<input checked="" type="checkbox"/> ACTIVE
<input type="radio"/>	dev-app-react	<input checked="" type="checkbox"/> ACTIVE

JSON for Flask:

```
{  
    "compatibilities": [  
        "EC2",  
        "FARGATE",  
        "MANAGED_INSTANCES"  
    ],  
    "containerDefinitions": [  
        {  
            "command": [  
                "bash",  
                "-c",  
                "sleep 10 && ./migrate.sh && gunicorn --bind 0.0.0.0:8000 run:app"  
            ],  
            "cpu": 0,  
            "environment": [  
                {  
                    "name": "ALLOWED_ORIGINS",  
                    "value": "*"  
                },  
                {  
                    "name": "FLASK_APP",  
                    "value": "run.py"  
                },  
                {  
                    "name": "FLASK_DEBUG",  
                    "value": "1"  
                },  
                {  
                    "name": "DATABASE_URL",  
                    "value": "postgresql://postgres:9xtlPd85js@dev-app-db.cizic4iqc955.us-east-1.rds.amazonaws.com:5432/mydb"  
                },  
                {  
                    "name": "DB_USERNAME",  
                    "value": "postgres"  
                },  
                {  
                    "name": "DB_PORT",  
                    "value": "5432"  
                },  
                {  
                    "name": "SECRET_KEY",  
                    "value": "f4a83d7e15e9f8b1c23b4b73f9b09b8827f501bbdce1a3dca7d23d8c991e3f45"  
                },  
                {  
                    "name": "DB_NAME",  
                    "value": "mydb"  
                }  
            ]  
        }  
    ]  
}
```

```
        "value": "mydb"
    },
    {
        "name": "ENV",
        "value": "dev"
    },
    {
        "name": "DB_HOST",
        "value": "dev-app-db.cizic4iqc955.us-east-1.rds.amazonaws.com"
    },
    {
        "name": "DB_PASSWORD",
        "value": "9xtlPd85js"
    }
],
"essential": true,
"image": "307946636515.dkr.ecr.us-east-1.amazonaws.com/dev-app-flask:latest",
"logConfiguration": {
    "logDriver": "awslogs",
    "options": {
        "awslogs-group": "/aws/ecs/dev-flask",
        "awslogs-region": "us-east-1",
        "awslogs-stream-prefix": "/aws/ecs/dev-flask-service"
    }
},
"mountPoints": [],
"name": "flask-app",
"portMappings": [
    {
        "appProtocol": "http",
        "containerPort": 8000,
        "hostPort": 8000,
        "name": "app",
        "protocol": "tcp"
    }
],
"systemControls": [],
"volumesFrom": []
},
{
    "cpu": "1024",
    "executionRoleArn": "arn:aws:iam::307946636515:role/dev-ecs-task-execution-role",
    "family": "dev-app-flask",
    "memory": "2048",
    "networkMode": "awsvpc",
    "placementConstraints": [],
    "registeredAt": "2025-11-01T07:39:46.362Z",
    "registeredBy": "arn:aws:iam::307946636515:user/user1",
    "requiresAttributes": [
```

```

{
  "name": "com.amazonaws.ecs.capability.logging-driver.awslogs"
},
{
  "name": "ecs.capability.execution-role-awslogs"
},
{
  "name": "com.amazonaws.ecs.capability.ecr-auth"
},
{
  "name": "com.amazonaws.ecs.capability.docker-remote-api.1.19"
},
{
  "name": "ecs.capability.execution-role-ecr-pull"
},
{
  "name": "com.amazonaws.ecs.capability.docker-remote-api.1.18"
},
{
  "name": "ecs.capability.task-eni"
}
],
"requiresCompatibilities": [
  "FARGATE"
],
"revision": 7,
"status": "ACTIVE",
"taskDefinitionArn": "arn:aws:ecs:us-east-1:307946636515:task-definition/dev-app-flask:7",
"volumes": [],
"tags": [
  {
    "key": "Environment",
    "value": "dev"
  },
  {
    "key": "Application",
    "value": "flask"
  }
]
}

```

JSON for React:

```
{
  "compatibilities": [
    "EC2",
    "MANAGED_INSTANCES",
    "FARGATE"
  ]
}
```

```
[{"  
    "containerDefinitions": [  
        {  
            "cpu": 0,  
            "environment": [  
                {  
                    "name": "ENV",  
                    "value": "dev"  
                },  
                {  
                    "name": "BACKEND_URL",  
                    "value": "http://app:8000"  
                }  
            ],  
            "essential": true,  
            "image": "307946636515.dkr.ecr.us-east-1.amazonaws.com/dev-app-react:latest",  
            "logConfiguration": {  
                "logDriver": "awslogs",  
                "options": {  
                    "awslogs-group": "/aws/ecs/dev-react",  
                    "awslogs-region": "us-east-1",  
                    "awslogs-stream-prefix": "/aws/ecs/dev-react-service"  
                }  
            },  
            "mountPoints": [],  
            "name": "react",  
            "portMappings": [  
                {  
                    "appProtocol": "http",  
                    "containerPort": 80,  
                    "hostPort": 80,  
                    "name": "react",  
                    "protocol": "tcp"  
                }  
            ],  
            "systemControls": [],  
            "volumesFrom": []  
        }  
    ],  
    "cpu": "1024",  
    "executionRoleArn": "arn:aws:iam::307946636515:role/dev-ecs-task-execution-role",  
    "family": "dev-app-react",  
    "memory": "2048",  
    "networkMode": "awsvpc",  
    "placementConstraints": [],  
    "registeredAt": "2025-11-01T07:39:46.343Z",  
    "registeredBy": "arn:aws:iam::307946636515:user/user1",  
    "requiresAttributes": [  
    ]  
}
```

```
        "name": "com.amazonaws.ecs.capability.logging-driver.awslogs"
    },
    {
        "name": "ecs.capability.execution-role-awslogs"
    },
    {
        "name": "com.amazonaws.ecs.capability.ecr-auth"
    },
    {
        "name": "com.amazonaws.ecs.capability.docker-remote-api.1.19"
    },
    {
        "name": "ecs.capability.execution-role-ecr-pull"
    },
    {
        "name": "com.amazonaws.ecs.capability.docker-remote-api.1.18"
    },
    {
        "name": "ecs.capability.task-eni"
    }
],
"requiresCompatibilities": [
    "FARGATE"
],
"revision": 4,
"status": "ACTIVE",
"taskDefinitionArn": "arn:aws:ecs:us-east-1:307946636515:task-definition/dev-app-react:4",
"volumes": [],
"tags": [
    {
        "key": "Environment",
        "value": "dev"
    },
    {
        "key": "Application",
        "value": "react"
    }
]
}
```

Services:

Services (2) Info									
Manage tags Update Delete service Create									
Filter services by value									
Service name	ARN	Status	Schedul...	Launch ...	Task de...	Deployments and tasks	Last deploy		
dev-app-flask-service	arn:aws:ecs:us-e...	Active	REPLICA	FARGATE	dev-app-fl...	<div style="width: 100%;">2/2 Tasks running</div>	Completed	Manage tags	Update
dev-app-react-service	arn:aws:ecs:us-e...	Active	REPLICA	FARGATE	dev-app-re...	<div style="width: 100%;">2/2 Tasks running</div>	Completed	Manage tags	Update

Tasks:

Tasks (4)					
Filter tasks by property or value					
Task	Last status	Desired st...	T...	Health sta...	
110d4c43e3e344858cc97...	Running	Running	dev...	Healthy	
1cf17cb53085495eb7d98...	Running	Running	dev...	Healthy	
bbebe99991b840df87d7...	Running	Running	dev...	Healthy	
caa7f30369fb4605b306e...	Running	Running	dev...	Healthy	

Route 53:

Hosted zones (1)

Automatic mode is the current search behavior optimized for best filter results. [To change modes go to settings.](#)

Hosted zone name				
Filter records by property or value				
Hosted zone name	Type	Created by		Record count
rajeshapps.site	Public	Route 53		4

Public **rajeshapps.site** Info

Delete zone 1

▶ Hosted zone details

Records (4) Info

DNSSEC signing Hosted zone tags (0)

Records (4) Info

Automatic mode is the current search behavior optimized for best filter results. [To change modes go to set!](#)

Filter records by property or value Type Routing p... ▾

<input type="checkbox"/>	Record name	Type	Routing	Differ...	Alias
<input type="checkbox"/>	rajeshapps.site	NS	Simple	-	No
<input type="checkbox"/>	rajeshapps.site	SOA	Simple	-	No
<input type="checkbox"/>	dev.rajeshapps.site	A	Simple	-	Yes
<input type="checkbox"/>	_1a77d0313aa206fc17...	CNAME	Simple	-	No

Prerequisites

GitHub Secrets Required

The following secrets to be configured in GitHub repository settings:

1. AWS_ACCESS_KEY_ID: AWS IAM access key for authentication
2. AWS_SECRET_ACCESS_KEY: AWS IAM secret key for authentication

AWS Permissions Required

The IAM user/role must have permissions for:

- Terraform Workflow
 - EC2 (VPC, Security Groups, Subnets)

- ECS (Cluster, Service, Task Definition)
- RDS (Database instances)
- IAM (Roles and policies)
- S3 (Terraform state backend)
- ECR (Repository creation)
- Build & Deploy Workflow
 - ECR (Push images, authentication)
 - ECS (Describe/update task definitions and services)

Terraform State Backend

S3 bucket for storing Terraform state (configured in dev.tfbackend)

Output

The screenshot shows the DevOps Learning Platform homepage at dev.rajeshapps.site. The top navigation bar includes links for Home, Wiki (which is highlighted with a red box), and Manage Questions. The main content features three cards:

- Docker**: Learn Docker containerization from basics to advanced concepts. Includes a "Take Quiz" button.
- Kubernetes**: Master container orchestration with Kubernetes. Includes a "Take Quiz" button.
- Jenkins**: Continuous Integration/Continuous Deployment with Jenkins. Includes a "Take Quiz" button.

The screenshot shows the DevOps Learning Platform Wiki page. The top navigation bar includes links for Home, Wiki (which is highlighted with a red box), and Manage Questions. The left sidebar has a "Categories" section with "All Pages" selected (highlighted with a blue background) and a "Create New Page" button. The main content area is titled "All Wiki Pages" and displays the message "No wiki pages found." with a "Create First Page" button below it.

Question Management

Add Single Question

Topic Slug:

Question:

Options:

Option 1

Option 2

Bulk Upload Questions

Upload CSV File:

Format:

topic_slug,question_text,option1,option2,option3,option4,correct_answer

Choose File No file chosen

Upload CSV

CSV Template:

topic_slug,question_text,option1,option2,option3,option4,correct_answer

docker,What is Docker?,A containerization platf