

Project Presentation (Devops)

BUET CSE Fest 2022 Hackathon



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Stage 1: Deliverables

- Basic Application (Admin adds Courses)
- Unit Testing
- Automated Building and Testing
- Deployment
- CI/CD Pipeline

Basic Application

- **Frontend**
 - React App
- **Backend**
 - Express Framework with Node js
 - Prisma ORM (PostgreSQL)



Basic Application Demo

Admin Dashboard



Courses



Students



Courses Assignment



Result

ADD COURSE

Course ID : 5

Course Name

jvkjfr

Course Description

vdvesfb e t

DELETE

SAVE

Course ID : 10

Course Name

sRgerg

Course Description

ergergerf

DELETE

SAVE

Course ID : 11

Course Name

Course Description

DELETE

SAVE

Course ID : 16

Course Name

c

Course Description

desc

DELETE

SAVE

Course ID : 18

Course Name

c

Course Description

desc

DELETE

SAVE

Unit Testing

- **Frontend**
 - Enzyme with Jest
 - Testing framework for React App
- **Backend**
 - Supertest with Jest
 - Testing framework for Express API



Supertest

Unit Testing Demo

```
1 import React from "react";
2 import { shallow } from "enzyme";
3 import toJson from "enzyme-to-json";
4 import App from "../App";
5
6 describe('Component App Render', () => {
7   it('renders without crashing given the required props', () => {
8     const wrapper = shallow(<App/>);
9     expect(toJson(wrapper)).toMatchSnapshot();
10   });
11 });
```

Terminal: Local x Local (2) x Local (3) x + v

Snapshot Summary

> 3 snapshots updated from 3 test suites.

Test Suites: 8 passed, 8 total
Tests: 8 passed, 8 total
Snapshots: 3 updated, 5 passed, 8 total
Time: 11.228 s
Ran all test suites.

Frontend Test

```
describe('Login', () => {
  test('should respond with 200', async () => {
    const loginResponse = await request(app).post('/api/admin/login').send({
      "login": login,
      "password": "pass355dcvs6sd"
    })
    expect(loginResponse.statusCode).toBe(200)
    expect(loginResponse.body).toBeDefined()
    expect(typeof loginResponse.body.access_token).toBe("string")
    commonHeaders.authorization = "Bearer " + loginResponse.body.access_token;
  })
})

// create student
describe('Admin add student', () => {
  test('should respond with 200', async () => {
    const response = await request(app)
      .post('/api/admin/student/add')
      .set(commonHeaders)
      .send({
        "name": "name",
        "gender": "gender",
        "year": 12
      })

    expect(response.statusCode).toBe(200);
    expect(response.body).toBeDefined();
    expect(typeof response.body.id).toBe("number");
    student_id = response.body.id;
  })
});

describe('Admin add course', () => {
  test('should respond with 200', async () => {
    const response = await request(app)
```

Backend Test

Automated Test Build and Run

- **GitHub Actions**
 - Continuous Integration (CI) workflow right in the repository



```
node.js.yml × App.test.js × courses.js × Courses.js × A
name: Node.js CI
on:
  push:
    branches: [ "master" ]
  pull_request:
    branches: [ "master" ]
jobs:
  build:
    runs-on: ubuntu-latest
    strategy:
      matrix:
        node-version: [12.x, 14.x, 16.x]
    steps:
      - uses: actions/checkout@v3
      - name: Use Node.js ${ matrix.node-version }
        uses: actions/setup-node@v3
        with:
          node-version: ${ matrix.node-version }
          cache: 'npm'
      - run: npm install --force
      - run: npm test
```

Workflows

New workflow

All workflows

🔗 Node.js CI

Node.js CI

node.js.yml

🔍 Filter workflow runs

...

25 workflow runs

Event ▾

Status ▾

Branch ▾

Actor ▾

✔ Merge pull request #12 from mehrab-haque/dev-mehrab

Node.js CI #28: Commit d9ab3ef pushed by mehrab-haque

master

📅 1 hour ago

🕒 1m 8s

...

✔ demo change

Node.js CI #27: Pull request #12 opened by mehrab-haque

dev-mehrab

📅 1 hour ago

🕒 1m 5s

...

✔ Merge pull request #11 from mehrab-haque/dev-mehrab

Node.js CI #26: Commit 40dbc61 pushed by mehrab-haque

master

📅 4 hours ago

🕒 1m 0s

...

✔ students done

Node.js CI #25: Pull request #11 opened by mehrab-haque

dev-mehrab

📅 4 hours ago

🕒 54s

...

✔ Merge pull request #10 from mehrab-haque/dev-mehrab

Node.js CI #24: Commit 93fabb8 pushed by mehrab-haque

master

📅 15 hours ago

🕒 1m 6s

...

✔ change redeemed

Node.js CI #23: Pull request #10 opened by mehrab-haque

dev-mehrab

📅 15 hours ago

🕒 1m 14s

...

✔ Merge pull request #9 from mehrab-haque/dev-mehrab

Node.js CI #22: Commit bdd16b3 pushed by mehrab-haque

master

📅 15 hours ago

🕒 1m 6s

...

✔ demo

Node.js CI #21: Pull request #9 opened by mehrab-haque

dev-mehrab

📅 15 hours ago

🕒 57s

...

✔ Merge pull request #8 from mehrab-haque/dev-mehrab

Node.js CI #20: Commit eb84b94 pushed by mehrab-haque

master

📅 15 hours ago

🕒 1m 3s

...

✔ buildspec

Node.js CI #19: Pull request #8 opened by mehrab-haque

dev-mehrab

📅 15 hours ago

🕒 57s

...

Deployment

- **AWS S3 (Frontend)**
 - Highly scalable, reliable, cost-effective static storage
- **AWS Elastic Beanstalk (Backend)**
 - Flexible, auto-scalable deploying infrastructure
- **Amazon RDS (Relational Database)**
 - Easily operable Postgres DB service
 - Can produce multi AZ read replicas



Source

GitHub (Version 1)

Succeeded

- 1 hour ago

d9ab3efb

Source: Merge pull request #12 from mehrab-haque/dev-mehrab

Disable transition

Build

AWS CodeBuild

Succeeded

- 1 hour ago

Details

Source: Merge pull request #12 from mehrab-haque/dev-mehrab

Disable transition

Deploy

Amazon S3

Succeeded

- 1 hour ago

Frontend Deploy

Source

GitHub (Version 1)

Succeeded

- 4 hours ago

6585608a

Source: Merge pull request #7 from nayeem-17/znaim

Disable transition

Deploy

AWS Elastic Beanstalk

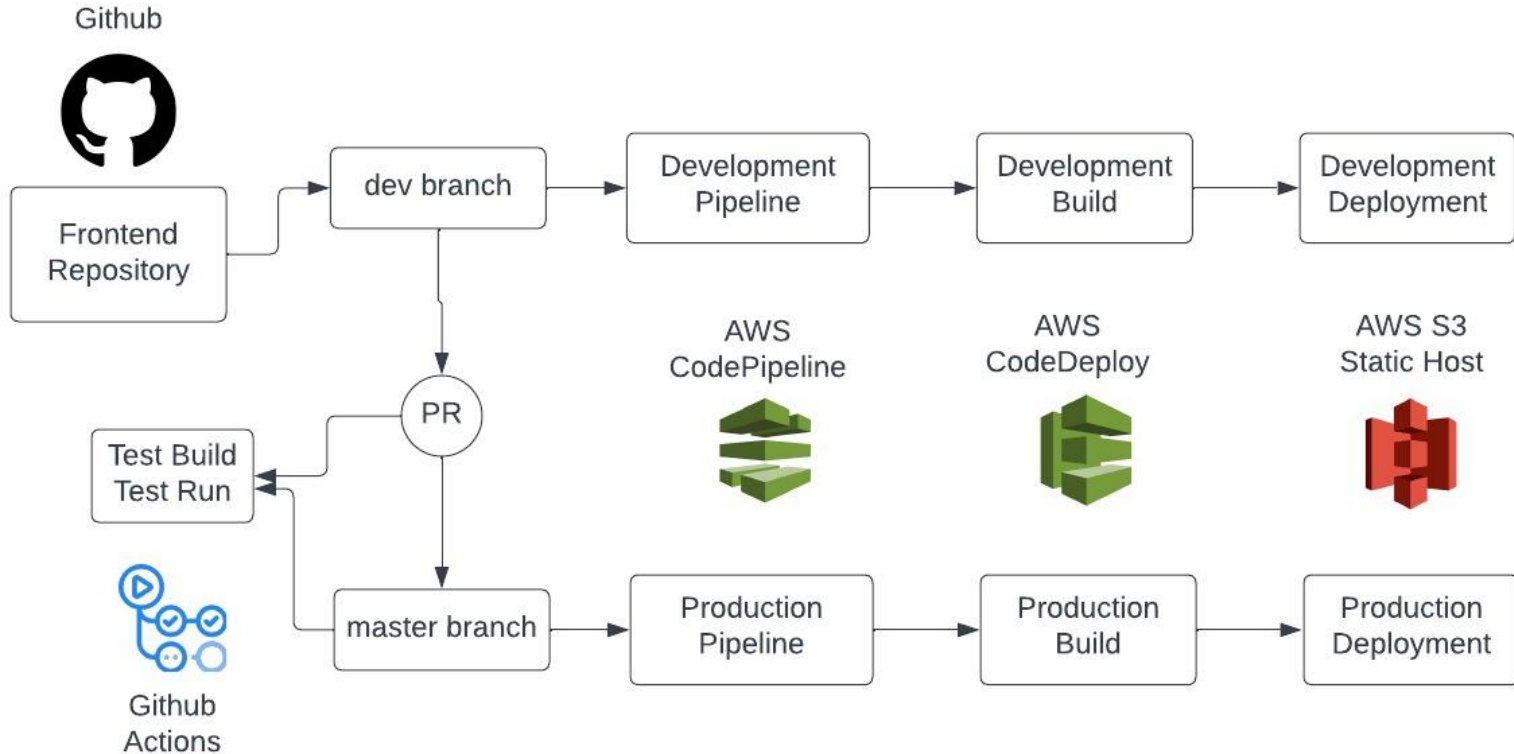
Succeeded

- 4 hours ago

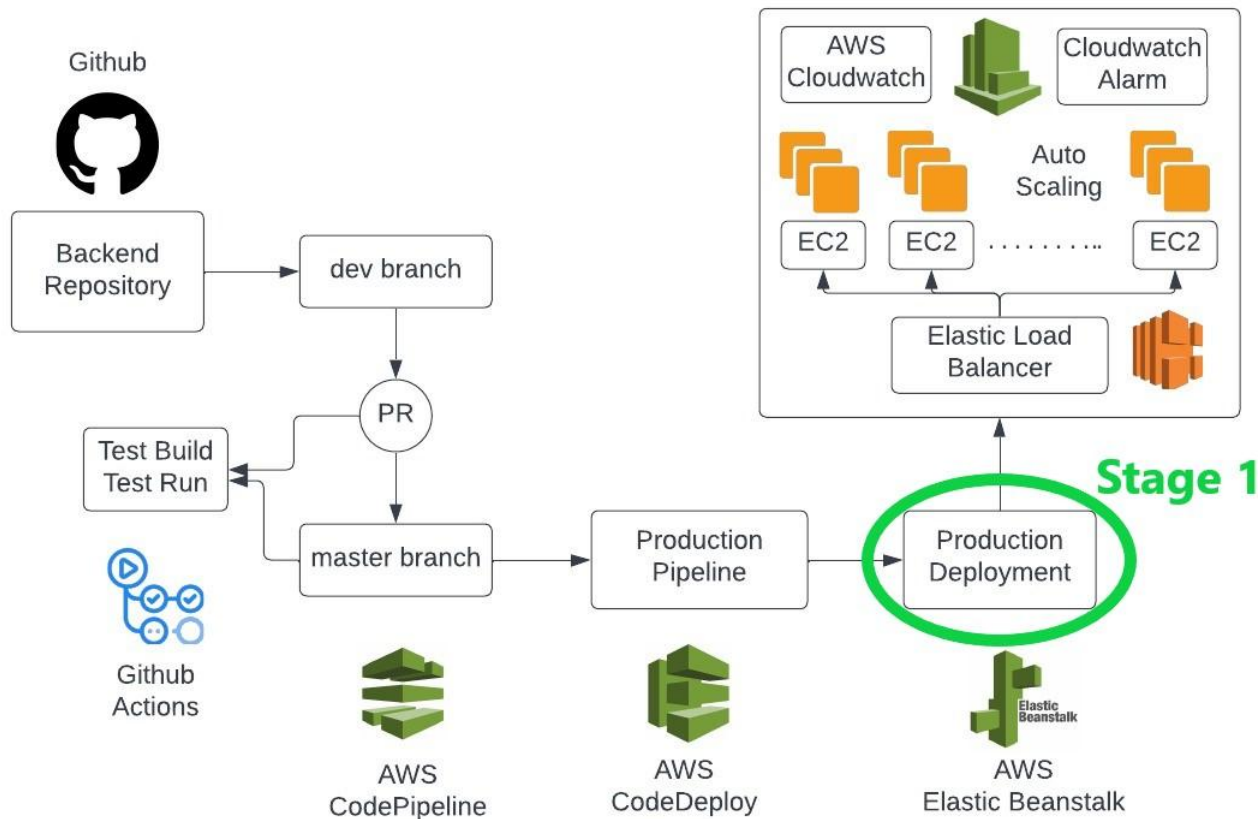
Source: Merge pull request #7 from nayeem-17/znaim

Backend Deploy

CI/CD Pipeline : Frontend



CI/CD Pipeline : Backend



Stage 2: Deliverables

- Upgraded Application (Admin adds Students, Students takes Courses)
- Application and Infrastructure Monitoring
- Log Issues
- Dependency Abstraction

Upgraded Application Demo

Admin Dashboard



Courses



Students



Courses Assignment



Result

ADD STUDENT

Student ID : 17

Student Name

Asif

Male

Year

2022

SAVE

Student ID : 8

Student Name

Year

2022

SAVE

Student ID : 10

Student Name

name

Year

12

SAVE

Student ID : 12

Student Name

name

Year

12

SAVE

Student ID : 13

Student Name

name

Year

12

SAVE

Student ID : 14

Student Name

name

Year

12

SAVE

Student ID : 3

Student Name

naim

Student ID : 5

Student Name

name

Student ID : 7

Student Name

name

Application and Infrastructure Monitoring

- **AWS CloudWatch**
 - Constantly monitors the website
 - Metrics to evaluate site status
 - Analytics with graph view in real-time
- **CloudWatch Alarm**
 - Triggers alarms based on preset metric value



Status Graph and Alarm Demo

Monitoring

Time Range

3 hours ▼

Period

1 minute ▼

Edit



Environment Health by health codes

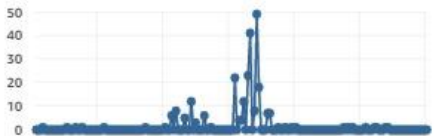


Info

Ok

8/5 06:30 8/5 07:00 8/5 07:30 8/5 08:00 8/5 08:30 8/5 09:00

Sum Requests by count



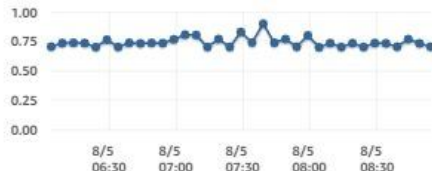
Max Network In in bytes



Target Response Time in seconds



CPU Utilization in percent



Max Network Out in bytes



Add Alarm

Sum RequestCount by count

Name:

User Count OverLoad Notification

Name should be less than 238 characters in length and can only contain numbers and letters

Description:

Optional.

Period:

1 minute ▼

Threshold: Sum RequestCount

>= ▼

1000

Change state after:

1 minute ▼

Notify:

A new SNS topic... ▼

Refresh

Topic name:

ElasticBeanstalkNotifications-bcf22Bnv-bcf22bnvEnv-AV

E-mail address:

mehrab.haque.0001@gmail.com

Notify when state changes to:

☒ OK

☒ Alarm

☒ Insufficient data

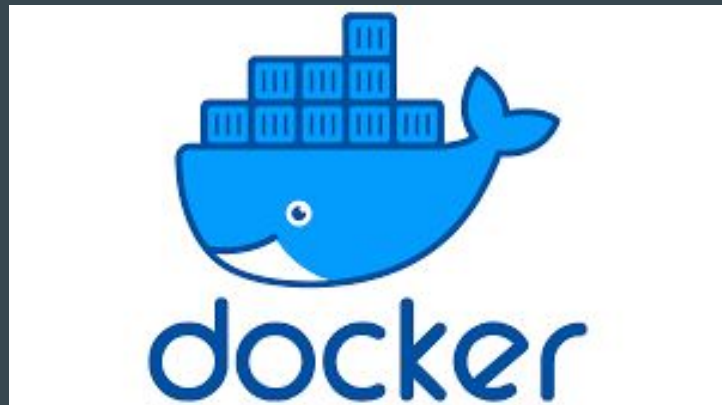
Log File Demo

- Application level log file to track any issues

```
access.log
17 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:19 +0000] "POST /api/admin/create HTTP/1.1" 409 33
18 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:19 +0000] "POST /api/admin/create HTTP/1.1" 409 33
19 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:20 +0000] "POST /api/admin/create HTTP/1.1" 200 8
20 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:22 +0000] "POST /api/admin/login HTTP/1.1" 200 155
21 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:22 +0000] "POST /api/admin/login HTTP/1.1" 200 155
22 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:23 +0000] "POST /api/admin/login HTTP/1.1" 200 155
23 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:25 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
24 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:26 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
25 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:26 +0000] "GET /api/admin/course/get/7 HTTP/1.1" 200 120
26 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:28 +0000] "PUT /api/admin/course/update/7 HTTP/1.1" 200 16
27 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "GET /api/admin/student/list HTTP/1.1" 200 2
28 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "GET /api/admin/student/get/undefined HTTP/1.1" 400 32
29 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "PUT /api/admin/student/update/undefined HTTP/1.1" 400 32
30 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "DELETE /api/admin/student/delete/undefined HTTP/1.1" 400 32
31 ::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "DELETE /api/admin/course/delete/7 HTTP/1.1" 200 16
32 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:34 +0000] "POST /api/admin/create HTTP/1.1" 409 33
33 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:34 +0000] "POST /api/admin/create HTTP/1.1" 409 33
34 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:35 +0000] "POST /api/admin/create HTTP/1.1" 200 8
35 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:36 +0000] "POST /api/admin/login HTTP/1.1" 200 155
36 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:36 +0000] "POST /api/admin/login HTTP/1.1" 200 155
37 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:38 +0000] "POST /api/admin/login HTTP/1.1" 200 155
38 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:40 +0000] "POST /api/admin/student/add HTTP/1.1" 200 8
39 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
40 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/student/list HTTP/1.1" 200 52
41 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/student/get/1 HTTP/1.1" 200 50
42 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "PUT /api/admin/student/update/1 HTTP/1.1" 400 32
43 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
44 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:42 +0000] "GET /api/admin/course/get/8 HTTP/1.1" 200 120
45 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:43 +0000] "DELETE /api/admin/student/delete/1 HTTP/1.1" 200 16
46 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:44 +0000] "PUT /api/admin/course/update/8 HTTP/1.1" 200 16
47 ::ffff:127.0.0.1 - - [04/Aug/2022:21:02:46 +0000] "DELETE /api/admin/course/delete/8 HTTP/1.1" 200 16
48 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:36 +0000] "POST /api/admin/create HTTP/1.1" 409 33
49 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:36 +0000] "POST /api/admin/create HTTP/1.1" 409 33
50 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:38 +0000] "POST /api/admin/create HTTP/1.1" 200 8
51 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:39 +0000] "POST /api/admin/login HTTP/1.1" 200 155
52 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:39 +0000] "POST /api/admin/login HTTP/1.1" 200 155
53 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:40 +0000] "POST /api/admin/login HTTP/1.1" 200 155
54 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:42 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
55 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:42 +0000] "POST /api/admin/student/add HTTP/1.1" 200 8
56 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:43 +0000] "GET /api/admin/student/list HTTP/1.1" 200 52
57 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:43 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
58 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:44 +0000] "GET /api/admin/student/get/2 HTTP/1.1" 200 50
59 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:44 +0000] "GET /api/admin/course/get/9 HTTP/1.1" 200 120
60 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:46 +0000] "PUT /api/admin/student/update/2 HTTP/1.1" 200 16
61 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:46 +0000] "PUT /api/admin/course/update/9 HTTP/1.1" 200 16
62 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:47 +0000] "DELETE /api/admin/student/delete/2 HTTP/1.1" 200 16
63 ::ffff:127.0.0.1 - - [04/Aug/2022:21:03:47 +0000] "DELETE /api/admin/course/delete/9 HTTP/1.1" 200 16
```

Dependency Abstraction: Containerization

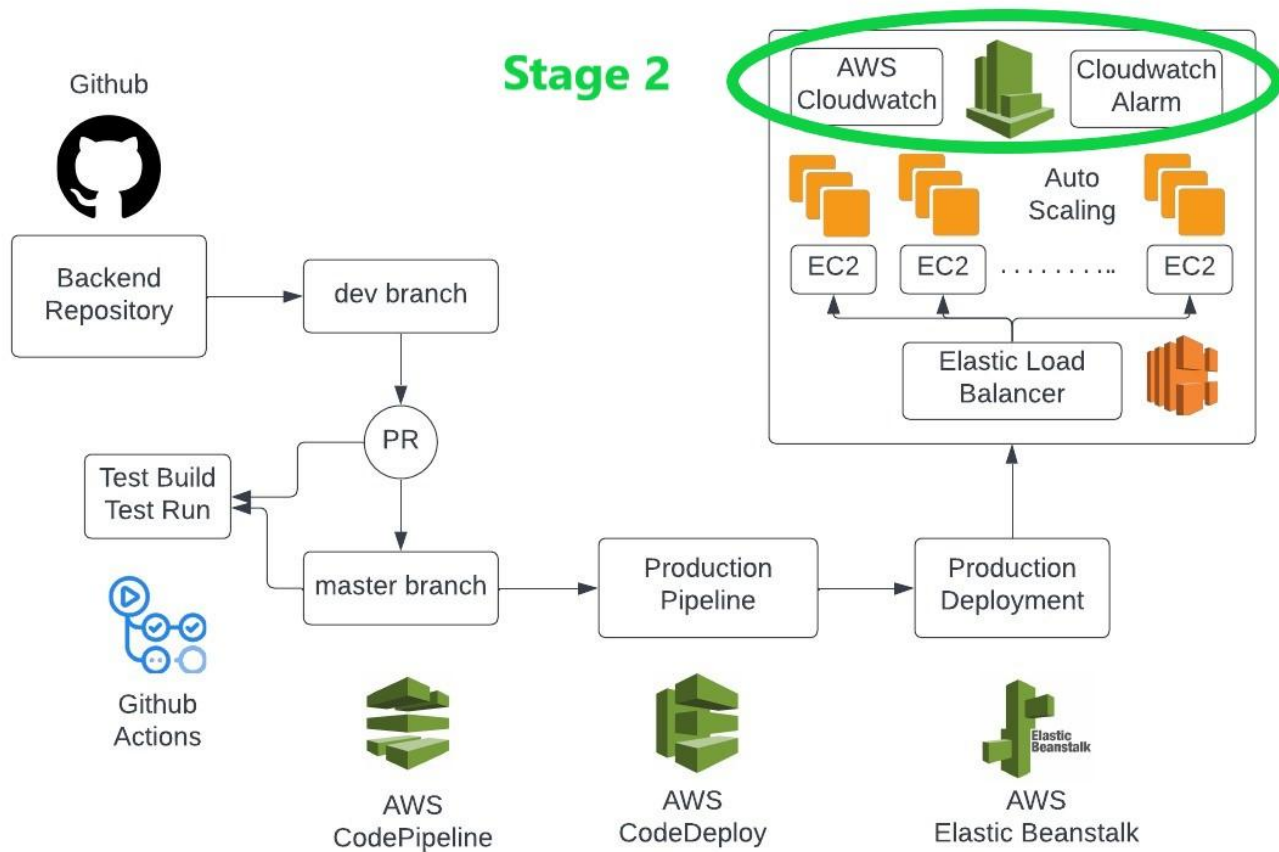
- **Docker**
 - Easy to replicate development and production servers
 - Same pre-defined requirements



```
docker-compose.yml x
docker-compose.yml > {} services > {} node_app
You, 9 hours ago | 2 authors (Zannatul Naim and others) | docker-compose.yml (compose-spec.json)
1 version: "3.1"
You, 9 hours ago | 2 authors (Zannatul Naim and others)
2 services:
You, 9 hours ago | 2 authors (Zannatul Naim and others)
3   node_app:
4     build: .
5     ports:
6       - 80:8000
7     env_file:
8       - .prod.env
9     volumes:
10      - ../app/
11      - /app/node_modules
12     restart: unless-stopped
13
```

```
docker-compose.test.yml x
docker-compose.test.yml > {} services > {} postgres > [ ] ports > 0
You, 13 hours ago | 1 author (You) | docker-compose.yml (compose-spec.json)
1 version: "3"
You, 13 hours ago | 1 author (You)
2 services:
You, 13 hours ago | 1 author (You)
3   postgres:
4     container_name: postgres-container
5     image: postgres
6     expose:
7       - 5432
8     ports:
9       - "5432:5432"
You, 13 hours ago | 1 author (You)
10   environment:
11     POSTGRES_USER: postgres
12     POSTGRES_PASSWORD: pass
13     POSTGRES_DB: demo
14   volumes:
15     - ./postgresDb:/var/lib/postgresql/data
16   restart: unless-stopped
17
```

Upgraded CI/CD Pipeline : Backend



Stage 3: Deliverables

- Advanced Application (Admin adds Results, Students checks Results)
- Dynamic Load Handling

Dynamic Load Handling

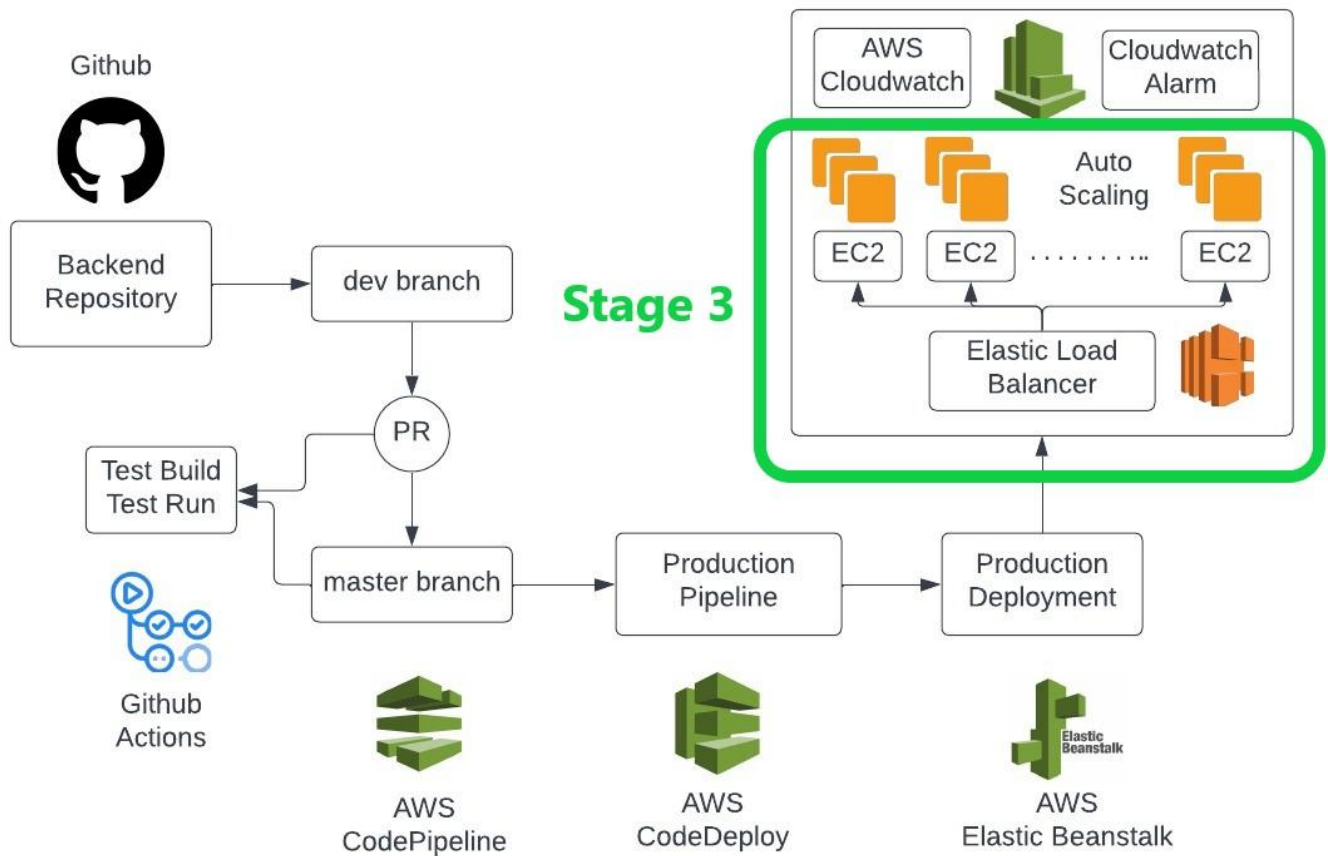
- **AWS Elastic Load Balancer**
 - Automatically distributes network traffic across multiple target instances
 - Scales automatically



Amazon **ELB**

Capacity	AMI ID: ami-00473ef7d3f6027dd Availability Zones: Any Breach duration: 5 Capacity rebalancing: disabled Environment type: load balancing, auto scaling Instance types: t2.micro,t2.small Lower threshold: 2000000 Max: 4 Metric: NetworkOut Min: 1 Period: 5 Placement: Scale down increment: -1 Scale up increment: 1 Scaling cooldown: 360 seconds Statistic: Average Unit: Bytes Upper threshold: 6000000	Edit
Load balancer	Listeners: 1 Load balancer type: application Processes: 1 Rules: 0 Shared: false Store logs: disabled	Edit

Complete CI/CD Pipeline : Backend



Thank You!

Any Questions or Feedback?