Project Presentation (Devops)

BUET CSE Fest 2022 Hackathon

Developed and Presented by:

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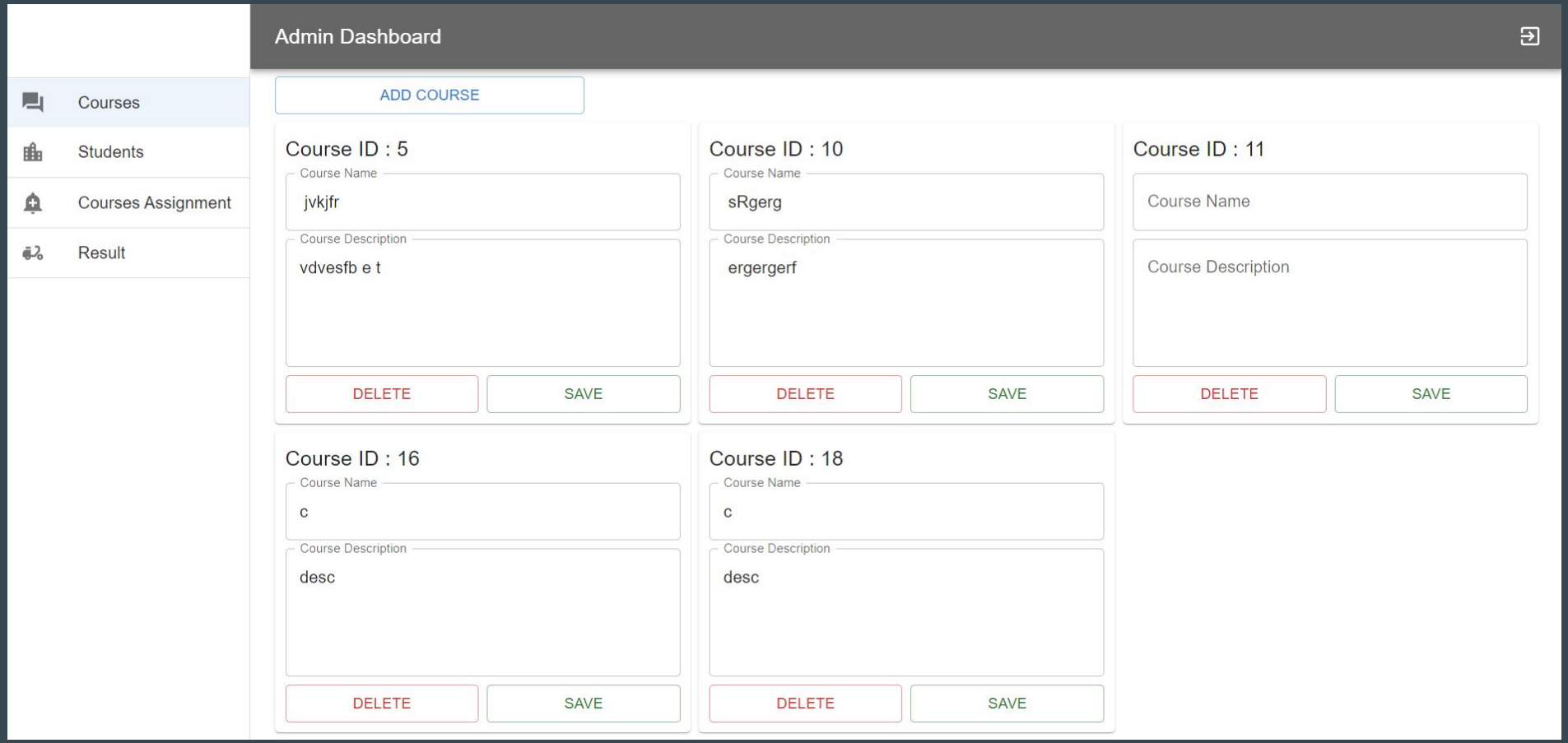
Stage 1: Deliverables

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

Basic Application

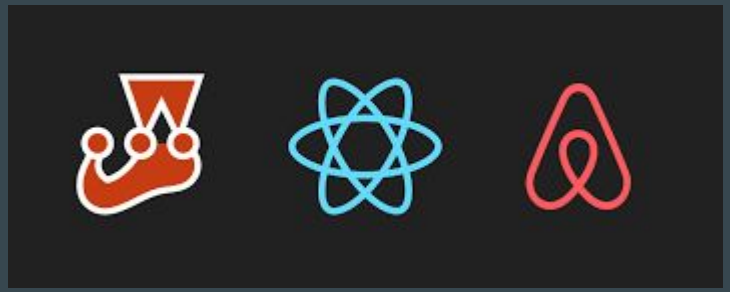
- **Frontend**
  - React App
- **Backend**
  - Express Framework with Node js
  - Prisma ORM (PostgreSQL)

Basic Application Demo



Unit Testing

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



Unit Testing Demo

```
import React from "react";
import { shallow } from "enzyme";
import toJson from "enzyme-to-json";
import App from "../App";

describe( name: "Component App Render", fn: () => {
    it( name: "renders without crashing given the required props", fn: () => {
        const wrapper = shallow(<App/>);
        expect(toJson(wrapper)).toMatchSnapshot();
    });
});
```

```
Terminal:  Local  Local (2)  Local (3)

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)
```

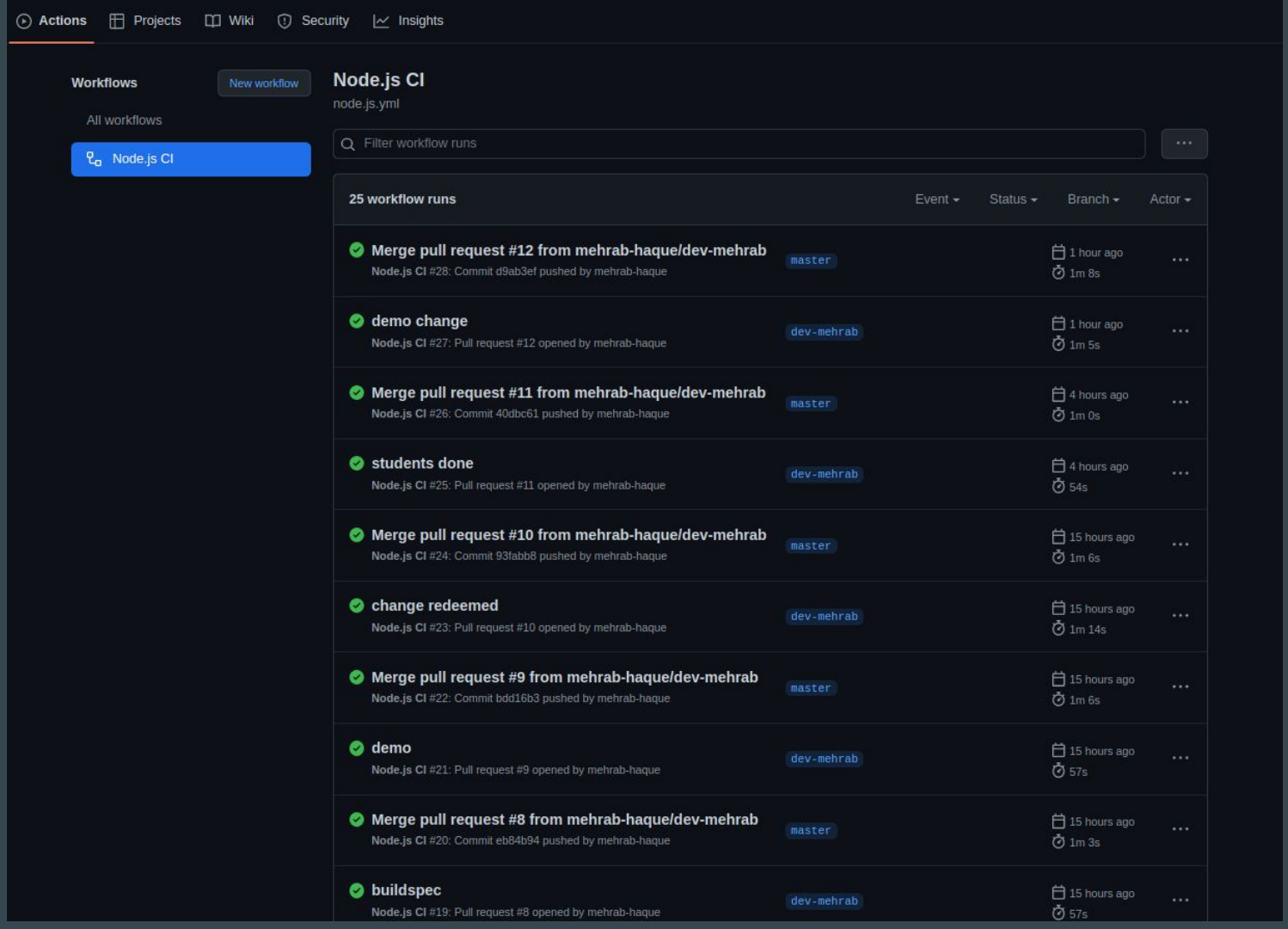
Backend Test

Automated Test Build and Run

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

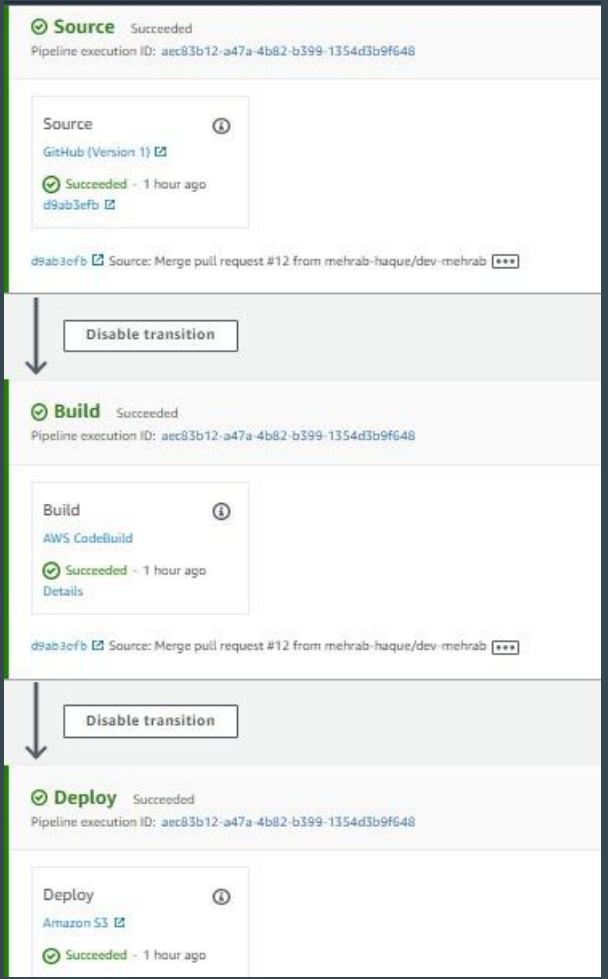
node.js.yml | App.test.js | courses.js | Courses.js

```yaml
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
```

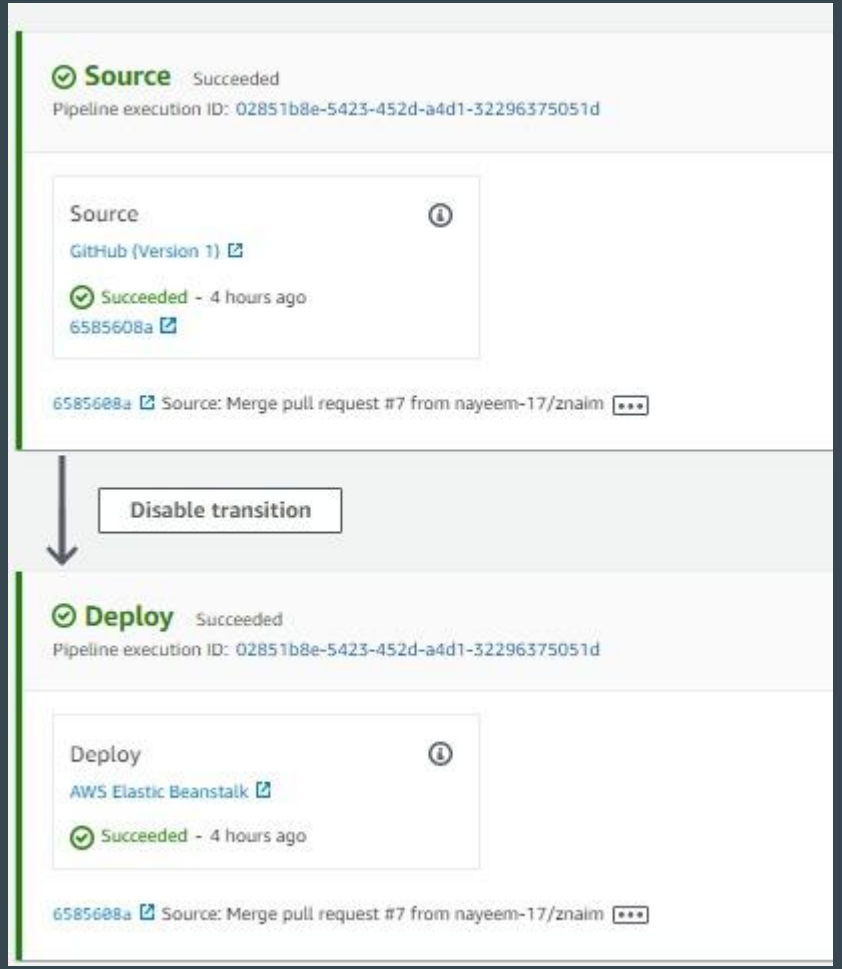

Actions
Projects
Wiki
Security
Insights
Workflows
New workflow
All workflows
Node.js CI
Node.js CI
node.js.yml
Filter workflow runs
25 workflow runs
Event
Status
Branch
Actor
Merge pull request #12 from mehrab-haque/dev-mehrab
Node.js CI #28: Commit d9ab3ef pushed by mehrab-haque
master
1 hour ago
1m 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

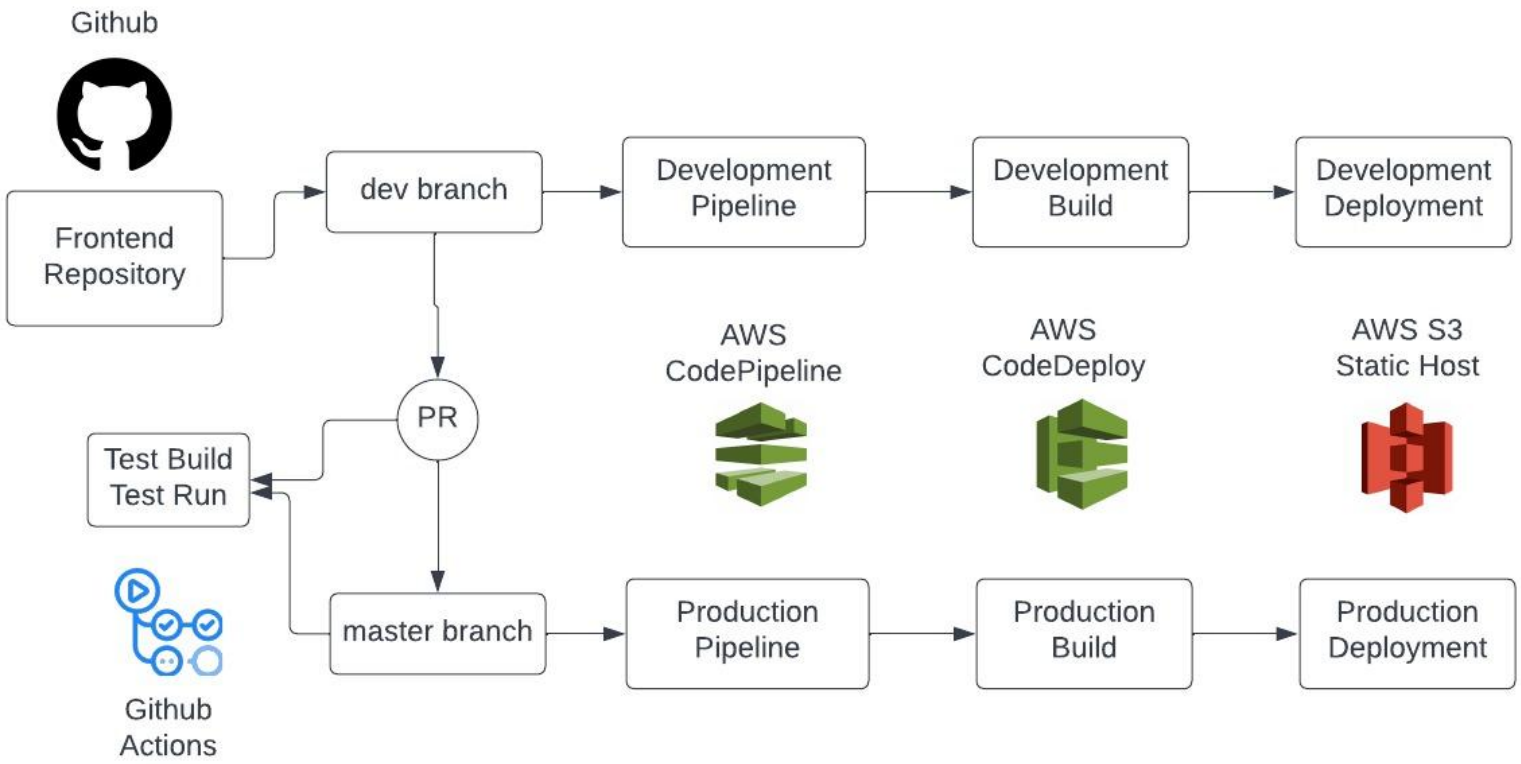


Frontend Deploy

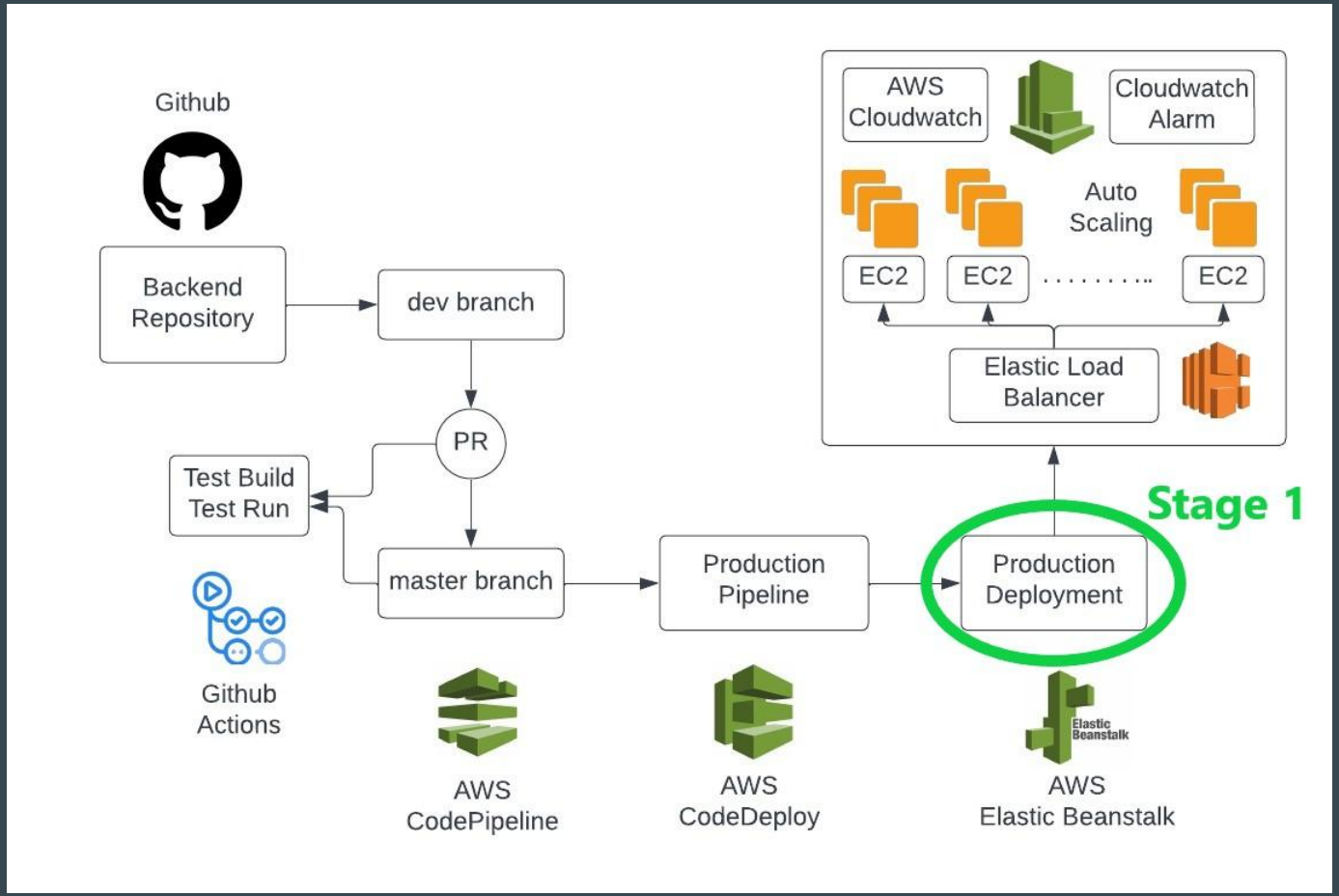


Backend Deploy

CI/CD Pipeline : Frontend



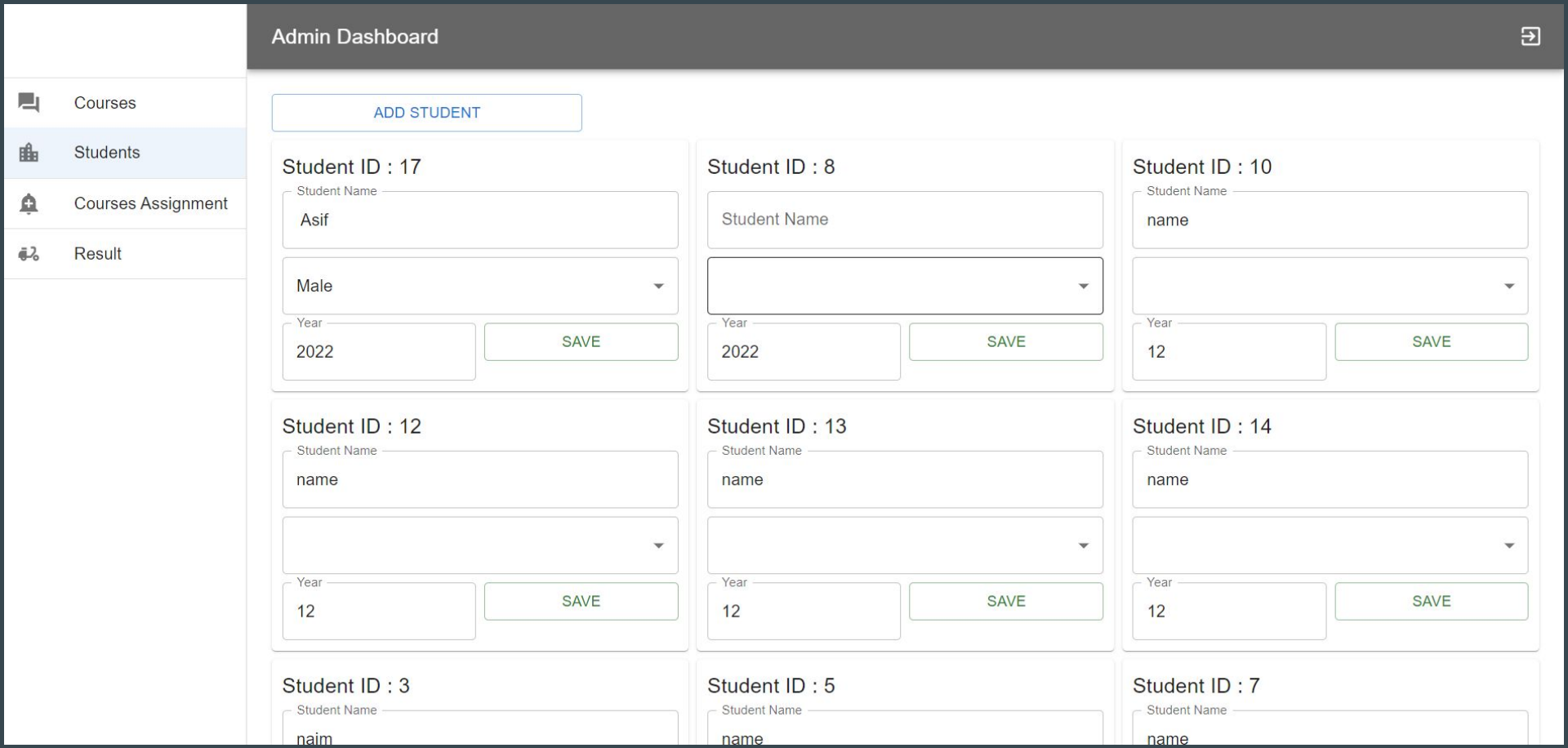
CI/CD Pipeline : Backend



Stage 2: Deliverables

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

Upgraded Application Demo

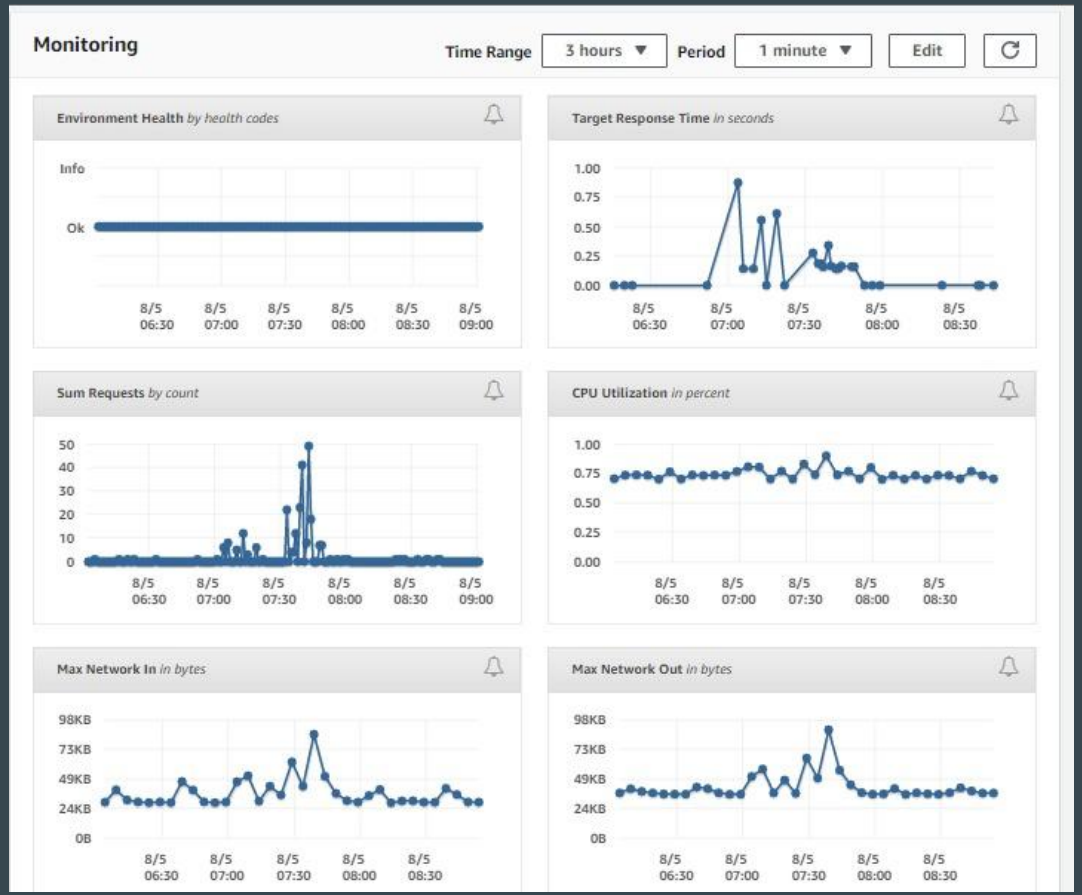


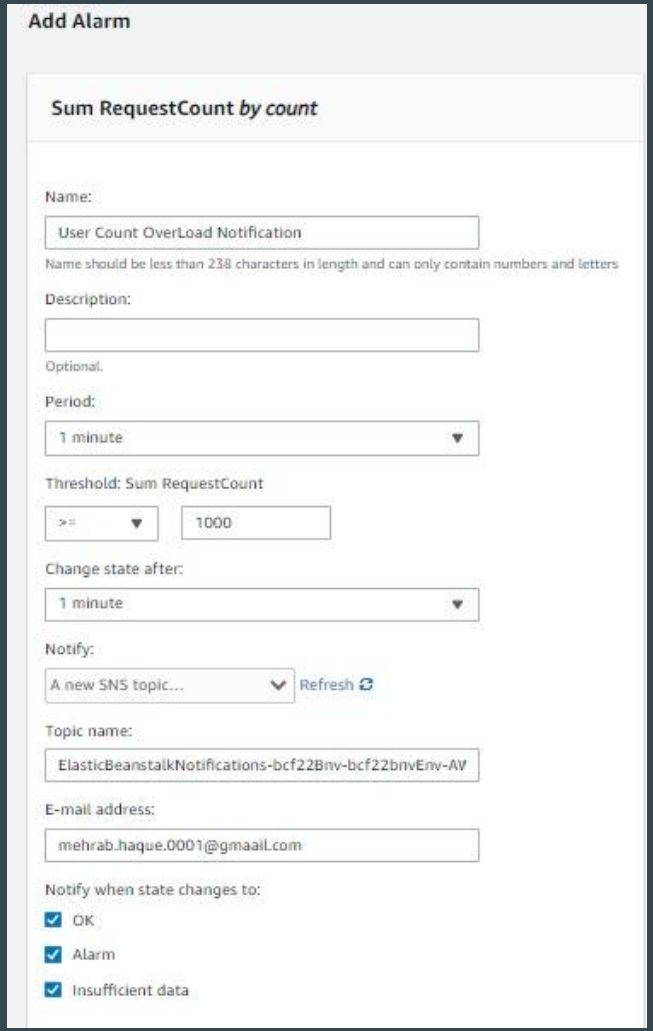
Application and Infrastructure Monitoring

- **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





Log File Demo

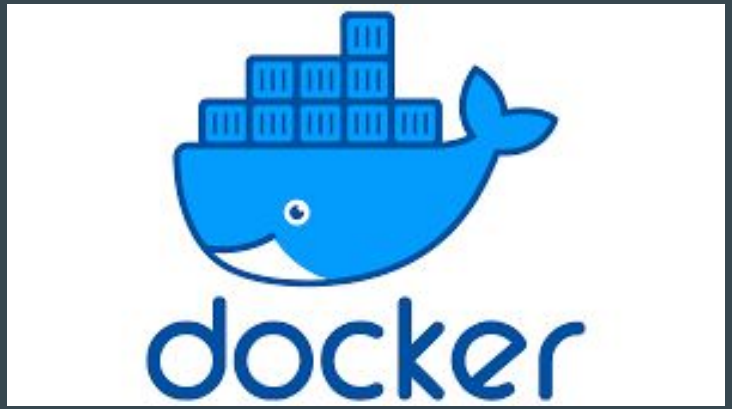
- Application level log file to track any issues

access.log

```
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:19 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:19 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:20 +0000] "POST /api/admin/create HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:22 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:22 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:23 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:25 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:26 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:26 +0000] "GET /api/admin/course/get/7 HTTP/1.1" 200 120
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:28 +0000] "PUT /api/admin/course/update/7 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "GET /api/admin/student/list HTTP/1.1" 200 2
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "GET /api/admin/student/get/undefined HTTP/1.1" 400 32
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "PUT /api/admin/student/update/undefined HTTP/1.1" 400 32
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "DELETE /api/admin/student/delete/undefined HTTP/1.1" 400 32
::ffff:127.0.0.1 - - [04/Aug/2022:21:00:30 +0000] "DELETE /api/admin/course/delete/7 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:34 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:34 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:35 +0000] "POST /api/admin/create HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:36 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:36 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:38 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:40 +0000] "POST /api/admin/student/add HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/student/list HTTP/1.1" 200 52
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/student/get/1 HTTP/1.1" 200 50
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "PUT /api/admin/student/update/1 HTTP/1.1" 400 32
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:41 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:42 +0000] "GET /api/admin/course/get/8 HTTP/1.1" 200 120
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:43 +0000] "DELETE /api/admin/student/delete/1 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:44 +0000] "PUT /api/admin/course/update/8 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:02:46 +0000] "DELETE /api/admin/course/delete/8 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:36 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:36 +0000] "POST /api/admin/create HTTP/1.1" 409 33
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:38 +0000] "POST /api/admin/create HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:39 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:39 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:40 +0000] "POST /api/admin/login HTTP/1.1" 200 155
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:42 +0000] "POST /api/admin/course/add HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:42 +0000] "POST /api/admin/student/add HTTP/1.1" 200 8
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:43 +0000] "GET /api/admin/student/list HTTP/1.1" 200 52
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:43 +0000] "GET /api/admin/course/list HTTP/1.1" 200 354
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:44 +0000] "GET /api/admin/student/get/2 HTTP/1.1" 200 50
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:44 +0000] "GET /api/admin/course/get/9 HTTP/1.1" 200 120
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:46 +0000] "PUT /api/admin/student/update/2 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:46 +0000] "PUT /api/admin/course/update/9 HTTP/1.1" 200 16
::ffff:127.0.0.1 - - [04/Aug/2022:21:03:47 +0000] "DELETE /api/admin/student/delete/2 HTTP/1.1" 200 16
::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

docker-compose.yml > { } services > { } node_app

You, 9 hours ago | 2 authors (Zannatul Naim and others) | docker-compose.yml (compose-spec.json)

```yaml
version: "3.1"
```

You, 9 hours ago | 2 authors (Zannatul Naim and others)

```yaml
services:
```

You, 9 hours ago | 2 authors (Zannatul Naim and others)

```yaml
  node_app:
    build: .
    ports:
      - 80:8000
    env_file:
      - .prod.env
    volumes:
      - .:/app/
      - /app/node_modules
    restart: unless-stopped
```

docker-compose.test.yml

docker-compose.test.yml > { } services > { } postgres > [ ] ports > 0

You, 13 hours ago | 1 author (You) | docker-compose.yml (compose-spec.json)

```yaml
version: "3"
```

You, 13 hours ago | 1 author (You)

```yaml
services:
```

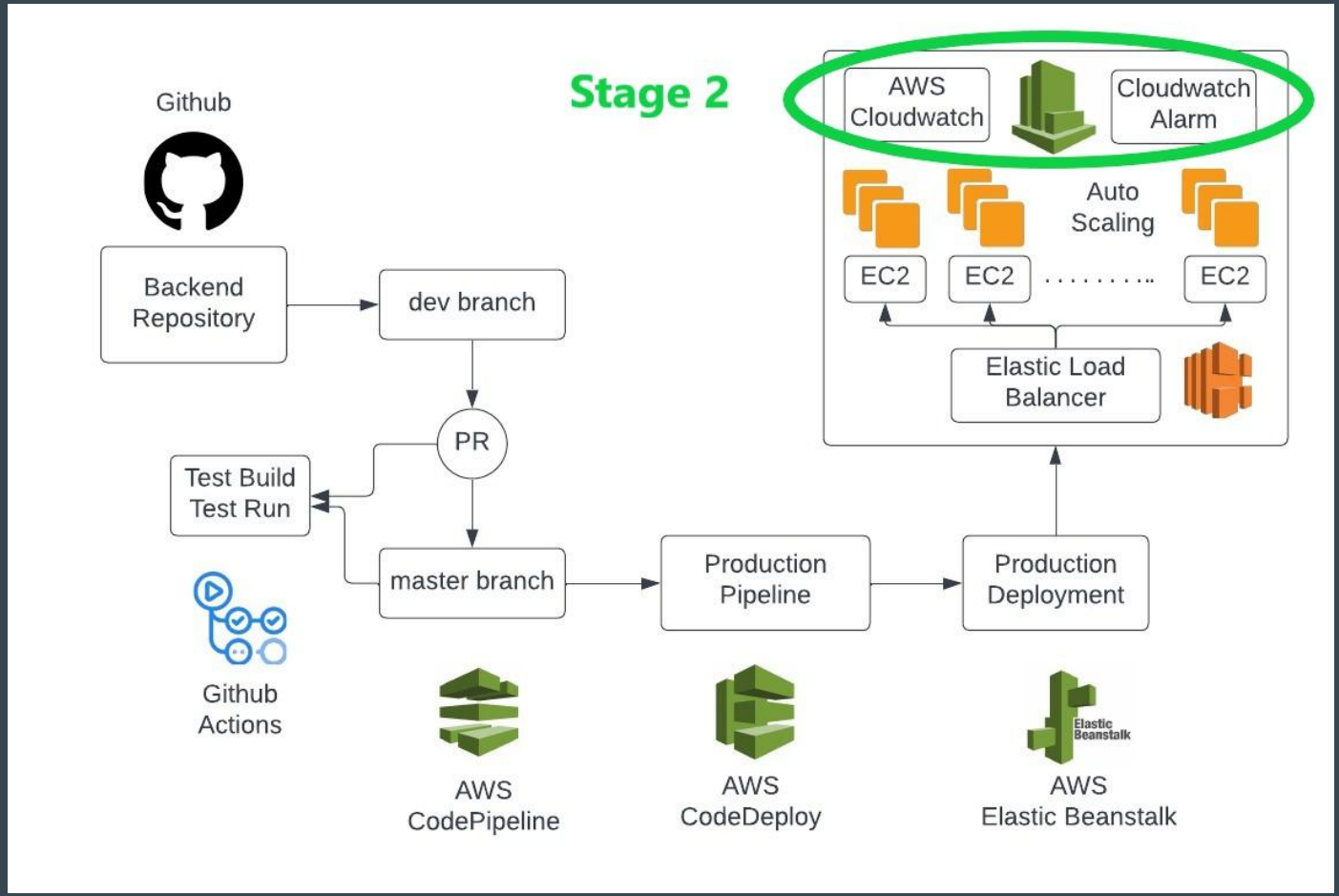
You, 13 hours ago | 1 author (You)

```yaml
  postgres:
    container_name: postgres-container
    image: postgres
    expose:
      - 5432
    ports:
      - "5432:5432"
```

You, 13 hours ago | 1 author (You)

```yaml
    environment:
      POSTGRES_USER: postgres
      POSTGRES_PASSWORD: pass
      POSTGRES_DB: demo
    volumes:
      - ./postgresDb:/var/lib/postgresql/data
    restart: unless-stopped
```

Upgraded CI/CD Pipeline : Backend



Stage 3: Deliverables

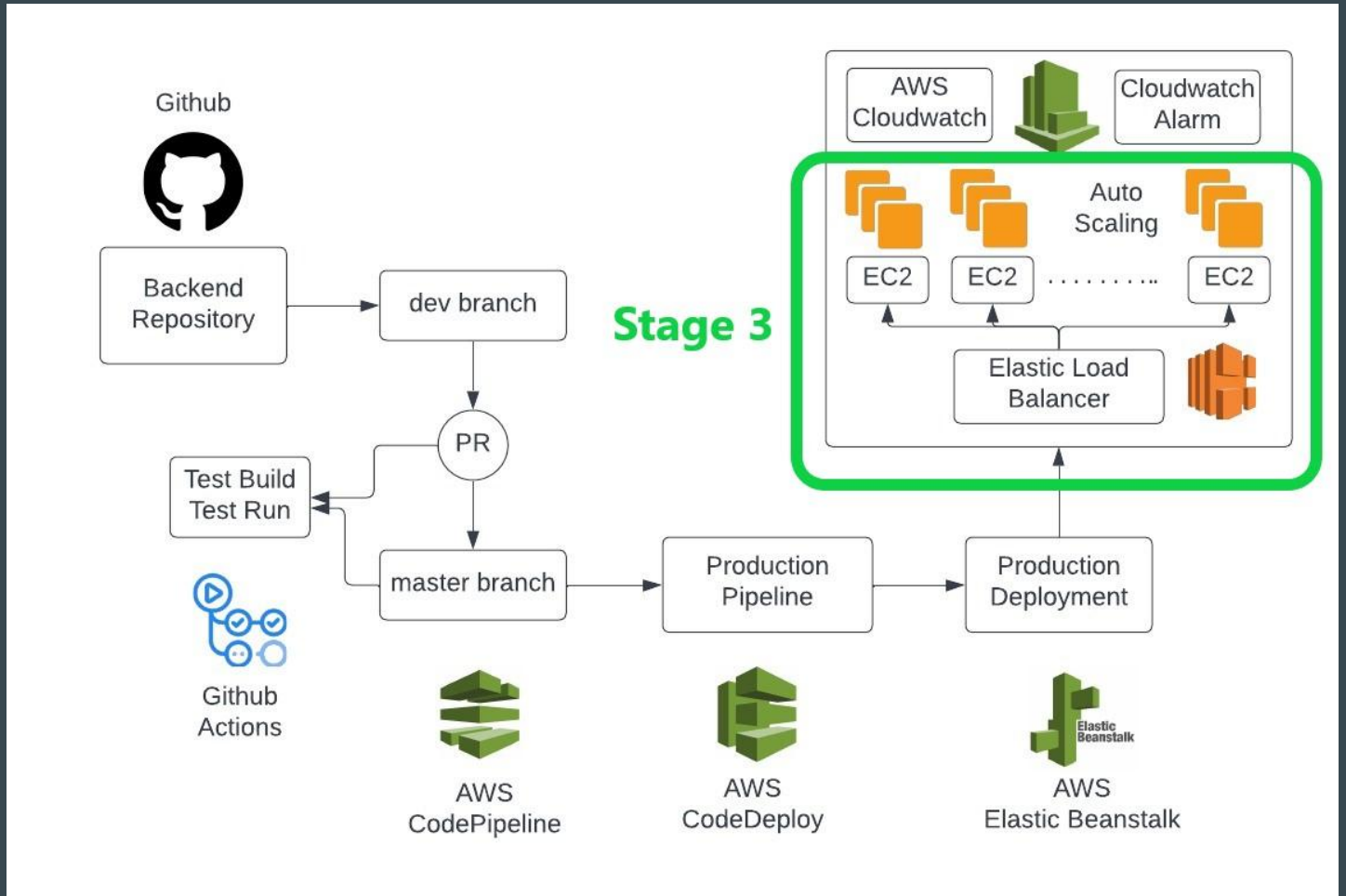
- Advanced Application (Admin adds Results, Students checks Results)
- Dynamic Load Handling

Dynamic Load Handling

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

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?