

Project 3
Flask-Based Student Registration Web Application
deployed using Jenkins

Batch

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Title: Flask-Based Student Registration Web Application deployed using Jenkins

Objective:

Develop and deploy a Flask-based web application that allows users to register students by submitting their details via a web form. The application should store the submitted data in a backend and provide the ability to retrieve or display this information when needed.

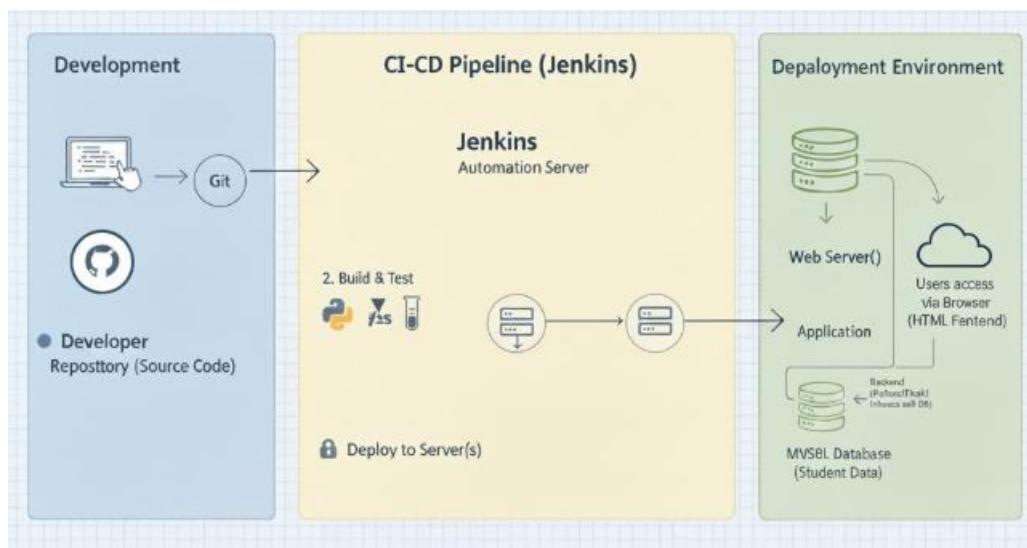
Project Overview:

This project involves designing a simple web application that mimics a student registration system. The goal is to gain hands-on experience in web development, form handling, backend logic, and data storage using Python Flask and standard frontend technologies.

Technology Stack:

- ✓ Frontend: HTML, CSS
- ✓ Backend: Python (Flask)
- ✓ Database: MySQL
- ✓ Version Control: Git & GitHub
- ✓ Deployment (Optional): EC2

Architectural diagram



Step .1: Install Python and Dependencies

1. Install Python 3: Ensure that Python 3 is installed on your system.

- Flask==2.3.2
- mysql-connector-python

```
Flask==2.3.2
mysql-connector-python
```

Step 2: Set up MySQL Database

1. Install and start MySQL Server.
2. Create a database named studentdb.
3. Create students table with fields:
 - id (primary key, auto-increment)
 - name, email, phone, course, address, contact

```
CREATE TABLE students (
    id INT AUTO_INCREMENT PRIMARY KEY,
    name VARCHAR(100),
    email VARCHAR(100),
    phone VARCHAR(20),
    course VARCHAR(100),
    address VARCHAR(200),
    contact VARCHAR(100)
);
```

Step 3: Install Jenkins

1. Install Jenkins server.
2. Install Git Plugin via Manage Jenkins → Manage Plugins.
 - Manage Jenkins → Manage Plugins → Available → Git Plugin
 - Git
 - Pipeline
 - SSH Agent
 - Ansible (optional)
 - Python plugin

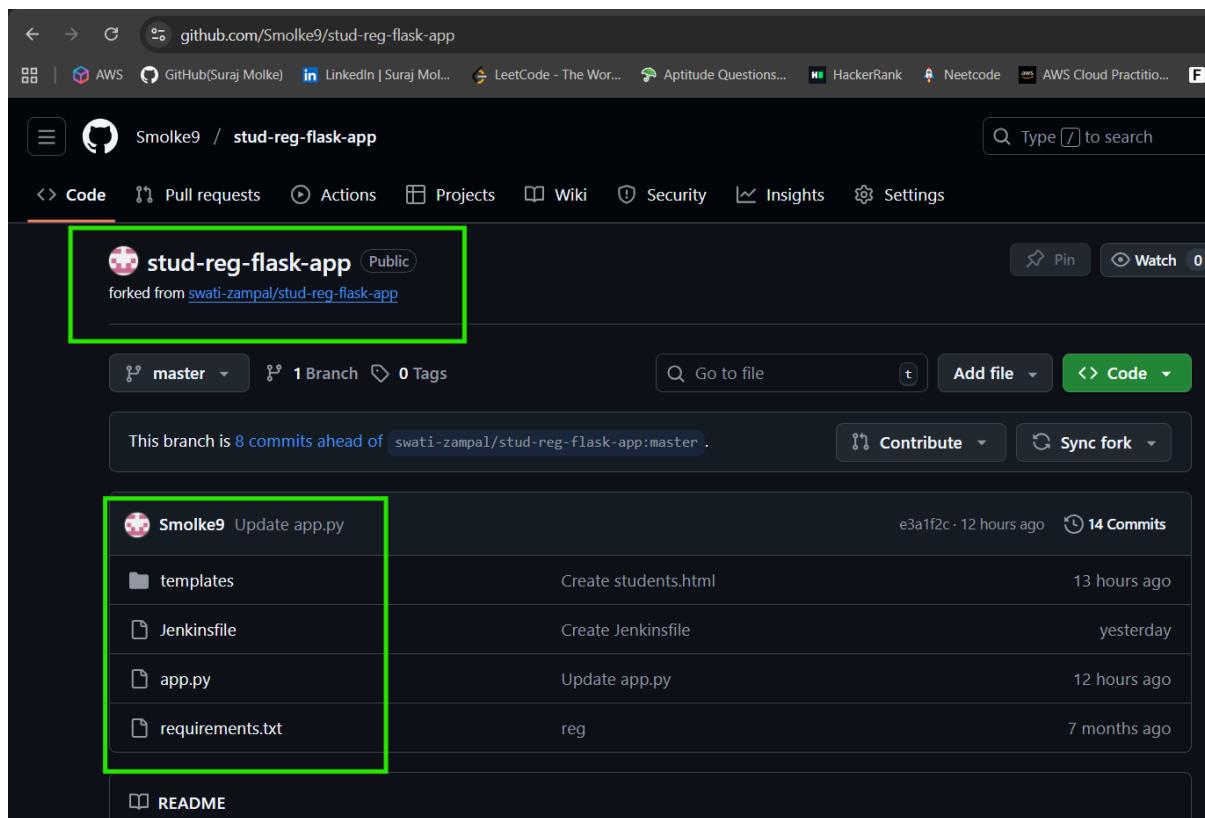
Step 4: Install socat

Install socat on Jenkins agent using:

```
sudo apt-get install socat
```

Step 5: Application File Structure From Forked Via <https://github.com/swati-zampal/stud-reg-flask-app.git> To My Repo <https://github.com/Smolke9/stud-reg-flask-app.git>

- app.py – Main Flask application logic
- requirements.txt – Python dependencies
- templates/
 - register.html
 - students.html
- Jenkinsfile – CI/CD pipeline stages



Step 6: Application Code Development

- Uses mysql.connector for database connectivity.
- '/' route displays registration form.
- '/students' displays stored student data.
- Runs on host=0.0.0.0 port=5000.

Step 7: Templates

- register.html – HTML form for user input.
- students.html

Step 8: Jenkins Pipeline Stages

8.1 Clone GitHub Repo – pulls latest code.

The screenshot shows the Jenkins Pipeline configuration page for a job named 'flask1'. The 'Pipeline' tab is selected in the sidebar. A green box highlights the 'GitHub project' section, which includes a 'Project url' field containing 'https://github.com/Smolke9/stud-reg-flask-app.git/'. Below this section are several other configuration options like 'Discard old builds', 'Do not allow concurrent builds', and 'Do not allow the pipeline to resume if the controller restarts'. At the bottom are 'Save' and 'Apply' buttons.

8.2 Create Virtual Environment – isolates dependencies.

Jenkins Script

The screenshot shows the Jenkins Pipeline configuration page for the same 'flask1' job. The 'Pipeline' tab is selected. A green box highlights the 'Script' editor area, which contains the following Groovy code:

```

agent any

stages {
    stage('Clone GitHub Repo') {
        steps {
            echo "Cloning repository..."
            git branch: 'master', url: 'https://github.com/Smolke9/stud-reg-flask-app.git'
        }
    }

    stage('Create Virtual Environment') {
        steps {
            sh '''
                python3 -m venv venv
                ...
            '''
        }
    }
}

```

The 'Use Groovy Sandbox' checkbox is checked. At the bottom are 'Save' and 'Apply' buttons.

8.3 Install Dependencies – Flask + MySQL connector.

8.4 Run Flask App – starts on port 5000.

8.5 Expose Port using socat – forwards 5000 → 5050.

Jenkins Project Deploy Success

The screenshot shows the Jenkins Pipeline interface for the 'flask1' pipeline. On the left, there's a sidebar with various Jenkins-related links like Status, Changes, Build Now, Configure, Delete Pipeline, GitHub, Favorite, Open Blue Ocean, Stages, Rename, Pipeline Syntax, and Credentials. Below that is a 'Builds' section with a dropdown menu and a filter input. A green box highlights the 'Stage View' section. The 'Stage View' title is 'flask1' with a checkmark icon. Below it is the stage name 'flask app deploy'. The 'Stage View' section contains a horizontal timeline with six stages: 'Clone GitHub Repo', 'Create Virtual Environment', 'Install Dependencies', 'Run Flask App', 'Verify Port 5000', and 'Test App Reachability'. Each stage has a progress bar and a duration: 978ms, 4s, 4s, 10s, 337ms, and 368ms respectively. Below the timeline is a summary: 'Average stage times: (full run time: ~21s)' and a table showing the actual run times for each stage. At the bottom of the stage view, there's a list of build history items:

- Last build (#1), 2 min 9 sec ago
- Last stable build (#1), 2 min 9 sec ago
- Last successful build (#1), 2 min 9 sec ago
- Last completed build (#1), 2 min 9 sec ago

The status bar at the bottom shows weather (7°C, Sunny), system icons (Windows logo, search, taskbar icons), and system information (ENG IN, 16:12, 19-11-2025).

8.6 Verify Access – curl health check ensures app is running.

A curl command is executed to perform a final health check. A successful response confirms that the entire deployment chain, from the Flask app to the socat port forwarding, is working correctly

The screenshot shows the Jenkins Pipeline console output for the '#1' build of the 'flask1' pipeline. A green box highlights the output area. The output shows the results of a curl command:

```
100 539 100 539 0 0 99538 0 --::---- --::--- --::--- 105k
<!DOCTYPE html>
<html>
<head>
    <title>Student Registration Form</title>
</head>
<body>
    <h1>Register Student</h1>
    <form method="post">
        Name: <input type="text" name="name"><br><br>
        Email: <input type="email" name="email"><br><br>
        Phone: <input type="text" name="phone"><br><br>
        Course: <input type="text" name="course"><br><br>
        Address: <textarea name="address"></textarea><br><br>
        Contact: <input type="text" name="contact"><br><br>
        <button type="submit">Register</button>
    </form>
</body>
</html>
[Pipeline] 
[Pipeline] // stage
[Pipeline] 
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

The status bar at the bottom shows weather (7°C, Sunny), system icons (Windows logo, search, taskbar icons), and system information (ENG IN, 16:11, 19-11-2025). The Jenkins version 'Jenkins 2.536' is also visible.

Step 9: On port 5000 page available

Not secure 13.232.184.169:5000

AWS GitHub(Suraj Molke) LinkedIn | Suraj Mol

Register Student

Name:

Email:

Phone:

Course:

Address:

Contact:

Finally Student data successfully registered in mysql database.

Conclusion

- **Separation of Concerns:** The frontend (HTML), backend (Flask), and database (MySQL) are distinct layers, making the application modular and easier to maintain.
- **Version Control Best Practices:** Using Git and GitHub ensures that all code changes are tracked, collaborated on effectively, and easily revertible. This is fundamental for team-based development and stable releases.
- **Automated CI/CD (DevOps):** Jenkins is at the heart of this project, automating the entire workflow from code commit to deployment. This significantly:
 - **Reduces Manual Errors:** Eliminates human mistakes in the build, test, and deployment phases.
 - **Increases Speed:** Speeds up the delivery of new features and bug fixes to users.
 - **Ensures Quality:** Automated tests (unit and integration) run with every change, catching issues early in the development cycle.
 - **Promotes Consistency:** Guarantees that deployments are consistent across environments.
- **Scalability & Maintainability:** A well-structured Flask application interacting with a robust MySQL database provides a solid foundation that can be scaled horizontally if needed and is relatively easy to debug and enhance.

In conclusion, this project provides a comprehensive and automated pipeline for building and deploying a Flask-based web application. It not only delivers a functional student registration system but also establishes a professional and efficient development and deployment process, making it a strong foundation for future enhancements and continuous delivery.