

Courier Management System — Project Report

RISHITH SAHU - PES1UG23CS481

PUNURU SAI MANUJ REDDY - PES1UG23CS454

SECTION :H

Abstract

This project implements a Courier Management System — a web application that allows users to create courier shipments, make payments, track deliveries, and receive notifications. Admins can manage shipments and assign delivery agents, while agents can view assigned shipments and mark them delivered. The system uses Flask (Python) with SQLAlchemy for the backend and MySQL for persistent storage.

Objectives

- Build a functional web application for creating and tracking courier shipments.
- Provide role-based access (User, Admin, Agent).
- Implement payment flow with server-side and client-side validations.
- Provide notifications (email and SMS) with a DB-backed fallback.
- Ensure reliable tracking history and minimal duplication through DB procedures/triggers.

Key Features

- User registration and login.
- Create courier shipments (sender & receiver details, addresses, weight, type).
- Payment page with validation (credit/debit/UPI) and server-side checks.
- Admin dashboard: list couriers, assign agents, view payments.
- Agent dashboard: view assigned couriers, mark delivered.
- Courier tracking history stored in `Courier_tracking`.
- Notifications: email and SMS (configurable in DB); in-app persistence if external services unavailable.
- Database stored procedures, functions, views and triggers to centralize event handling.

Technologies Used

- Python 3.11
- Flask (web framework)
- Jinja2 (templating)
- SQLAlchemy (ORM)
- MySQL (mysql-connector)
- Bootstrap 5 (UI)
- Optional: Twilio (SMS), SMTP for email

System Architecture (high-level)

- Client (browser): interacts with Flask server via HTML forms and JS validation.
- Server (Flask): handles routes, validation, session-based auth, calls stored procedures for key operations, sends notifications.
- Database (MySQL): stores domain data (Courier, Payments, Courier_tracking, Delivery_agent, Users) and contains stored procedures, functions, views, and triggers to ensure consistent tracking and enable reporting.

Database Design (summary)

The screenshot displays the MySQL Workbench interface. The left sidebar shows the 'SCHEMAS' tree with 'courierdb' selected. The main editor window contains a SQL script for initializing the 'courierdb' database. The script includes comments, database creation, character set settings, and table creation statements. The bottom pane shows the 'Action Output' tab with a detailed log of the executed SQL commands and their results, including warnings about deprecated integer display widths.

```
1 --
2 -- Courier Management System Database
3 -- Version 4.1 (Full data with 10+ dummy rows per table)
4 --
5
6 -- Initial Setup
7 SET SQL_MODE = "NO_AUTO_VALUE_ON_ZERO";
8 START TRANSACTION;
9 SET time_zone = "+00:00";
10
11
12 -- Create and Use Database
13 CREATE DATABASE IF NOT EXISTS courierdb
14     DEFAULT CHARACTER SET utf8mb4
15     COLLATE utf8mb4_general_ci;
16 USE courierdb;
17
18 -- Table Structures (Dropping existing tables to prevent errors on re-run)
19 --
```

#	Time	Action	Message	Duration / Fetch
1	22:52:14	SET SQL_MODE = "NO_AUTO_VALUE_ON_ZERO"	0 row(s) affected	0.000 sec
2	22:52:14	START TRANSACTION	0 row(s) affected	0.000 sec
3	22:52:14	SET time_zone = "+00:00"	0 row(s) affected	0.000 sec
4	22:52:14	CREATE DATABASE IF NOT EXISTS courierdb; DEFAULT CHARACTER SET utf8mb4 COLLATE utf8mb4_general_ci	1 row(s) affected	0.016 sec
5	22:52:14	USE courierdb	0 row(s) affected	0.000 sec
6	22:52:14	DROP TABLE IF EXISTS Feedback, Payments, Courier_tracking, Contact, Courier, Courier_pricing, Delivery_agent, Credentials, User, Admin	0 row(s) affected, 10 warnings(s): 1051 Unknown table 'courierdb.feedback' 1051 Unknown table 'courierdb.payments' 1051 Unknown table 'courierdb.co...	0.016 sec
7	22:52:14	CREATE TABLE Admin (aid INT(11) NOT NULL AUTO_INCREMENT, email VARCHAR(50) NOT NULL UNIQUE, name VARCHAR(50) DEFAULT...	0 row(s) affected, 1 warning(s): 1681 Integer display width is deprecated and will be removed in a future release.	0.031 sec
8	22:52:14	CREATE TABLE User (uid INT(11) NOT NULL AUTO_INCREMENT, email VARCHAR(50) NOT NULL UNIQUE, name VARCHAR(50) DEFAULT N...	0 row(s) affected, 2 warning(s): 1681 Integer display width is deprecated and will be removed in a future release. 1681 Integer display width is deprecated...	0.047 sec
9	22:52:14	CREATE TABLE Credentials (email VARCHAR(50) NOT NULL, password VARCHAR(255) NOT NULL, role ENUM('User', 'Admin') NOT NULL, uid...	0 row(s) affected, 2 warning(s): 1681 Integer display width is deprecated and will be removed in a future release. 1681 Integer display width is deprecated...	0.047 sec
10	22:52:14	CREATE TABLE Delivery_agent (agentid INT AUTO_INCREMENT, name VARCHAR(50) NOT NULL, email VARCHAR(50) NOT NULL UNIQUE...	0 row(s) affected	0.015 sec
11	22:52:14	CREATE TABLE Courier_pricing (priceid INT AUTO_INCREMENT, courier_type ENUM('Domestic', 'International') NOT NULL, min_weight DECIMA...	0 row(s) affected, 1 warning(s): 1681 Integer display width is deprecated and will be removed in a future release.	0.015 sec
12	22:52:14	CREATE TABLE Courier (cid INT(11) NOT NULL AUTO_INCREMENT, uid INT(11) DEFAULT NULL, email VARCHAR(50) NOT NULL, remail VA...	0 row(s) affected, 5 warning(s): 1681 Integer display width is deprecated and will be removed in a future release. 1681 Integer display width is deprecated...	0.047 sec
13	22:52:15	CREATE TABLE Contact (cid INT(11) NOT NULL AUTO_INCREMENT, email VARCHAR(50) NOT NULL, title VARCHAR(50) NOT NULL, commen...	0 row(s) affected, 2 warning(s): 1681 Integer display width is deprecated and will be removed in a future release. 1681 Integer display width is deprecated...	0.031 sec
14	22:52:15	CREATE TABLE Courier_tracking (trackid INT AUTO_INCREMENT, cid INT NOT NULL, status VARCHAR(50) NOT NULL, current_location VAR...	0 row(s) affected	0.031 sec
15	22:52:15	CREATE TABLE Payments (pid INT AUTO_INCREMENT, cid INT NOT NULL, uid INT NOT NULL, amount DECIMAL(10,2) NOT NULL, payment...	0 row(s) affected	0.031 sec
16	22:52:15	CREATE TABLE Feedback (fid INT AUTO_INCREMENT, cid INT DEFAULT NULL, uid INT NOT NULL, comment TEXT, date DATETIME DEF...	0 row(s) affected	0.047 sec
17	22:52:15	INSERT INTO Admin (email, name, phoneno) VALUES (admin1@courier.com, 'Rajesh Kumar', '9999999901'), (admin2@courier.com, 'Sunita Sharma', '...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec
18	22:52:15	INSERT INTO User (email, name, phoneno, aid) VALUES (alice@example.com, 'Alice', '9876543210', 1), (bob@example.com, 'Bob', '9876543211', 2),...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.016 sec
19	22:52:15	INSERT INTO Credentials (email, password, role, uid, aid) VALUES (admin1@courier.com, 'adminpass1', 'Admin', NULL, 1), (admin2@courier.com, 'ad...	20 row(s) affected Records: 20 Duplicates: 0 Warnings: 0	0.015 sec
20	22:52:15	INSERT INTO Delivery_agent (name, email, phone, role, aid) VALUES (admin1@courier.com, 'adminpass1', 'Admin', NULL, 1), (admin2@courier.com, 'ad...	10 row(s) affected Records: 10 Duplicates: 0 Warnings: 0	0.000 sec

Main tables:

- `Courier` — stores shipments (cid, sender/receiver details, addresses, billno, agentid, priceid, date)
- `Courier_tracking` — timeline of status updates for a courier (trackid, cid, status, current_location, updated_at)
- `Payments` — payment information (pid, cid, uid, amount, payment_mode, payment_status, transaction_date)
- `Delivery_agent` — delivery agents (agentid, name, email, phone)
- `Notification_config` — SMTP/Twilio settings (admin-editable)

Stored routines created:

- `sp_mark_payment_completed(p_cid)` — mark payments as Completed and insert `Payment Received` tracking if needed.
- `sp_assign_agent(p_cid, p_agentid)` — set `agentid` for courier and insert an assignment tracking entry if changed.

Stored functions:

- `fn_payment_status(p_cid)` — returns payment status.

- ``fn_last_tracking_status(p_cid)`` — returns latest tracking status.

Views:

- ``vw_courier_summary`` — summary per courier (billno, amount, payment_status, last_status, agentid).
- ``vw_agent_assignments`` — per-agent assigned-count summary.

Triggers:

- ``trg_payments_after_insert`` — AFTER INSERT on ``Payments``, inserts ``Payment Received`` tracking when appropriate (deduplicates using last status and 120s window).
- ``trg_courier_after_update_agent`` — AFTER UPDATE on ``Courier``, inserts assignment/unassignment tracking entries similar to above.

Notes: Triggers and procedures include deduplication logic to avoid duplicate ``Courier_tracking`` rows when both app and DB insert similar events.

Implementation Highlights

```
def show_create_object(obj_type, name):
    """Show CREATE statement for PROCEDURE/FUNCTION/VIEW/TRIGGER using SHOW CREATE ..."""
    with app.app_context():
        try:
            q = text(f"SHOW CREATE {obj_type} `{name}`")
            res = db.session.execute(q).fetchall()
            print(f'SHOW CREATE {obj_type} {name}:')
            for r in res:
                print(r)
        except Exception as e:
            print('Error showing create for', obj_type, name, e)
```

```
def call_procedure_mark_payment_completed(courier_id):
    """Call stored procedure sp_mark_payment_completed(:cid) using SQLAlchemy.
    Uses transactional execution via db.engine.begin().
    """
    with app.app_context():
        try:
            with db.engine.begin() as conn:
                conn.execute(text("CALL sp_mark_payment_completed(:cid)"), {"cid": courier_id})
            print('Called sp_mark_payment_completed for cid=', courier_id)
        except Exception as e:
            print('Error calling procedure:', e)
```

```
def demonstrate_trigger_payment(courier_id, user_id, amount=100.0):
    """Insert a Payments row with status Completed and then query Courier_tracking to show trigger effect.
    """
    WARNING: This will insert data into your DB. Use with test/demo data.
    with app.app_context():
        try:
            with db.engine.begin() as conn:
                # Insert a payment row that should fire the payments trigger
                conn.execute(text("INSERT INTO Payments (cid, uid, amount, payment_mode, payment_status, transaction_date) VALUES (:cid, :uid, :amt, 'Credit Card', 'Completed', NOW())"),
                    {"cid": courier_id, "uid": user_id, "amt": amount})
                print('Inserted Payments row (Completed) for cid=', courier_id)
                # read recent tracking rows
                rows = conn.execute(text("SELECT * FROM Courier_tracking WHERE cid = :cid ORDER BY updated_at DESC LIMIT 5"), {"cid": courier_id}).fetchall()
                print('Recent Courier_tracking rows:')
                for r in rows:
                    print(dict(r))
            except Exception as e:
                print('Error inserting payment/reading tracking:', e)
```

- ``app.py`` contains Flask routes for all pages (index, login/register, dashboard, create_courier, payment, agent/admin dashboards, assign, update status, notify helpers).
- A context processor ``inject_now()`` provides ``now()`` to templates for footer timestamps.

- Payment validation:
- Client-side: JS ensures digits-only card entry (16 digits), expiry format, CVV checks, UPI validation.
- Server-side: validates card digits (16), expiry against IST ``ist_now()``, CVV length. Calls ``sp_mark_payment_completed`` to finalize payment.
- Notifications: ``notify_parties()`` constructs email/SMS messages using DB-backed configuration; ``send_email()`` and ``send_sms()`` handle external sends where configured. The DB stores notification settings via ``admin_notification_config`` route.
- Stored routines centralize key operations. The app was updated to call procedures for payment completion and agent assignment.

How to Run Locally (development)

1. Ensure MySQL is running and a database ``courierdb`` exists. Adjust ``app.config["SQLALCHEMY_DATABASE_URI"]`` in ``app.py`` if needed.

2. Install Python dependencies (example):

```
pip install -r requirements.txt
```

(If no requirements file, install Flask, SQLAlchemy, mysql-connector-python, werkzeug)

3. Set environment variables for optional SMTP/Twilio if needed:

```
$env:SMTP_SERVER='smtp.example.com'; $env:SMTP_PORT='587'; $env:SMTP_USERNAME='user'; $env:SMTP_PASS
```

4. Run the app:

```
python app.py
```

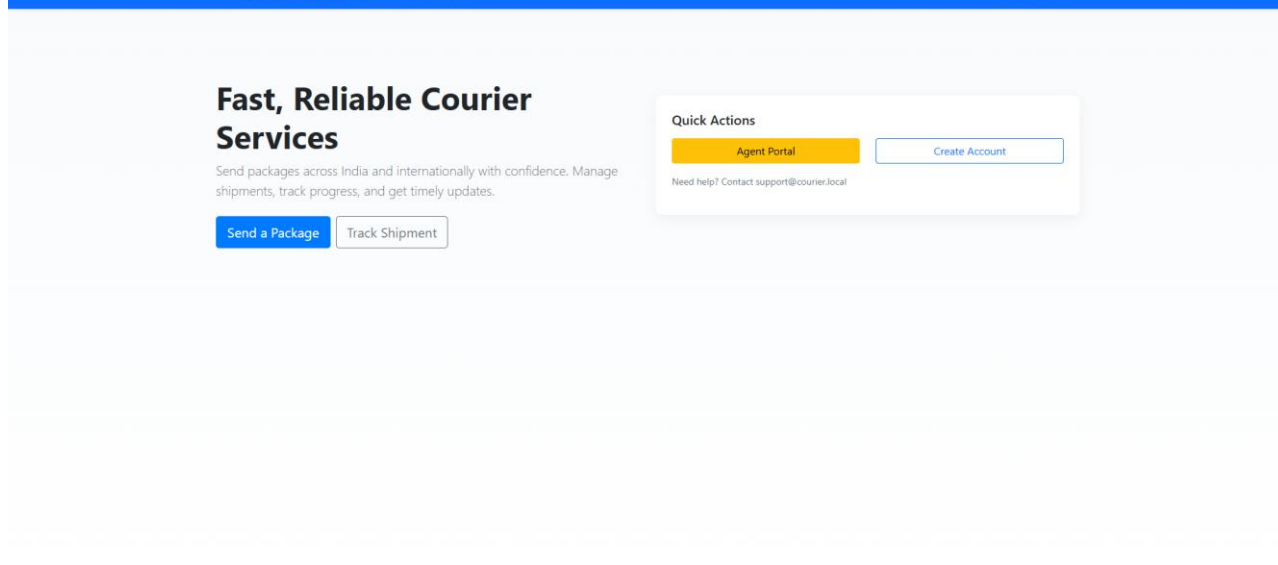
5. Open `http://127.0.0.1:5000` in a browser.

Testing & Verification

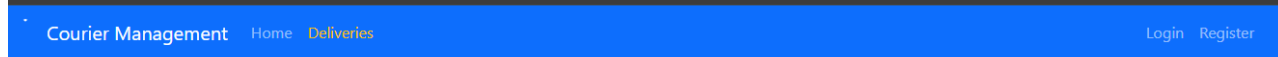
- Manual tests performed:
- Create courier → verify ``Payments`` row created (Pending) and ``Courier_tracking`` initial Pending entry.
- Payment page validation (client + server) → call ``sp_mark_payment_completed`` and verify ``Courier_tracking`` has 'Payment Received'.
- Assign agent via admin dashboard → ``sp_assign_agent`` called, courier ``agentid`` updated and tracking entry added.
- Notifications: ``admin_notify_test`` and ``notify_test/`` endpoints to exercise email/SMS sending; if external not configured, messages are logged and persisted (in-app fallback).

Github Link: <https://github.com/RishithSahu/Courier-Management-Service>

Application Screenshots:



nt_login ☆



Email

Phone Number

Login

Welcome, Ravi Kumar!



Your Assigned Couriers

Bill No	Sender	Receiver	Type	Weight	Status	Actions
1001	Alice	Receiver One	Domestic	0.50 kg	Delivered	<button>Closed</button>

Send a Courier

Sender Details

Name

test

Email

test@gmail.com

Phone

4564879159

Address

PES University, RR Campus

Receiver Details

Name

tester

Email

tester@gmail.com

Phone

8974562132

Address

PES University, EC Campus

Package Details

Weight (kg)

19

Courier Type

Domestic

Destination Country

India

Create CourierCancel

Courier created successfully. Please complete payment to confirm the delivery.



Payment Details

Amount: ₹250.00**Bill Number:** 1763660322

Select Payment Method

Credit Card

Card Number

4984949849499494

Expiry Date

02/35

CVV

...

Invalid or expired expiry date.

Pay NowCancel

Track Your Courier

Enter Tracking Number / Bill No

Track

Tracking Information

Pending
● Location: PES University, RR Campus
2025-11-20 23:08:42

Welcome back, Rajesh Kumar!

Admin Dashboard

Total Users

11

Total Couriers

12

Total Payments

12

Recent Couriers

Bill No	Sender	Receiver	Type	Weight	Date	Status	Agent	Actions			
1763660155	test	tester	Domestic	16.00 kg	2025-11-20	Pending	Select Agent	Assign	Track	Set status	Update
1763660322	test	tester	Domestic	19.00 kg	2025-11-20	Pending	Select Agent	Assign	Track	Set status	Update
1010	Julia	Receiver Ten	Domestic	0.80 kg	2025-10-10	At Hub	John Smith		Track	Set status	Update
1009	Ian	Receiver Nine	Domestic	6.00 kg	2025-10-09	Picked Up	Anita Rao		Track	Set status	Update
1008	Hannah	Receiver Eight	International	30.00 kg	2025-10-08	At Hub	David Miller		Track	Set status	Update
1007	George	Receiver Seven	Domestic	25.00 kg	2025-10-07	Delivered	Mary Thomas		Track	Set status	Update
1006	Fiona	Receiver Six	International	18.50 kg	2025-10-06	Dispatched	David Miller		Track	Set status	Update
1005	Evan	Receiver Five	Domestic	12.00 kg	2025-10-05	In Transit	Ramesh Patel		Track	Set status	Update
1004	Diana	Receiver Four	International	8.00 kg	2025-10-04	Customs Clearance	Tom Lee		Track	Set status	Update