

# Commuter Reservation System

DAMG 6210 - Database Management & Design | Final Project

## **Group 4**

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# Problem & Solution

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## ✗ Current Problems

- ✗ Manual ticket booking process
- ✗ Inconsistent data & overbooking
- ✗ No centralized management
- ✗ No real-time seat tracking
- ✗ Inefficient waitlist handling
- ✗ No audit trail
- ✗ Security vulnerabilities

## ✓ Our Solution

- ✓ Oracle Database (3NF)
- ✓ Business rules at DB level
- ✓ 40 confirmed + 5 waitlist
- ✓ Auto waitlist promotion
- ✓ 3-tier security model
- ✓ Complete audit logging
- ✓ PL/SQL packages

# Team Responsibilities

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## **Aravind Balaji**

Schema Design, Tables, Constraints, Sequences, Indexes, Documentation

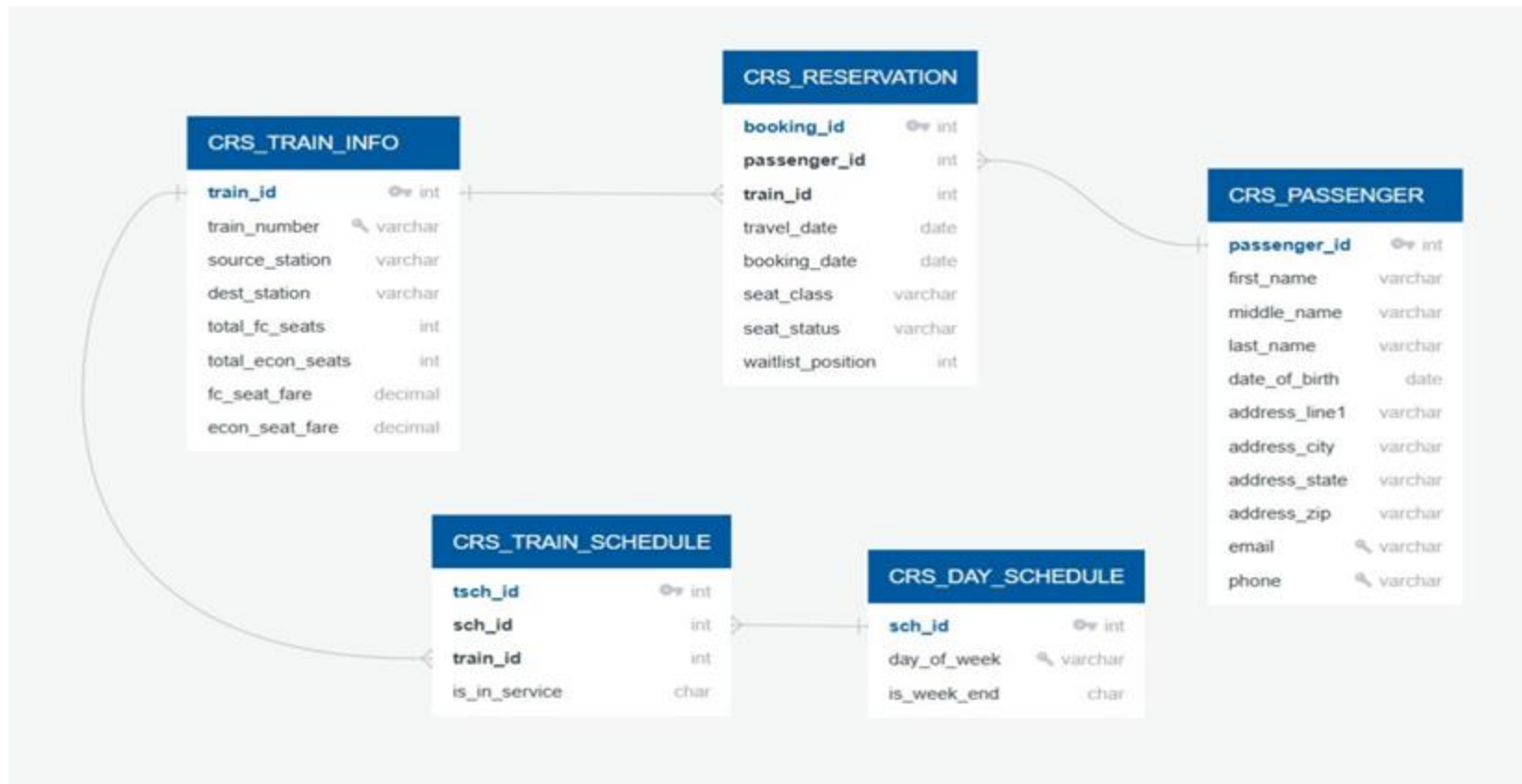
## **Akshay Dnyaneshwar Govind**

Master Data, Seed Data, Test Cases, Permissions, Audit Log

## **Pranav Narendrabhai Patel**

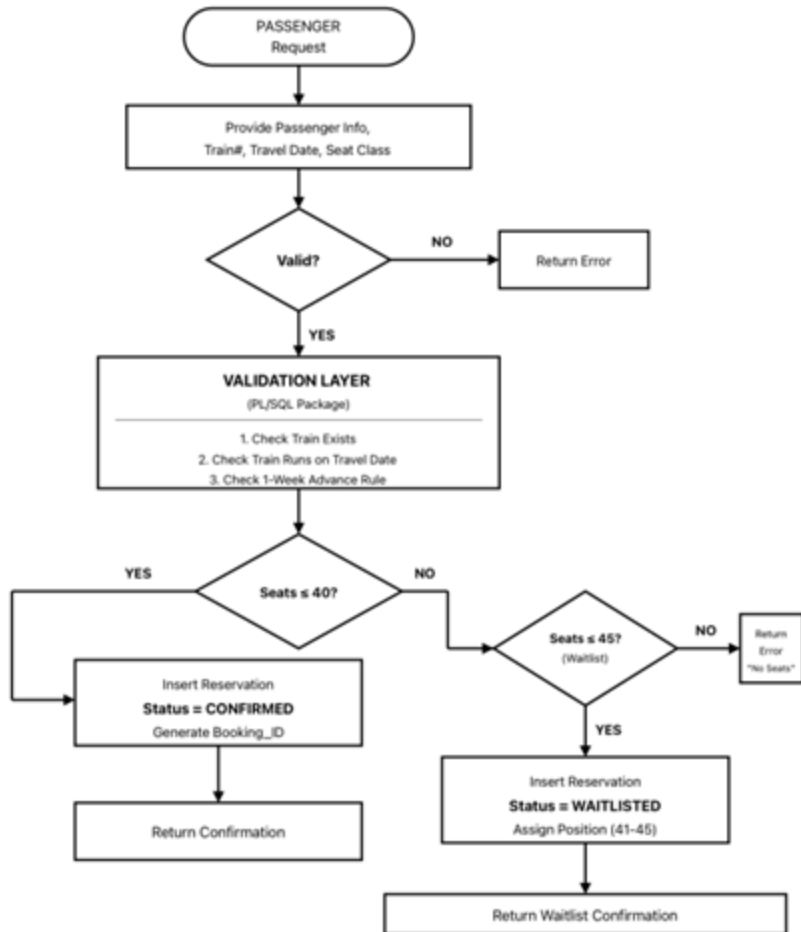
PL/SQL Packages, Stored Procedures, Functions, Triggers, Reports

# ER Diagram



Entity	Attributes
CRS_TRAIN_INFO	Train_ID (PK), Train_Number (UNIQUE), Source_Station, Dest_Station, Total_FC_Seats, Total Econ_Seats, FC_Seat_Fare, Econ_Seat_Fare
CRS_DAY_SCHEDULE	Sch_ID (PK), Day_of_Week (UNIQUE), Is_Week_End → removes day/weekend redundancy
CRS_TRAIN_SCHEDULE	TSch_ID (PK), Sch_ID (FK → CRS_DAY_SCHEDULE), Train_ID (FK → CRS_TRAIN_INFO), Is_In_Service → Bridge table for M:N relationship
CRS_PASSENGER	Passenger_ID (PK), First_Name, Middle_Name, Last_Name, Date_of_Birth, Address_Line1, Address_City, Address_State, Address_Zip, Email (UNIQUE), Phone (UNIQUE)
CRS_RESERVATION	Booking_ID (PK), Passenger_ID (FK → CRS_PASSENGER), Train_ID (FK → CRS_TRAIN_INFO), Travel_Date, Booking_Date, Seat_Class, Seat_Status, Waitlist_Position

## Booking Workflow



## Cancellation Workflow

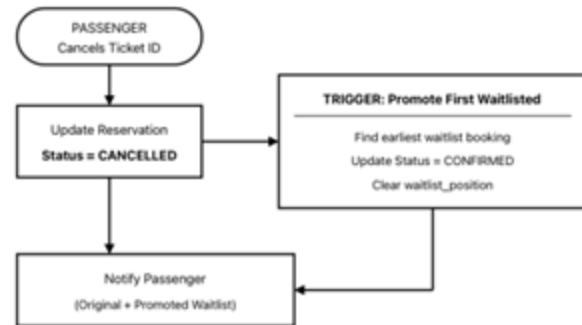


Table	Description	Rows
CRS_TRAIN_INFO	Train master (routes, fares)	6
CRS_DAY_SCHEDULE	Days of week	7
CRS_TRAIN_SCHEDULE	Train ↔ Day bridge	~29
CRS_PASSENGER	Passenger info	22+
CRS_RESERVATION	Booking records	45+
CRS_AUDIT_LOG	Audit trail	Varies

# Business Rules Implemented

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## **Seat Capacity**

40 confirmed + 5 waitlist per class (FC/ECON)

## **Advance Booking Limit**

Maximum 7 days in advance only

## **Unique Identity**

Email & Phone must be unique per passenger

## **Past Date Prevention**

Cannot book tickets for past dates

## **Waitlist Promotion**

Auto-promote first waitlisted on cancellation

## **Schedule Validation**

Train must operate on selected travel day

## **Age Categories**

Minor (<18), Adult (18-59), Senior (≥60)

## **Valid Seat Class**

Only FC (First Class) or ECON (Economy)



# Capacity Model & Waitlist Logic

Seats 1-40: CONFIRMED ✓

41-45:  
WAITLIST  
⌚

46+:  
REJECT ✗

## Booking Flow

- ✓ Seats available → Status = CONFIRMED
- ✓ Seats full, waitlist open → WAITLISTED (41-45)
- ✓ Everything full → Booking REJECTED

## On Cancellation (Trigger)

- CONFIRMED cancelled → Trigger fires
- Position 41 → Promoted to CONFIRMED
- Positions 42-45 → Shift up by 1

# Three-Tier Security Model

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## CRS\_ADMIN\_USER

Schema Owner / DBA

- ✓ Full DDL/DML
- ✓ CREATE, DROP
- ✓ INSERT, UPDATE
- ✓ All operations

 IT Department

## CRS\_DATA\_USER

Application User

- ✓ EXECUTE procedures
- ✗ Direct table access
- ✗ INSERT/UPDATE
- ✗ See raw data

 Ticket Agent / App

## CRS\_REPORT\_USER

Read-Only Access

- ✓ SELECT on views
- ✗ Any modifications
- ✗ Execute procedures
- ✗ Access tables

 Manager / Analyst

 **Principle of Least Privilege Applied** - Users get only minimum permissions needed

# PL/SQL Implementation

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## CRS\_PASSENGER\_PKG

- **add\_passenger()** - Register new
- **update\_passenger()** - Update info
- **get\_passenger\_info()** - Get details

Validates: Unique email/phone, valid DOB

## CRS\_BOOKING\_PKG

- **book\_ticket()** - Book with auto status
- **cancel\_ticket()** - Cancel & promote
- **check\_availability()** - Real-time seats
- **get\_booking\_details()** - Full info

## Triggers (4)

- trg\_audit\_passenger
- trg\_audit\_reservation
- trg\_audit\_train\_info
- trg\_promote\_waitlist (Compound)

## Views (5)

- BOOKING\_REPORT\_VIEW
- OCCUPANCY\_VIEW
- REVENUE\_VIEW
- PASSENGER\_AGE\_VIEW
- AUDIT\_REPORT\_VIEW

# Test Results - All 17 Tests Passed

## Positive Tests (6)

#	Test Case	Result
1	Book 40 seats → CONFIRMED	✓ PASS
2	Book 5 more → WAITLISTED	✓ PASS
3	Book 46th → REJECTED	✓ PASS
4	Cancel → Waitlist promoted	✓ PASS
5	Wrong day → REJECTED	✓ PASS
6	Age categorization	✓ PASS

## Negative Tests (11)

Code	Scenario	Result
-20001	Duplicate Email	✓
-20002	Duplicate Phone	✓
-20003	Future DOB	✓
-20010	Invalid Passenger ID	✓
-20011	Invalid Train Number	✓
-20012	Invalid Seat Class	✓
-20013	Beyond 7-day limit	✓
-20014	Past date booking	✓
-20015	Train not running	✓
-20020	Booking not found	✓
-20021	Already cancelled	✓



Thank You!