

Commuter Reservation System

DAMG 6210 - Database Management & Design | Final Project

Group 4

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Problem & Solution

✗ 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

Aravind Balaji

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

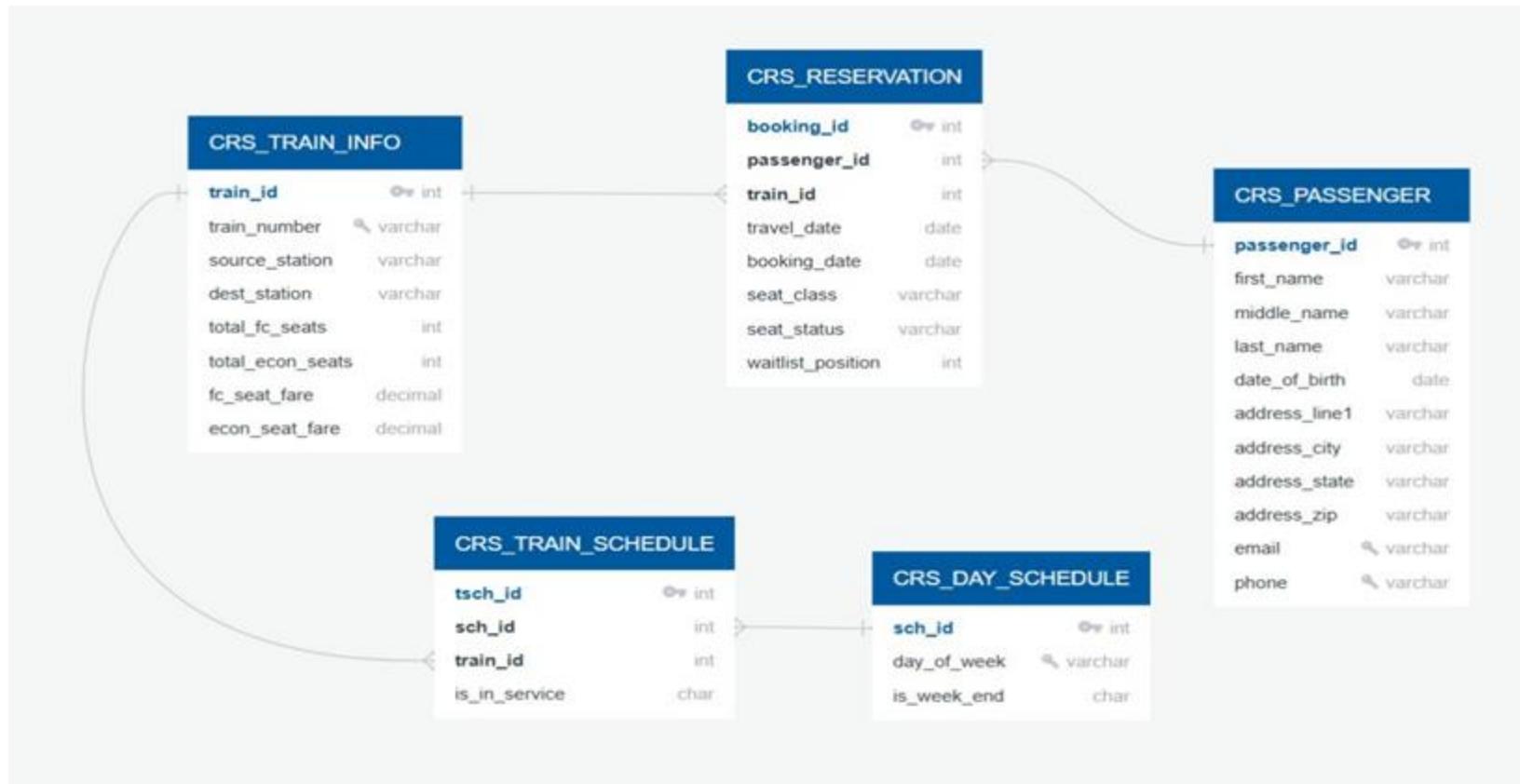
Akshay Dnyaneshwar Govind

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

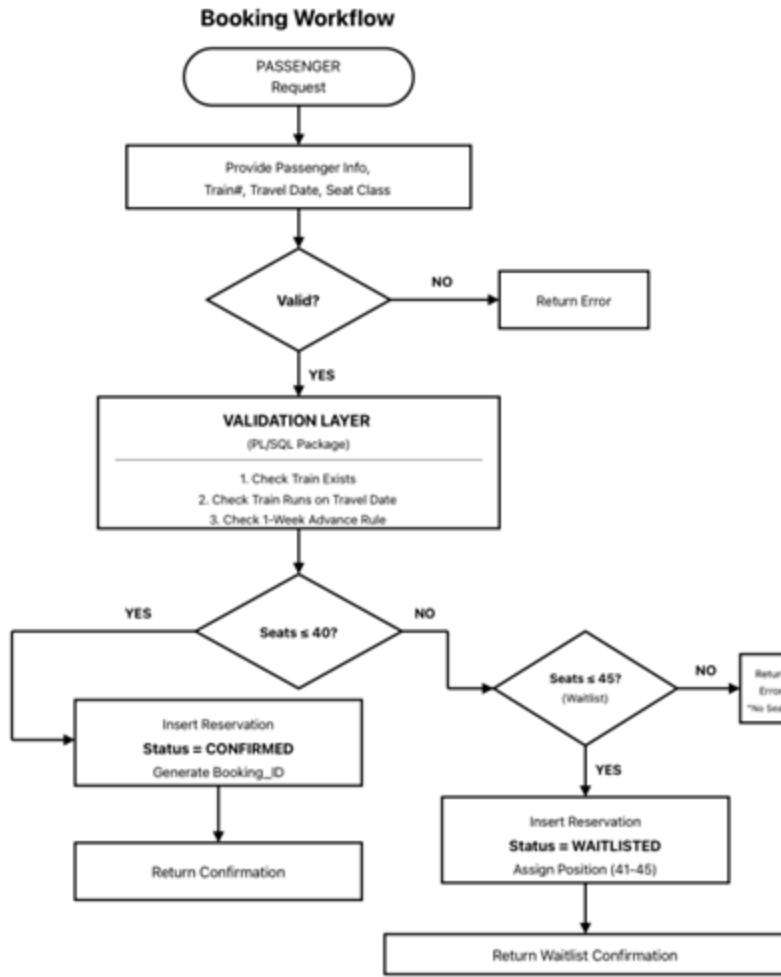
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PL/SQL Packages, Stored Procedures, Functions, Triggers, Reports

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



Cancellation Workflow

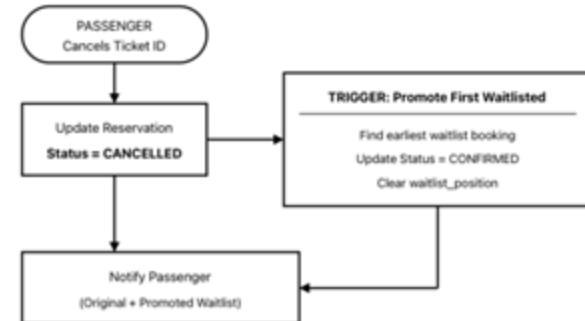


Table	Description	Rows
CRS_TRAIN_INFO	Train master (routes, fares)	6
CRS_DAY_SCHEDULE	Days of week	7
CRS_TRAIN_SCHEDULE	Train ↔ Day bridge	~29
CRS_PASSENGER	Passenger info	22+
CRS_RESERVATION	Booking records	45+
CRS_AUDIT_LOG	Audit trail	Varies

Business Rules Implemented

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

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

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!