Database Design: Train Booking

A guide for a database design for a sample train booking system

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This guide is a companion to my YouTube video on designing a database for a train booking system.

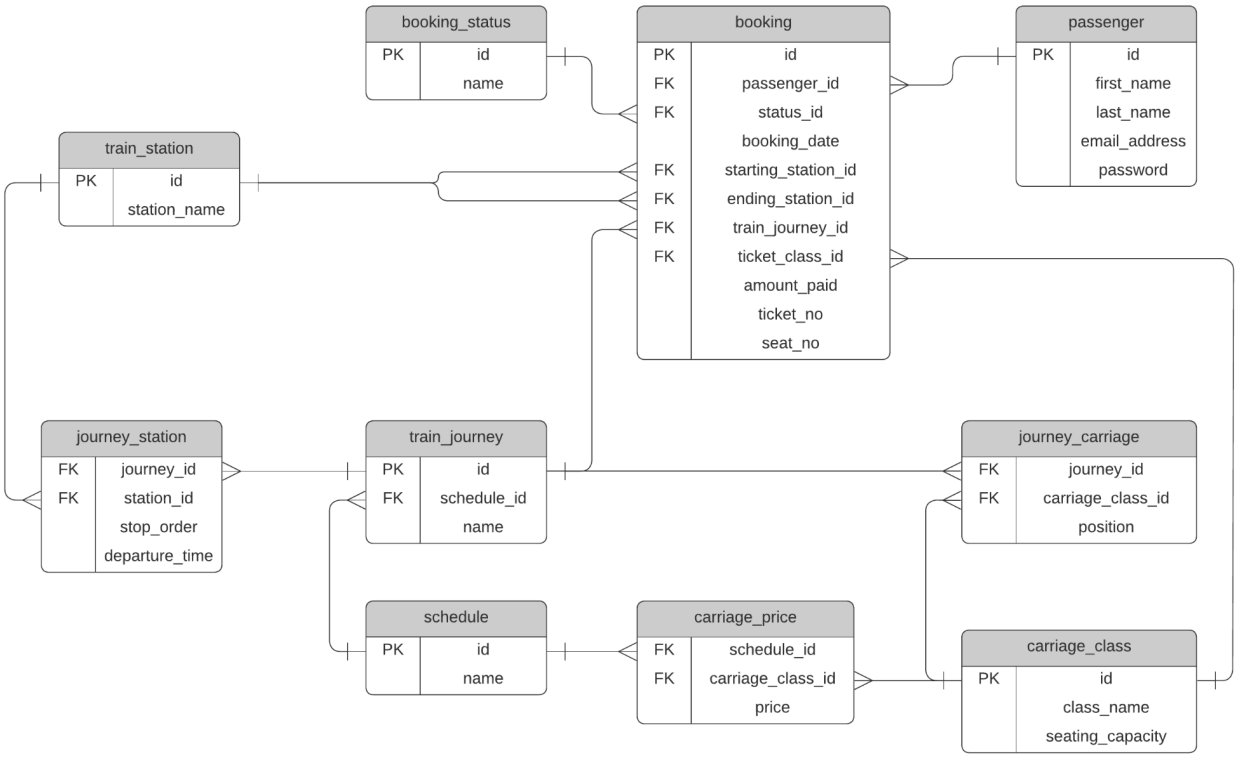
In this guide, you'll see:

- An Entity Relationship Diagram for a train booking system, from my YouTube video.
- An explanation of the purpose of each table and field, with sample data
- SQL scripts to create each of these tables with some sample data

Let's get into it.

Entity Relationship Diagram

Here's the ERD for this database:



Database Definition

This section explains each of these tables and fields.

train_station

A train station that exists on the train network. A train can arrive and depart from a train station as part of its journey.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
station_name	A name of the train station, which can be displayed on the website for users to identify it.	Penn Station, South Station

train_journey

A single journey of a train that starts at one station at one time and ends at another station at another time.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
schedule_id	A foreign key to the schedule record for this journey, so we can tell whether this journey is for a Weekday, Weekend, or some other schedule.	1, 2, 3
name	The name given to this journey so it can be shown on the website if needed	"9:05 Penn Station to Boston South Station" "12:45 Chicago to Washington DC"

journey_station

A combination of all of the stations that are included in a train journey.

Column	Description	Sample Data
journey_id	The foreign key to the train journey table, to indicate which journey this record is for.	1, 2, 3
station_id	The foreign key to the train station table, to indicate which station this record is for.	1, 4, 9
stop_order	A number that indicates the sequence or order that the train journey takes. It can be used to show the route that the journey takes (the stations and the order they stop in)	1 for the first station, 2 for the next station, and so on.
departure_time	The time that the train departs from this station.	9:10 11:15 16:21

schedule

A list of different schedules that can be applied to a train journey, because a train journey can run on a Weekday schedule, a Weekend schedule, or even a public holiday.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
name	A name for the schedule which can be displayed on the website and understood by users.	Weekday Weekend Public Holiday

carriage_class

A list of different classes of train carriages. In real trains, different classes have different quality seating and amenities. In the system, different classes have different prices and seating capacity.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
class_name	The name of the class, which can be shown to a user and understood by a user	First Second Economy
seating_capacity	The number of seats available on a carriage of this class. The maximum number of passengers that can book for this class of carriage.	20 50 100

journey_carriage

A record of carriages for each train journey, because each train has many carriages, and a carriage can be used for many trains.

Column	Description	Sample Data
journey_id	A foreign key to the train journey table, to indicate which journey this carriage is for.	1, 2, 3
carriage_class_id	A foreign key to the carriage class table, to indicate which class this carriage is for.	1, 2, 3
position	The position in the train that the carriage sits. This can help with printing on tickets or informing the passenger where their carriage is.	1, 3, 6

carriage_price

A record that captures the price for a ticket on a specific class of carriage for a specific schedule.

For example, a weekday First Class ticket, or a weekend Economy ticket.

Column	Description	Sample Data
schedule_id	A foreign key for the schedule that identifies which schedule the price applies	1, 2, 3

	to.	
carriage_class_id	A foreign key for the carriage class that identifies which class the price applies to	1, 2, 3
price	The price for the combination of schedule and class	20, 45, 200, 280

booking

A record of a booking that a passenger has made, with references to all of the other information for the booking.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
passenger_id	A foreign key to the passenger table to identify the passenger that the booking is for	1, 5, 18, 20
status_id	A foreign key to the booking status table to identify the status of this booking	1, 2
booking_date	The date that the booking was made	2023-08-30, 2023-09-21, 2024-03-05
starting_station_id	A foreign key to the train station table to identify the station that the booking starts at (the station where the passenger gets onto the train).	3, 15, 29
ending_station_id	A foreign key to the train station table to identify the station that the booking finishes at (the station where the passenger gets off the train)	4, 18, 22
train_journey_id	A foreign key to the train journey table, to indicate the journey that has been booked by the passenger.	1, 3, 6
ticket_class_id	A foreign key to the carriage_class table, to indicate the class of the ticket that the passenger has booked.	1, 2, 3

amount_paid	The amount paid for this booking by the passenger	20, 25, 50, 98
ticket_no	A number that identifies the ticket for this booking, which can be printed or displayed on the ticket.	15, 80, 231
seat_no	The number of the seat that the passenger has booked on a carriage. This can be printed or displayed on the ticket	3, 15, 29

passenger

The passenger who has made the booking, and also the person who can login to the booking system.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
first_name	The first name of the passenger	John Sandip Stephanie
last_name	The last name of the passenger	Kumar Smith Jones
email_address	The email address for the passenger, which can be used to send booking details to and to login.	john@apple.com
password	The password for this passenger for logging into the booking system.	An encrypted value for the password

booking_status

A lookup table for the status of a booking, such as Active or Cancelled.

Column	Description	Sample Data
id	Primary key. A unique identifier for the row.	1, 2, 3
name	The status value that is shown on the screen and understandable by the user	Active Cancelled Pending

SQL Scripts

Here is the SQL code to create the tables for this database.

The script is written for MySQL, but it can easily be modified to work on your preferred database vendor by changing the data types and removing the IF EXISTS (if your database doesn't support it).

```
CREATE DATABASE train_booking;

USE train_booking;

DROP TABLE IF EXISTS booking;
DROP TABLE IF EXISTS passenger;
DROP TABLE IF EXISTS booking_status;
DROP TABLE IF EXISTS journey_carriage;
DROP TABLE IF EXISTS carriage_price;
DROP TABLE IF EXISTS carriage_class;
DROP TABLE IF EXISTS journey_station;
DROP TABLE IF EXISTS train_station;
DROP TABLE IF EXISTS train_journey;
DROP TABLE IF EXISTS schedule;

CREATE TABLE schedule (
  id INT AUTO_INCREMENT,
  name VARCHAR(200),
  CONSTRAINT pk_schedule PRIMARY KEY (id)
);

CREATE TABLE train_journey (
  id INT AUTO_INCREMENT,
  schedule_id INT,
  name VARCHAR(500),
  CONSTRAINT pk_trainjourney PRIMARY KEY (id),
  CONSTRAINT fk_ts_schedule FOREIGN KEY (schedule_id) REFERENCES
schedule (id)
);
```

```
CREATE TABLE train_station (
  id INT AUTO_INCREMENT,
  station_name VARCHAR(200),
  CONSTRAINT pk_trainstation PRIMARY KEY (id)
);

CREATE TABLE journey_station (
  journey_id INT,
  station_id INT,
  stop_order INT,
  departure_time DATETIME,
  CONSTRAINT fk_js_journey FOREIGN KEY (journey_id) REFERENCES
train_journey (id),
  CONSTRAINT fk_js_station FOREIGN KEY (station_id) REFERENCES
train_station (id)
);

CREATE TABLE carriage_class (
  id INT AUTO_INCREMENT,
  class_name VARCHAR(50),
  seating_capacity INT,
  CONSTRAINT pk_carclass PRIMARY KEY (id)
);

CREATE TABLE carriage_price (
  schedule_id INT,
  carriage_class_id INT,
  price INT,
  CONSTRAINT fk_carprice_schedule FOREIGN KEY (schedule_id) REFERENCES
schedule (id),
  CONSTRAINT fk_carprice_class FOREIGN KEY (carriage_class_id)
REFERENCES carriage_class (id)
);


CREATE TABLE journey_carriage (
  journey_id INT,
  carriage_class_id INT,
  position INT,
  CONSTRAINT fk_jc_journey FOREIGN KEY (journey_id) REFERENCES
train_journey (id),
  CONSTRAINT fk_jc_carclass FOREIGN KEY (carriage_class_id) REFERENCES
carriage_class (id)
);

CREATE TABLE booking_status (
  id INT AUTO_INCREMENT,
```

```
  name VARCHAR(50),
  CONSTRAINT pk_bookingstatus PRIMARY KEY (id)
);

CREATE TABLE passenger (
  id INT AUTO_INCREMENT,
  first_name VARCHAR(500),
  last_name VARCHAR(500),
  email_address VARCHAR(350),
  password VARCHAR(500),
  CONSTRAINT pk_passenger PRIMARY KEY (id)
);

CREATE TABLE booking (
  id INT AUTO_INCREMENT,
  passenger_id INT,
  status_id INT,
  booking_date DATE,
  starting_station_id INT,
  ending_station_id INT,
  train_journey_id INT,
  ticket_class_id INT,
  amount_paid INT,
  ticket_no INT,
  seat_no VARCHAR(5),
  CONSTRAINT pk_booking PRIMARY KEY (id),
  CONSTRAINT fk_booking_passenger FOREIGN KEY (passenger_id) REFERENCES
passenger (id),
  CONSTRAINT fk_booking_status FOREIGN KEY (status_id) REFERENCES
booking_status (id),
  CONSTRAINT fk_booking_startstn FOREIGN KEY (starting_station_id)
REFERENCES train_station (id),
  CONSTRAINT fk_booking_endstn FOREIGN KEY (ending_station_id)
REFERENCES train_station (id),
  CONSTRAINT fk_booking_journey FOREIGN KEY (train_journey_id)
REFERENCES train_journey (id),
  CONSTRAINT fk_booking_class FOREIGN KEY (ticket_class_id) REFERENCES
carriage_class (id)
);
```

Conclusion

I hope you found this guide useful. If you have any questions or issues with it, let me know at ben@databasestar.com.

Thanks,

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