



Project: Car Rental Database

Your company, Apasaja Pte Ltd, has been commissioned to design and implement a database application to record information about car rental operation for the PinjaMobil Pte Ltd. The application stores and manages historical information about the customers and cars.

The application stores and manages information about customers. A customer is identified by their NRIC number. Some customer may have driving license. The application also stores a name of the customer, the date of birth, as well as car preference. The car preference will be based on a brand and model of the car as stored in the database.

The application also stores and manages information about the cars. A specific car is identified by their license plate with the color of the car recorded. The current scheme for license plate starts with letter S followed by two letters, four digits, and the final checksum letter (see: Wikipedia). The brand and the model of each car are also recorded, which we call as the make of the car.

To accommodate future purchases, the application should allow recording of the make of the car even if we have currently no car with the given brand and model. This is also important as some customer may have a preference for a car make that the company does not have yet. There are also additional information about the capacity of the car that depends on the make of the car. As there is no modification of the car, all cars with the same make will have the same capacity.

The application tracks which customers rented which cars. The record of the start date and end date are recorded for each rental. We will use the notation $[start, end]$ to indicate the interval from start to end *inclusive* of both dates. Given two interval $[s1, e1]$ and $[s2, e2]$, we will still treat the following two cases as overlapping interval: (i) $e1 = s2$ and (ii) $e2 = s1$. This is because the interval we are using is *inclusive* of both dates. Obviously, a car already rented in the interval $[s1, e1]$ cannot be rented again in the interval $[s2, e2]$ if the interval overlaps.

The application also tracks all passenger information of a car that are being rented. If a car is not currently being rented, there should be no passenger. For simplicity, the passenger will ride for the entire duration of the rented car. So if a car is being rented in the interval $[s, e]$, then any passenger of this car will ride in the car for the entire interval $[s, e]$.

Note that the customer renting need not be one of the passengers. In other words, a customer may initiate a rent for another passenger. The number of passenger must be smaller than or equal to the capacity of the car depending on their make. Furthermore, one *or more* of the passenger must have a driving license. Similar to how a car cannot be rented on overlapping dates, a customer cannot be a passenger on two different cars being rented with overlapping dates.

Finally, the application stores and manages only historical records and does not manage future events. For our purpose, given the new year of 2025, we will only test on dates of up to 2024. You do not have to make an explicit check for the date.

References

- [1] Iso 8601 date and time format. <https://www.iso.org/iso-8601-date-and-time-format.html>. Visited on 31 January 2024.
- [2] Iso week date. https://en.wikipedia.org/wiki/ISO_week_date. Visited on 31 January 2024.
- [3] Mockaroo - random data generator and api mocking tool. www.mockaroo.com. Visited on 31 January 2024.
- [4] National registration identity card. https://en.wikipedia.org/wiki/National_Registration_Identity_Card. Visited on 31 January 2024.
- [5] Vehicle registration plates of singapore. https://en.wikipedia.org/wiki/Vehicle_registration_plates_of_Singapore. Visited on 31 January 2024.

2. (6 points) Schema

(a) (6 points) Entity-Relationship Diagram

Draw the entity-relationship diagram for the application, including candidate keys and cardinality constraints, in the notations of the lecture.

You should not simply translate the DDL from your previous submission to entity-relationship diagram. Instead, you should have a fresh attempt.

(b) (0 points) Schema Translation

Given your entity-relationship diagram, you are encouraged to translate the diagram into DDL. There is no submission for this. Instead, you are encouraged to compare the DDL from your previous submission with the current DDL.

Submission

- Canvas Submission: “Assignments > Questions 2” (*one file per project group*)

- **Files**

- ER Diagram: `erd.pdf`

Ensure that your entity-relationship diagram can be viewed without zooming. Additional penalties may be imposed on unreadable diagram.

You may add explanation for the diagram but we may not have sufficient time to read all explanation. As such, ensure that you are using only the notation from the lecture.

Note: Ensure the name is correct before submission (i.e., in your computer). Canvas may perform renaming, that is normal and we will accept Canvas renaming scheme.

Note: There is no submission for schema translation but you are encouraged to attempt them and discuss them on Canvas.