

Report:

- In ROUTE relation, Distance Travelled attribute is not functionally dependent on tuple {Src Airport, Dest Airport} as different flights follow different routes, Eg: a flight from New York to Delhi could make a stopover at Dubai or London and hence, the distance covered in these cases would be different and not just dependent source and destination.

- In ROUTE relation, the Time Duration attribute is not functionally dependent on tuple {Scheduled Departure, Scheduled Arrival} as time duration might include take-off delays, in-flight delays, etc.

- In Airport relation, the Time Zone attribute is not functionally dependent on {City+Country}. We found some cities have two airports where both airports might follow a different timeline. Hence, 3-NF is not violated since there is no functional dependency in the first place.

- **PNR Number -> Route ID in Boarding Pass entity**

All the passengers travelling on the same PNR Number have different Boarding Pass IDs but travel on the same Route ID. For the Boarding Pass entity, the PNR Number is not a superkey, but Route ID is a prime attribute as it is part of the candidate key {Aadhar_card_number+Route ID}. Note that this is a violation of BCNF, but it does not violate 3NF.

- We are eliminating attributes like 'is_senior_citizen' and 'age' as they are derived from the attribute 'Date of Birth.' We have also removed the derived attribute 'direct/stopover' as this can be inferred from the cardinality of the result of the join of relations 'Route' and 'Stopover Airports of the Route.' We have read that the derived attributes can be included while defining 'views' for the database.

- We had used Ticket No. as ID for Passenger, whereas we had used the Aadhar_card_number as ID for Airport and Airline employees. For improved consistency, we have changed the ID mode of PASSENGER from Ticket No. to Aadhar_card_number.

Relational and 1NF both are Same

2NF changes

- **Addition of relation 'PNR Info Deduction'**

In 1-NF form, the Boarding Pass relation contains a functional dependency as follows : {PNR Number} -> {Scheduled Boarding Time, Class of Travel, Terminal Number} . Here, {PNR Number} is a subset of the candidate key {PNR Number+Seat} and 'Scheduled Boarding Time, Class of Travel, Terminal number'- all 3 are non-prime attributes. Hence, we add a separate relation 'PNR Info Deduction' to take care of this.

3NF changes

❖ (Aadhar_card_number of passenger -> {First Name,Minit,Last Name}) in 'Boarding Pass' relation

Comments: For the Boarding Pass entity, the Aadhar_card_number is not a superkey, and also, First Name, Minit, Last Name are non-prime attributes. So, we removed First Name, Minit, LastName from the Boarding Pass relation. But we didn't need to add a new table as the Passenger entity already has <Aadhar_card_number, First Name, Minit, Last Name> as a sub-tuple.

❖ (Barcode No. -> Baggage ID) in Luggage relation

Comments: Each baggage is associated with a Barcode No. and a Baggage ID. Here, there is a functional dependency of Barcode No. -> PNR Number. Here, Barcode No. is not a superkey, and also, PNR Number is a non-prime attribute. So, we have removed PNR Number from the Luggage relation. But we didn't need to add a new table as the Boarding Pass relation already has <Barcode No., PNR Number> as a sub-tuple.

❖ {Manufacturer+Plane_model}->'Capacity of Aircraft' in 'Aircraft' relation

Comments: We added this as {Manufacturer+Plane_Model} is not a superkey, and Capacity is also a non-prime attribute, so this was a valid 3NF violation for which we created a new relation 'Capacity of Aircraft.'

dbdiagram.io Links:

For Relational Model : <https://dbdiagram.io/d/636f2abfc9abfc61117216ab>

For 1NF : <https://dbdiagram.io/d/636d5534c9abfc611171cb66>

For 2NF : <https://dbdiagram.io/d/636e25aec9abfc611171efeb>

For 3NF : <https://dbdiagram.io/d/636e7e37c9abfc61117204b2>

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Relational Model and 1NF are same. So, Attaching snapshot of 1NF





