

AIRPORT PROJECT CONCEPTS

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1. After mapping ER to relational model

- a. Mapping of Regular Entity types:
For each strong Entity type E, a relation R is created which includes all the attributes of the entity type E. One or more attributes are chosen as the primary key of the relation R.
We have created a relation for each of the entity type.
- b. Mapping of Weak Entity types:
For each weak Entity type E, a relation R is created which includes all the attributes of the entity type E. Now add a foreign key attribute in R which references to the primary key attribute of the owner entity type, which is described by the identifying relationship of E.
We add Airport_code for ATC and Employee_number for DEPENDENTS.
- c. Mapping of 1:1 binary relationship types:
Choose any relation, say S, and add a foreign key attribute in S which references to the primary key attribute of other participating entity type.
We have added a foreign key Ticket_number in the relation PASSENGER.
- d. Mapping of 1:N binary relationship types:
Choose the relation, say S, which represents the participating entity type at the N-side of the relationship type. Add a foreign key attribute in S which references to the primary key attribute of the other participating entity type.
We have added Airport_code in EMPLOYEE, Head_PN (Passport_number of head of the family/friends) in PASSENGER.
- e. Mapping of M:N binary relationship types:
Create a new relation R for each of the M:N relationship types and include the primary keys of both the participating entity types as the foreign key attributes of R.
We have added a new relation CONTAINS which has Airport_code and Airline_ID as its attributes.
- f. Mapping of N-ary relationship types:
For each n-ary relationship type R, create a new relationship relation S to represent R.
Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
We have created a new relation JOURNEY which includes the primary key attributes of all the participating entity types.

AIRPORT

Name	<u>Airport_code</u>	Type	Country
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EMPLOYEE

<u>Airport_code</u>	<u>Employee_number</u>	Name	Date_of_birth	Phone_number	Designation	Salary
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AIRLINE

<u>Airline_ID</u>	Name	Owner
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CONTAINS

<u>Airport_code</u>	<u>Airline_ID</u>
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FLIGHT

<u>Flight_number</u>	Source	Destination	Status	Arrival	Departure	Occupancy_rate
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CREW MEMBER

Name	<u>Member_ID</u>	Designation	Flight_number
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TICKET

<u>Ticket_number</u>	Flight_number	Price	Seat_number	Class
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PASSENGER

<u>Passport_number</u>	Name	Address	Date_of_birth	Gender	Phone_number	Ticket_number	Head_PN
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JOURNEY

<u>Airline_ID</u>	<u>Flight_number</u>	<u>Member_ID</u>	<u>Passport_number</u>	Duration
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ATC

<u>Airport_code</u>	Number_of_members	Airport_name
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DEPENDENTS

<u>Employee_number</u>	Name	Date_of_birth	Gender	Relationship
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2. Relational model after conversion to 1NF

In order to remove multivalued attributes of the relation R, we create a new relation S and include primary key attribute of R and multivalued attribute of R as the primary key attributes of S. Also, remove the multivalued attribute from the relation R.

In order to remove composite attributes of the relation R, we create a new relation S and include primary key attribute of R and add some attributes (which describe the composite attribute of R) to S. Also, remove the composite attribute from the relation R.

We have split PASSENGER into PASSENGER_1, PASSENGER_2 and PASSENGER_3. Where PASSENGER_2 handles multivalued attribute Phone_number and PASSENGER_3 handles composite attribute Address. We have added attributes Area, City, Country and Pin_code in relation PASSENGER_3 to describe the address of a passenger.

AIRPORT

Name	<u>Airport_code</u>	Type	Country
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EMPLOYEE

<u>Employee_number</u>	<u>Airport_code</u>	Name	Date_of_birth	Phone_number	Designation	Salary
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AIRLINE

<u>Airline_ID</u>	Name	Owner
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CONTAINS

<u>Airport_code</u>	<u>Airline_ID</u>
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FLIGHT

<u>Flight_number</u>	Source	Destination	Status	Arrival	Departure	Occupancy_rate
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CREW MEMBER

Name	<u>Member_ID</u>	Designation	Flight_number
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TICKET

<u>Ticket_number</u>	Flight_number	Price	Seat_number	Class
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PASSENGER_1

<u>Passport_number</u>	Name	Date_of_birth	Gender	Head_PN	Ticket_number
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PASSENGER_2

<u>Passport_number</u>	<u>Phone_number</u>
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PASSENGER_3

<u>Passport_number</u>	Area	City	Country	Pin_code
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JOURNEY

<u>Airline_ID</u>	<u>Flight_number</u>	<u>Member_ID</u>	<u>Passport_number</u>	Duration
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ATC

<u>Airport_code</u>	Number_of_members	Airport_name
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DEPENDENTS

<u>Employee_number</u>	Name	Date_of_birth	Gender	Relationship
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3. Relational model after conversion to 2NF

Every non-prime attribute should be fully functionally dependent on a primary key or a set of primary key attributes.

In order to follow 2NF, we have split EMPLOYEE into EMPLOYEE_1 and EMPLOYEE_2. EMPLOYEE_1 has Airport_code as its primary key and other attributes Designation and Salary are fully functionally dependent on it.

EMPLOYEE_2 has Employee_Number as its primary key and attributes Name, Date_of_birth and Phone_number are fully functionally dependent on it.

AIRPORT

Name	<u>Airport_code</u>	Type	Country
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EMPLOYEE_1

<u>Airport_code</u>	Designation	Salary
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EMPLOYEE_2

<u>Employee_number</u>	Name	Date_of_birth	Phone_number
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AIRLINE

<u>Airline_ID</u>	Name	Owner
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CONTAINS

<u>Airport_code</u>	<u>Airline_ID</u>
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FLIGHT

<u>Flight_number</u>	Source	Destination	Status	Arrival	Departure	Occupancy_rate
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CREW MEMBER

Name	<u>Member_ID</u>	Designation	Flight_number
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TICKET

<u>Ticket_number</u>	Flight_number	Price	Seat_number	Class
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PASSENGER_1

<u>Passport_number</u>	Name	Date_of_birth	Gender	Head_PN	Ticket_number
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PASSENGER_2

<u>Passport_number</u>	<u>Phone_number</u>
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PASSENGER_3

<u>Passport_number</u>	Area	City	Country	Pin_code
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JOURNEY

<u>Airline_ID</u>	<u>Flight_number</u>	<u>Member_ID</u>	<u>Passport_number</u>	Duration
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ATC

<u>Airport_code</u>	Number_of_members	Airport_name
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DEPENDENTS

<u>Employee_number</u>	Name	Date_of_birth	Gender	Relationship
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4. Relational model after conversion to 3NF

There should not be any transitive dependency in the relations.

In the relation TICKET, we can see that Ticket_number, Class are fully functionally dependent on Ticket_number & Price is fully functionally dependent on Ticket_number, Class.

So, Price is transitively dependent on the primary key Ticket_number.

In order to convert to 3NF, we split the relation TICKET into Ticket_1 and TICKET_2.

TICKET_1 contains Flight_number, Class as primary keys and Price as the attribute.

TICKET_2 contains Ticket_number as the primary key and Flight_number, Seat_number and Class as the other attributes.

AIRPORT

Name	<u>Airport_code</u>	Type	Country
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EMPLOYEE_1

<u>Airport_code</u>	Designation	Salary
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EMPLOYEE_2

<u>Employee_number</u>	Name	Date_of_birth	Phone_number
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AIRLINE

<u>Airline_ID</u>	Name	Owner
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CONTAINS

<u>Airport_code</u>	<u>Airline_ID</u>
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FLIGHT

<u>Flight_number</u>	Source	Destination	Status	Arrival	Departure	Occupancy_rate
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CREW MEMBER

Name	<u>Member_ID</u>	Designation	Flight_number
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TICKET_1

<u>Flight_number</u>	<u>Class</u>	Price
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TICKET_2

<u>Ticket_number</u>	Flight_number	Seat_number	Class
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PASSENGER_1

<u>Passport_number</u>	Name	Date_of_birth	Gender	Head_PN	Ticket_number
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PASSENGER_2

<u>Passport_number</u>	<u>Phone_number</u>
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PASSENGER_3

<u>Passport_number</u>	Area	City	Country	Pin_code
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JOURNEY

<u>Airline_ID</u>	<u>Flight_number</u>	<u>Member_ID</u>	<u>Passport_number</u>	Duration
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ATC

<u>Airport_code</u>	Number_of_members	Airport_name
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DEPENDENTS

<u>Employee_number</u>	Name	Date_of_birth	Gender	Relationship
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