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GROUP PROJECT - Requirements Document (PHASE - 1)

1. Introduction to mini-world

For the purposes of this project, the universe of discourse is an airport that records information about passengers, flight crew, airplanes, and their journeys. In this case, we record the data related solely to 'Departures'. The data can be stored, manipulated, retrieved and made use of by the Airport Administration of an airport.

2. Database Requirements

The database has 7 entities and a superclass entity with 2 subclasses. There are 6 relationships between these entities that define the interactions between them.

3. Entities

- **Strong Entities**

- Airline
 - Identifies the airline company that each airline belongs to.
 - Has the attributes airline code and airline name.
 - Both airline code and airline name can uniquely identify the airline.
 - For the purposes of this database, the key attribute chosen is the airline code.
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- Airplane
 - Identifies each individual airplane that arrives at or departs from the airport.
 - Has the attributes Registration Number (a composite attribute composed of the airline code and vehicle id), Model, Date of Manufacture, and Age (derived from Date of Manufacture).
 - The Registration Number is used as a composite key attribute.

- Passenger
 - Identifies every passenger traveling on any of the airplanes in the airport. Even if the same person visits the same airport more than once, they are treated as a different passenger owing to differences in flight details.
 - Passenger has the attributes Name (composed of the Title, First Name and Last Name), PNR (Passenger Name Record) Number, Phone Number (multi-valued), Nationality (multi-valued), and Date of Birth.
 - PNR number is used as the key attribute for this entity.
- Airport
 - The entity Airport stores information about all the airports between which airplanes travel to and from the airport we are considering.
 - It has the attributes Airport Name, Airport Code, City, and Country.
 - The Airport code is used as the key attribute for this database.
- Journey
 - The entity Journey records the details of journeys made by each plane in a day.
 - It has the attributes Journey ID, Departure Time, Arrival Time and Duration (Derived from Departure Time and Arrival Time).
 - The Journey ID is used as the key attribute for this entity.
- Crew
 - The Crew Entity is a superclass that identifies the teams that facilitate the plane journey.
 - It has the attributes Crew ID, Number of Members and Years of Experience.
 - Crew ID is used as the key attribute to identify each crew.
 - Crew has the subclasses flight attendant crew and cockpit crew.
 - Flight Attendant Crew has the further attributes Head Flight Attendant Name, Assistant Flight Attendant, Head Server, Safety In-charge and Assistant Safety In-Charge
 - Cockpit Crew has the further attributes Pilot Name and Co-Pilot Name.

● Weak Entities

- Terminal

- This entity records the terminal from which the flight started using the attribute Terminal Number. The Terminal Number acts as a partial key, which when coupled with the primary key of the Airport, acts as an identifying attribute for the terminal.
- Luggage
 - This entity denotes the details of the luggage belonging to a particular passenger.
 - It has 'Weight' as an attribute which stores the weight (in kgs) of each piece of luggage belonging to an entity from the passenger entity set.

4. Relationships

- The airline **owns** multiple airplanes, but each airplane can belong to just one airline.
- A passenger **books** a Journey that has a flight attendant crew and a cockpit crew. Here, passenger, journey, attendant crew and cockpit crew are related by the quaternary relationship **books**. Each passenger can book exactly one journey, with exactly one flight attendant crew and exactly one cockpit crew. However, each tuple of journey, cockpit crew and flight attendant crew can have multiple passengers.
- Crew is the superclass with flight attendant crew and cockpit crew as its disjoint subclasses.
- Every Journey **takes off from** a terminal. A journey can start only at one terminal however each terminal can facilitate the beginning of multiple journeys.
- Passengers **carry** multiple pieces of luggage which are weak entities and are owned by the passengers (strong entity). Each piece of luggage can belong to just one passenger, but each passenger can have one, none or multiple pieces of luggage as long as the total pieces owned are less than 5..
- Airport **has** multiple terminals that are weak entities and belong to the owner Airport (strong entity). Each terminal can belong to just one airport, but each airport can have multiple terminals. An airport must have at least 2 terminals and a maximum of 150 terminals.
- An airplane **flies on** a journey. A single airplane can fly on multiple journeys, but a single journey can only be flown by a single airplane.

5. Functional Requirements

(a)

- Selection

1. Find all the airplane registration numbers for a given airline.
2. Find the names of all the pilots at the airport being considered.

- **Projection**

1. Find the number of Journeys in a day carrying more than a 100 passengers.
2. Find the number of Passengers in a particular Journey carrying more than 25kg luggage.

- **Aggregate**

1. Find the total number of passengers that booked a given Journey from a given Airport in a day.
2. Find the terminal with the smallest number of journeys starting from it.

- **Search**

1. Search for Passengers by PNR Number.
2. Search for Airplanes by Registration Number.

(b)

- **Analysis**

1. Find the number of airlines with average journey time of a particular day exceeding the average journey time of all journeys in a day.
2. Find the number of passengers who flew on journeys with flight attendant crew with more than 4 years of experience and cockpit crew with more than 6 years of experience.

- **Modification**

1. Given the Journey ID of a Journey, update the Arrival Time or Departure Time as specified. Consequently, the duration must also be changed.
2. Given the Journey ID of a Journey, update the terminal number of the terminal it must take off from.
3. Given the PNR number, delete the corresponding passenger from the passenger entity set.

4. Given airplane details, insert a new airplane into the database.