AIRPORT MANAGEMENT SYSTEM

GROUP NUMBER : 09
TEAM MEMBERS : Amogha A Halhalli   (2021101007)
                Ashutosh Srivastava   (2021101056)
                Harshvardhan   (2021111017)

_____

Introduction

The miniworld selected is of an AIrport.

This database stores all the information regarding the functioning of an Airport.

The design and structure of the database would provide a more efficient data system for reporting and retrieving data regarding the daily functioning of a particular Airport.

Purpose

- To safely store all the information regarding the Flights, Passengers , Crew Staff , Airport Personnels etc.
- To organise all the data regarding the daily flights in a logical manner so as to allow for easy and quick retrieval , as and when required.
- To retrieve information as swiftly as possible ,when required,, using simple queries in the form of Views ; at the same time restricting the access of the information regarding the Database to only the Authorised Users.

Applications

We can use our database for the following :-

- By the Crew Members to check their upcoming Flight.
- By ATC specialists to check for the flight schedules to give the clearances for takeoff and landing ,respectively
- By all the passenger to view their Current flight status and Updated Departure time (in case a flight is delayed)
- To find out the details regarding daily Operational load of an Airport to avoid overloading a ATC tower (i.e. they'll have to build more tower if load goes above a particular threshold or increase the Air Traffic controllers)
- To get the Employee details or Passenger details in case an accident at the Airport happens or Aircraft crash takes place

Entity Types

1. EMPLOYEE
   - a. Employee ID   : (Primary Key)(Composite Attribute)
        - i. Airport code : Not null, Unique, varchar[3]
        - ii. Employee Number : 10 digit integer
   - b. Name   : Not null, varchar[50]
   - c. Date of birth   : Not null, dd:mm:yyyy
   - d. Phone number : Not null, 12 digit integer (Candidate Key)
   - f. Designation   : Not null, varchar[20]
   - f. Salary   : Not null, Integer
   - g. Age (Derived attribute)

2. AIRPORT
   - a. Name   : Not null, varchar[50]
   - b. Airport code : Not null, Unique, varchar[3] (Primary Key)
   - c. Type   : Not null, varchar[20]
   - d. Country   : Not null, varchar[200]

3. AIRLINE
   - a. Airline ID   : Not null, Unique, varchar[50] (Primary Key)
   - b. Name   : Not null, Unique, varchar[50] (candidate key)
   - c. Owner   : Not null, varchar[50]

4. FLIGHT
   - a. Flight number   : Not null, Unique, 8 digit integer (Primary Key)
   - b. Source point   : Not null, varchar[50]
   - c. Destination   : Not null, varchar[50]
   - d. Status   : Not null, varchar[20]
   - e. Arrival details   : Not null, Time and Date
   - f. Departure Details : Not null, Time and Date
   - g. Occupancy rate   : Not null, decimal(2, 2)
   - h. Duration (derived attribute)

5. CREW MEMBER
   - a. Name   : Not null, varchar[50]
   - b. Member ID : Not null, Unique, 8 digit integer (Primary Key)
   - c. Designation : Not null, varchar[20]
   - d. Flight   : Not null, varchar[20]

6. PASSENGER
   - a. Passport Number : Not null, Unique, integer (Primary Key)
   - b. Name   : Not null, varchar[20]
   - c. Address   : Not null, varchar[200] (composite attribute)
   - d. Date of Birth   : Not null, dd:mm:yyyy
   - e. Gender   : Not null , 'M' or 'F' or 'T'
   - f. Phone Number   : Not null, 12 digit integer (Multivalued attribute)
   - g. Age (derived attribute) : Not null, integer less than 100

7. TICKET
   - a. Ticket number   : Not null, Unique, 10 digit integer (Primary Key)
   - b. Flight number   : Not null, varchar[50]
   - c. Price   : Not null, integer

    d. Seat Number   : Not null, integer

    e. Class   : Not null, varchar[50]

8. AIR TRAFFIC CONTROL Tower (ATC) (weak entity)
    a. Number of members : Not null, integer
    b. Airport Name   : Not null, varchar[50]

9. DEPENDENTS (weak entity)
    a. Name   : Not null, varchar[50]
    b. Date of Birth   : Not null, dd:mm:yyyy
    c. Gender   : Not null , 'M' or 'F' or 'T'
    d. Relationship   : Not null, varchar[20]

RELATIONSHIP TYPES

Degree : 2
1. BOOKS
   - Every passenger books a ticket and a ticket is brought by each passenger.
   - Entity Types : PASSENGER, TICKET
   - Cardinality Ratio : 1:1
   - Participation Constraints : Passenger(1, 1); Ticket(1, 1)
2. CANCELS
   - Passengers can cancel a ticket and a ticket is cancelled by each passenger.
   - Entity Types : PASSENGER, TICKET
   - Cardinality Ratio : 1:1
   - Participation Constraints : Passenger (1, 1); Ticket(1, 1)
3. MANAGED_BY (Identifying Relationship)
   - Each airport is managed by one or more ATC's and each ATC belongs to an airport.
   - Entity Types : AIRPORT, AIR TRAFFIC CONTROL
   - Cardinality Ratio : 1:N
   - Participation Constraints : Airport (1, 1); Air Traffic Control (1, N)
4. CONSISTS OF
   - Each airport consists of many employees and employees work in an airport.
   - Entity Types : AIRPORT, EMPLOYEE
   - Cardinality Ratio : 1:N
   - Participation Constraints : Airport (1, 1); Employeesl (1, N)
5. CONTAINS
   - Each airport contains some airlines and each airline has its planes in some airports.
   - Entity Types : AIRPORT, AIRLINE
   - Cardinality Ratio : M:N
   - Participation Constraints : Airport (1, 1); Airline(1, N)
6. ASSISTS
   - ATC tower assists flight with necessary information & flights take help of ATC towers.
   - Entity Types : AIR TRAFFIC CONTROL, FLIGHT
   - Cardinality Ratio : 1:N
   - Participation Constraints : ATC (1, 1); Flight(1, N)
7. TRAVELLING WITH (Recursive Relationship)
   - Each passenger can travel with multiple other flying partners (family/friends)
   - Entity Types : PASSENGER, PASSENGER
   - Cardinality Ratio : 1:N
   - Participation Constraints : Passenger (1, 1); Passenger (0, N)
8. DEPENDENTS_OF (Identifying Relationship)
   - Each employee can be dependent on other members like family or friends.
   - Entity Types : EMPLOYEE, DEPENDENT

- Cardinality Ratio : 1:N
- Participation Constraints : Employee (1, 1); Passenger (0, N)

Degree : 4
1. JOURNEY :
   Entity Types : AIRLINE, CREW MEMBER, PASSENGERS, FLIGHT
   Description : CREW MEMBER belong to AIRLINE (M:N)
               AIRLINE has FLIGHT (M:N)
               FLIGHT carries PASSENGERS (1:N)
               CREW MEMBER serve PASSENGERS (M:N)
               PASSENGERS using AIRLINE (N:1)
               CREW MEMBER travel in FLIGHT (N:1)

Functional Requirements

1. **Retrievals**
   a. Query Functions
      i. Selection
         - View all the Upcoming Flight
         - View all the Passenger details of a particular flight
      ii. Projection:
         - Estimating Inflation in ticket Prices
         - Expected Occupancy (in %) in a flight depending on the season
         - Expected increase in Salary of Employees working in the airport
      iii. Aggregate:
         - Duration of a flight
         - Average Ticket Price over a route
      iv. Search:
         - Crew members of a particular flight.
         - Search for a Employee's and Passenger's details
   b. Analysis:
      - Variation of Ticket prices with varying occupancies (>90%, 50%-90%, <50%) (check)
      - Finding the cheapest flight on a route (Check)

2. **Modifications**
   Insert
           1. Ticket details (on booking by passengers)
           2. Flight details (newly introduced by Airline)
           3. Employee (newly appointed in a airport)

   Delete
           1. Passenger (on cancellation of ticket)
           2. Employee (on retirement)
           3. Flight (on cancellation)

   Update
           1. Flight details (if any changes)
           2. Employee details (if any changes)
           3, Ticket details (if any changes)
           4. Updating the Occupancy Rate (On every ticket booking)

_____