

# **CS561: Advanced Topics In Database Systems Spring-2012**

## **Homework 1**

**Total Points:** 40

**Release Date:** 01/24/2012

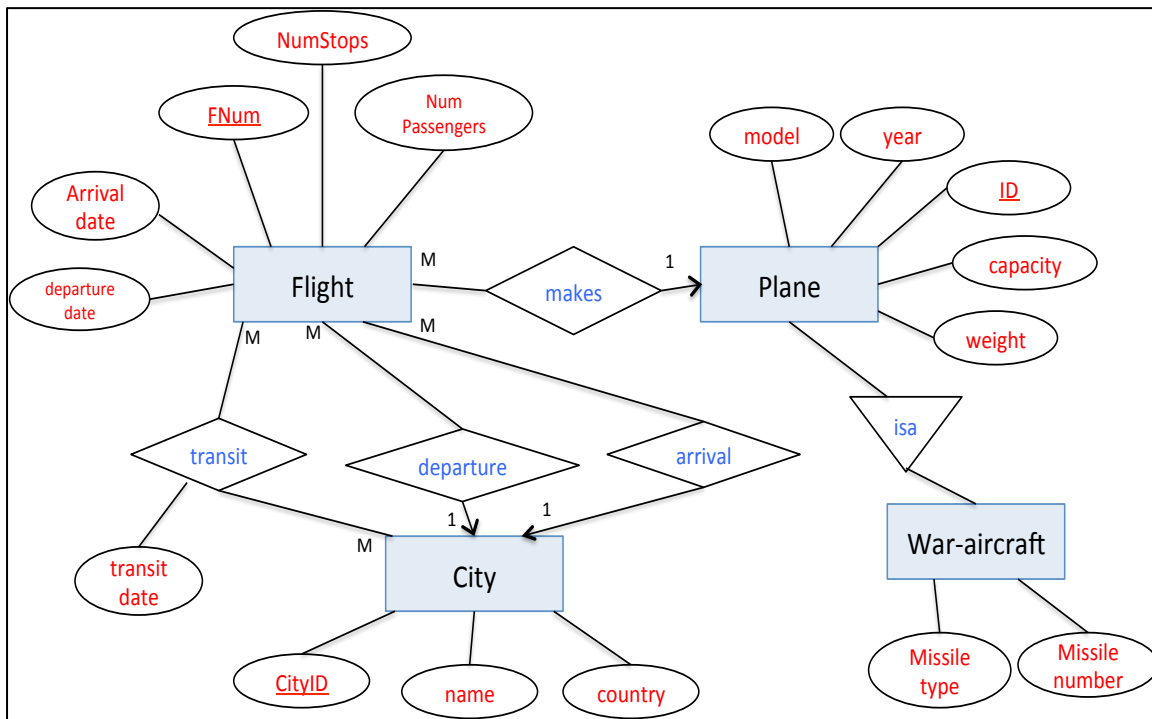
**Due Date:** 01/31/2012 (In class)

**References:** Lectures 2 & 3 Slides + the book chapter available on the course website (and blackboard)

Given the following “Airline” application

- We have two types of planes; passenger planes and war aircrafts. Both types of planes have common properties such as ID (unique identifier), model, capacity, year in which it is built, and weight.
- Each passenger plane can make many flights. Each flight has a departure city, arrival city, and it can make transit in many other cities. Also each flight has the departure date, arrival date, and the transit date and duration in each of the transit cities (assume the ‘date’ captures both the date and exact time).
- Each flight has some properties such as: FlightNum (unique identifier), number of transit stops, number of passengers.
- For each city, we have a CityID (unique identifier), name, and country.
- For war aircrafts, we keep track of the missile type carried on the aircraft and the number of missiles.

One possible ER diagram capturing the above requirements (for relational model) is the following:



In the ER diagram, we have the following:

1. Keys of entity sets are underlined
2. The cardinalities of relationships are indicated using the arrow heads as well as the number notation (1-M: One-to-Many) and (M-M: Many-to-Many)
3. ‘isa’ relationship is the inheritance (subclass) relationship.

### **Question 1 [10 Points]**

Provide an Object-Oriented design that is equivalent to the application above. Use the ODL (Object Definition Language) given in lectures to define the classes and relationships. (Provide appropriate data types of your choice)

### **Question 2 [10 Points]**

Provide an Object-Relational design that is equivalent to the application above. Use the SQL-99 Language given in lectures to define the user-defined types and relationships. Each of the four entity sets should be defined based on user-defined types. (Provide appropriate data types of your choice)

### **Question 3 [20 Points]**

Provide syntax for SQL-99 queries over the object-relational model that you designed in Question 2 to answer the following queries: (You may need to define ordering for certain user-defined types to answer the queries).

- 1- Report flights that have more than 2 transit stops. Order flights based on the transit duration.
- 2- Report the war crafts that have weight more than 200 tons.
- 3- Report the departure, arrival, and transit cities of flight number 'FL230'.
- 4- For each city, report the number of flights departed from that city between Jan-2011 and Jan-2012.

### **Submission Mechanism**

Either submit a hardcopy in the beginning of class on the due date or submit electronically using blackboard system (by 4:00pm on the due date).

### **Late Policy:**

We follow the late policy stated on the course website.