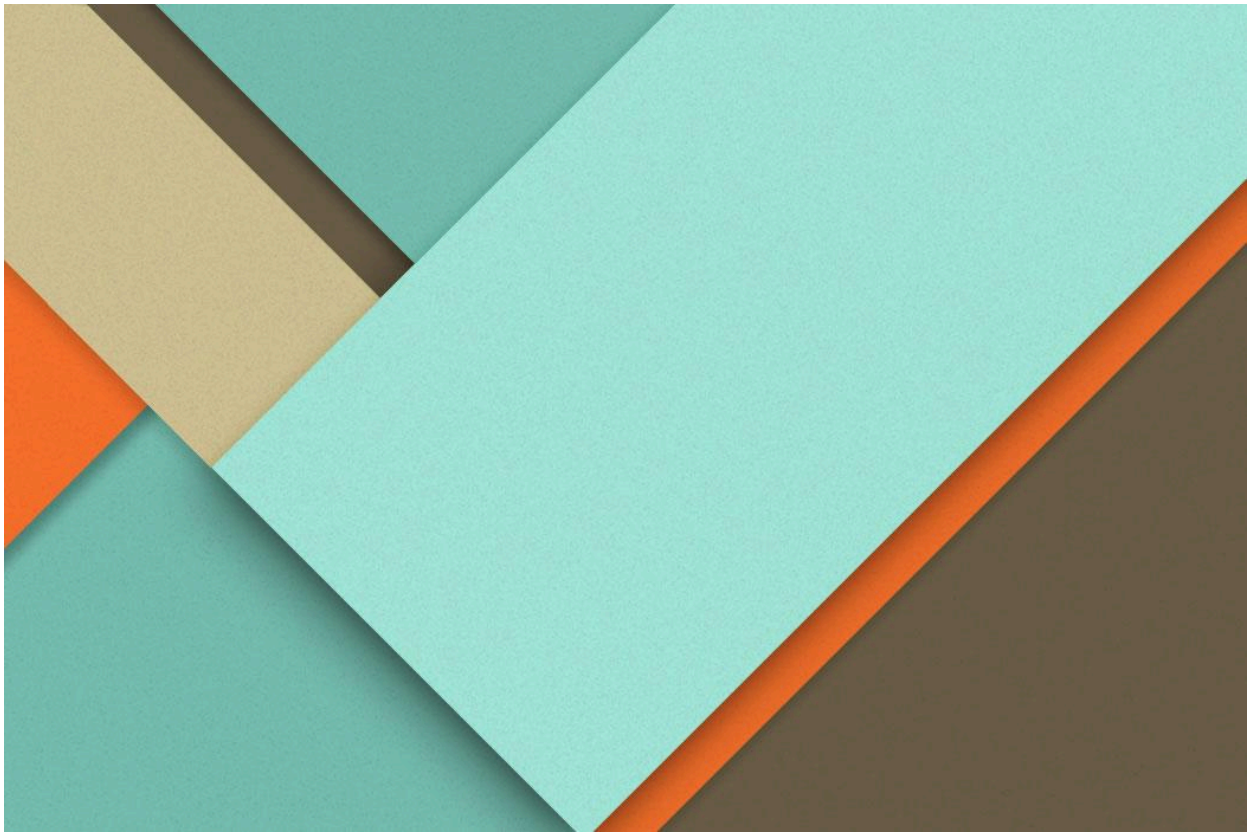

IT314 : Software Engineering

LAB - 04 : Class Diagram

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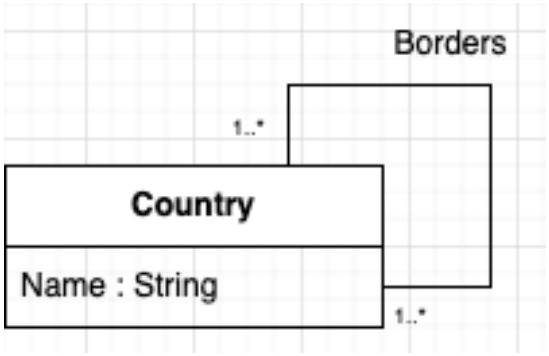
Q1. Prepare a class diagram for the following object diagram that shows a portion of Europe.

Figure-1

Ans :



Classes:

1. **Country**
    - Attributes:
        - `Name: String`

Associations:

- A **Country** is associated with other **Country** instances through a **Borders** relationship.
- The multiplicity on both sides of the association is **1..***, meaning each country must border at least one other country but can border multiple countries.

Q2. Prepare a class diagram for the object diagram given in Figure -2. Explain your multiplicity decisions. What is the smallest number of points required to construct a polygon? Does it make a difference whether or not points may be shared between polygons? Your answer should address the fact that points are ordered.

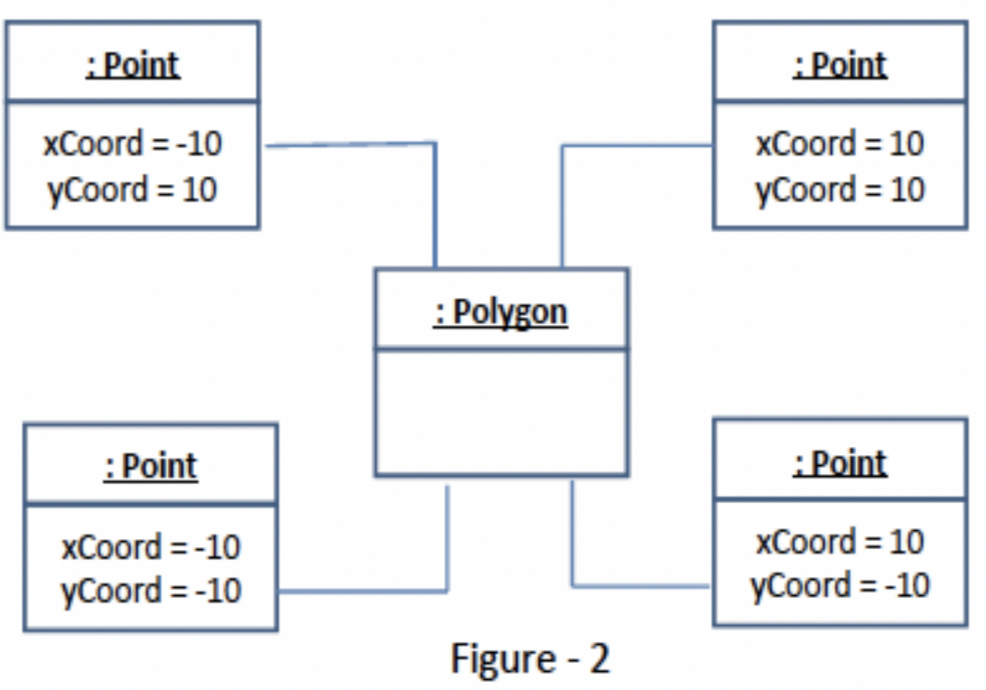


Figure - 2

Ans :

Classes:

1. **Point**
   - Attributes:
     - `X_Coord: Integer`
     - `Y_Coord: Integer`
2. **Polygon**
   - Attributes:
     - No Attributes

Associations:

- A **Polygon** is associated with multiple **Points** in an ordered manner. This reflects the fact that a polygon is formed by a sequence of points connected in order.

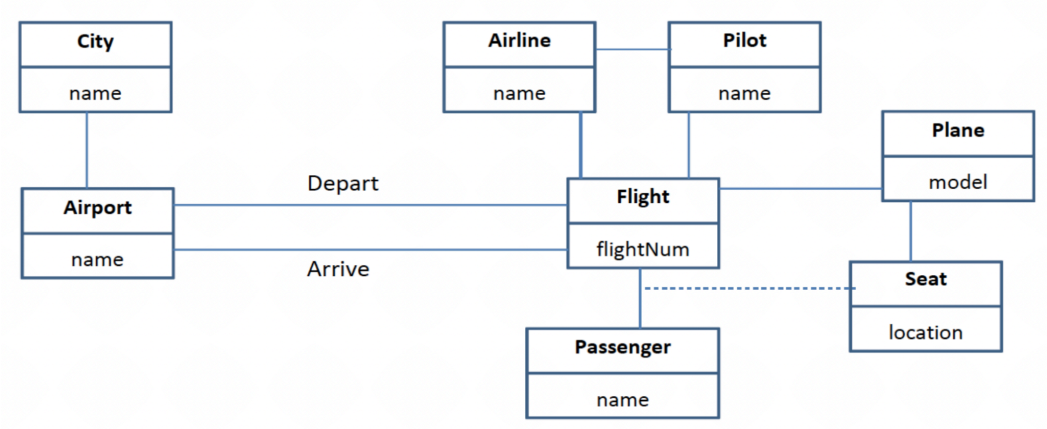
Multiplicity:

1. **From Polygon to Point**:
    - **3..***: A polygon requires at least 3 points to form (since the smallest polygon is a triangle), and a polygon can have more points to represent more complex shapes (e.g., squares, pentagons, etc.).
2. **From Point to Polygon**:
    - **1** or **1..**: The points can either be unique to a single polygon (1) or shared between multiple polygons (1..) depending on whether the points are reused in different polygons.

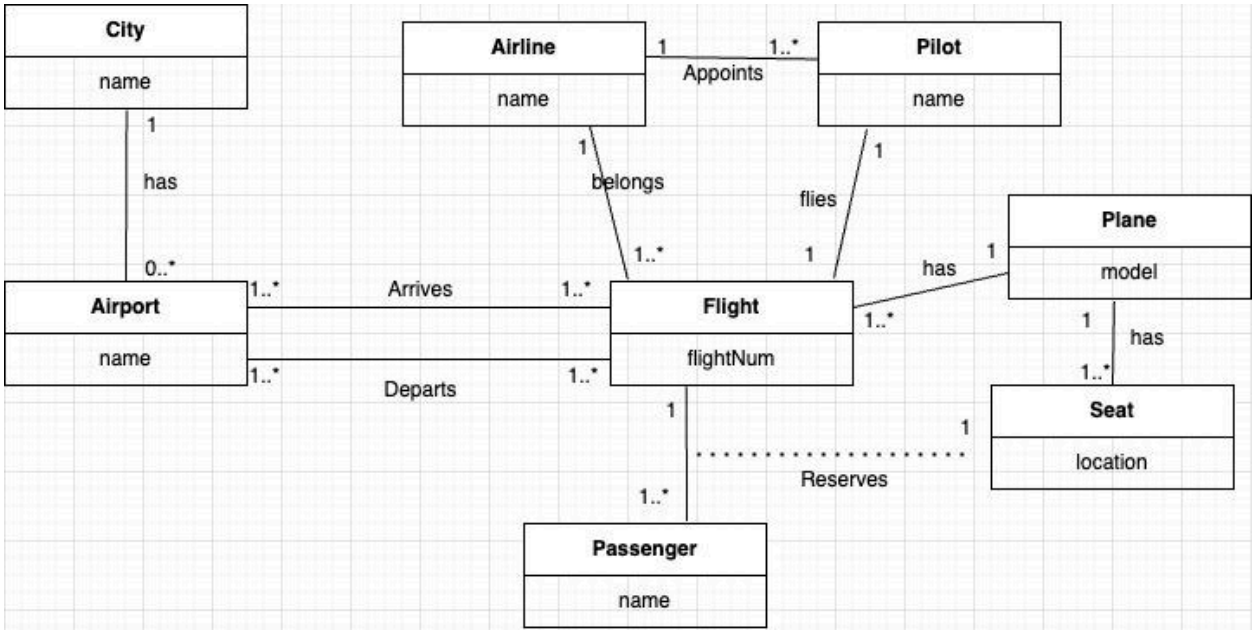
Point Sharing:

- If **points are shared** between polygons, fewer points are needed overall because the same points can be reused across multiple polygons. For example, two polygons could share a side, meaning two points are common between them.
- If **points are not shared**, each polygon will require its own set of distinct points. This would increase the total number of points required to construct multiple polygons.

Q3. Figure 3 is a partially completed class diagram of an air transportation system. Add multiplicities in the diagram. Also add association names to unlevelled associations.

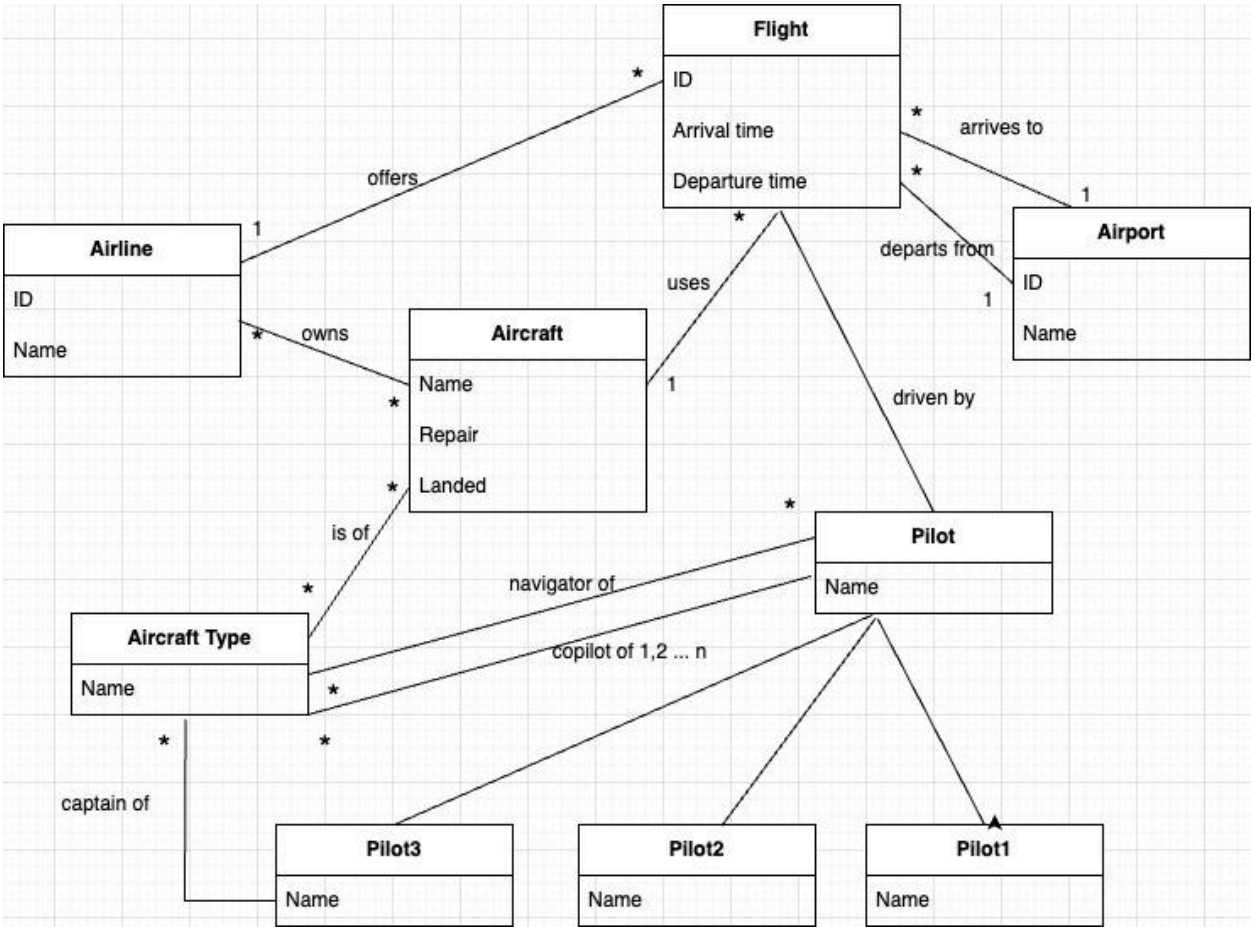


Ans :



Q4. We want to model a system for management of flights and pilots. An airline operates flights. Each airline has an ID. Each flight has an ID a departure airport and an arrival airport: an airport as a unique identifier. Each flight has a pilot and a co-pilot, and it uses an aircraft of a certain type; a flight has also a departure time and an arrival time. An airline owns a set of aircrafts of different types. An aircraft can be in a working state or it can be under repair. In a particular moment an aircraft can be landed or airborne. A company has a set of pilots: each pilot has an experience level: 1 is minimum, 3 is maximum. A type of aeroplane may need a particular number of pilots, with a different role (e.g.: captain, co-pilot, navigator): there must be at least one captain and one co-pilot, and a captain must have a level 3.

Ans :



Thank You