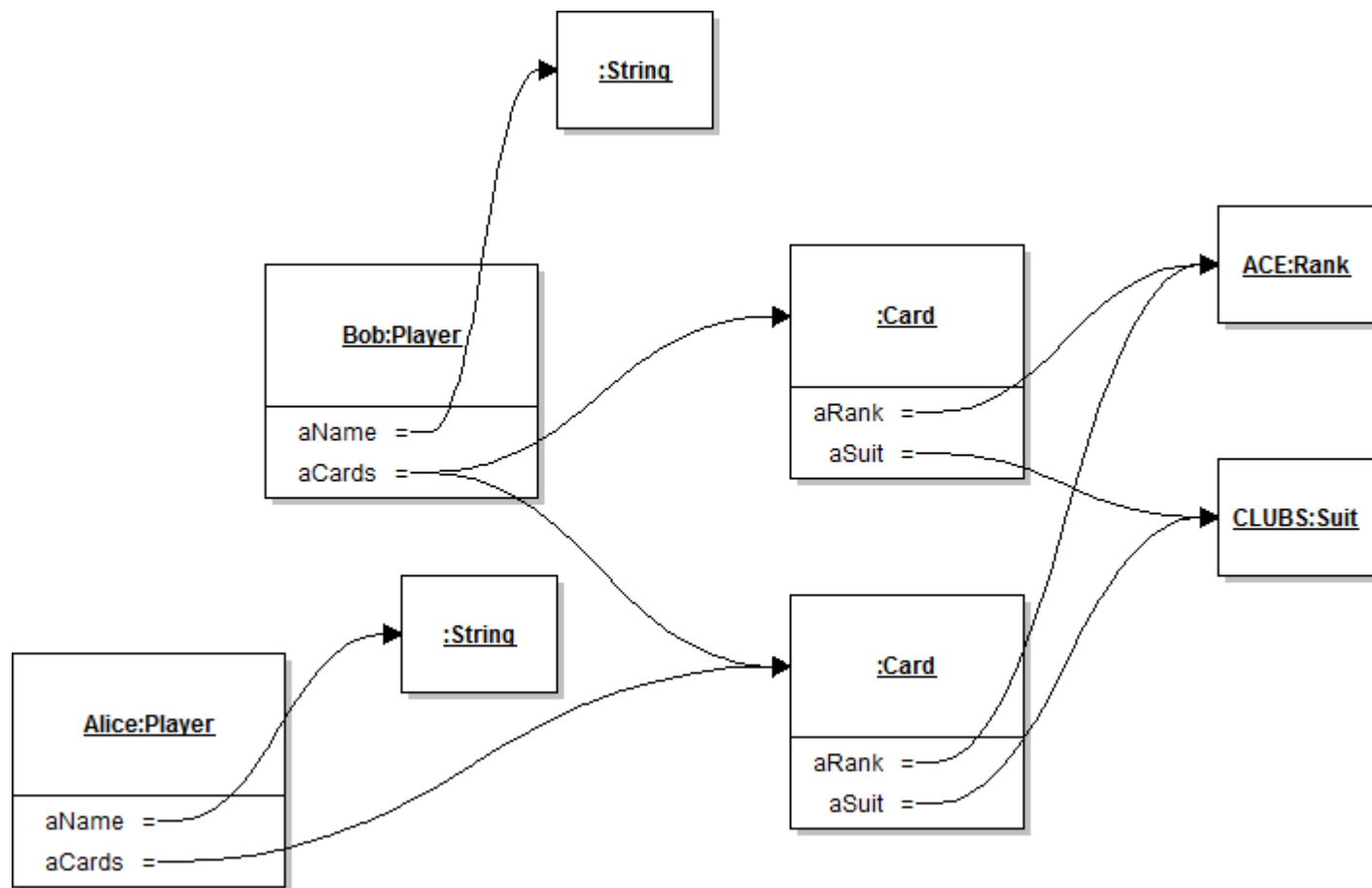


# Today

(BTW some of that stuff is not in the book)

- Object characteristics
- Ensuring object uniqueness:
  - Singleton Pattern
  - Flyweight Pattern
- Equality testing
- Hashing
- Serialization
  - Binary
  - JavaScript Object Notation (JSON) *if time permits*



# Mutability and Uniqueness

		Immutable	
		Yes	No
Unique	Yes	Rank.CLUBS	Class
	No	Card	Player

# Singleton Pattern

- All clients need to access a shared instance of a class.
- You want to ensure that no additional instances can be created accidentally.

GameEngine
- <s> GameEngine INSTANCE
- GameEngine()
+ <s> GameEngine getInstance()

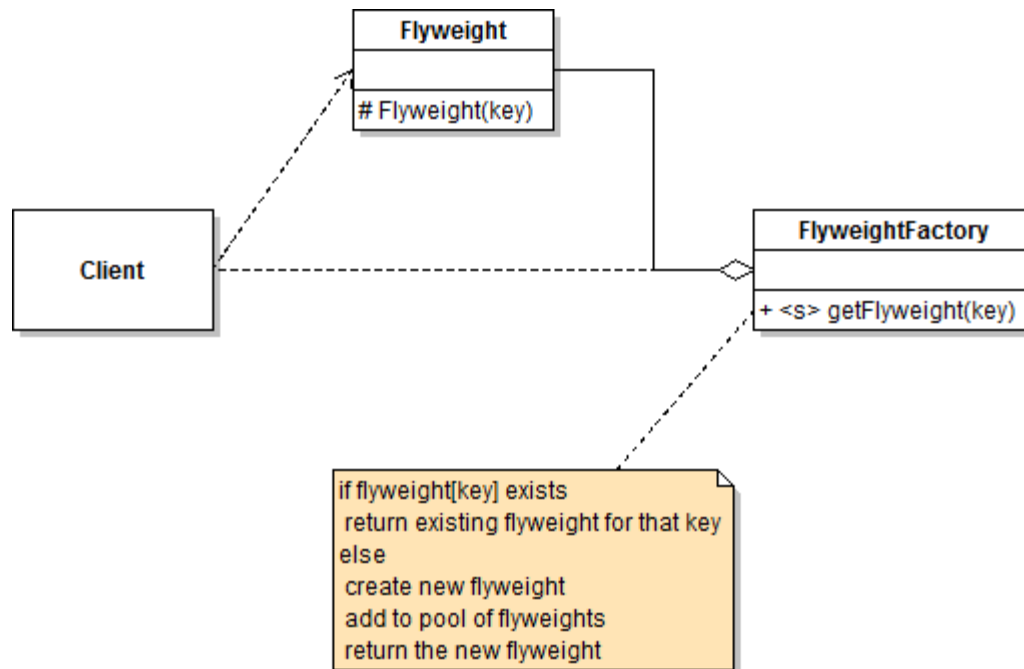
```
/**
 * Captures the state of the game.
 */
public final class GameEngine
{
    private static final GameEngine INSTANCE = new GameEngine();

    private GameEngine(){}

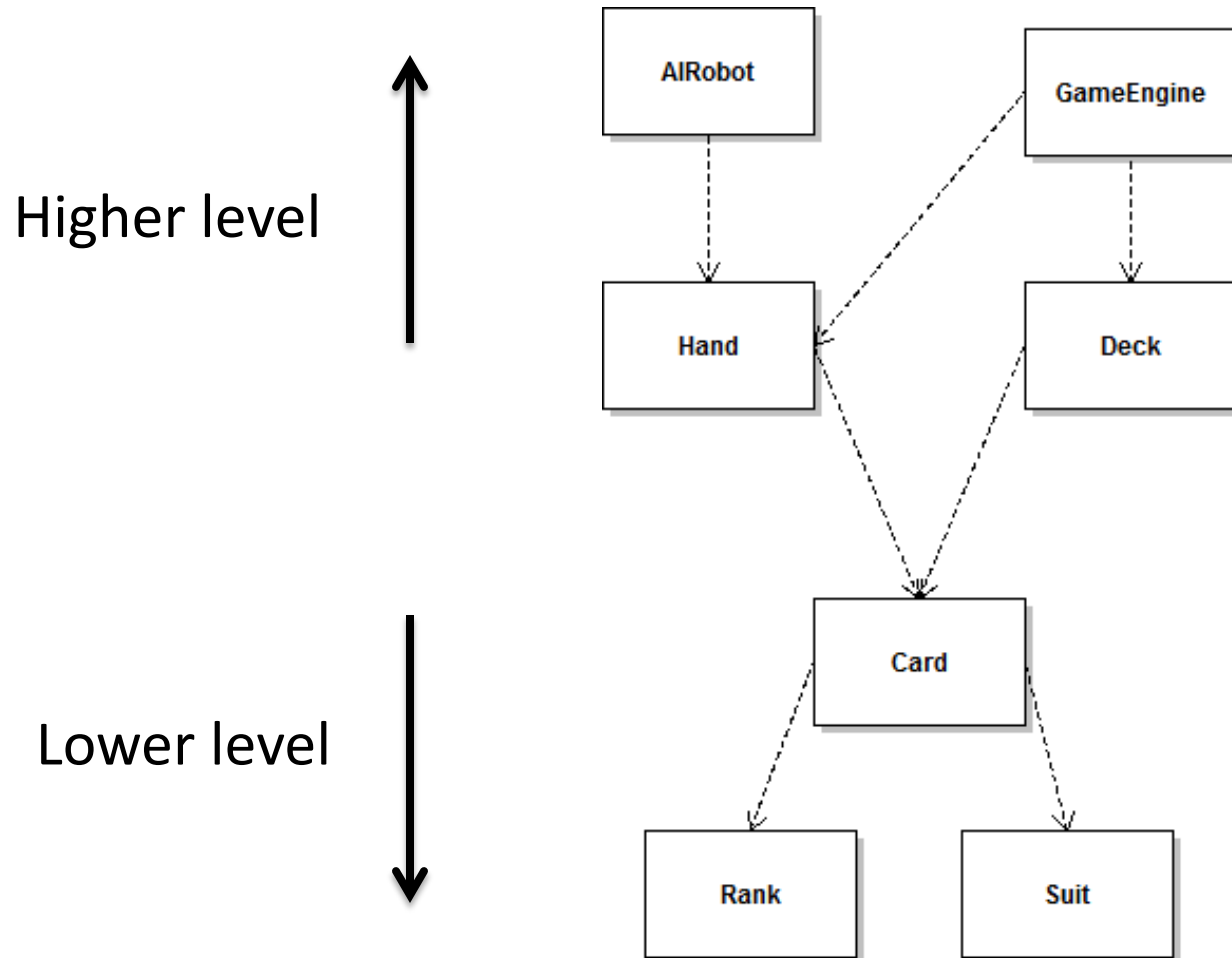
    /**
     * @return The singleton instance of the game engine.
     */
    public static GameEngine getInstance()
    {
        return INSTANCE;
    }
}
```

# Flyweight Pattern

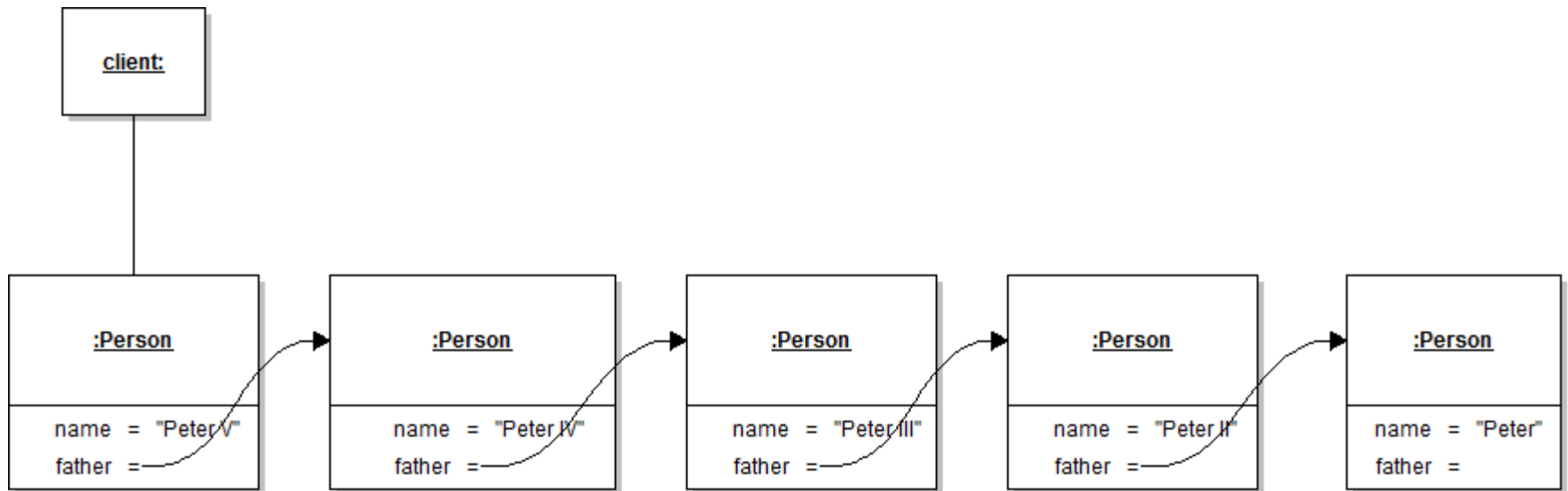
- Use shared objects instead of large numbers of separate objects with identical state.



# A (Good) Dependency Graph

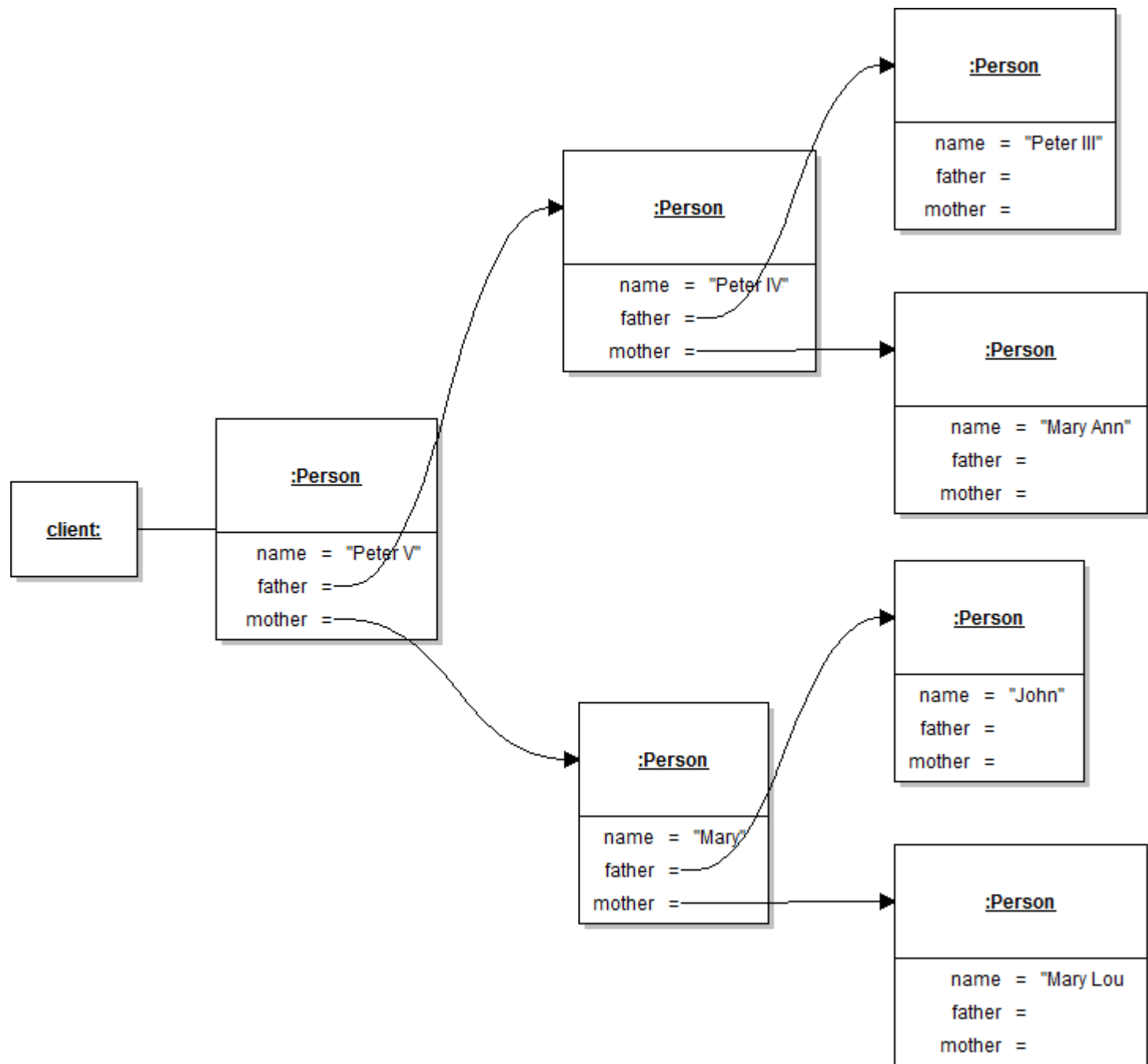


# Meet the Peters



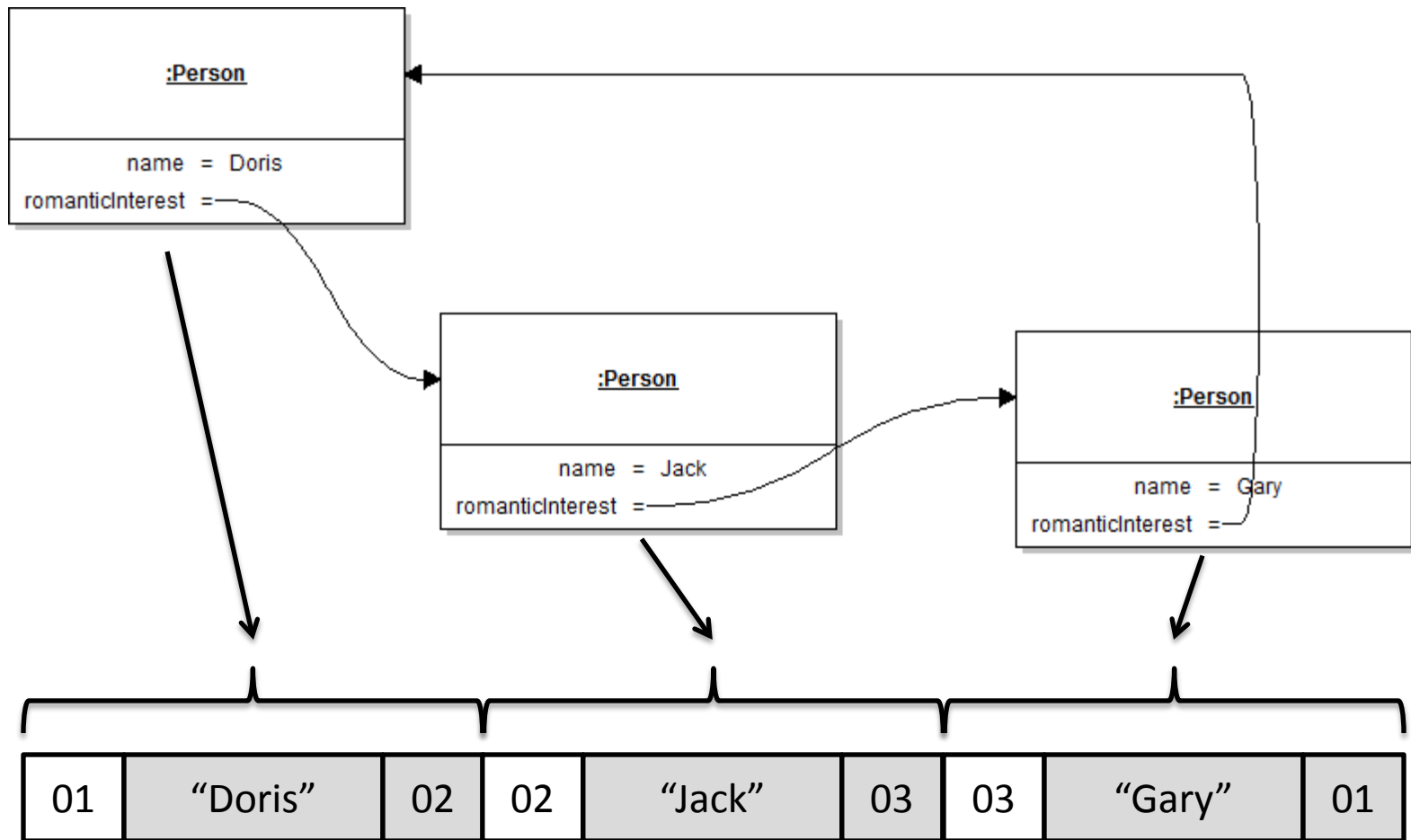
Peters.txt

Peter V  
Peter IV  
Peter III  
Peter II  
Peter





# Binary Serialization



# JSON Serialization

```
[{"aName":"Bob"},  
 {"aName":"Doris",  
  "aRomanticInterest":  
    {"aName":"Jack",  
     "aRomanticInterest":  
       {"aName":"Gary"}  
    }  
  }  
]
```