# Assignment 5: Singleton Design Pattern

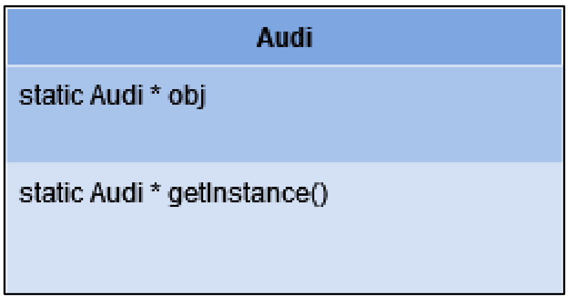
## What is Singleton Design Pattern?

Singleton is a creational design pattern, which ensures that only one object of its kind exists and provides a single point of access to it for any other code.

## Intent

It is a design pattern that lets you ensure that a class has only one instance, while providing a global access point to this instance.

## Structure (Class Diagram)



## Implementation (Code)

### 1) Eager Singleton

```
public class SingleTon {
   public static void main(String[] args) {
      Audi obj1 = Audi.getInstance();
      Audi obj2 = Audi.getInstance();
   }
}

class Audi {
   public static Audi obj = new Audi(); // Creating static object of class Audi
   private Audi(){ } // Creating Constructor
   // Creating Static object to achieve singleton pattern.
   public static Audi getInstance(){
      System.out.println("This is Audi Q3");
      return obj;
   }
}
```

**Output:**

```
This is Audi Q3
This is Audi Q3
```

## 2) Lazy Singleton

```
public class SingleTonLazyDemo {
    public static void main(String[] args) {
        BMW obj1 = BMW.getInstance();
        BMW obj2 = BMW.getInstance();
    }
}

class BMW {
    public static BMW obj = new BMW();
    private BMW(){
        System.out.println("This is BMW I4");
    }
    public static BMW getInstance(){
        if (obj == null){
            obj = new BMW(); // Creating the object here....lazy 😟
        }
        return obj;
    }
}
```

**Output:**

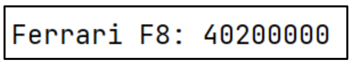
```
This is BMW I4
```

## 3) Double-checked Locking

```
public class SynchronizedGetInstance {
    public static void main(String[] args) {
        Thread t1 = new Thread(new Runnable() {
            public void run() {
                Ferrari obj = Ferrari.getInstance();
            }
        });
        Thread t2 = new Thread(new Runnable() {
            public void run() {
                Ferrari obj = Ferrari.getInstance();
            }
        });
        t1.start();
        t2.start();
    }
}
```

```
class Ferrari {
    public static Ferrari obj;
    private Ferrari(){
        System.out.println("Ferrari F8: 40200000");
    }
    public static Ferrari getInstance(){ // Double checked Locking – removing synchronized
        if (obj == null){
            synchronized (Ferrari.class) { // Putting Synchronized here
                if (obj == null) {
                    obj = new Ferrari();
                }
            }
        }
        return obj;
    }
}
```

**Output:**

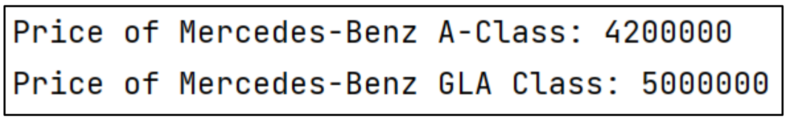


```
Ferrari F8: 40200000
```

## 4) Enum Singleton

```
public class SingleTonLazyDemo {

    public static void main(String[] args) {

        BMW obj1 = BMW.getInstance();

        BMW obj2 = BMW.getInstance();

    }

}

class BMW {

    public static BMW obj = new BMW();

    private BMW(){

        System.out.println("This is BMW I4");

    }

    public static BMW getInstance(){

        if (obj == null){

            obj = new BMW();

        }

        return obj;

    }

}
```

**Output:**



```
Price of Mercedes-Benz A-Class: 4200000
Price of Mercedes-Benz GLA Class: 5000000
```

## Applicability

1. Use the Singleton pattern when a class in your program should have just a single instance available to all clients; for example, a single database object shared by different parts of the program.
2. The Singleton pattern disables all other means of creating objects of a class except for the special creation method. This method either creates a new object or returns an existing one if it has already been created.
3. Use the Singleton pattern when you need stricter control over global variables.