

Exercise 1: Implementing the Singleton Pattern

Scenario:

You need to ensure that a logging utility class in your application has only one instance throughout the application lifecycle to ensure consistent logging.

Steps:

1. Created a New Java Project:

- Project name: SingletonPatternExample

2. Defined the Singleton Class:

- Created a class named Logger
- Made the constructor private
- Used a private static instance variable
- Provided a public static method to return the single instance

Logger.java

```
1  public class Logger {
2      private static Logger loggerInstance;
3
4      private Logger() {
5          System.out.println(x:"Logger initialized...");
6      }
7
8      public static Logger getInstance() {
9          if (loggerInstance == null) {
10             loggerInstance = new Logger();
11          }
12          return loggerInstance;
13     }
14
15     public void log(String message) {
16         System.out.println("[LOG]: " + message);
17     }
18 }
19
```

3. Implemented Singleton Logic:

- Used lazy initialization in getInstance() to create only one instance
- Verified using object references

4. Tested Singleton Implementation:

- Wrote a Main class to test and verify that both variables point to the same Logger instance

Main.java

```
J Main.java x
J Main.java
1 public class Main {
    Run | Debug | Run main | Debug main
2     public static void main(String[] args) {
3         Logger log1 = Logger.getInstance();
4         log1.log(message:"First log message");
5
6         Logger log2 = Logger.getInstance();
7         log2.log(message:"Second log message");
8
9         if (log1 == log2) {
10             System.out.println(x:"Both loggers are the same instance (Singleton Verified)");
11         } else {
12             System.out.println(x:"Different instances (Singleton Failed)");
13         }
14     }
15 }
16
```

Output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\Hp\Desktop\cts assessments\Engineering concepts\design nd patterns\pgm> javac Logger.java Main.java
>>
PS C:\Users\Hp\Desktop\cts assessments\Engineering concepts\design nd patterns\pgm> java Main
Logger initialized...
[LOG]: First log message
[LOG]: Second log message
Both loggers are the same instance (Singleton Verified )
PS C:\Users\Hp\Desktop\cts assessments\Engineering concepts\design nd patterns\pgm> □
```