



链滴

# JAVA 中 atomic 原子类解决线程同步问题

作者: [yhm2](#)

原文链接: <https://ld246.com/article/1577779725804>

来源网站: [链滴](#)

许可协议: [署名-相同方式共享 4.0 国际 \(CC BY-SA 4.0\)](#)

# 第一篇文章

## 优化前

问题描述:

有二十个线程，前十个线程，每个线程分别对共享变量进行加1操作，循环10次  
后十个线程，每个线程对共享变量进行减1操作，循环10次  
每个线程操作后，输出共享变量的值

直接代码:

```
package com.yhm.testSpringMvc.Thread;

import java.util.concurrent.atomic.AtomicInteger;

public class AtomicClassTestBefore {

    private static Integer integer = new Integer(100);

    public static void main(String[] args) {
        for (int i = 0; i < 10; i++) {
            new Thread(new yhmDecrementClass()).start();
            new Thread(new yhmIncrementClass()).start();
        }
    }

    static class yhmIncrementClass implements Runnable {

        @Override
        public void run() {
            for (int i = 0; i < 10; i++) {
                System.out.println(Thread.currentThread().getName() + "," + integer++);
            }
        }
    }

    static class yhmDecrementClass implements Runnable {

        @Override
        public void run() {
            for (int i = 0; i < 10; i++) {
                System.out.println(Thread.currentThread().getName() + "," + integer--);
            }
        }
    }
}
```

## 输出结果:

```
D:\JAVA\jdk8_64\bin\java -agentlib:jdwp=transport=dt_socket,address=127.0.0.1:59643,suspend=y,server=n -Dfile.encoding=UTF-8 -classpath "D:\JAVA\jdk8_64\jre\lib\charsets.jar;D:\JAVA\jdk8_64\jre\lib\deploy.jar;D:\JAVA\jdk8_64\jre\lib\ext\access-bridge-64.jar;D:\JAVA\jdk8_64\jre\lib\ext\clldrdata.jar;D:\JAVA\jdk8_64\jre\lib\ext\dnsns.jar;D:\JAVA\jdk8_64\jre\lib\ext\jaccess.jar;D:\JAVA\jdk8_64\jre\lib\ext\jfxrt.jar;D:\JAVA\jdk8_64\jre\lib\ext\localedata.jar;D:\JAVA\jdk8_64\jre\lib\ext\nashorn.jar;D:\JAVA\jdk8_64\jre\lib\ext\sunec.jar;D:\JAVA\jdk8_64\jre\lib\ext\sunjce_provider.jar;D:\JAVA\jdk8_64\jre\lib\ext\sunmscapi.jar;D:\JAVA\jdk8_64\jre\lib\ext\sunpkc11.jar;D:\JAVA\jdk8_64\jre\lib\ext\zipfs.jar;D:\JAVA\jdk8_64\jre\lib\javaws.jar;D:\JAVA\jdk8_64\jre\lib\jce.jar;D:\JAVA\jdk8_64\jre\lib\jfr.jar;D:\JAVA\jdk8_64\jre\lib\jfxswt.jar;D:\JAVA\jdk8_64\jre\lib\jsse.jar;D:\JAVA\jdk8_64\jre\lib\management-agent.jar;D:\JAVA\jdk8_64\jre\lib\plugin.jar;D:\JAVA\jdk8_64\jre\lib\resources.jar;D:\JAVA\jdk8_64\jre\lib\rt.jar;D:\ideaPros\codeGitee\AM\target\classes;D:\repo\junit\junit\4.12\junit-4.12.jar;D:\repo\org\hamcrest\hamcrest-core\1.3\hamcrest-core-1.3.jar;D:\repo\javax\servlet\servlet-api\2.5\servlet-api-2.5.jar;D:\repo\org\springframework\spring-core\4.2.5.RELEASE\spring-core-4.2.5.RELEASE.jar;D:\repo\commons-logging\commons-logging\1.2\commons-logging-1.2.jar;D:\repo\org\springframework\spring-beans\4.2.5.RELEASE\spring-beans-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-context\4.2.5.RELEASE\spring-context-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-aop\4.2.5.RELEASE\spring-aop-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-expression\4.2.5.RELEASE\spring-expression-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-tx\4.2.5.RELEASE\spring-tx-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-web\4.2.5.RELEASE\spring-web-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-webmvc\4.2.5.RELEASE\spring-webmvc-4.2.5.RELEASE.jar;D:\repo\org\springframework\spring-test\4.2.5.RELEASE\spring-test-4.2.5.RELEASE.jar;D:\repo\org\slf4j\slf4j-log4j12\1.6.6\slf4j-log4j12-1.6.6.jar;D:\repo\org\slf4j\slf4j-api\1.6.6\slf4j-api-1.6.6.jar;D:\repo\log4j\log4j\1.2.17\log4j-1.2.17.jar;D:\repo\cglib\cglib-nodep\3.2.2\cglib-nodep-3.2.2.jar;D:\repo\org\aspectj\aspectjweaver\1.7.4\aspectjweaver-1.7.4.jar;D:\repo\com\alibaba\dubbo\2.5.3\dubbo-2.5.3.jar;D:\repo\org\springframework\spring\2.5.6.SEC03\spring-2.5.6.SEC03.jar;D:\repo\org\javassist\javassist\3.15.0-GA\javassist-3.15.0-GA.jar;D:\repo\org\jboss\netty\netty\3.2.5.Final\netty-3.2.5.Final.jar;D:\chengxu\intelliJIDEA\IntelliJ IDEA 2017.3.5\lib\idea_rt.jar" com.y.m.testSpringMvc.Thread.AtomicClassTestBefore
Connected to the target VM, address: '127.0.0.1:59643', transport: 'socket'
Thread-0,100
Thread-0,99
Thread-0,98
Thread-0,97
Thread-0,96
Thread-0,95
Thread-0,94
Thread-0,93
Thread-0,92
Thread-0,91
Thread-2,91
Thread-2,89
Thread-2,88
Thread-2,87
Thread-4,90
Thread-4,85
Thread-3,90
Thread-3,83
Thread-3,84
Thread-1,90
Thread-3,85
```

Thread-5,84  
Thread-4,84  
Thread-11,89  
Thread-11,89  
Thread-9,90  
Thread-2,85  
Thread-10,92  
Thread-10,90  
Thread-10,89  
Thread-10,88  
Thread-6,86  
Thread-15,86  
Thread-15,86  
Thread-15,87  
Thread-10,87  
Thread-10,89  
Thread-10,87  
Thread-10,86  
Thread-10,85  
Thread-10,85  
Thread-14,91  
Thread-13,91  
Thread-13,83  
Thread-13,84  
Thread-13,85  
Thread-2,92  
Thread-2,87  
Thread-2,86  
Thread-2,85  
Thread-2,84  
Thread-9,91  
Thread-11,90  
Thread-12,91  
Thread-12,85  
Thread-12,84  
Thread-12,83  
Thread-12,82  
Thread-4,90  
Thread-5,88  
Thread-8,89  
Thread-8,80  
Thread-8,79  
Thread-8,78  
Thread-8,77  
Thread-8,76  
Thread-3,88  
Thread-3,74  
Thread-3,75  
Thread-3,76  
Thread-3,77  
Thread-3,78  
Thread-7,87  
Thread-1,86  
Thread-7,79

Thread-7,81  
Thread-7,82  
Thread-7,83  
Thread-7,84  
Thread-7,85  
Thread-7,86  
Thread-7,87  
Thread-7,88  
Thread-8,75  
Thread-8,89  
Thread-5,79  
Thread-4,80  
Thread-12,81  
Thread-12,87  
Thread-12,86  
Thread-12,85  
Thread-12,84  
Thread-11,84  
Thread-9,83  
Thread-13,86  
Thread-14,84  
Thread-19,84  
Thread-18,88  
Thread-18,86  
Thread-18,85  
Thread-18,84  
Thread-18,83  
Thread-18,82  
Thread-18,81  
Thread-18,80  
Thread-18,79  
Thread-18,78  
Thread-17,88  
Thread-17,77  
Thread-17,78  
Thread-15,87  
Thread-15,79  
Thread-16,88  
Thread-6,87  
Thread-6,80  
Thread-16,81  
Thread-15,80  
Thread-15,77  
Thread-15,78  
Thread-15,79  
Thread-15,80  
Thread-17,79  
Thread-19,85  
Thread-14,86  
Thread-13,85  
Thread-9,84  
Thread-11,83  
Thread-11,84  
Thread-11,85

Thread-11,86  
Thread-11,87  
Thread-11,88  
Thread-4,88  
Thread-4,89  
Thread-4,88  
Thread-4,87  
Thread-4,86  
Thread-5,87  
Thread-8,88  
Thread-1,80  
Thread-8,86  
Thread-5,85  
Thread-9,83  
Thread-9,87  
Thread-9,88  
Thread-9,89  
Thread-9,90  
Thread-13,82  
Thread-13,92  
Thread-14,83  
Thread-14,94  
Thread-14,93  
Thread-19,82  
Thread-19,91  
Thread-19,92  
Thread-19,93  
Thread-19,94  
Thread-19,95  
Thread-19,96  
Thread-19,97  
Thread-17,81  
Thread-17,98  
Thread-16,78  
Thread-16,100  
Thread-16,99  
Thread-16,98  
Thread-16,97  
Thread-16,96  
Thread-16,95  
Thread-16,94  
Thread-6,79  
Thread-17,99  
Thread-14,92  
Thread-14,93  
Thread-14,92  
Thread-14,91  
Thread-13,93  
Thread-13,90  
Thread-9,91  
Thread-5,86  
Thread-1,85  
Thread-1,92  
Thread-1,93

```
Thread-1,94
Thread-1,95
Thread-5,91
Thread-17,92
Thread-6,93
Thread-17,98
Thread-17,98
Thread-5,97
Thread-5,99
Thread-5,100
Thread-1,96
Thread-6,99
Thread-6,102
Thread-6,101
Thread-6,100
Thread-6,99
Thread-1,101
Disconnected from the target VM, address: '127.0.0.1:59643', transport: 'socket'
```

Process finished with exit code 0

从结果可以看到，最后输出的结果并非100（共享变量初始值100）

原因分析：

JAVA中每个线程对共享变量的操作并非同步进行，为了提升线程的运行速度，对每个线程都有单独内存分配，即共享变量只有一个，但是每个线程复制了一份到自己的内存区域内。A线程对共享变量操作，实际上是对自己单独内存区域内变量的操作，操作完成后并不会马上改变共享变量的值，可以各自在干着自己线程的事情。

解决办法：需要线程同步，每个线程对共享变量的操作应该马上生效！

## 优化后

```
package com.yhm.testSpringMvc.Thread;

import java.util.concurrent.atomic.AtomicInteger;

public class AtomicClassTest {

    private static AtomicInteger atomicInteger = new AtomicInteger(100);

    public static void main(String[] args) {
        for (int i = 0; i < 10; i++) {
            new Thread(new yhmDecrementClass()).start();
            new Thread(new yhmIncrementClass()).start();
        }
    }

    static class yhmIncrementClass implements Runnable {
```





epo\org\javassist\javassist\3.15.0-GA\javassist-3.15.0-GA.jar;D:\repo\org\jboss\netty\netty\3.2.5.Final\netty-3.2.5.Final.jar;D:\chengxu\intelliJIDEA\IntelliJ IDEA 2017.3.5\lib\idea\_rt.jar" com.y  
m.testSpringMvc.Thread.AtomicClassTest

Connected to the target VM, address: '127.0.0.1:60088', transport: 'socket'

Thread-0,101  
Thread-0,102  
Thread-0,103  
Thread-0,104  
Thread-0,105  
Thread-0,106  
Thread-0,107  
Thread-0,108  
Thread-0,109  
Thread-0,110  
Thread-1,109  
Thread-2,110  
Thread-3,108  
Thread-3,108  
Thread-3,108  
Thread-1,109  
Thread-6,107  
Thread-3,106  
Thread-5,107  
Thread-4,109  
Thread-4,105  
Thread-4,107  
Thread-4,108  
Thread-4,108  
Thread-4,109  
Thread-4,111  
Thread-2,109  
Thread-11,111  
Thread-11,111  
Thread-11,111  
Thread-11,110  
Thread-11,109  
Thread-2,112  
Thread-2,109  
Thread-4,112  
Thread-4,110  
Thread-10,110  
Thread-9,107  
Thread-9,111  
Thread-9,110  
Thread-9,110  
Thread-9,108  
Thread-9,107  
Thread-9,106  
Thread-9,105  
Thread-9,104  
Thread-9,103  
Thread-8,106  
Thread-8,104  
Thread-8,105

Thread-8,106  
Thread-8,107  
Thread-8,108  
Thread-8,109  
Thread-8,110  
Thread-8,111  
Thread-8,112  
Thread-5,104  
Thread-3,105  
Thread-7,106  
Thread-6,107  
Thread-6,110  
Thread-6,111  
Thread-1,106  
Thread-6,112  
Thread-7,109  
Thread-3,110  
Thread-3,110  
Thread-5,111  
Thread-19,109  
Thread-18,111  
Thread-17,112  
Thread-17,107  
Thread-17,106  
Thread-10,113  
Thread-16,112  
Thread-16,107  
Thread-16,108  
Thread-16,109  
Thread-16,110  
Thread-16,111  
Thread-16,112  
Thread-16,113  
Thread-16,114  
Thread-16,115  
Thread-4,111  
Thread-2,109  
Thread-2,116  
Thread-15,108  
Thread-14,108  
Thread-11,107  
Thread-11,116  
Thread-13,108  
Thread-12,112  
Thread-12,115  
Thread-12,116  
Thread-12,117  
Thread-12,118  
Thread-12,119  
Thread-12,120  
Thread-12,121  
Thread-12,122  
Thread-12,123  
Thread-13,114

Thread-13,122  
Thread-13,121  
Thread-13,120  
Thread-13,119  
Thread-13,118  
Thread-11,115  
Thread-14,117  
Thread-15,116  
Thread-2,117  
Thread-2,117  
Thread-10,106  
Thread-17,105  
Thread-18,108  
Thread-18,119  
Thread-18,120  
Thread-18,121  
Thread-18,122  
Thread-18,123  
Thread-18,124  
Thread-18,125  
Thread-19,107  
Thread-5,108  
Thread-5,124  
Thread-5,123  
Thread-5,122  
Thread-5,121  
Thread-5,120  
Thread-5,119  
Thread-3,109  
Thread-3,118  
Thread-7,111  
Thread-6,112  
Thread-6,117  
Thread-6,118  
Thread-6,119  
Thread-6,120  
Thread-1,111  
Thread-7,116  
Thread-3,117  
Thread-19,125  
Thread-19,117  
Thread-19,116  
Thread-19,115  
Thread-19,114  
Thread-19,113  
Thread-19,112  
Thread-19,111  
Thread-18,126  
Thread-17,118  
Thread-17,110  
Thread-17,109  
Thread-2,119  
Thread-10,118  
Thread-10,110

```
Thread-10,111
Thread-10,112
Thread-10,113
Thread-10,114
Thread-15,116
Thread-15,114
Thread-15,113
Thread-15,112
Thread-15,111
Thread-15,110
Thread-15,109
Thread-15,108
Thread-14,117
Thread-11,116
Thread-13,117
Thread-11,108
Thread-14,109
Thread-10,115
Thread-2,109
Thread-17,108
Thread-7,118
Thread-7,106
Thread-7,105
Thread-1,119
Thread-7,104
Thread-17,107
Thread-14,108
Thread-13,107
Thread-14,102
Thread-17,101
Thread-7,102
Thread-7,101
Thread-1,103
Thread-14,102
Thread-13,101
Thread-14,101
Thread-14,102
Thread-14,103
Thread-1,100
Thread-1,102
Thread-1,101
Thread-1,100
Disconnected from the target VM, address: '127.0.0.1:60088', transport: 'socket'
```

Process finished with exit code 0

可以看到，最后一个线程的最后一次操作，得到的值是100，即所有线程的操作是对同一个变量进行。每个线程对变量的改变，对于其他线程都是生效的