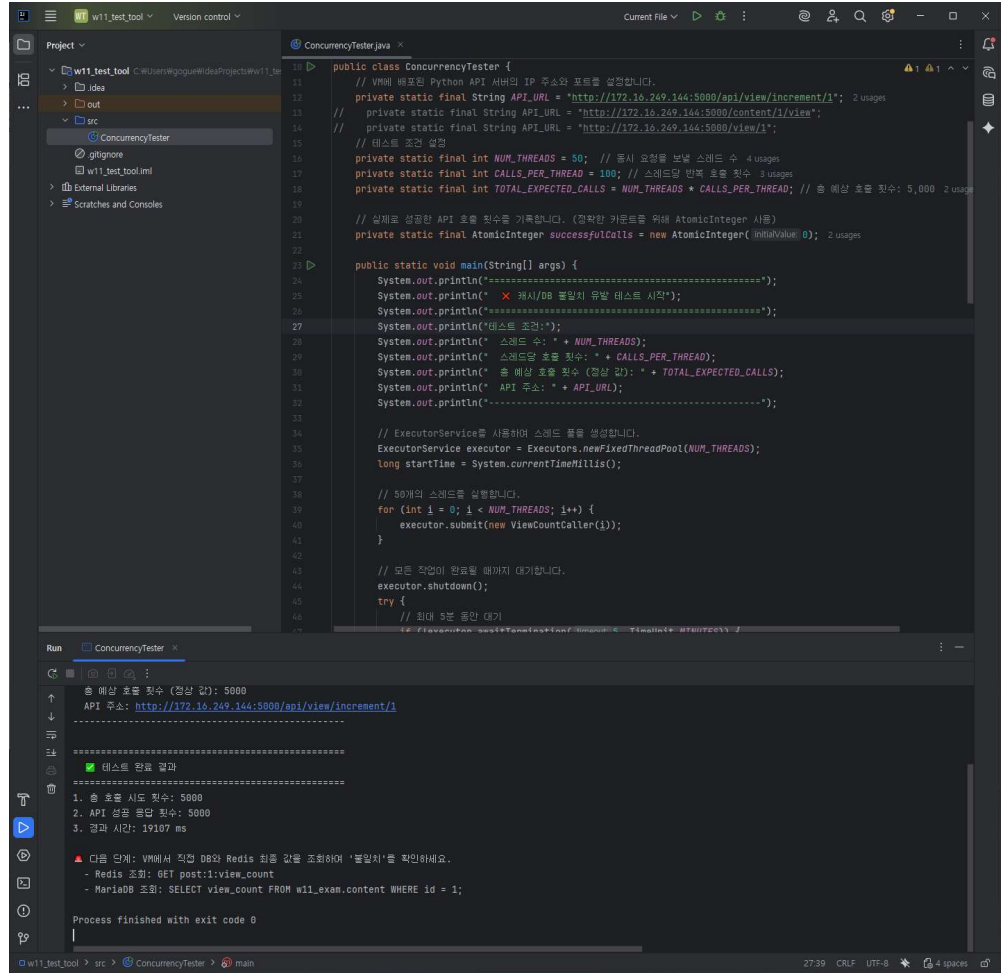
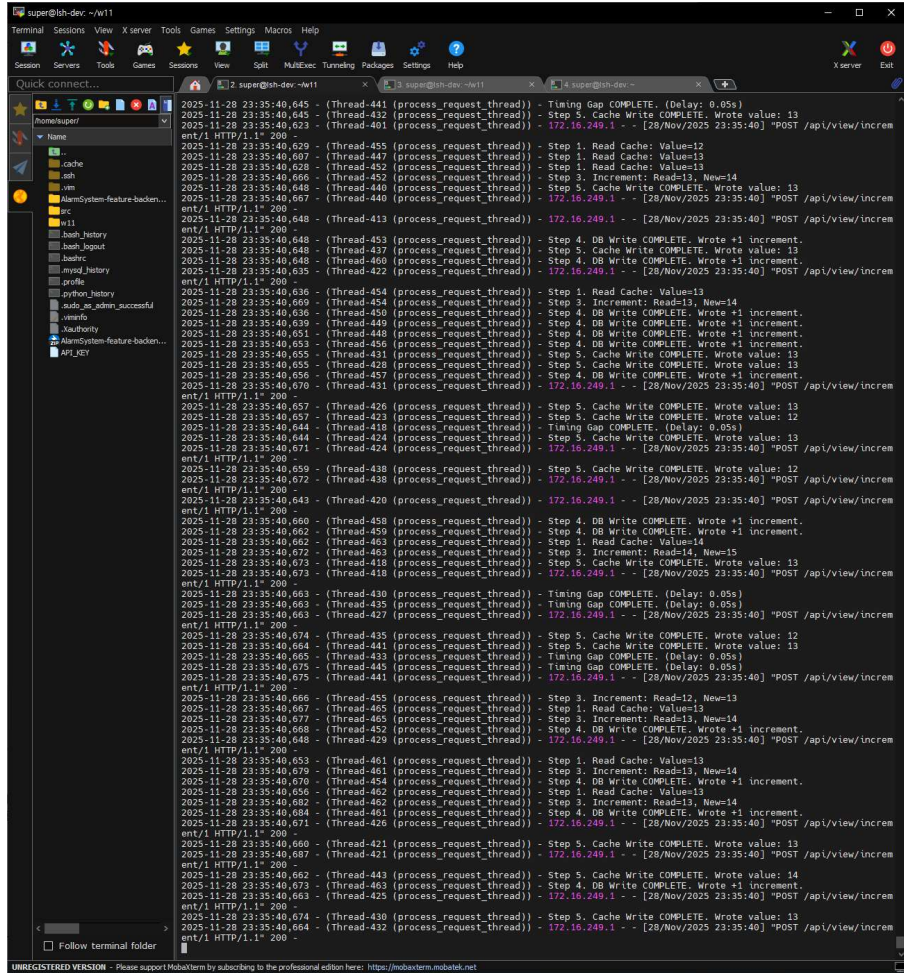


기본



기본

```
MariaDB [w11_exam]>
MariaDB [w11_exam]>
MariaDB [w11_exam]>
MariaDB [w11_exam]> select * from content;
+-----+
| id | view_count |
+-----+
| 1 | 5000 |
+-----+
1 row in set (0.000 sec)

MariaDB [w11_exam]> █
```

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DB출력 결과

```
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"153"
127.0.0.1:6379> █
```

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캐시 출력결과

lock

```
2025-11-28 23:39:01.913 - (Thread-50 (process_request_thread)) - Updated: 49 -> 50
2025-11-28 23:39:01.914 - (Thread-50 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:01] "POST /api/view/increase" 200
2025-11-28 23:39:01.967 - (Thread-51 (process_request_thread)) - Updated: 50 -> 51
2025-11-28 23:39:01.968 - (Thread-51 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:01] "POST /api/view/increase" 200
2025-11-28 23:39:02.022 - (Thread-52 (process_request_thread)) - Updated: 51 -> 52
2025-11-28 23:39:02.022 - (Thread-52 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.075 - (Thread-53 (process_request_thread)) - Updated: 52 -> 53
2025-11-28 23:39:02.076 - (Thread-53 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.129 - (Thread-54 (process_request_thread)) - Updated: 53 -> 54
2025-11-28 23:39:02.130 - (Thread-54 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.183 - (Thread-55 (process_request_thread)) - Updated: 54 -> 55
2025-11-28 23:39:02.184 - (Thread-55 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.237 - (Thread-56 (process_request_thread)) - Updated: 55 -> 56
2025-11-28 23:39:02.238 - (Thread-56 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.292 - (Thread-57 (process_request_thread)) - Updated: 56 -> 57
2025-11-28 23:39:02.292 - (Thread-57 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.345 - (Thread-58 (process_request_thread)) - Updated: 57 -> 58
2025-11-28 23:39:02.346 - (Thread-58 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.399 - (Thread-59 (process_request_thread)) - Updated: 58 -> 59
2025-11-28 23:39:02.400 - (Thread-59 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.453 - (Thread-60 (process_request_thread)) - Updated: 59 -> 60
2025-11-28 23:39:02.454 - (Thread-60 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.507 - (Thread-61 (process_request_thread)) - Updated: 60 -> 61
2025-11-28 23:39:02.508 - (Thread-61 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.561 - (Thread-62 (process_request_thread)) - Updated: 61 -> 62
2025-11-28 23:39:02.562 - (Thread-62 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.615 - (Thread-63 (process_request_thread)) - Updated: 62 -> 63
2025-11-28 23:39:02.616 - (Thread-63 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.669 - (Thread-64 (process_request_thread)) - Updated: 63 -> 64
2025-11-28 23:39:02.670 - (Thread-64 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.723 - (Thread-65 (process_request_thread)) - Updated: 64 -> 65
2025-11-28 23:39:02.724 - (Thread-65 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.777 - (Thread-66 (process_request_thread)) - Updated: 65 -> 66
2025-11-28 23:39:02.778 - (Thread-66 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.831 - (Thread-67 (process_request_thread)) - Updated: 66 -> 67
2025-11-28 23:39:02.832 - (Thread-67 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.885 - (Thread-68 (process_request_thread)) - Updated: 67 -> 68
2025-11-28 23:39:02.886 - (Thread-68 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.939 - (Thread-69 (process_request_thread)) - Updated: 68 -> 69
2025-11-28 23:39:02.940 - (Thread-69 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:02.994 - (Thread-70 (process_request_thread)) - Updated: 69 -> 70
2025-11-28 23:39:02.994 - (Thread-70 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:02] "POST /api/view/increase" 200
2025-11-28 23:39:03.048 - (Thread-71 (process_request_thread)) - Updated: 70 -> 71
2025-11-28 23:39:03.048 - (Thread-71 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
2025-11-28 23:39:03.102 - (Thread-72 (process_request_thread)) - Updated: 71 -> 72
2025-11-28 23:39:03.102 - (Thread-72 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
2025-11-28 23:39:03.156 - (Thread-73 (process_request_thread)) - Updated: 72 -> 73
2025-11-28 23:39:03.156 - (Thread-73 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
2025-11-28 23:39:03.210 - (Thread-74 (process_request_thread)) - Updated: 73 -> 74
2025-11-28 23:39:03.210 - (Thread-74 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
2025-11-28 23:39:03.264 - (Thread-75 (process_request_thread)) - Updated: 74 -> 75
2025-11-28 23:39:03.264 - (Thread-75 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
2025-11-28 23:39:03.318 - (Thread-76 (process_request_thread)) - Updated: 75 -> 76
2025-11-28 23:39:03.318 - (Thread-76 (process_request_thread)) - 172.16.249.1 - - [28/Nov/2025 23:39:03] "POST /api/view/increase" 200
```

```
public class ConcurrencyTester {
    // VM에 배포된 Python API 서버의 IP 주소와 포트를 설정합니다.
    private static final String API_URL = "http://172.16.249.144:5000/api/view/increment/1";
    private static final String API_URL = "http://172.16.249.144:5000/content/1/view";
    private static final String API_URL = "http://172.16.249.144:5000/view/1";
    // 테스트 조건 설정
    private static final int NUM_THREADS = 50; // 동시 요청을 보낼 스레드 수. 4 usages
    private static final int CALLS_PER_THREAD = 100; // 스레드당 반복 호출 횟수. 3 usages
    private static final int TOTAL_EXPECTED_CALLS = NUM_THREADS * CALLS_PER_THREAD; // 총 예상 호출 횟수: 5,000 2 usages

    // 실제로 성공한 API 호출 횟수를 기록합니다. (정확한 카운트를 위해 AtomicInteger 사용)
    private static final AtomicInteger successfulCalls = new AtomicInteger(initialValue: 0);

    public static void main(String[] args) {
        System.out.println("=====");
        System.out.println(" X 캐시/DB 불일치 유발 테스트 시작");
        System.out.println("=====");
        System.out.println("테스트 조건:");
        System.out.println(" 스레드 수: " + NUM_THREADS);
        System.out.println(" 스레드당 호출 횟수: " + CALLS_PER_THREAD);
        System.out.println(" 총 예상 호출 횟수 (정상 값): " + TOTAL_EXPECTED_CALLS);
        System.out.println(" API 주소: " + API_URL);
        System.out.println("=====");

        // ExecutorService를 사용하여 스레드 풀을 생성합니다.
        ExecutorService executor = Executors.newFixedThreadPool(NUM_THREADS);
        long startTime = System.currentTimeMillis();

        // 50개의 스레드를 실행합니다.
        for (int i = 0; i < NUM_THREADS; i++) {
            executor.submit(new ViewCounter(i));
        }

        // 모든 작업이 완료될 때까지 대기합니다.
        executor.shutdown();
        try {
            // 최대 5분 동안 대기
            if (!executor.awaitTermination(5, TimeUnit.MINUTES)) {
                // ...
            }
        } catch (InterruptedException e) {
            // ...
        }

        long endTime = System.currentTimeMillis();
        long totalTime = endTime - startTime;

        System.out.println("=====");
        System.out.println("총 예상 호출 횟수 (정상 값): 5000");
        System.out.println("API 주소: http://172.16.249.144:5000/api/view/increment/1");
        System.out.println("=====");
        System.out.println("✓ 테스트 완료 결과");
        System.out.println("=====");
        System.out.println("1. 총 호출 시도 횟수: 5000");
        System.out.println("2. API 성공 응답 횟수: 5000");
        System.out.println("3. 결과 시간: 271651 ms");

        System.out.println("=====");
        System.out.println("다음 단계: VM에서 직접 DB와 Redis 최종 값을 조회하여 '불일치'를 확인하세요.");
        System.out.println("- Redis 조회: GET post:1:view_count");
        System.out.println("- MariaDB 조회: SELECT view_count FROM w11_exam.content WHERE id = 1;");
        System.out.println("=====");
        System.out.println("Process finished with exit code 0");
    }
}
```

lock

```
MariaDB [w11_exam]> select * from content;
+-----+
| id | view_count |
+-----+
| 1 | 5000 |
+-----+
1 row in set (0.000 sec)

MariaDB [w11_exam]>
```

DB출력 결과

```
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"5000"
127.0.0.1:6379>
```

캐시 출력결과

incr

Terminal Sessions View X server Tools Games Settings Macros Help

Quick connect...

2. super@ish-dev-~w11

ent/1 HTTP/1.1" 200 - (Thread-832 (process_request_thread)) - Redis INCR Result: 832
2025-11-29 04:33:28,588 - (Thread-840 (process_request_thread)) - Redis INCR Result: 839
2025-11-29 04:33:28,618 - (Thread-837 (process_request_thread)) - Redis INCR Result: 837
2025-11-29 04:33:28,566 - (Thread-823 (process_request_thread)) - Redis INCR Result: 824
2025-11-29 04:33:28,598 - (Thread-807 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,599 - (Thread-802 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,599 - (Thread-834 (process_request_thread)) - Redis INCR Result: 834
2025-11-29 04:33:28,600 - (Thread-811 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,601 - (Thread-836 (process_request_thread)) - Redis INCR Result: 835
2025-11-29 04:33:28,601 - (Thread-808 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,605 - (Thread-801 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,606 - (Thread-835 (process_request_thread)) - Redis INCR Result: 836
2025-11-29 04:33:28,605 - (Thread-806 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,608 - (Thread-805 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,610 - (Thread-810 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,611 - (Thread-820 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,611 - (Thread-809 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,615 - (Thread-839 (process_request_thread)) - Redis INCR Result: 838
2025-11-29 04:33:28,622 - (Thread-842 (process_request_thread)) - Redis INCR Result: 840
2025-11-29 04:33:28,624 - (Thread-817 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,626 - (Thread-827 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,626 - (Thread-838 (process_request_thread)) - Redis INCR Result: 841
2025-11-29 04:33:28,628 - (Thread-814 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,628 - (Thread-841 (process_request_thread)) - Redis INCR Result: 842
2025-11-29 04:33:28,630 - (Thread-812 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,631 - (Thread-816 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,634 - (Thread-843 (process_request_thread)) - Redis INCR Result: 843
2025-11-29 04:33:28,641 - (Thread-818 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,641 - (Thread-819 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,641 - (Thread-831 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,646 - (Thread-845 (process_request_thread)) - Redis INCR Result: 844
2025-11-29 04:33:28,649 - (Thread-833 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,650 - (Thread-821 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,650 - (Thread-849 (process_request_thread)) - Redis INCR Result: 845
2025-11-29 04:33:28,688 - (Thread-865 (process_request_thread)) - Redis INCR Result: 865
2025-11-29 04:33:28,652 - (Thread-844 (process_request_thread)) - Redis INCR Result: 848
2025-11-29 04:33:28,653 - (Thread-803 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,653 - (Thread-850 (process_request_thread)) - Redis INCR Result: 849
2025-11-29 04:33:28,693 - (Thread-837 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,655 - (Thread-848 (process_request_thread)) - Redis INCR Result: 847
2025-11-29 04:33:28,656 - (Thread-846 (process_request_thread)) - Redis INCR Result: 850
2025-11-29 04:33:28,695 - (Thread-867 (process_request_thread)) - Redis INCR Result: 867
2025-11-29 04:33:28,657 - (Thread-826 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,627 - (Thread-813 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,664 - (Thread-854 (process_request_thread)) - Redis INCR Result: 853
2025-11-29 04:33:28,665 - (Thread-853 (process_request_thread)) - Redis INCR Result: 852
2025-11-29 04:33:28,697 - (Thread-825 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:33:28] "POST /api/view/increm
ent/1 HTTP/1.1" 200 -
2025-11-29 04:33:28,669 - (Thread-852 (process_request_thread)) - Redis INCR Result: 855
2025-11-29 04:33:28,670 - (Thread-856 (process_request_thread)) - Redis INCR Result: 854

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Project w11_test_tool C:\Users\gogue\IdeaProjects\w11_test_tool

src

ConcurrencyTester

ConcurrencyTester.java

```
18 public class ConcurrencyTester {
19     // VM에 배포된 Python API 서버의 IP 주소와 포트를 설정합니다.
20     private static final String API_URL = "http://172.16.249.144:5000/api/view/increment/1"; // 2 usages
21     private static final String API_URL = "http://172.16.249.144:5000/content/1/view";
22     private static final String API_URL = "http://172.16.249.144:5000/view/1";
23     // 테스트 조건 설정
24     private static final int NUM_THREADS = 50; // 동시 요청을 보낼 스레드 수 4 usages
25     private static final int CALLS_PER_THREAD = 100; // 스레드당 반복 호출 횟수 3 usages
26     private static final int TOTAL_EXPECTED_CALLS = NUM_THREADS * CALLS_PER_THREAD; // 총 예상 호출 횟수: 5,000 2 usages
27
28     // 실제로 성공한 API 호출 횟수를 기록합니다. (정확한 카운트를 위해 AtomicInteger 사용)
29     private static final AtomicInteger successfulCalls = new AtomicInteger(0); // 2 usages
30
31     public static void main(String[] args) {
32         System.out.println("=====");
33         System.out.println(" X 캐시/DB 불일치 유발 테스트 시작");
34         System.out.println("=====");
35         System.out.println("테스트 조건:");
36         System.out.println(" 스레드 수: " + NUM_THREADS);
37         System.out.println(" 스레드당 호출 횟수: " + CALLS_PER_THREAD);
38         System.out.println(" 총 예상 호출 횟수 (정상 값): " + TOTAL_EXPECTED_CALLS);
39         System.out.println(" API 주소: " + API_URL);
40         System.out.println("=====");
41
42         // ExecutorService를 사용하여 스레드 풀을 생성합니다.
43         ExecutorService executor = Executors.newFixedThreadPool(NUM_THREADS);
44         long startTime = System.currentTimeMillis();
45
46         // 50개의 스레드를 실행합니다.
47         for (int i = 0; i < NUM_THREADS; i++) {
48             executor.submit(new ViewCounter(i));
49         }
50
51         // 모든 작업이 완료될 때까지 대기합니다.
52         executor.shutdown();
53         try {
54             // 최대 5분 동안 대기
55             executor.awaitTermination(5, TimeUnit.MINUTES);
56         } catch (InterruptedException e) {
57             e.printStackTrace();
58         }
59         long endTime = System.currentTimeMillis();
60         long duration = endTime - startTime;
61         System.out.println("테스트 완료. 총 호출 횟수: " + successfulCalls.get());
62         System.out.println("실행 시간: " + duration + " ms");
63     }
64 }
```

Run ConcurrencyTester

총 예상 호출 횟수 (정상 값): 5000
API 주소: <http://172.16.249.144:5000/api/view/increment/1>

=====

✓ 테스트 완료 결과

=====

- 총 호출 시도 횟수: 5000
- API 성공 응답 횟수: 5000
- 경과 시간: 16070 ms

다음 단계: VM에서 직접 DB와 Redis 최종 값을 조회하여 '불일치'를 확인하세요.

- Redis 조회: GET post:1:view_count
- MariaDB 조회: SELECT view_count FROM w11_exam.content WHERE id = 1;

Process finished with exit code 0

incr

```

MariaDB [w11_exam]>
MariaDB [w11_exam]>
MariaDB [w11_exam]> select * from content;
+-----+
| id | view_count |
+-----+
| 1 | 5000 |
+-----+
1 row in set (0.000 sec)

MariaDB [w11_exam]>

```

DB출력 결과

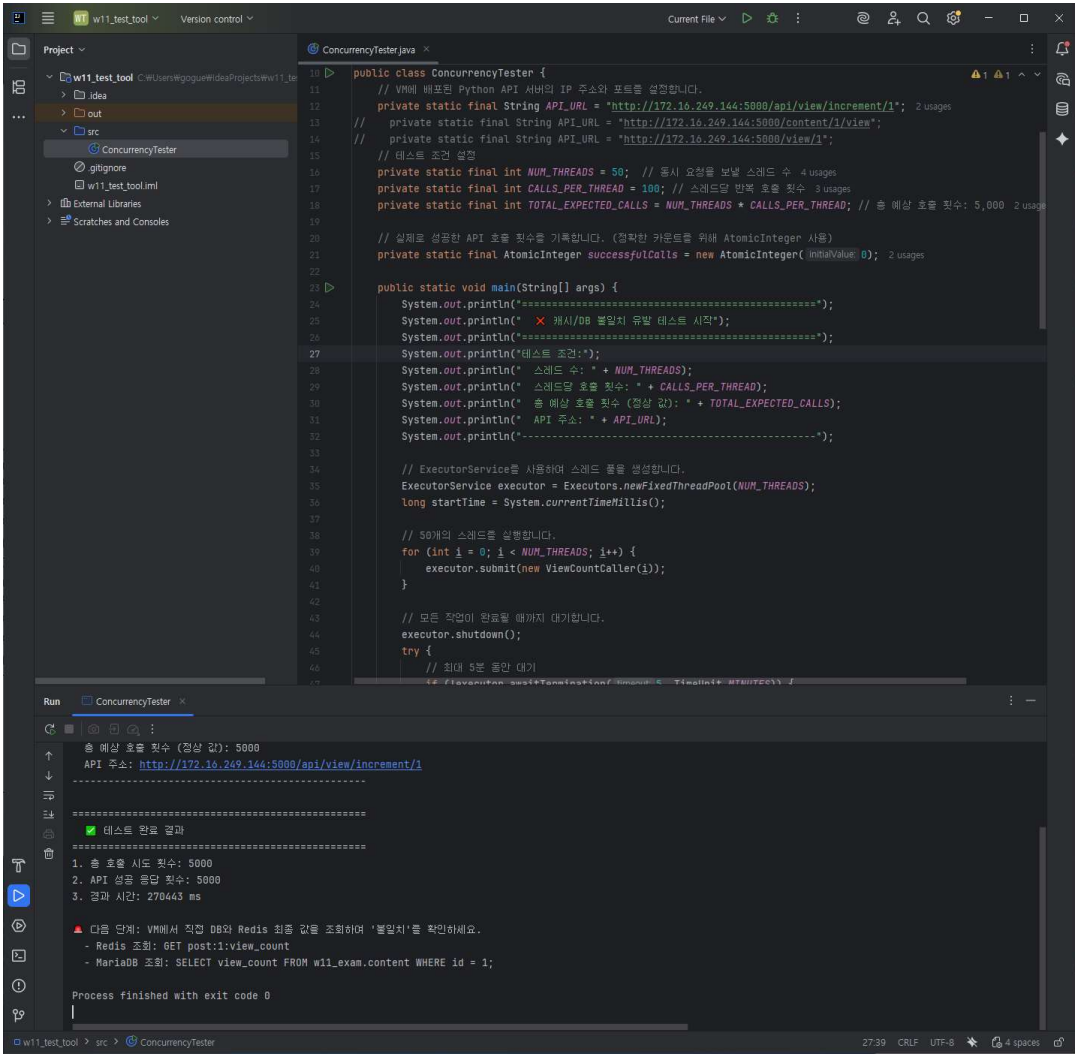
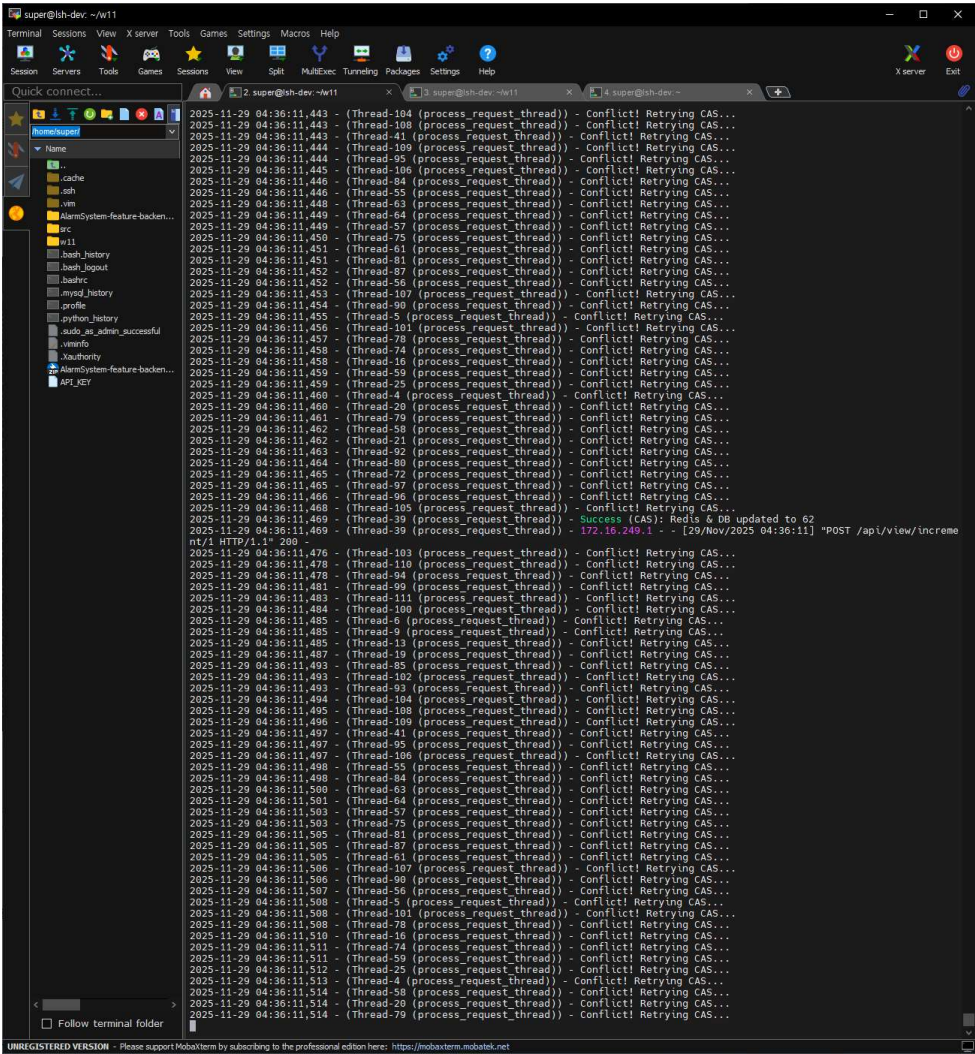
```

127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"5000"
127.0.0.1:6379>

```

캐시 출력결과

cas(check-and-set)



cas(check-and-set)

```
MariaDB [w11_exam]>
MariaDB [w11_exam]> select * from content;
+----+-----+
| id | view_count |
+----+-----+
| 1  | 5000      |
+----+-----+
1 row in set (0.000 sec)

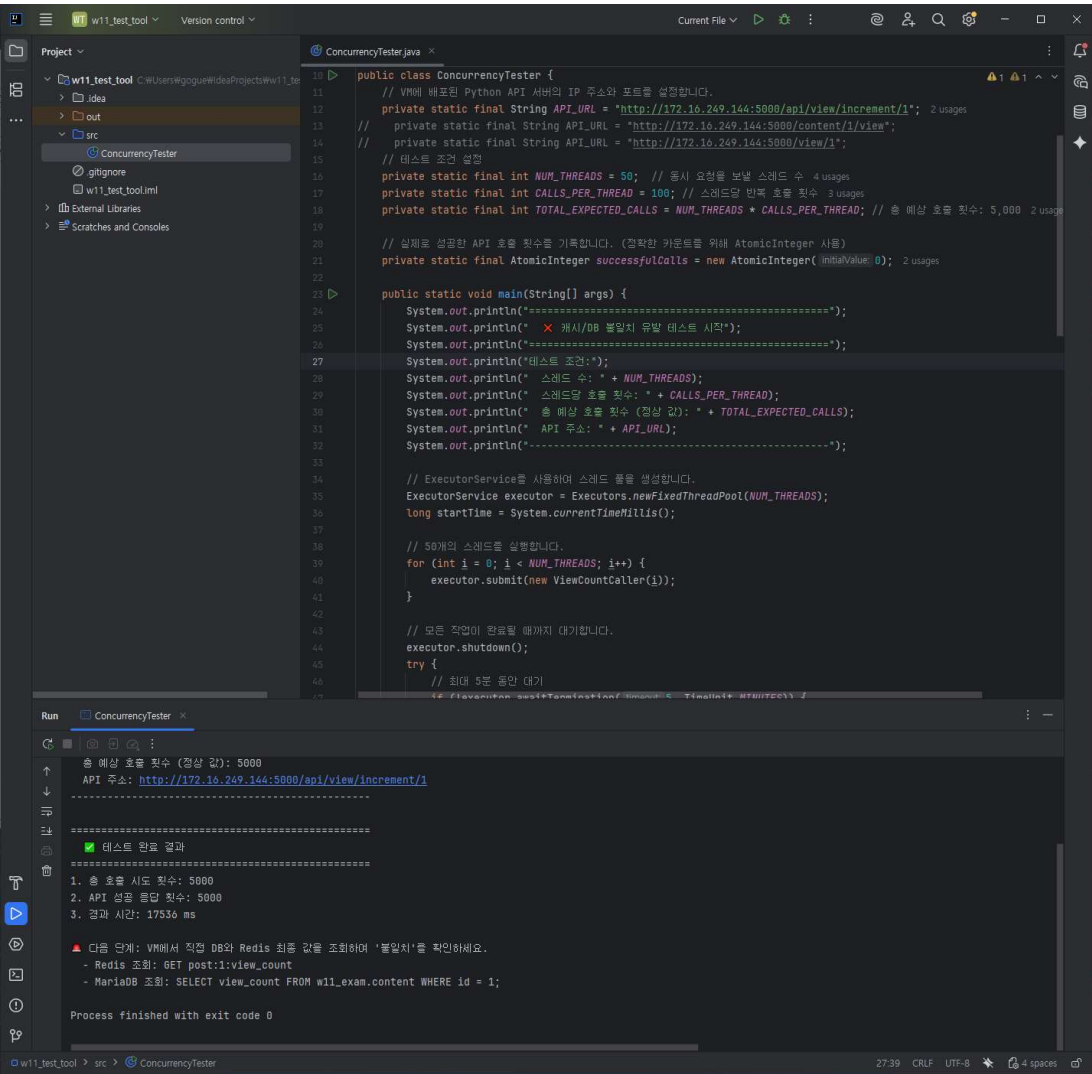
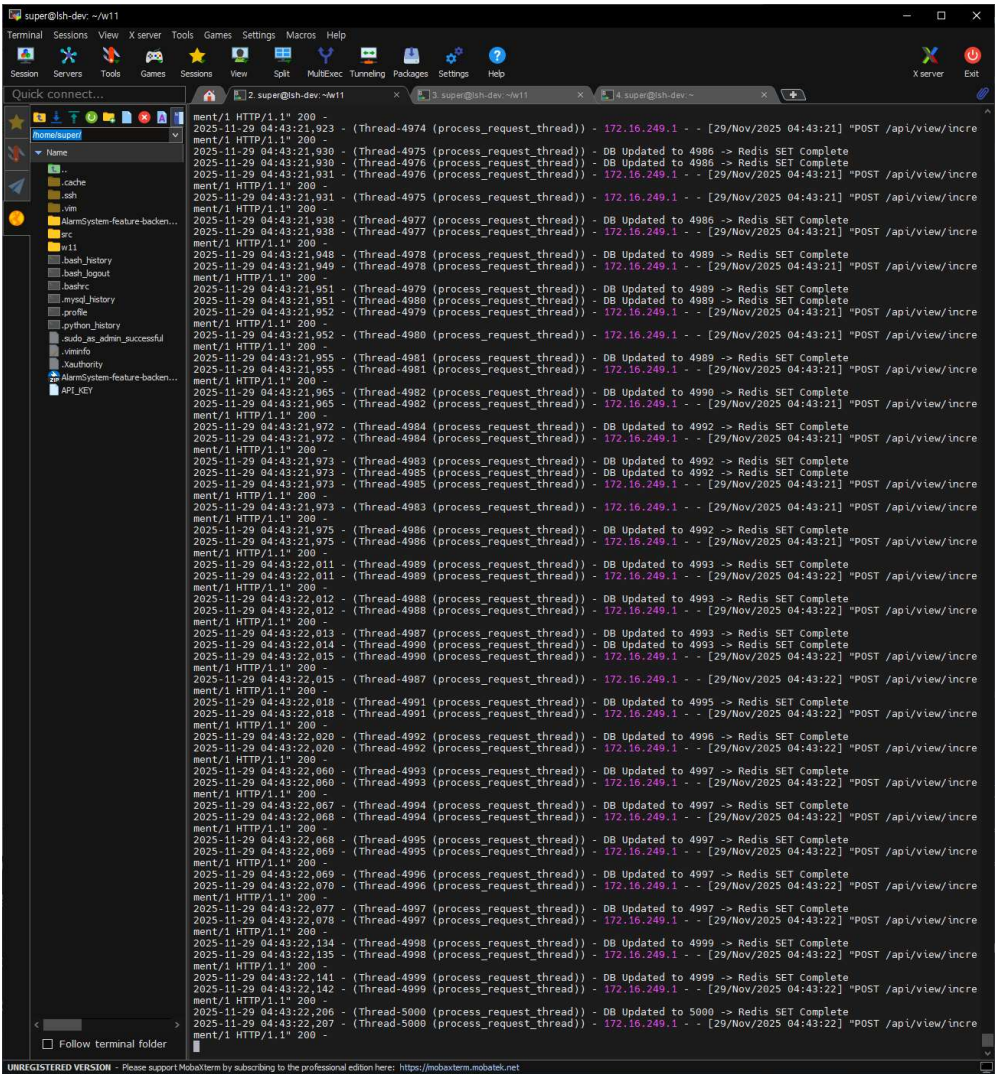
MariaDB [w11_exam]>
```

DB출력 결과

```
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"5000"
127.0.0.1:6379>
```

캐시 출력결과

write-through



write-through

```
MariaDB [w11_exam]>
MariaDB [w11_exam]> select * from content;
+----+-----+
| id | view_count |
+----+-----+
| 1  | 5000      |
+----+-----+
1 row in set (0.000 sec)

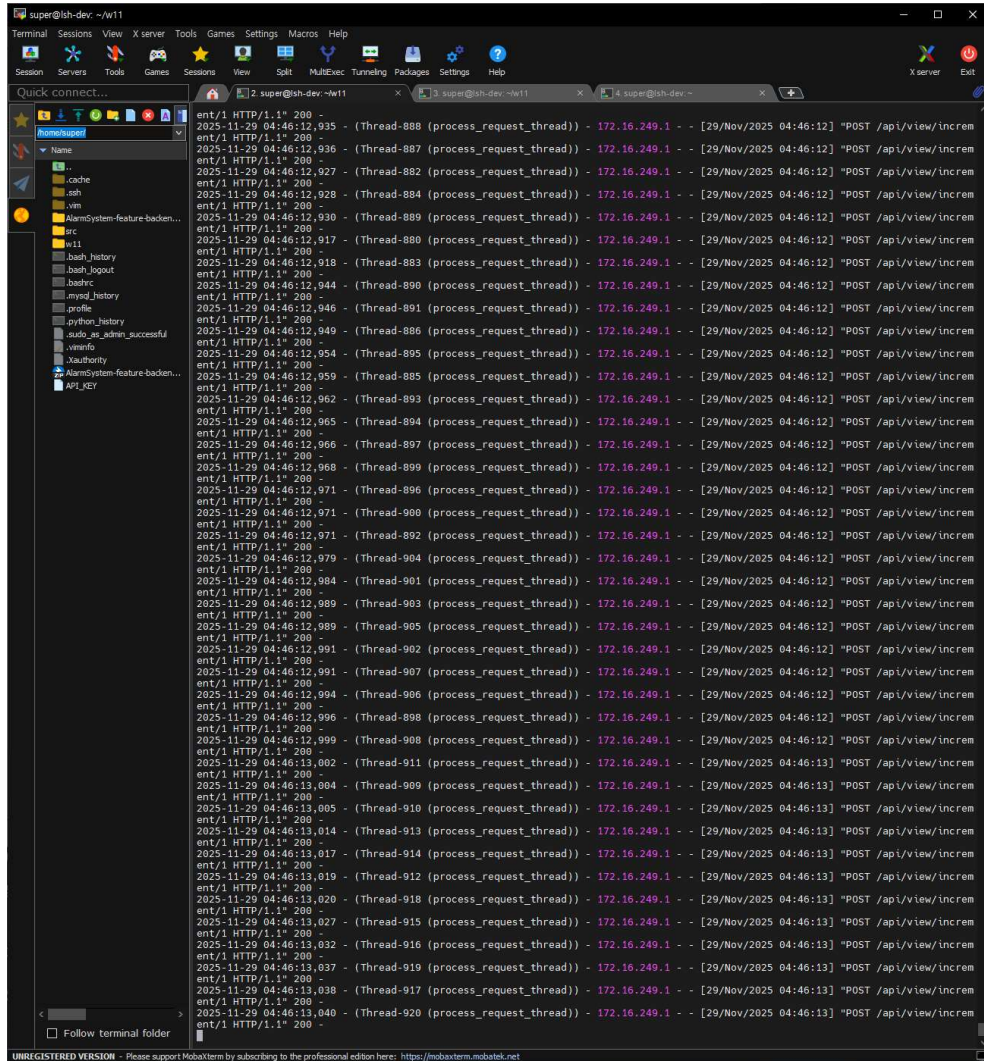
MariaDB [w11_exam]> 
```

DB출력 결과

```
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"5000"
127.0.0.1:6379> 
```

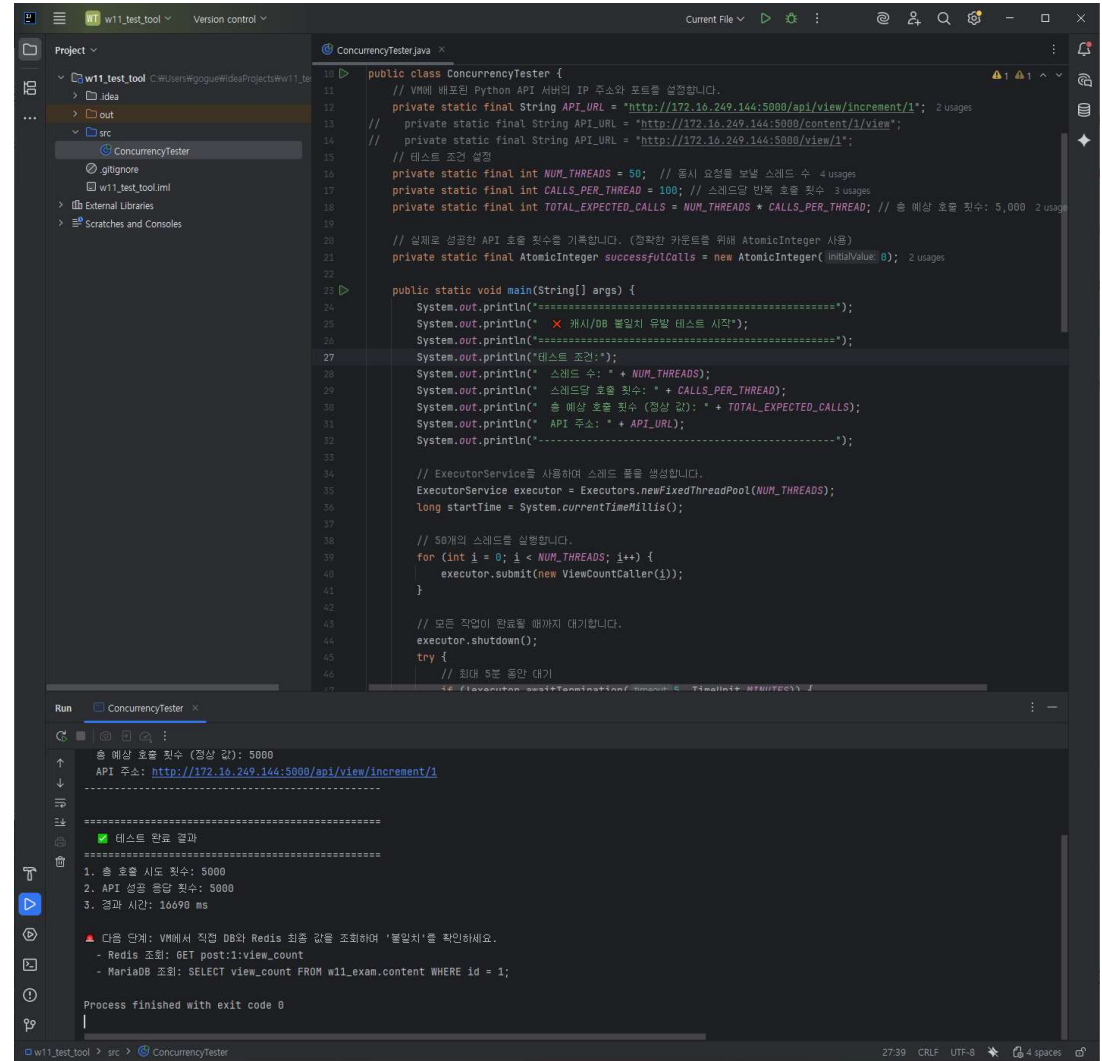
캐시 출력결과

double-checked-locking



```
super@ish-dev: ~/w11
2. super@ish-dev: ~/w11
4. super@ish-dev: ~/w11

ent/1 HTTP/1.1" 200 - (Thread-888 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.935 - (Thread-887 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.936 - (Thread-882 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.927 - (Thread-884 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.928 - (Thread-889 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.930 - (Thread-880 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.917 - (Thread-883 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.918 - (Thread-886 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.944 - (Thread-890 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.946 - (Thread-891 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.949 - (Thread-885 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.954 - (Thread-888 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.959 - (Thread-889 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.962 - (Thread-893 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.965 - (Thread-894 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.966 - (Thread-897 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.968 - (Thread-899 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.971 - (Thread-896 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.971 - (Thread-900 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.971 - (Thread-892 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.979 - (Thread-904 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.984 - (Thread-901 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.989 - (Thread-903 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.989 - (Thread-905 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.991 - (Thread-902 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.991 - (Thread-907 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.994 - (Thread-906 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.996 - (Thread-898 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:12.999 - (Thread-908 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:12] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.002 - (Thread-911 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.004 - (Thread-909 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.005 - (Thread-910 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.014 - (Thread-913 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.017 - (Thread-914 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.019 - (Thread-912 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.020 - (Thread-918 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.032 - (Thread-916 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.037 - (Thread-919 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.038 - (Thread-917 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
2025-11-29 04:46:13.040 - (Thread-920 (process_request_thread)) - 172.16.249.1 - - [29/Nov/2025 04:46:13] "POST /api/view/increment/1" 200
ent/1 HTTP/1.1" 200 -
```



```
public class ConcurrencyTester {
    // VM에 배포된 Python API 서버의 IP 주소와 포트를 설정합니다.
    private static final String API_URL = "http://172.16.249.144:5000/api/view/increment/1"; // 2 usages
    // private static final String API_URL = "http://172.16.249.144:5000/content/1/view";
    private static final String API_URL = "http://172.16.249.144:5000/view/1";
    // 테스트 조건 설정
    private static final int NUM_THREADS = 50; // 동시 요청을 보낼 스레드 수 4 usages
    private static final int CALLS_PER_THREAD = 100; // 스레드당 반복 호출 횟수 3 usages
    private static final int TOTAL_EXPECTED_CALLS = NUM_THREADS * CALLS_PER_THREAD; // 총 예상 호출 횟수: 5,000 2 usages

    // 실제로 성공한 API 호출 횟수를 기록합니다. (정확한 카운트를 위해 AtomicInteger 사용)
    private static final AtomicInteger successfulCalls = new AtomicInteger(initialValue: 0); // 2 usages

    public static void main(String[] args) {
        System.out.println("=====");
        System.out.println(" X 배치/DB 불일치 유발 테스트 시작!");
        System.out.println("=====");
        System.out.println("테스트 조건:");
        System.out.println("스레드 수: " + NUM_THREADS);
        System.out.println("스레드당 호출 횟수: " + CALLS_PER_THREAD);
        System.out.println("총 예상 호출 횟수 (정상 값): " + TOTAL_EXPECTED_CALLS);
        System.out.println("API 주소: " + API_URL);
        System.out.println("-----");

        // ExecutorService를 사용하여 스레드 풀을 생성합니다.
        ExecutorService executor = Executors.newFixedThreadPool(NUM_THREADS);
        long startTime = System.currentTimeMillis();

        // 50개의 스레드를 실행합니다.
        for (int i = 0; i < NUM_THREADS; i++) {
            executor.submit(new ViewCounter(i));
        }

        // 모든 작업이 완료될 때까지 대기합니다.
        executor.shutdown();
        try {
            // 최대 5분 동안 대기
        } catch (InterruptedException e) {
            e.printStackTrace();
        }

        long endTime = System.currentTimeMillis();
        long duration = endTime - startTime;

        System.out.println("=====");
        System.out.println("테스트 완료 결과");
        System.out.println("=====");
        System.out.println("1. 총 호출 시도 횟수: 5000");
        System.out.println("2. API 성공 응답 횟수: 5000");
        System.out.println("3. 경과 시간: 16690 ms");

        System.out.println("다음 단계: VM에서 직접 DB와 Redis 최종 값을 조회하여 '불일치'를 확인하세요.");
        System.out.println("- Redis 조회: GET post::view_count");
        System.out.println("- MariaDB 조회: SELECT view_count FROM w11_exam.content WHERE id = 1;");

        System.out.println("Process finished with exit code 0");
    }
}
```

Run ConcurrencyTester

총 예상 호출 횟수 (정상 값): 5000
API 주소: http://172.16.249.144:5000/api/view/increment/1

테스트 완료 결과

1. 총 호출 시도 횟수: 5000
2. API 성공 응답 횟수: 5000
3. 경과 시간: 16690 ms

다음 단계: VM에서 직접 DB와 Redis 최종 값을 조회하여 '불일치'를 확인하세요.
- Redis 조회: GET post::view_count
- MariaDB 조회: SELECT view_count FROM w11_exam.content WHERE id = 1;

Process finished with exit code 0

double-checked-locking

```
MariaDB [w11_exam]>
MariaDB [w11_exam]> select * from content;
+----+-----+
| id | view_count |
+----+-----+
| 1  | 5000      |
+----+-----+
1 row in set (0.000 sec)

MariaDB [w11_exam]>
```

DB출력 결과

```
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379>
127.0.0.1:6379> GET post:1:view_count
"5000"
127.0.0.1:6379>
```

캐시 출력결과