

## DBMSL

### Assignment 7: Database Triggers

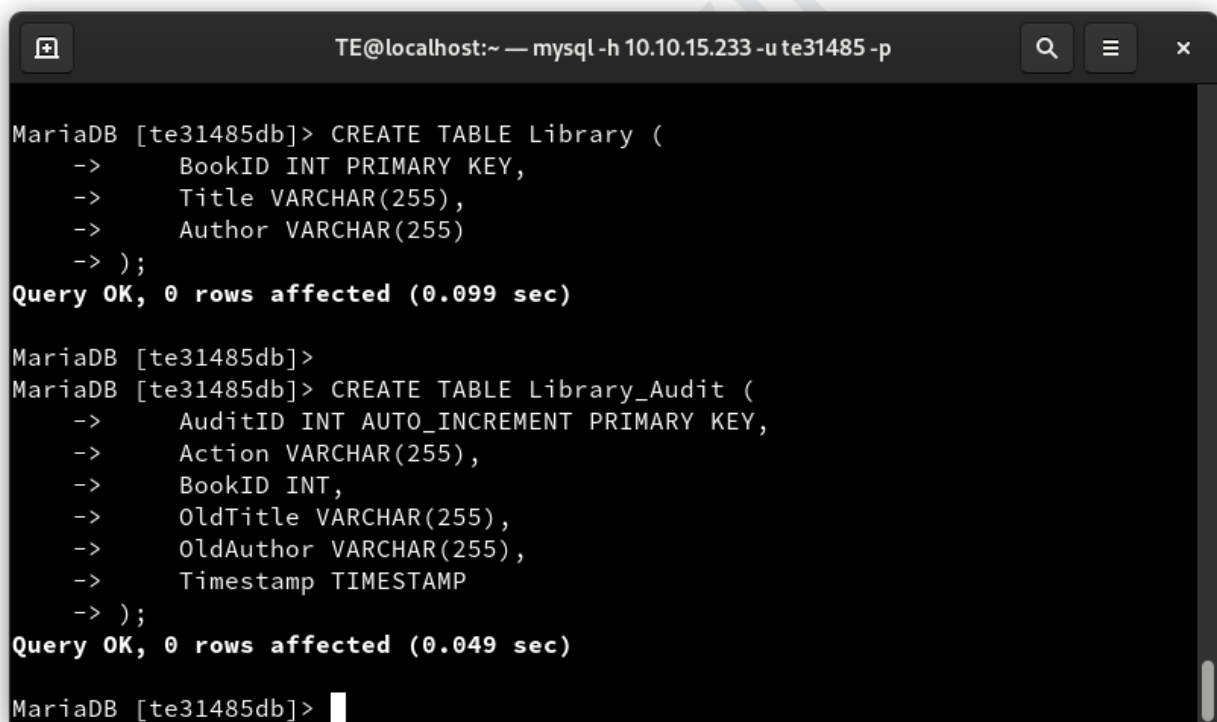
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#### PROBLEM STATEMENT:

Write a database trigger on the **Library** table. The system should keep track of the records that are being uploaded or deleted. The old value of updated or deleted records should be added in the **Library\_Audit** table.

(All types of triggers - row-level, statement level, before, after trigger)

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```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> CREATE TABLE Library (
  ->     BookID INT PRIMARY KEY,
  ->     Title VARCHAR(255),
  ->     Author VARCHAR(255)
  -> );
Query OK, 0 rows affected (0.099 sec)

MariaDB [te31485db]>
MariaDB [te31485db]> CREATE TABLE Library_Audit (
  ->     AuditID INT AUTO_INCREMENT PRIMARY KEY,
  ->     Action VARCHAR(255),
  ->     BookID INT,
  ->     OldTitle VARCHAR(255),
  ->     OldAuthor VARCHAR(255),
  ->     Timestamp TIMESTAMP
  -> );
Query OK, 0 rows affected (0.049 sec)

MariaDB [te31485db]> 
```

### Row-level before-insert trigger to track inserted records:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> DELIMITER //
MariaDB [te31485db]>
MariaDB [te31485db]> CREATE TRIGGER BeforeLibraryInsert
-> BEFORE INSERT ON Library FOR EACH ROW
-> BEGIN
->     INSERT INTO Library_Audit (Action, BookID, OldTitle, OldAuthor, Timestamp)
->     VALUES ('INSERT', NEW.BookID, NULL, NULL, NOW());
-> END;
-> //
Query OK, 0 rows affected (0.072 sec)

MariaDB [te31485db]>
MariaDB [te31485db]> DELIMITER ;
MariaDB [te31485db]>
```

### Row-level before-update trigger to track updated records:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> DELIMITER //
MariaDB [te31485db]>
MariaDB [te31485db]> CREATE TRIGGER BeforeLibraryUpdate
-> BEFORE UPDATE ON Library FOR EACH ROW
-> BEGIN
->     IF NEW.Title != OLD.Title OR NEW.Author != OLD.Author THEN
->         INSERT INTO Library_Audit (Action, BookID, OldTitle, OldAuthor, Timestamp)
->         VALUES ('UPDATE', OLD.BookID, OLD.Title, OLD.Author, NOW());
->     END IF;
-> END;
-> //
Query OK, 0 rows affected (0.055 sec)

MariaDB [te31485db]>
MariaDB [te31485db]> DELIMITER ;
```

### Row-level before-delete trigger to track deleted records:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p
MariaDB [te31485db]>
MariaDB [te31485db]> DELIMITER ;
MariaDB [te31485db]> DELIMITER //
MariaDB [te31485db]>
MariaDB [te31485db]> CREATE TRIGGER BeforeLibraryDelete
-> BEFORE DELETE ON Library FOR EACH ROW
-> BEGIN
->     INSERT INTO Library_Audit (Action, BookID, OldTitle, OldAuthor, Timestamp)
->     VALUES ('DELETE', OLD.BookID, OLD.Title, OLD.Author, NOW());
-> END;
-> //
Query OK, 0 rows affected (0.064 sec)

MariaDB [te31485db]>
MariaDB [te31485db]> DELIMITER ;
```

### Statement-level after-trigger to track batch operations (e.g., DELETE or INSERT INTO ... SELECT):

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p
MariaDB [te31485db]> DELIMITER //
MariaDB [te31485db]>
MariaDB [te31485db]> CREATE TRIGGER AfterLibraryStatement
-> AFTER INSERT OR DELETE ON Library
-> BEGIN
->     -- Note: In this trigger, you can log the action and timestamp as needed.
->     INSERT INTO Library_Audit (Action, BookID, OldTitle, OldAuthor, Timestamp)
->     VALUES ('STATEMENT', NULL, NULL, NULL, NOW());
-> END;
-> //
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MariaDB server version for the right syntax to use near 'OR DELETE ON Library BEGIN' at line 1
      INSERT INTO Library_Audit (Action, BookID, 0' at line 1
MariaDB [te31485db]>
MariaDB [te31485db]> DELIMITER ;
```

## Insert a new book:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> INSERT INTO Library (BookID, Title, Author) VALUES (1, 'The
Catcher in the Rye', 'J.D. Salinger');
Query OK, 1 row affected (0.011 sec)

MariaDB [te31485db]> select * from Library;
+-----+-----+-----+
| BookID | Title                | Author      |
+-----+-----+-----+
|      1 | The Catcher in the Rye | J.D. Salinger |
+-----+-----+-----+
1 row in set (0.001 sec)

MariaDB [te31485db]> select * from Library_Audit;
+-----+-----+-----+-----+-----+-----+
| AuditID | Action | BookID | OldTitle | OldAuthor | Timestamp      |
+-----+-----+-----+-----+-----+-----+
|      1 | INSERT |      1 | NULL     | NULL      | 2023-10-03 15:18:21 |
+-----+-----+-----+-----+-----+-----+
1 row in set (0.001 sec)
```

## Update an existing book:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> UPDATE Library SET Title = 'To Kill a Mockingbird' WHERE BookID = 1;
Query OK, 1 row affected (0.058 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MariaDB [te31485db]> select * from Library_Audit;
+-----+-----+-----+-----+-----+-----+
| AuditID | Action | BookID | OldTitle                | OldAuthor      | Timestamp      |
+-----+-----+-----+-----+-----+-----+
|      1 | INSERT |      1 | NULL                     | NULL           | 2023-10-03 15:18:21 |
|      2 | UPDATE |      1 | The Catcher in the Rye   | J.D. Salinger  | 2023-10-03 15:19:41 |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.001 sec)

MariaDB [te31485db]> select * from Library;
+-----+-----+-----+
| BookID | Title                | Author      |
+-----+-----+-----+
|      1 | To Kill a Mockingbird | J.D. Salinger |
+-----+-----+-----+
1 row in set (0.001 sec)
```

## Delete a book:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> DELETE FROM Library WHERE BookID = 1;
Query OK, 1 row affected (0.018 sec)

MariaDB [te31485db]> select * from Library;
Empty set (0.001 sec)

MariaDB [te31485db]> select * from Library_Audit;
+-----+-----+-----+-----+-----+-----+
| AuditID | Action | BookID | OldTitle          | OldAuthor   | Timestamp          |
+-----+-----+-----+-----+-----+-----+
| 1       | INSERT | 1       | NULL              | NULL        | 2023-10-03 15:18:21 |
| 2       | UPDATE | 1       | The Catcher in the Rye | J.D. Salinger | 2023-10-03 15:19:41 |
| 3       | DELETE | 1       | To Kill a Mockingbird | J.D. Salinger | 2023-10-03 15:20:36 |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.001 sec)

MariaDB [te31485db]> 
```

## Batch insert using INSERT INTO ... SELECT:

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> INSERT INTO Library (BookID, Title, Author)
-> SELECT 2, 'Pride and Prejudice', 'Jane Austen'
-> UNION
-> SELECT 3, '1984', 'George Orwell';
Query OK, 2 rows affected (0.015 sec)
Records: 2  Duplicates: 0  Warnings: 0

MariaDB [te31485db]> select * from Library;
+-----+-----+-----+
| BookID | Title          | Author      |
+-----+-----+-----+
| 2       | Pride and Prejudice | Jane Austen |
| 3       | 1984           | George Orwell |
+-----+-----+-----+
2 rows in set (0.001 sec)
```

```
TE@localhost:~ — mysql -h 10.10.15.233 -u te31485 -p

MariaDB [te31485db]> select * from Library_Audit;
+-----+-----+-----+-----+-----+-----+
| AuditID | Action | BookID | OldTitle          | OldAuthor   | Timestamp          |
+-----+-----+-----+-----+-----+-----+
| 1       | INSERT | 1       | NULL              | NULL        | 2023-10-03 15:18:21 |
| 2       | UPDATE | 1       | The Catcher in the Rye | J.D. Salinger | 2023-10-03 15:19:41 |
| 3       | DELETE | 1       | To Kill a Mockingbird | J.D. Salinger | 2023-10-03 15:20:36 |
| 4       | INSERT | 2       | NULL              | NULL        | 2023-10-03 15:21:19 |
| 5       | INSERT | 3       | NULL              | NULL        | 2023-10-03 15:21:19 |
+-----+-----+-----+-----+-----+-----+
5 rows in set (0.001 sec)

MariaDB [te31485db]> 
```