

Assignment 2

Part 2

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Git repository - https://git.cs.dal.ca/vjoshi/csci_5408_assignment_2_problem_2.git

2 transactions as shown below execute concurrently in Java code

Transaction 1 –

```
START TRANSACTION;
SELECT @class_Id:=class_Id FROM classroom WHERE classroom_name = "Tupper Theater";
UPDATE course SET class_Id = @class_Id WHERE course_id=5408;
INSERT INTO bookborrowed VALUES (101,924759,1);
SELECT @book_price:=book_price from book WHERE book_Id=101;
UPDATE dalcards SET card_balance=card_balance - @book_price , card_transaction ="Book Purchase", trans_amount=@book_price WHERE Student_student_id=924759;
COMMIT;
```

1. Get class ID for "Tupper Theater"
2. Update classroom where course "5408" is taught.
3. Borrow book id 101 by student with id "924759" from library id "1".
4. Select the price of the book.
5. Update the balance by the book price in "Dalcards" and register the transaction.

Transaction 2 –

```
START TRANSACTION;
SELECT @class_Id:=class_Id FROM classroom WHERE classroom_name = "Auditorium";
UPDATE course SET class_Id = @class_Id WHERE course_id=5408;
DELETE FROM classroom WHERE classroom_name = "Tupper Theater";
UPDATE book SET book_price=9 WHERE book_Id=101;
INSERT INTO bookborrowed VALUES (101,924759,1);
SELECT @book_price:=book_price from book WHERE book_Id=101;
UPDATE dalcards SET card_balance=card_balance - @book_price , card_transaction ="Book Purchase", trans_amount=@book_price WHERE Student_student_id=924759;
COMMIT;
```

1. Get classId for classroom "Auditorium".
2. Update classroom where course "5408" is taught.
3. Delete classroom "Tupper Theater".
4. Update the price of bookID "101" to 9.
5. Borrow book id 101 by student with id "924759" from library id "1".
6. Select the price of the book.
7. Update the balance by the book price in "Dalcards" and register the transaction.

Issues with executing transaction without locks.

Case 1- Transaction 2 executes query on classroom table before transaction 1 commits

a. Classroom “Tupper Building” will be deleted by transaction 2 and when transaction 1 fetches it, the classroom will not exist in the database causing a NULL update to class_Id column in **course** table.

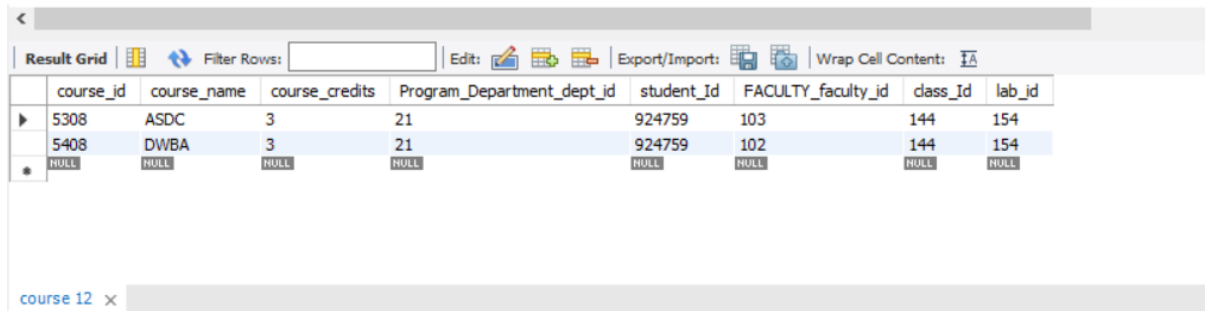
b. Price of book ‘101’ will be updated to 9 by transaction 2. Hence the book will be purchased in transaction 2 for 9 and in transaction 1 for 9. Resulting update will be $\text{card_balance} = \text{card_balance} - 9 - 9$ instead of $\text{card_balance} = \text{card_balance} - 5 - 9$;

Case 2 – Transaction 1 updates card_balance in **dalcards** table but does not commit

a. If transaction 2 reads the card_balance , then it will result in an inconsistent balance value.

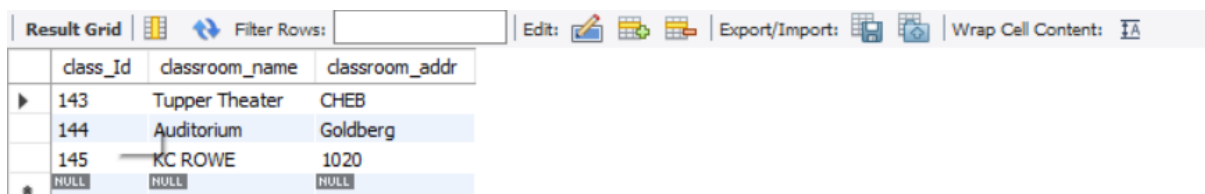
Before Transaction –

Course



course_id	course_name	course_credits	Program_Department_dept_id	student_Id	FACULTY_faculty_id	class_Id	lab_id
5308	ASDC	3	21	924759	103	144	154
5408	DWBA	3	21	924759	102	144	154
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

classroom



class_Id	classroom_name	classroom_addr
143	Tupper Theater	CHEB
144	Auditorium	Goldberg
145	KC ROWE	1020
NULL	NULL	NULL

book

book_Id	book_name	book_price	author_id
101	Concepts of Physics	5	501
102	Concepts of Maths	6	503
103	Concepts of Chemistry	13	502
104	Adv Physics	17	501
NULL	NULL	NULL	NULL

bookborrowed

book_Id	student_id	library_id
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bookborrowed 15 x

dalcard

idDalCard	Upass_Start_Date	Upass_End_Date	card_balance	card_transaction	trans_amount	Student_student_id
924759	2022-08-01	2023-04-01	500	Book Purchase	5	924759
NULL	NULL	NULL	NULL	NULL	NULL	NULL

After transaction execution with locks

```
TransactionT1.java TransactionT2.java DBQuery.java Main.java LockManager.java Thread.class
2
3 * import java.sql.Connection;
6
7 public class TransactionT2 extends Thread implements MyTransaction{
8
9     public HashMap<String,String> transLockTables = new HashMap<String,String>();
10
11     public TransactionT2() {
12         transLockTables.put("classroom", "WRITE");
13         transLockTables.put("course", "WRITE");
14         transLockTables.put("bookborrowed", "WRITE");
15         transLockTables.put("book", "WRITE");
16         transLockTables.put("dalcard", "WRITE");
17     }
18
19     public HashMap<String, String> getTransLockTables() {
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Course

class_Id for 5408 is set to 144 and not Null which may be the case without synchronization

course_id	course_name	course_credits	Program_Department_dept_id	student_Id	FACULTY_faculty_id	class_Id	lab_id
5308	ASDC	3	21	924759	103	144	154
5408	DWBA	3	21	924759	102	144	154
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

course 42 x

Classroom

Class details for “Tupper Theater” removed as expected.

class_Id	classroom_name	classroom_addr
144	Auditorium	Goldberg
145	KC ROWE	1020
NULL	NULL	NULL

classroom 43 x

book

book_Id	book_name	book_price	author_id
101	Concepts of Physics	9	501
102	Concepts of Maths	6	503
103	Concepts of Chemistry	13	502
104	Adv Physics	17	501
NULL	NULL	NULL	NULL

book 44 x

Output

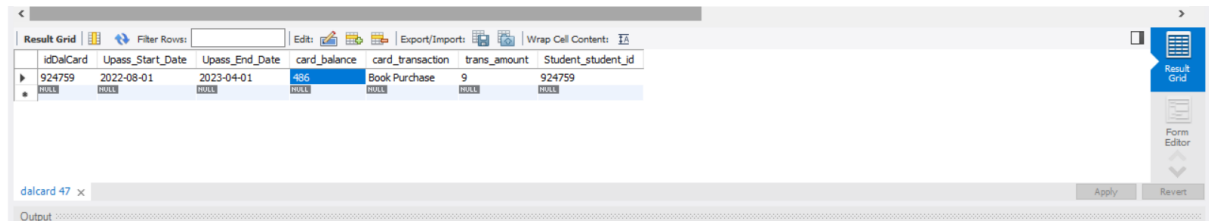
book_Id	student_id	library_id
101	924759	1
101	924759	1

bookborrowed 45 x

Output

Dalcard

Balance is reduced first by 5 and then by 9. I.e. $500 - 5 - 9 = 486$ as expected.



The screenshot shows the MySQL Workbench interface with a 'Result Grid' window. The window title is 'dalcard 47'. The grid contains one row of data. The columns are: idDalCard, Upass_Start_Date, Upass_End_Date, card_balance, card_transaction, trans_amount, and Student_student_id. The values in the row are: 924759, 2022-08-01, 2023-04-01, 486, Book Purchase, 9, and 924759. The 'card_balance' cell is highlighted in blue. The interface includes a toolbar with options like 'Filter Rows', 'Edit', 'Export/Import', and 'Wrap Cell Content'. On the right side, there are buttons for 'Result Grid', 'Form Editor', 'Apply', and 'Revert'.

idDalCard	Upass_Start_Date	Upass_End_Date	card_balance	card_transaction	trans_amount	Student_student_id
924759	2022-08-01	2023-04-01	486	Book Purchase	9	924759

Citations

1. MySQL Workbench (8.0 CE). Oracle. Available:

<https://dev.mysql.com/downloads/workbench/>

2. Google Cloud Platform. Google. Available: <https://console.cloud.google.com>