



Australian
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程序代写代做 CS编程辅导



Databases Transactions – Part 1

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Introduction

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Transaction – A Classical Example



- **Scenario:** Suppose Steve's account balance is **\$1000** and Bob's balance is **\$200**. Now Steve wants to transfer **\$500** into Bob's account.

- There are several steps involved in transferring the money:

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- 1 **Check** Steve's balance;

- 2 **Update** Steve's balance;

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- 3 **Check** Bob's balance;

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- 4 **Update** Bob's balance.

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- Steve later checked his balance (it was **\$500**), which looked good to Steve. However, Bob told Steve that he hadn't received his money yet (still **\$200** in Bob's account instead of **\$700**).

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Question: What did happen?

Transaction – A Classical Example



- **Reason:** Due to power outage, the system **stopped working just after updating** Steve's balance
- **Task:** Transfer \$500 from Steve's account to Bob's account

1 SELECT balance FROM ACCOUNT
WHERE name = 'Steve';

2 UPDATE ACCOUNT
SET balance = balance-500
WHERE name='Steve';

3 SELECT balance FROM ACCOUNT
WHERE name = 'Bob';

4 UPDATE ACCOUNT
SET balance = balance+500
WHERE name = 'Bob';

Operations	Steve	Bob
before 1	\$1000	\$200
after 1	\$1000	\$200
after 2	\$500	\$200
after 3	\$500	\$200
after 4	\$500	\$700

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Transaction – A Classical Example



- We need an approach that
 - either the balance of Steve and Bob remain unchanged **if the money transfer fails**
 - or Steve's balance is **\$500** and Bob's is **\$700** **if the money transfer succeeds.**

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1 SELECT balance FROM ACCOUNT
WHERE name = 'Steve';

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2 UPDATE ACCOUNT
SET balance = balance-500
WHERE name='Steve';

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3 SELECT balance FROM ACCOUNT
WHERE name = 'Bob';

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4 UPDATE ACCOUNT
SET balance = balance+500

Operations	Steve	Bob
before 1	\$1000	\$200
after 1	\$1000	\$200
after 2	\$500	\$200
after 3	\$500	\$200
after 4	\$500	\$700

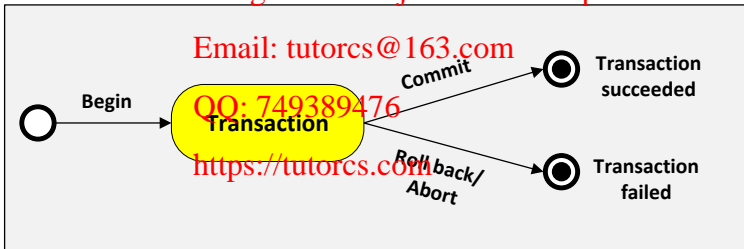


程序代写代做 CS编程辅导 What is a Transaction?



- DBMSs provide **transaction support** for solving this kind of problem.
- A **transaction** is a single database operations grouped together for execution as a logical unit in a DBMS.
- Different from an execution of a program outside the DBMS (e.g., a C program) in many ways!

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程序代写代做 CS编程辅导 What is a Transaction?



- Database applications access a database **by transactions** rather than individual operations

- e.g., large databases and hundreds of concurrent users: banking, supermarket checkout, airline reservation, online purchasing, etc.

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- Why transactions?** They can **enforce data integrity** in the following situations:

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- multiple users may modify and share data at the same time;
- transaction, system, and media failures may happen from time to time.

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- What does a transaction look like?**

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- `INSERT`, `SELECT`, `UPDATE`, `DELETE`, `BEGIN`, `COMMIT`, `ABORT` (`ROLLBACK`), etc. from a high-level language perspective;
- `read`, `write`, `begin`, `commit`, `abort` at the internal process level.



程序代写代做 CS编程辅导 Transaction – Language Level



- **Database operation** Transaction (at the SQL language level) may include: **SELECT**, **INSERT**, **DELETE**.
- **Other operations:** **BEGIN**, **COMMIT**, **ABORT** (**ROLLBACK**)

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BEGIN TRANSACTION

1 SELECT balance FROM ACCOUNT WHERE name = 'Steve';

2 UPDATE ACCOUNT
SET balance = balance-500 WHERE name='Steve';

3 SELECT balance FROM ACCOUNT WHERE name = 'Bob';

4 UPDATE ACCOUNT
SET balance = balance+500 WHERE name = 'Bob';

COMMIT

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Transactions - Internal Process Level



- **Basic operations** of a transaction (at the internal process level) are
 - **read(X)**: loads a copy of object X from main memory;
 - **write(X)**: modifies in-memory copy of object X (and writes it to disk later on);
- **Granularity of objects**: tables, rows, cells, or memory pages;
- **Other operations**:
 - **begin**: marks the beginning of a transaction;
 - **commit**: signals a successful end of the transaction - all changes can safely be applied to the database permanently;
 - **abort**: signals the transaction has ended unsuccessfully - undo all operations of the transaction.

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Transactions - Internal Process Level



```
T: BEGIN TRANSACTION
T: SELECT balance FROM Account WHERE name = 'Steve';
T: UPDATE Account SET balance = balance-500 WHERE name='Steve';
T: SELECT balance FROM Account WHERE name = 'Bob';
T: UPDATE Account SET balance = balance+500 WHERE name = 'Bob';
T: COMMIT;
```

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Objects:

- A - Steve's account balance;
- B - Bob's account balance.

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Steps

1	read(A)
2	write(A) (A:=A-500)
3	read(B)
4	write(B) (B:=B+500)
5	commit