

数据库事务差分测试

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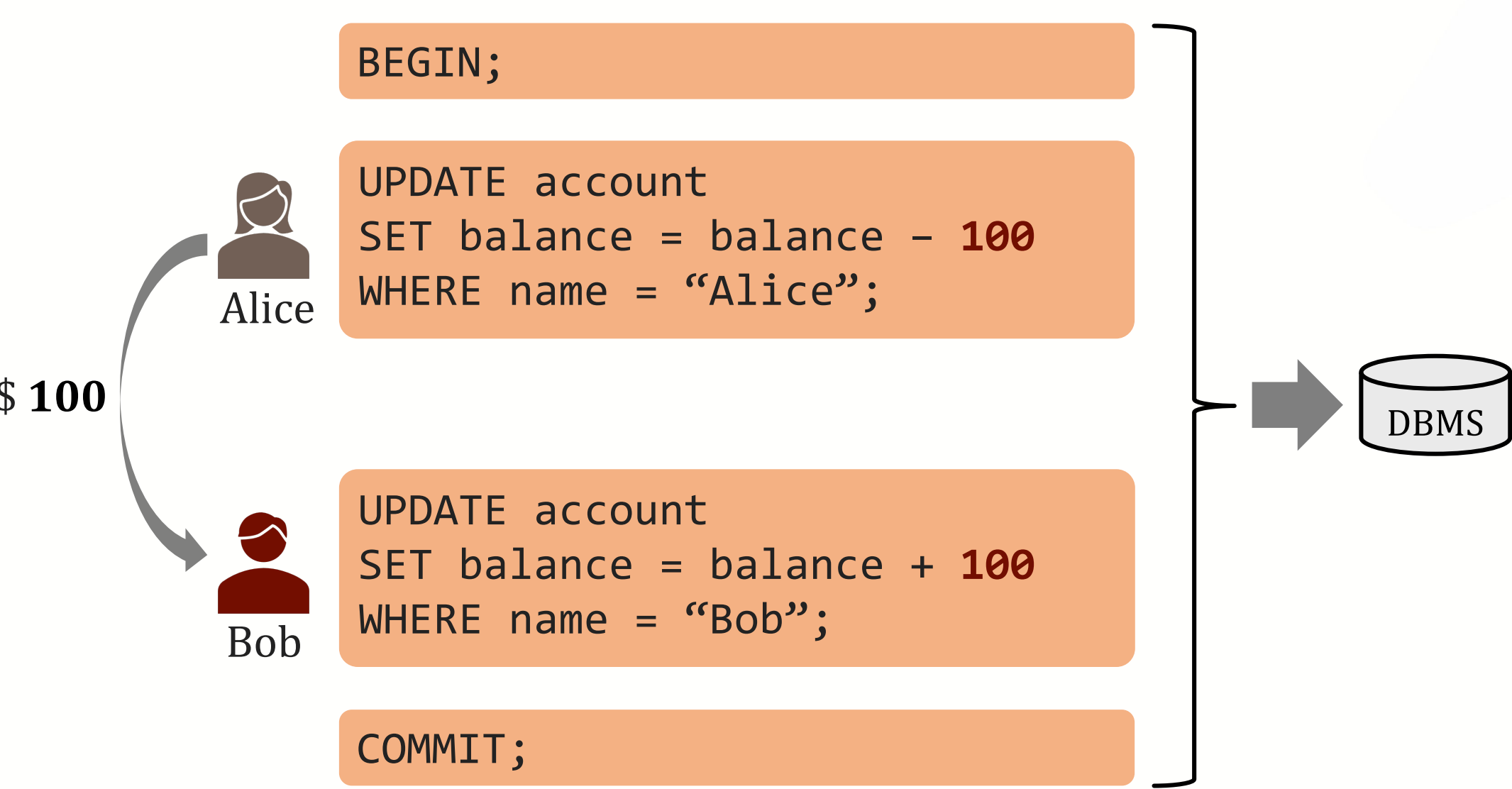
Differentially Testing Database Transactions for Fun and Profit

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Transaction

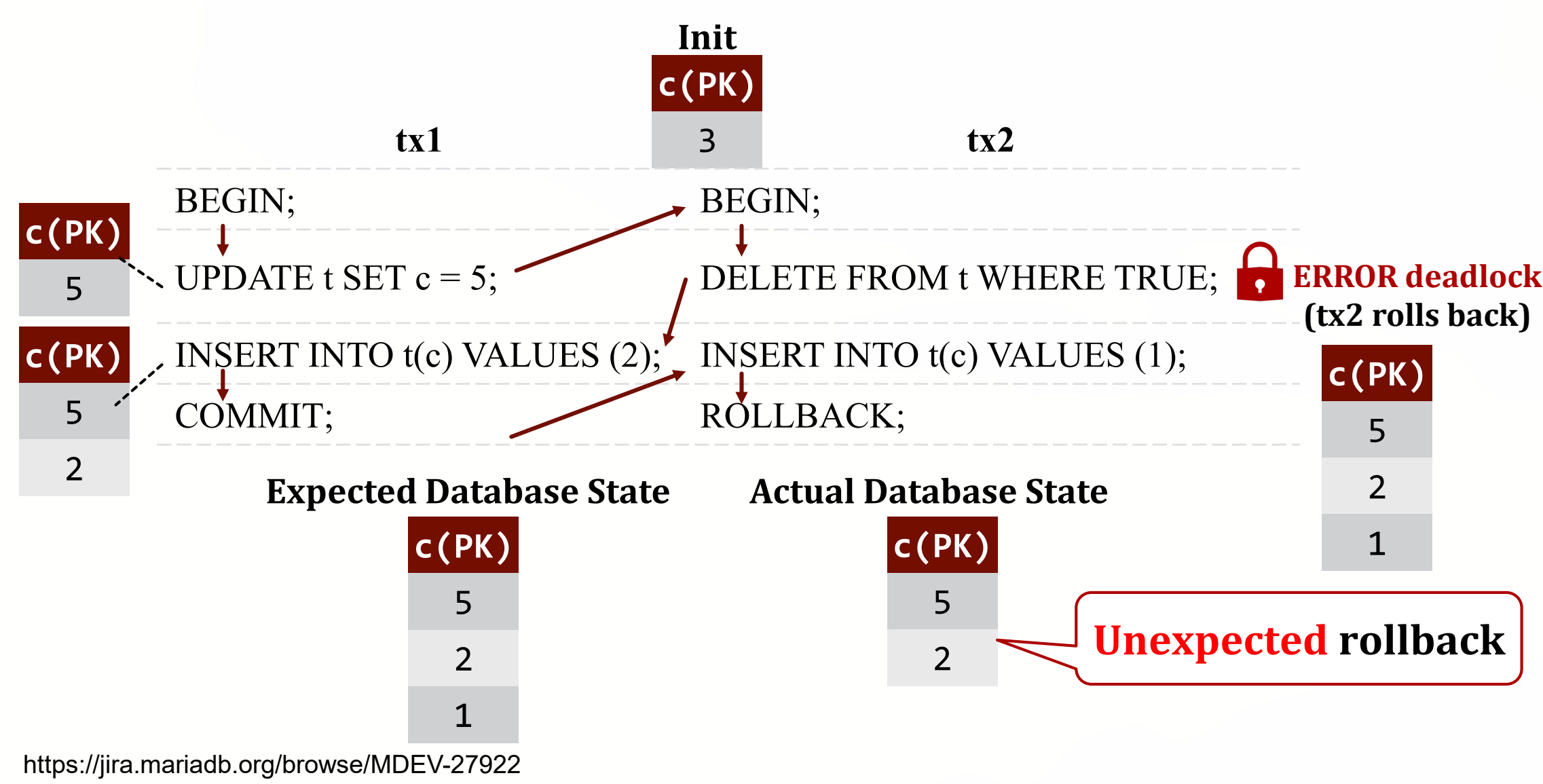
DBMSs utilize transactions to ensure data consistency and integrity



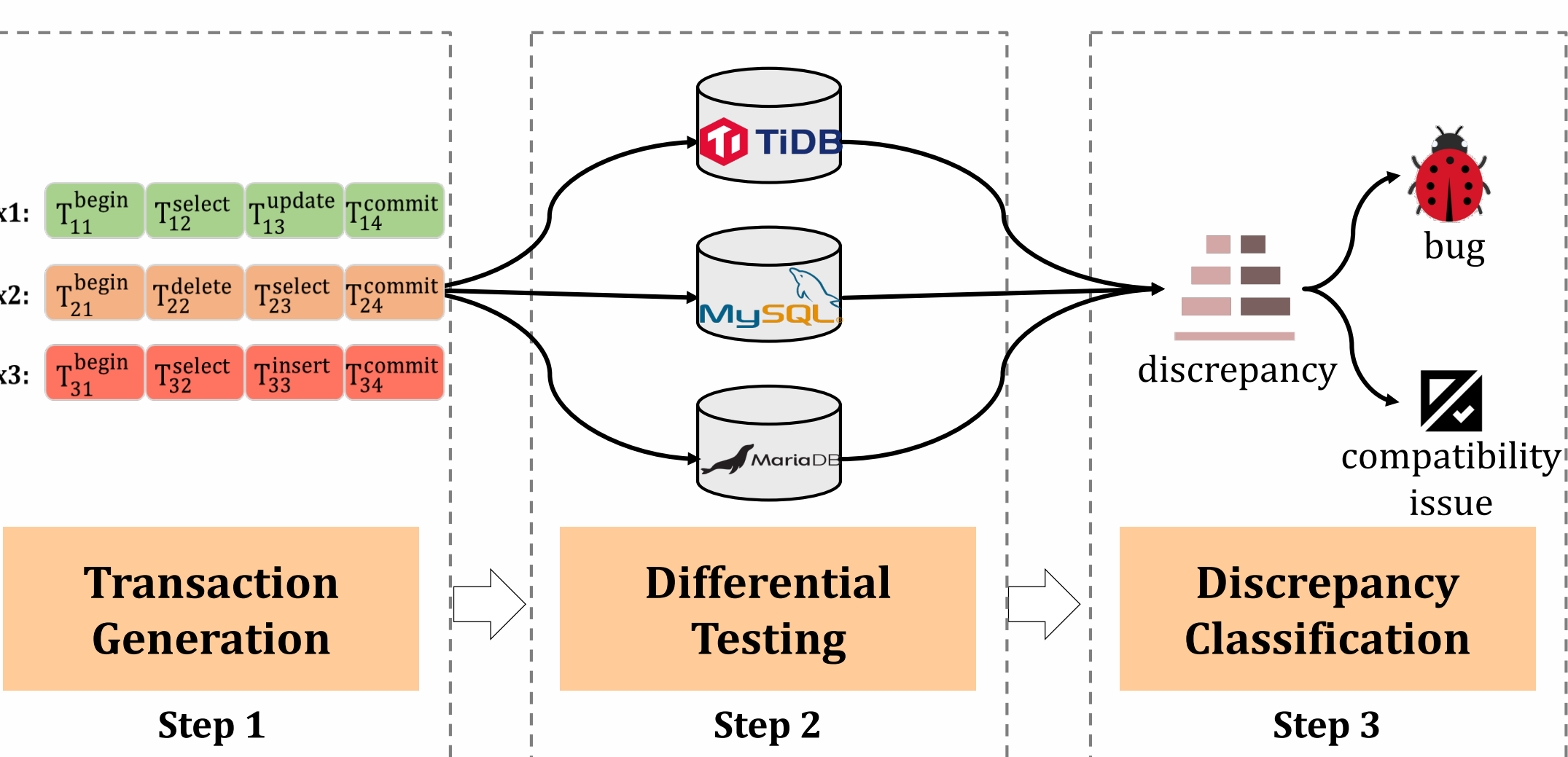
Transaction Bug

Buggy transaction implementations can cause transaction bugs

Transaction bugs cause incorrect database states and query results

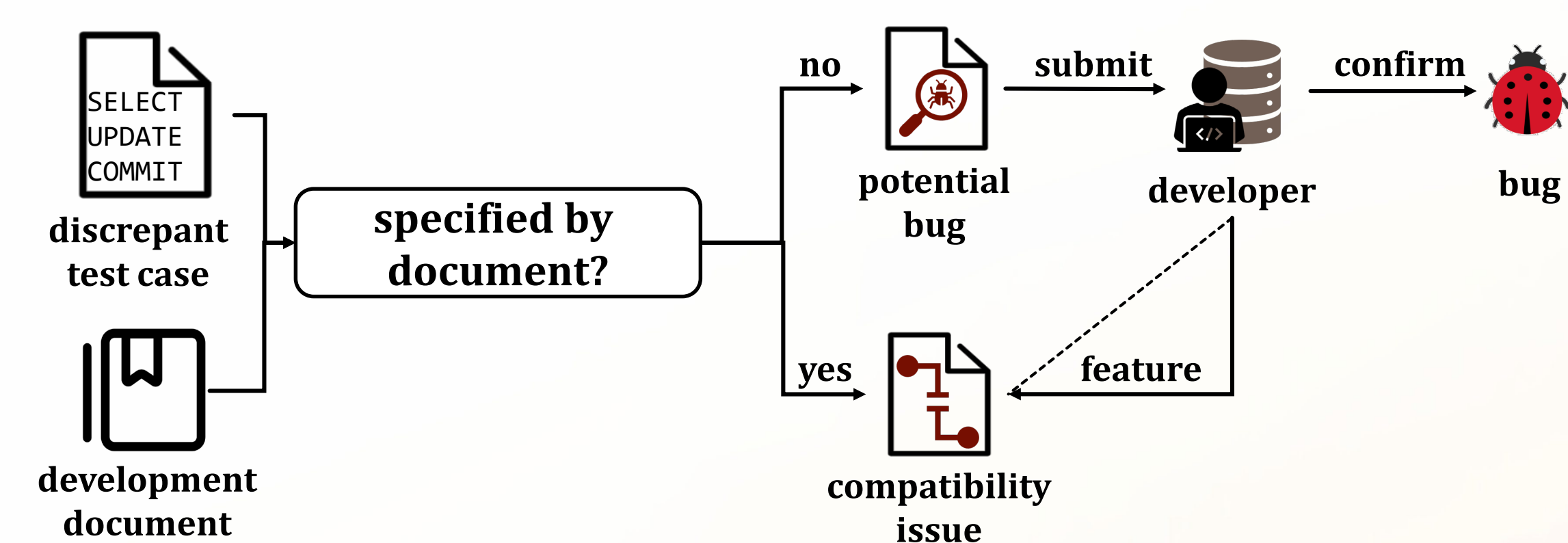


DT² Overview



Discrepancy Classification

Investigate whether it is a bug or a compatibility issue



Bug Results

DT² has detected 16 unique bugs, including 6 unknown bugs

DBMS	Total	Confirmed		Unconfirmed	False Positive
		Unknown	Duplicate		
MySQL	4	0	2	0	2
MariaDB	7	4	1	2	0
TiDB	5	2	3	0	0
Total	16	6	6	2	2

Compatibility Issue Results

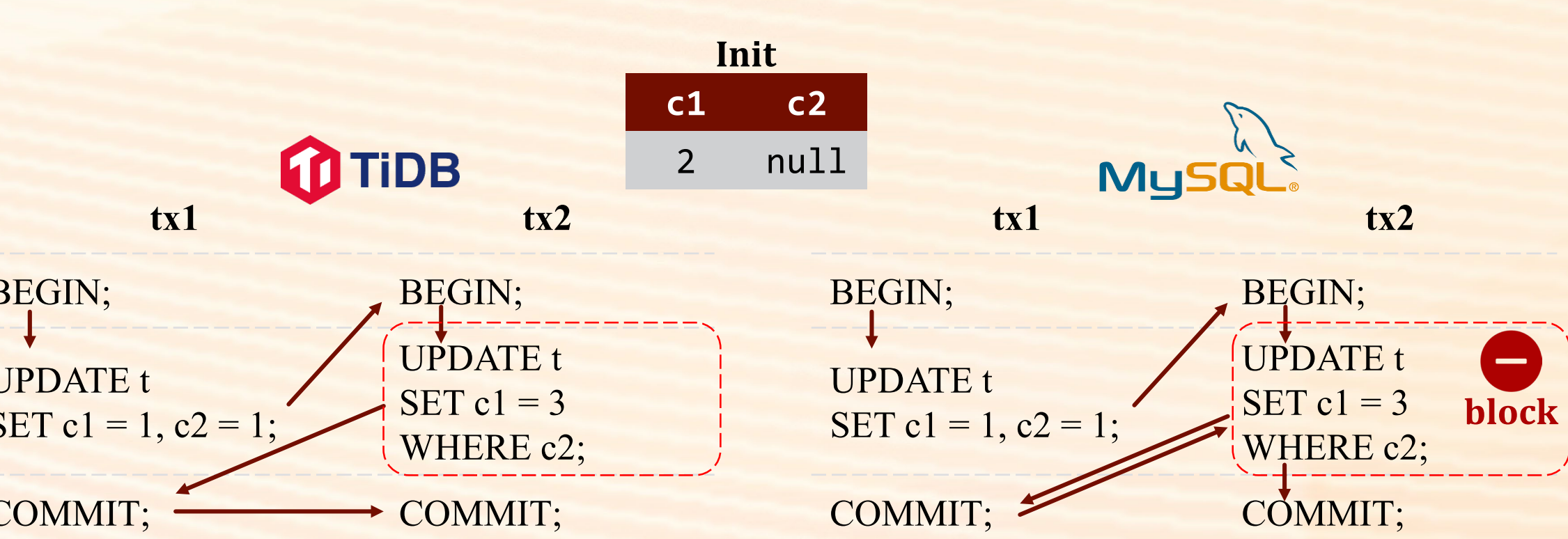
DT² has detected 92 unique compatibility issues, including 88 transaction-related compatibility issues

DBMS	Total	Transaction Related				Transaction Unrelated
		RU	RC	RR	SER	
MySQL - MariaDB	10	0	0	4	4	2
MySQL - TiDB	39	-	11	28	-	0
MariaDB - TiDB	43	-	11	30	-	2
Total	92	0	22	62	4	4

Inconsistent Lock Mechanisms (78/88)

Lock rows at Repeatable Read

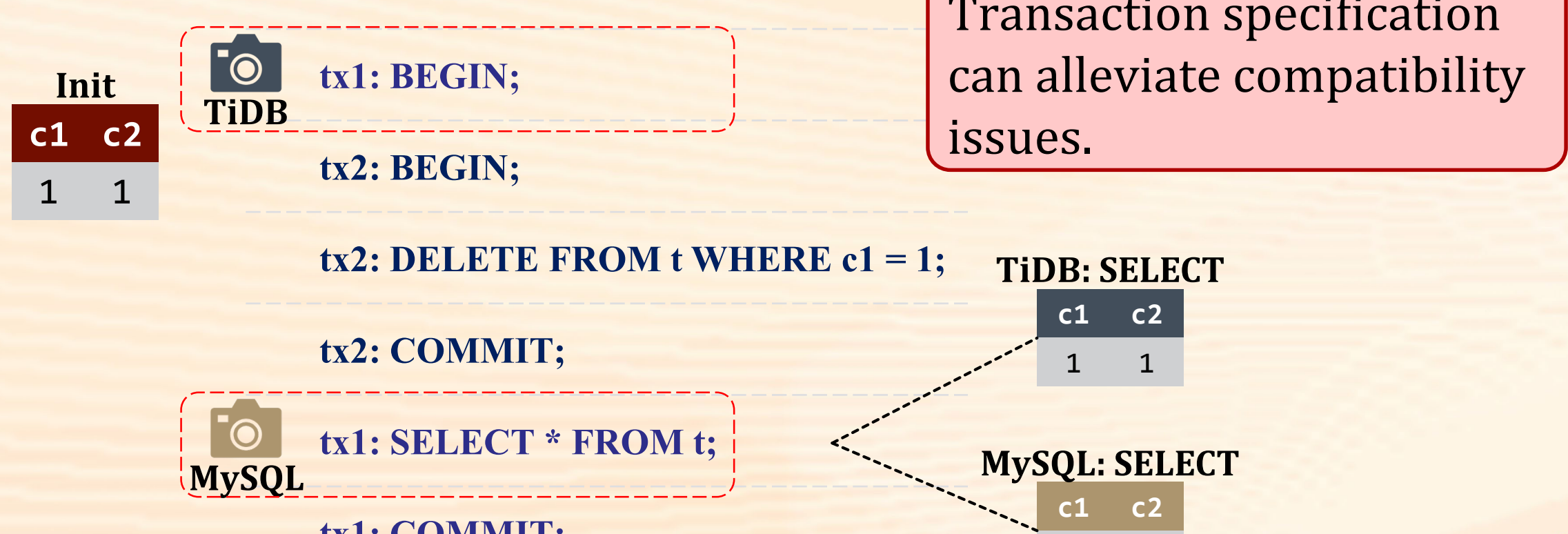
- TiDB: if WHERE condition's evaluated value is true
- MySQL and MariaDB: no matter WHERE condition's evaluated value



Inconsistent Snapshot Creation (6/88)

Create snapshot at Repeatable Read

- TiDB: at the BEGIN statement
- MySQL and MariaDB: at the first SELECT statement



Transaction specification can alleviate compatibility issues.