

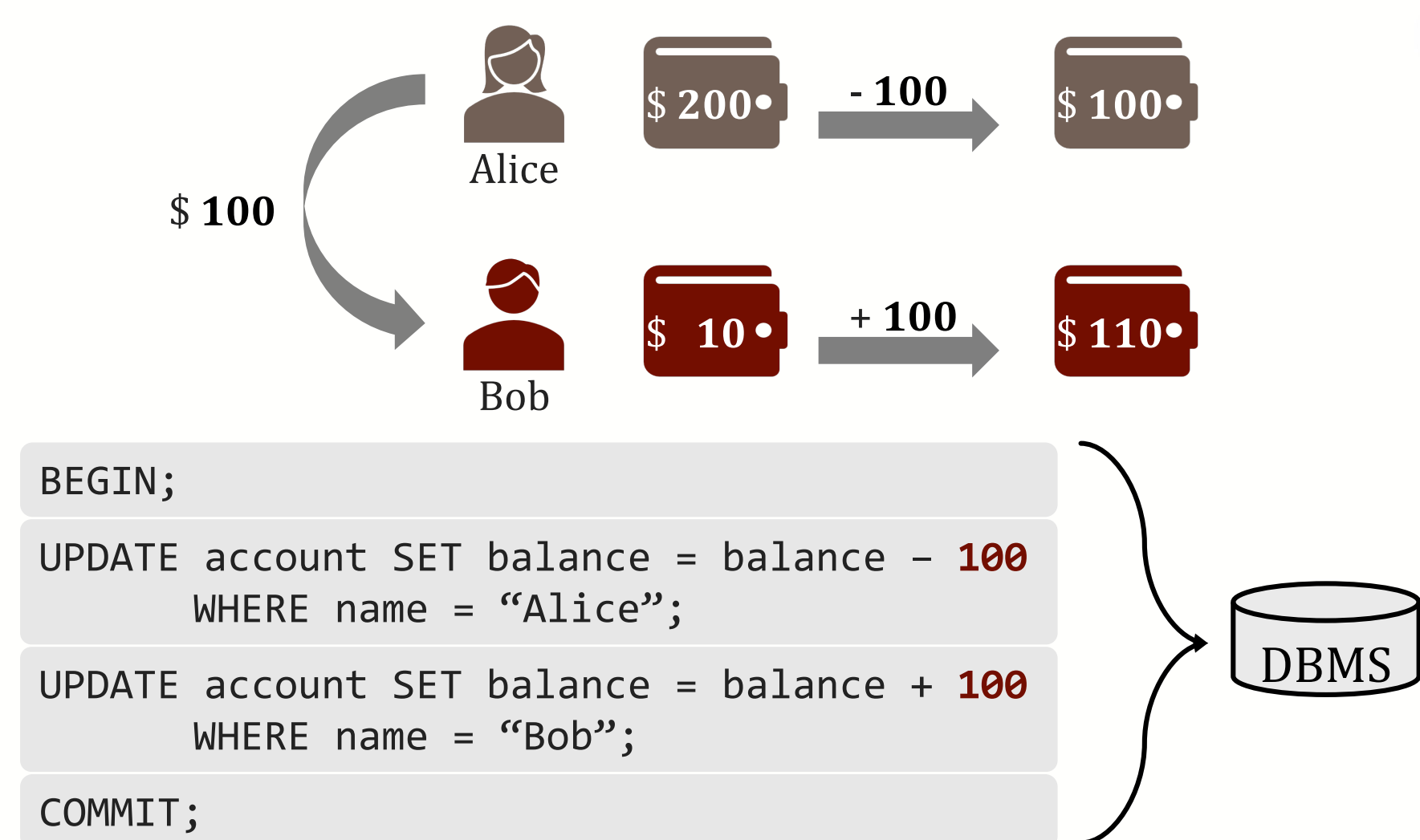
# 基于事务预言构建检测隔离缺陷

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Detecting Isolation Bugs via Transaction Oracle Construction  
The 45th IEEE/ACM International Conference on Software Engineering  
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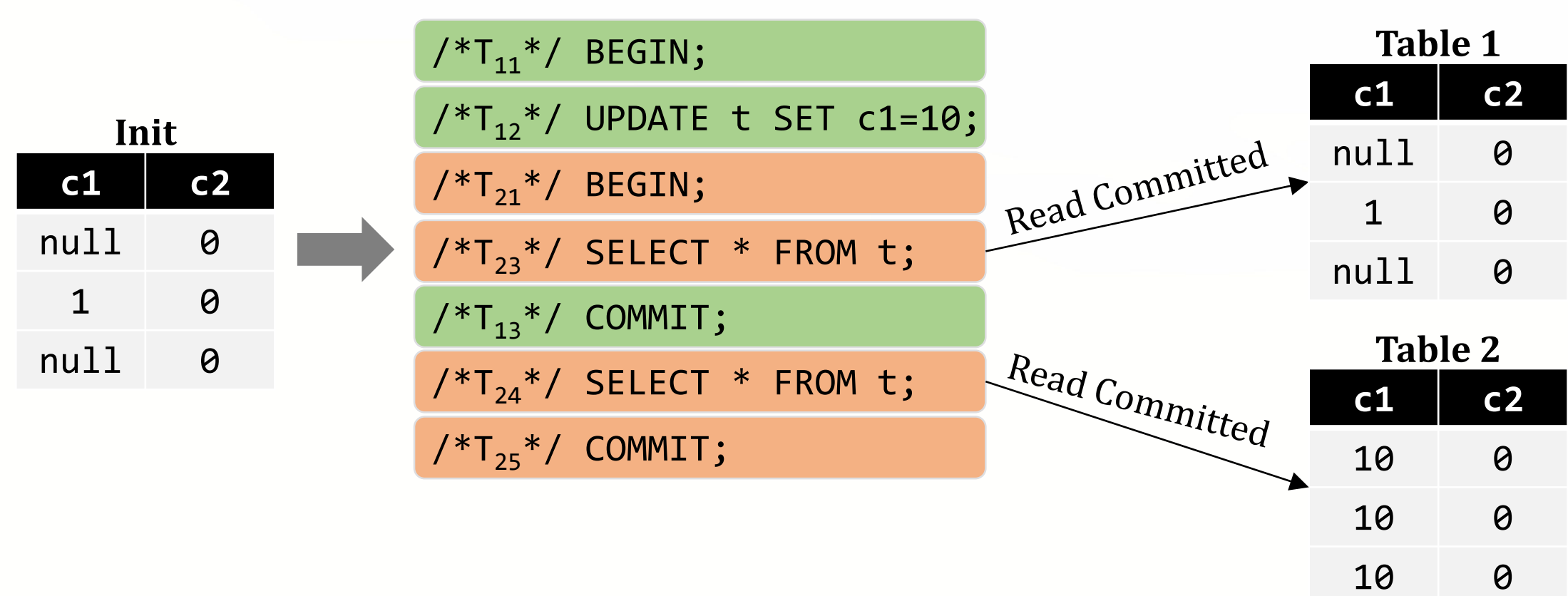
## Transaction

DBMSs utilize transactions to ensure data integrity



## Isolation Level

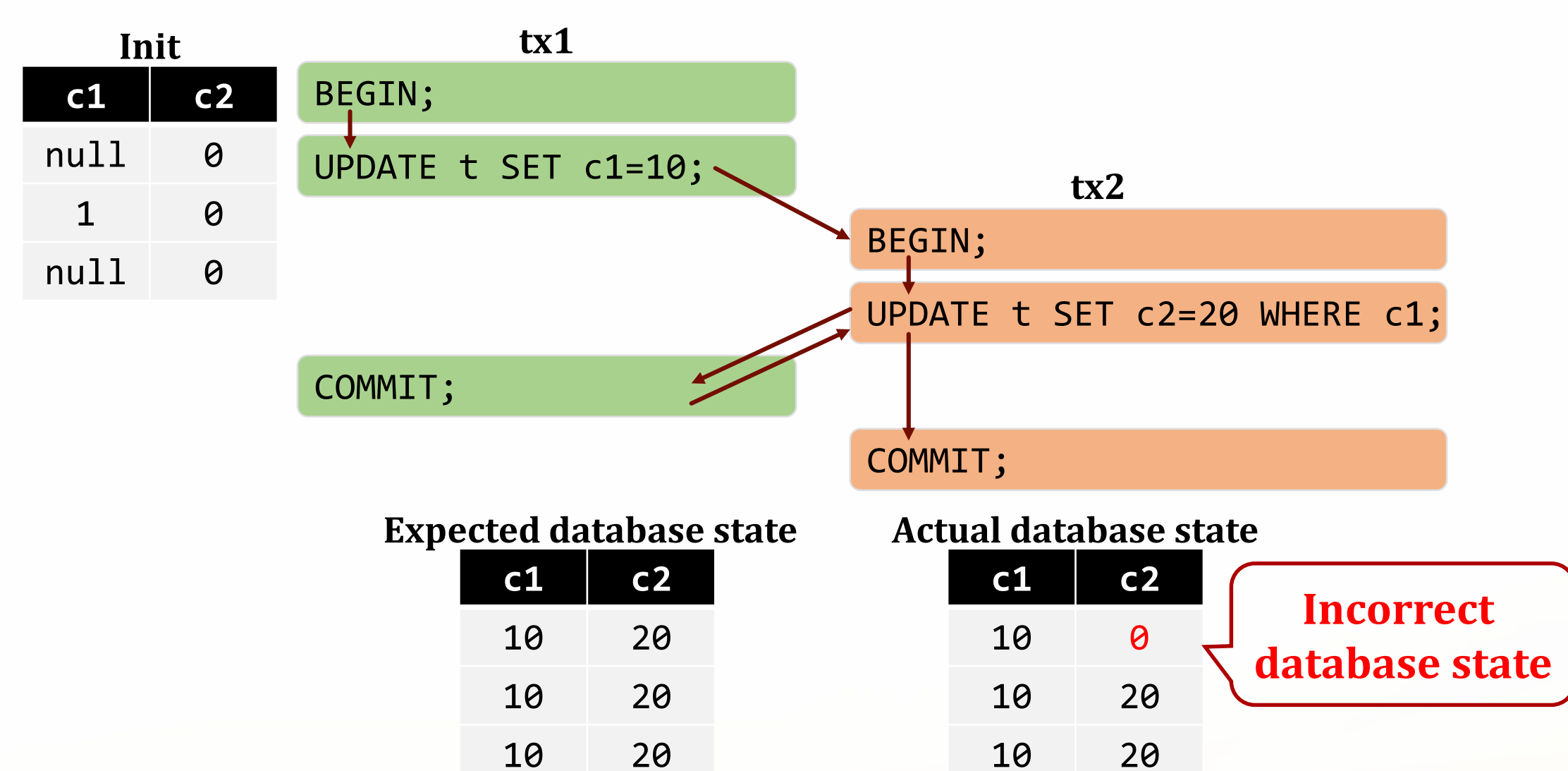
Isolation levels affect the visibility of transaction statements to other concurrent transactions



## Isolation Bug

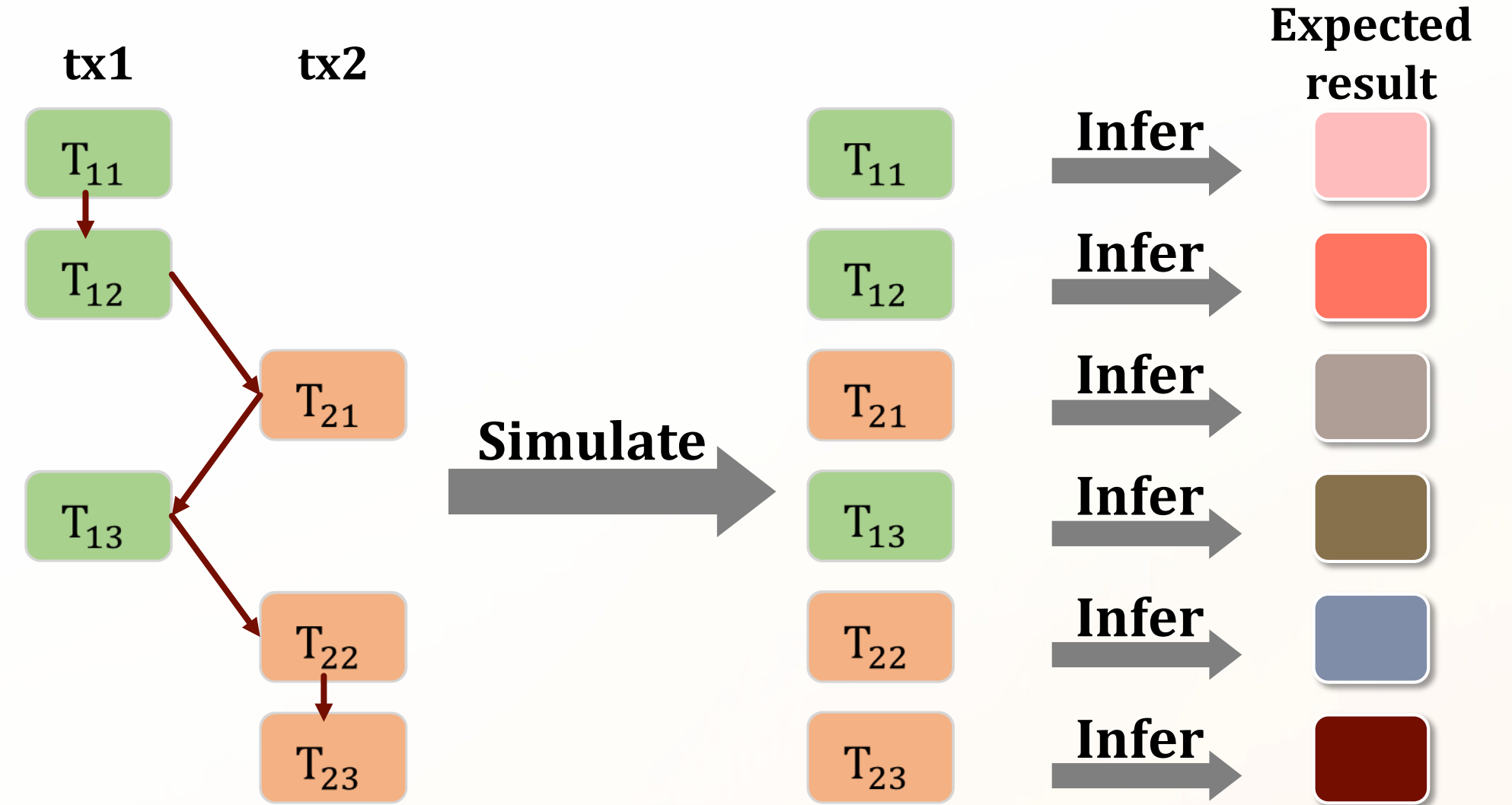
Buggy transaction processing mechanisms and implementations can cause isolation bugs

- Violate corresponding isolation semantics
- Lead to incorrect database states and query results



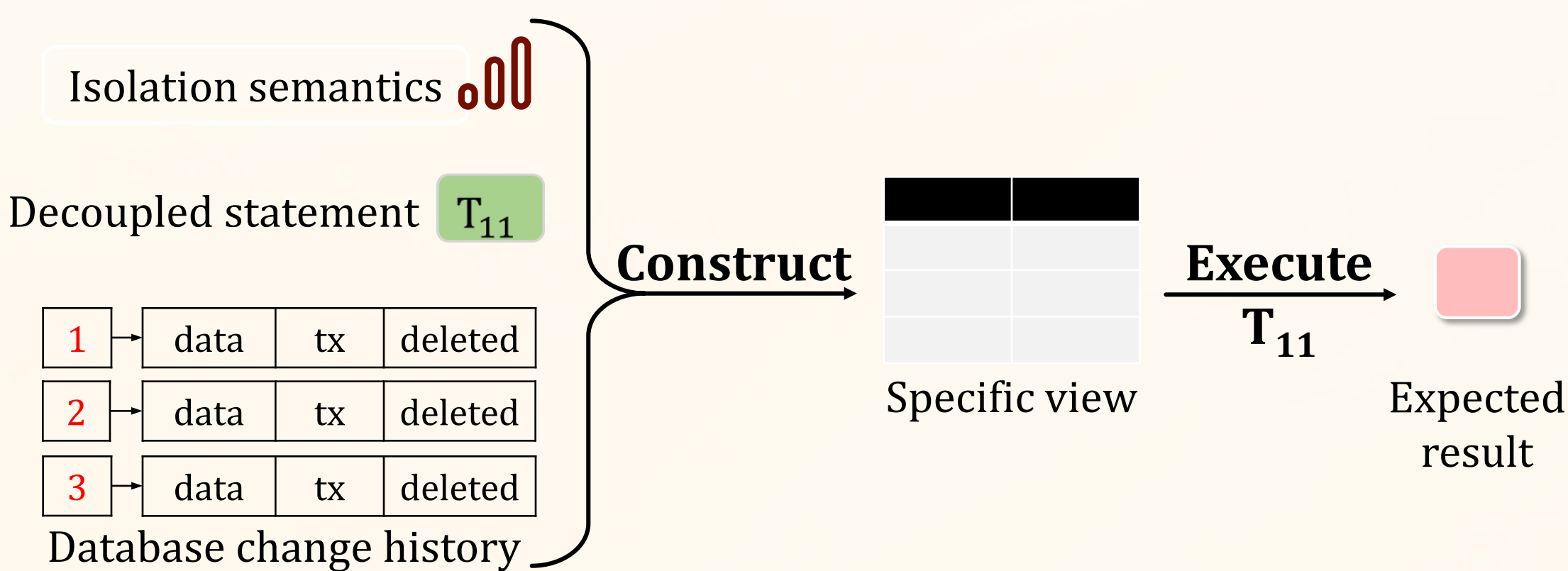
## Transaction Oracle Construction (Troc)

Simulate concurrent transaction execution by decoupling transactions into independent statements



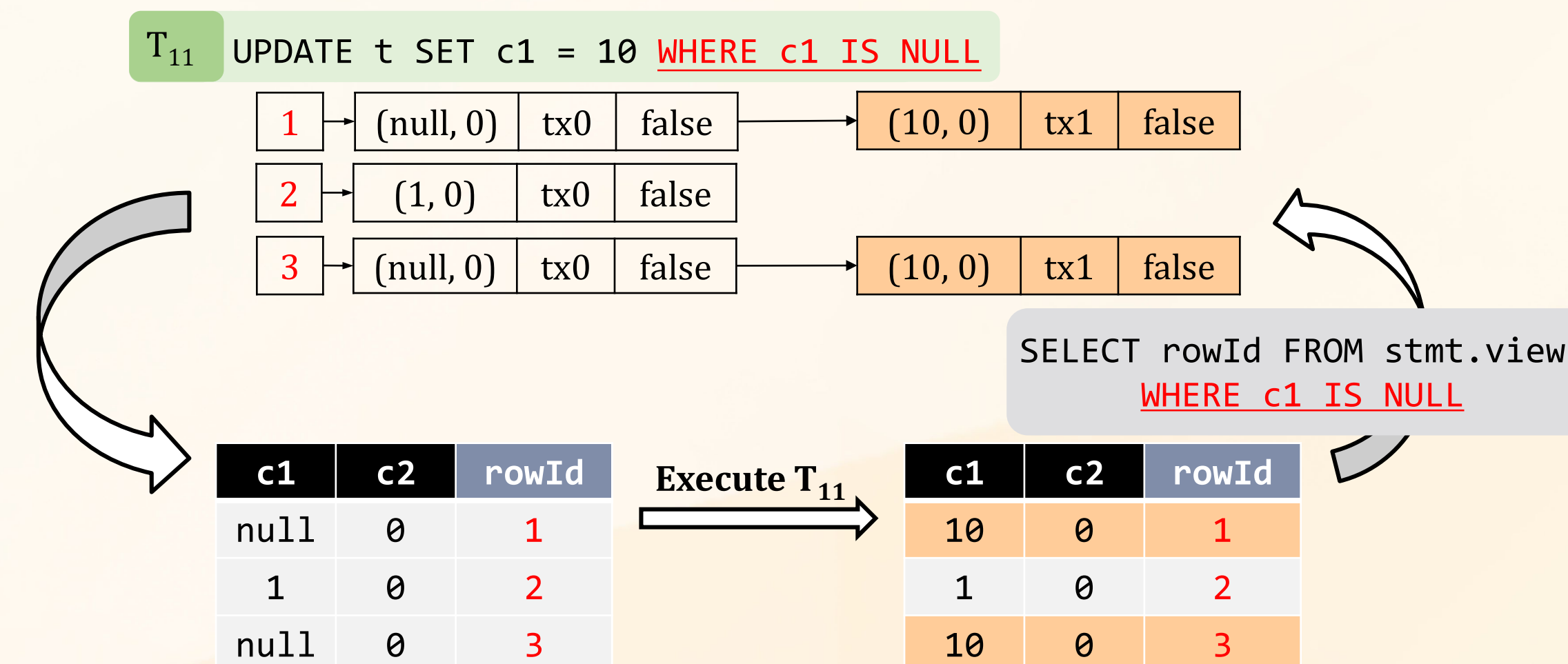
## Transaction Oracle Construction (Troc)

We construct a transaction oracle without reimplementing a reference DBMS



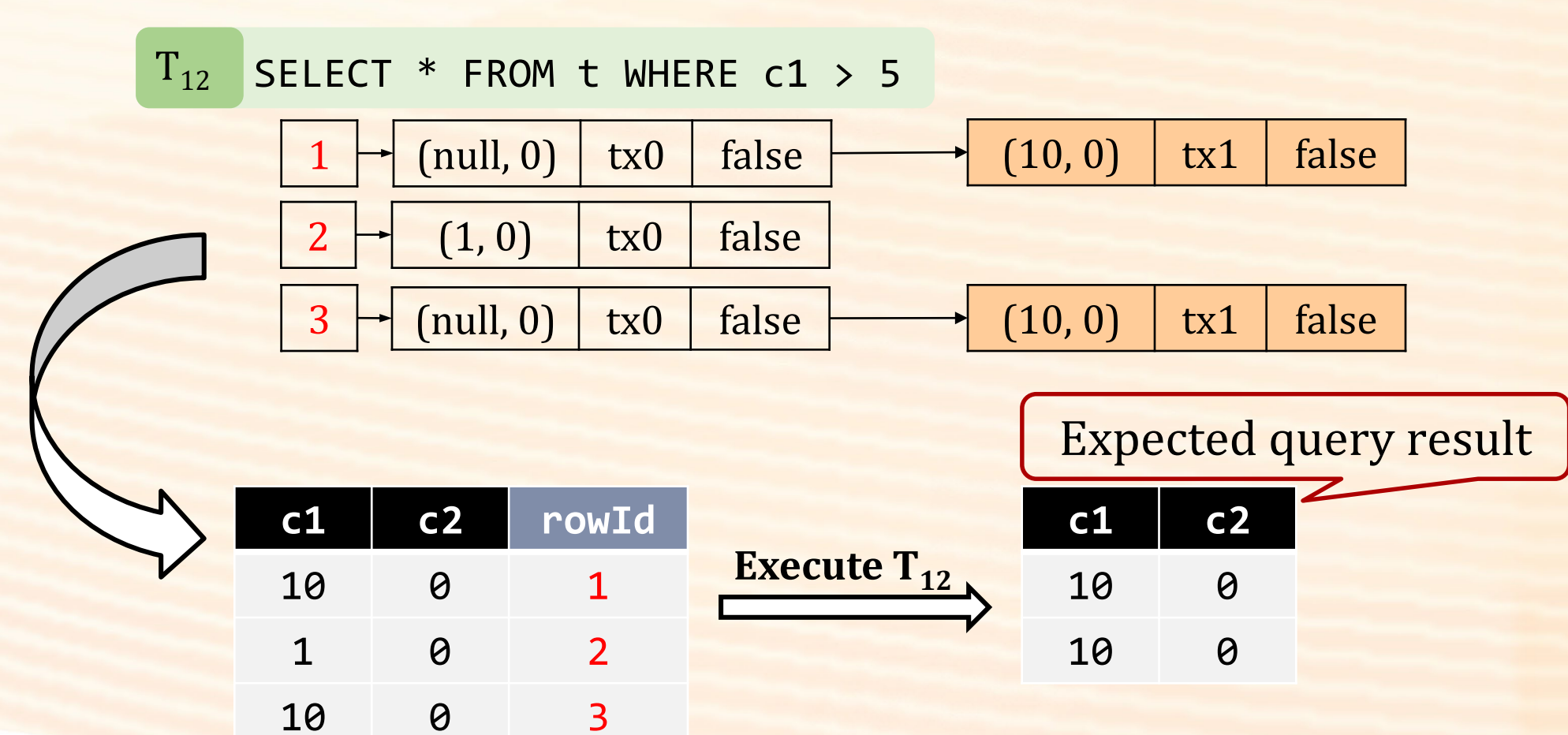
## View Construction

Build database change history for UPDATE. Attach new data versions for the modification to the view



## View Construction

Construct database view for SELECT statements based on isolation semantics



## Bug Results

Troc has detected 12 unique bugs, including 7 new confirmed bugs

DBMS	Total	New	Duplicate
MySQL	4	1	3
MariaDB	4	3	1
TiDB	4	3	1
<b>Total</b>	<b>12</b>	<b>7</b>	<b>5</b>