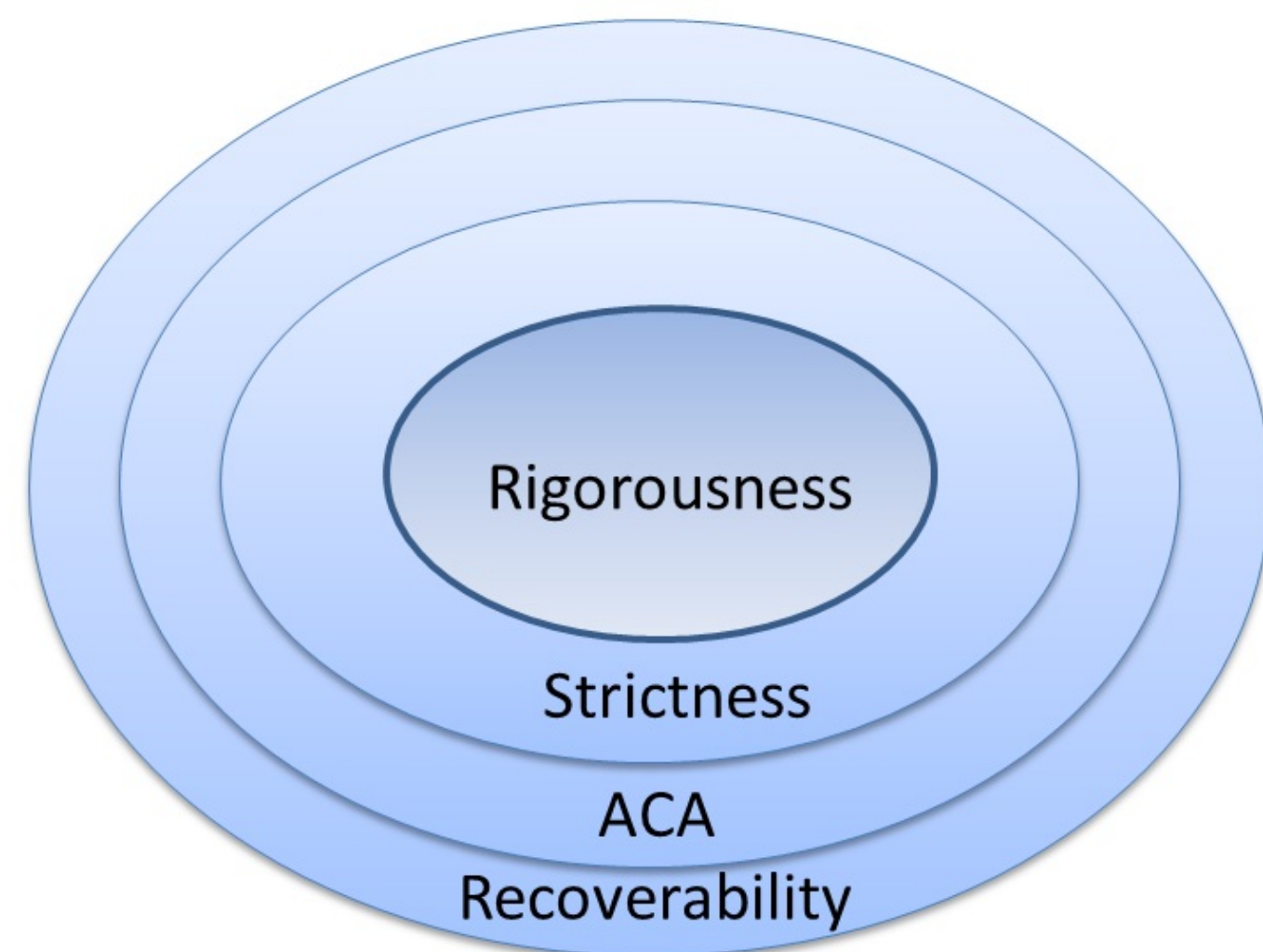


GOAL

Compare STM consistency conditions with related database consistency conditions.

DATABASE CONDITIONS [1]



Recoverability

All the transactions that have written the shared values read by transaction T , should commit before T .

Avoiding Cascading Aborts

If a transaction, T_1 writes a value read by another transaction T_2 , then T_2 can commit only after T_1 is committed.

Strictness

A transaction writing to a data item should complete (commit or abort) before another transaction reads from the data item or overwrites it.

Rigorousness

In addition to strictness, a transaction can write to a data item only if all the transactions reading it have committed or aborted.

TRANSACTIONAL MEMORY

A simple approach to programming concurrent applications, guaranteeing *Atomicity*, *Consistency* and *Isolation*.

STM CONDITIONS



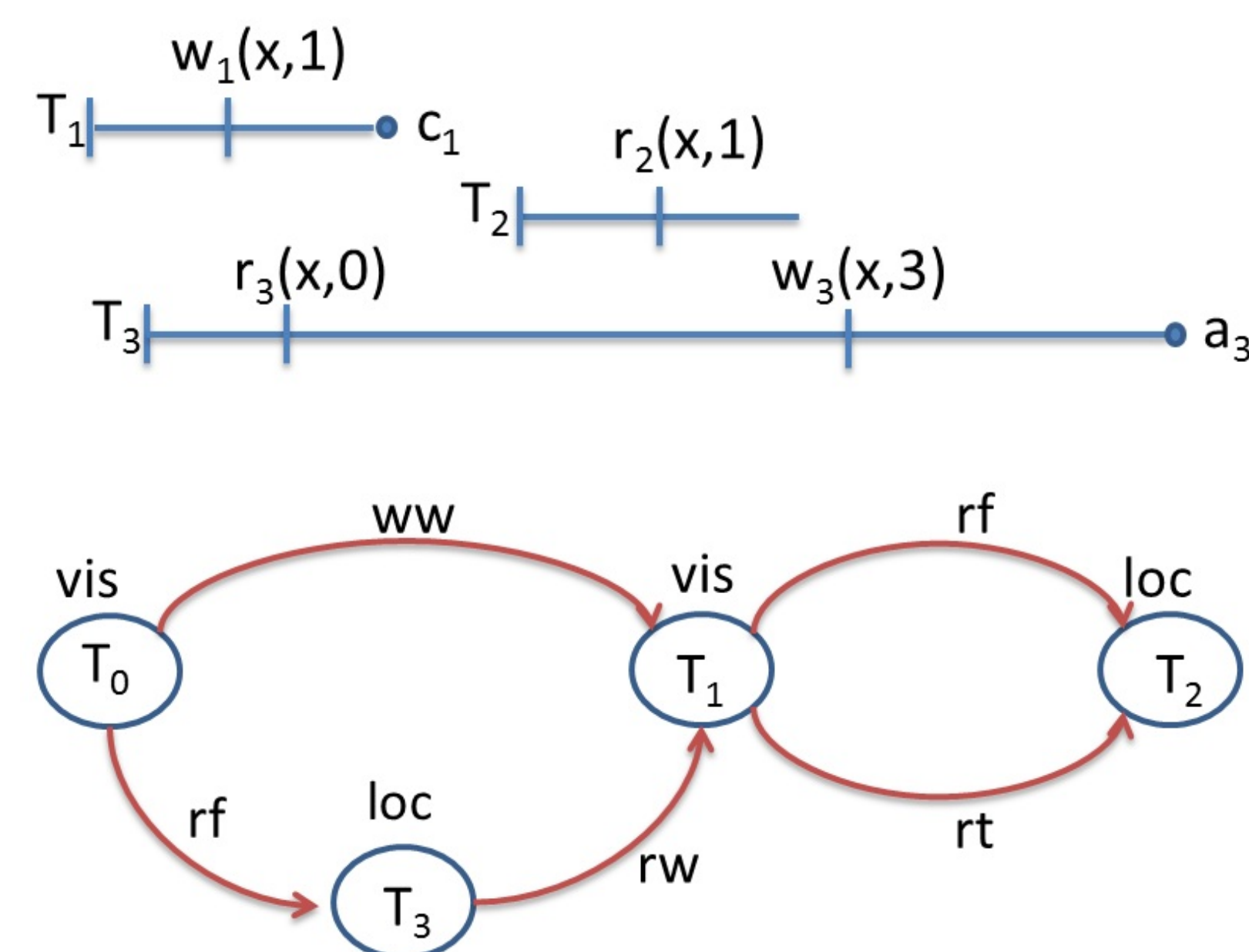
Opacity [2]

All the committed and aborted transactions appear as if they execute in a sequential order and this order respects real-time occurrences of all transactions.

Virtual World Consistency (VWC) [3]

For an aborted transaction, the values it reads are consistent only with respect to its *causal past*.

Opacity Graph Equivalent characterization of opacity, based on acyclicity of the graph representation of a history.

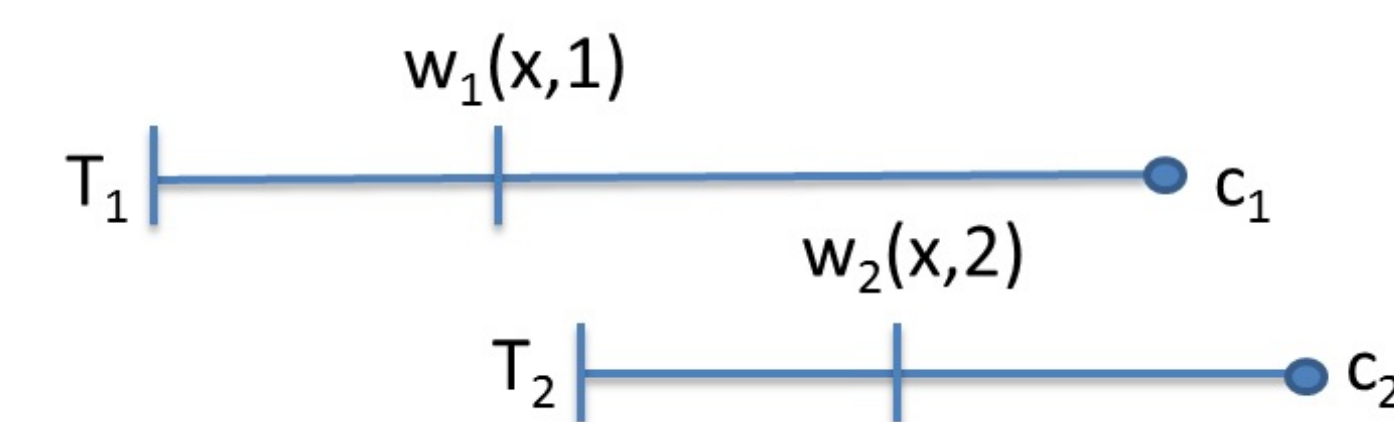


RESULTS

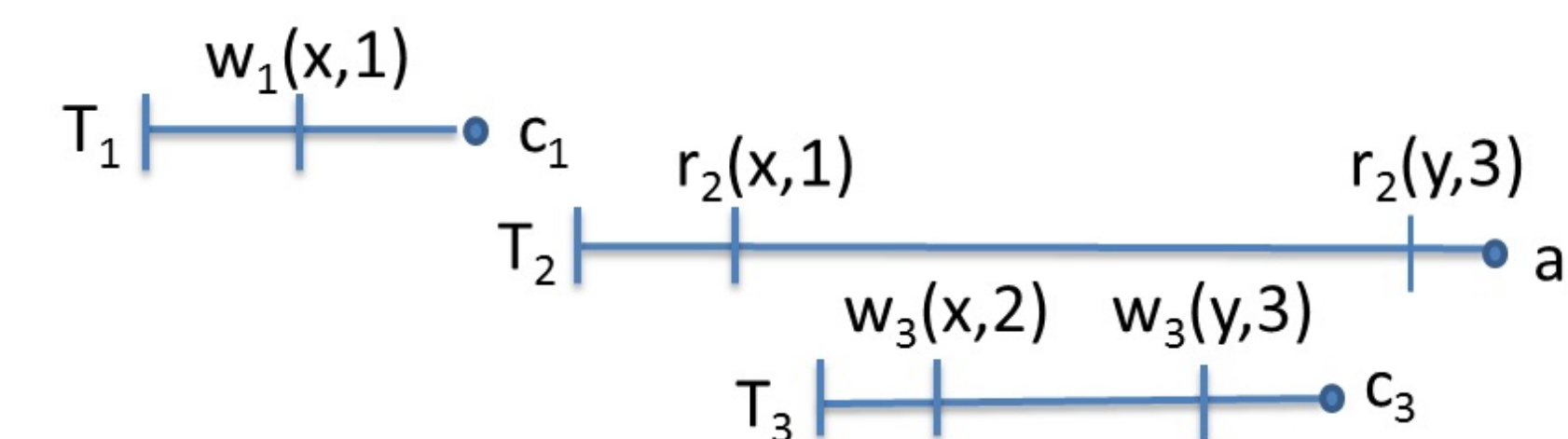
Rigorousness is Contained in Opacity

The opacity graph of a rigorous STM history is *acyclic*.

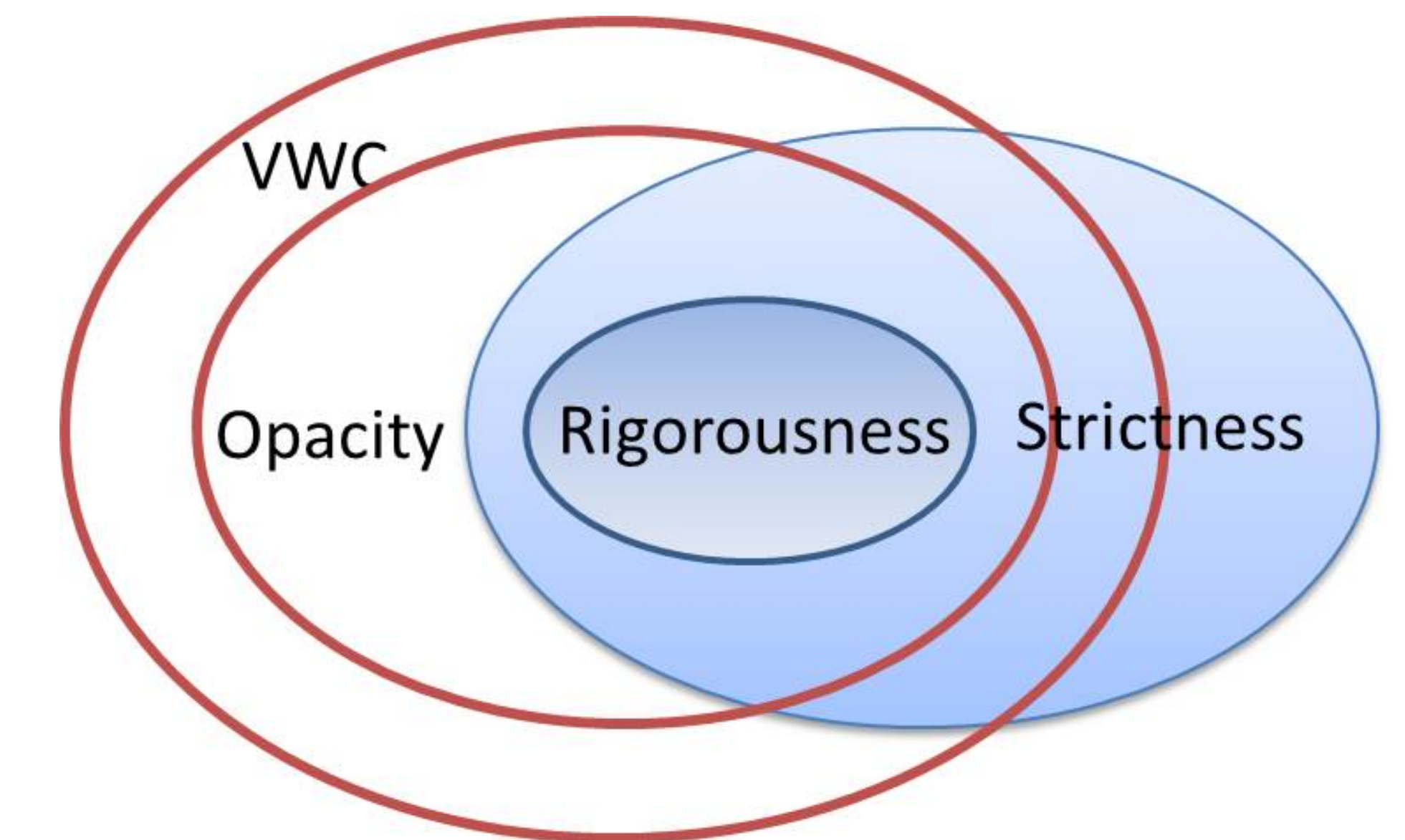
Theorem 1 $Rigorousness \subsetneq Opacity$.



History that is opaque, but not rigorous.



History that is opaque, but not strict.



NON-EAGERNESS

Logical Commit Point

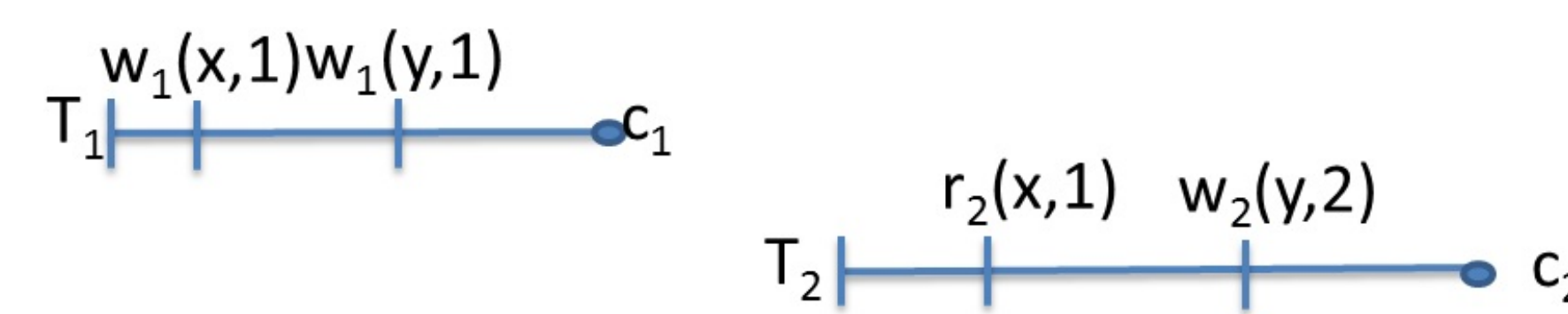
The point at which the transaction is sure to commit successfully.

Non eager STM

STMs that write only after their logical commit-point.

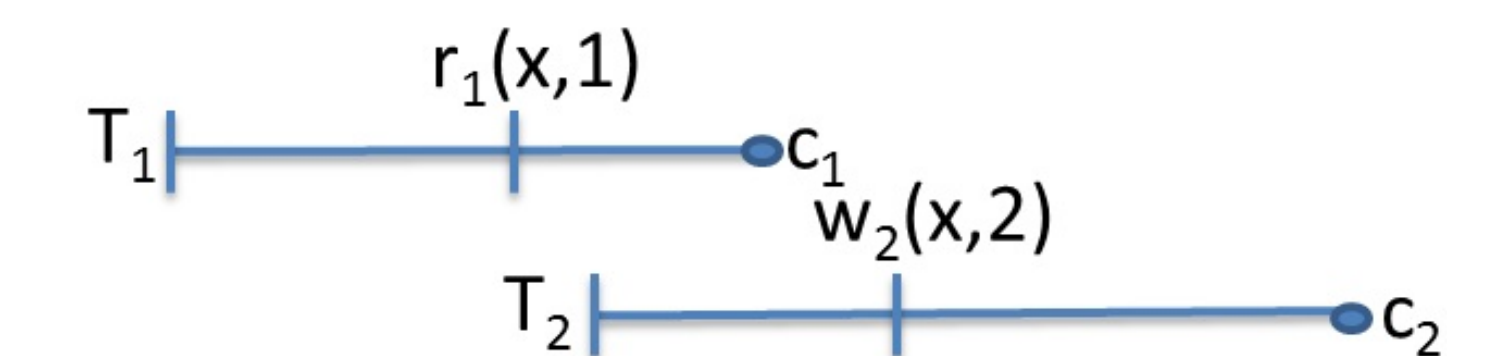
Non-eagerness Implies Strictness

Theorem 2 A non-eager STM is strict.

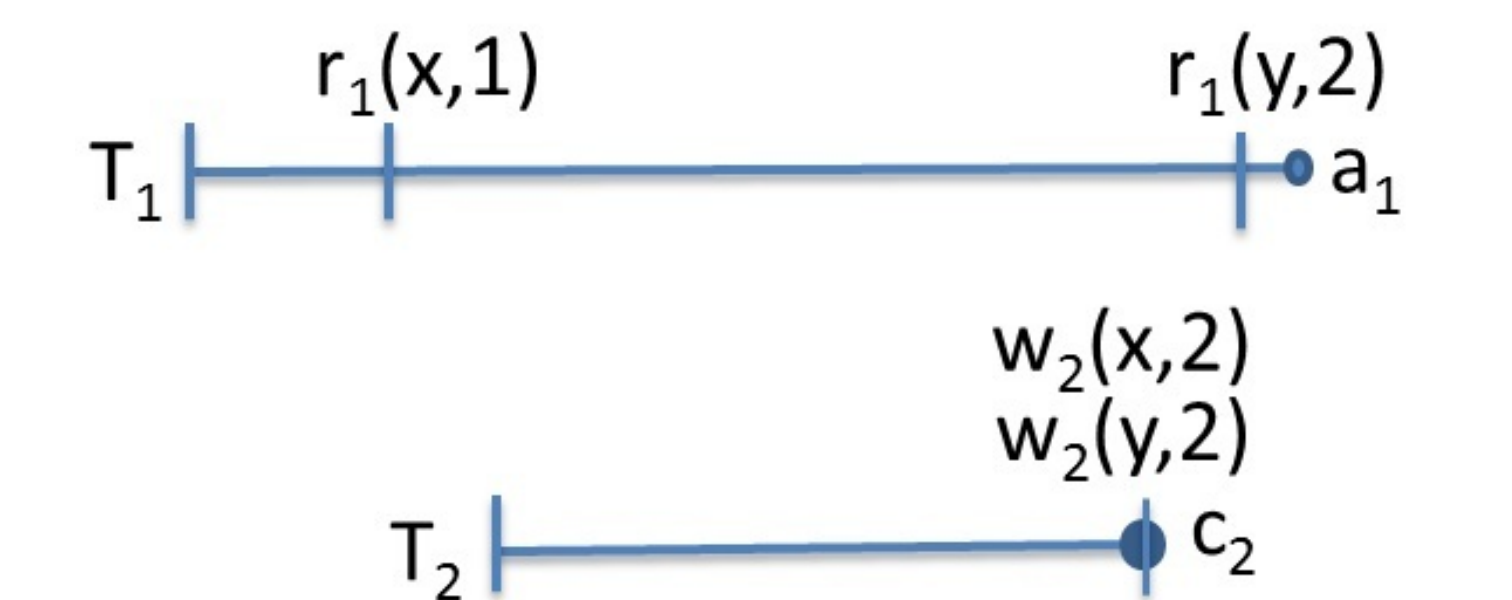


History that is *strict*, but not non-eager.

Incomparable to Rigorousness and Opacity



History that is rigorous (and hence opaque), but *not* non-eager.



History that is non-eager, but not opaque (and hence not rigorous).

REFERENCES

[1] P.A. Bernstein, V.Hadzilacos, and N. Goodman. Concurrency Control and Recovery in Database Systems. Addison Wesley, 1987.

[2] R. Guerroui, M. Kapalka. On the correctness of transactional memory. PPOPP '08

[3] D. Imbs, J.R.G. de Mendivil, and M. Raynal. Virtual World Consistency: a new condition for stm systems. PODC '09

[4] S. Doherty, L. Groves, V. Luchangco, and M. Moir. Towards formally specifying and verifying transactional memory. Electron. Notes Theor. Comput. Sci., Dec '09.

FUTURE DIRECTIONS

Relate TMS (Transactional memory specification) [4] to the database conditions.

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