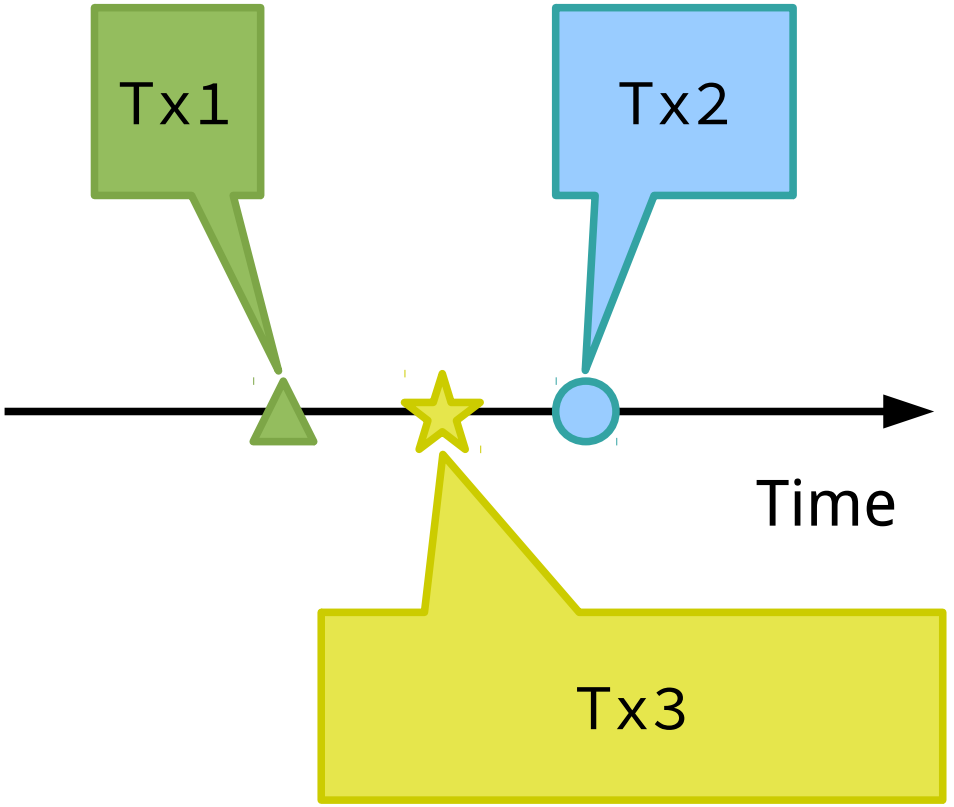
# Transaction Preserialisation in Transactional Memory

Tiago M. Vale, João A. Silva, Ricardo R. Dias, João M. Lourenço
CITI – NOVA University of Lisbon
WTM 2014

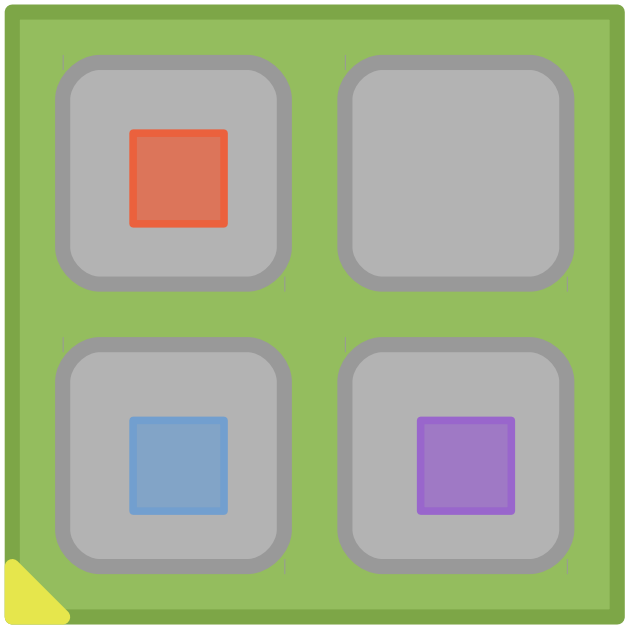
# Transactions



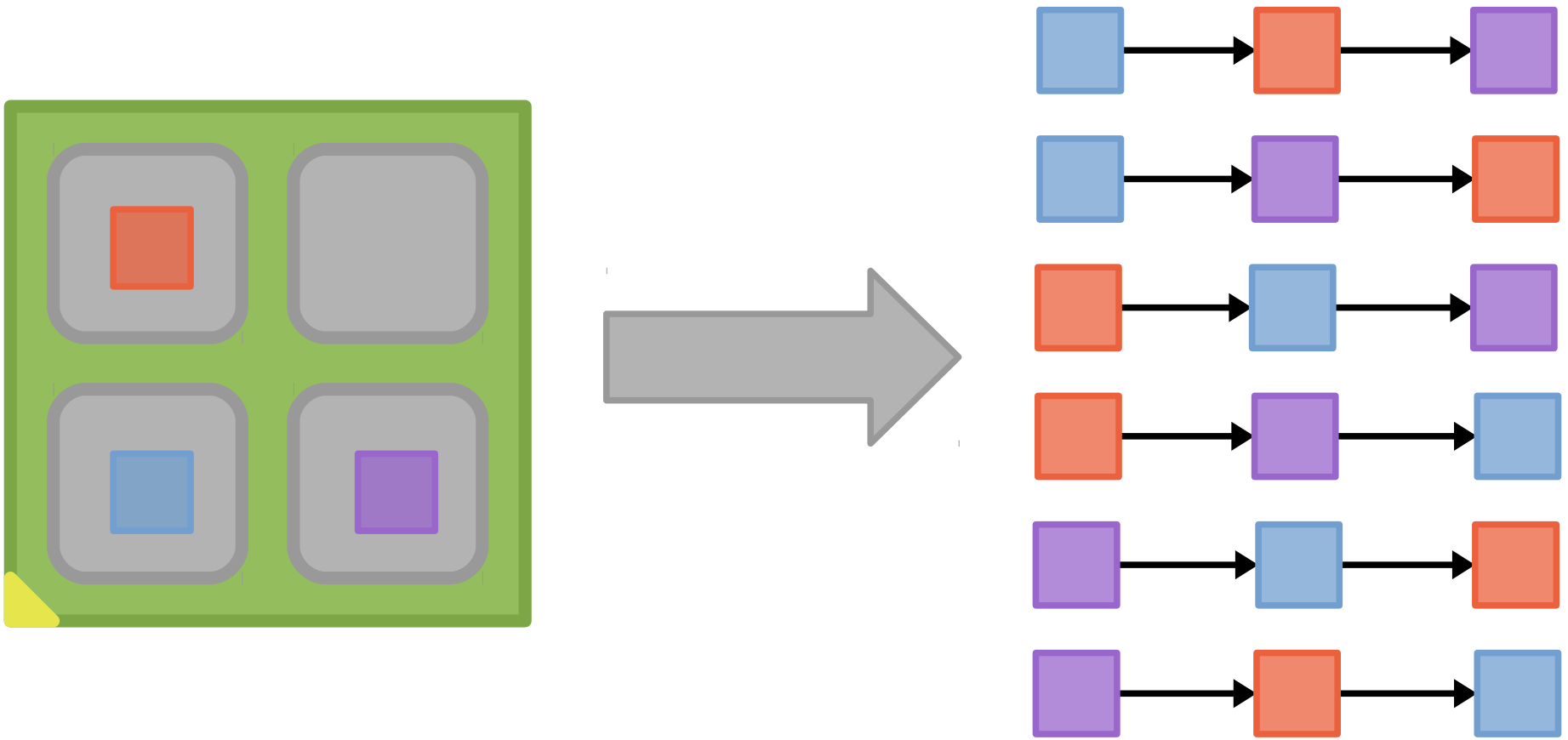
# Serializability

"The result of concurrently executing a set of transactions is equivalent to **some** sequential execution of the same transactions."

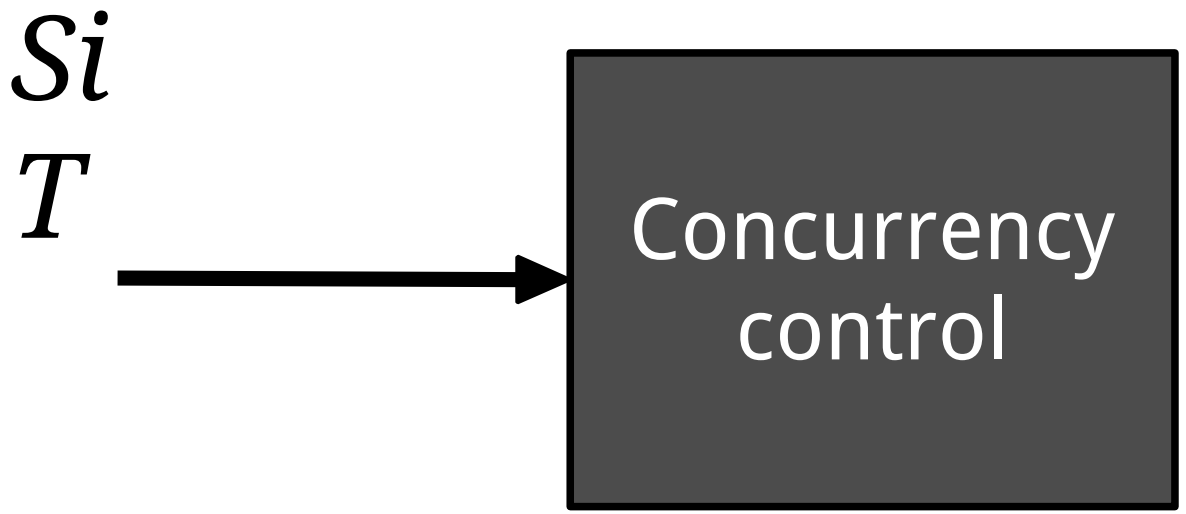
# Serializability



# Serializability



# Traditional concurrency control



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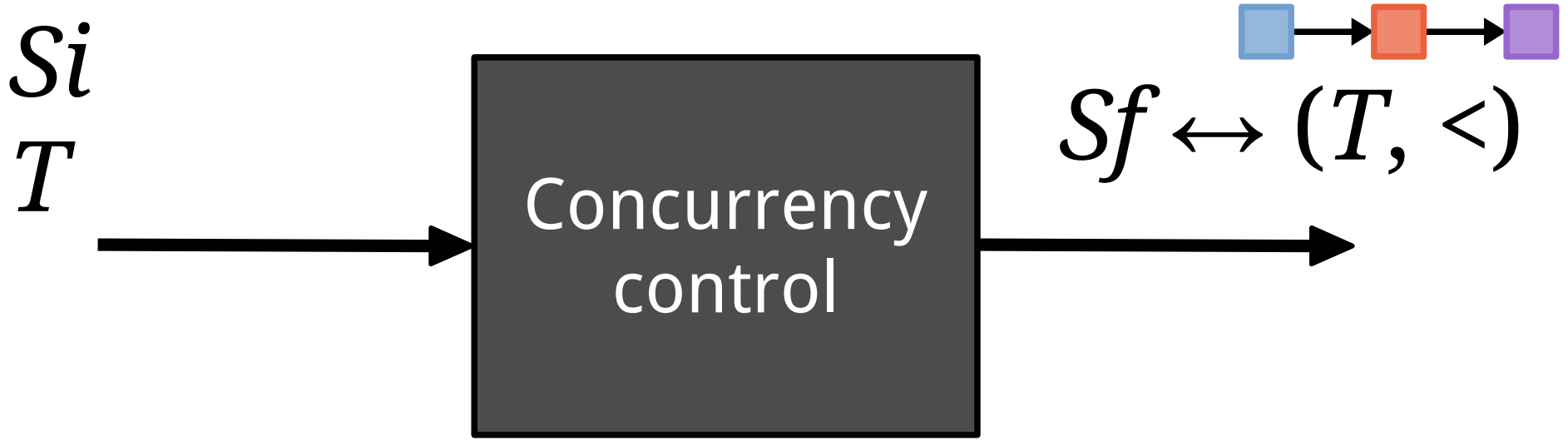

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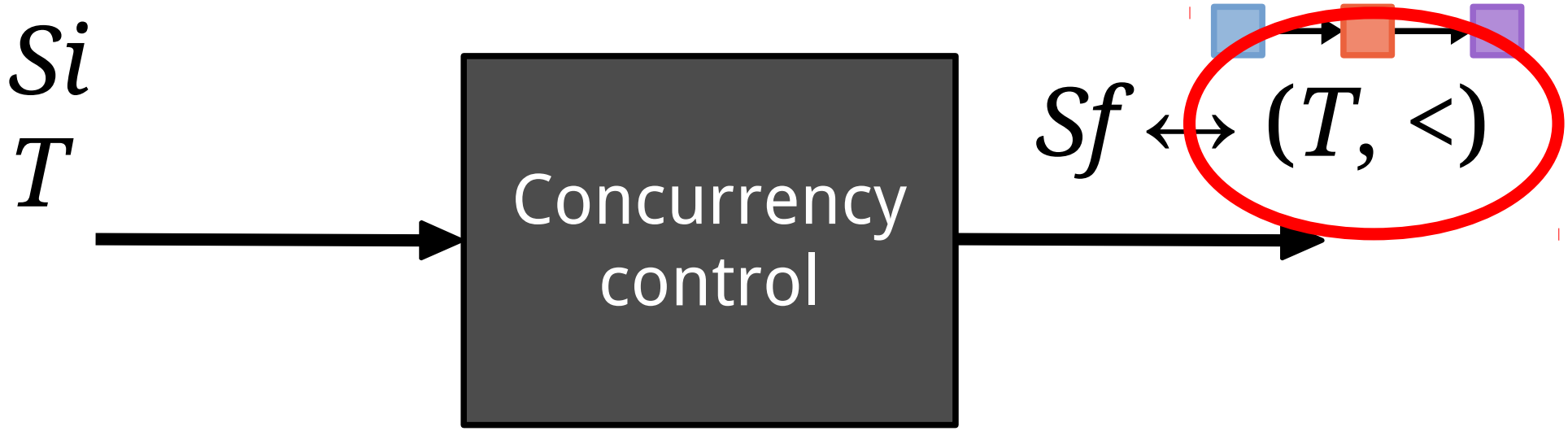


Computed nondeterministically during transaction runtime

# Optimistic concurrency control (OCC)

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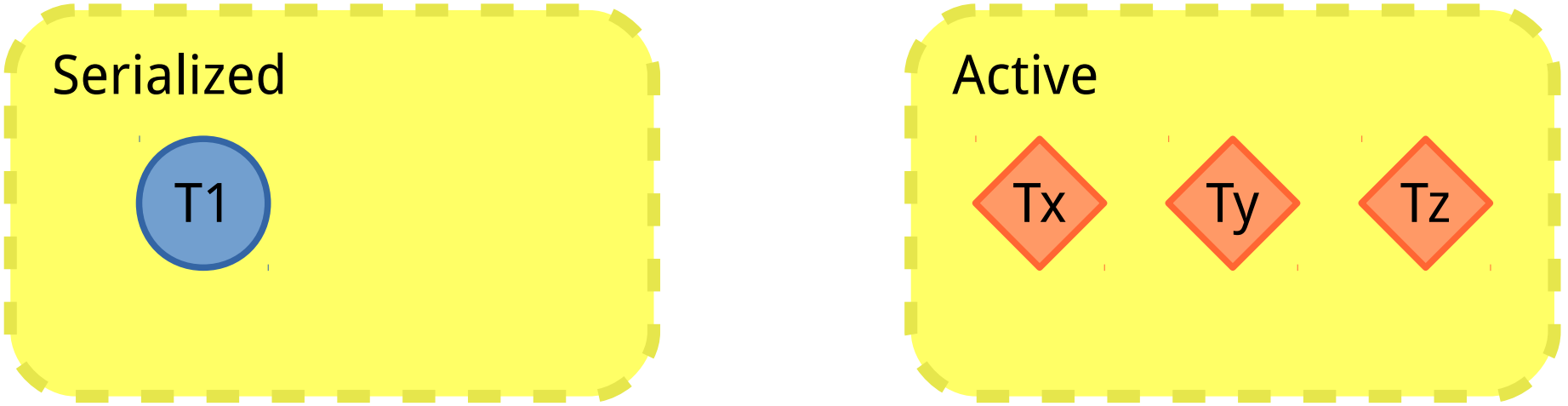

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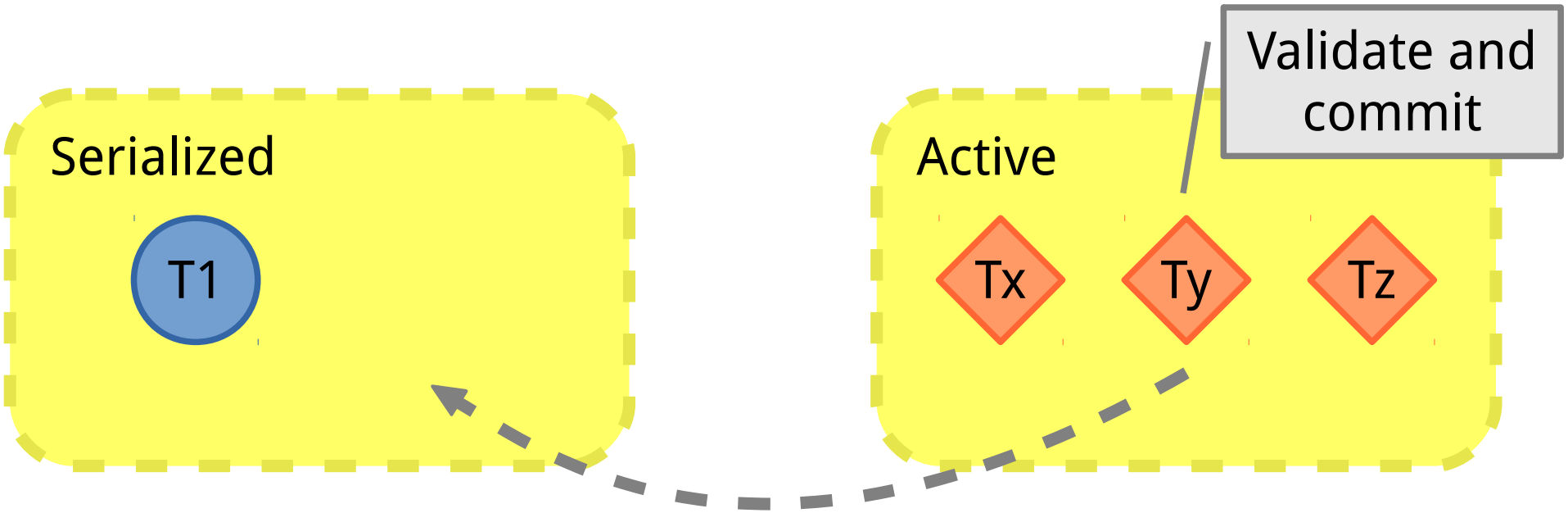

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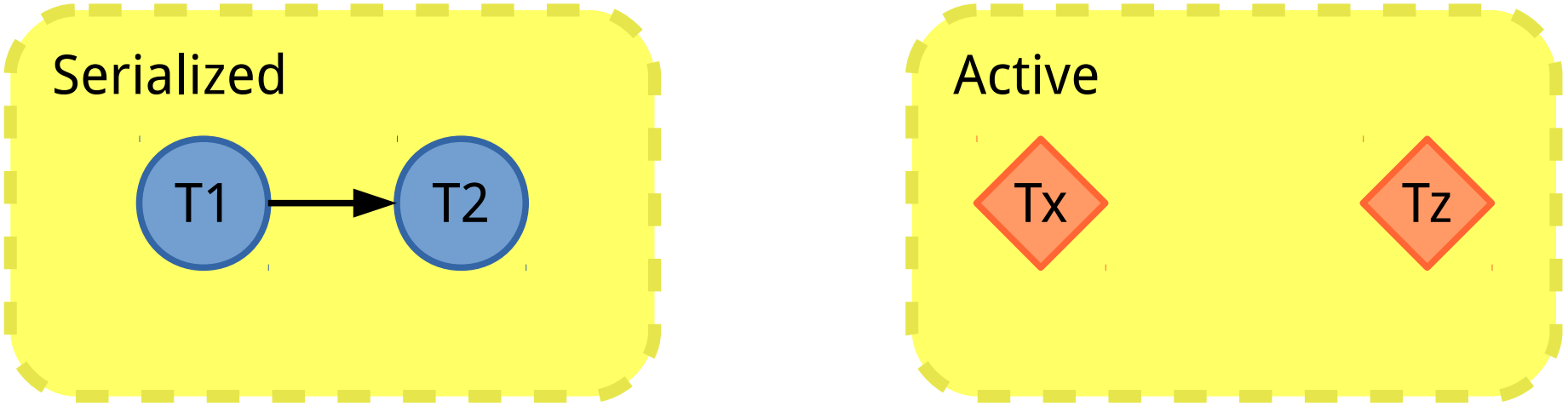

Two distinct tasks at the same time:

(1) defining the serialization order;

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(1) defining the serialization order;

(2) controlling the concurrent execution to respect the defined order.

We propose to **separate** them!

# Deterministic concurrency control

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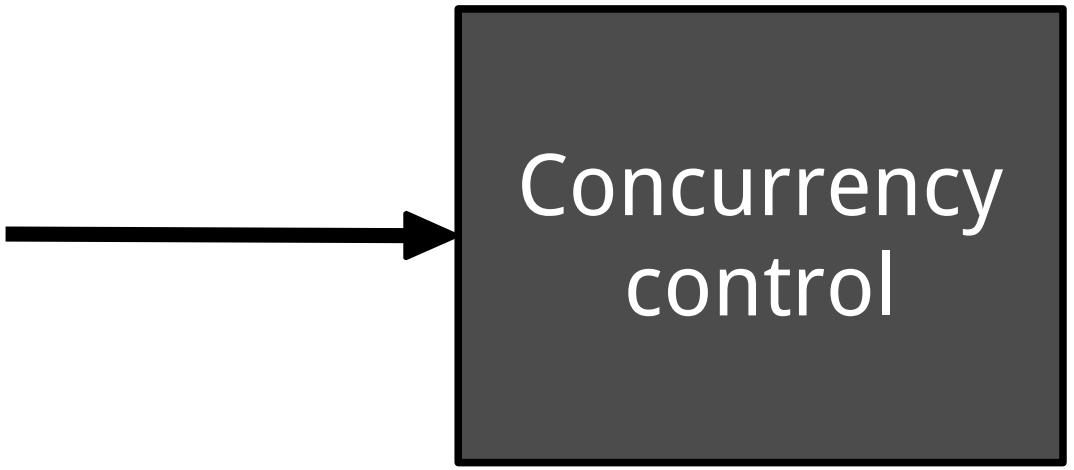

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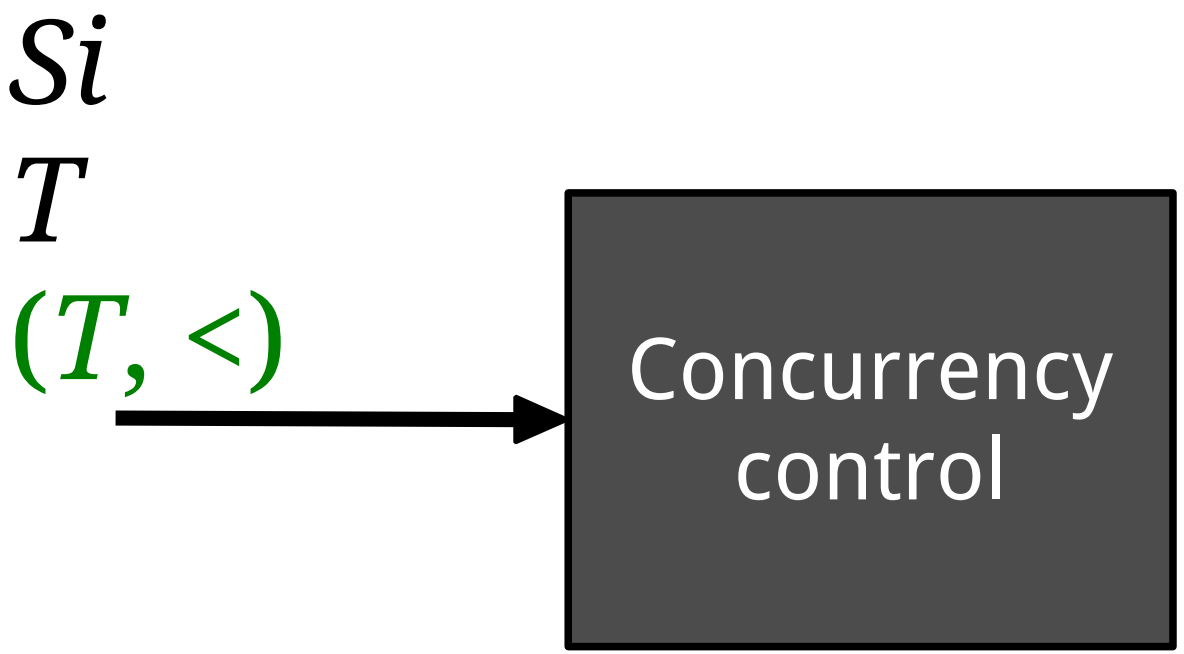

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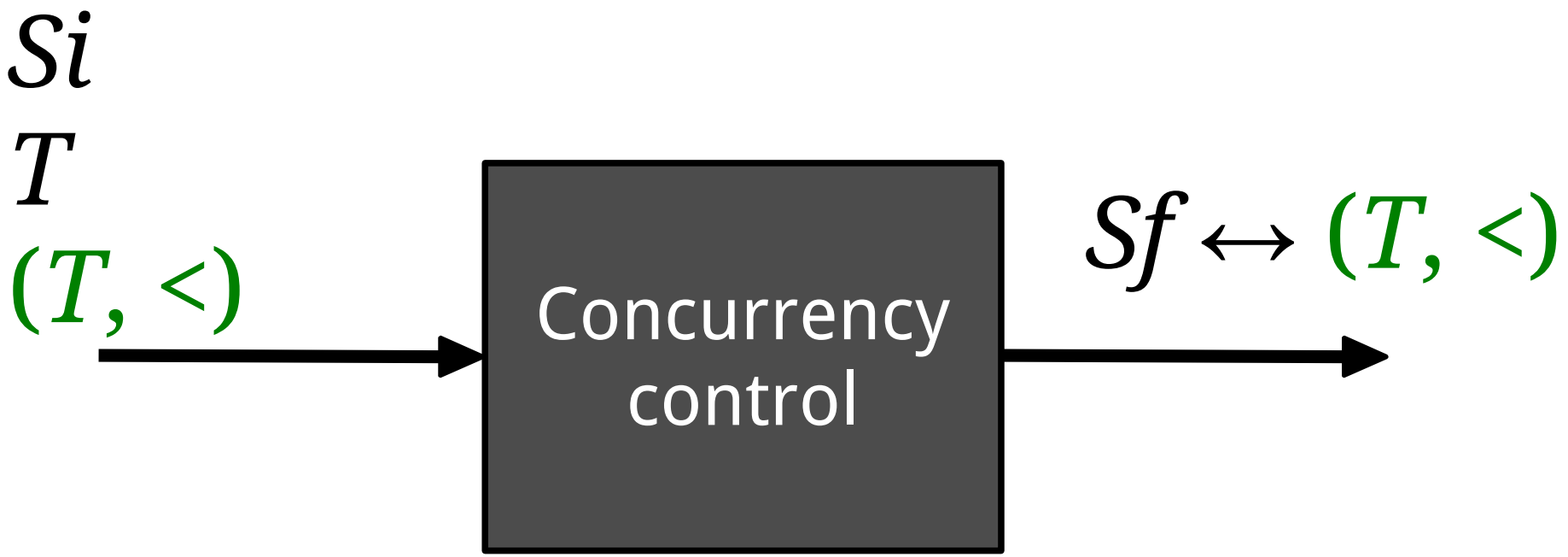
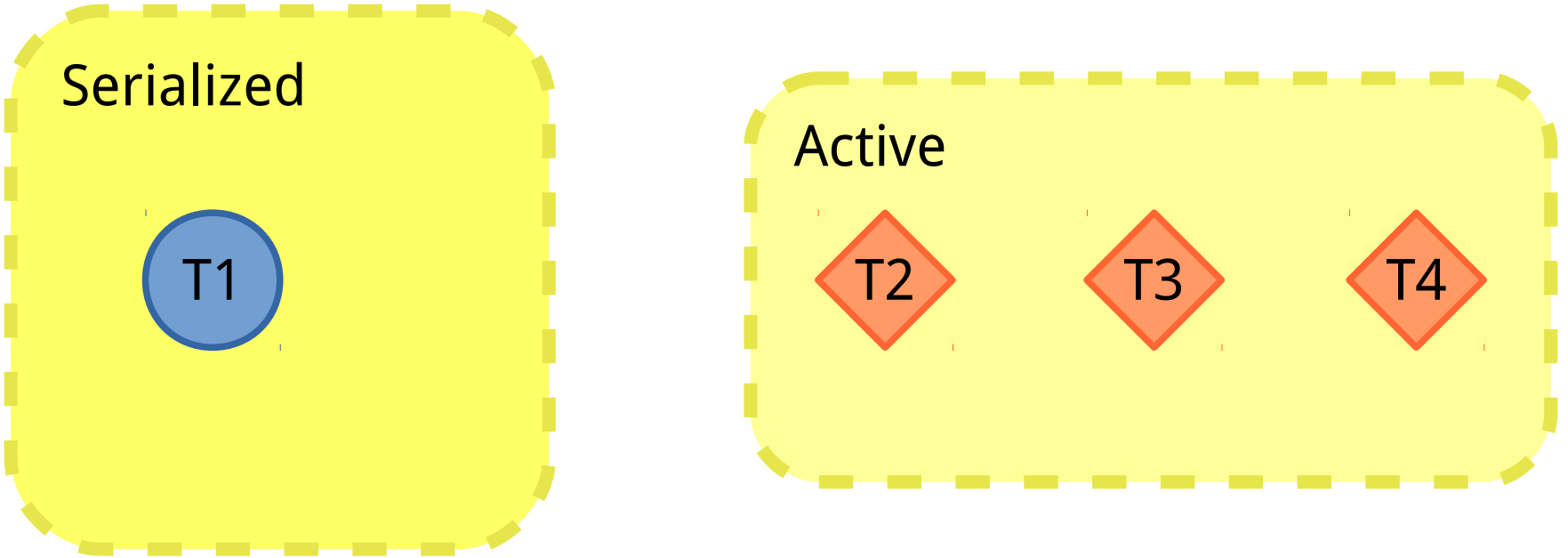
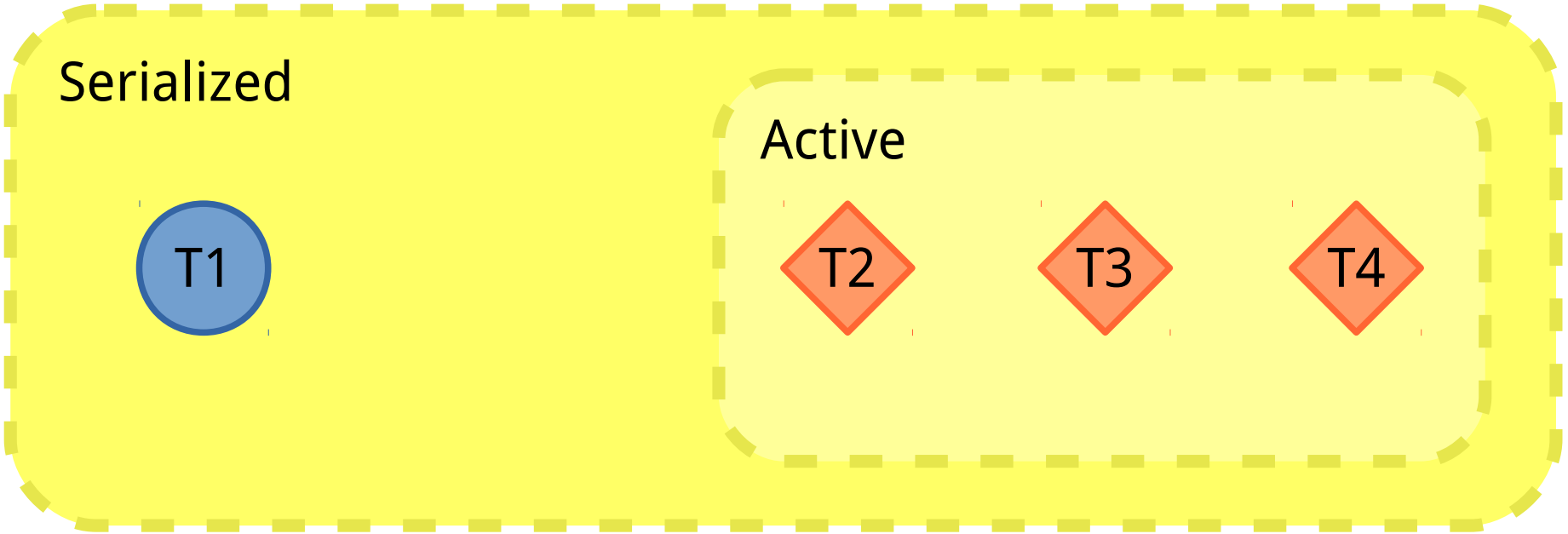


# Optimistic Concurrency Control (OCC)
# **+ Ordered commit**

# Ordered commit



# Ordered commit



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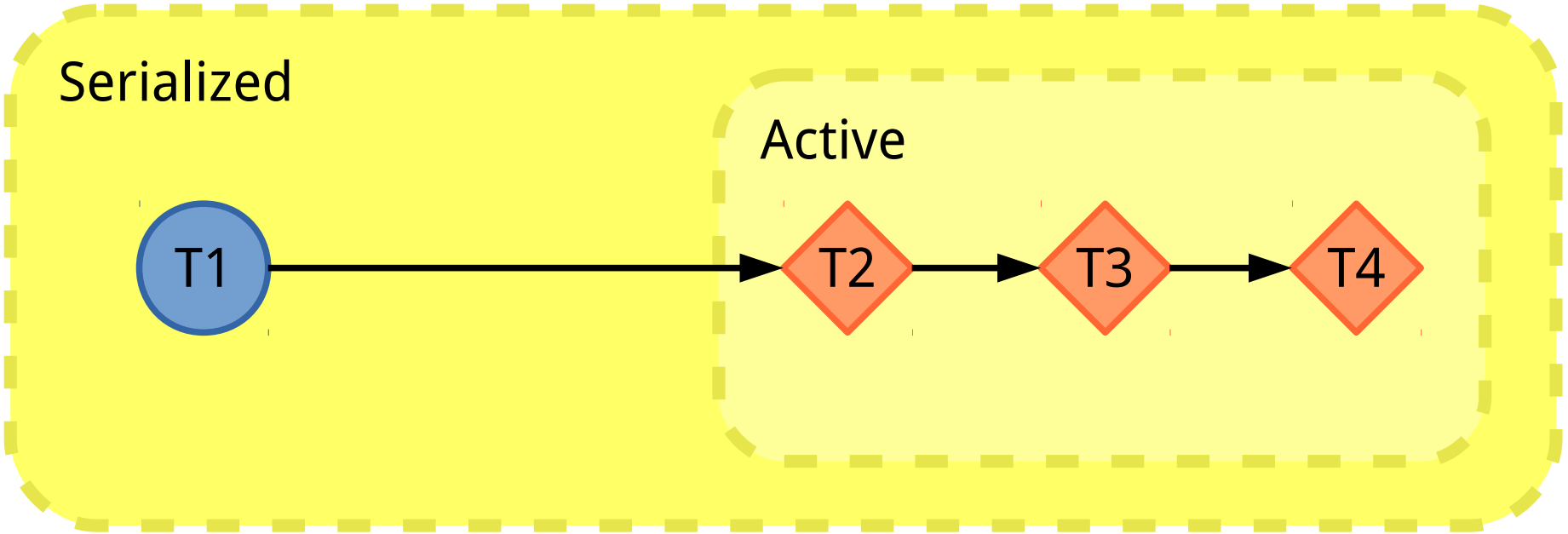

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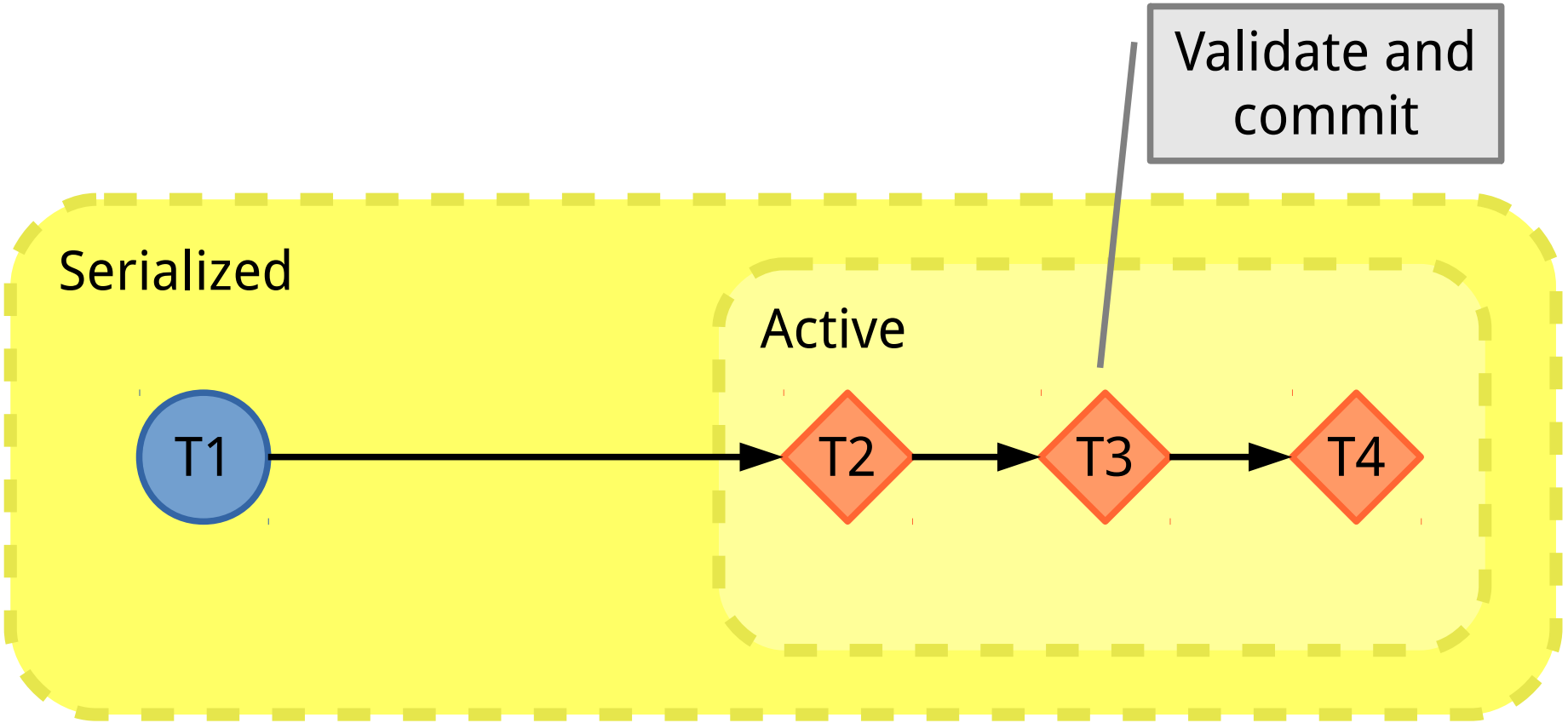

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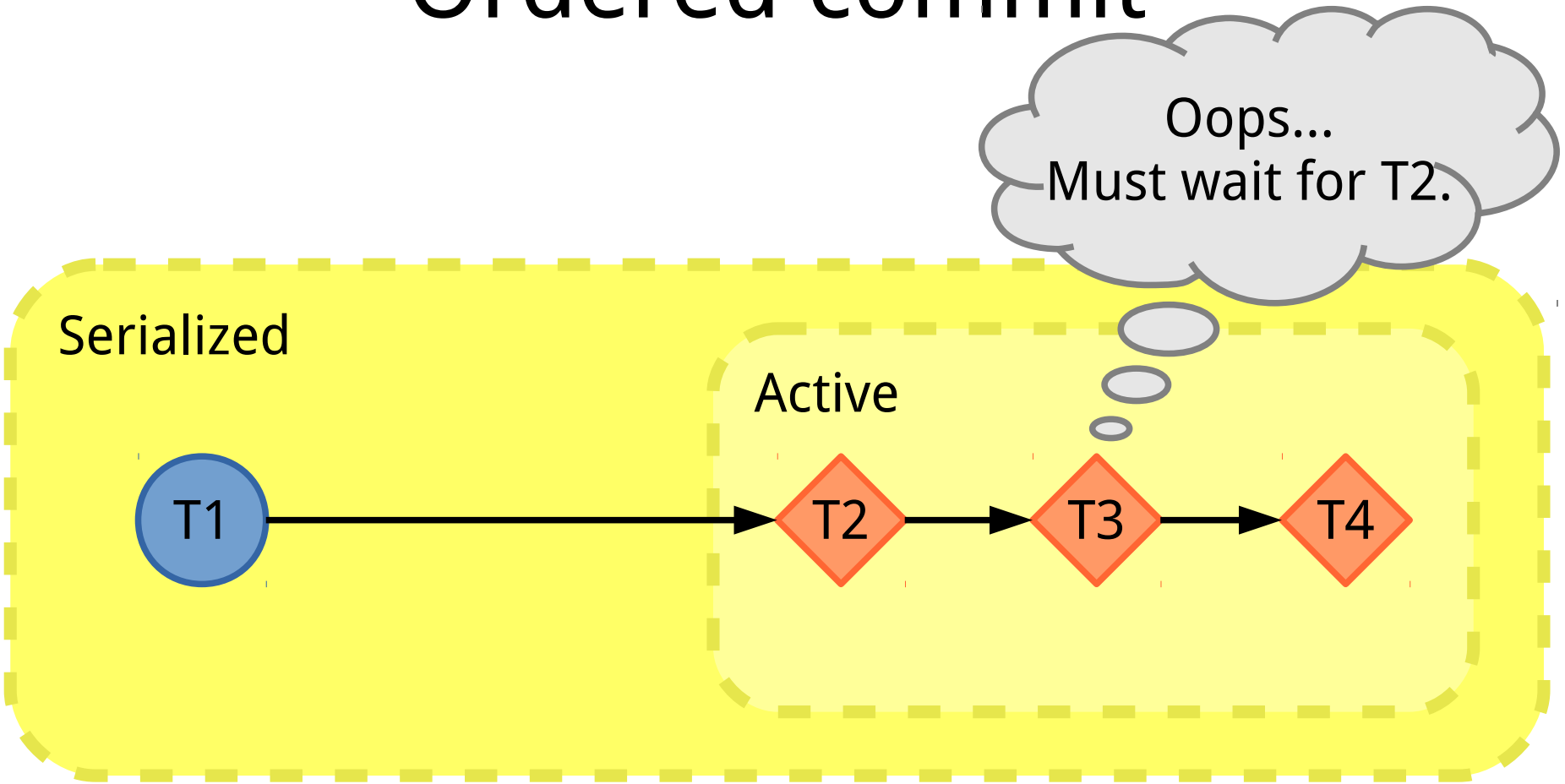

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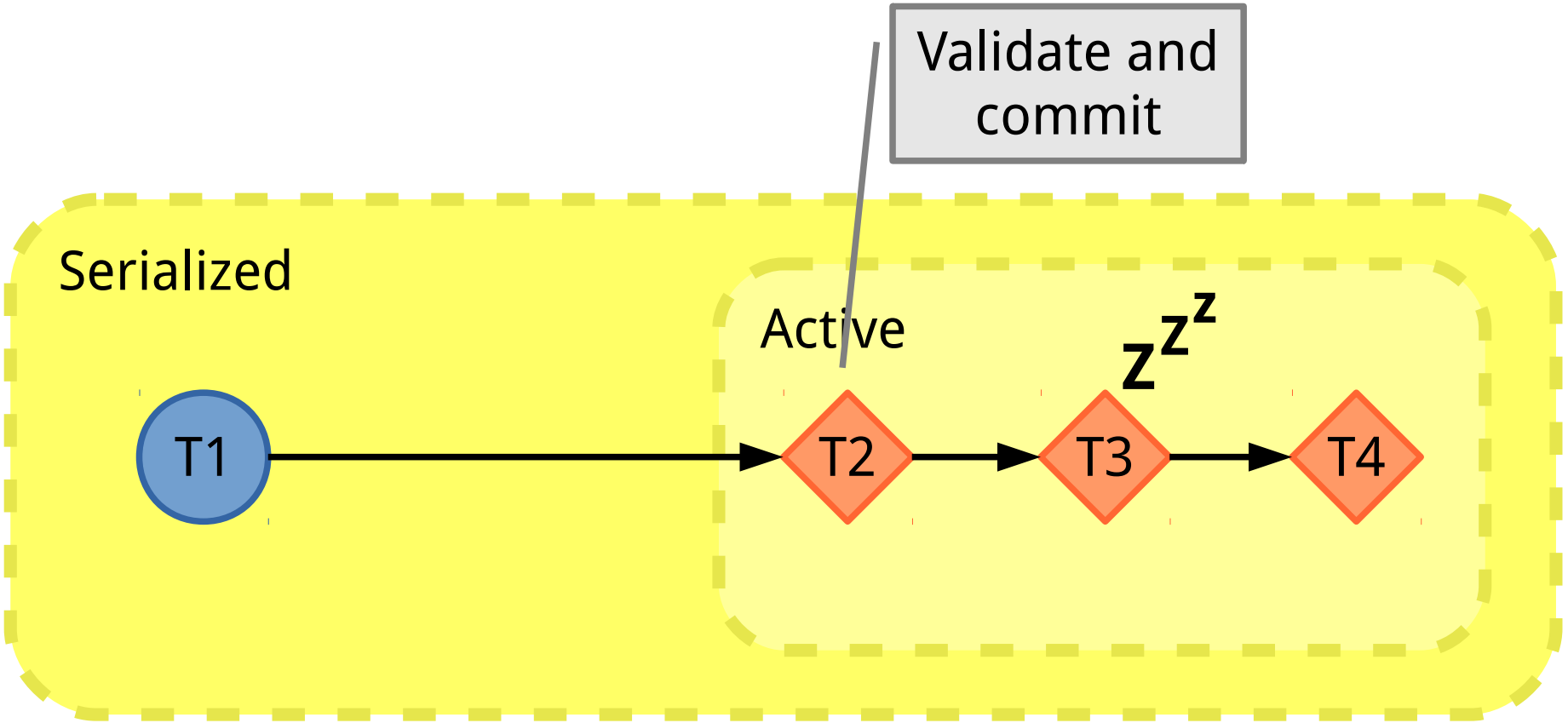

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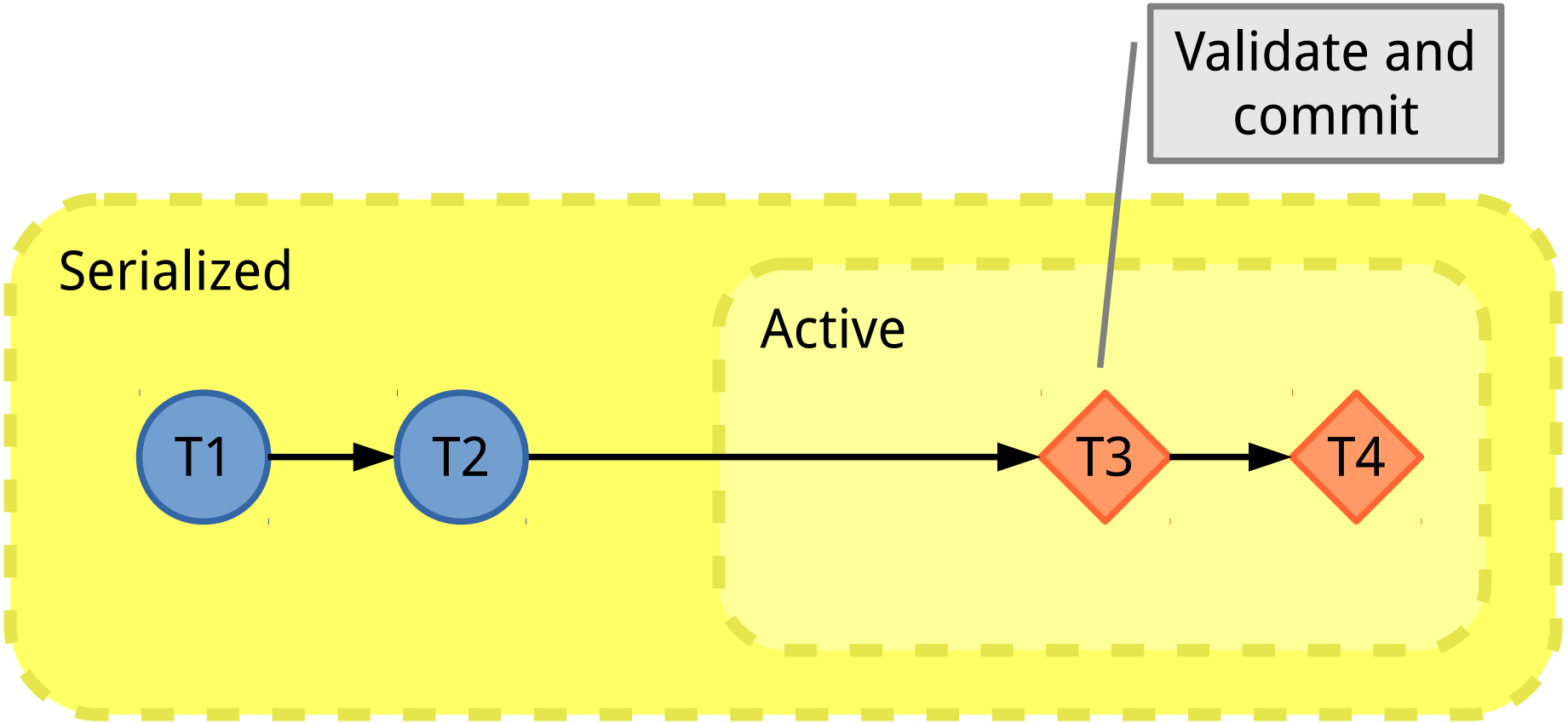
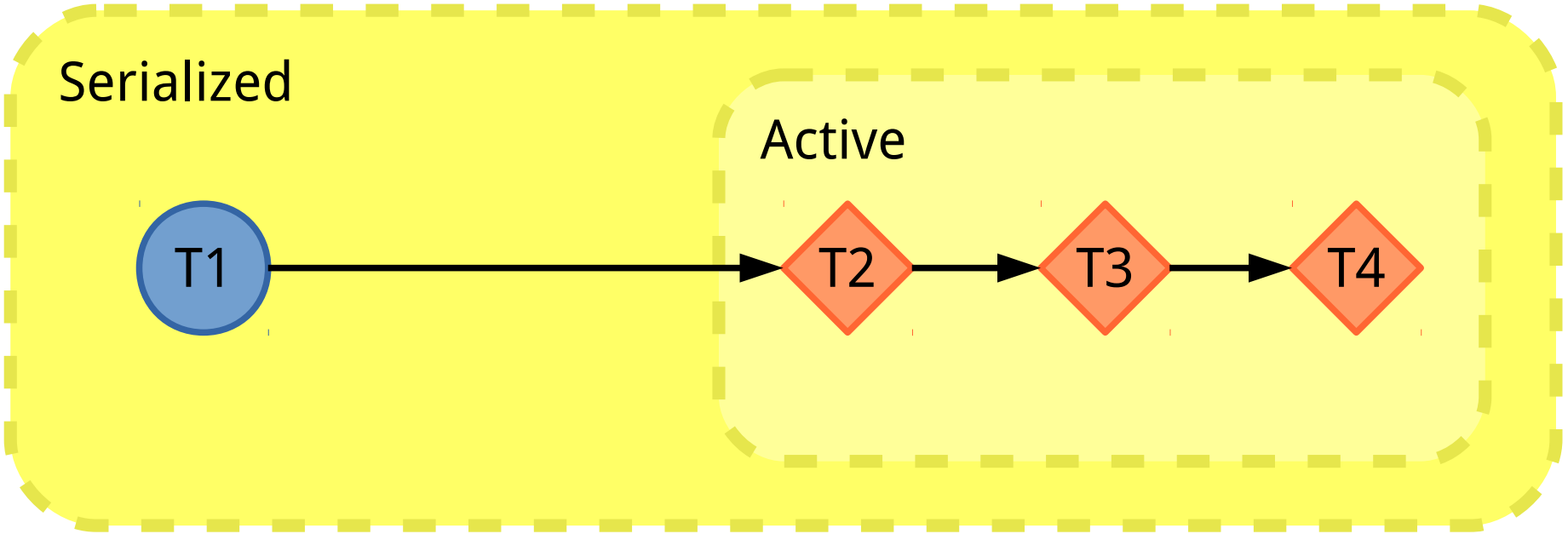


Optimistic Concurrency Control (OCC)
+ Ordered commit
**+ Fast transactions**

# Fast transactions



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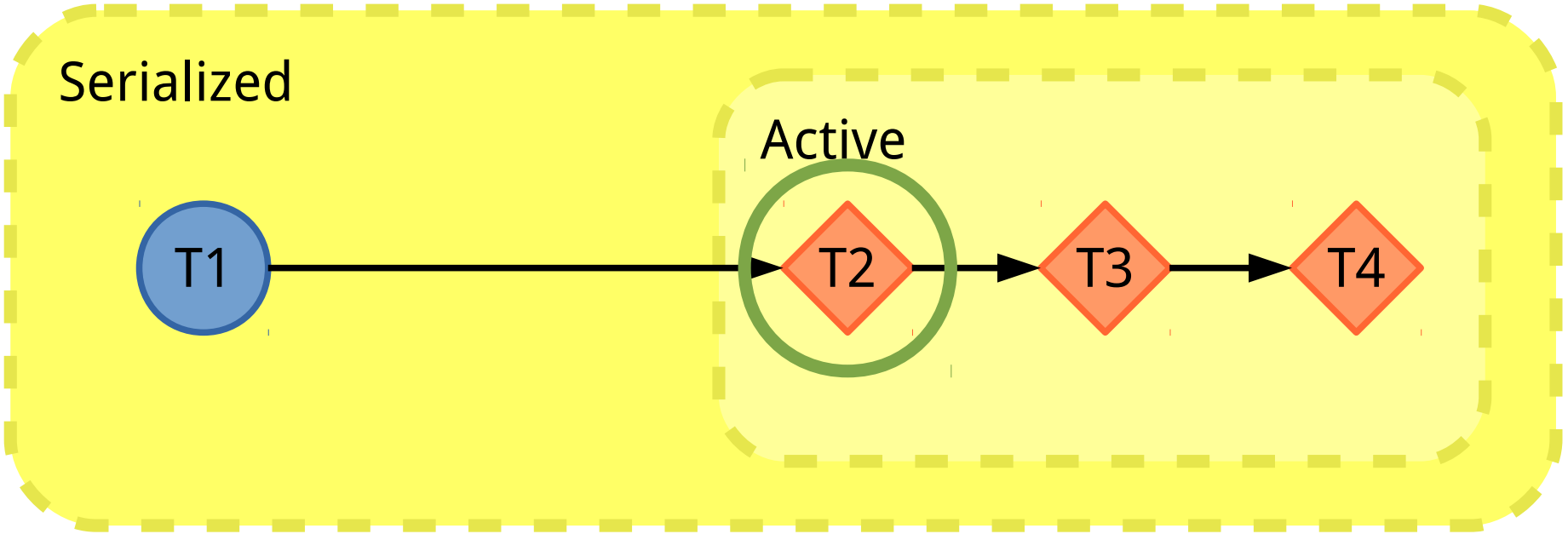

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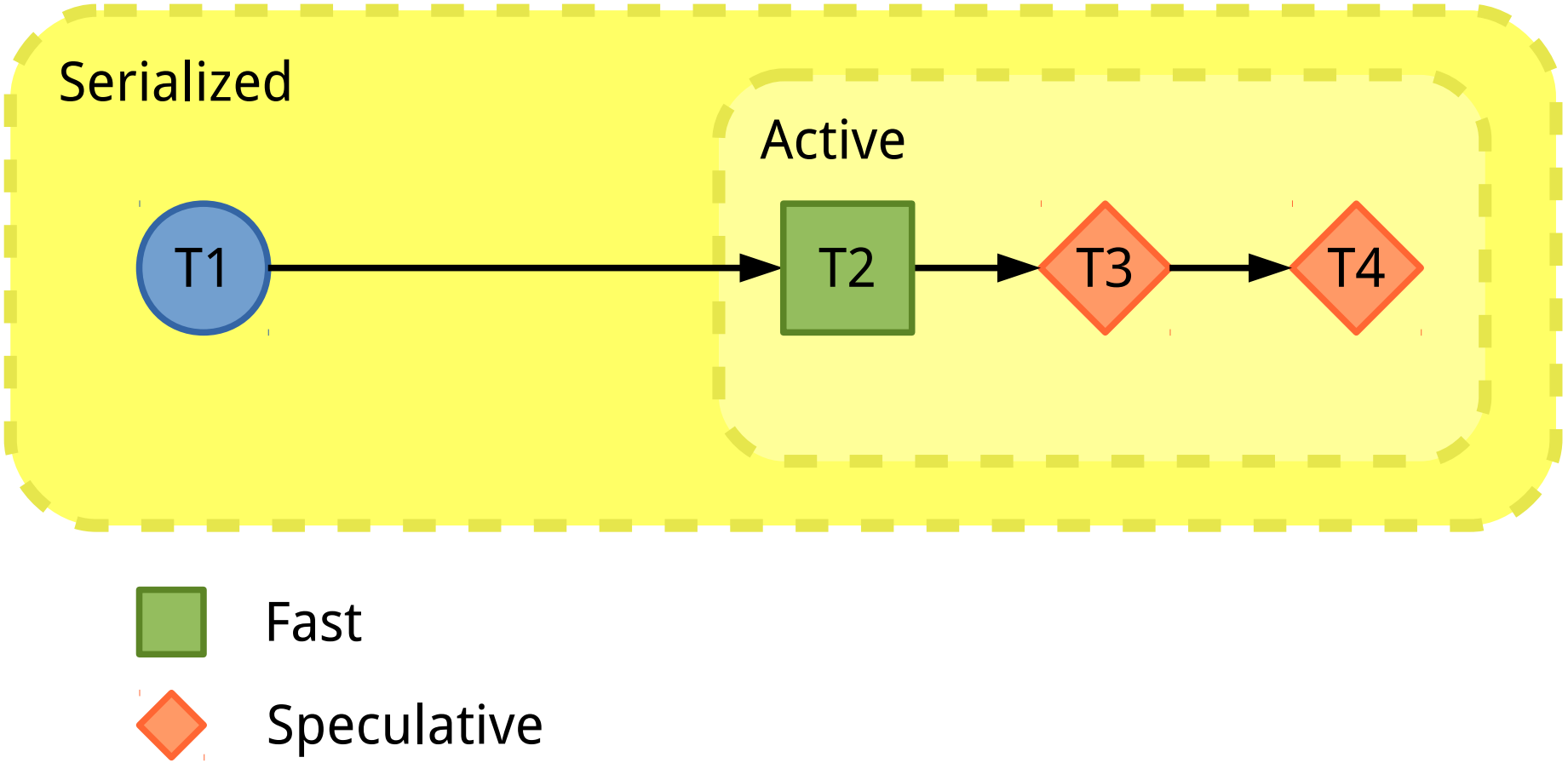

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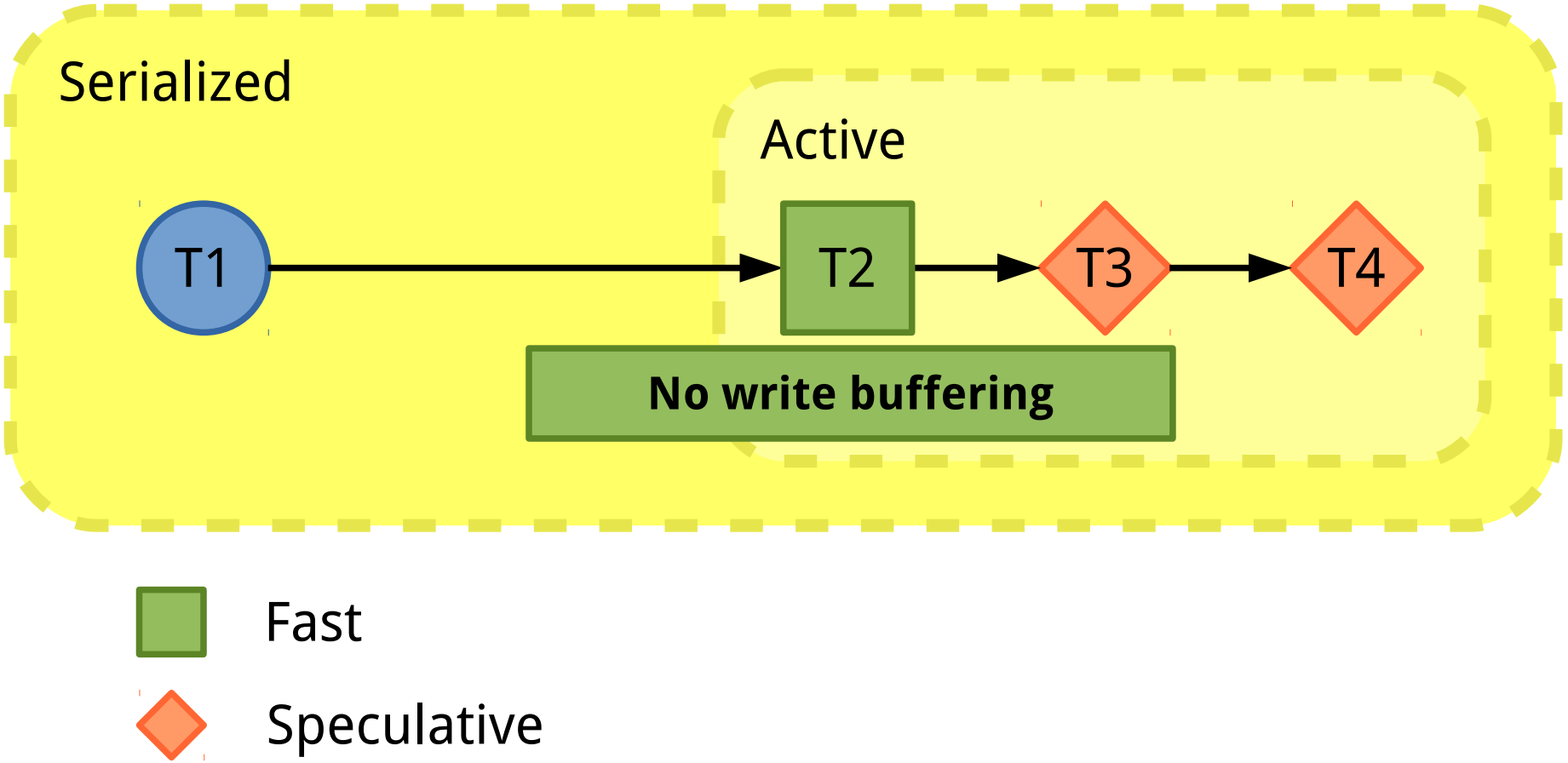

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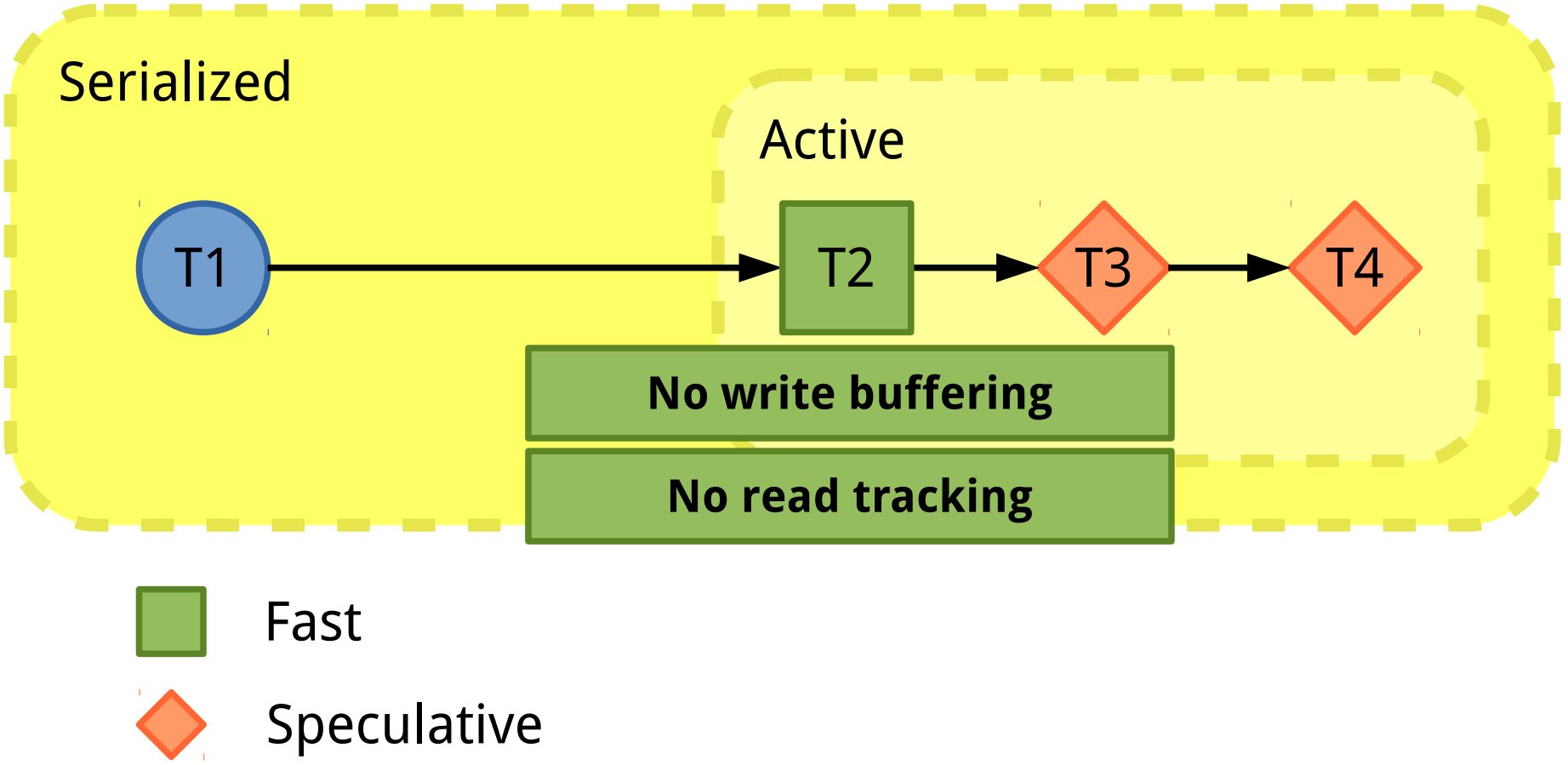

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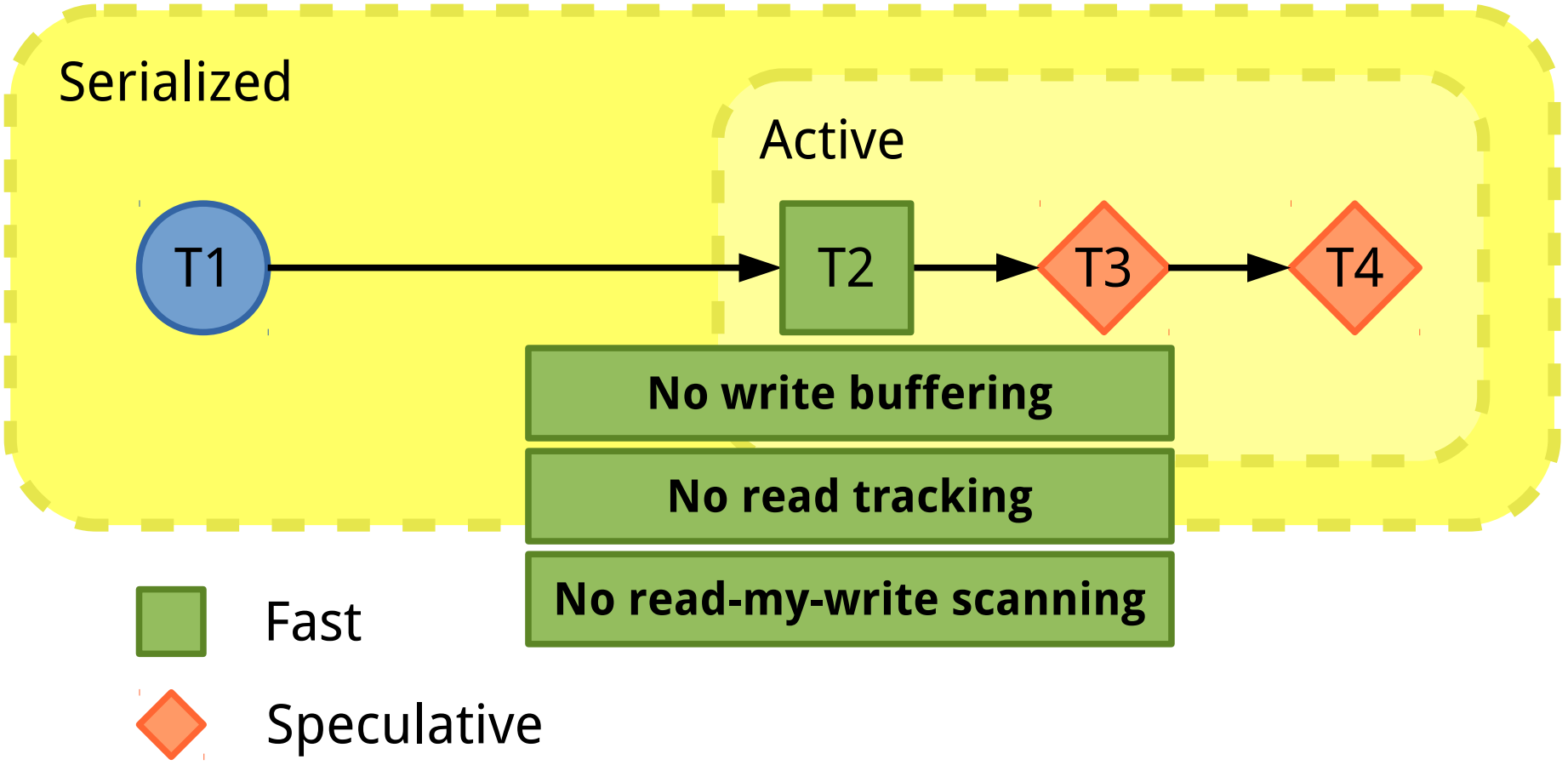

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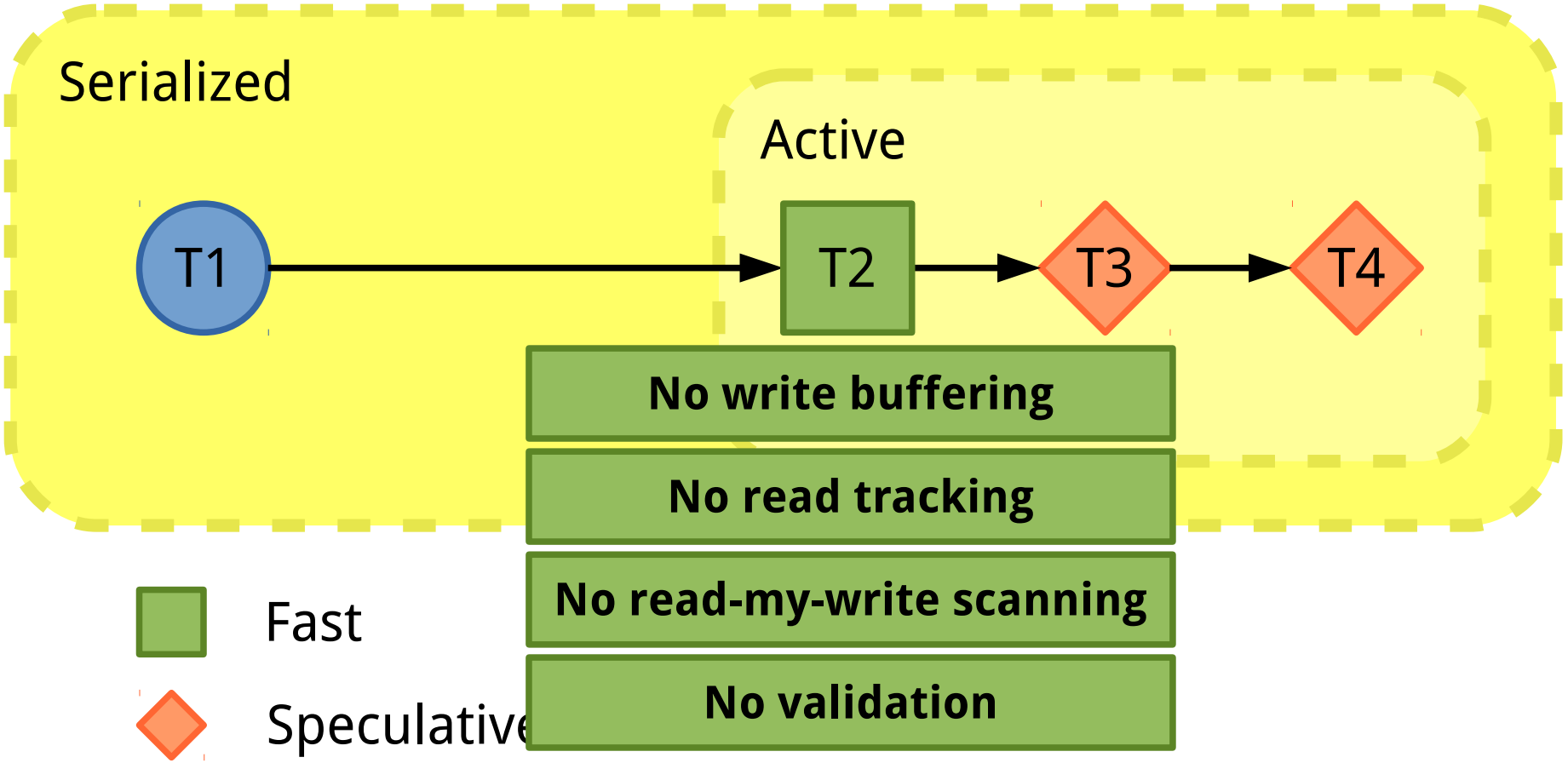

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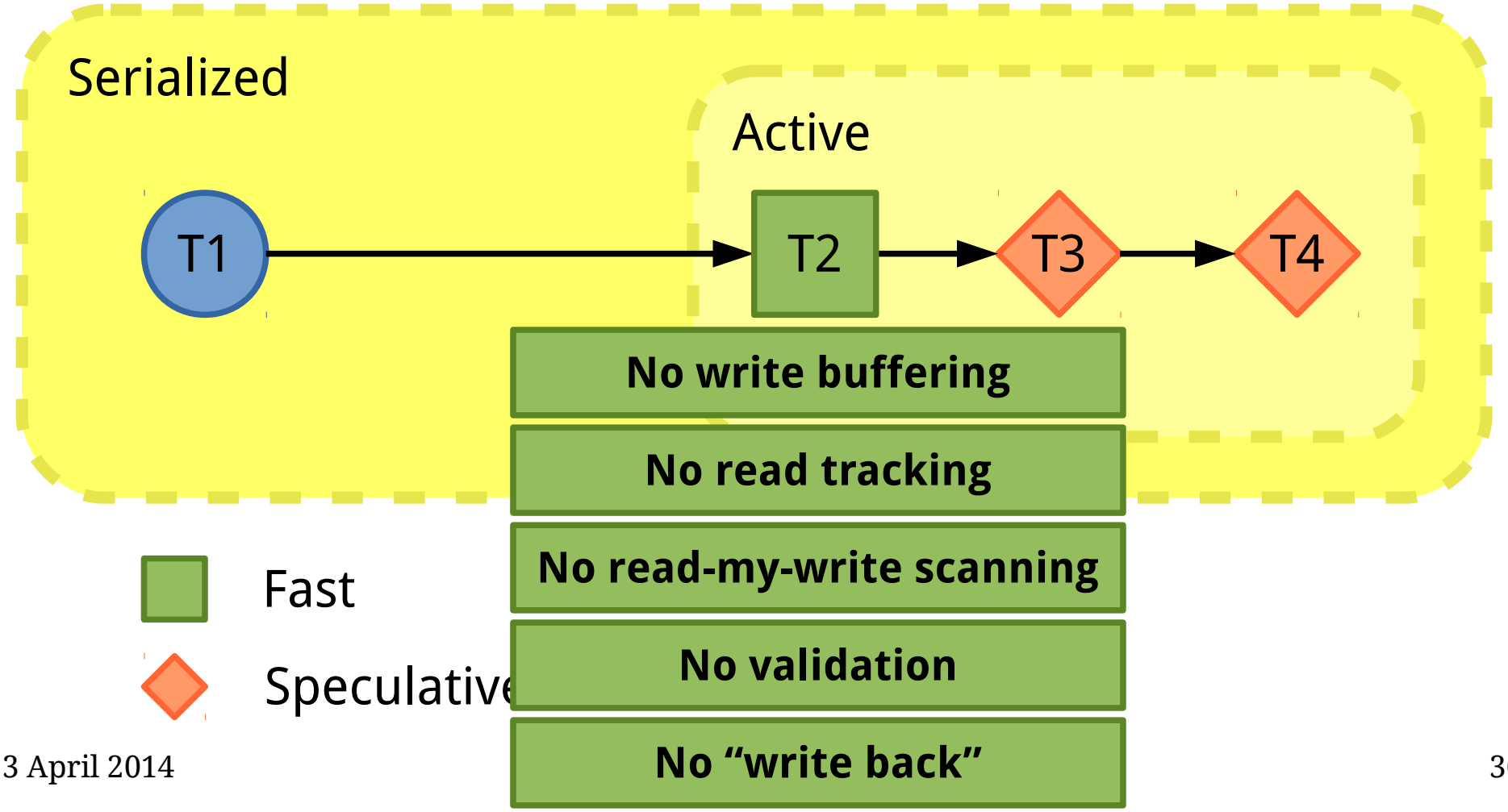

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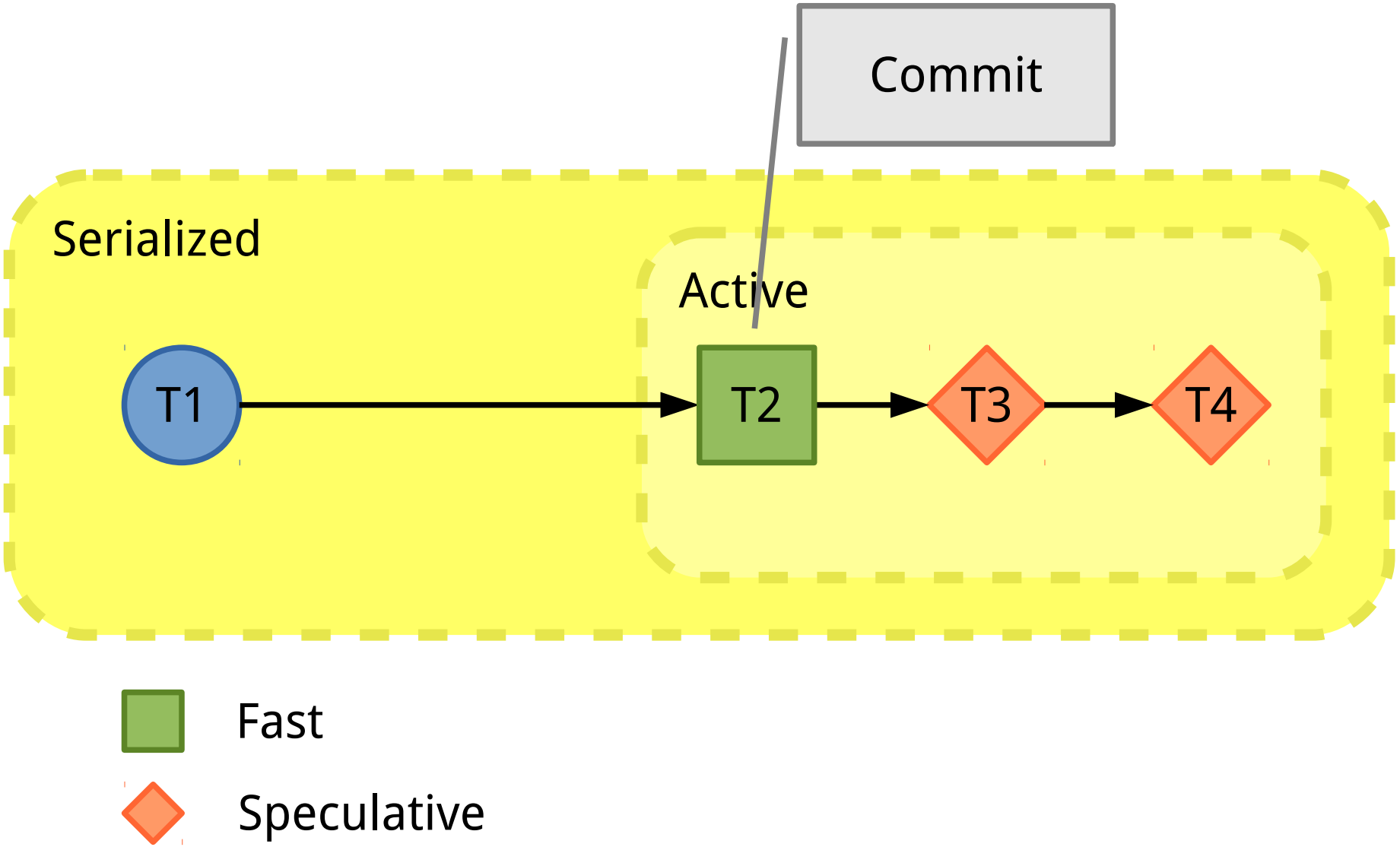

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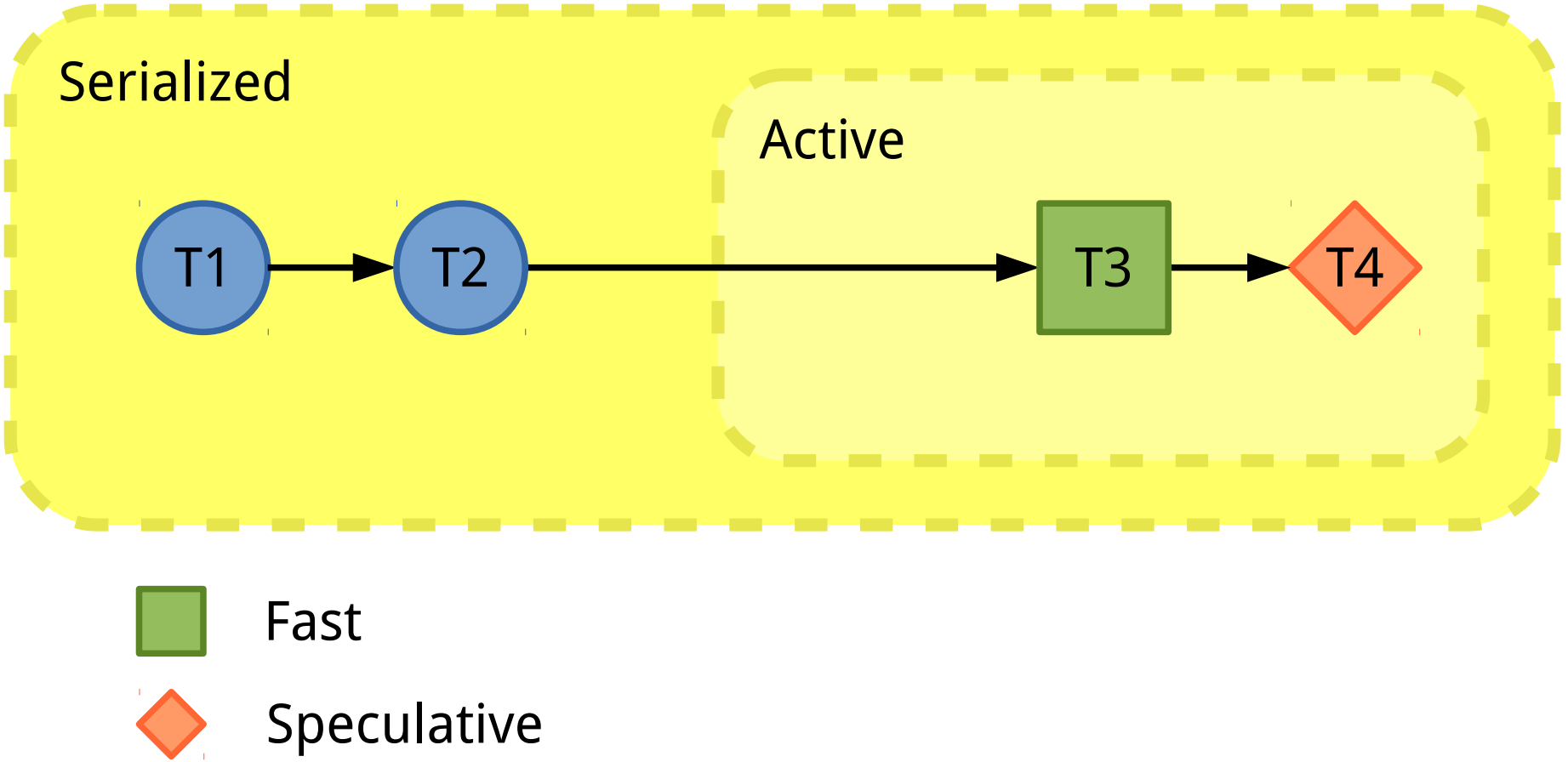

# Use cases

- State machine replication (SMR): agreement phase defines the total order
- Deterministic multi-threading: (DMT) threads take turns committing transactions
- Starvation-free (SF) transactions

# Understanding the tradeoff

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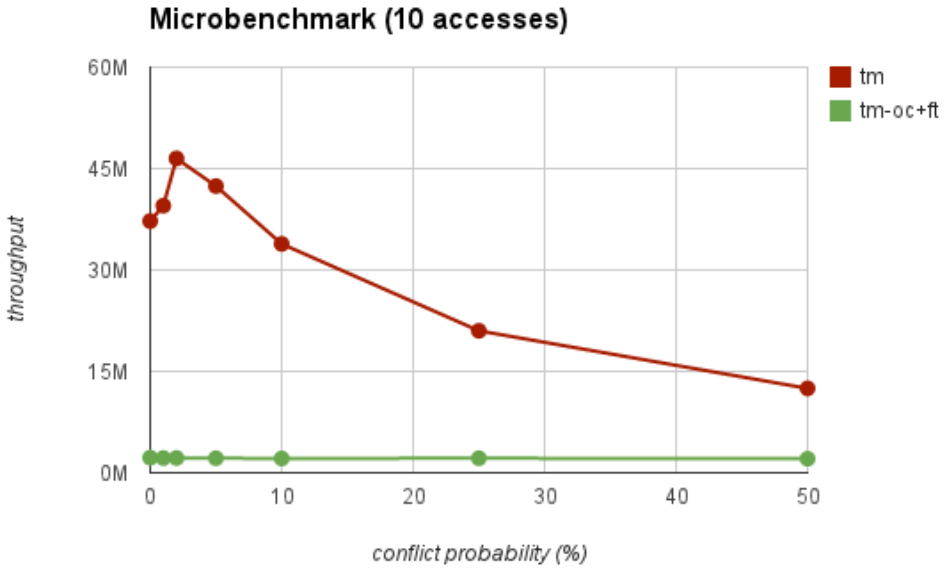
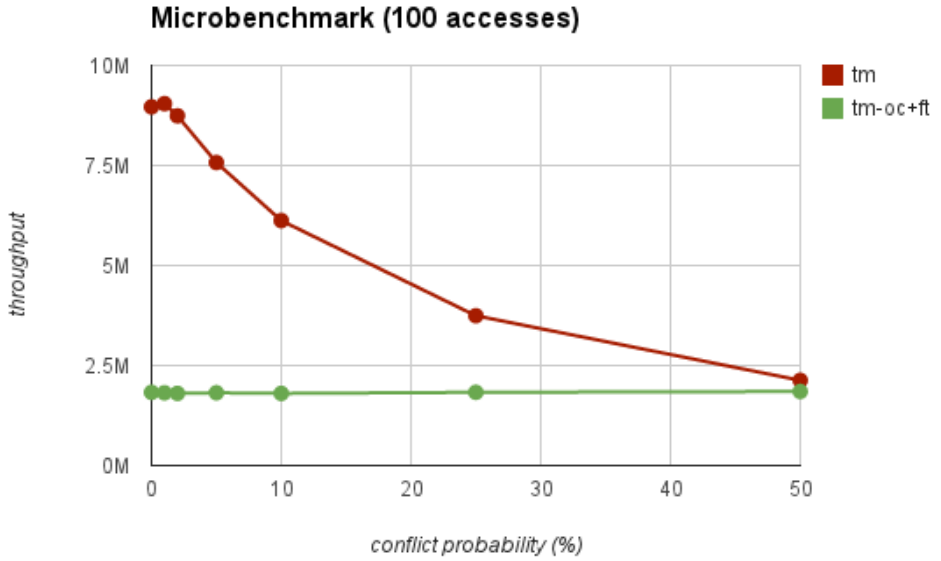
Transaction length



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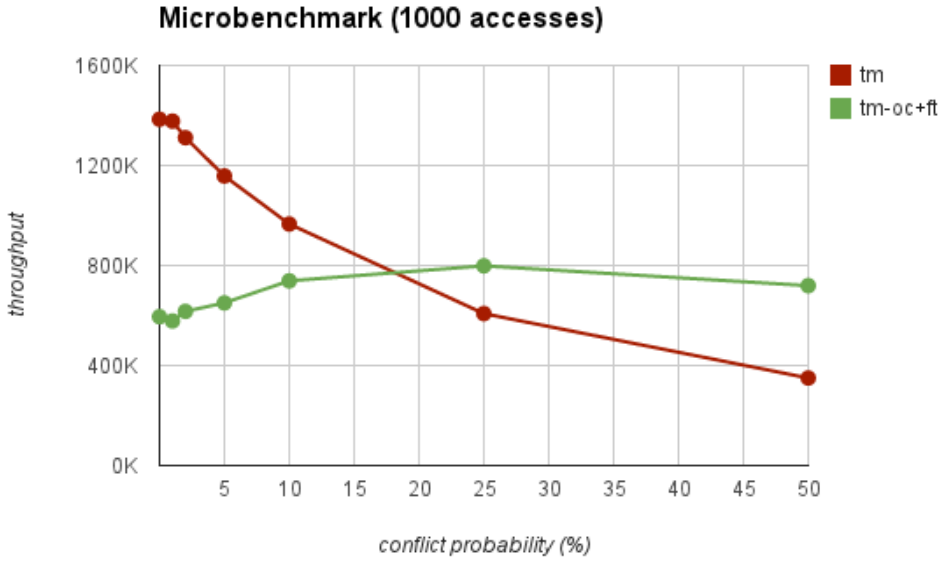
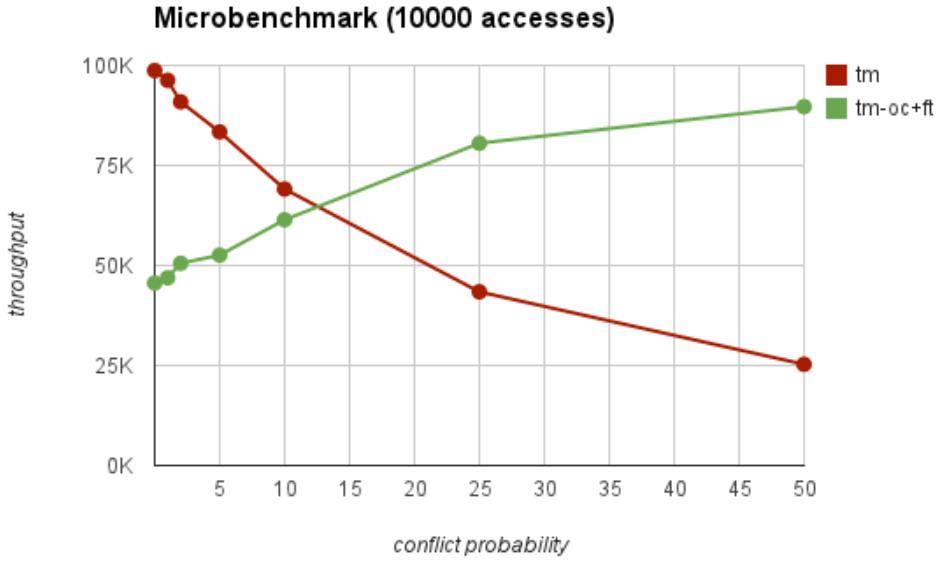
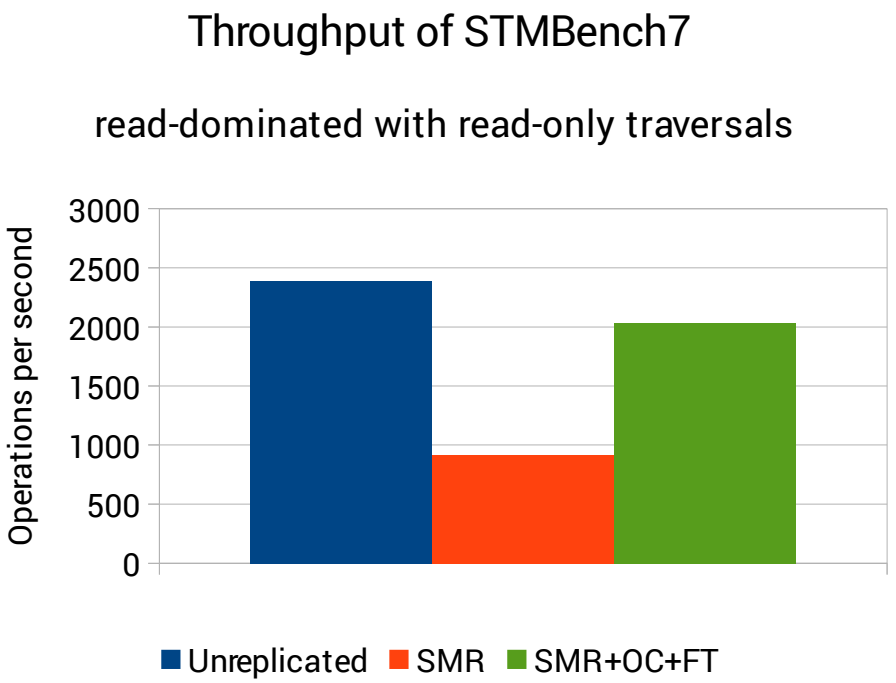


# Preliminary results: SMR



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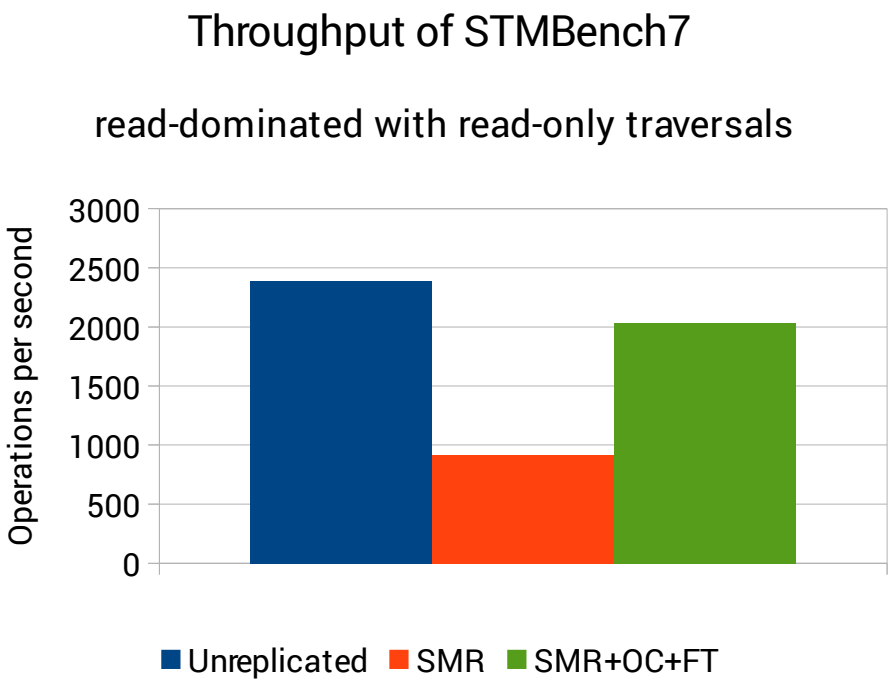
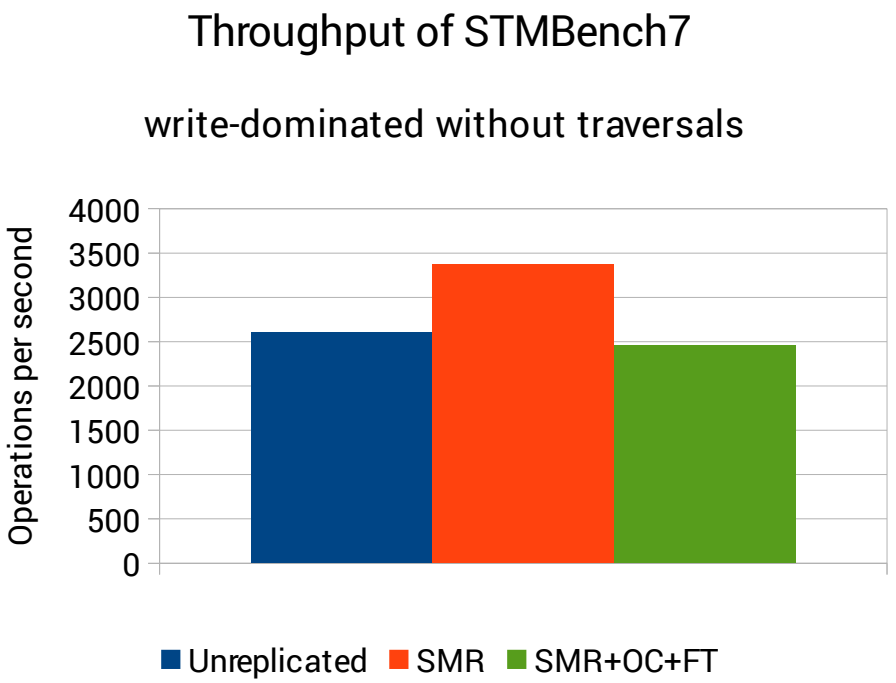
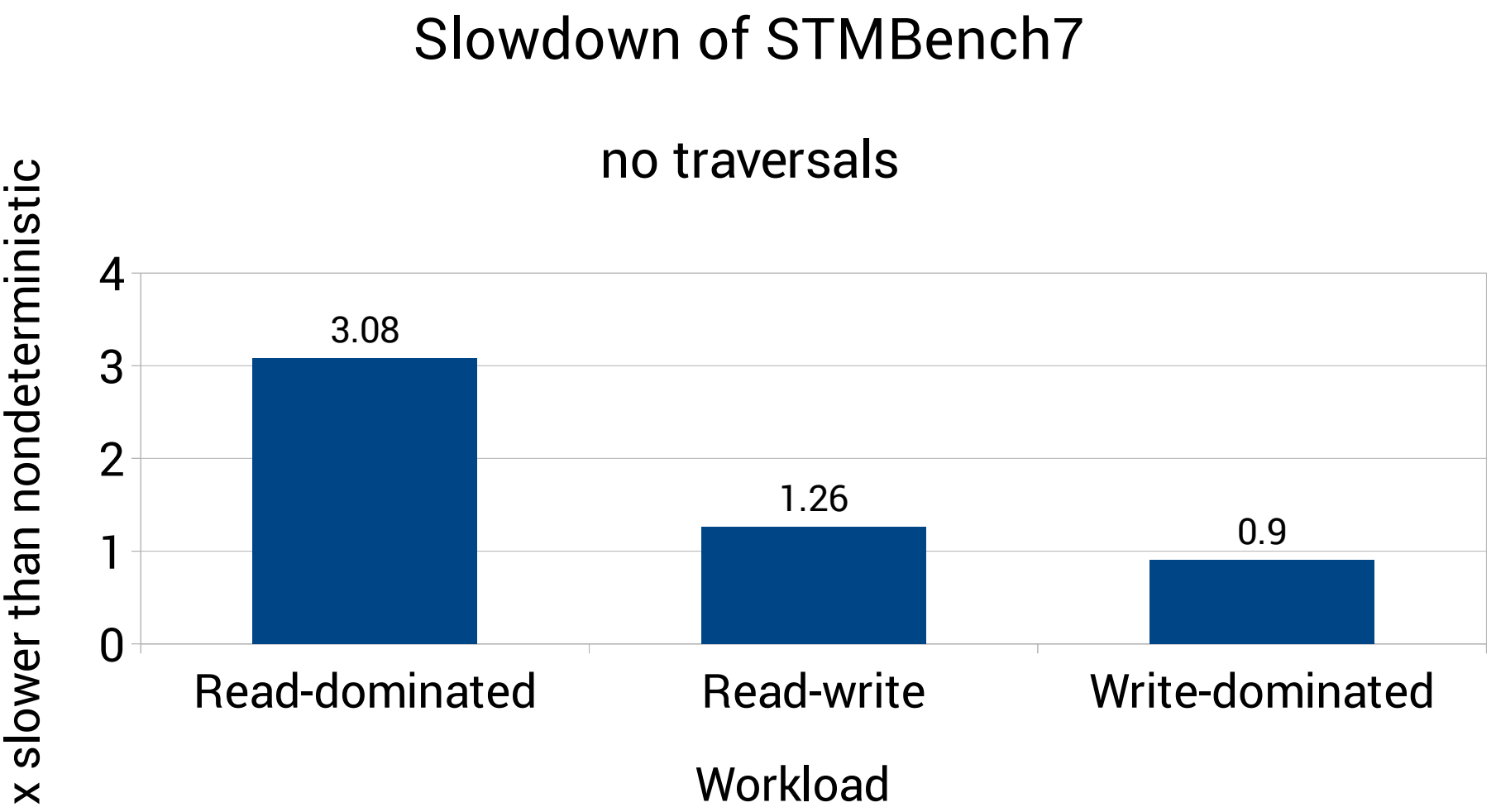
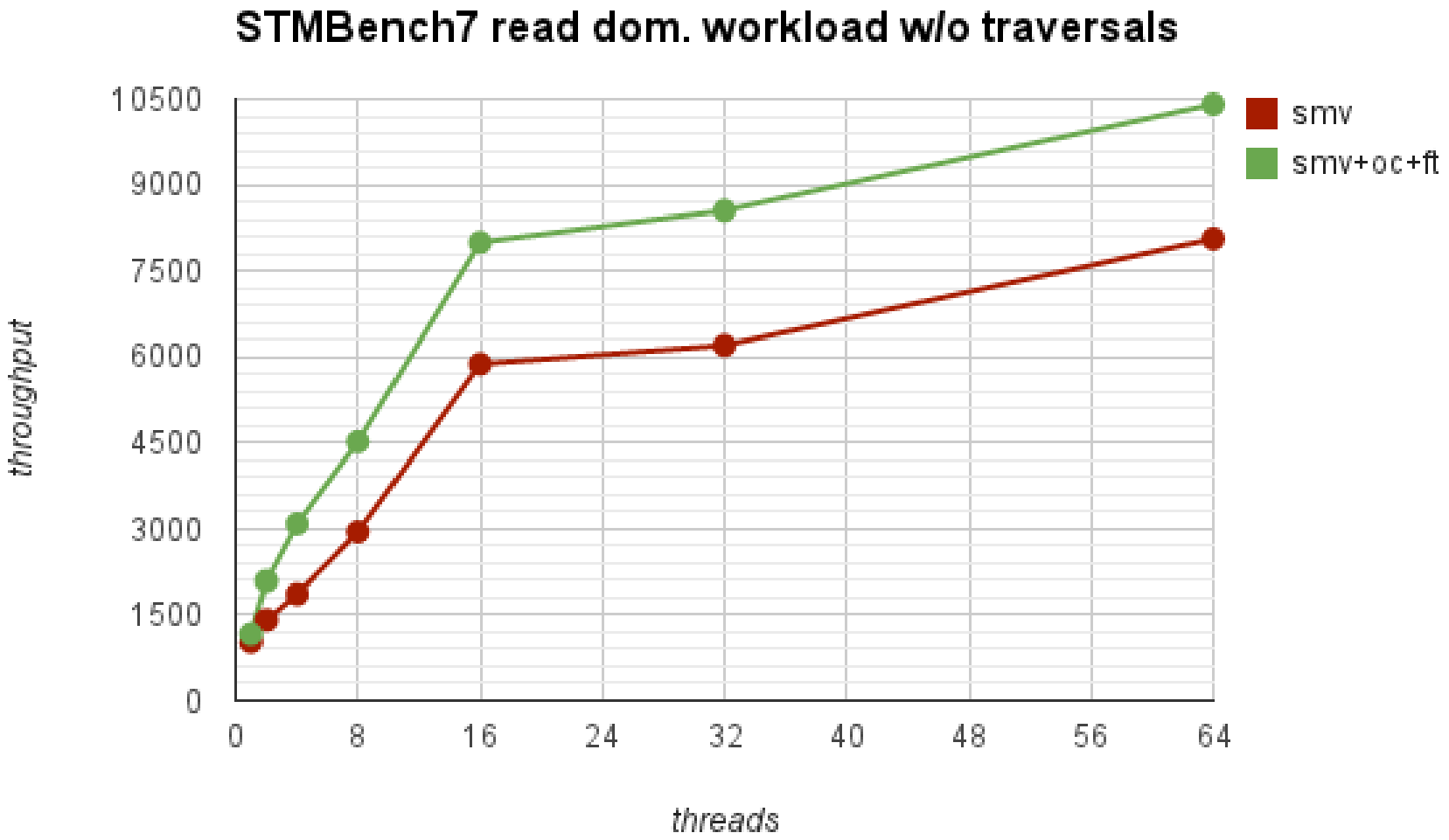


# Preliminary results: DMT



# Preliminary results: Starvation



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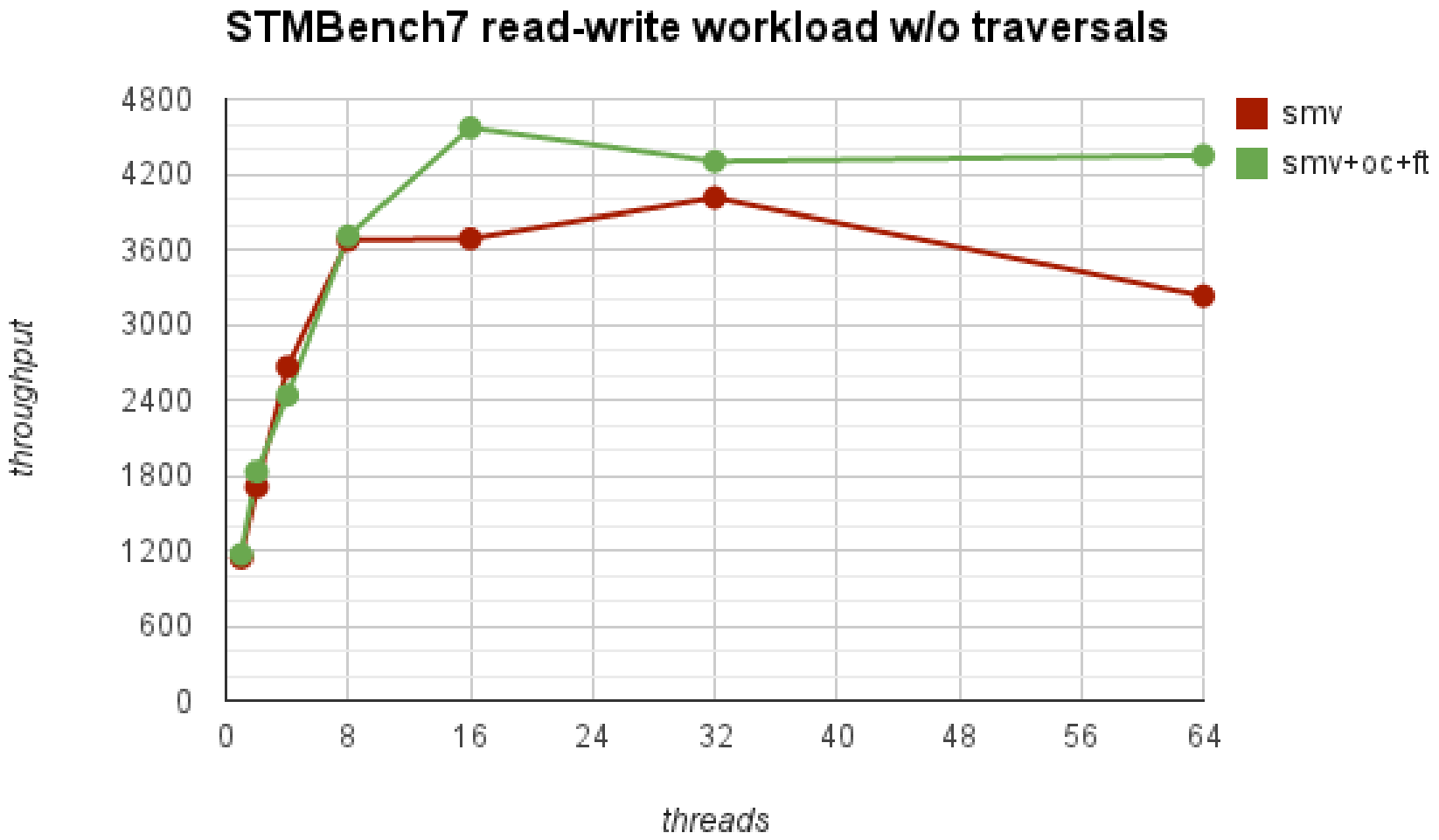

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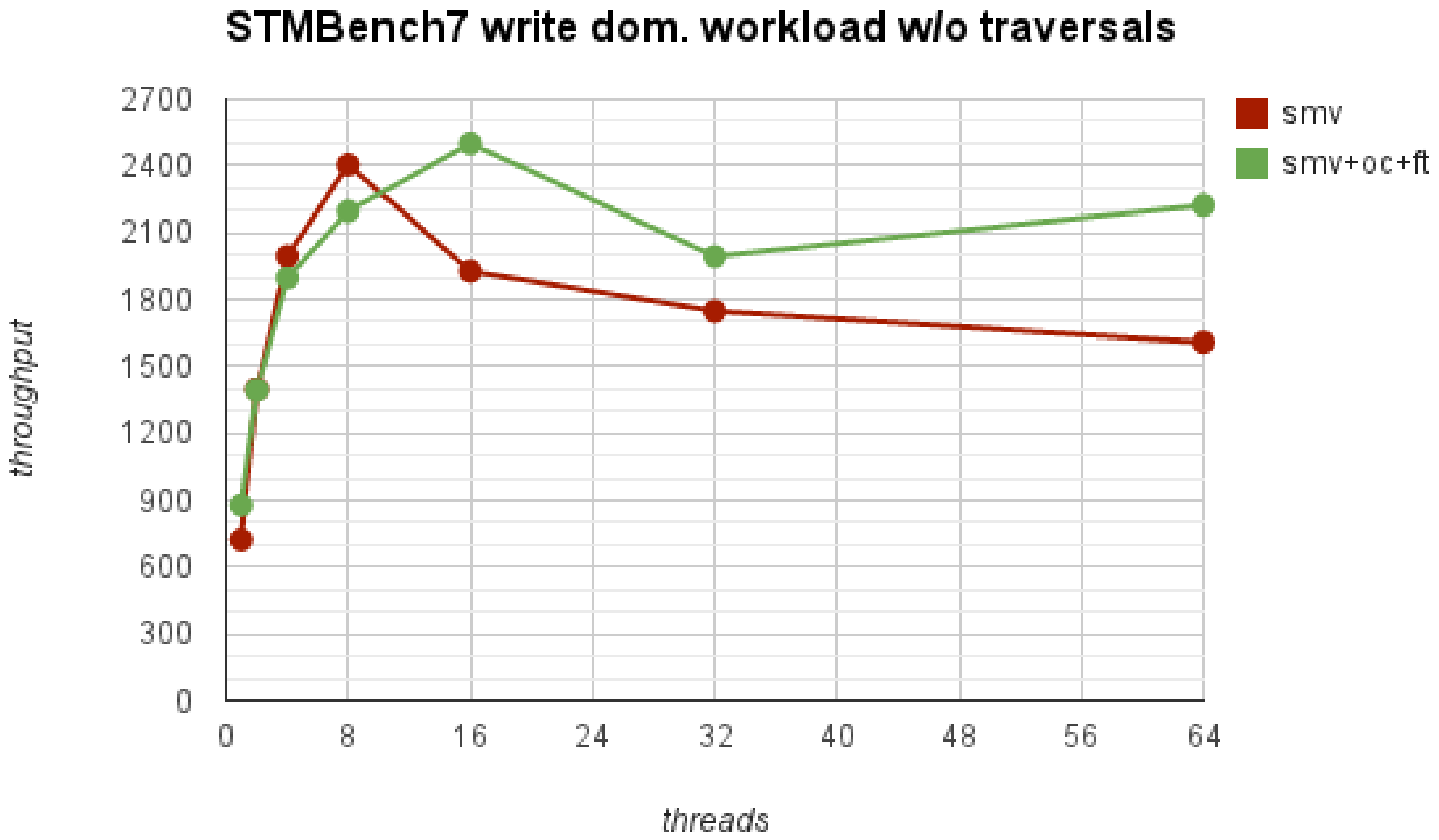

# Conclusion

- Separate serialization from concurrency control
- Allows concurrent SMR, DMT, and SF transactions
- Transaction size is a key factor: unavoidable for SMR and DMT, but not SF transactions
- Require more information about transactions to relax ordered commit constraint

Thank you for your time and attention.

Criticism, comments and suggestions are welcome!