

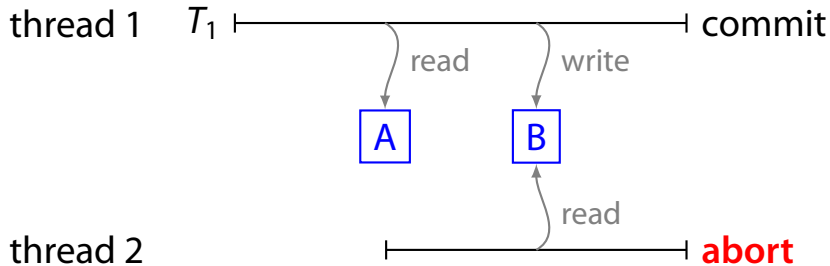
The Semantics of Progress in Lock-Based Transactional Memory

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Transactional Memory

Transactional Memory



Practice

DSTM, SXM, TL2, RSTM, JVSTM, NZTM,
Haskell STM, TinySTM, McRT-STM, BartokSTM, SwissTM, ...

Practice

DSTM, SXM, TL2, RSTM, JVSTM, NZTM,
Haskell STM, TinySTM, McRT-STM, BartokSTM, SwissTM, ...

semantics, inherent limitations Theory

Semantics
of
Transactional Memory

2 aspects

correctness condition

1

nothing bad happens

correctness condition

opacity

[PPoPP'08]

nothing bad happens

progress property

something good happens

2

progress property:

When can a transaction be aborted?

progress property

obstruction-freedom

[SPAA'08]

something good happens

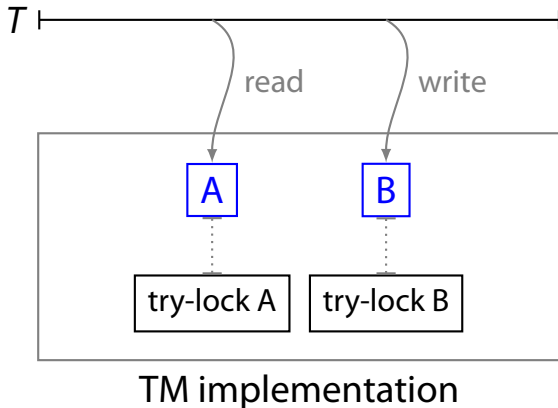
progress property

lock-based TMs?

this talk

something good happens

Lock-Based TM Implementation



progress property

lock-based TM

=

ensures **strong progressiveness**

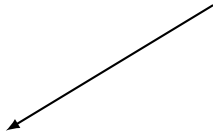
something good happens

Strongly progressive TMs

TL2, TinySTM, RSTM, BartokSTM, McRT-STM, ...

Contributions

Lock-based TMs



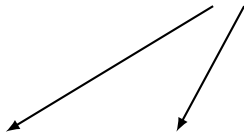
**progress
semantics**



strong
progressiveness

Contributions

Lock-based TMs



**progress
semantics**



strong
progressiveness

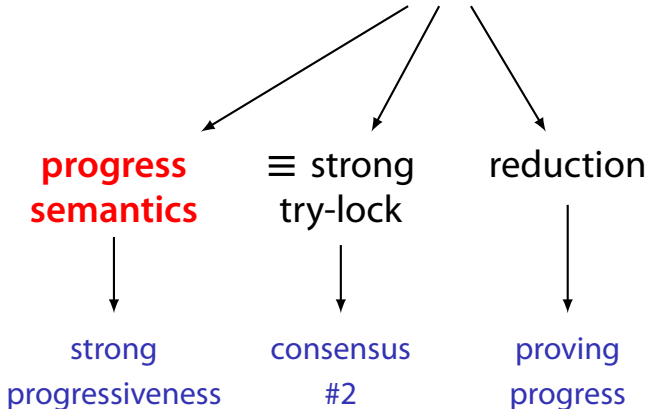
≡ strong
try-lock



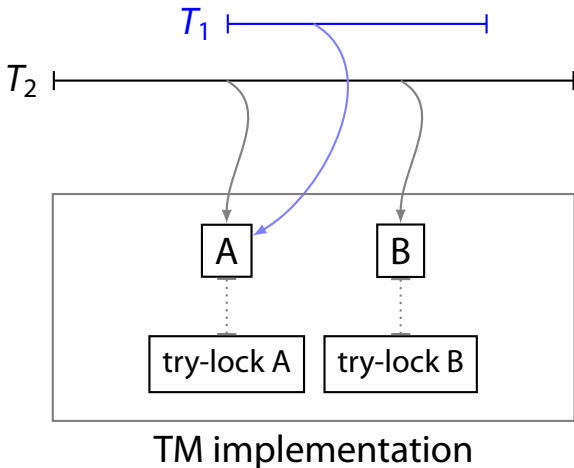
consensus
#2

Contributions

Lock-based TMs

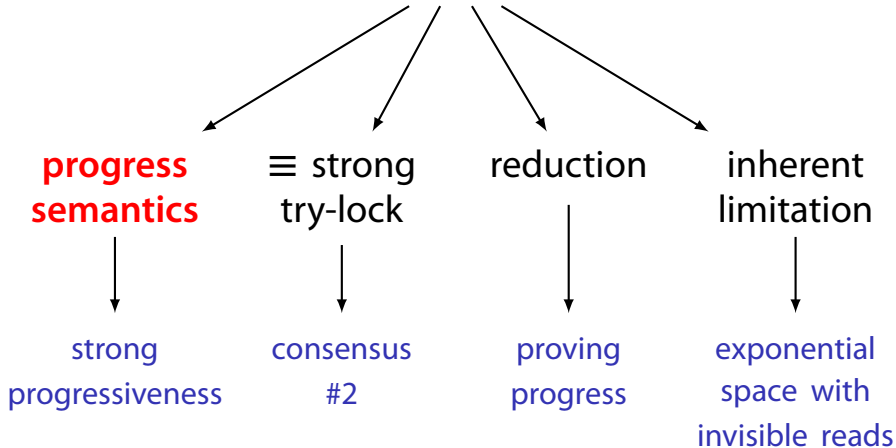


Reduction

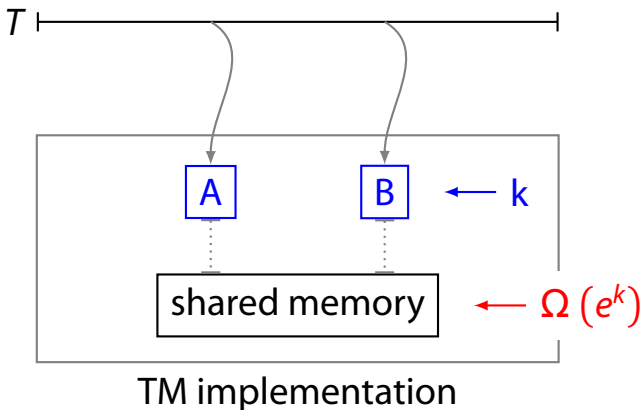


Contributions

Lock-based TMs



Inherent Complexity



Strong Progressiveness

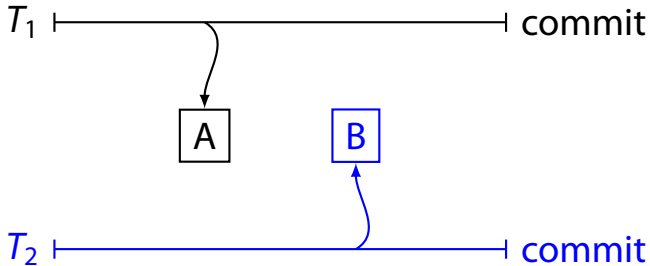
Strong Progressiveness

If a group of concurrent transactions
conflict on at most 1 object,
then 1 of those must commit.

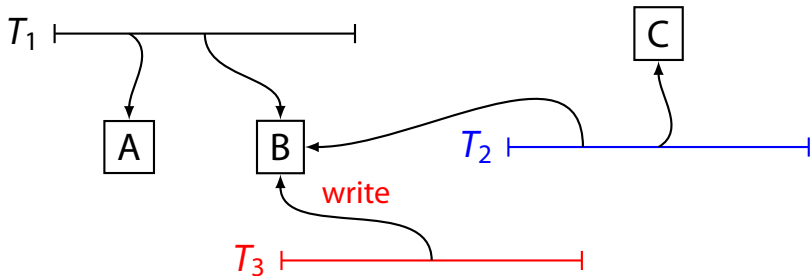
Example 1

T_1 |-----| commit

Example 2



Example 3



commit or commit or commit

Strong Progressiveness

If a **group of concurrent transactions** conflict on at most 1 object, then 1 of those must commit.

T_1 |-----|

T_2 |-----|

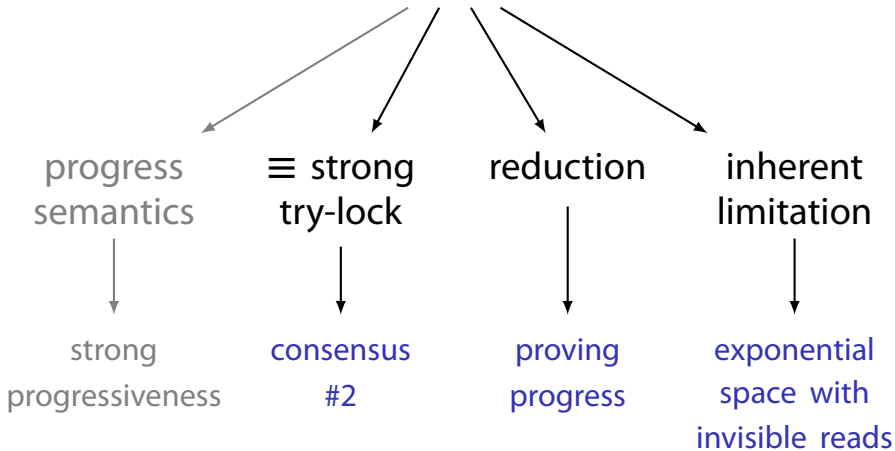
T_3 |-----|

Strong Progressiveness

If a group of concurrent transactions
conflict on at most 1 object,
then 1 of those must commit.

In the Paper...

Lock-based TMs



How much progress
can a TM ensure

