Concurrent infoflow security-preserving compilation

Short talk: DeepSpec Summer School ’18

Robert Sison | PhD supervisors: Toby Murray, Kai Engelhardt

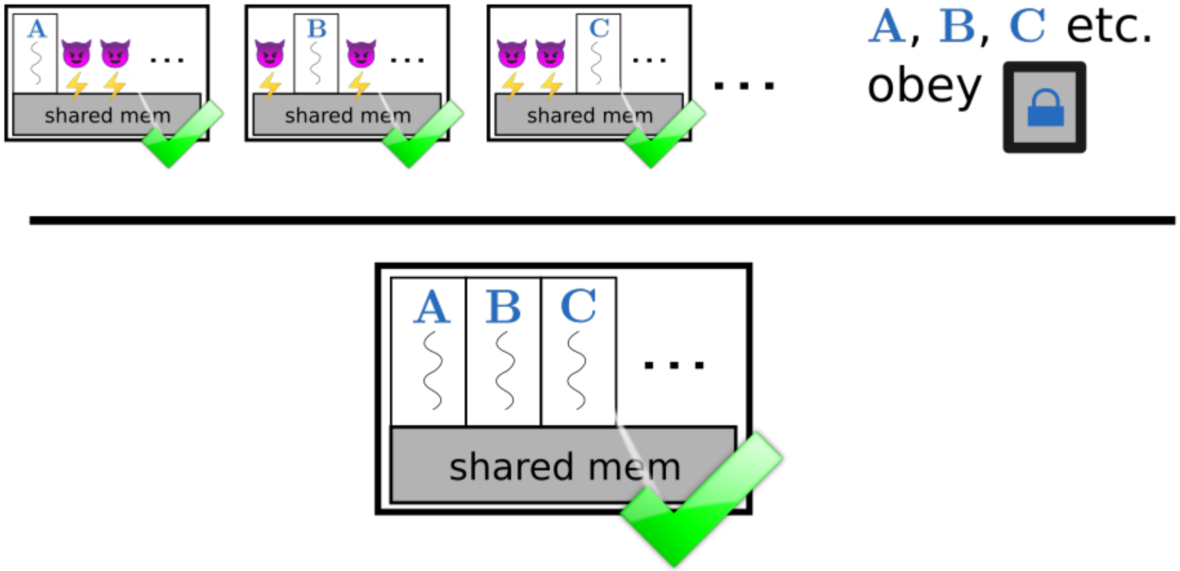
July 2018

THE UNIVERSITY OF
NEW SOUTH WALES

Motivation

Infoflow security

(Noninterference, for shared-variable concurrent programs)



A, B, C etc. obey 🔒

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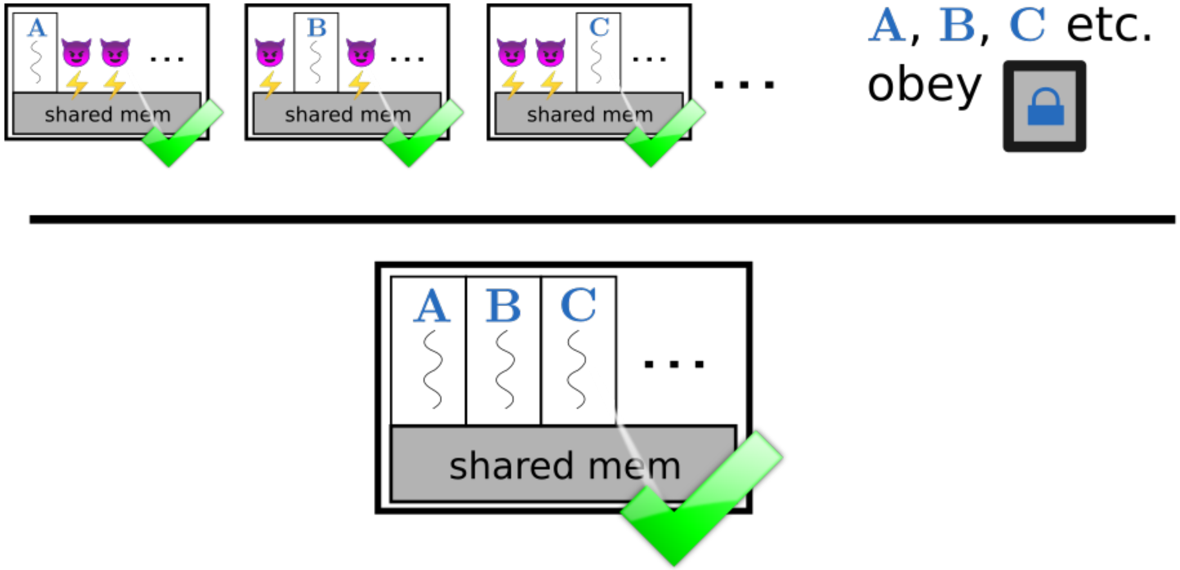

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Infoflow security-preserving compilation

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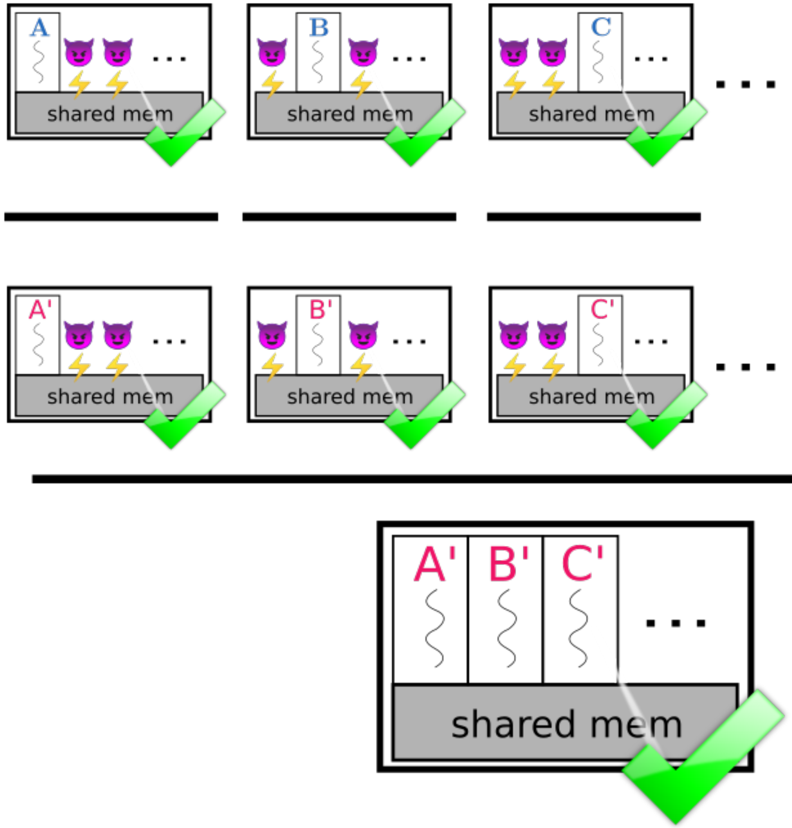

A, B, C etc. obey 🔒

Source

A', B', C' etc. obey 🔒

Target

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Infoflow security-preserving compilation

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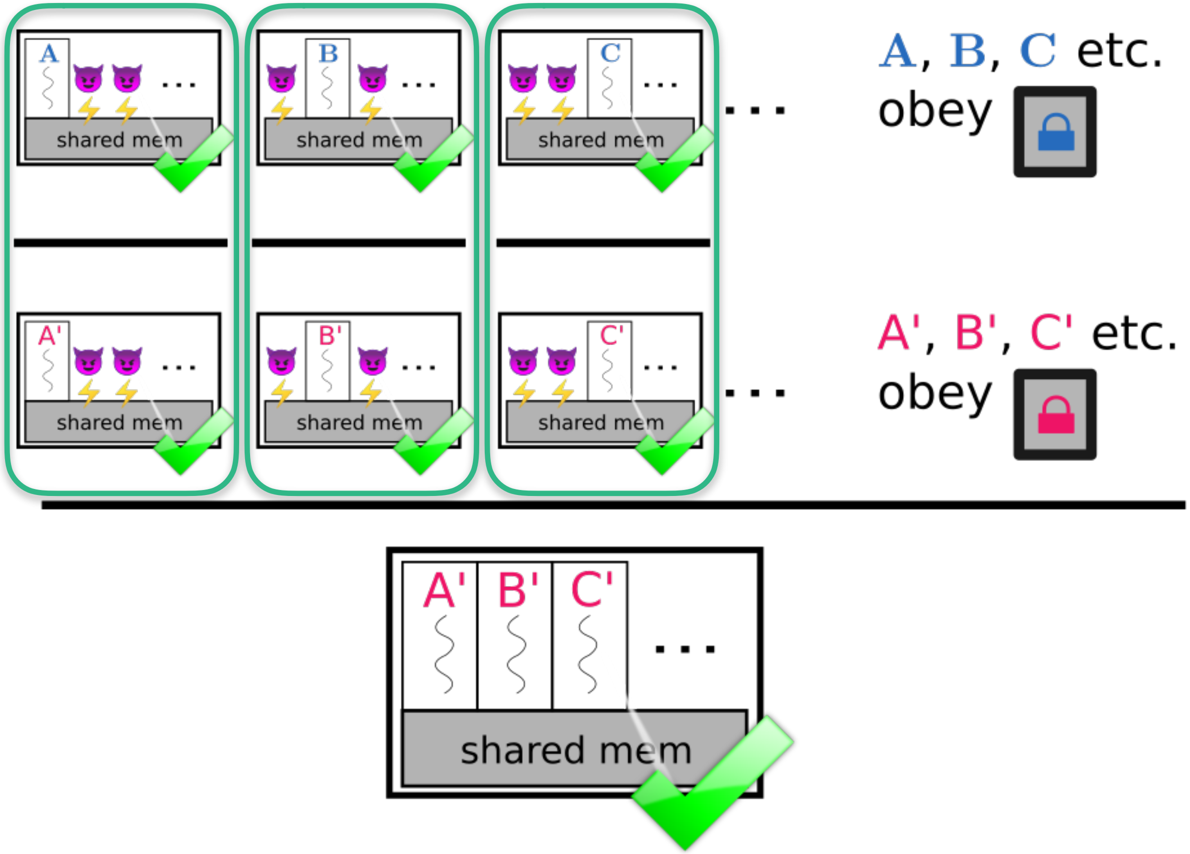

A, B, C etc. obey 🔒

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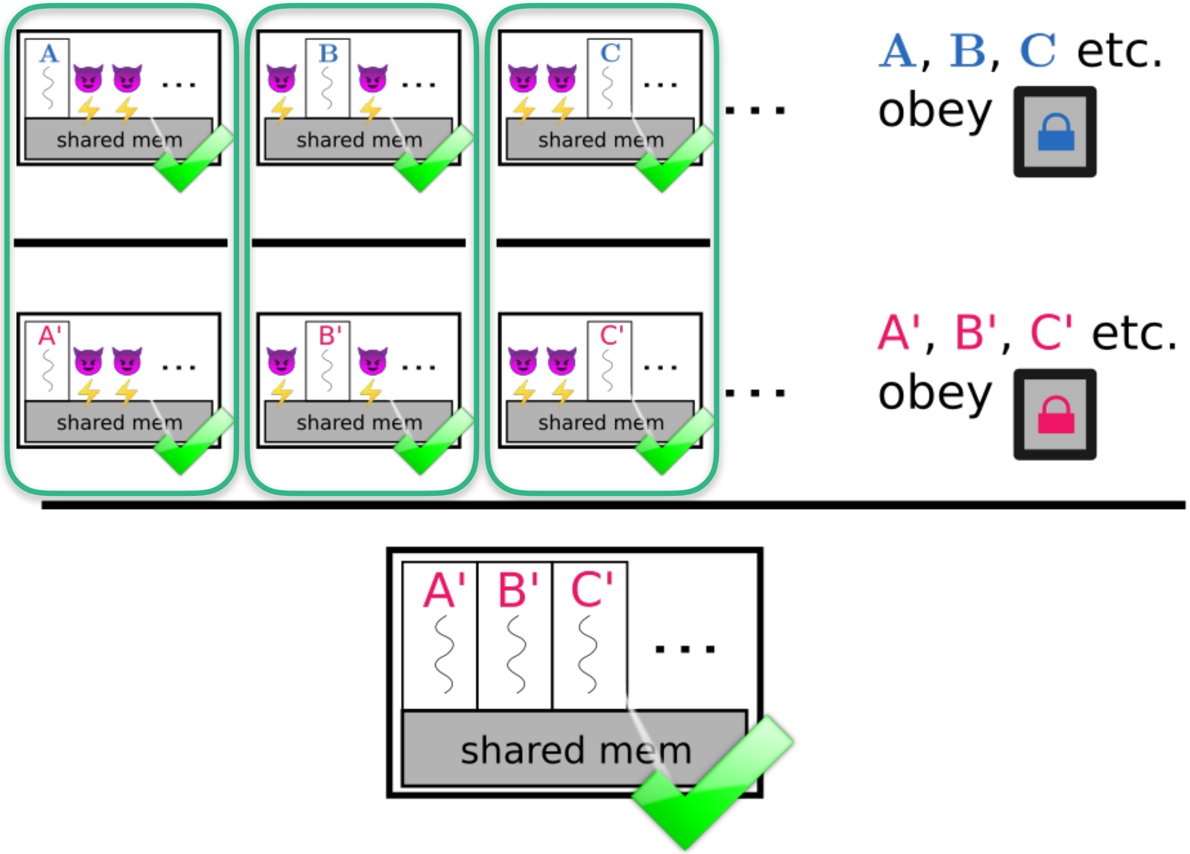
Source

Target

My PhD focus

Infoflow security-preserving compilation



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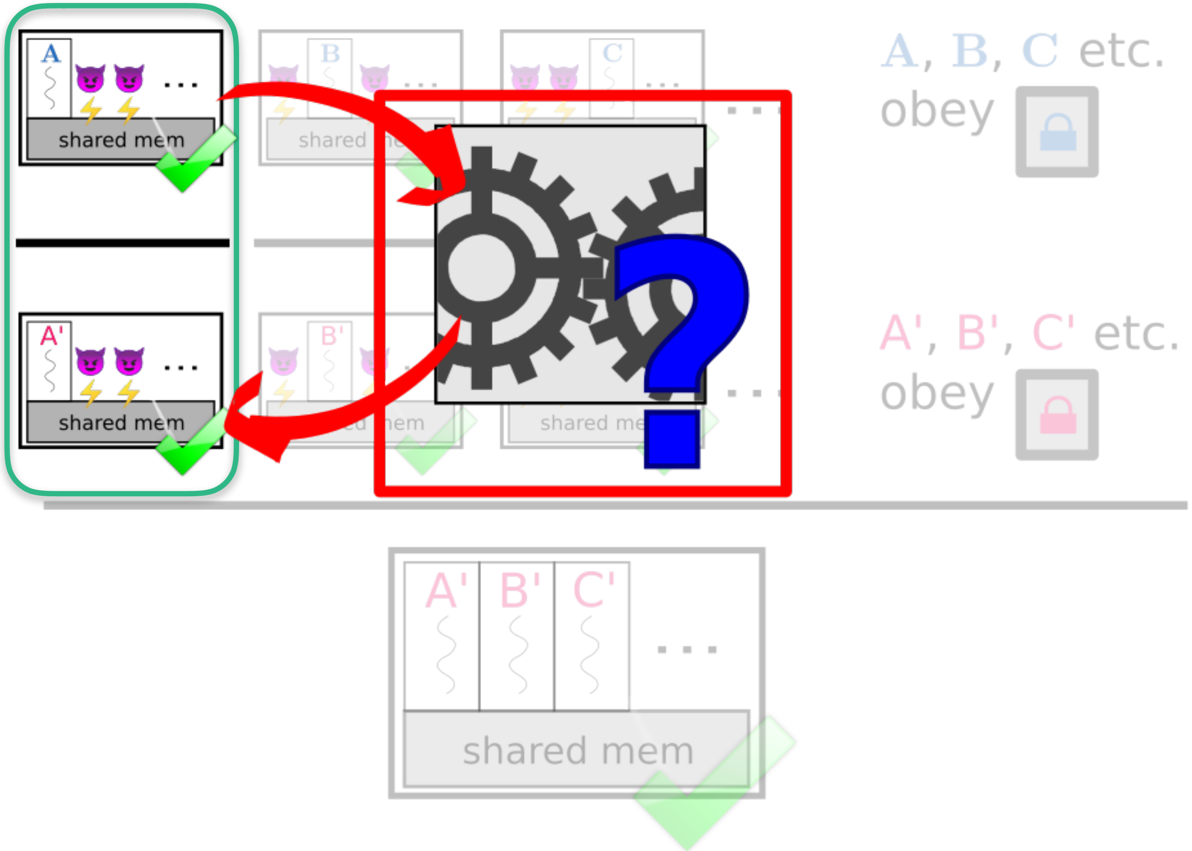
My PhD focus

Infoflow security-preserving compilation

What does it take to prove this?



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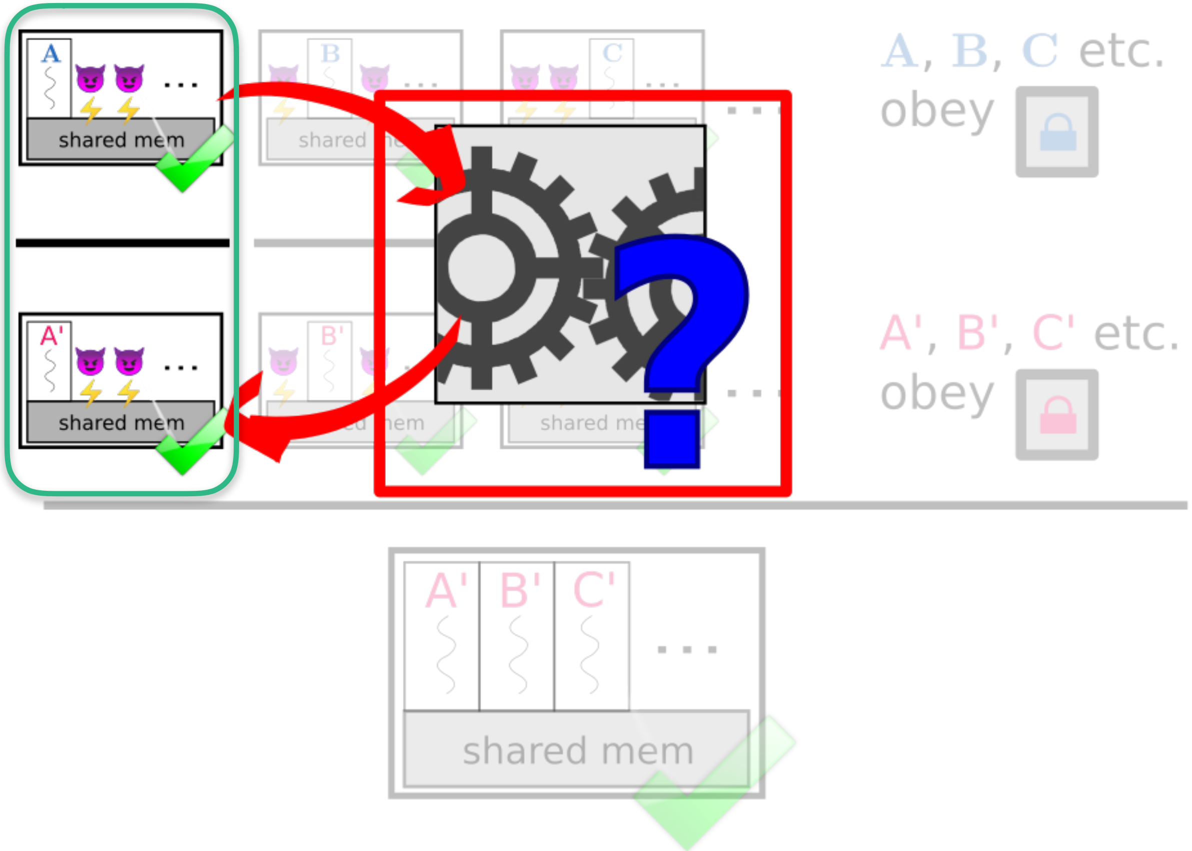
My PhD: so far

Infoflow security-preserving compilation



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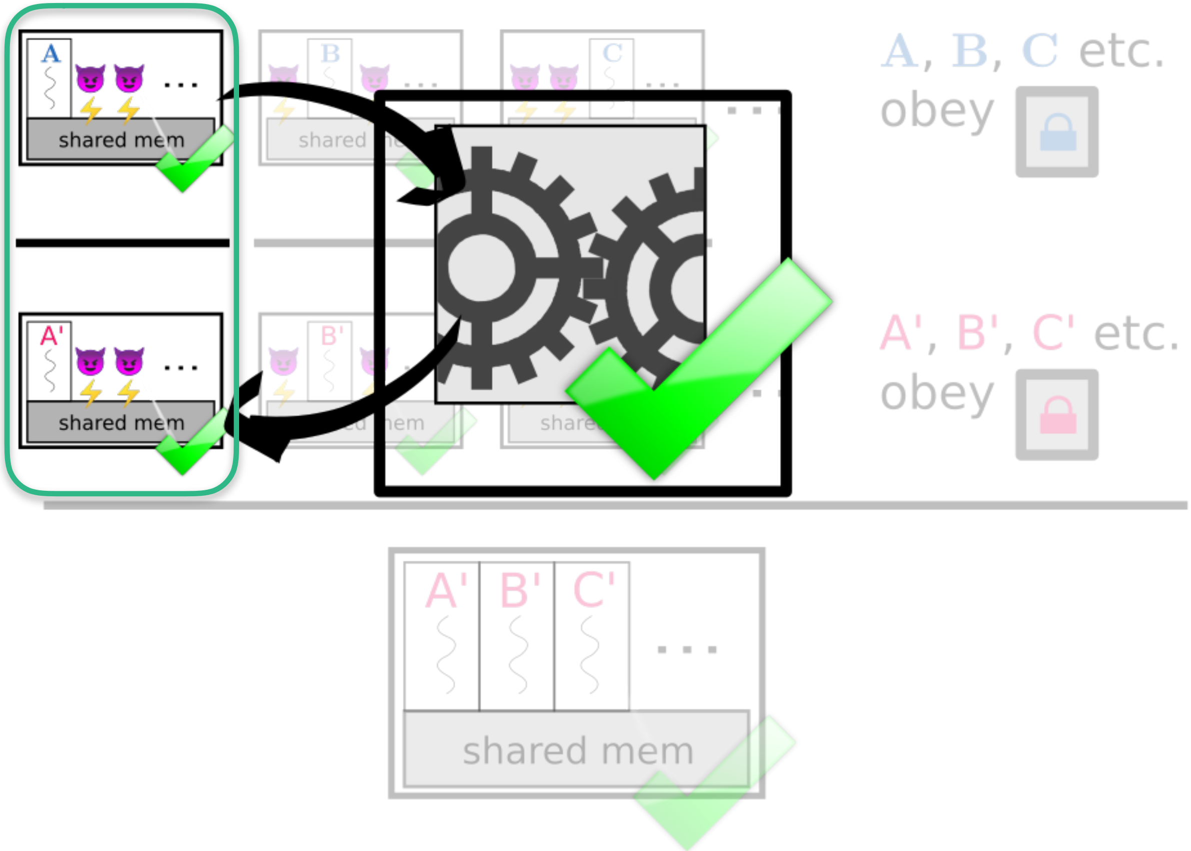
Infoflow security-preserving compilation

- With no H-branching: (Instantiation of [Murray et al, CSF'16])



Source

Generic "While"

Target

Generic "RISC"

(Formalized in Isabelle/HOL, open source: www.covern.org)

My PhD: so far

Infoflow security-preserving compilation

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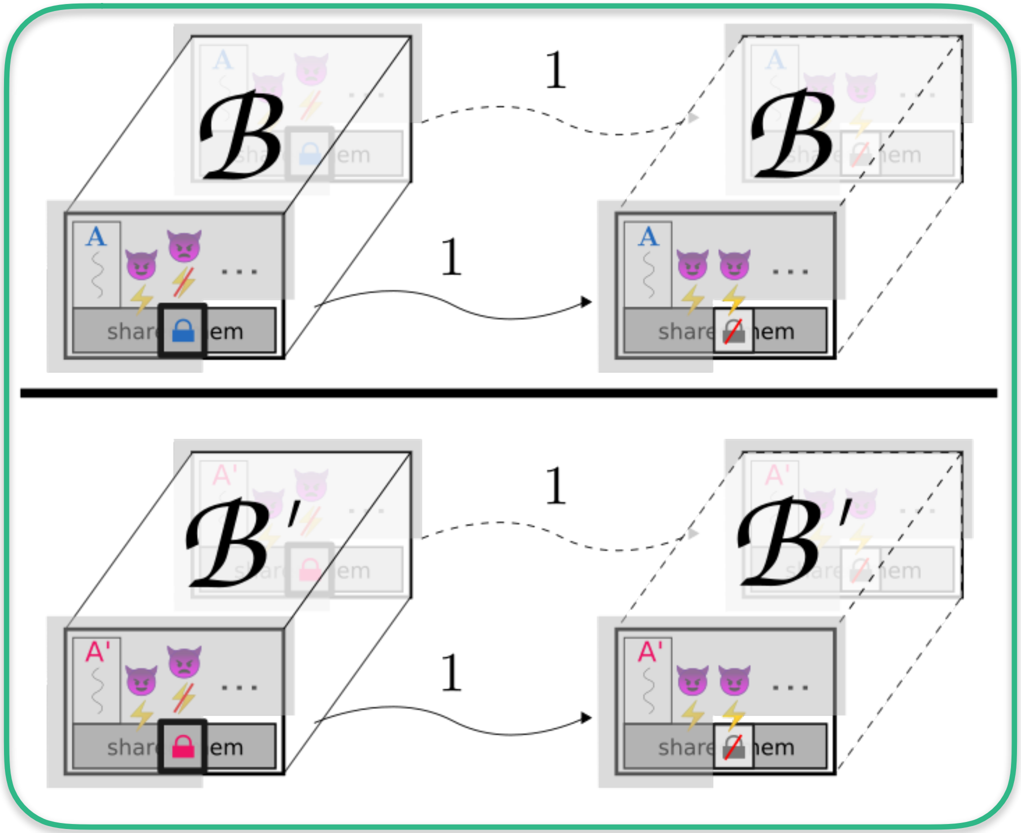

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Bisimulations B, B'

(Formalized in Isabelle/HOL, open source: www.covern.org)

My PhD: so far

Infoflow security-preserving compilation

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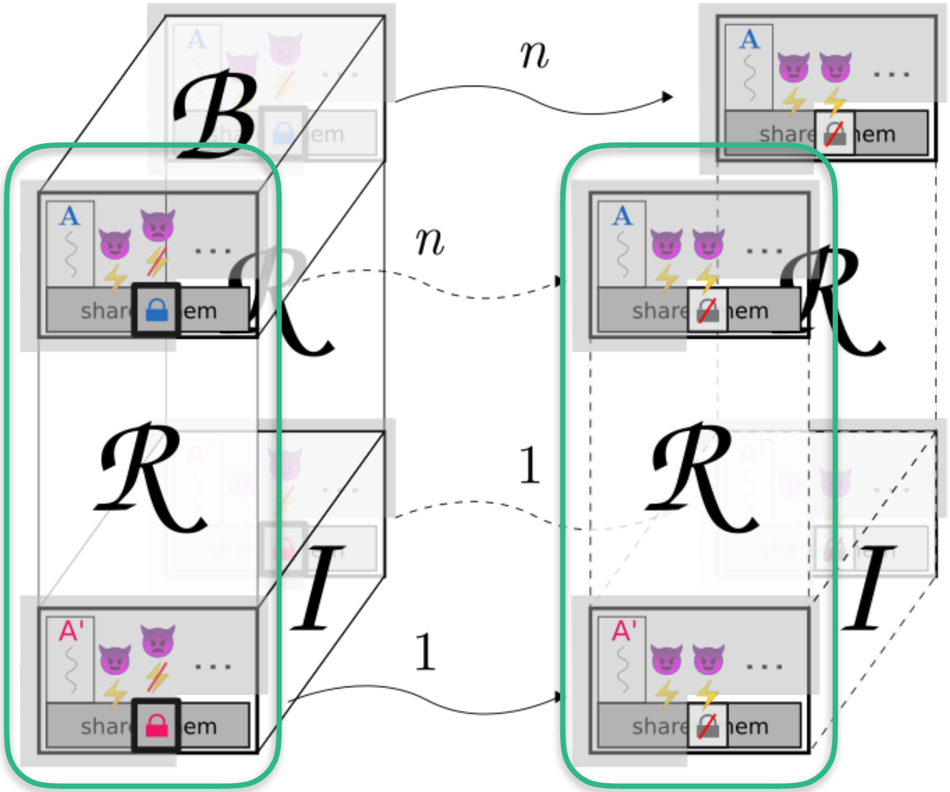

Refinement relation *R*

Bisimulations *B, B’*

(Formalized in Isabelle/HOL, open source: www.covern.org)

My PhD: so far

Infoflow security-preserving compilation

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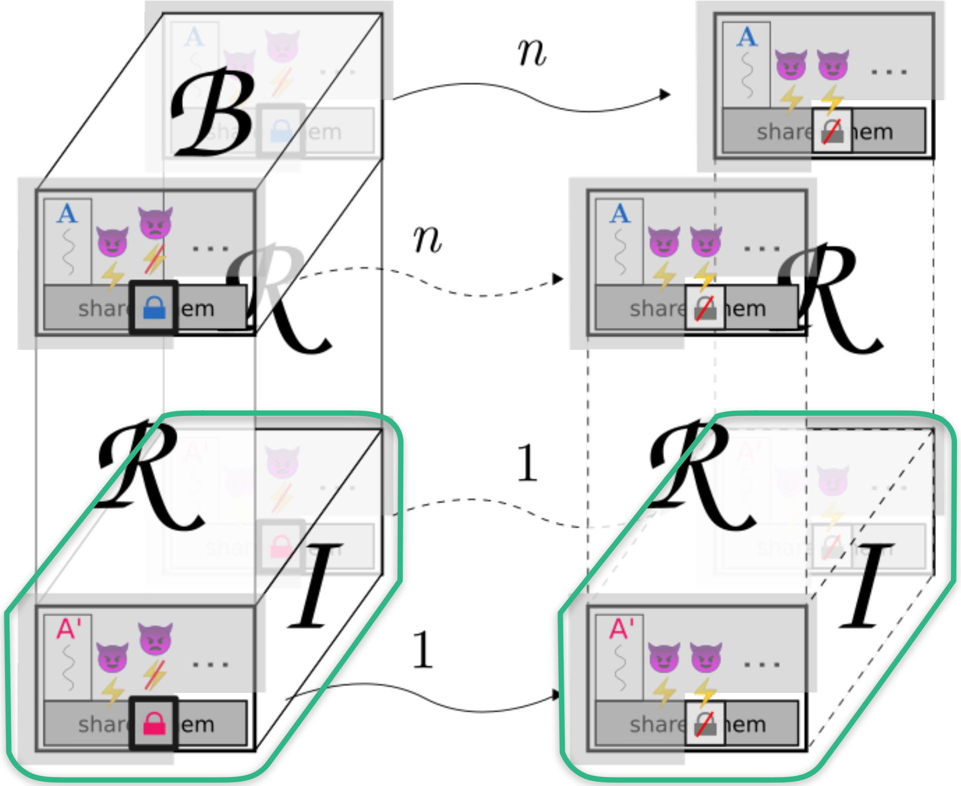


Refinement relation R

Coupling invariant I (pc-security)

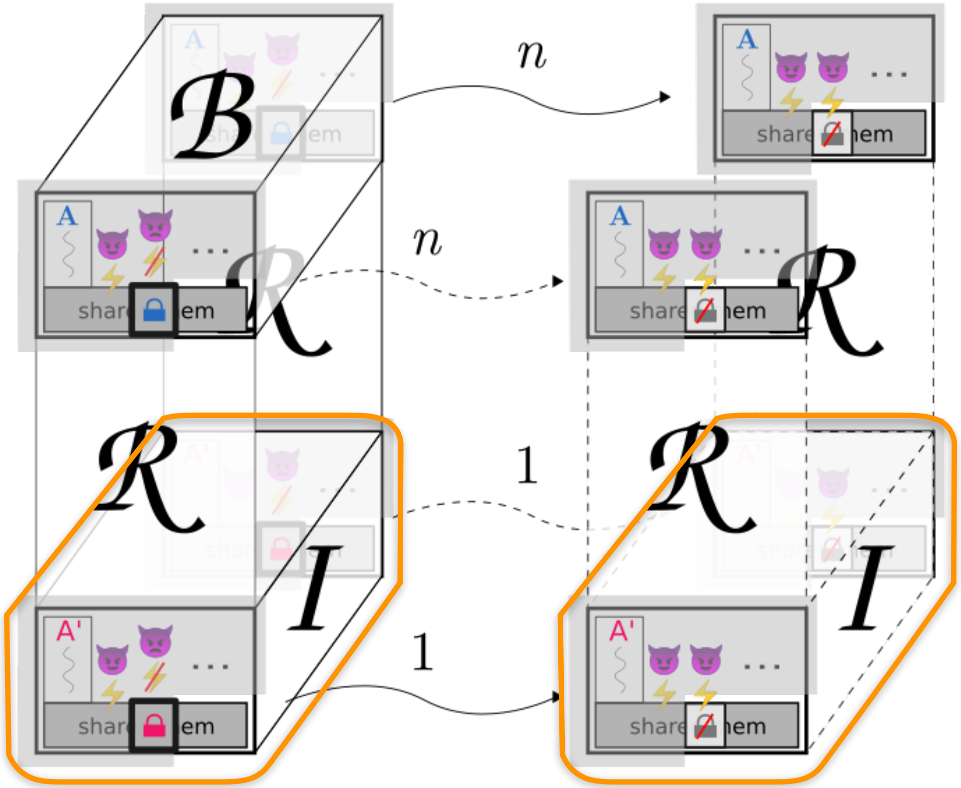
Bisimulations B, B'

(Formalized in Isabelle/HOL, open source: www.covern.org)

My PhD: work in progress

Infoflow security-preserving compilation

- With H-branching? (Relaxation of coupling invariant)



Refinement relation *R*

Coupling invariant *I*
(~~pc-security~~)

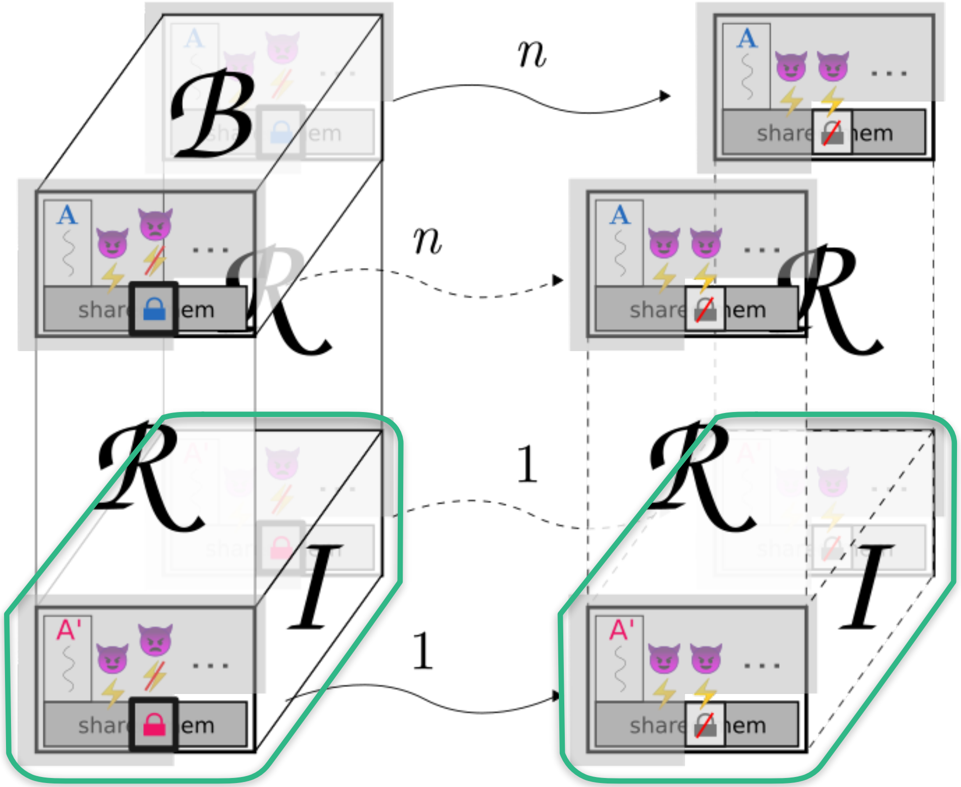
Bisimulations *B*, *B’*

(See: www.covern.org, branch “h-correction”)

For feedback

Infoflow security-preserving compilation

- Applicable to CompCert?



Refinement relation R

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(Simplifications, requirements from [Murray et al, CSF’16])

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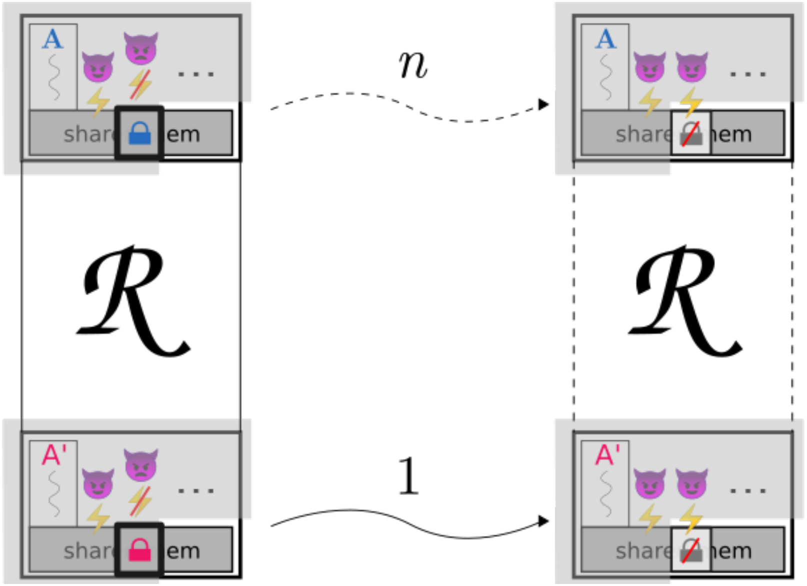

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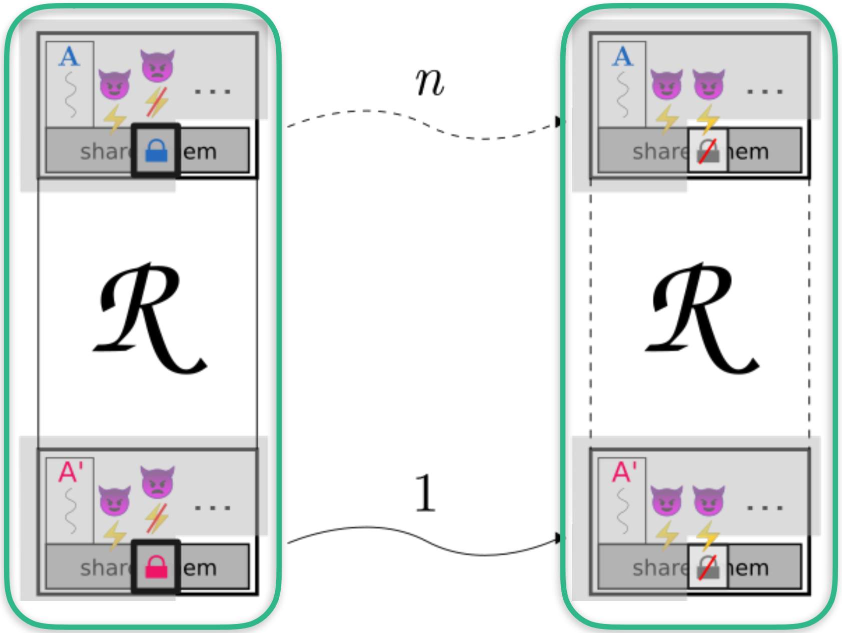

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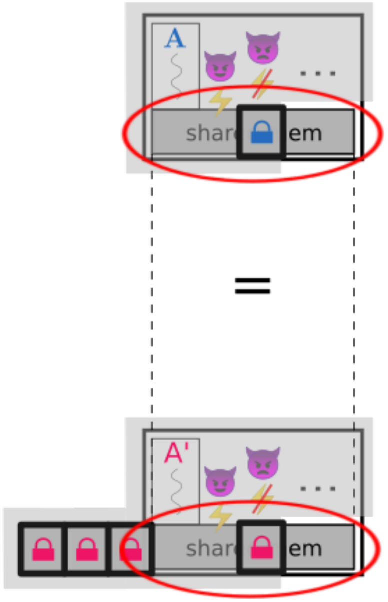
  - Must preserve *all* shared mem contents
  - *No* new shared state allowed



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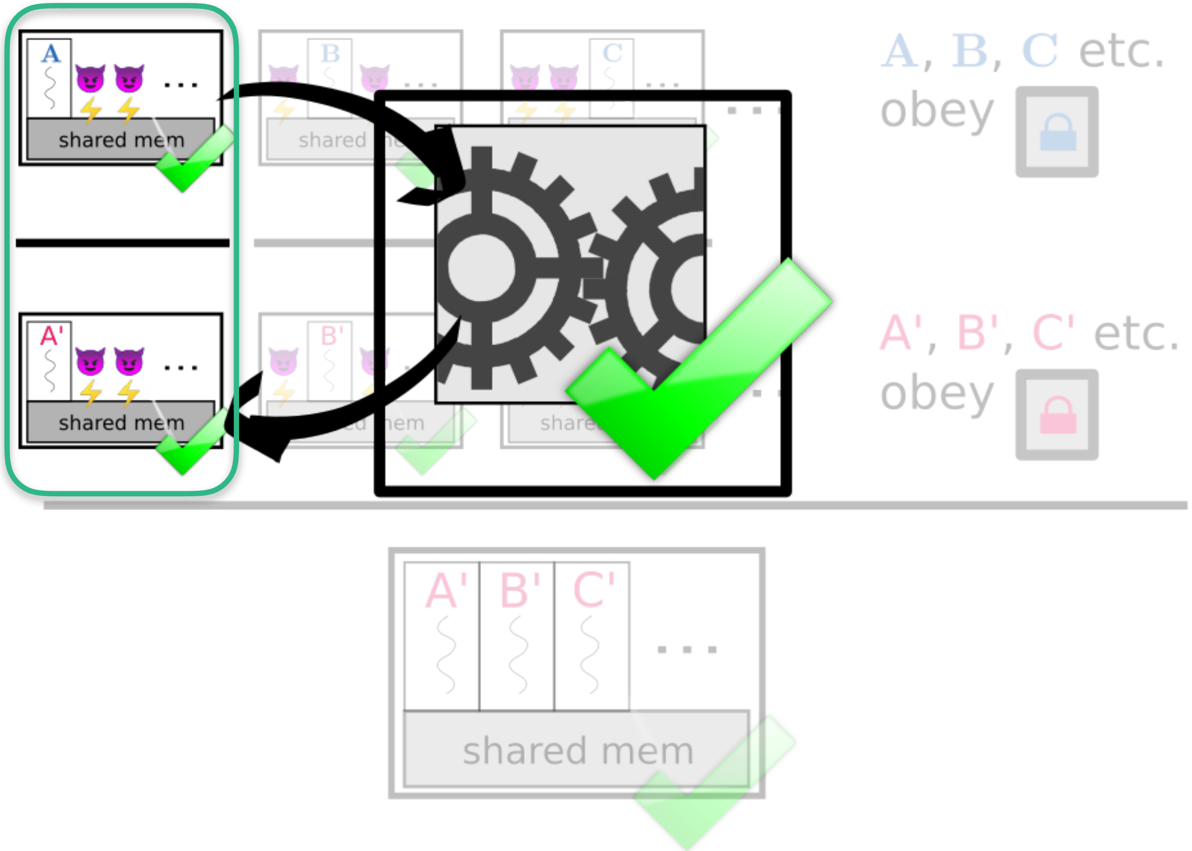

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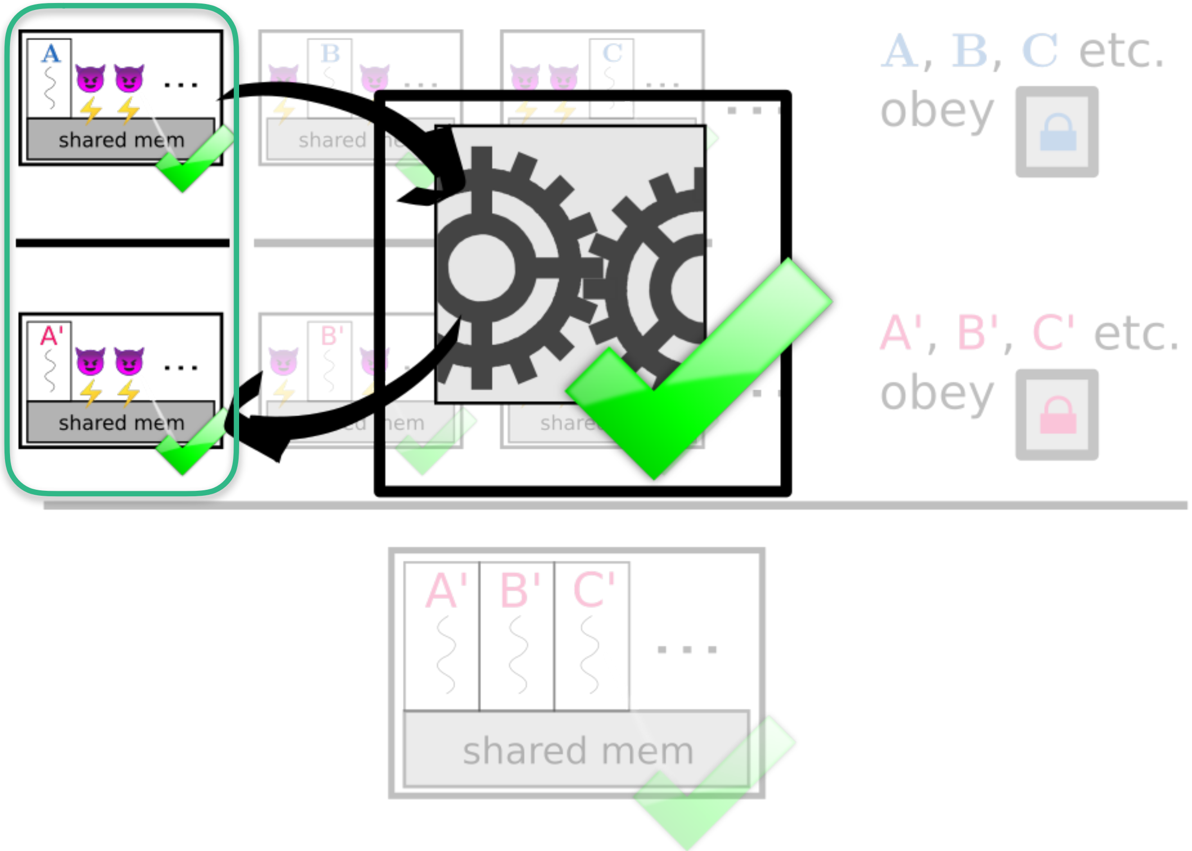

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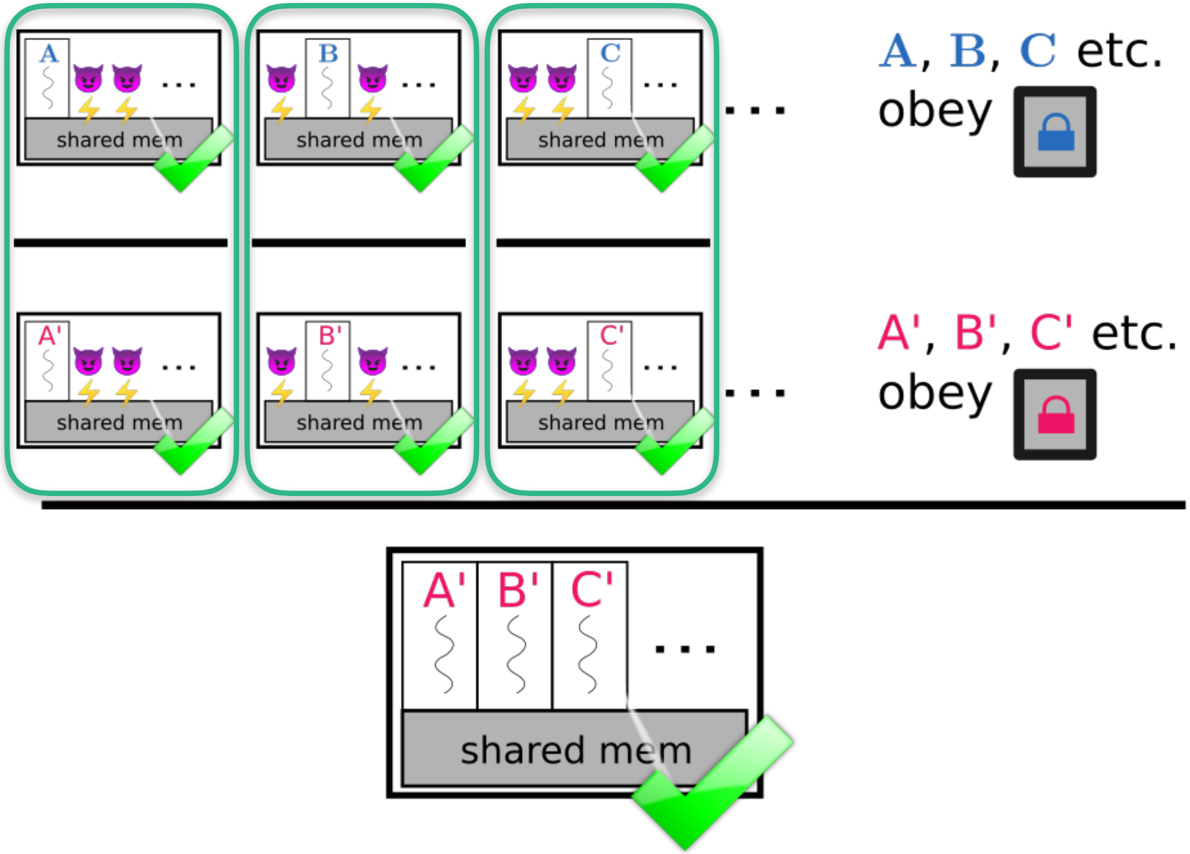

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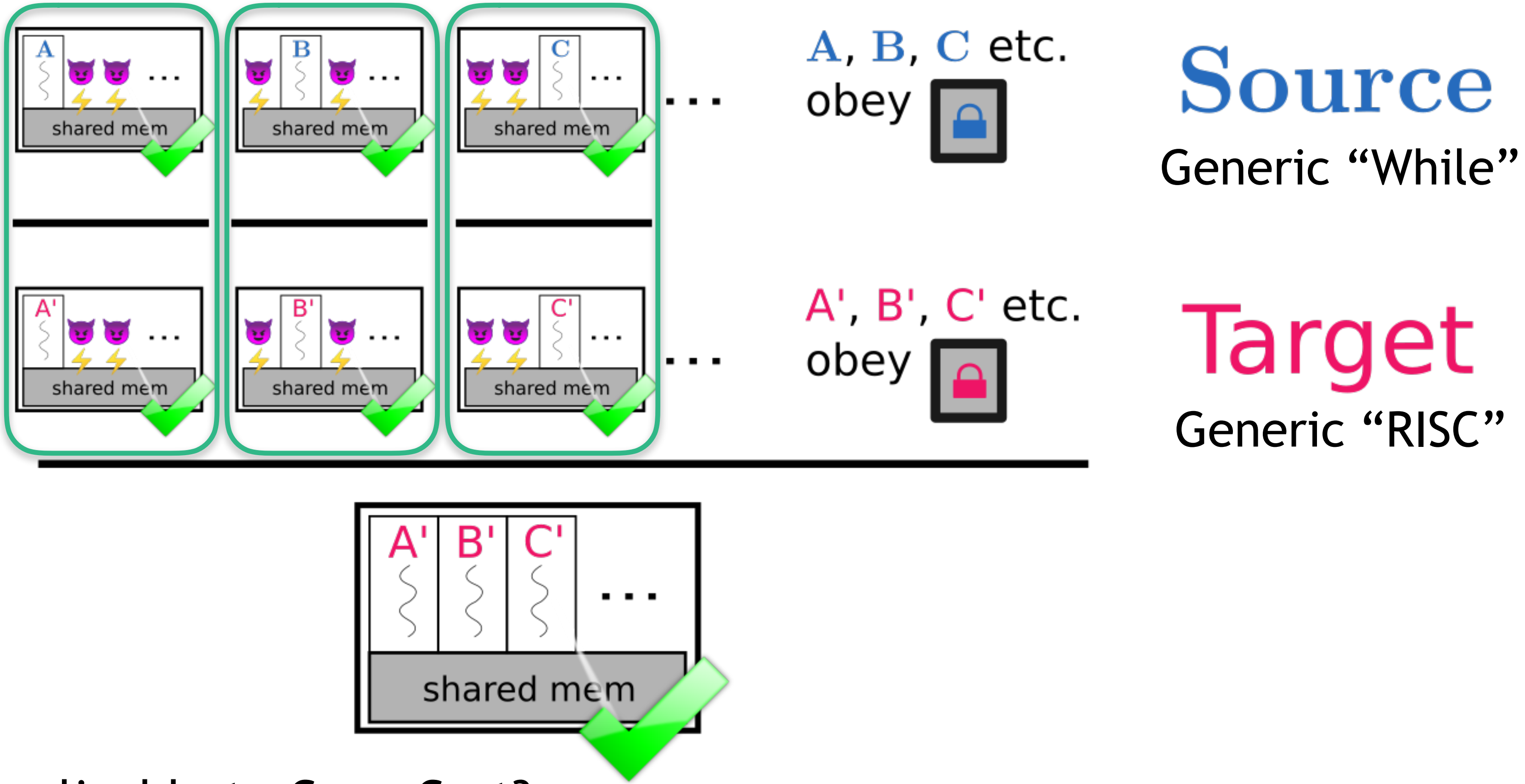

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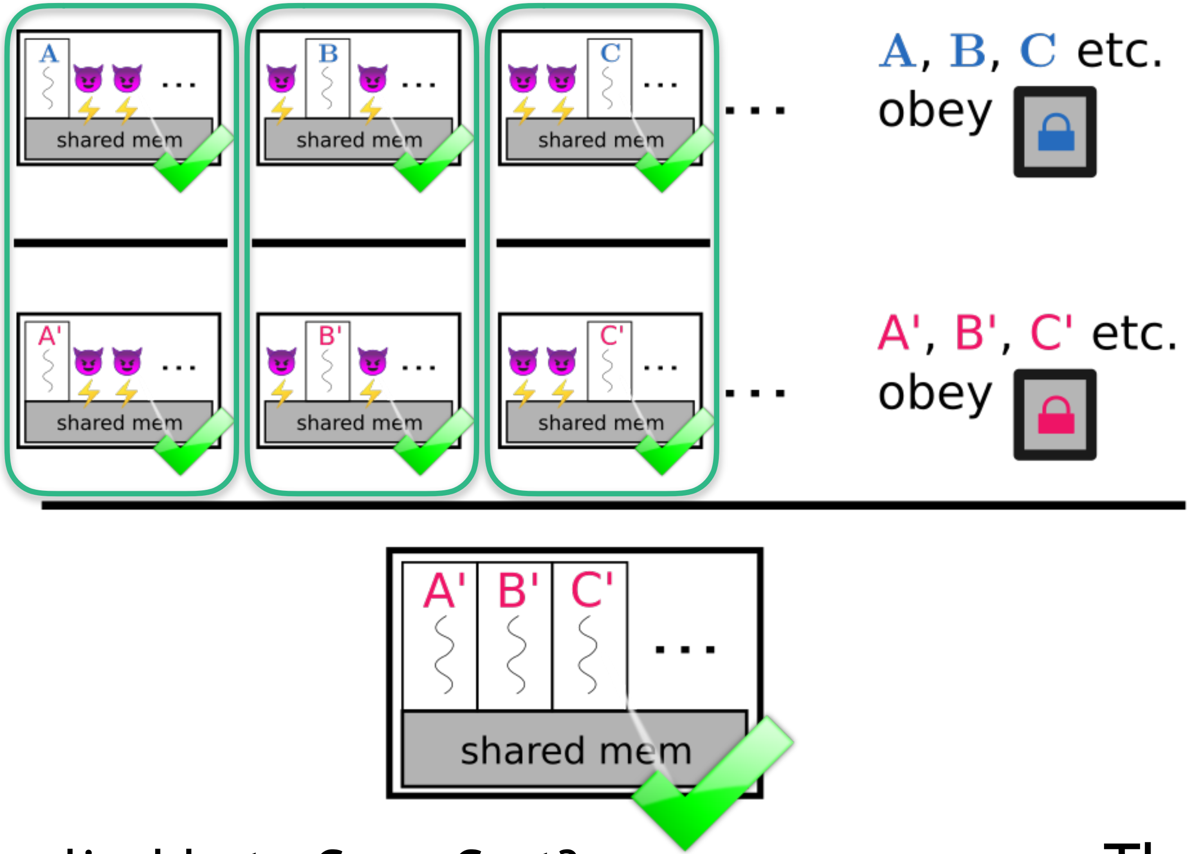

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Thank you! Q & A

DATA 61

Thank you

Trustworthy Systems
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PhD Student

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