Performance Evaluation for Gradual Typing

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9 years of sound gradual typing

Gradual Typing for Functional Languages,
Jeremy Siek & Walid Taha.
SFP '06

Interlanguage Migration: From Scripts to Programs,
Sam Tobin-Hochstadt & Matthias Felleisen.
OOPSLA '06

9 years of sound gradual typing

Micro

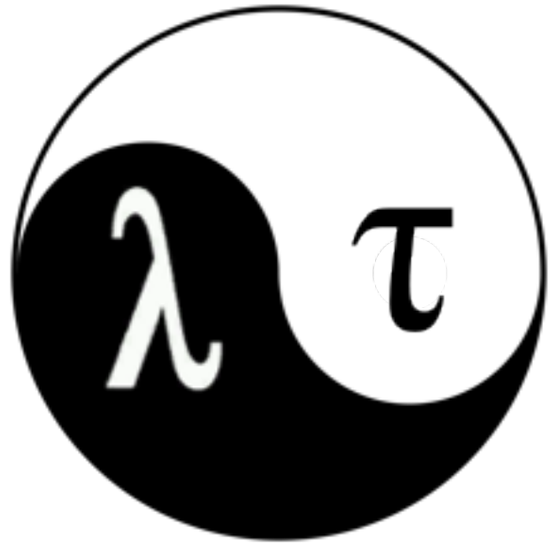
Macro

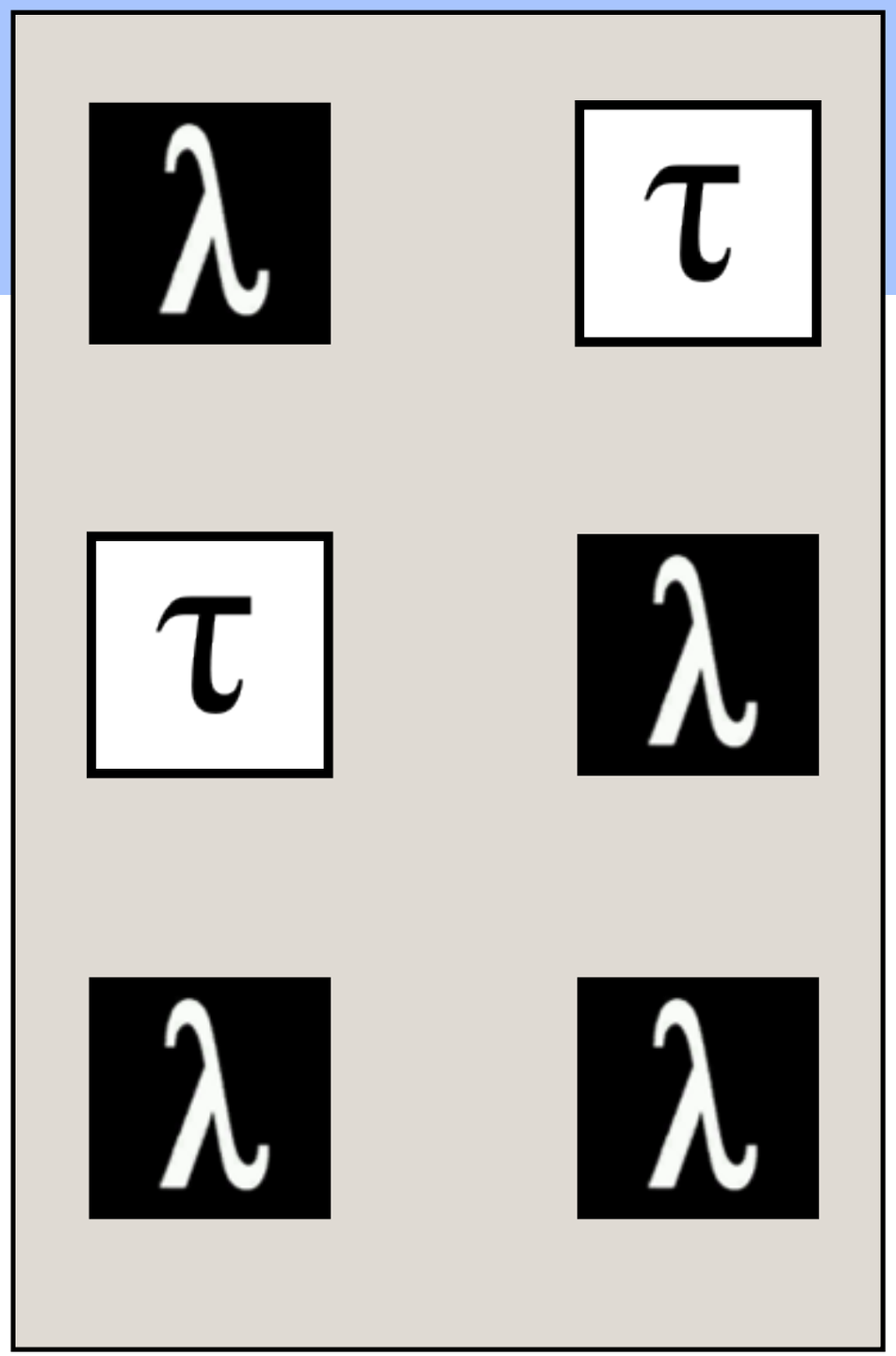
Micro

- focus on single-module programs

- type system catches incompatibilities

- all values implicitly type DYN





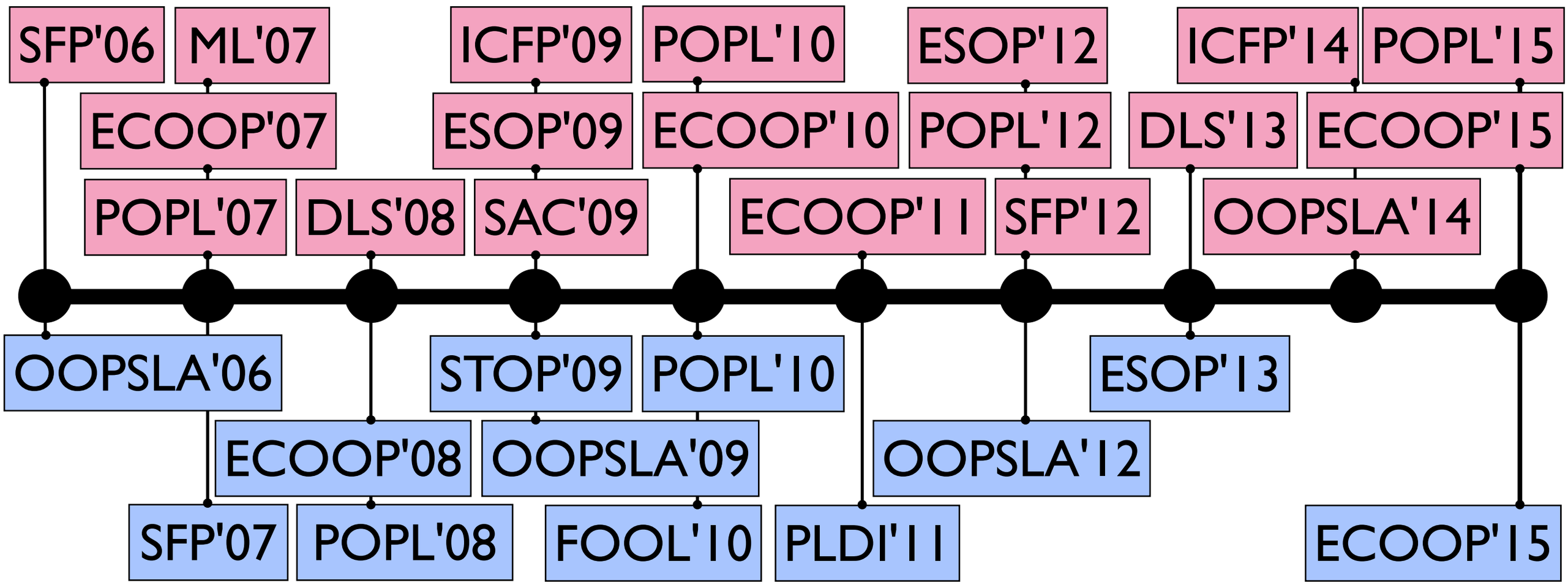
Macro

- multi-module, untyped programs

- eliminate a class of errors

- each *module* fully typed/untyped

9 years of sound gradual typing



Over **50** publications since 2006

http://github.com/samth/gradual-typing-bib

Performance?

Performance?

4x

10x

22x

33x

9 years of publications

and nobody publishes evaluations

because performance sucks

Gradual Typing ... is practical?

Gradual Typing ... is practical?

Performance? 

Soundness? 

Types without Soundness

- catch "obvious" logical errors

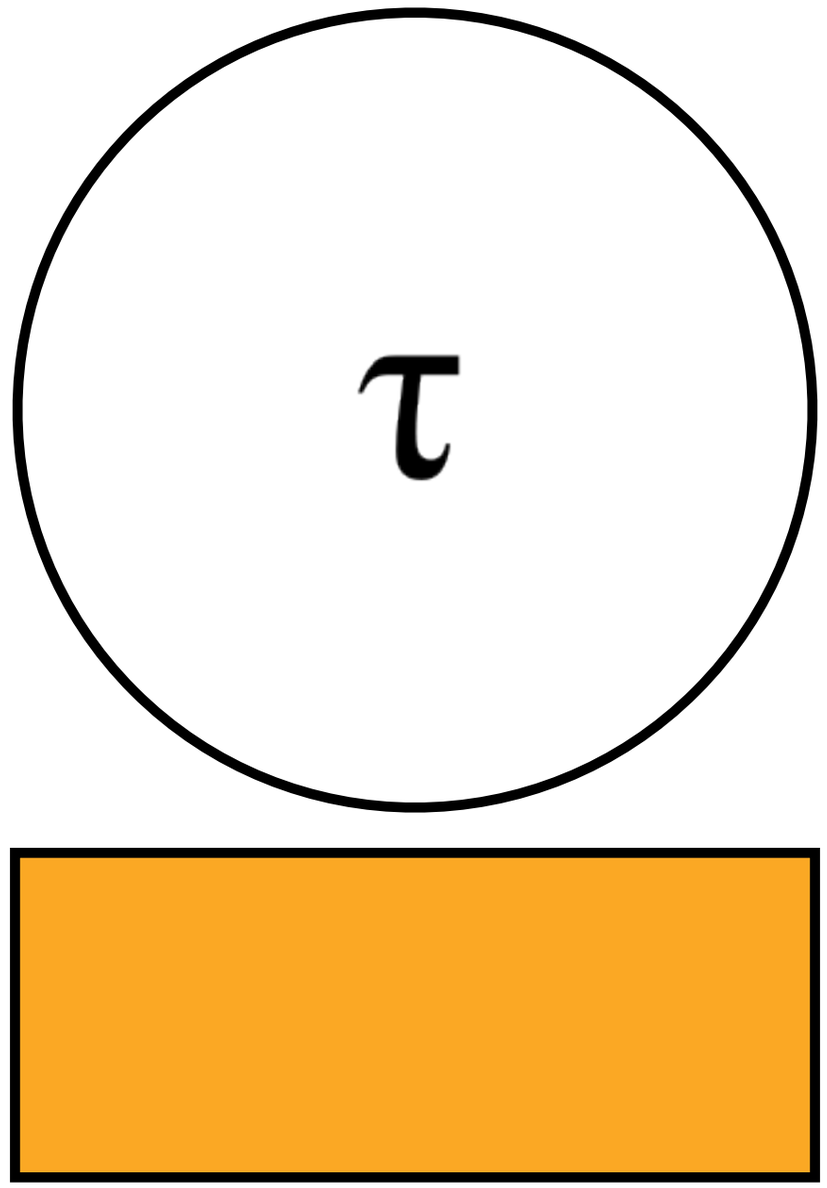
- serve as documentation

- may not be correct, or complete

Types + Soundness

eliminate a class of errors from typed code !

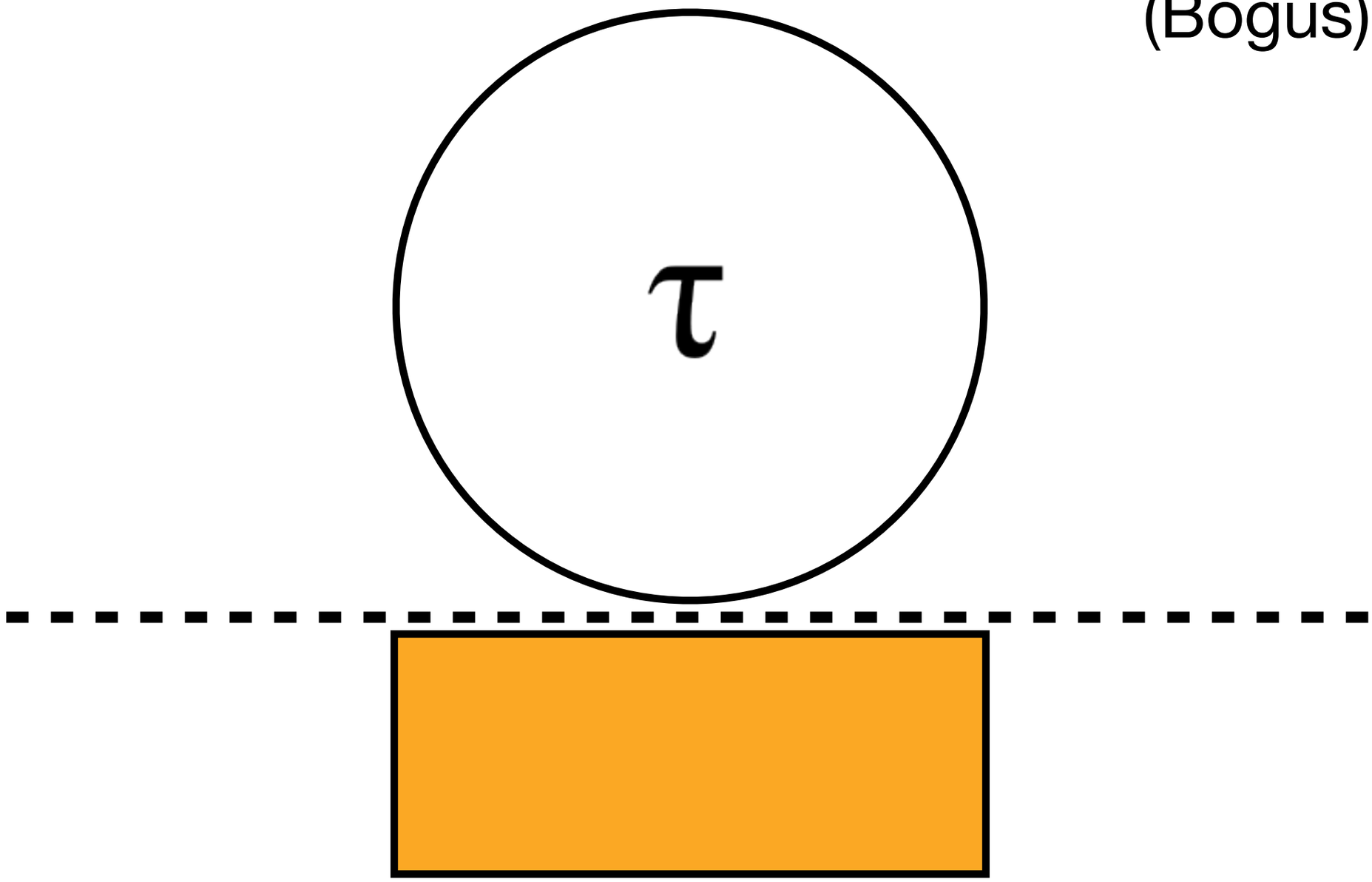
Every typed language...



Rests on an
untyped runtime

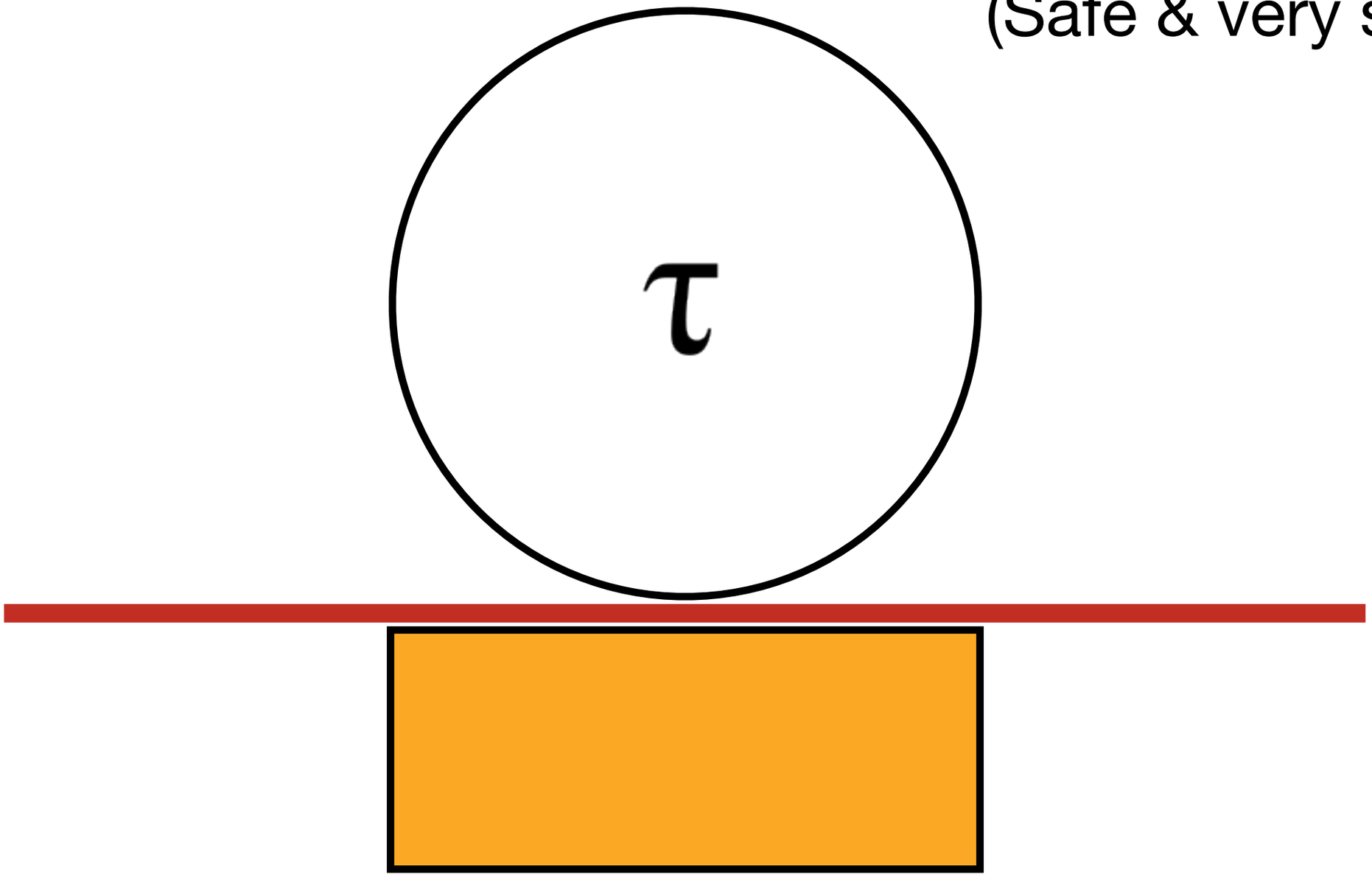
Option 1: Trusted Computing Base

(Bogus)



Option 2: Check Everything

(Safe & very slow)



Types + Soundness (revised)

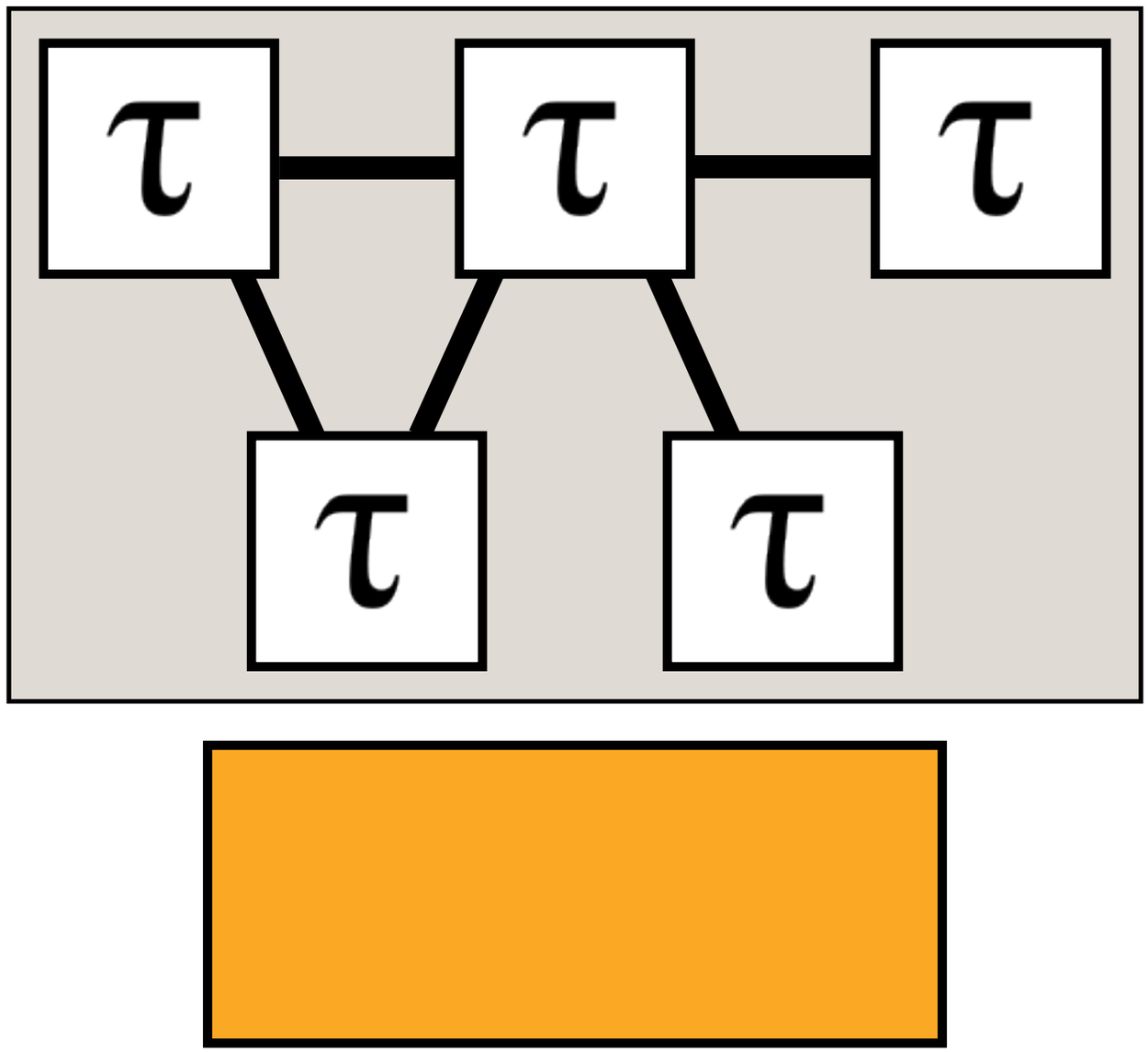
eliminate a class of errors from typed code

identify errors at typed-untyped boundaries

→ Option 1: Trusted Computing Base

Option 2: Check Everything

The Reality of (Macro) Gradual Typing



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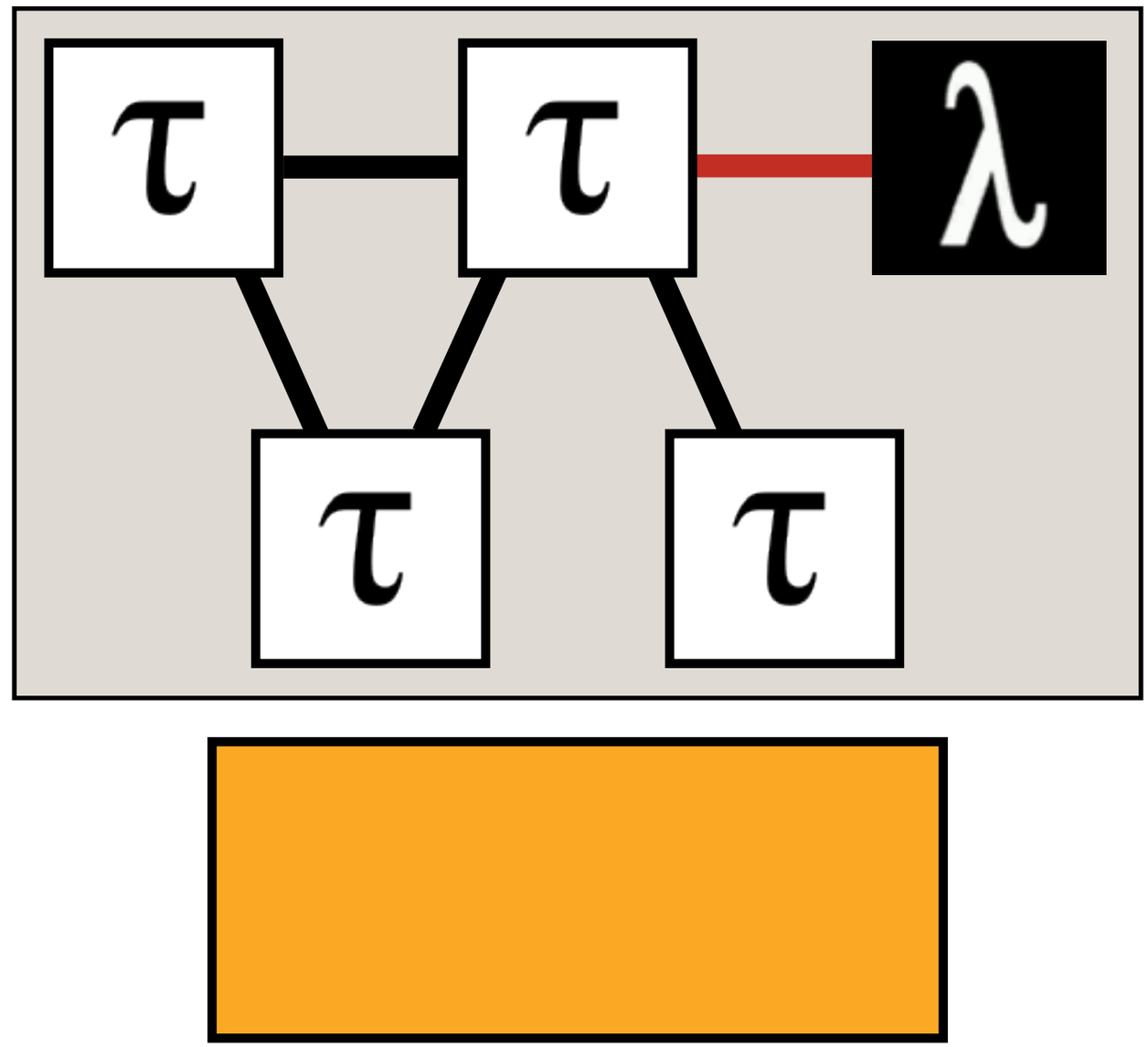

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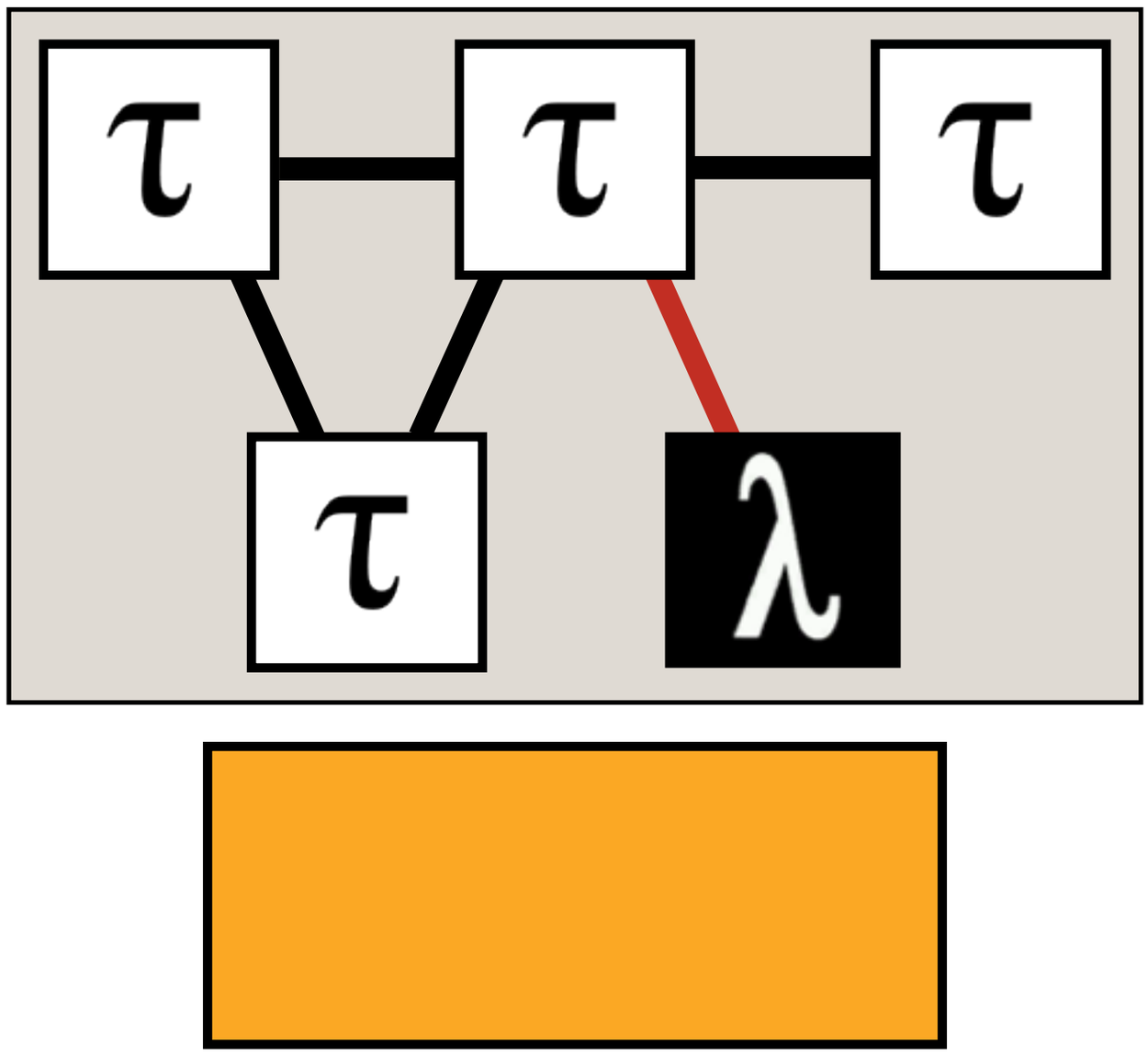

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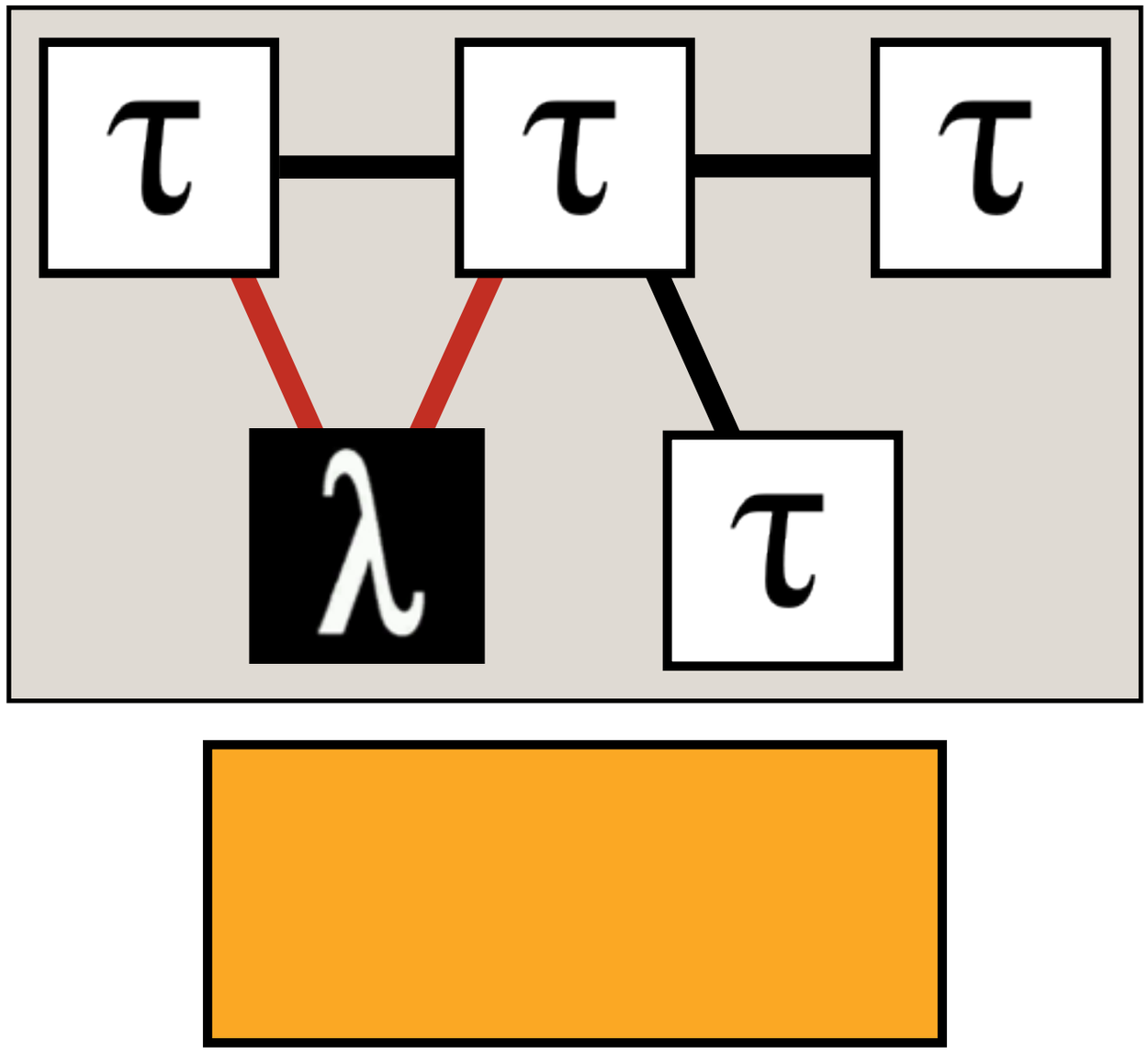

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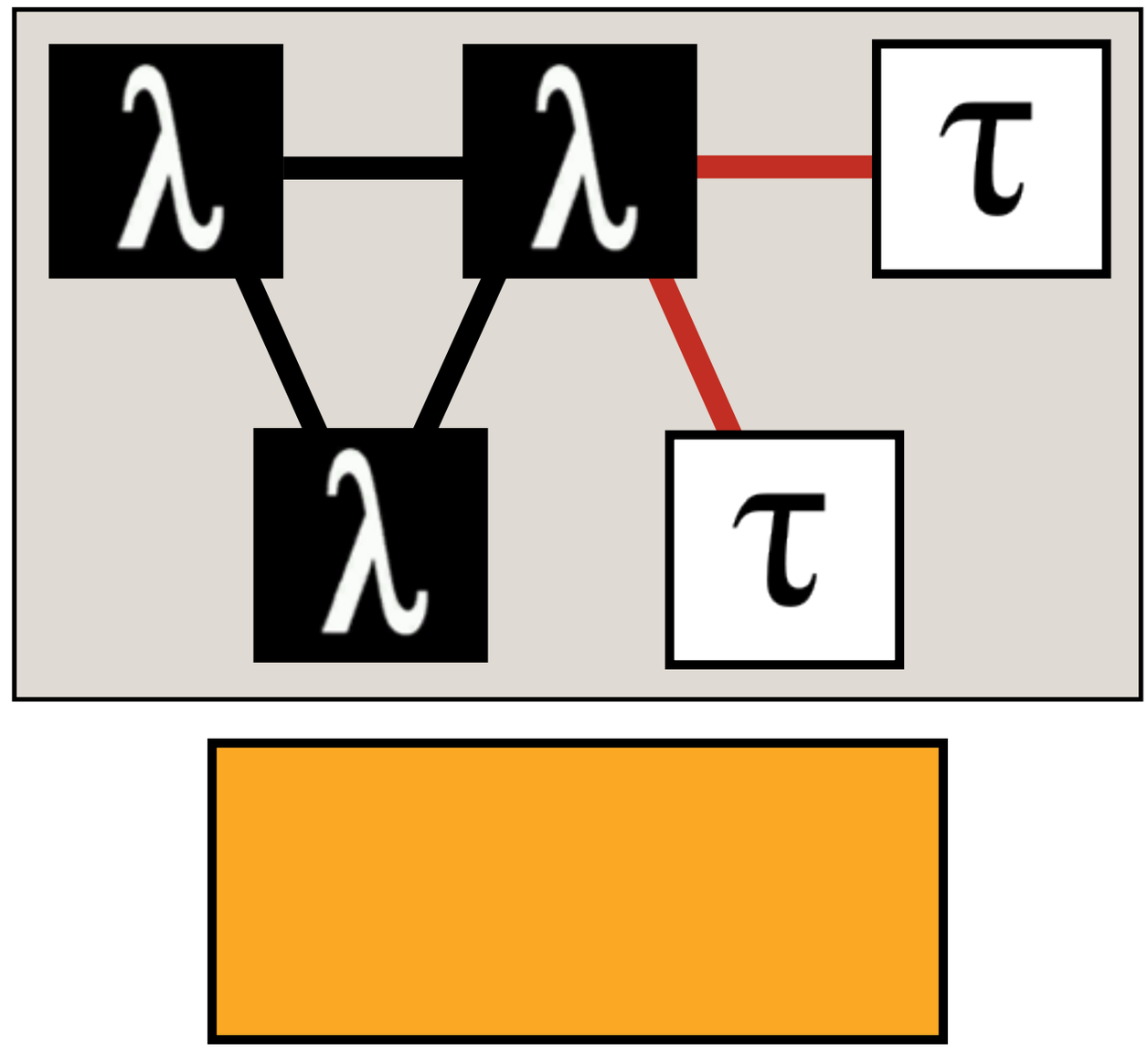

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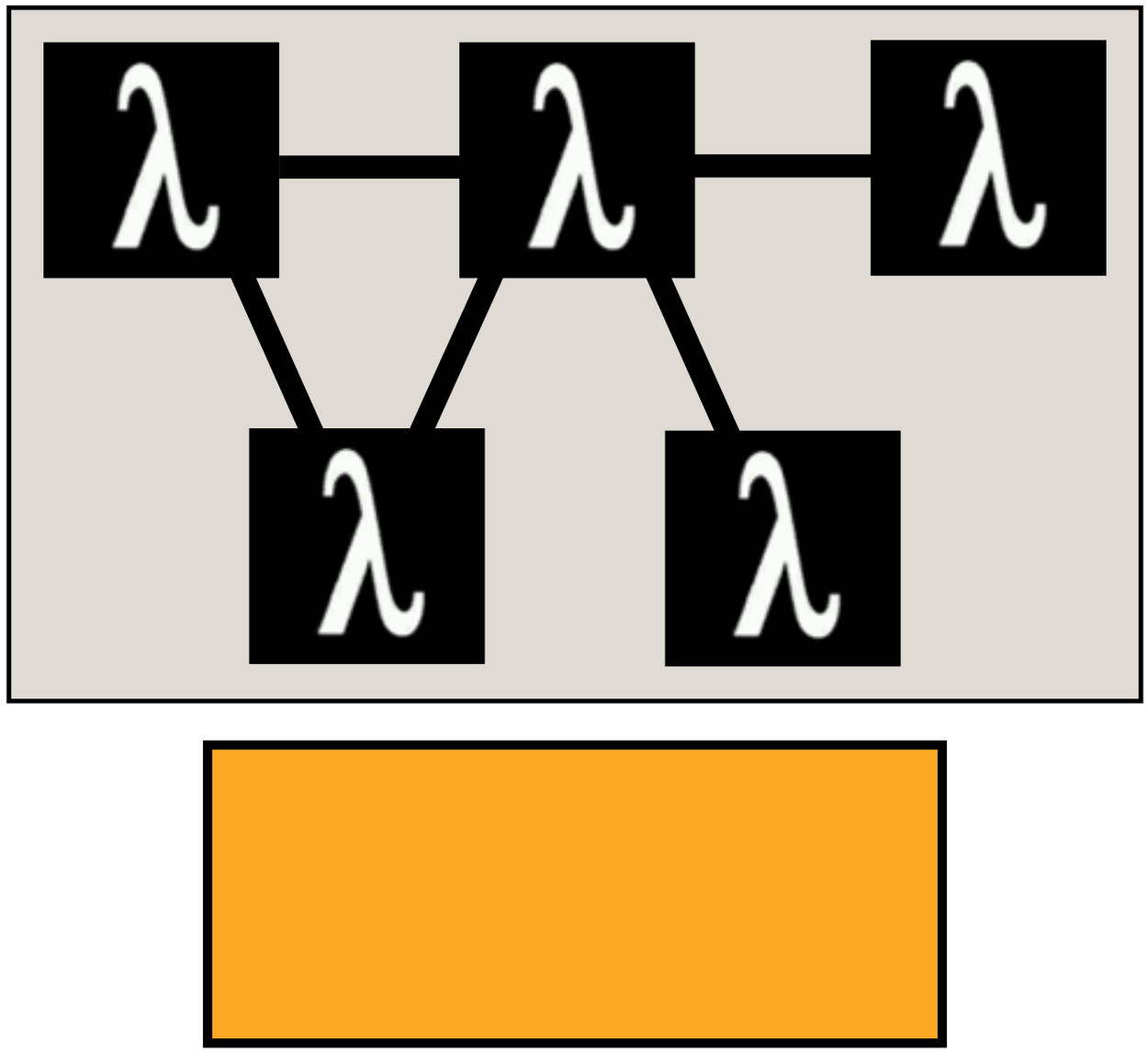

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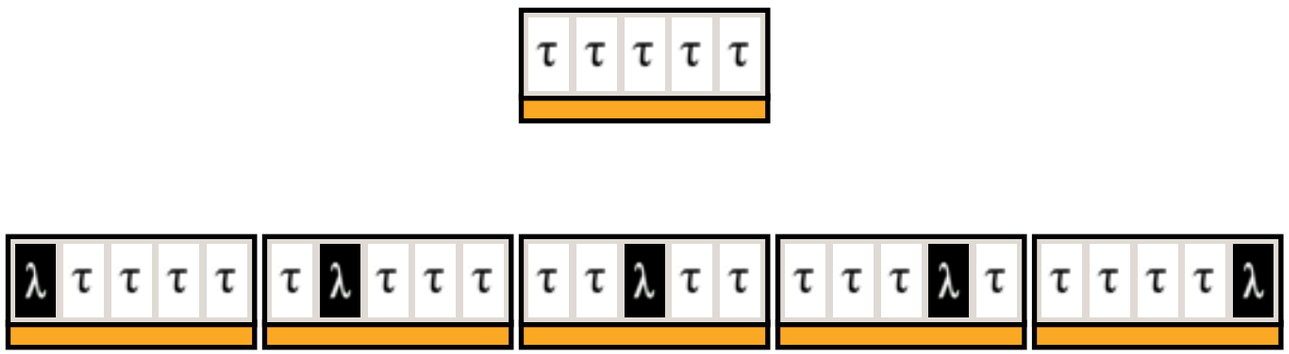


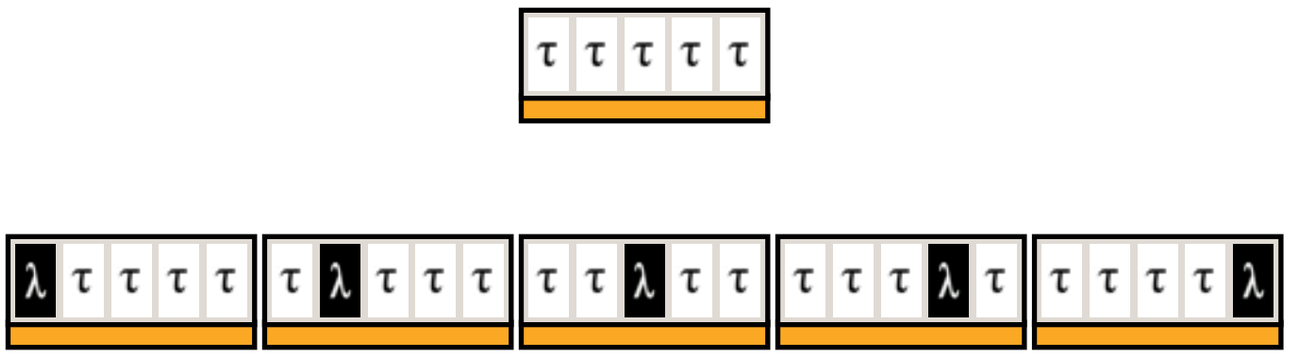
Recap

- Gradual type systems have "bad" performance

- Type soundness is imperative

- Issue: typed-untyped boundaries

The Reality of (Macro) Gradual Typing



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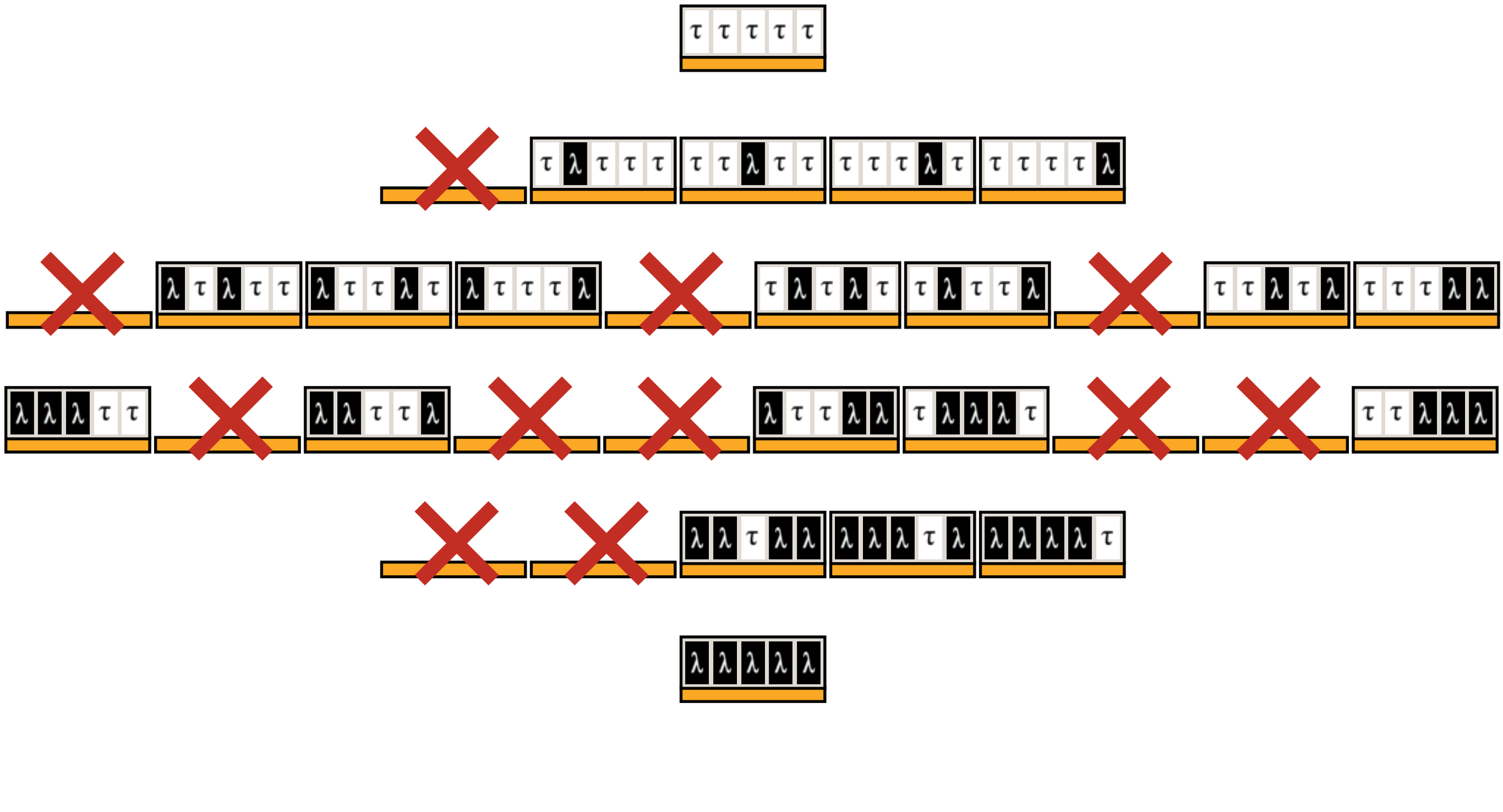

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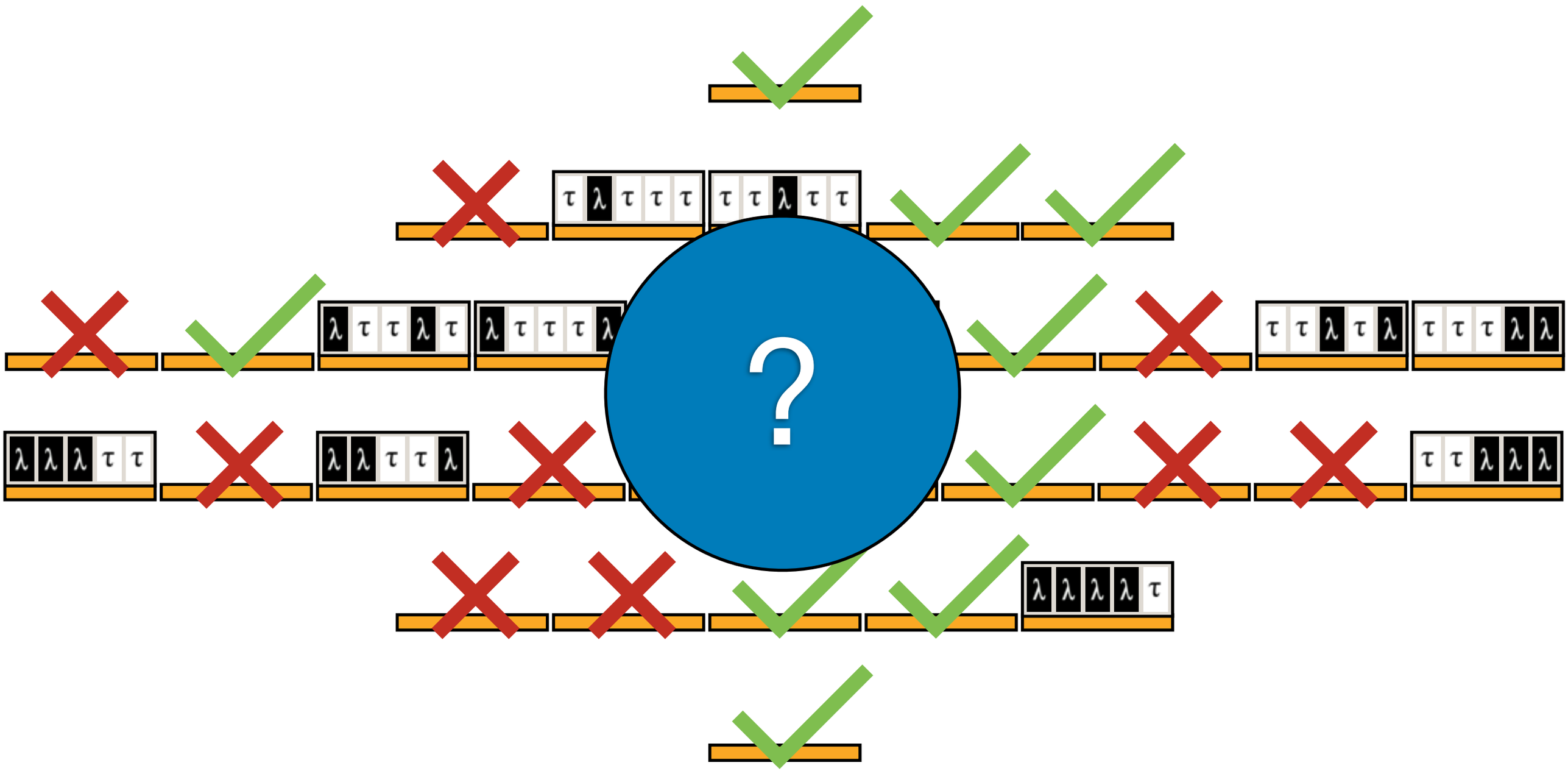


Proposal

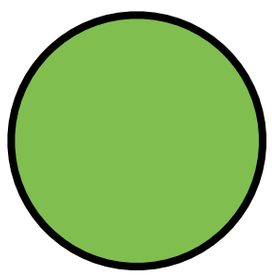
I. Define "boundary"

II. Run the **entire lattice**

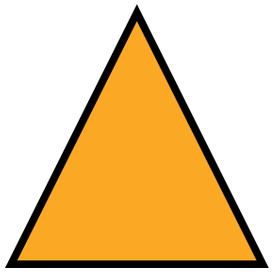
III. Define "performant"

IV. Report the % of performant variations

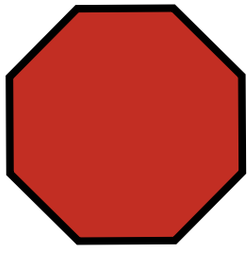
To be continued...



If you **agree**, then **use** our framework



If you **disagree**, then **propose** an alternative



Bottom line: no more "footnotes" on performance!

How to Scale?

- Hire a cluster

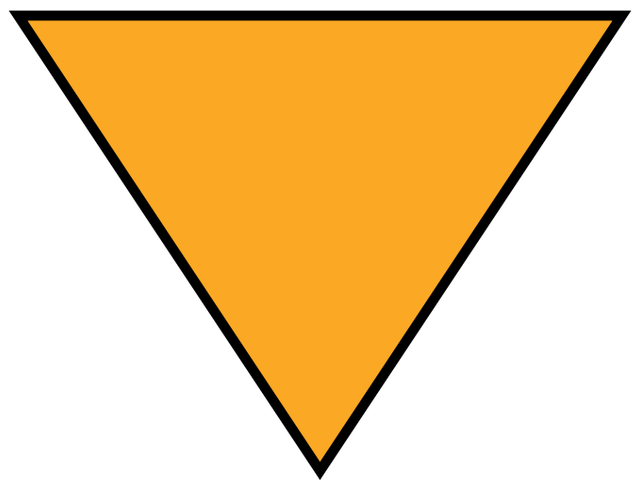
- Random sampling

- Offer fewer configurations

- Tools to identify / exclude configs.

Gradual Typing: Promise

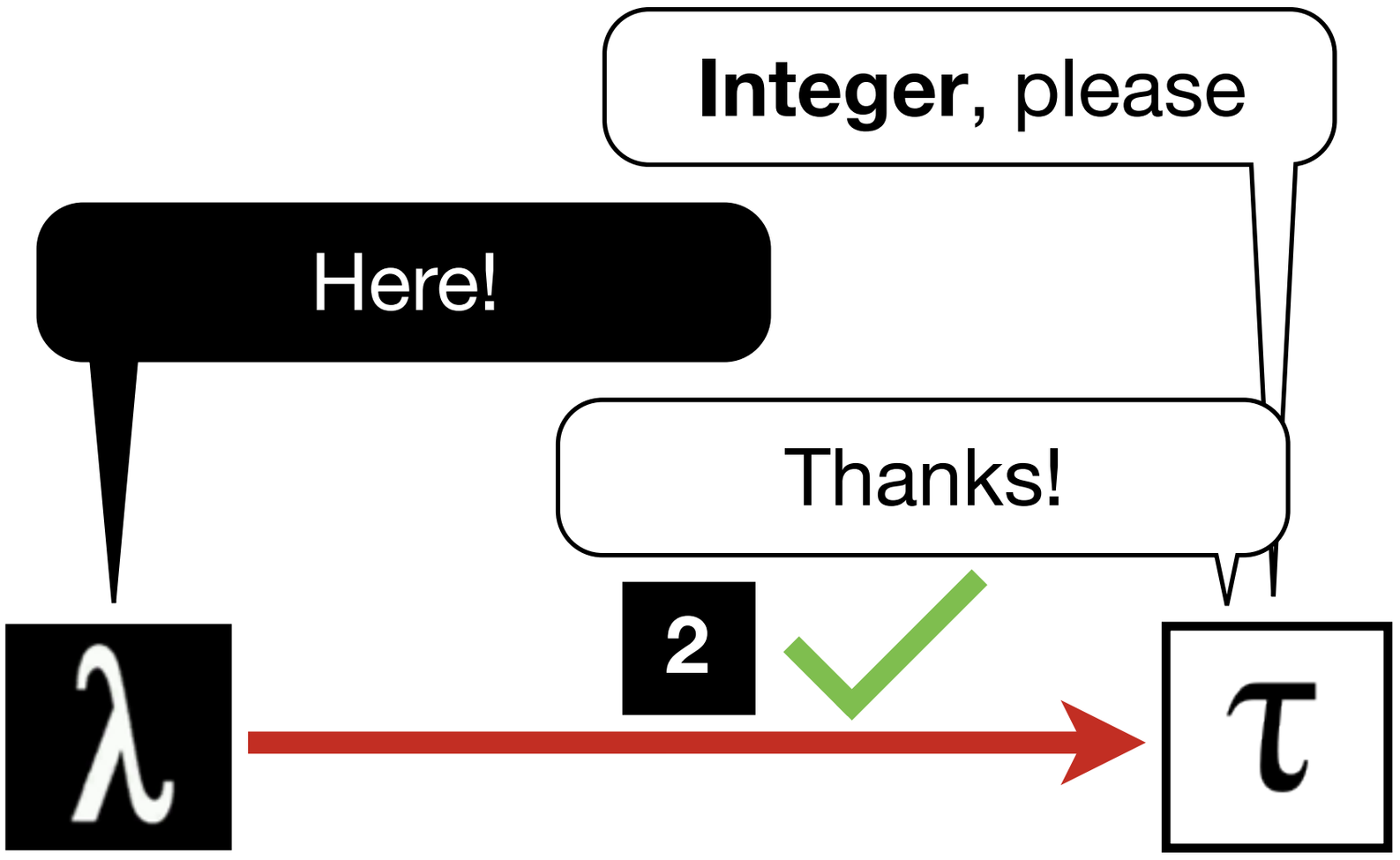
Expressive



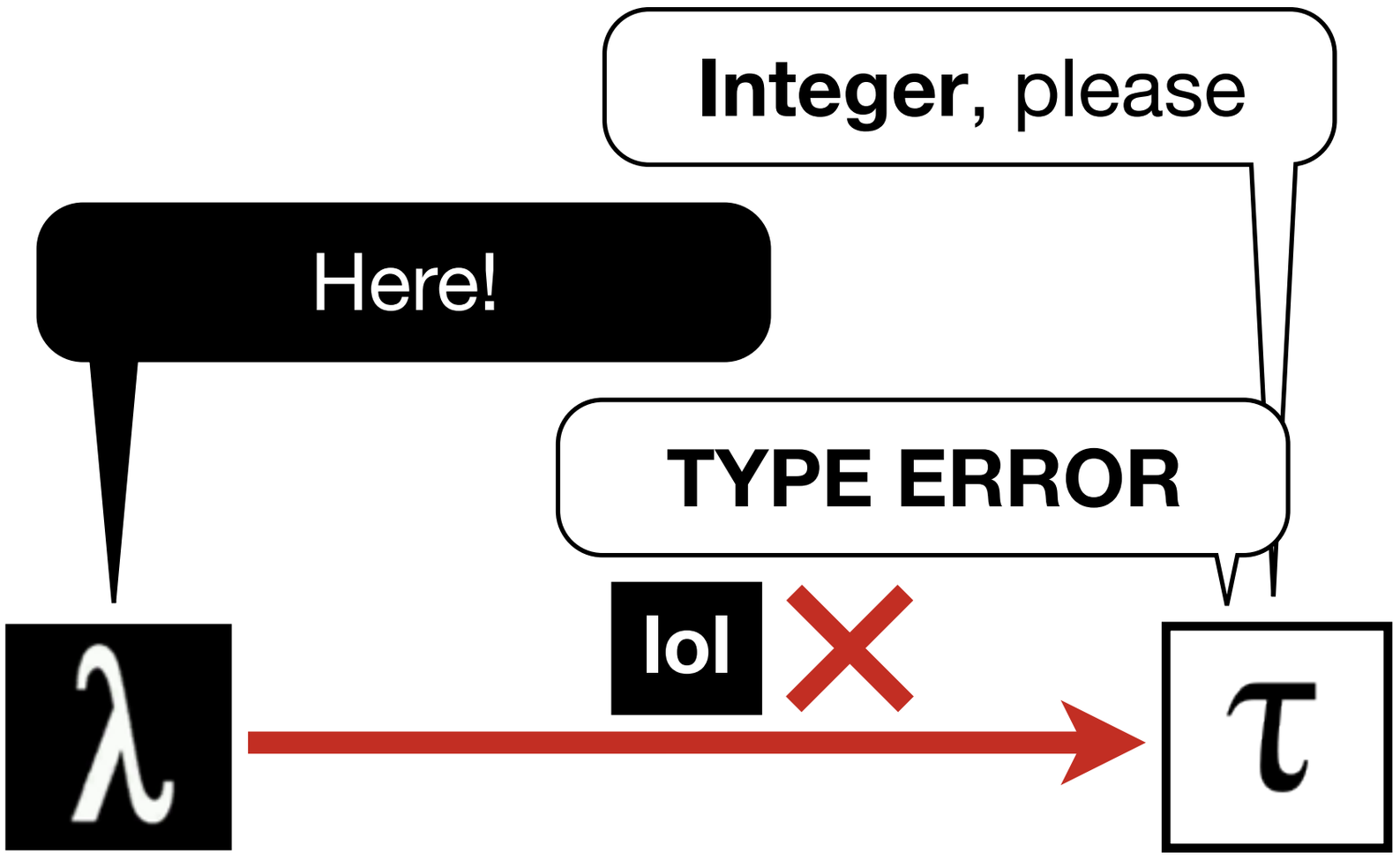
Sound

Performant

Boundaries



Boundaries



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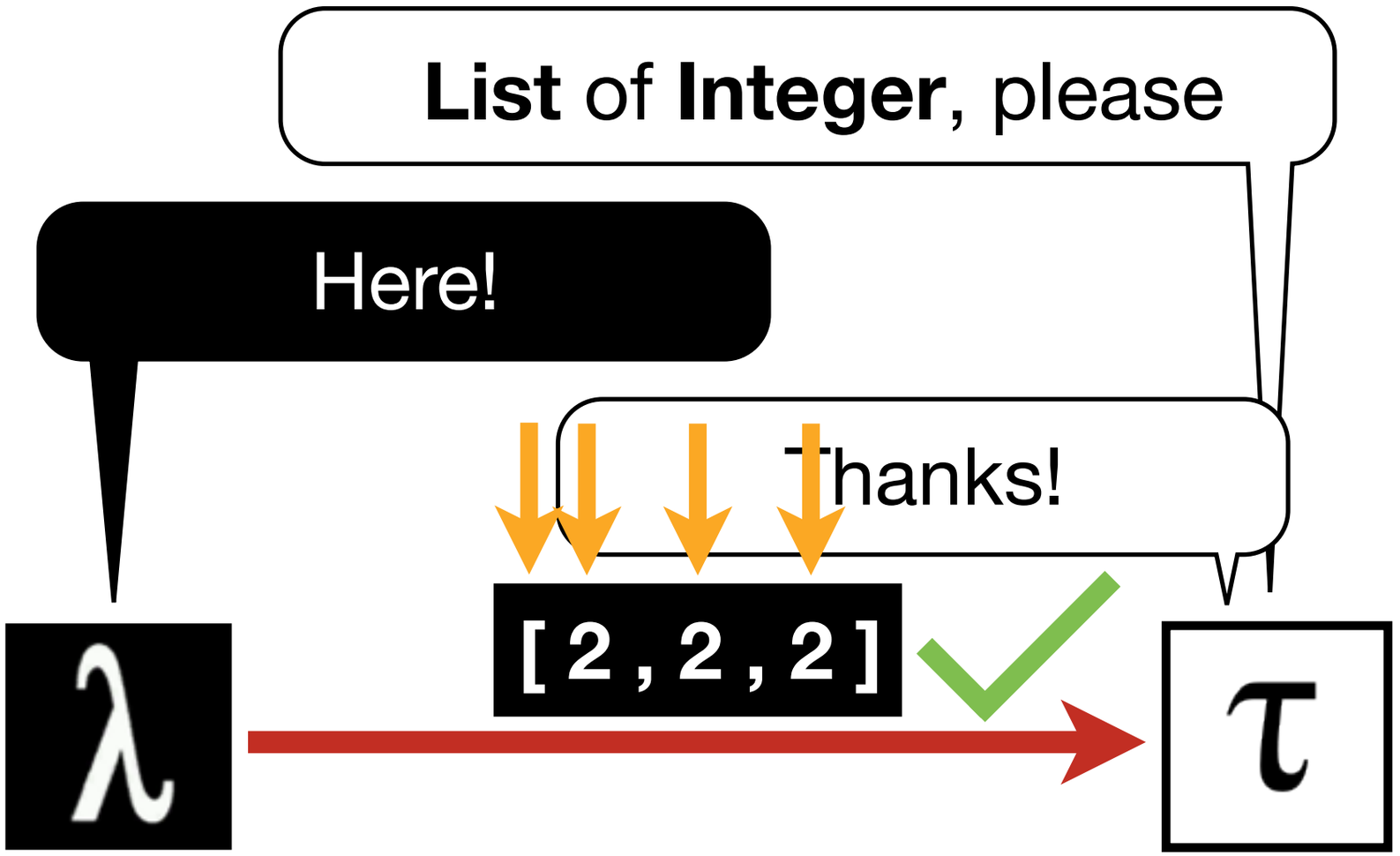
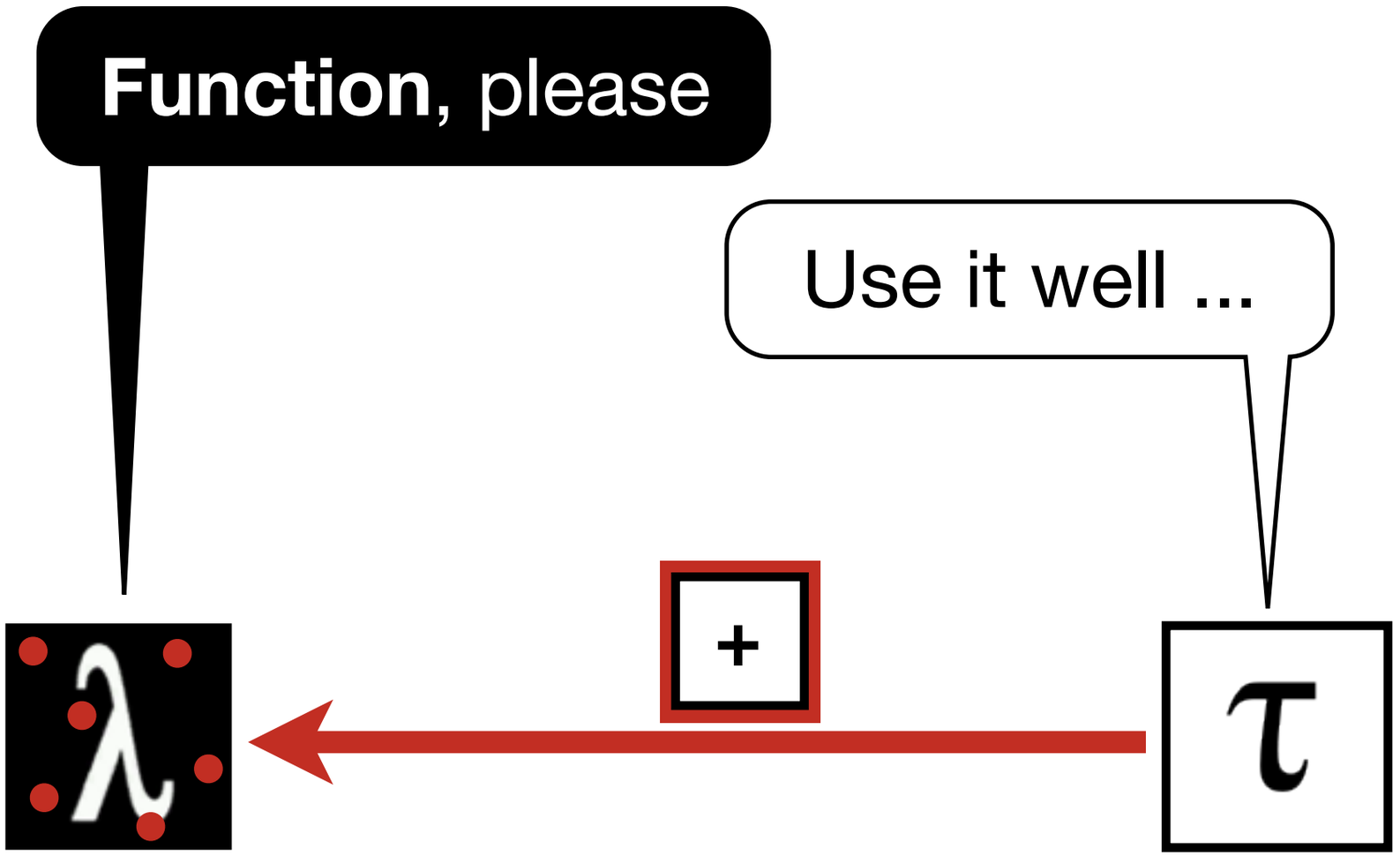


Boundaries



Reinheitsgebot

1 barrel of wine + 1 teaspoon of sewage

=

1 barrel of sewage