Stabilize

and other integrity traits

Mark S. Miller — Agoric

Chip Morningstar — METAMASK

Richard Gibson — Agoric

Mathieu Hofman — Agoric

105th Plenary

December 2024

TC 39

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JS Structs Working Group

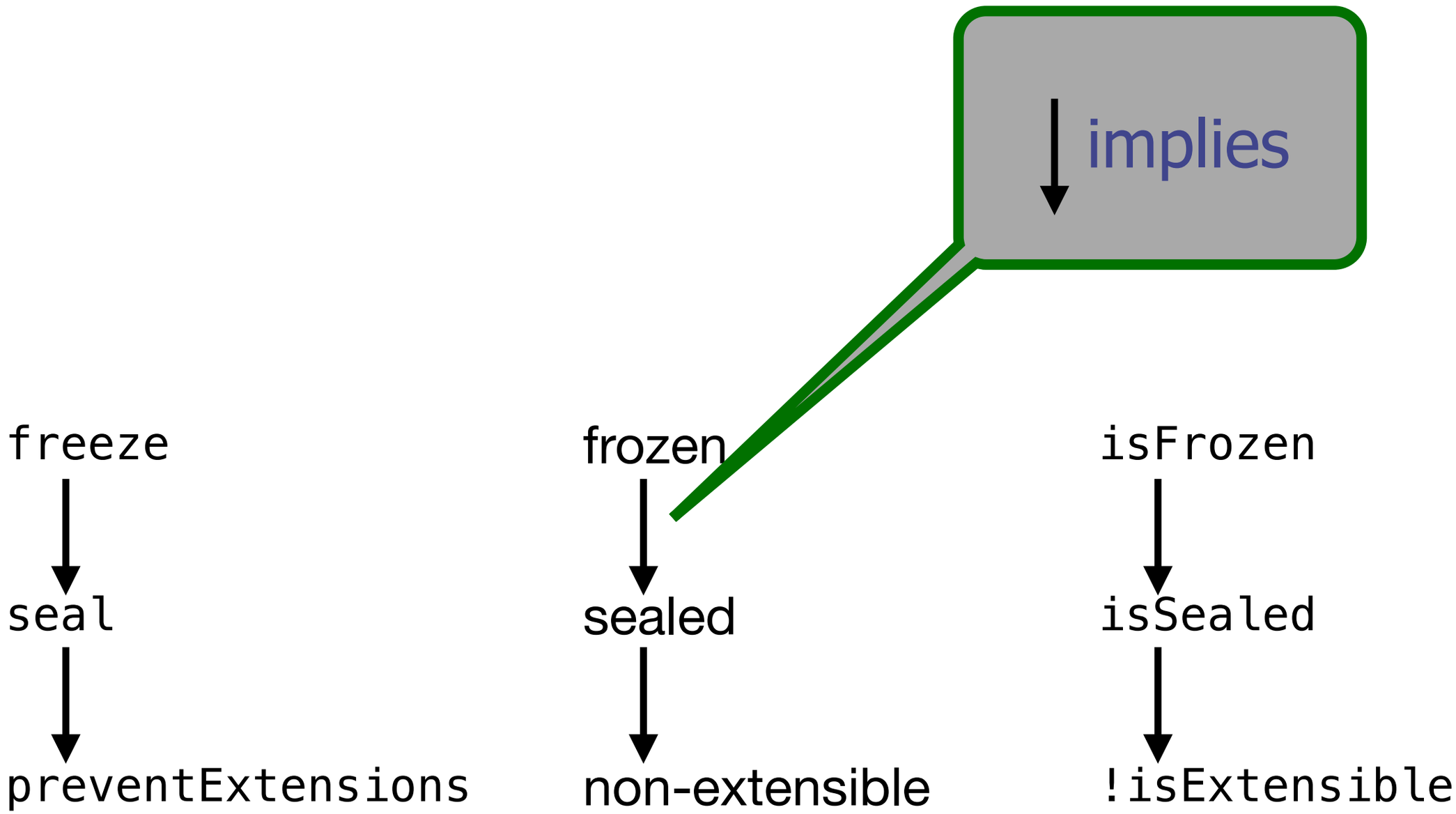
November 2024

105th Plenary

December 202[illegible]

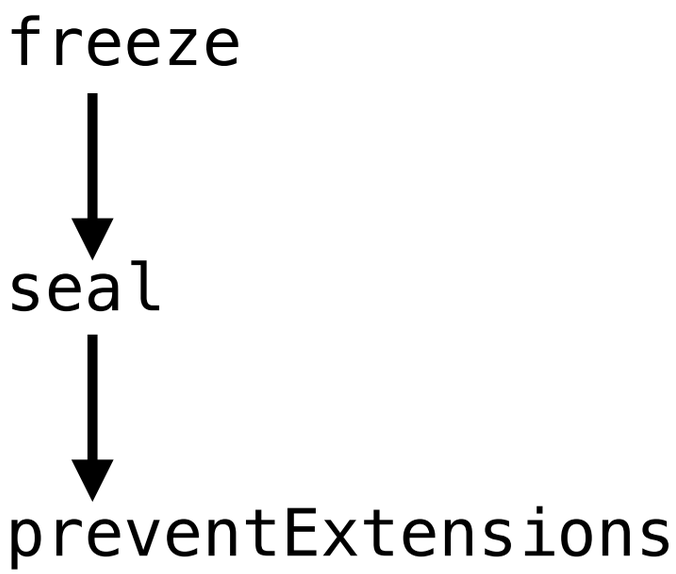
TC 39

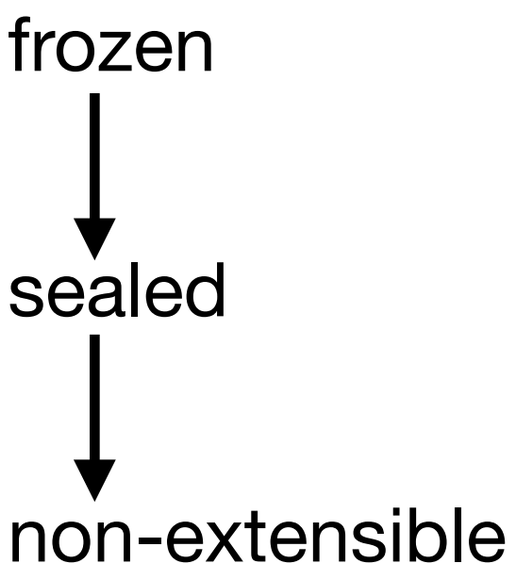
Current Integrity “Levels”

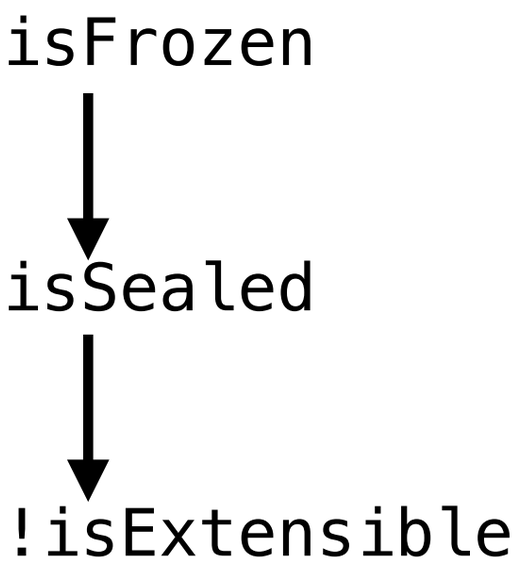


Current Integrity “Levels”

- Monotonic one-way switch
- Stronger object invariants
- Proxy is X iff target is X

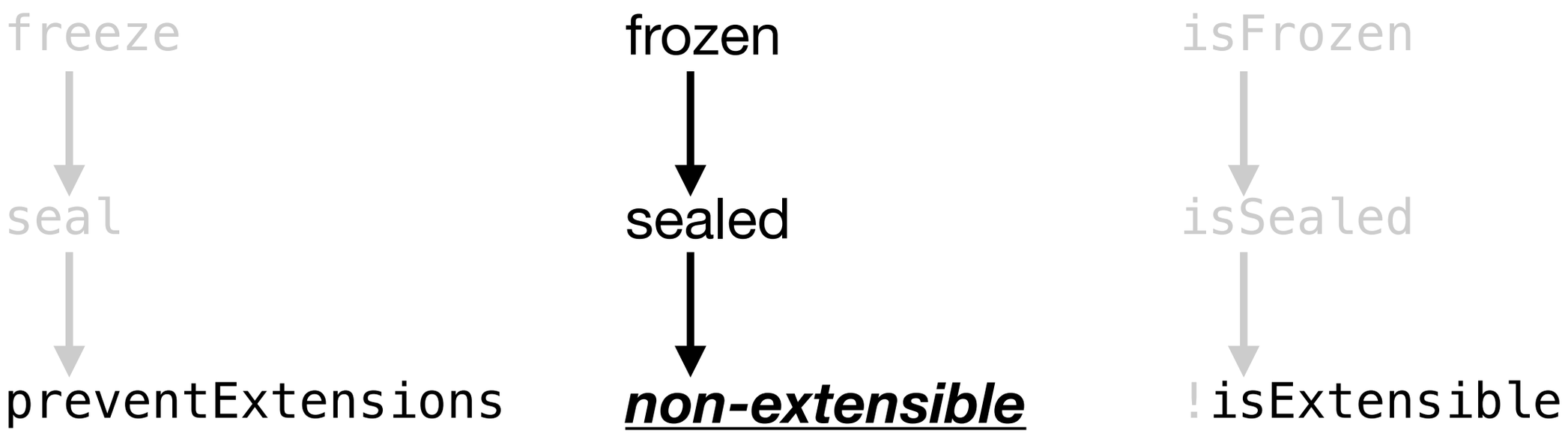






Current Integrity “Levels”

- ***Explicit*** vs Emergent
- 2 Proxy traps per ***explicit*** integrity “level”



Need better integrity support

frozen

↓

sealed

↓

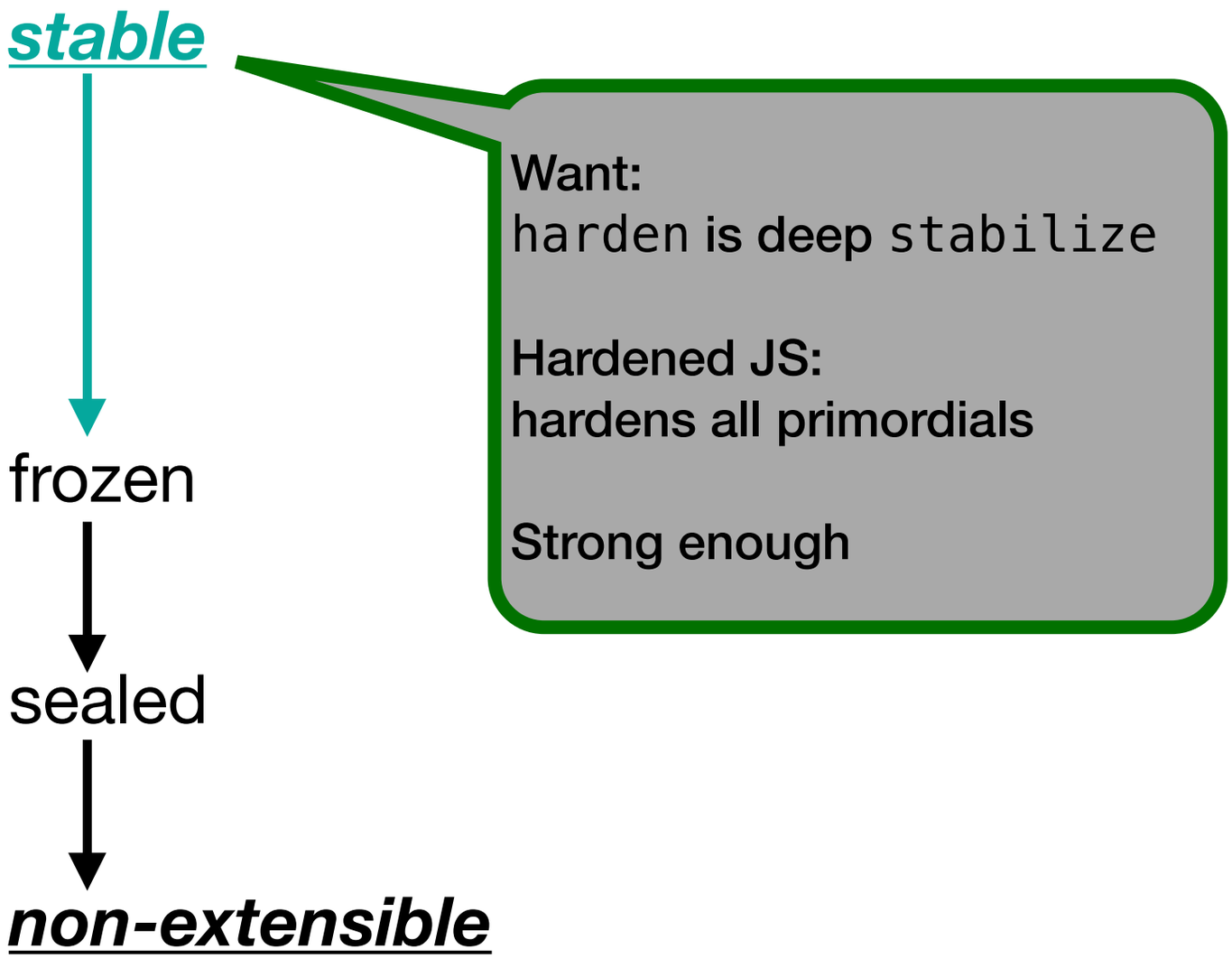
non-extensible

Today:
`harden` **is deep** `freeze`

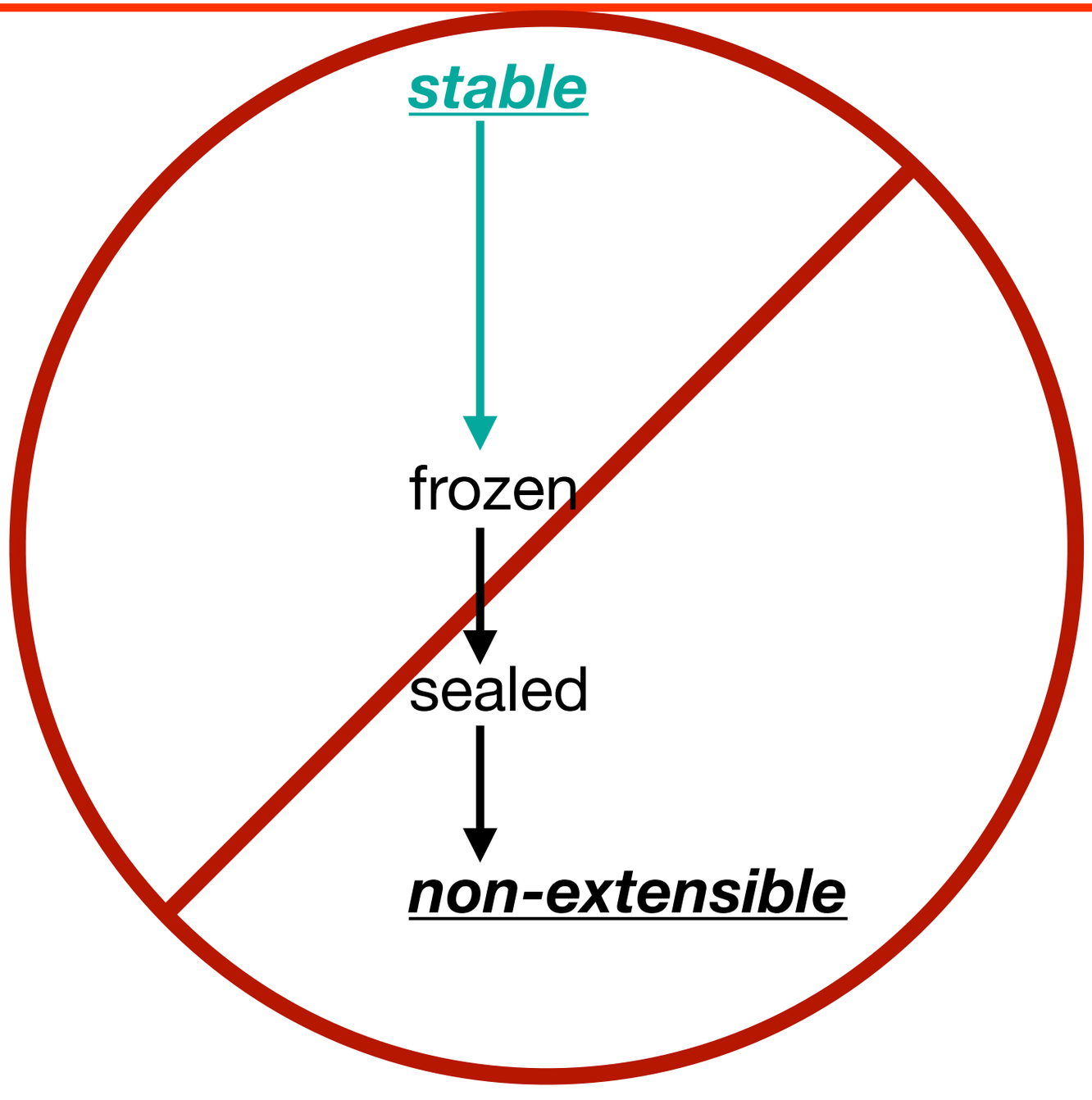
Hardened JS:
hardens all primordials

3 weaknesses

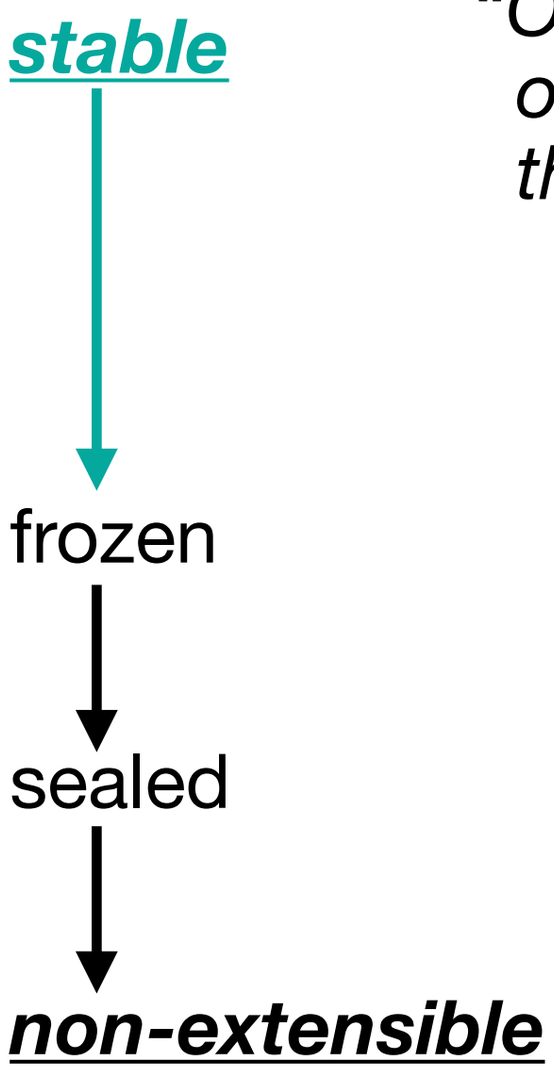
First Try


stable
frozen
sealed
non-extensible
Want:
harden is deep stabilize
Hardened JS:
hardens all primordials
Strong enough

First Try. But Structs Cannot be Frozen



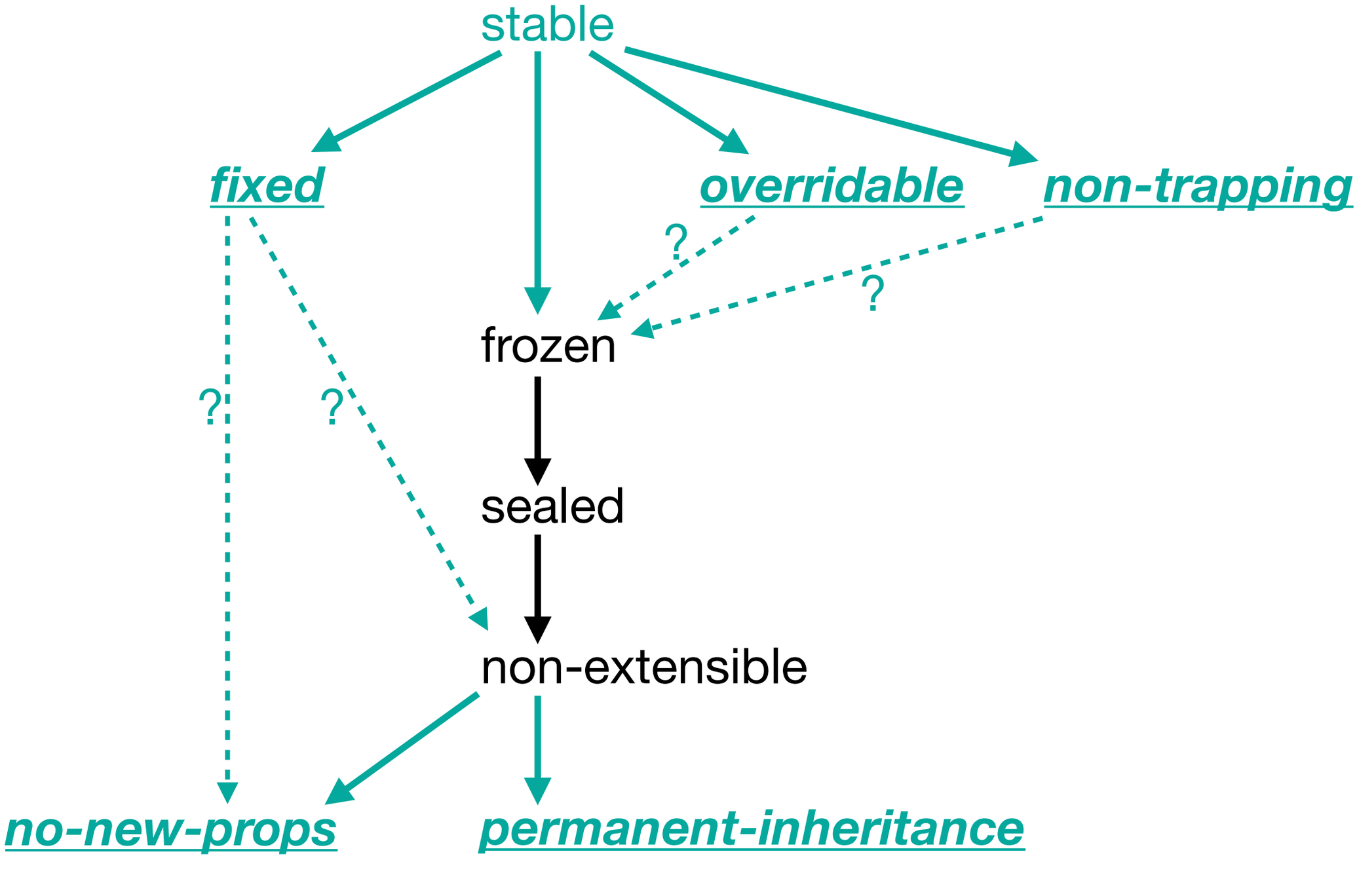
First Try. But Structs Cannot be Frozen



"*Only two ways to […],*
one is to bundle,
the other is to unbundle."

—Jim Barksdale

Maximally Unbundled Integrity “Traits”



fixed

Mitigate return-override mistake

fixed

```
class Superclass {
  constructor(key) { return key; }
}

class Subclass extends Superclass {
  #value
  constructor(key, value) {
    super(key);
    this.#value = value;
  }
}

new Subclass(struct, 'a');
```

No *stamping*

Fixed shape structs

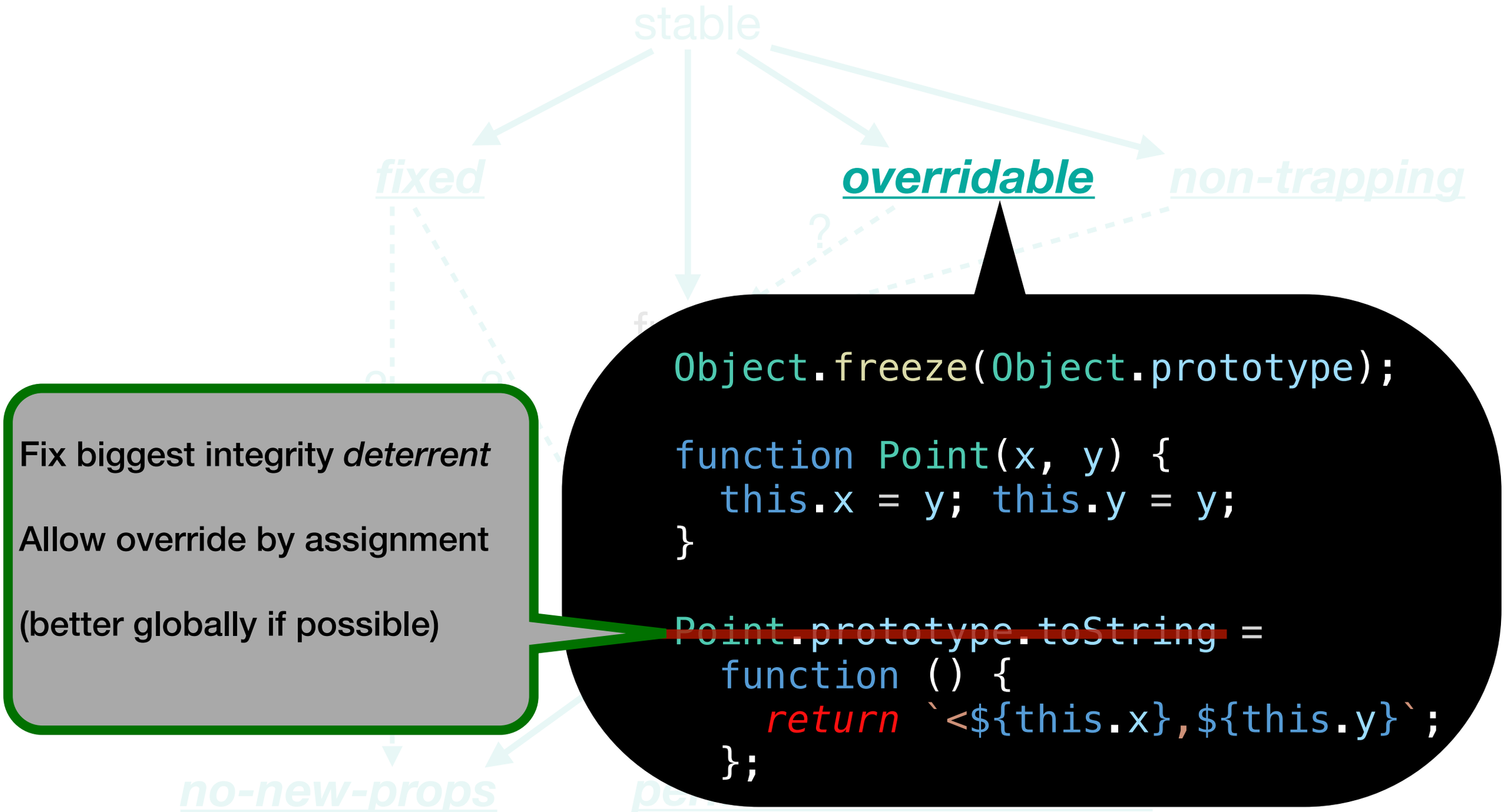
Retcon `windowProxy`

Virtualizable weakness

no-new-props

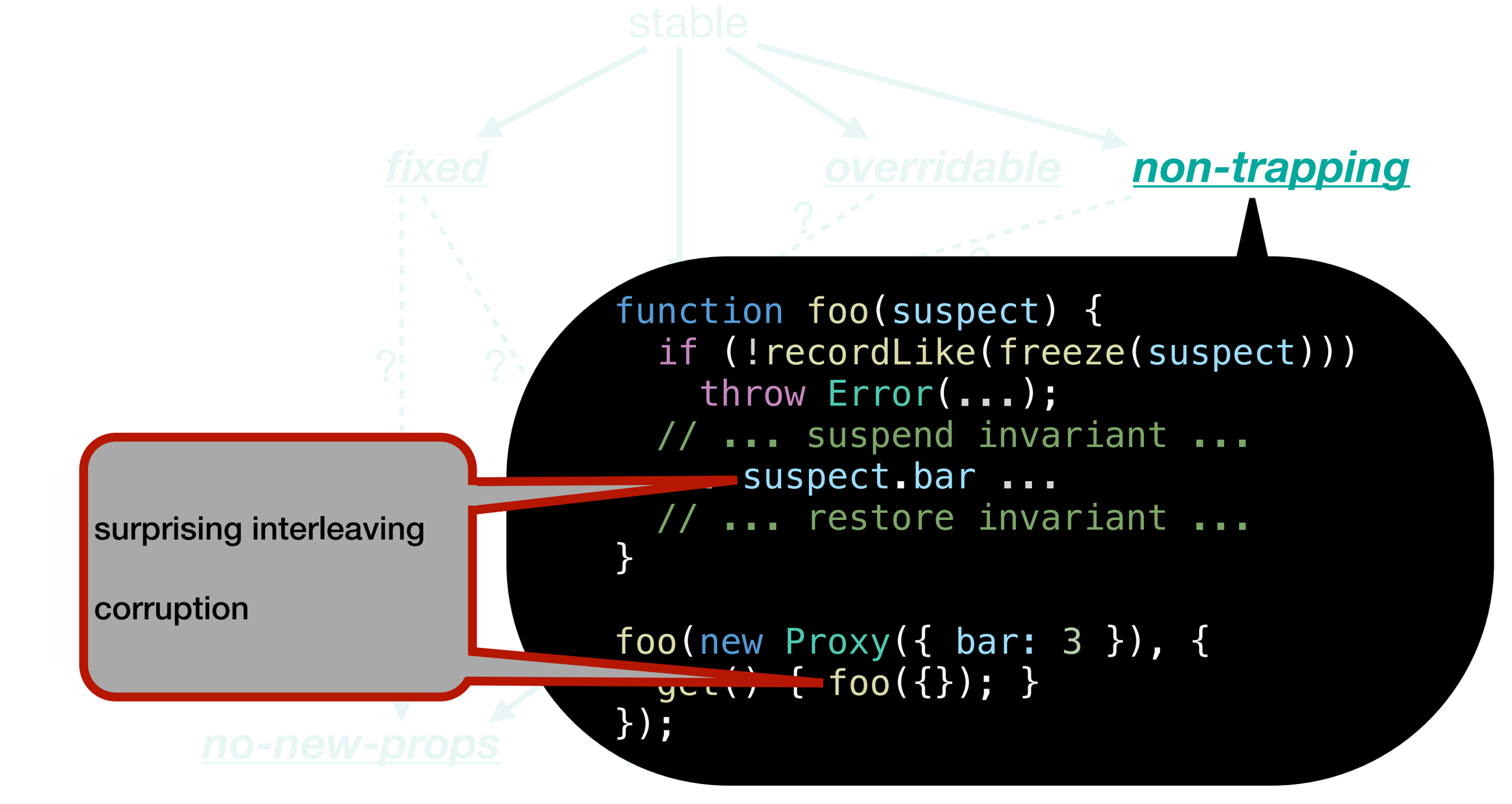
overridable

Mitigate assignment-override mistake



non-trapping

Mitigate proxy reentrancy hazards



non-trapping

Mitigate proxy reentrancy hazards

records were just pojos

No handler traps
(or equivalent for exotics)

pojos help defensiveness

stable

overridable

non-trapping

no-new-props

```
function foo(suspect) {
  if (!recordLike(stabilize(suspect)))
    throw Error(...);
  // ... suspend invariant ...
  ... suspect.bar ...
  // ... restore invariant ...
}

foo(new Proxy({ bar: 3 }), {
  get() { foo({}); }
});
```

permanent-inheritance

Retcon `windowProxy`, `Object.prototype`

Too much magic

Make objects less exotic

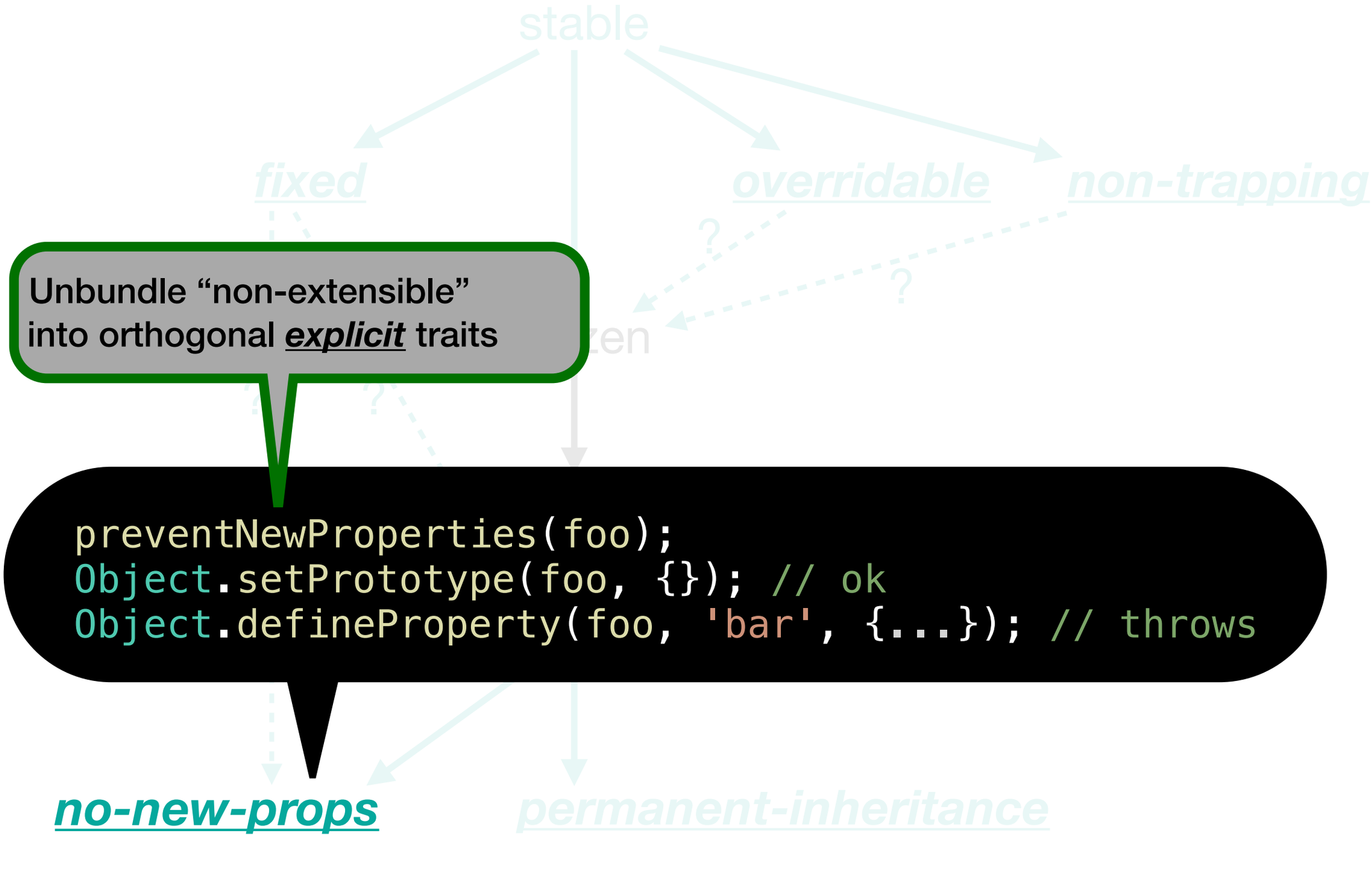
```
> Object.setPrototypeOf(window, {});
Uncaught TypeError: Immutable prototype object
‘#<Window>' cannot have their prototype set

> Object.setPrototypeOf(Object.prototype, {});
Uncaught TypeError: Immutable prototype object
‘Object.prototype' cannot have their prototype set
```

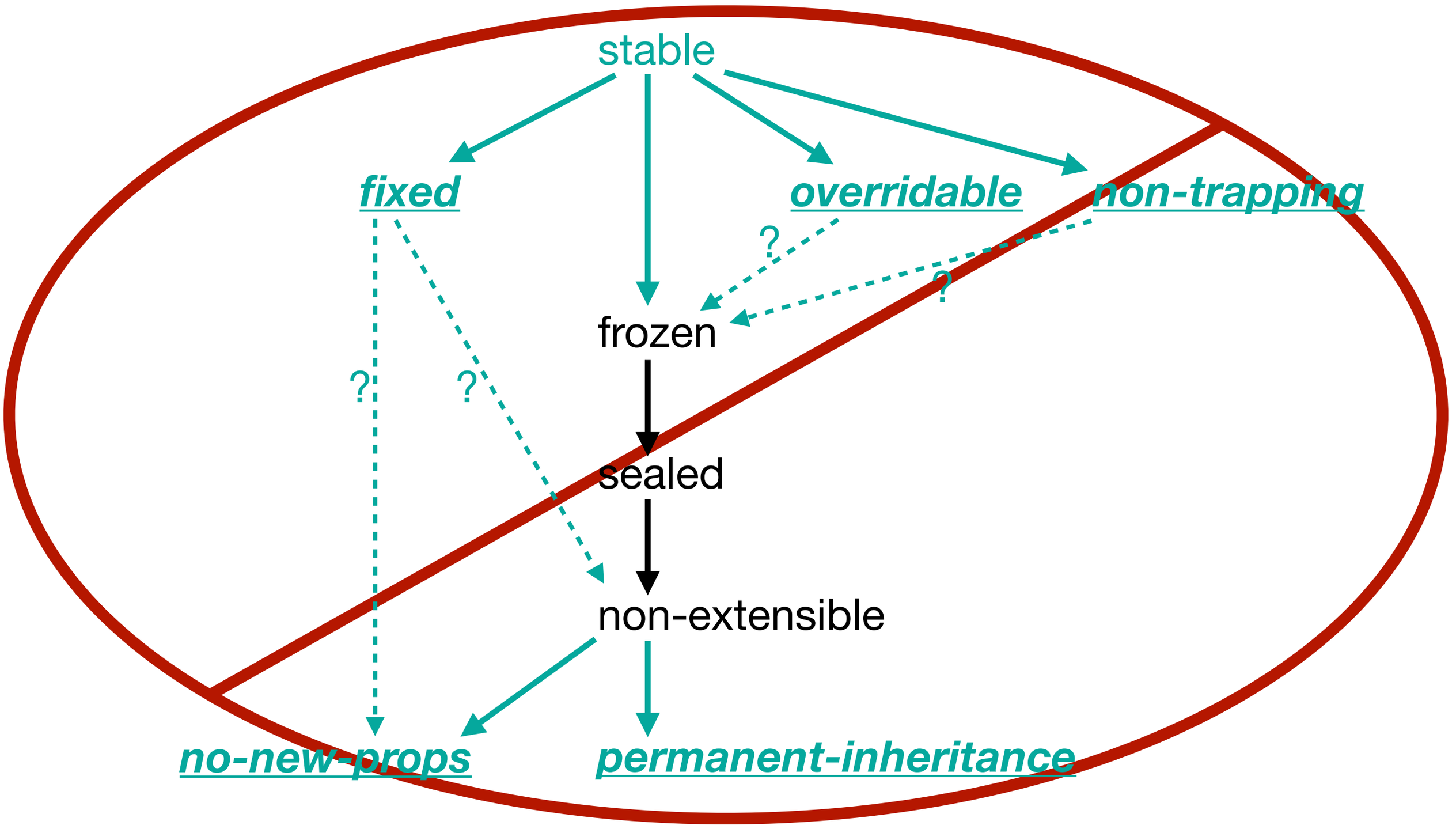
fixed *non-trapping* *no-new-props* ***permanent-inheritance***

no-new-props

Rest of non-extensible unbundling



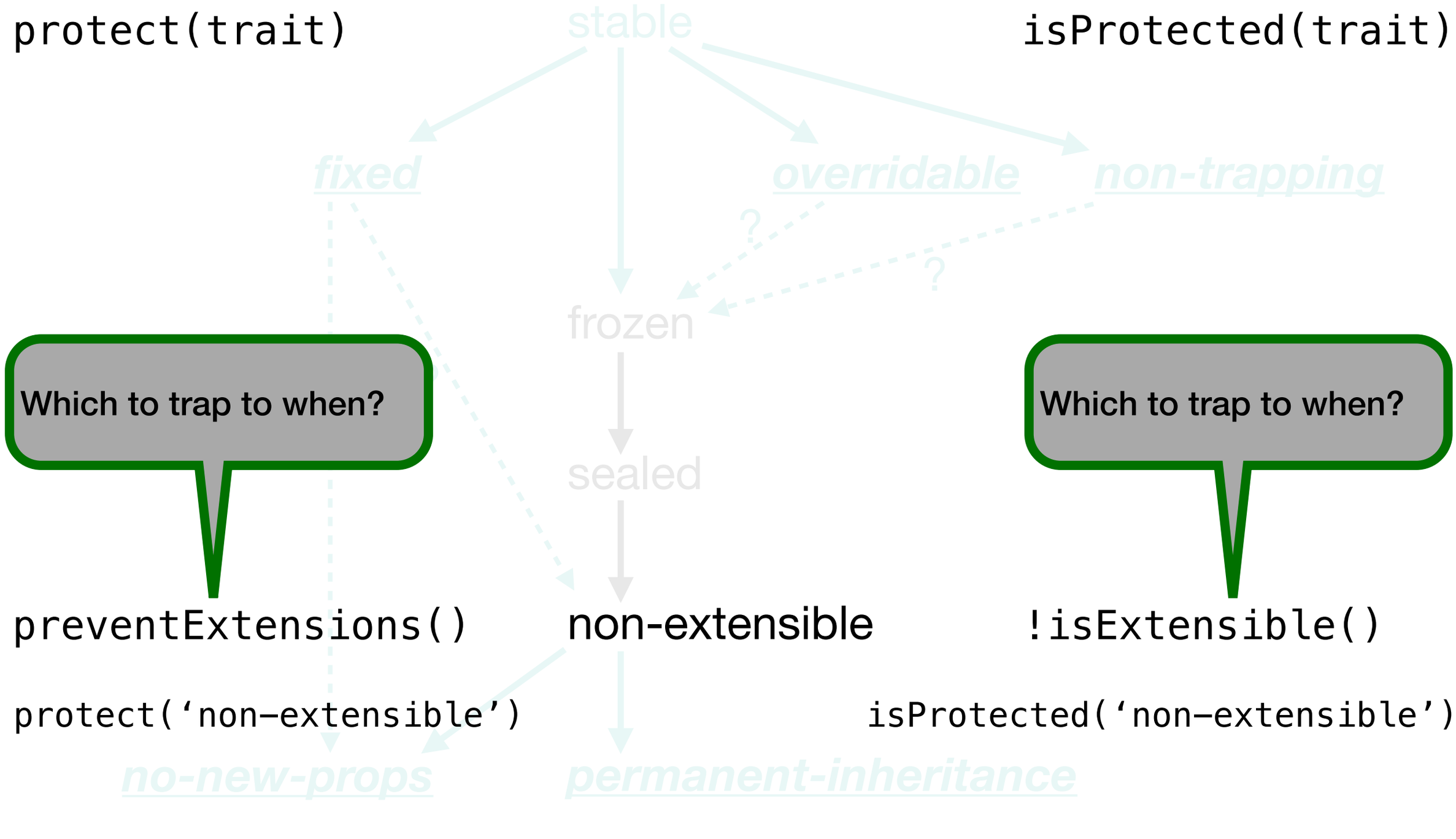
10 New Proxy Traps — Too many!



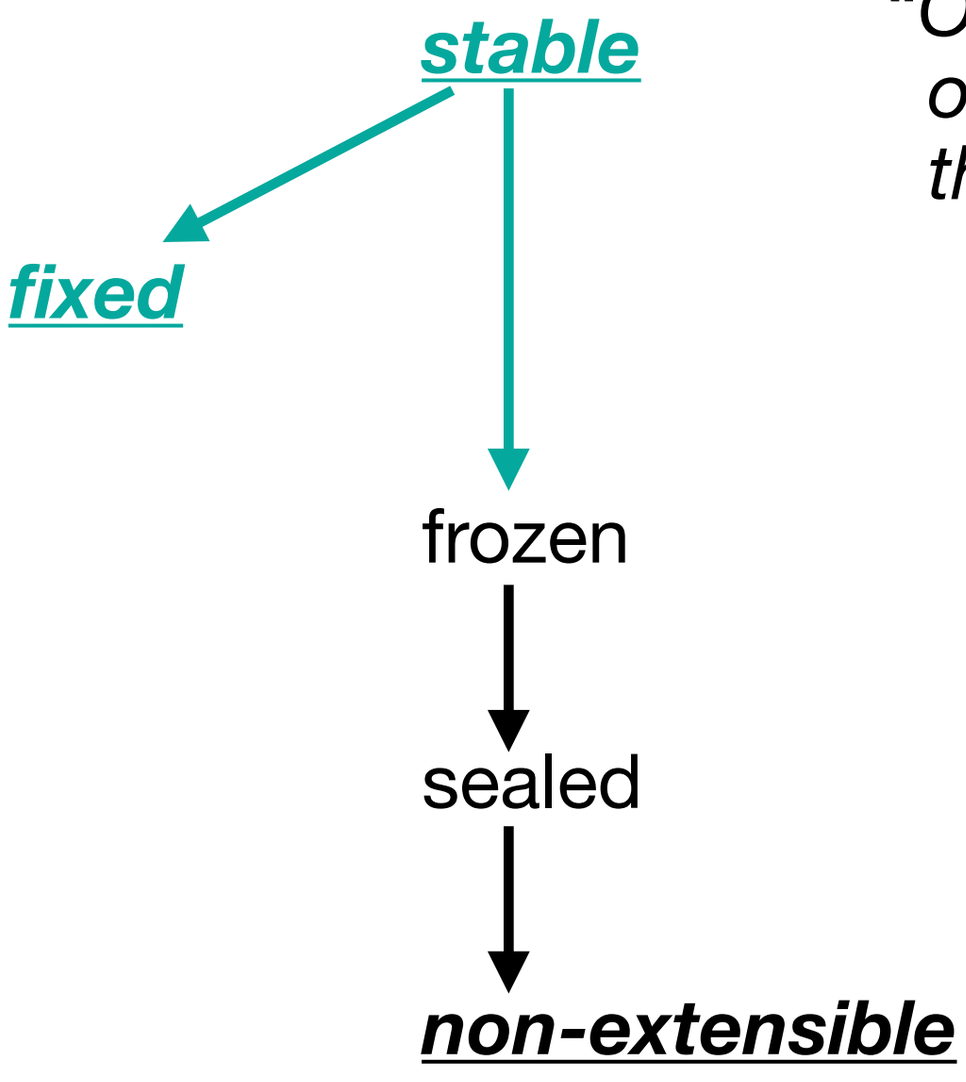
2 New Parameterized Proxy Traps

`protect(trait)`

`isProtected(trait)`



Minimal Proposed Integrity “Traits”



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Questions? Stage 1?