
Traits

Limitations and Ideas

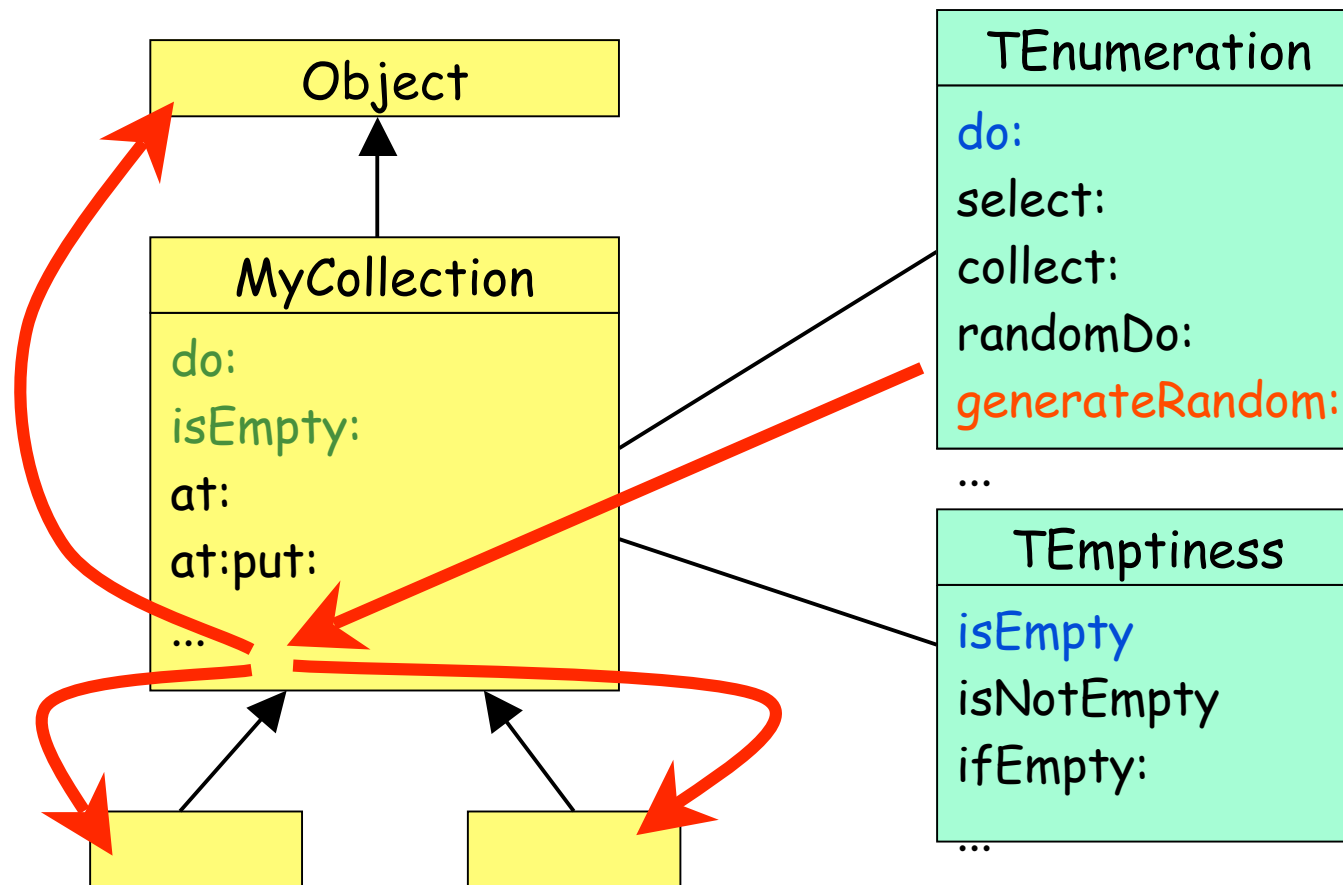
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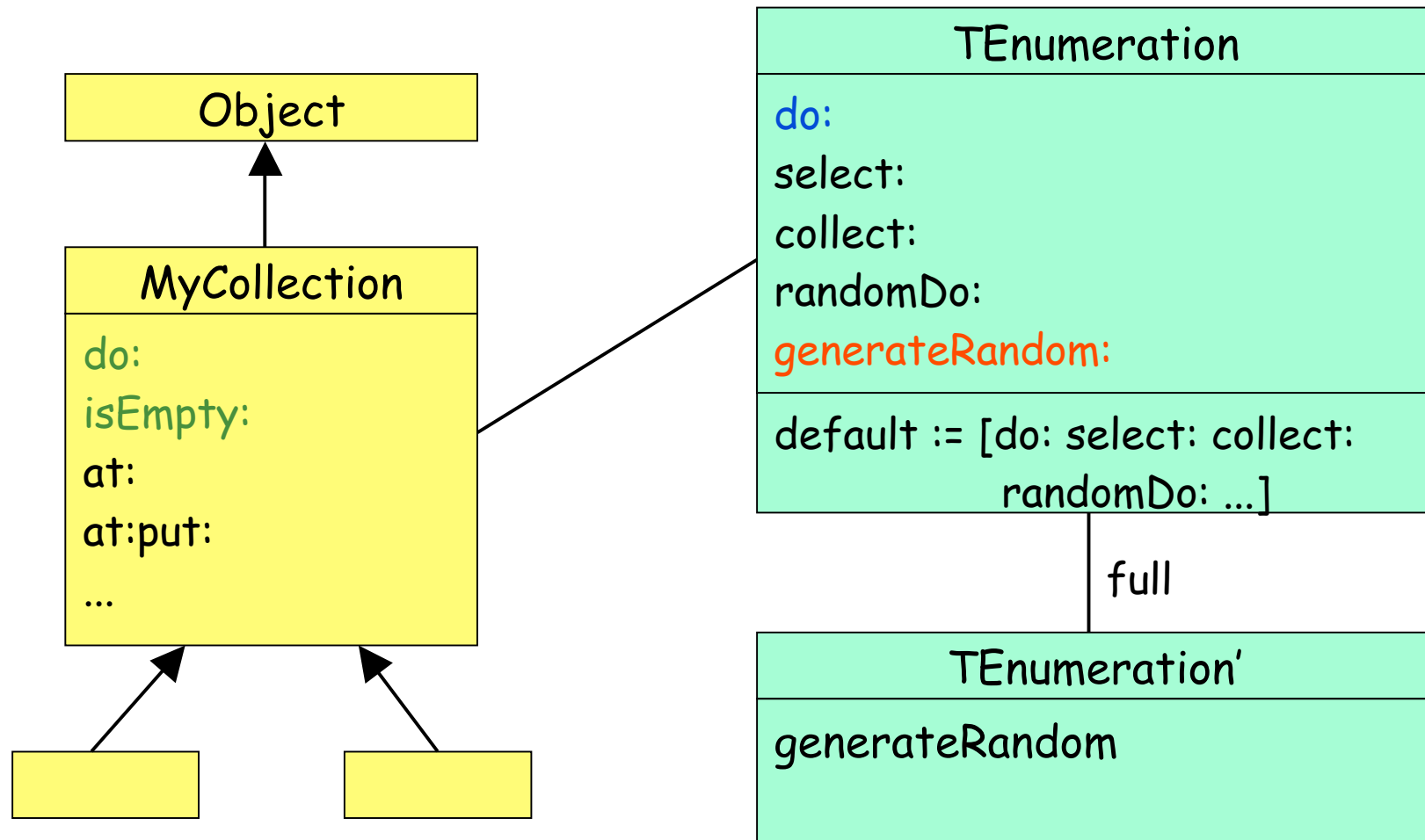
Limitations of Traits

- No encapsulation mechanism for traits
- Traits cannot specify state variables
- Trait composition and inheritance are not fully orthogonal
 - Do we really need both mechanisms?
 - Can we replace them with a single, uniform mechanism?

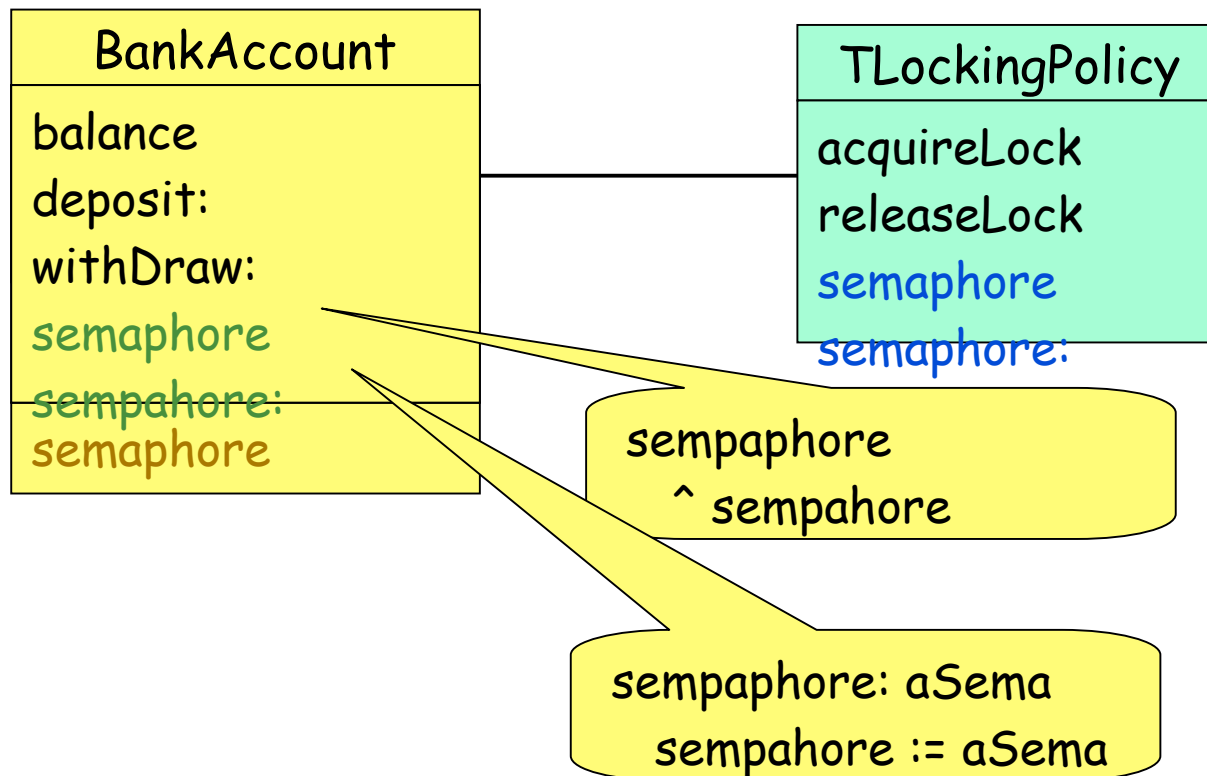
Limitation: Lack of Encapsulation



Idea: Using Interfaces



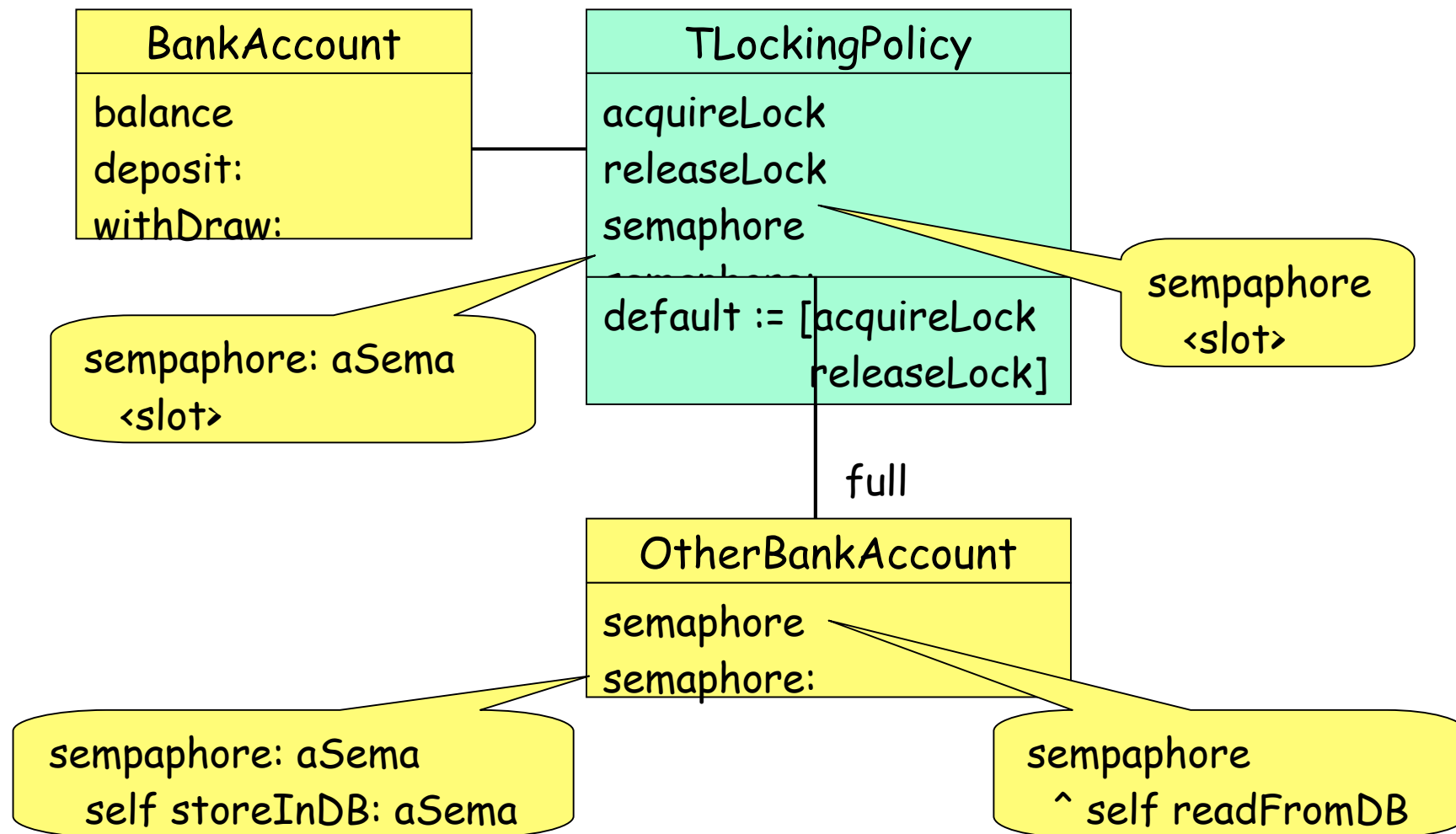
Limitation: No State in Traits



Reasons against State

- No encapsulation
 - State in traits would be accessible in the class anyway ✓
- Diamond situation
 - Should state be duplicated?
- State affects the generality of a trait
 - Some clients may want to bind traits differently
- Initialization
 - How is the state in traits initialized

Idea: Representing State as Methods



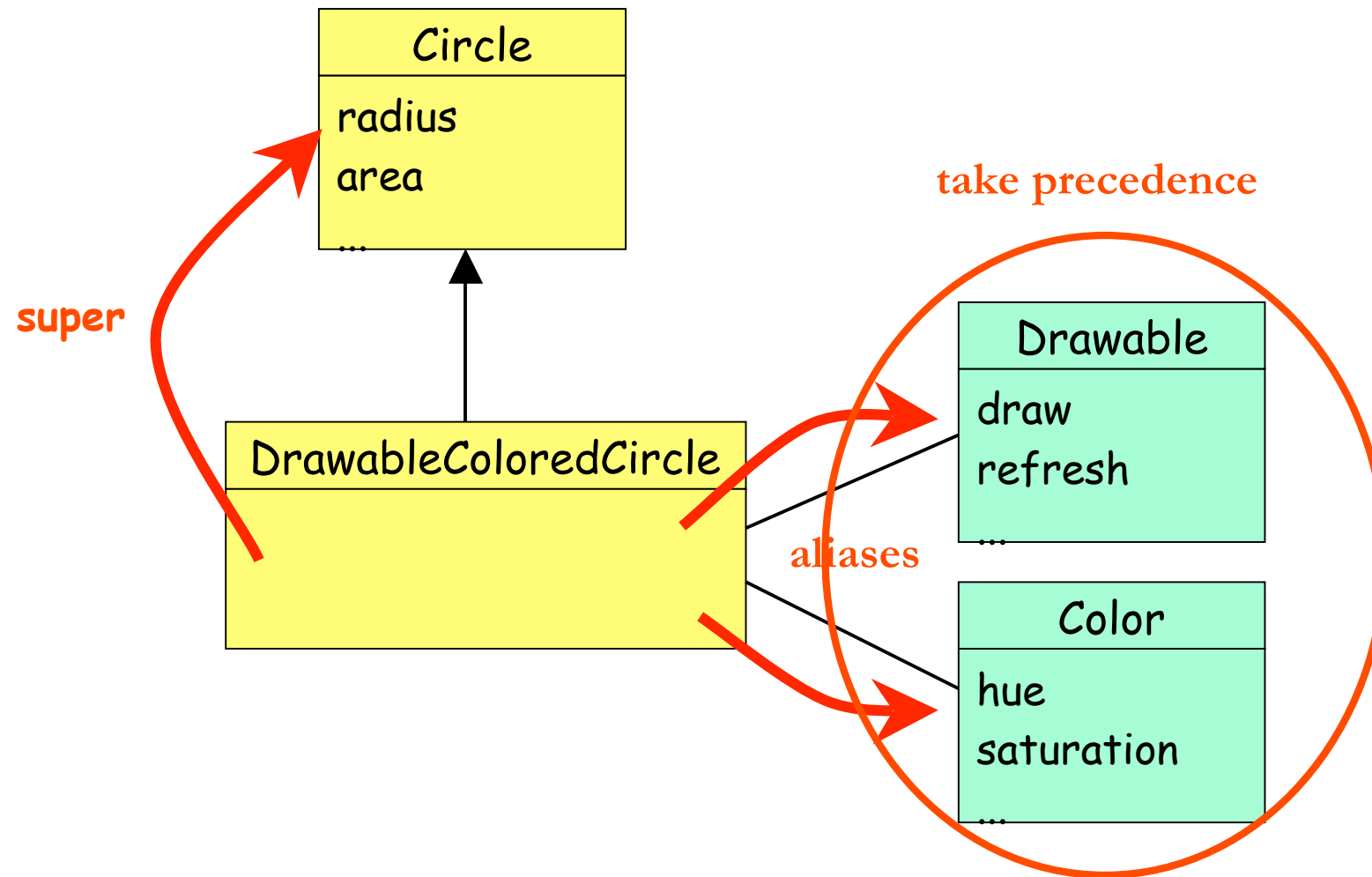
Reasons against State: Revisited

- No encapsulation
 - State in traits would be accessible in the class anyway ✓
- Diamond situation
 - Should state be duplicated? ✓
- State affects generality of a trait
 - Some clients may already provide the necessary state
 - Would result in “too much state” ✓
- Initialization
 - How is the state in traits initialized ?

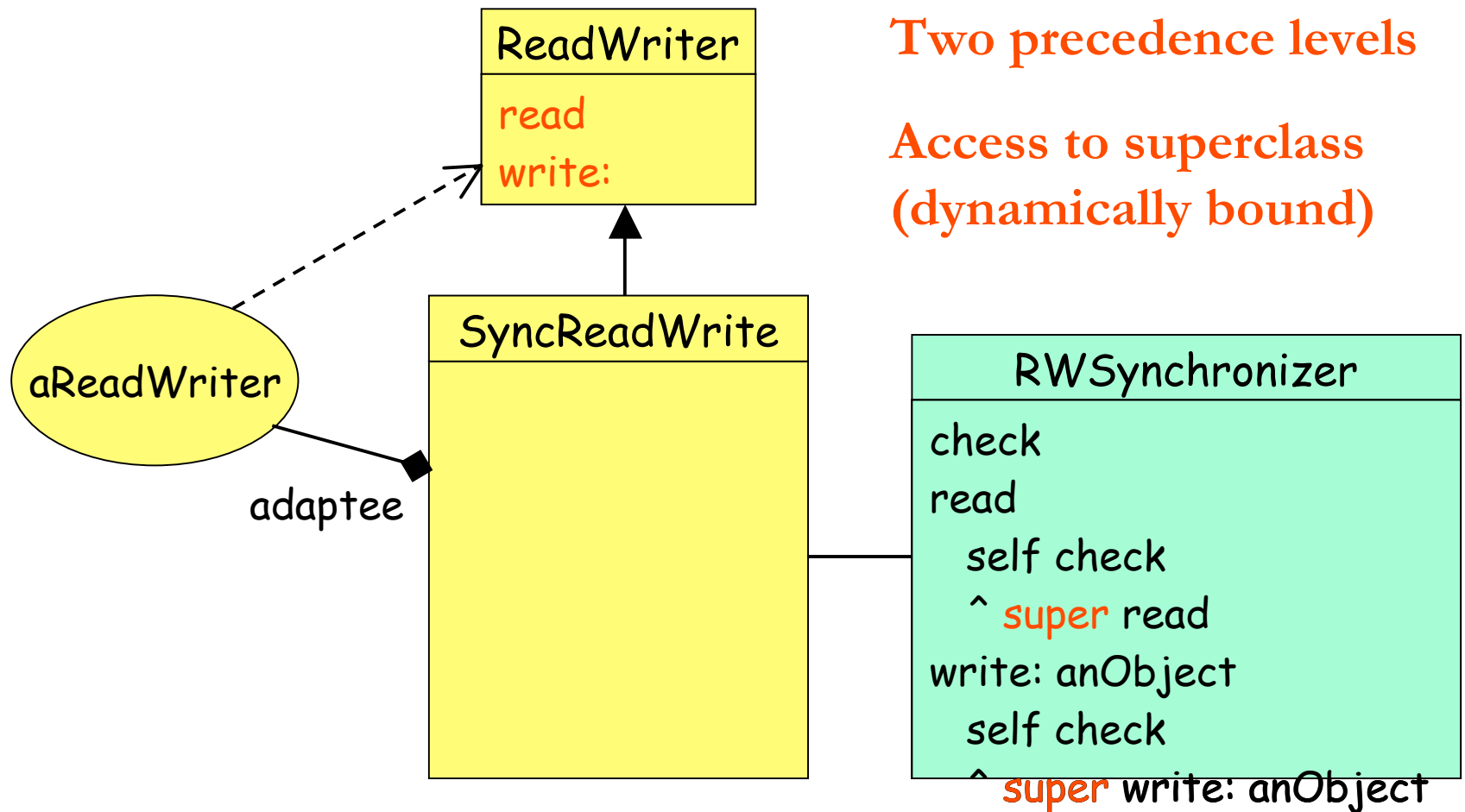
Do we Need Traits Comp. & Inheritance?

- If we have traits with encapsulation and state...
 - traits and classes are essentially the same
 - the only difference is how they are composed:
 - Classes are reused by inheritance
 - Traits are reused by traits composition
- What is the difference between these composition mechanisms?

Inheritance vs. Traits Composition



Example



Conclusion

- Combining *trait composition* with an *encapsulation mechanism* opens new possibilities
 - Unifying methods and slots gives us stateful traits without much overhead
 - Open problem: Initialization
- Challenges for a uniform composition mechanism
 - Accessing original methods via **super**, aliases or both?
 - What are the precedence rules?
 - Do we need different levels of precedence?
 - How many levels?