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Software Engineering Design & Construction

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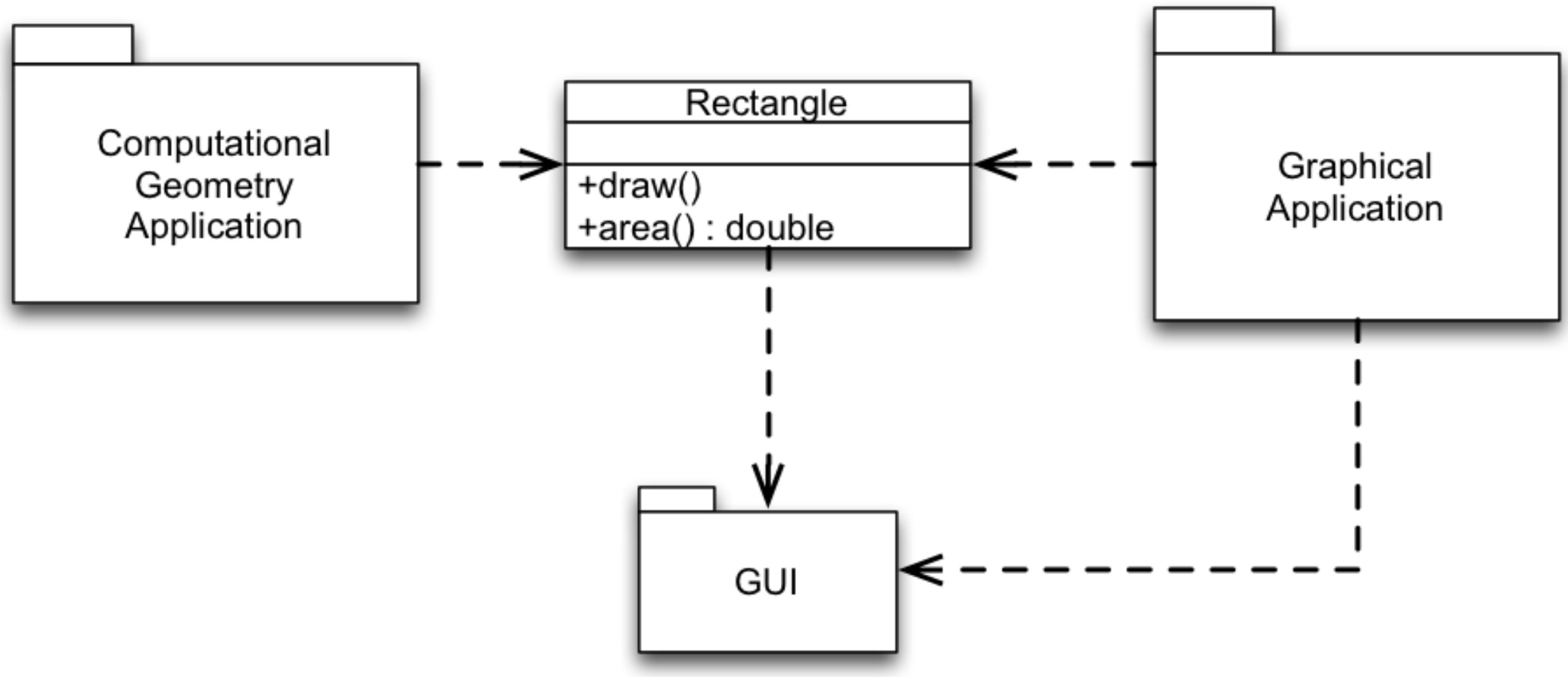
Single Responsibility Principle

Single Responsibility Principle

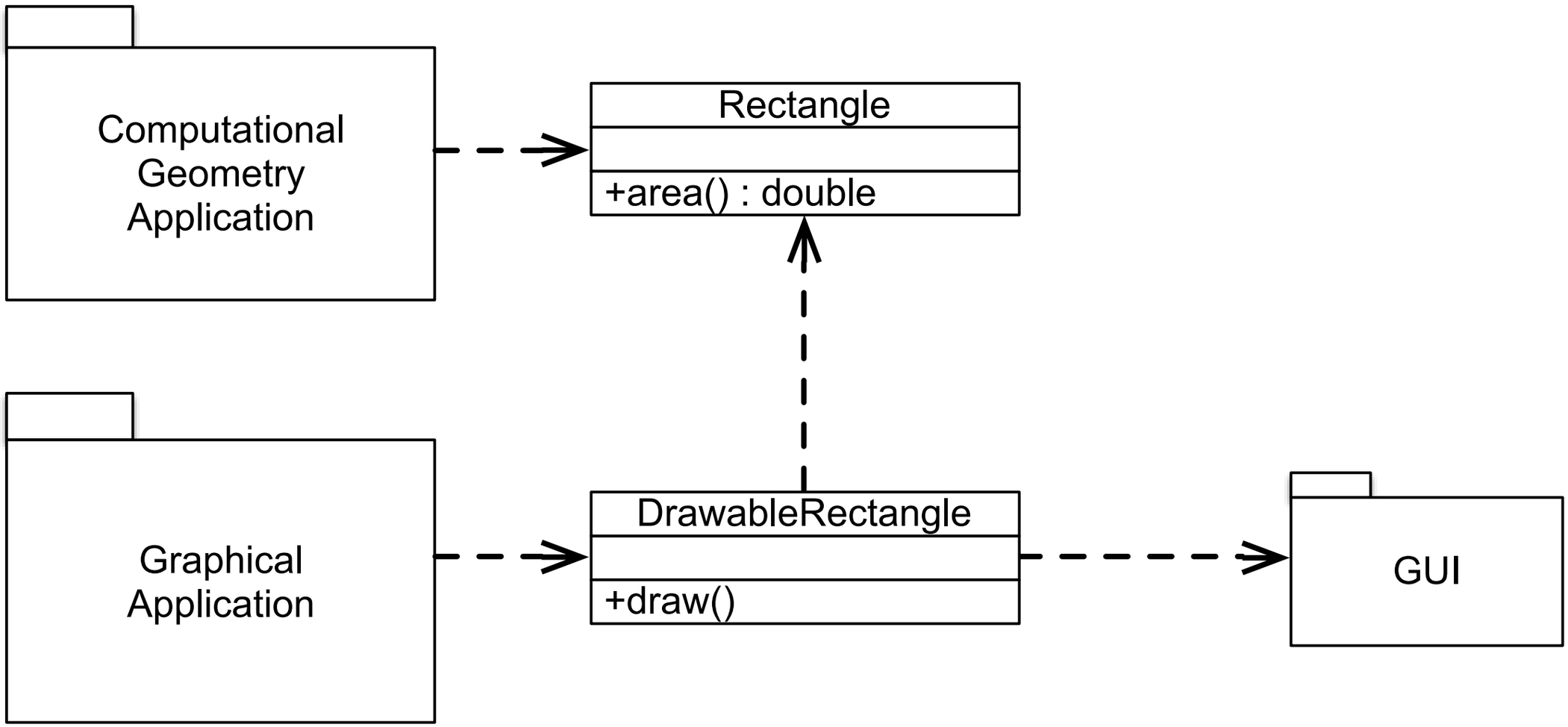
A class should have only one reason to change.

–Agile Software Development; Robert C. Martin; Prentice Hall, 2003

What do you think of the following design?



A Single-Responsibility Compliant Design



Responsibility

- In general, a class is assigned the responsibility to know or do something (one thing).

- Examples:
  - Class `PersonData` is responsible for knowing the data of a person.
  - Class `CarFactory` is responsible for creating `Car` objects.

- A responsibility is an axis of change.

- A class with only one responsibility has only one reason to change!

Cohesion

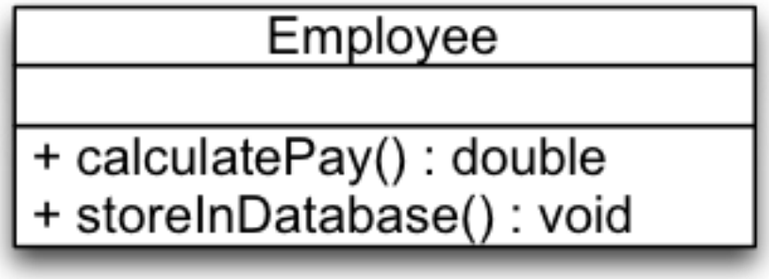
- Cohesion measures the degree of togetherness among the elements of a class.
- In a class with high cohesion every element is part of the implementation of exactly one concept. The elements of the class work together to achieve one common functionality.
- A class with high cohesion implements only one responsibility!

SRP and Cohesion

- Applying the single-responsibility principle maximizes the cohesion of classes.

- Classes with high cohesion ...
  - can be reused easily,
  - are easily understood,
  - protect clients from changes, that should not affect them.

Should we split the responsibilities of this class?



When to apply the Single-Responsibility Principle?

- We **should split** a class that has two responsibilities if:
  - Both responsibilities will change separately.
  - The responsibilities are used separately by other classes.
  - Responsibilities pertain to optional features of the system.
- We **should not** split responsibilities if:
  - Both responsibilities will only change together, e.g. if they together implement one common protocol.
  - Both responsibilities are only used together by other classes.
  - Responsibilities pertain to mandatory features.

This principle also applies at higher-abstraction levels! E.g. at the component-level.

Do perform the strategic application of principles!

Only apply a principle, if there is a symptom!