Decorator Pattern – Structural

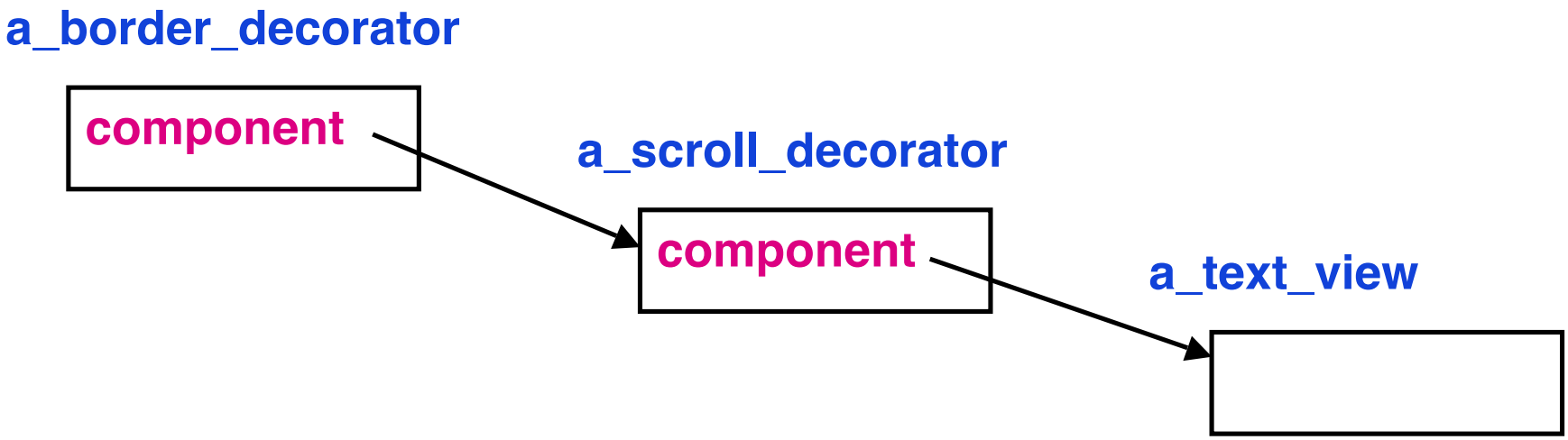
- Intent
  - » **Attach additional responsibilities to an object dynamically.**
  - » **Provide a flexible alternative to subclassing for extending functionality**

Decorator – Motivation

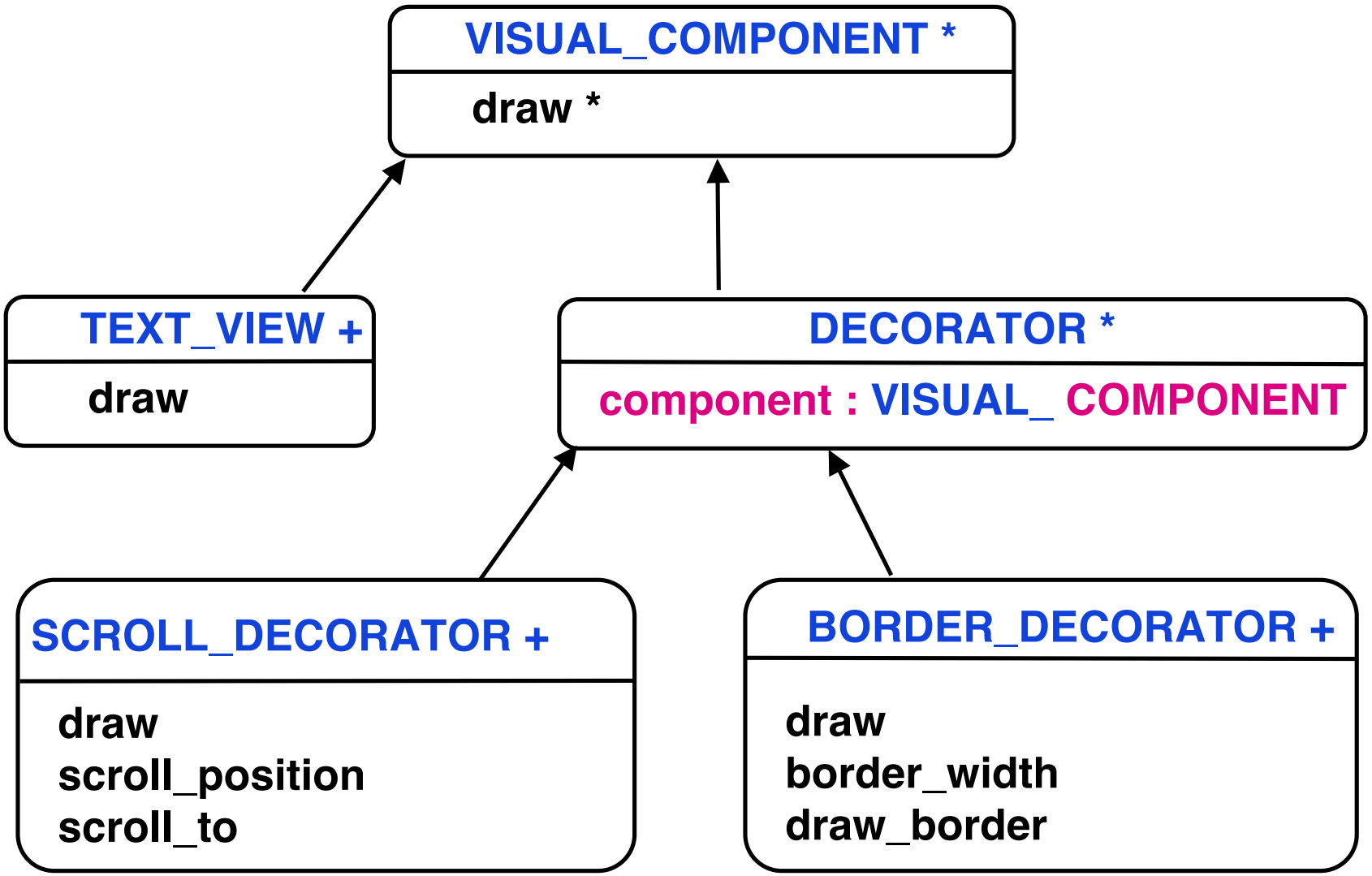
- Motivation – Applicability
  - » **Need to add responsibility to individual objects not to entire classes**
    - **Add properties like border, scrolling, etc to any user interface component as needed**
  - » **Enclose object within a decorator object for flexibility**
    - **Nest recursively for unlimited customization**

Decorator – Example

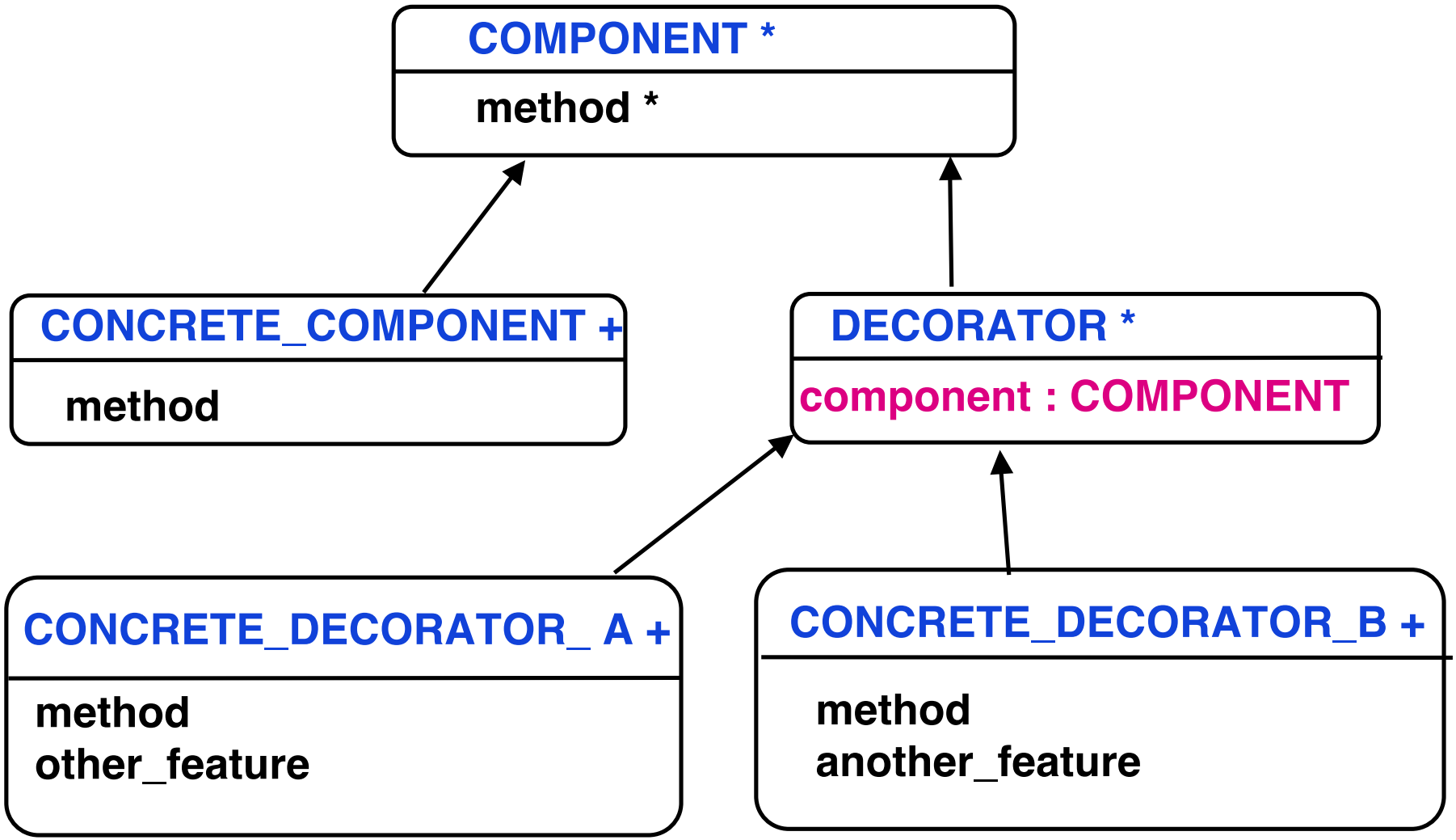
- Compose a border decorator with a scroll decorator for text view.



Decorator – Example Diagram



Decorator – General Structure



Decorator – Implementation

```
class COMPONENT feature method deferred end

class CONCRETE_COMP feature method do ... end

class DECORATOR feature
   component : COMPONENT
end

class CONCRETE_DECECORATOR feature
   method do
      pre_actions
      component.method
      post_actions
end
```

Recursively do method for next in chain

Decorator – Applicability

- Add responsibilities to individual objects dynamically and transparently

  Without affecting other objects

- For responsibilities that can be withdrawn
- When subclass extension is impractical

  Sometimes a large number of independent extensions are possible

  Avoid combinatorial explosion

  Class definition may be hidden or otherwise unavailable for subclassing

Decorator – Participants

- Component

  Defines the interface for objects that can have responsibilities added to them dynamically

- Concrete component

  Defines an object to which additional responsibilities can be attached

- Decorator

  Maintains a reference to a component object and defines an interface that conforms to COMPONENT

- Concrete decorator

  Add responsibilities to the component

Decorator – Consequences

- Benefits
  - » **More flexible than static inheritance**
    - > **Can add and remove responsibilities dynamically**
    - > **Can handle combinatorial explosion of possibilities**
  - » **Avoids feature laden classes high up in the hierarchy**
    - > **Pay as you go when adding responsibilities**
    - > **Can support unforeseen features**
    - > **Decorators are independent of the classes they decorate**
    - > **Functionality is composed in simple pieces**

Decorator – Consequences – 2

- Liabilities
  - » From object identity point of view, a decorated component is not identical
    - > Decorator acts as a transparent enclosure
    - > Cannot rely on object identity when using decorators
  - » Lots of little objects
    - > Often result in systems composed of many look alike objects
    - > Differ in the way they are interconnected, not in class or value of variables
    - > Can be difficult to learn and debug

Decorator – Related Patterns

- Adapter changes interface to an object, while Decorator changes an objects responsibilities
- Decorator is a degenerate Composite (only one component)
- Strategy lets you change the internals of an object, while Decorator changes the exterior