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**

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Decorator – Example

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

a_border_decorator

a_scroll_decorator

a_text_view

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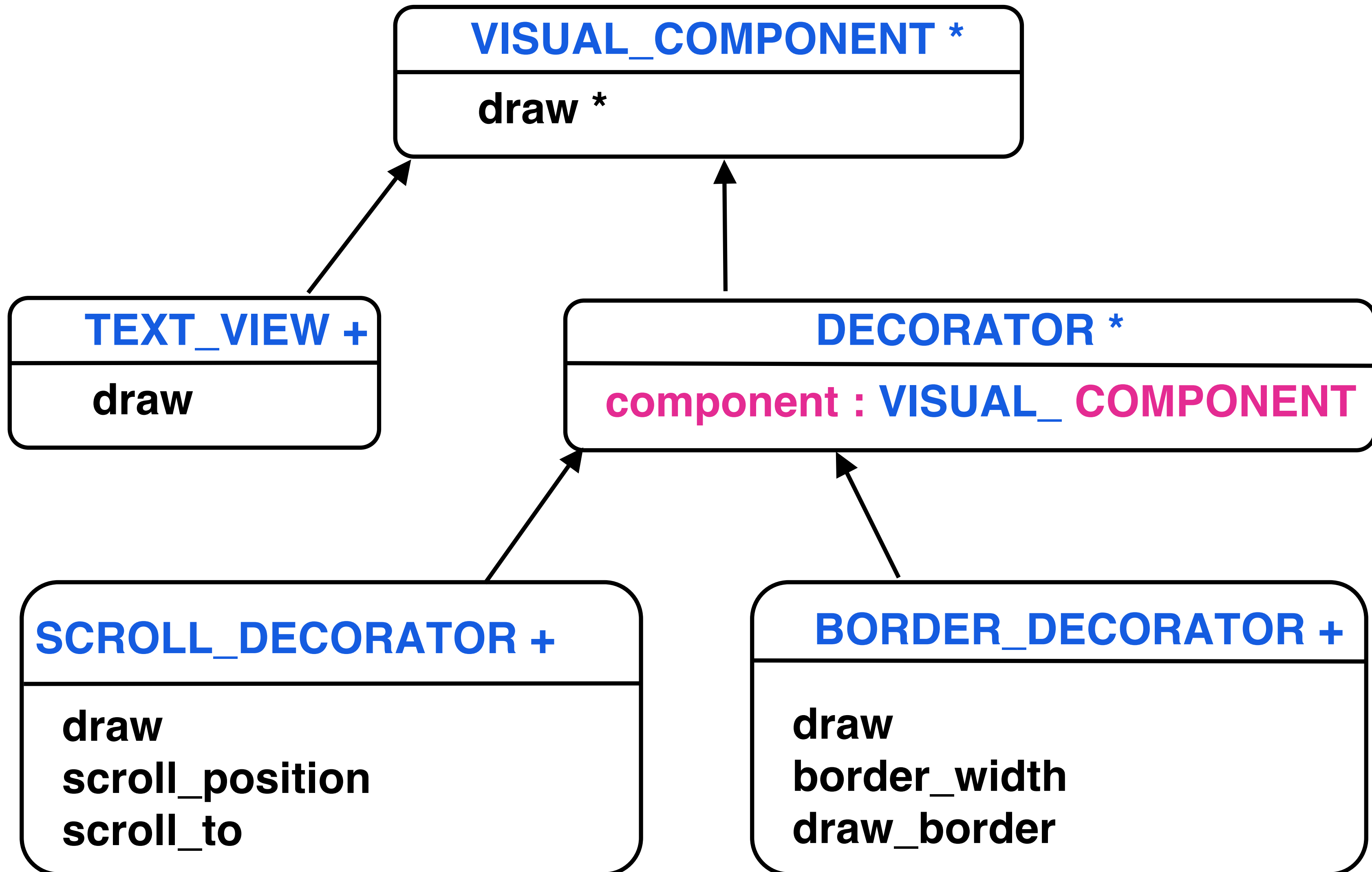
Decorator – Example Diagram



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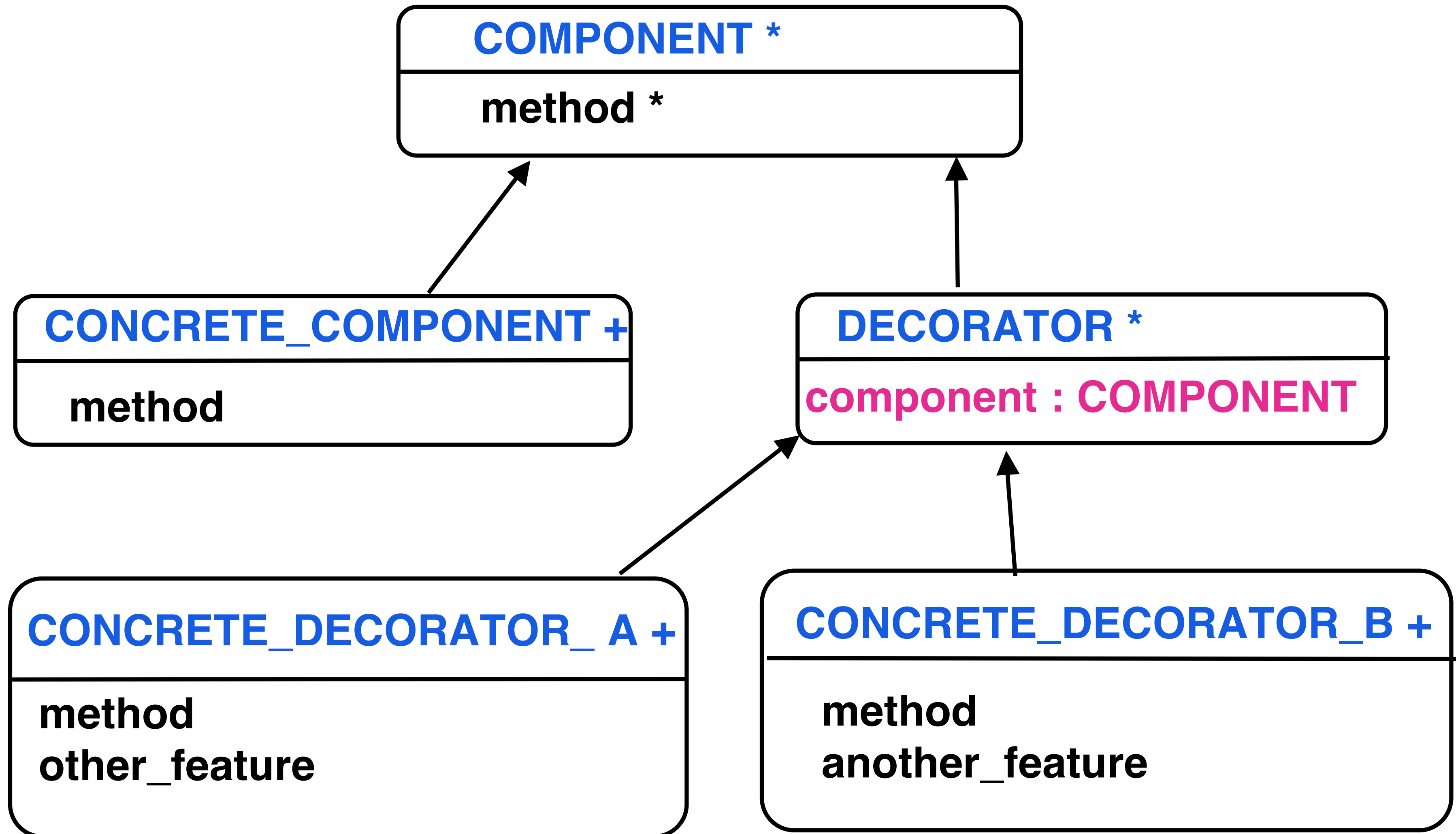
Decorator – General Structure



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Decorator – Implementation

```
class COMPONENT feature method deferred end

class CONCRETE_COMP feature method is... end

class DECORATOR feature
   component : COMPONENT
 end

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

Recursively do method for next in chain

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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- For responsibilities that can be withdrawn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

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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

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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

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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

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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

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