Behavioral Patterns

Software Modeling

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Basic Concepts of Behavioral Patterns

- **Intent**: Focus on how classes distribute responsibilities among them, and at the same time each class just does a single cohesive function. It is like a F1 Pits Team, each one has a **single Responsability**, but all together creates a complete team workflow.
- **Motivation**:
  - **Problem**: A system should be configured with multiple algorithms, and a system should be independent of how its operations are performed.
    Solution: Define each algorithm, encapsulate each one, and make them work together.

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Iterator Concepts

- The **Iterator** pattern is a behavioral pattern that allows sequential access to the elements of an aggregate object without exposing its underlying representation.
- The **Iterator** pattern is used when you want to provide a standard way to iterate over a collection and hide the implementation details of how the collection is traversed.

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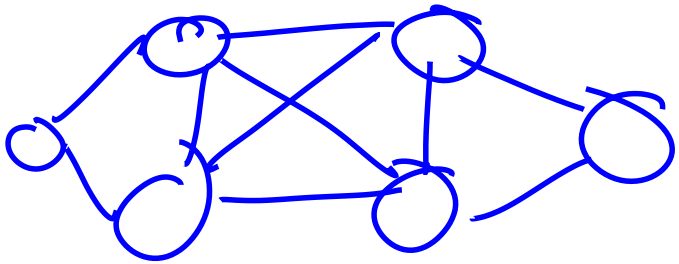

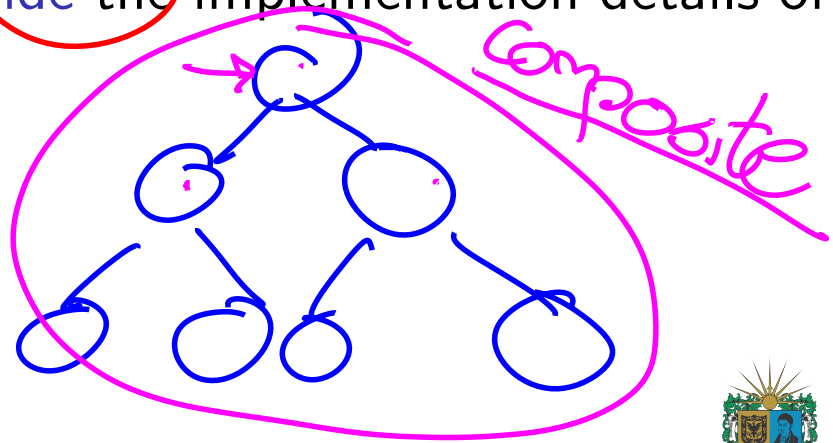

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Iterator Classes Structure

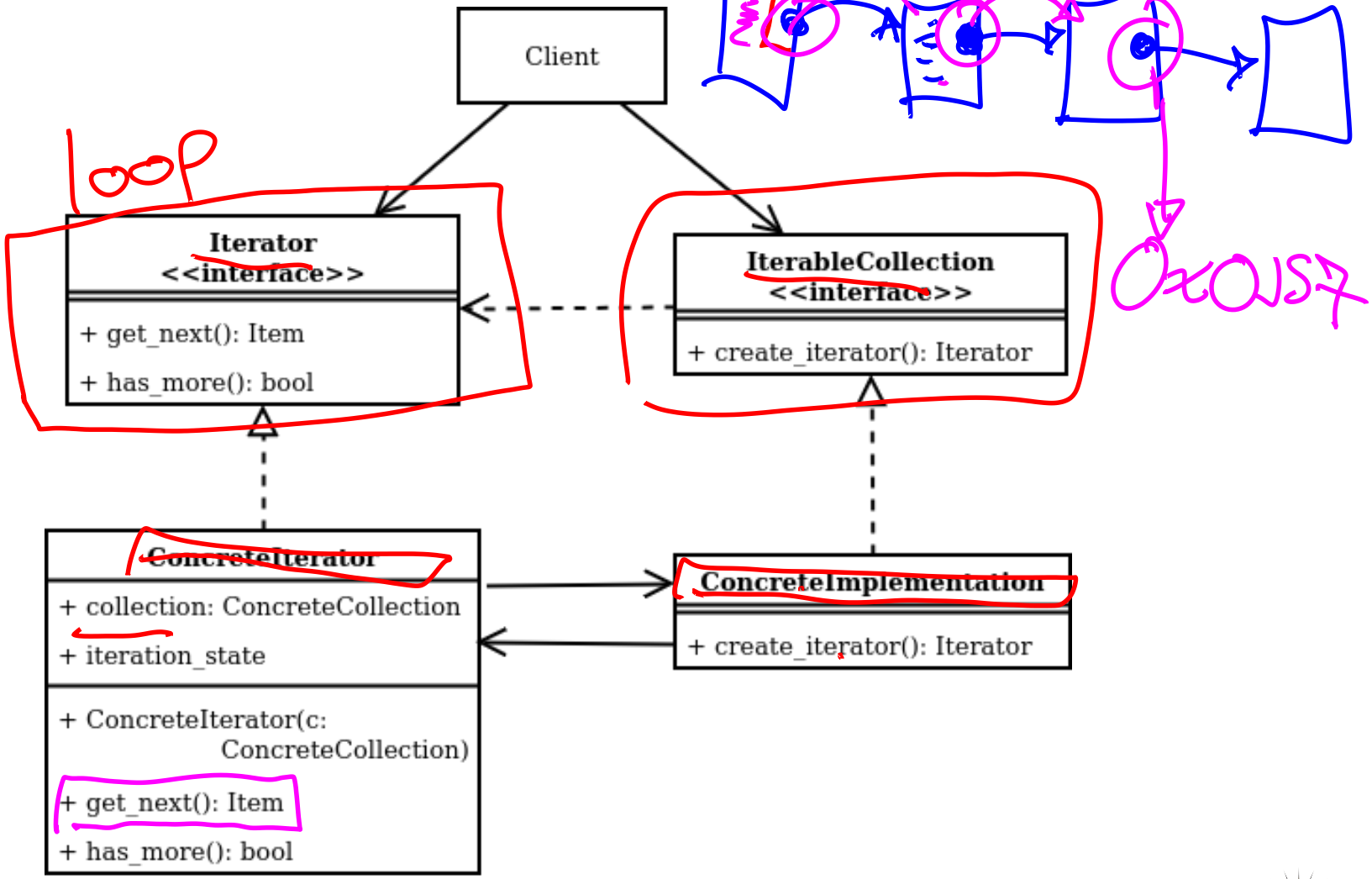
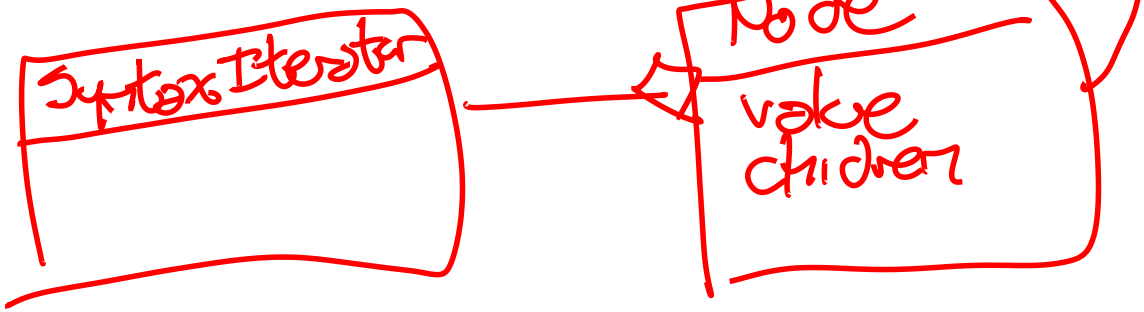


Figure: Iterator Pattern Class Diagram

Iterator Example: A Syntax Tree



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Memento Concepts

- The **Memento** pattern is a behavioral pattern that lets you save and restore the previous state of an object without revealing the details of its implementation.
- The **Memento** pattern is used when you want to provide the ability to restore an object to its previous state (undo).
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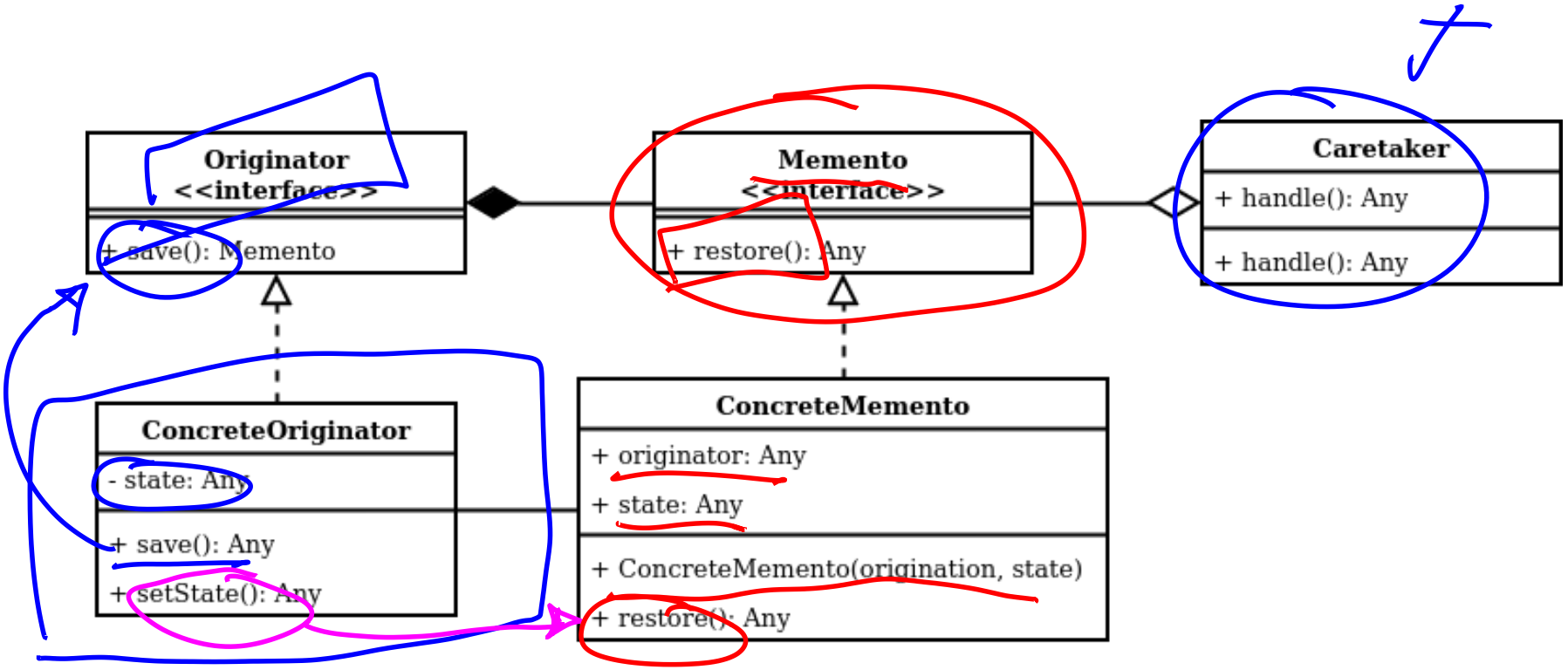

Figure: Memento Pattern Class Diagram

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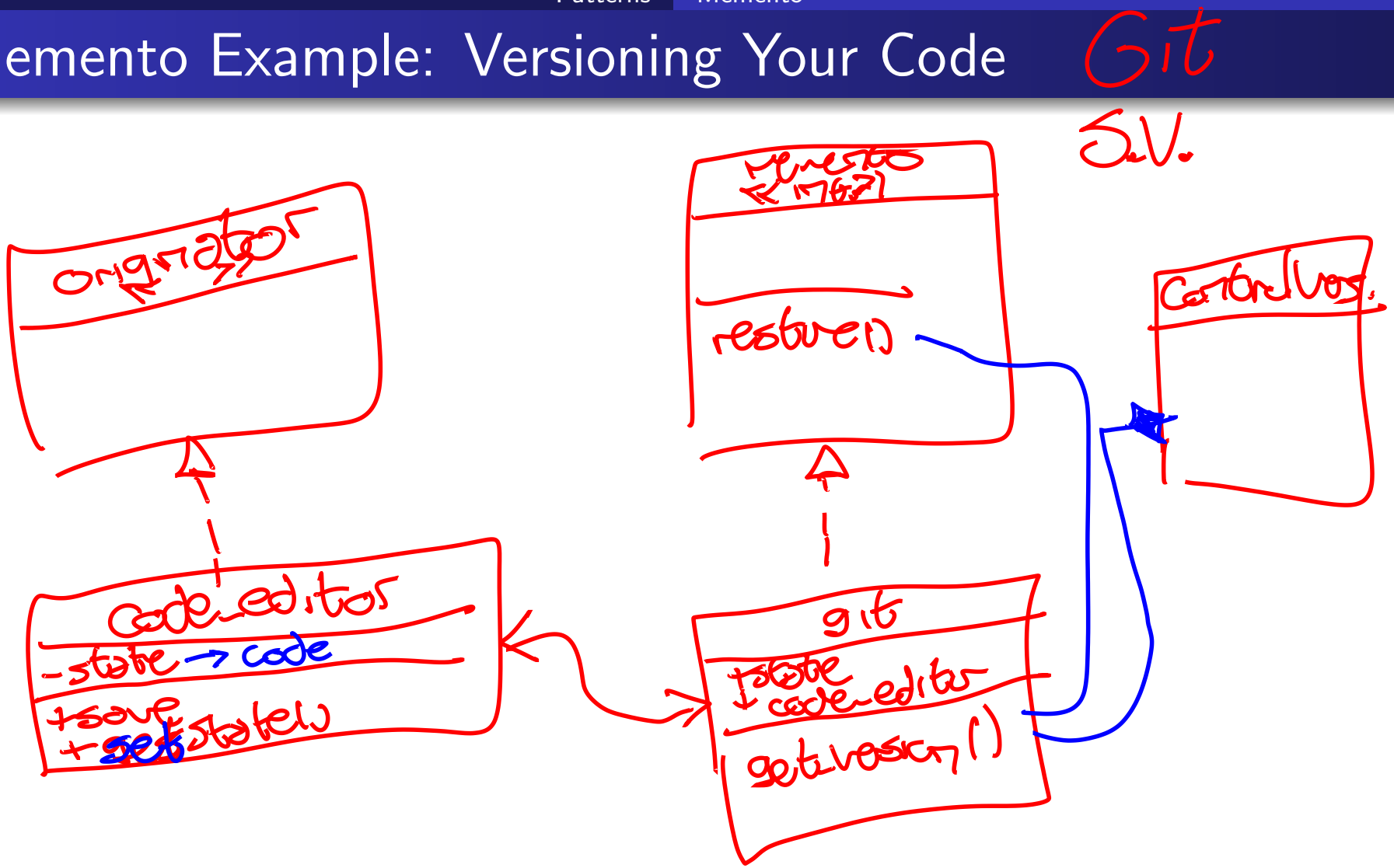
Memento Example: Versioning Your Code



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Strategy Concepts

- The **Strategy** pattern is a behavioral pattern that lets you define a family of algorithms, put each of them into a separate class, and make their objects interchangeable.
- The **Strategy** pattern is used when you want to define a class that will have one behavior that is similar to other behaviors in a list.
- The **Strategy** pattern is used when you need to use one of several behaviors dynamically.

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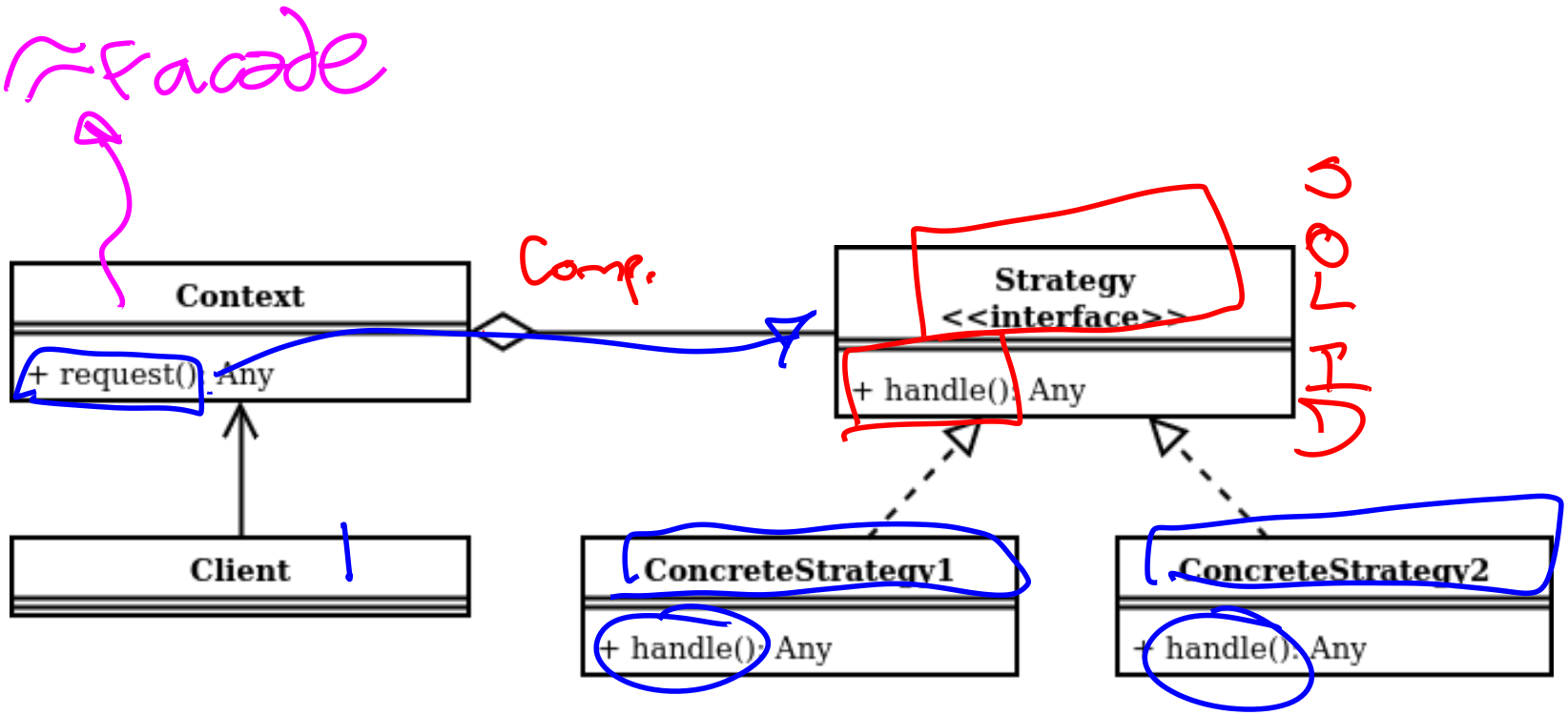
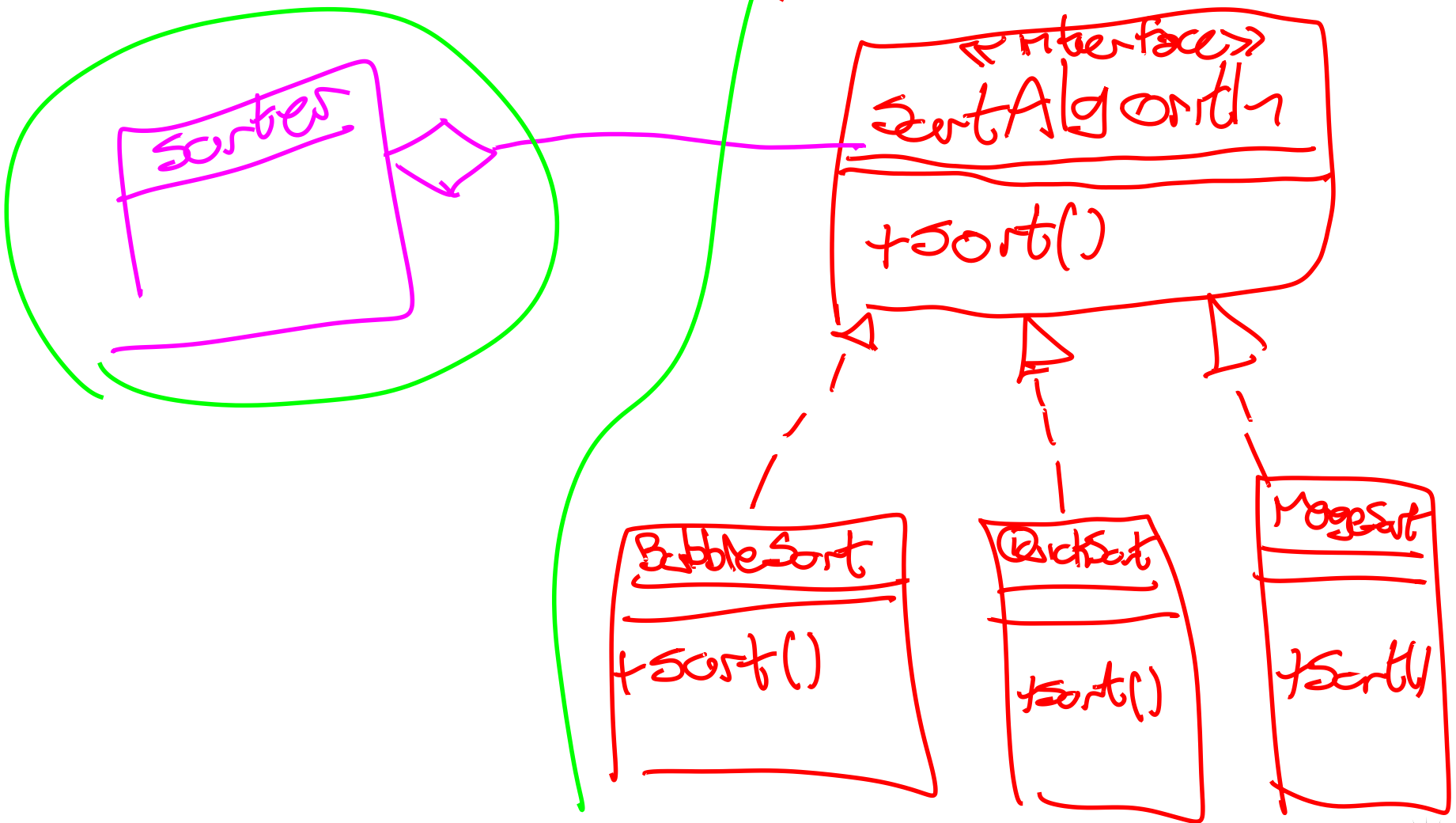


Figure: Strategy Pattern Class Diagram

Strategy Example : Sort Algorithms



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Template Concepts

- The **Template** pattern is a behavioral pattern that defines the program skeleton of an algorithm in the superclass but lets subclasses override specific steps of the algorithm without changing its structure.
- The **Template** pattern is used when you want to let clients extend only specific steps of an algorithm, but not the whole algorithm or its structure.
- The **Template** pattern is used when you have several classes that contain the same set of methods, but you want to avoid code duplication.

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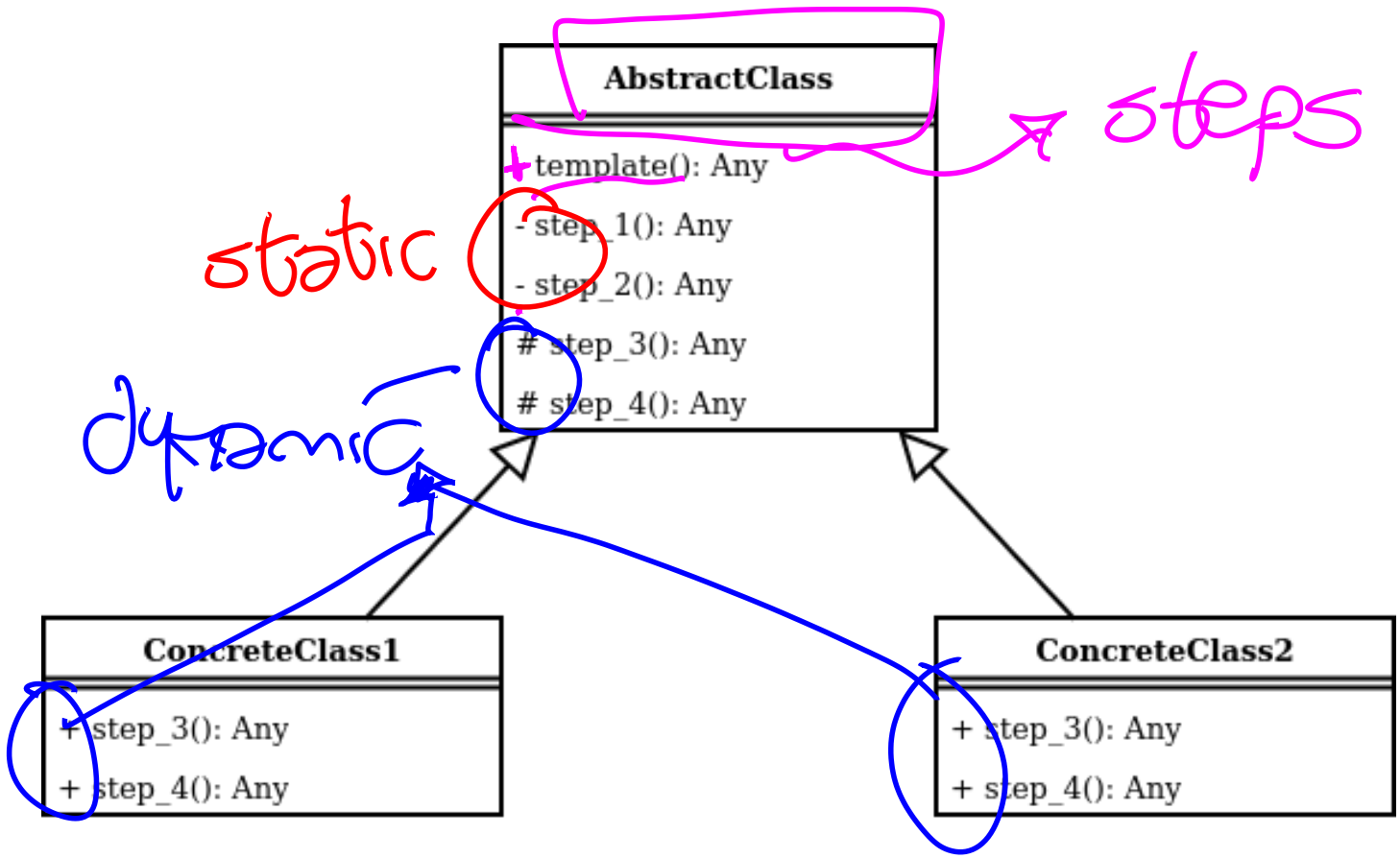

Figure: Template Pattern Class Diagram

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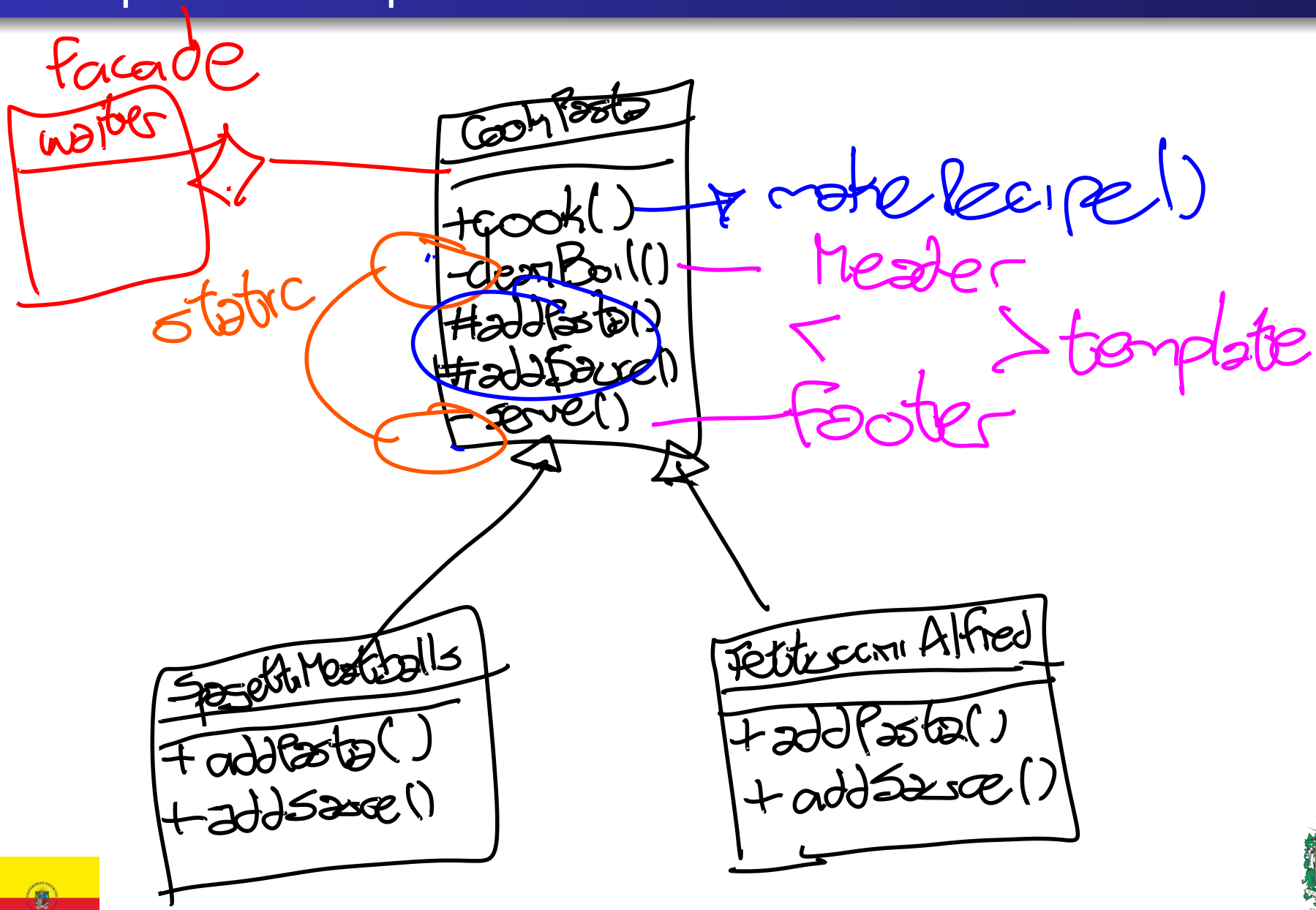
Template Example: Let's Cook Pasta!



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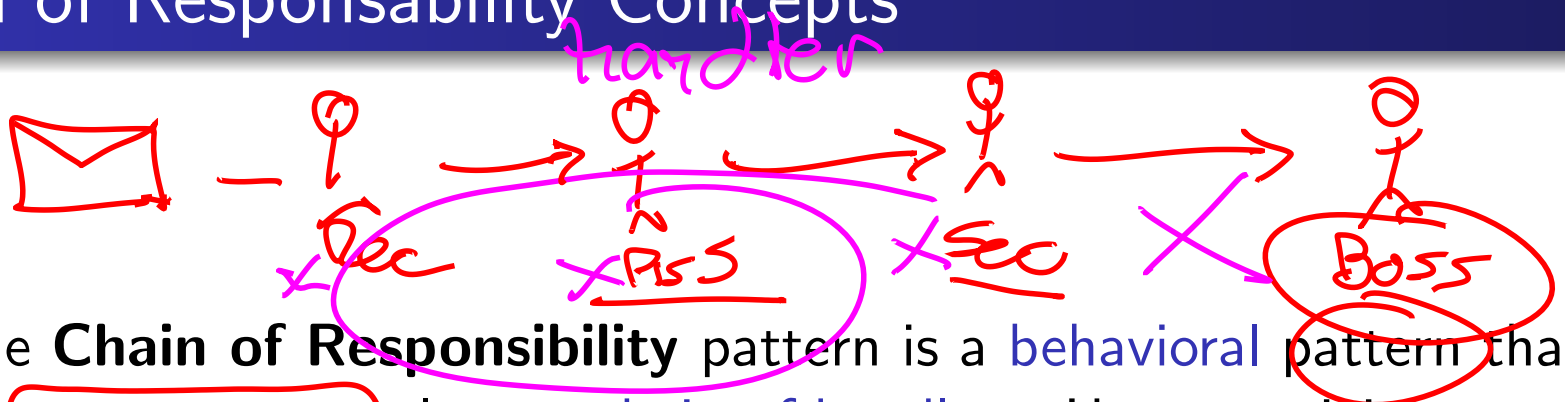
Chain of Responsability Concepts



- The **Chain of Responsibility** pattern is a behavioral pattern that lets you pass requests along a chain of handlers. Upon receiving a request, each handler decides either to process the request or to pass it along the chain.
- The **Chain of Responsibility** pattern is used when you want to give more than one object a chance to handle a request.
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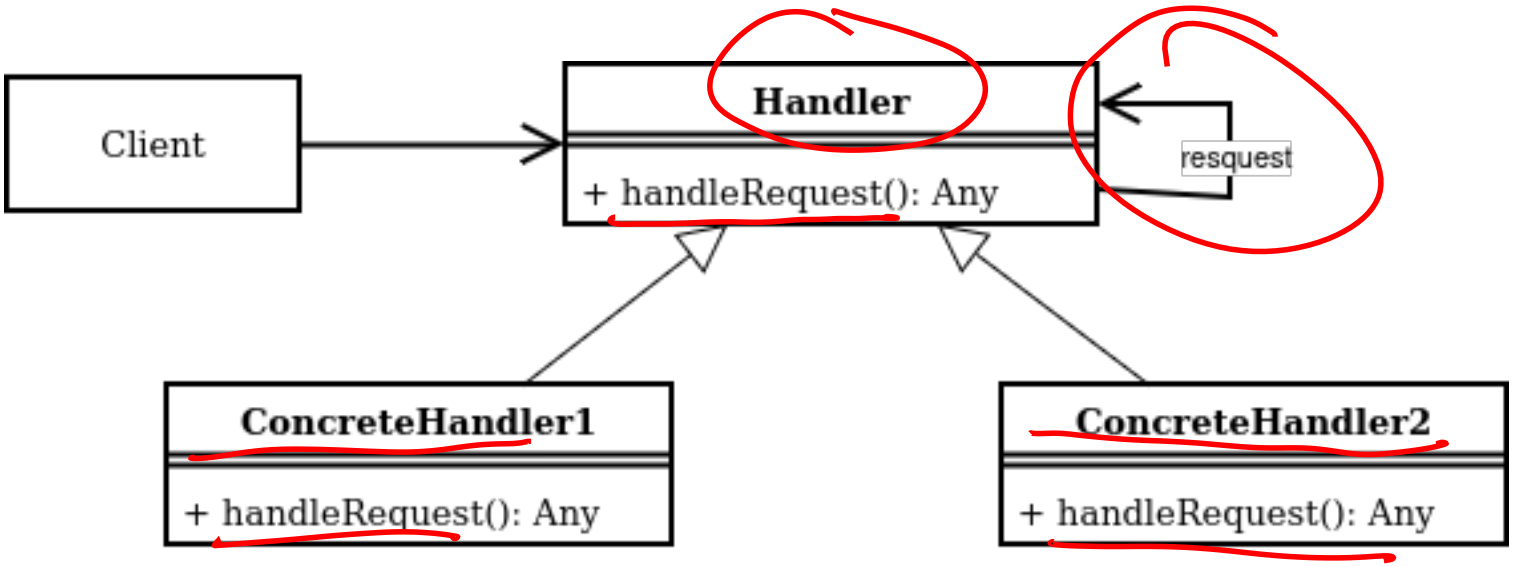

Figure: Chain of Responsability Pattern Class Diagram

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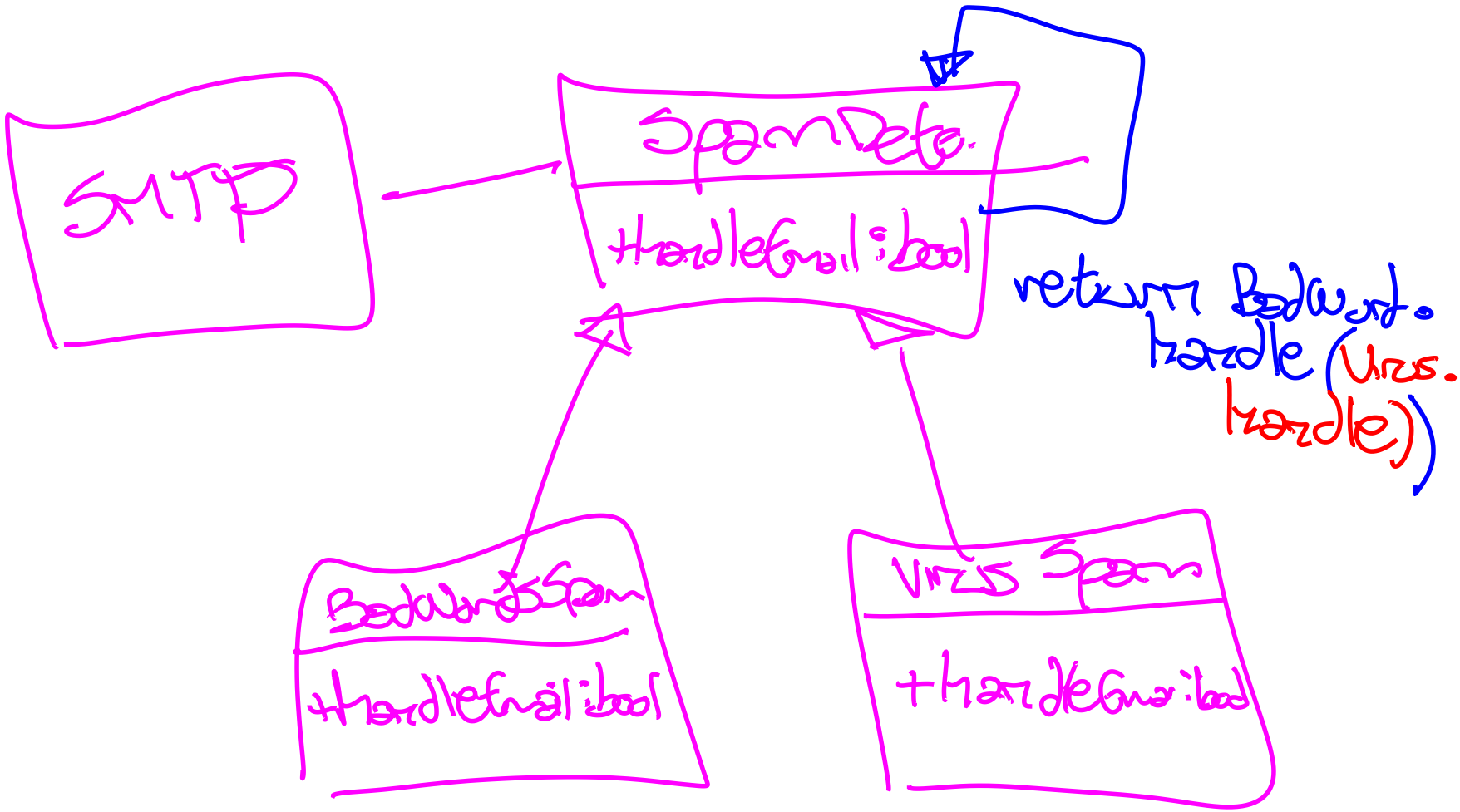
Chain of Responsability Example: Filter an Email



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- The **State** pattern is a behavioral pattern that lets an object alter its behavior when its internal state changes. It appears as if the object changed its class.
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- The **State** pattern is used when you want to avoid a large number of conditional statements in your code.

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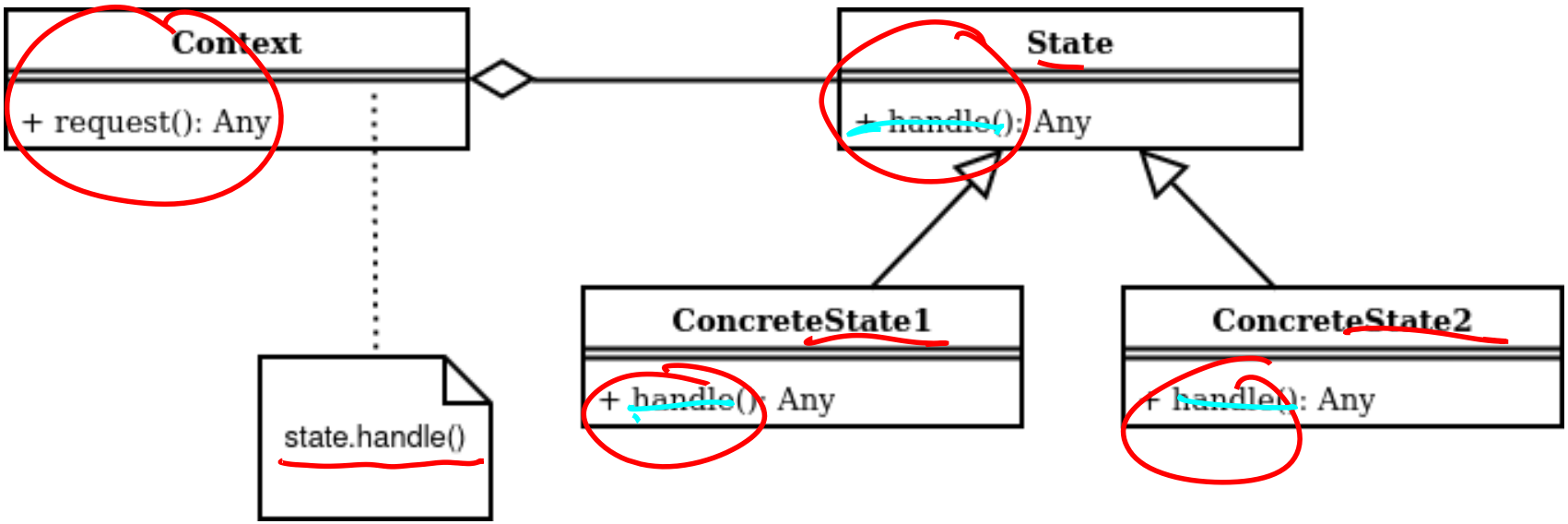
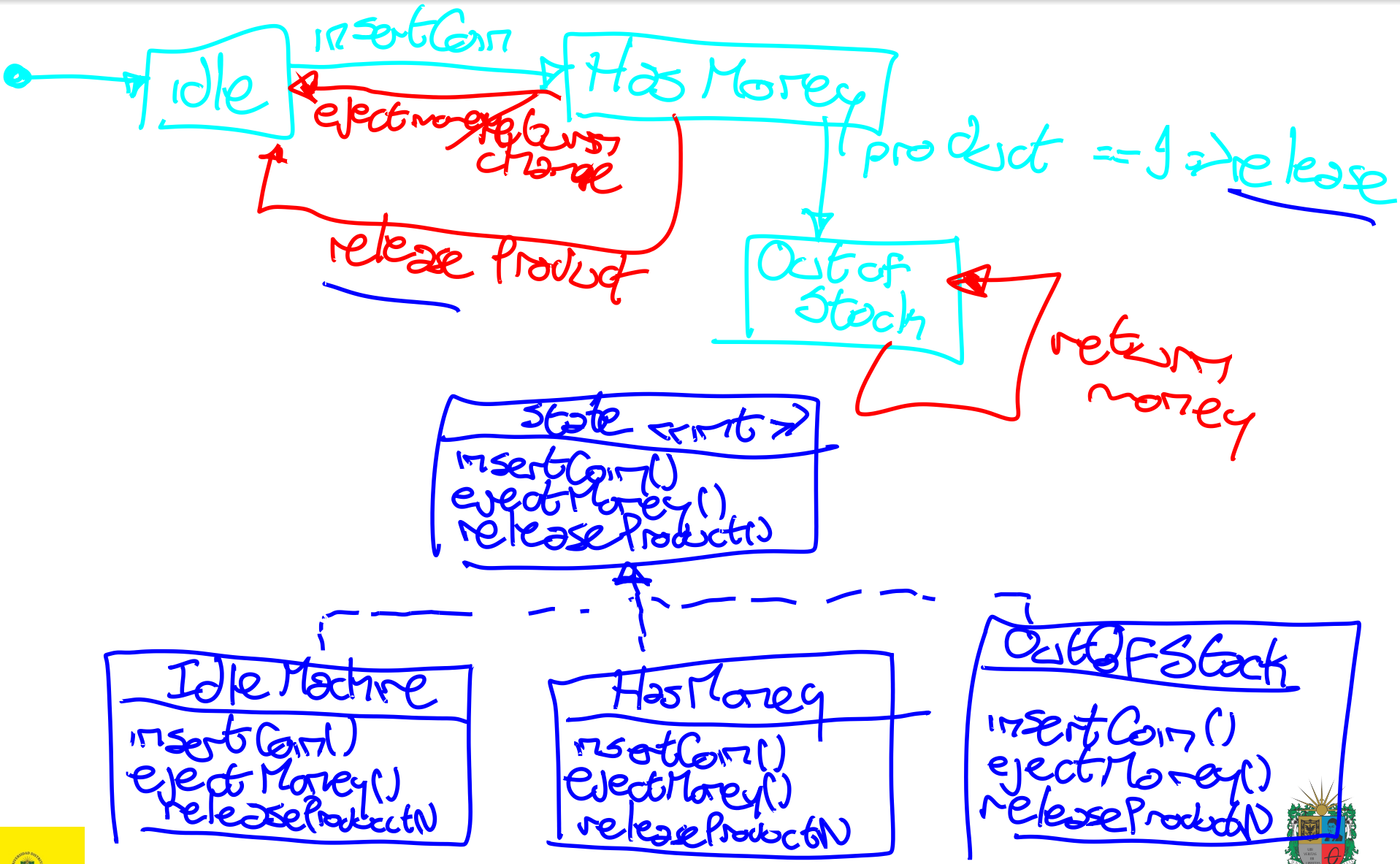


Figure: State Pattern Class Diagram

State Example: Vending Machine



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Mediator Concepts

- The **Mediator** pattern is a behavioral pattern that lets you reduce chaotic dependencies between objects. The pattern restricts direct communications between the objects and forces them to collaborate only via a mediator object.
- The **Mediator** pattern is used when you want to reduce the number of dependencies between your classes.
- The **Mediator** pattern is used when you want to simplify the communication between objects in a system.

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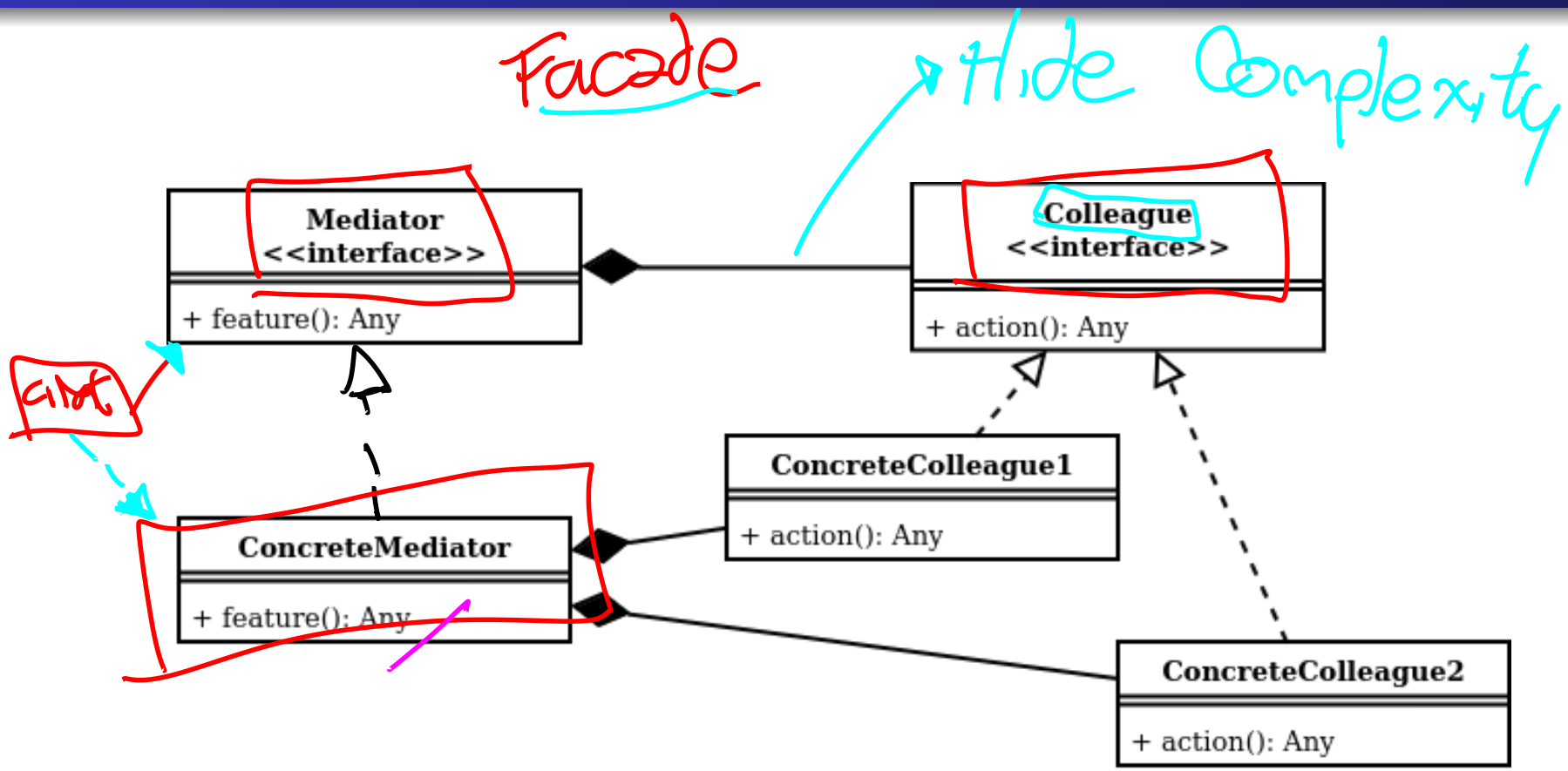
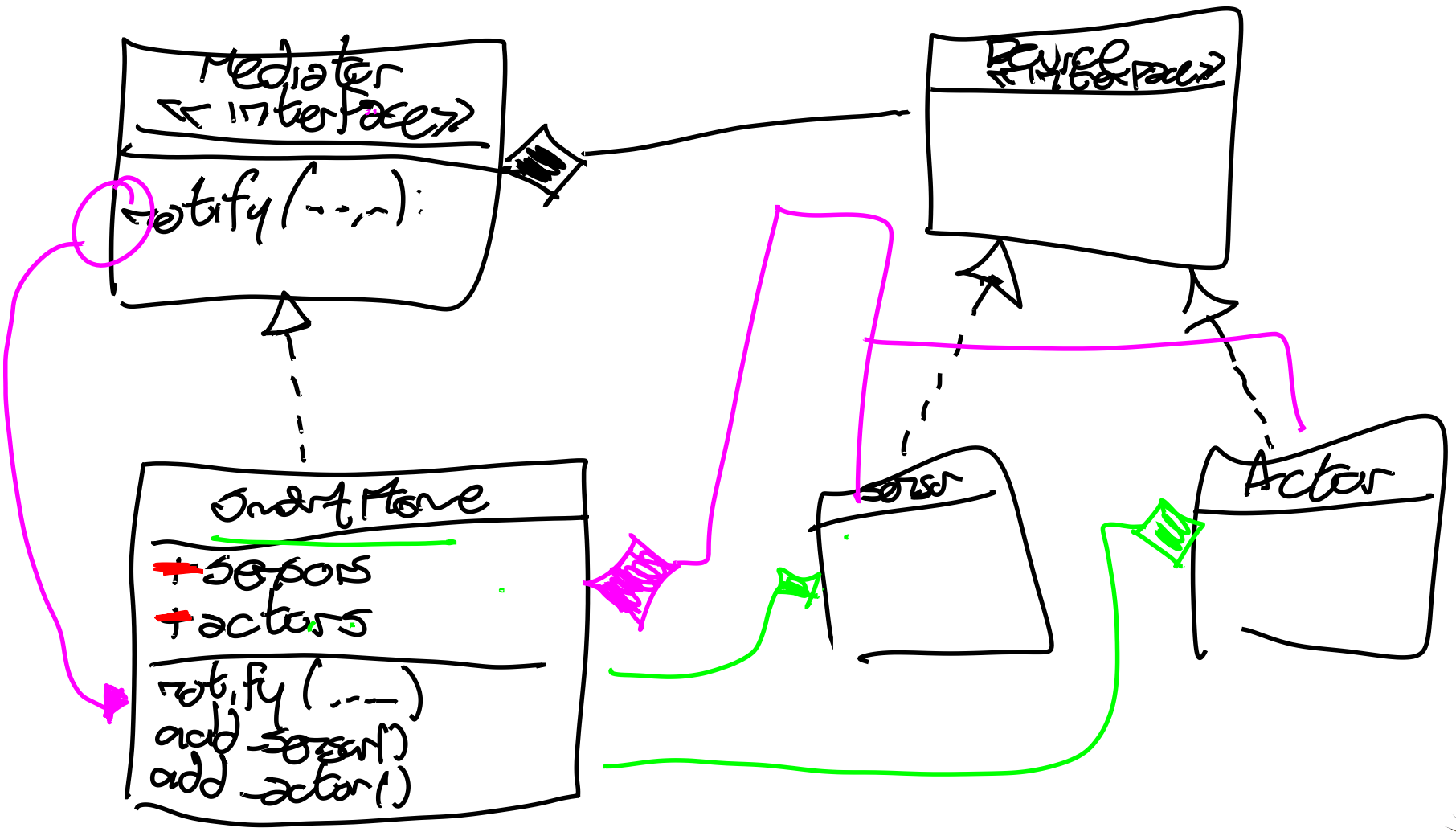


Figure: Mediator Pattern Class Diagram

Mediator Example: Smart Home



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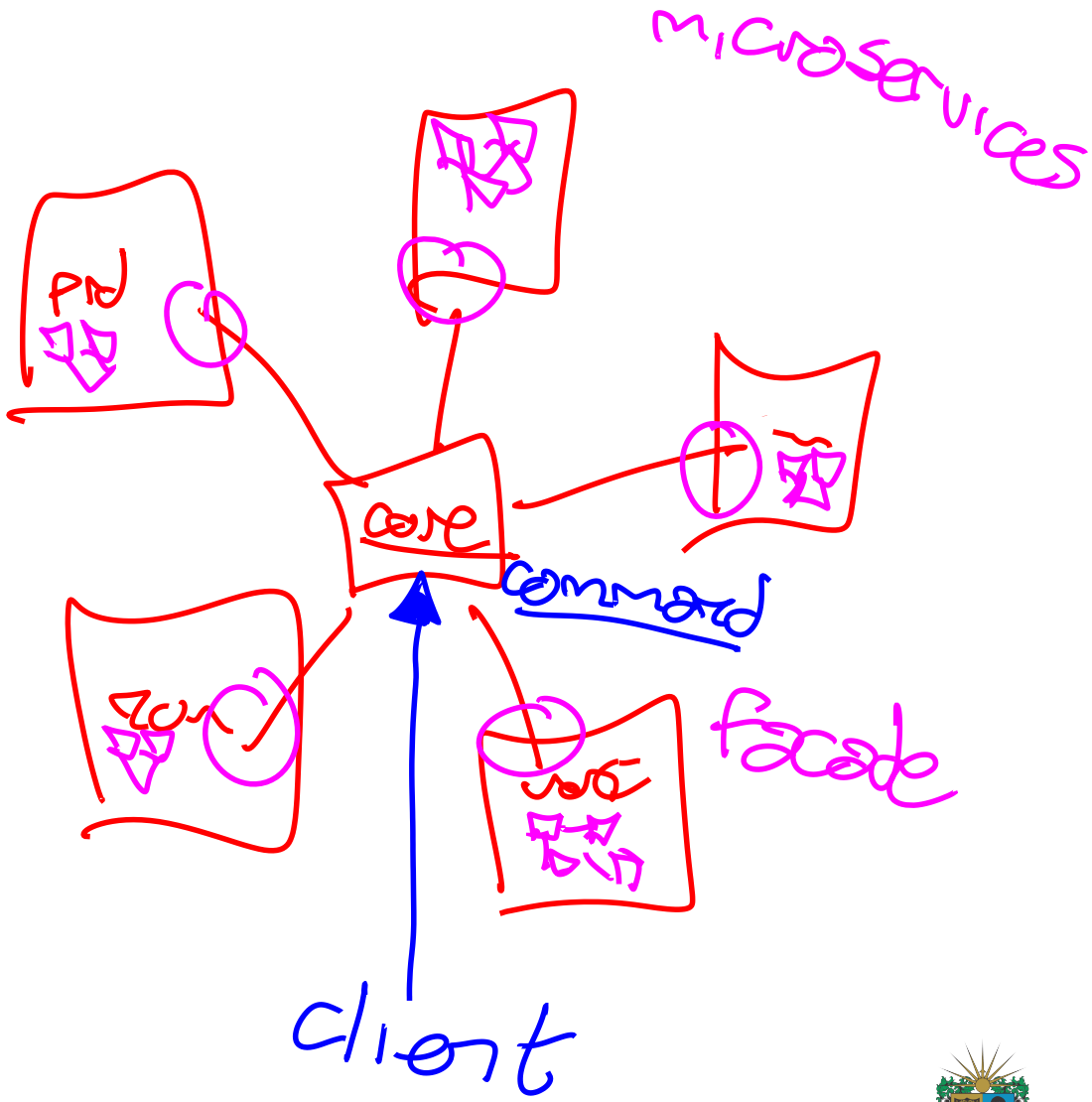

Command Concepts

fifo => First-In First-Out

- The **Command** pattern is a behavioral pattern that turns a request into a stand-alone object that contains all information about the request. This transformation lets you pass requests as a method argument, delay or queue a request's execution, and support undoable operations.
- The **Command** pattern is used when you want to parameterize objects with commands.
- The **Command** pattern is used when you want to queue operations, schedule their execution, or execute them remotely.

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All day Midnight cola_late_offs

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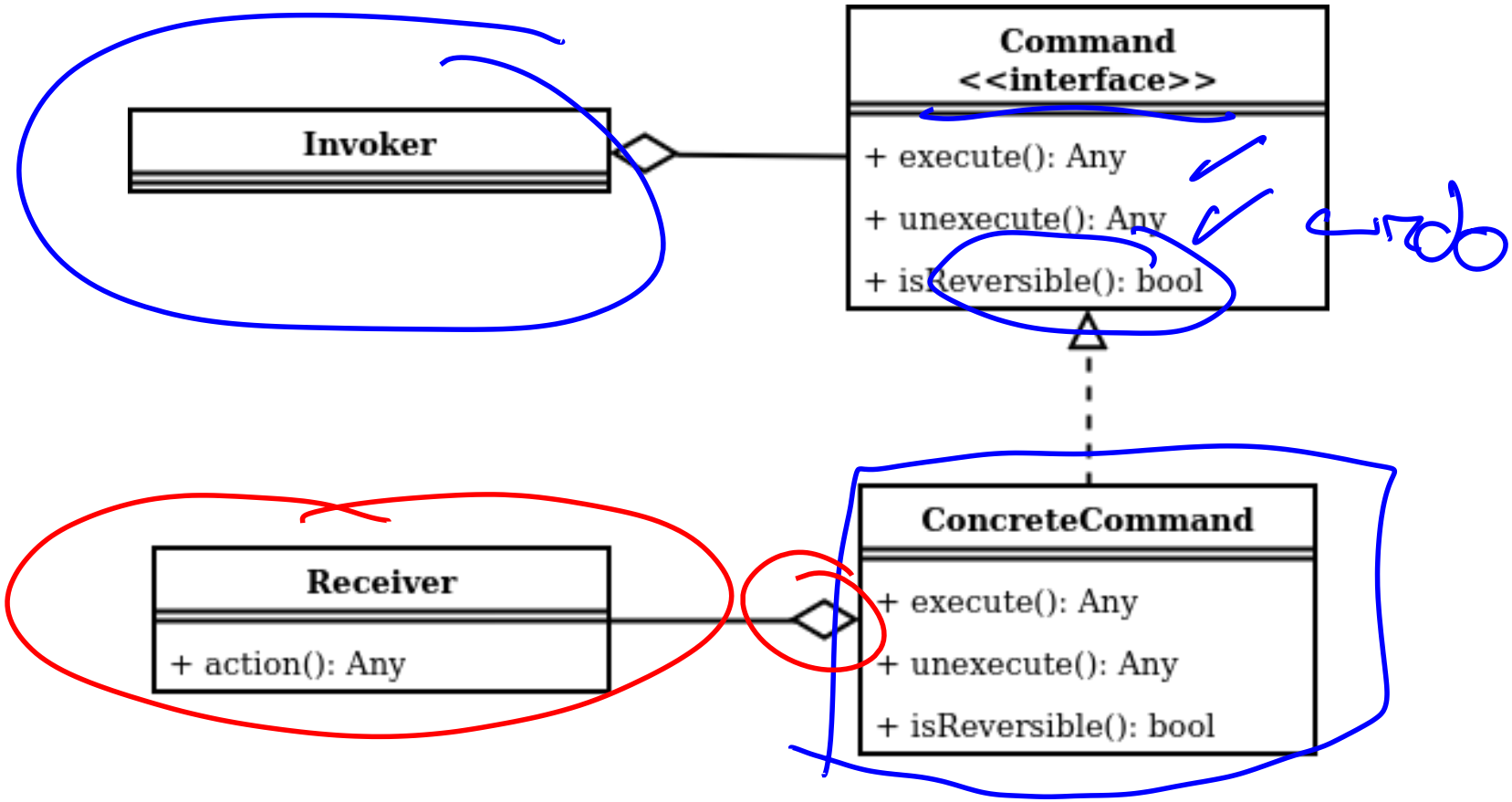

Figure: Command Pattern Class Diagram

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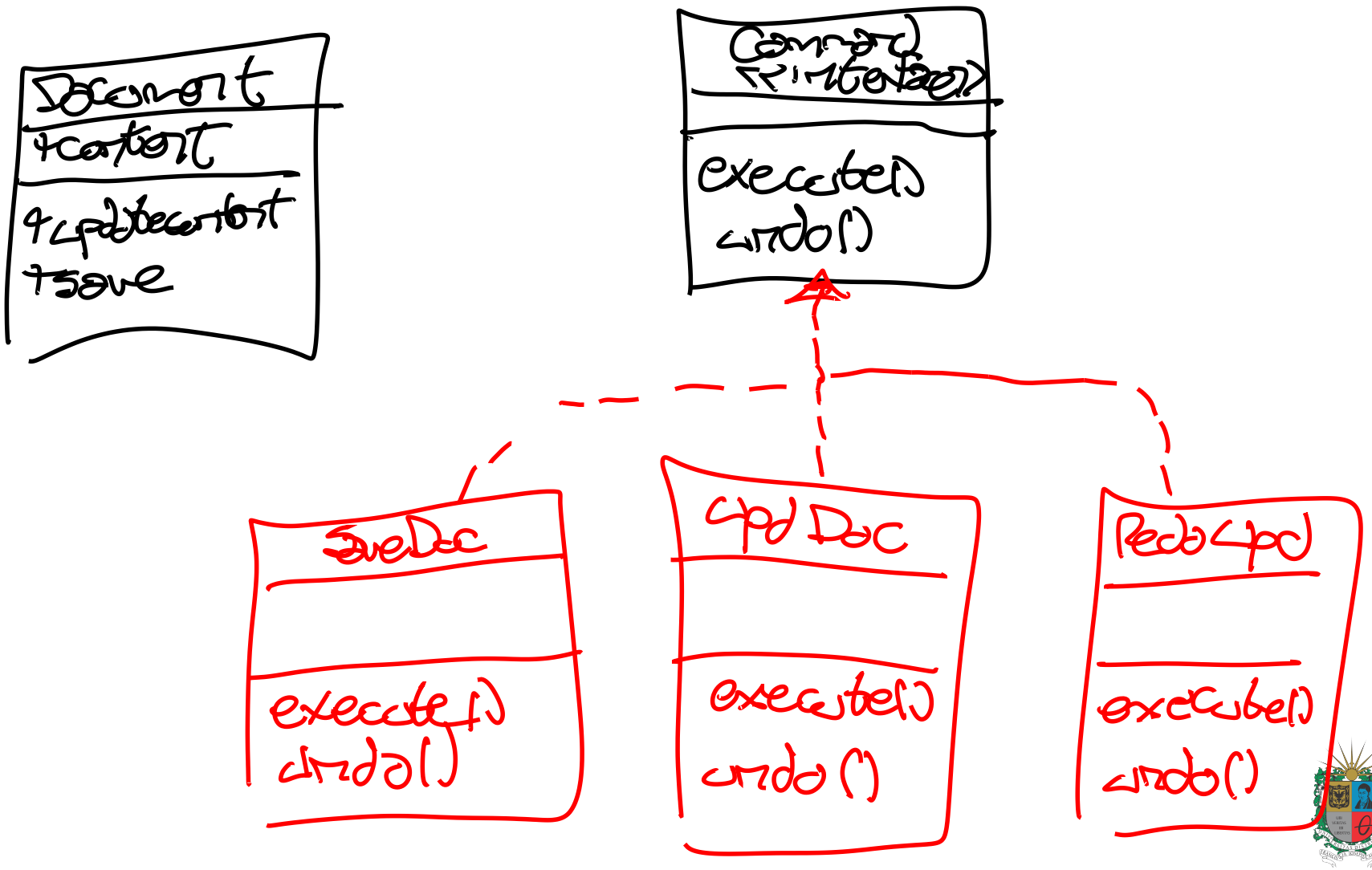
Command Example: Your Own Text Editor



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Observer Concepts

- The **Observer** pattern is a behavioral pattern that lets you define a subscription mechanism to notify multiple objects about any events that happen to the object they're observing.
- The **Observer** pattern is used when you need many other objects to receive an update when another object changes.
- The **Observer** pattern is used when an object should be able to notify other objects without making assumptions about who these objects are.

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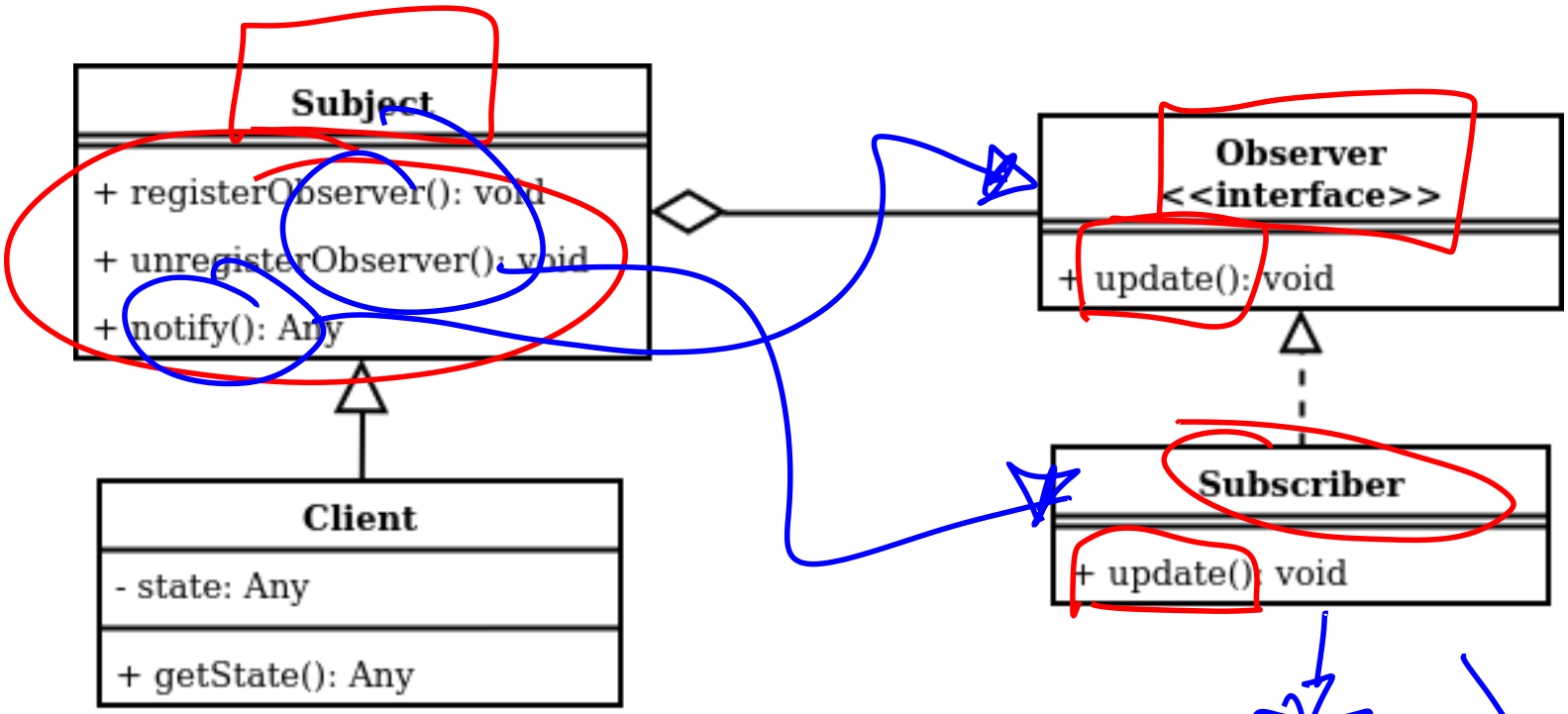
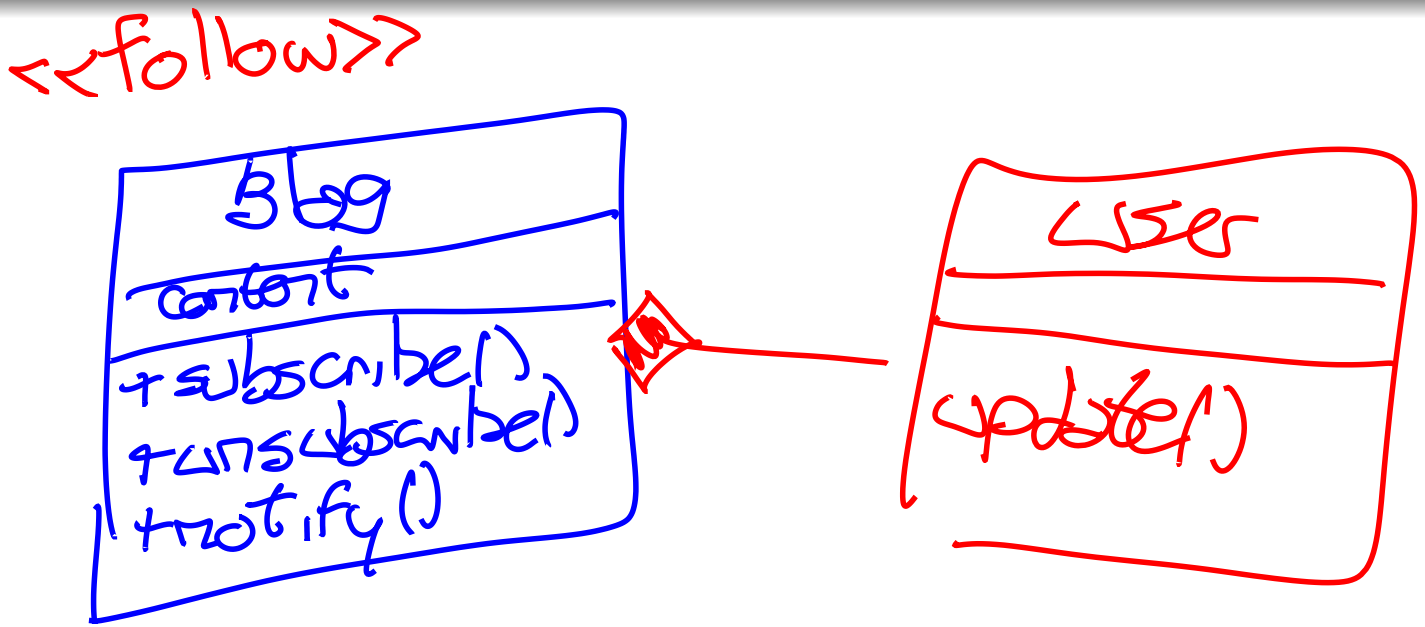


Figure: Observer Class Diagram

Observer Example: Blogs!



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Conclusions

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Thanks!

Questions?

Repo: *https://github.com/EngAndres/ud-public/tree/main/courses/software-modeling*

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