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Software Engineering and Architecture

Pattern Catalog: Decorator

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New Requirement

- Alphatown wants to log all coin entries:
  - [time] [value]

- Example:
  - 14:05:12 5 cent
  - 14:05:14 25 cent
  - 14:55:10 25 cent

- ☺

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The 3-1-2 machinery

- Let us look at the machinery:
- ③ Identify the responsibility whose concrete behaviour may vary
- ① Express responsibility as an interface
- ② Composition: “Let someone else do the job”

- How does this apply?

- What is 3-1-2 here?

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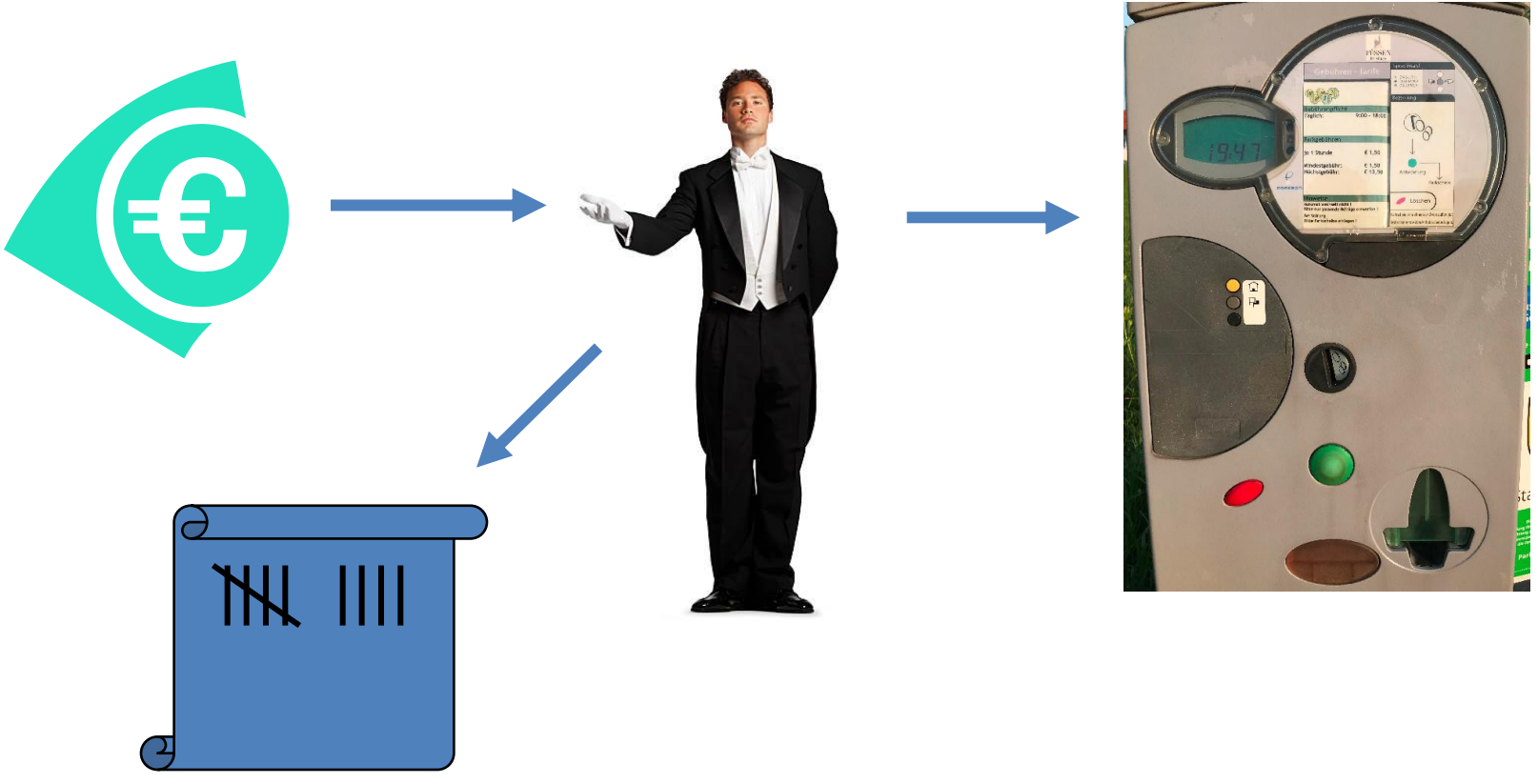
Analysis

- ③ Identify the responsibility whose concrete behaviour may vary
  - It is the “Accept payment” responsibility

- ① Express responsibility as an interface
  - A) PaymentAcceptPayment role? Cohesion???
  - B) PayStation role? Already in place!
- ② Let someone else do the job
  - Maybe let someone handle the coins *before* the parking machine receives them?

Metaphor: Principle 2

- *Introduce an **intermediate** person/object*



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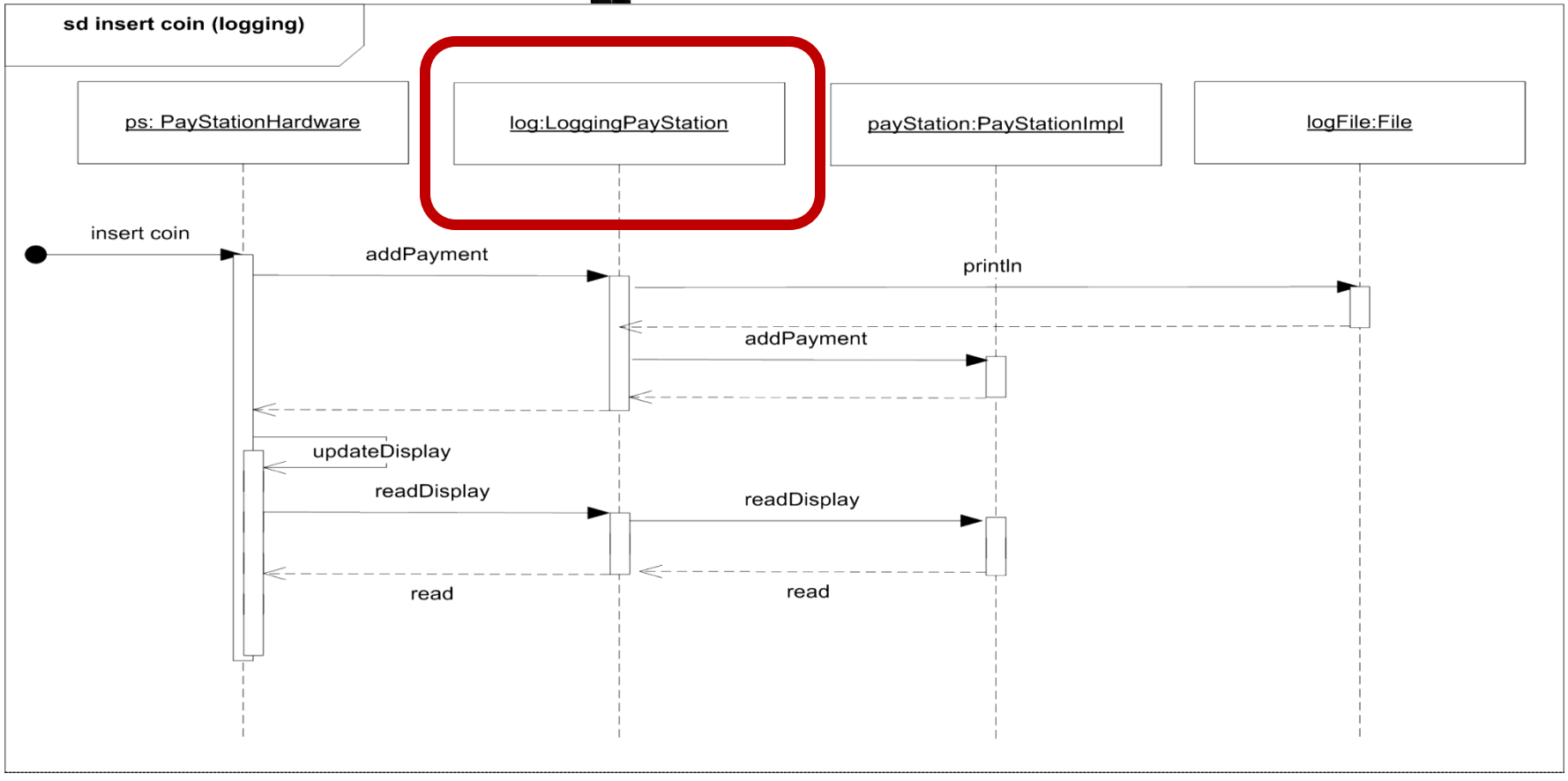
Dynamics



[Demo]

- **Refactoring process** – solution first programming
  - Establish basis: run TestPayStation
  - ps = new LogDecoratedPS(ps);
  - In LogDecoratePS do
    - Intro ‘private PayStation delegate;’
    - Select it, and choose menu ‘Code/Delegate methods…’
  - Rerun tests
  - Introduce the decorating statement in the LogDec…
  - ”Flip the reference” to enable/disable at runtime

Flip Reference

- We can ‘flip’ the reference at run-time
  - Will we call methods on one or the other

Flip Reference

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As In…

- ‘Flipping’ code

```
@Test  henrikbaerbak.csdevf25.d42913 *
public void manualDecoratorTest() throws IllegalCoinException {
  // Given the ConcreteComponent
  PayStation realPayStation = new StandardPayStation(new LinearRateStrategy());
  // When I decorate it
  PayStation payStation = new LogDecoratedPayStation(realPayStation);
  // Then I manually verify behavior
  payStation.addPayment( coinValue: 5);
  payStation.addPayment( coinValue: 10);
  // Flip pointer back
  payStation = realPayStation;
  payStation.addPayment( coinValue: 25);
}
```

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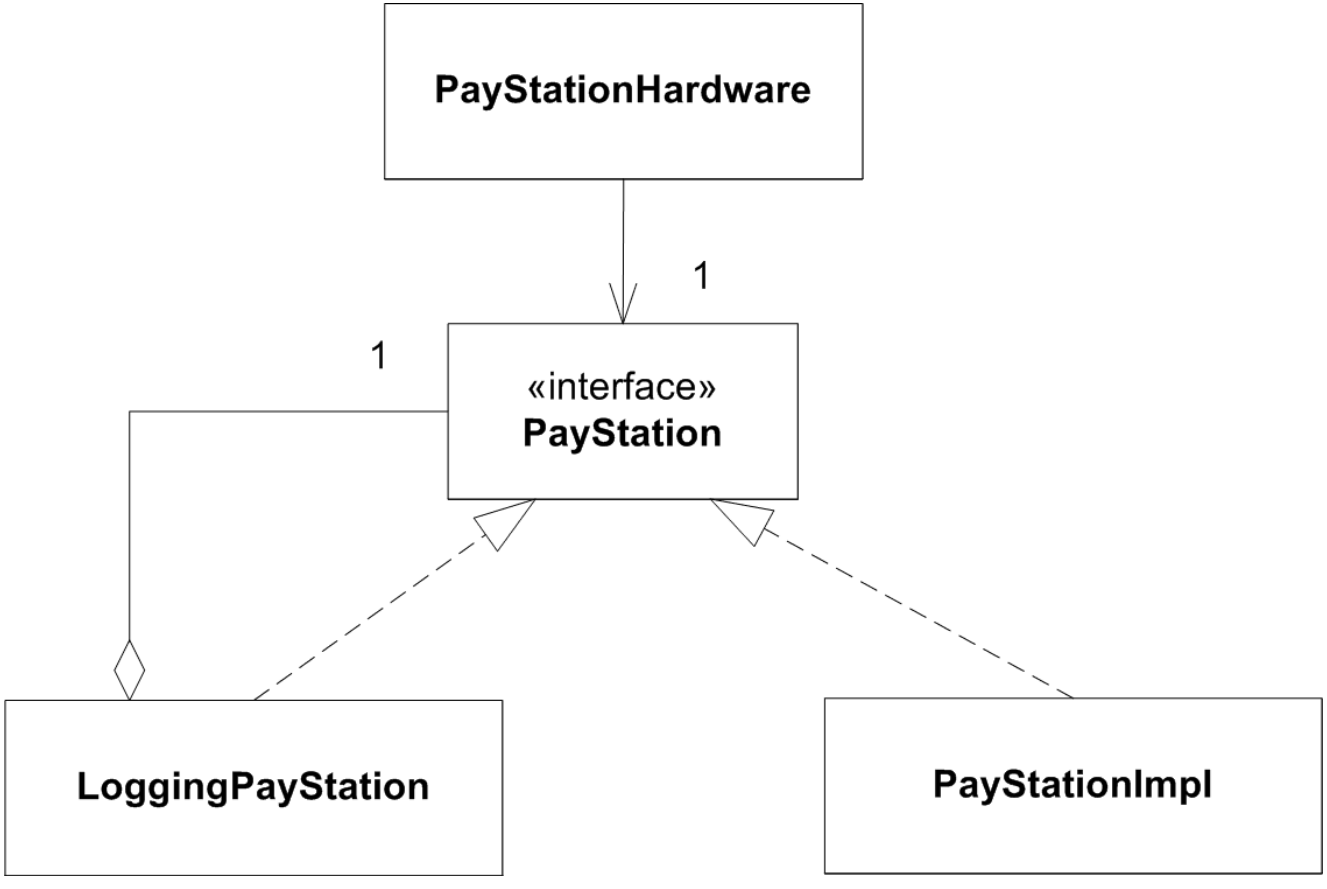
Decorator Pattern

Structure


PayStationHardware
1
1
«interface»
PayStation
LoggingPayStation
PayStationImpl

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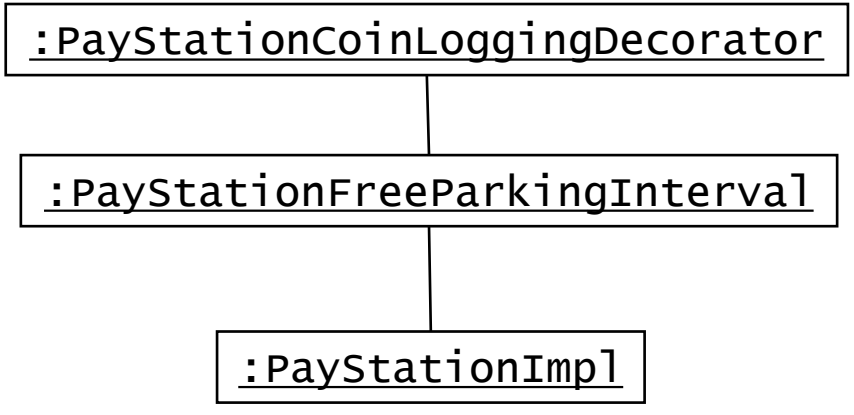
Chaining decorators

- Decorators can form chains.
- New requirement:
  - no payment possible in 19.00 – 07.00 interval



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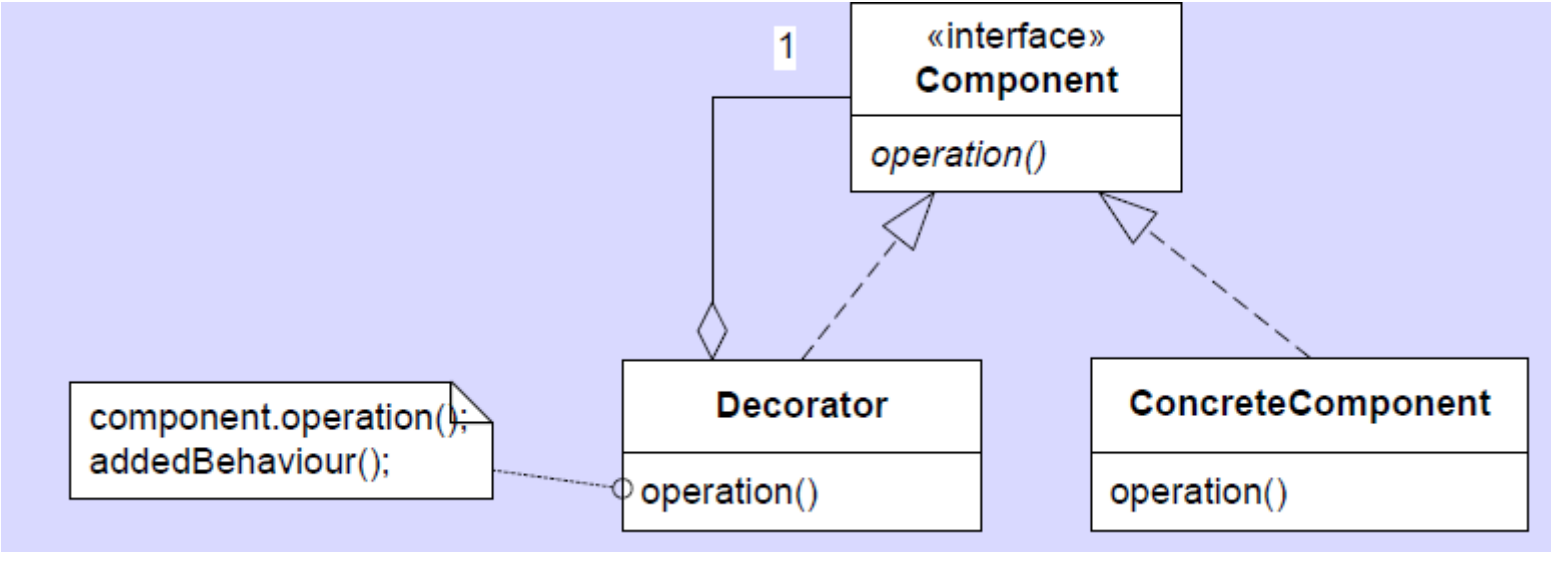
Automagical pattern?

- The decorator is yet another application of 3-1-2 and the principles of flexible design!



Consequences

- Benefits
  - Adding and removing behavior at run-time
  - Incrementally add responsibilities
  - Complex behavior by chaining decorators
- Liabilities
  - Analyzability suffers as you end up with lots of little objects
    - Behavior is constructed at run-time instead of being written in the static code
  - Delegation code tedious to write (without IDE ☺)
    - Make a ‘null decorator’ as base class