Entwicklung objektorientierter Software mit formalen Methoden

Design Patterns

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Design Patterns: Libraries for design

Collection of solutions for common software design problems

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Document design decisions of a software system

$\Rightarrow$ increase of maintenance

Description scheme of design patterns

Motivation

Where does the need for this pattern come from?

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Under which circumstances is it applicable?

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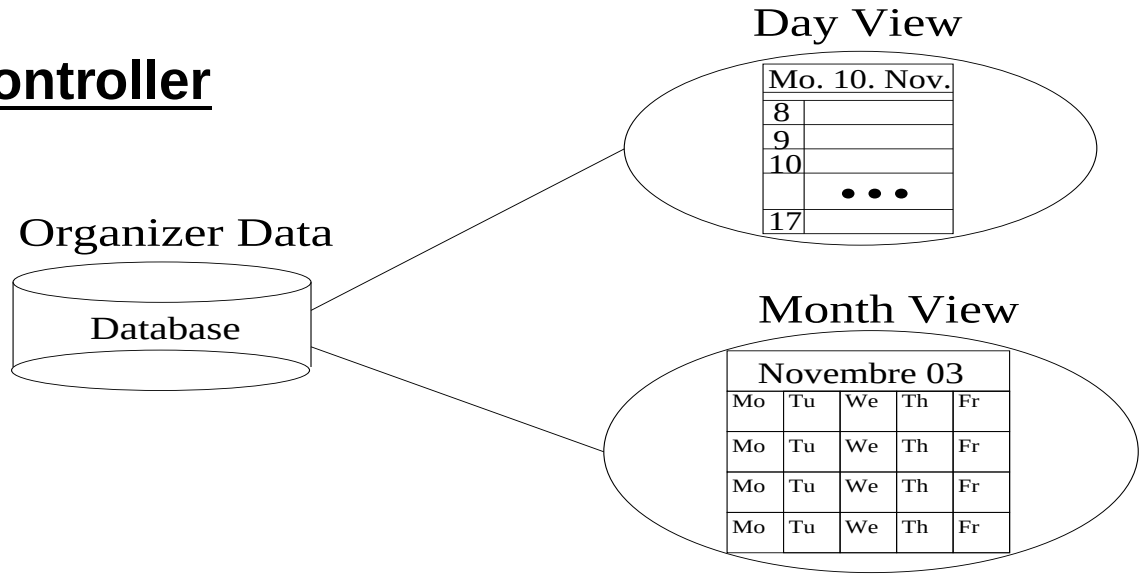
Consequences

What are the effects when using this pattern?

Improving Consistence and Reusability

Model View Controller



Keeping Model, View and Controller separate allows

- **different consistence views**
- **reuse of views in other contexts**
- **dynamic chosen response**

The »Observer«: Separates model and view

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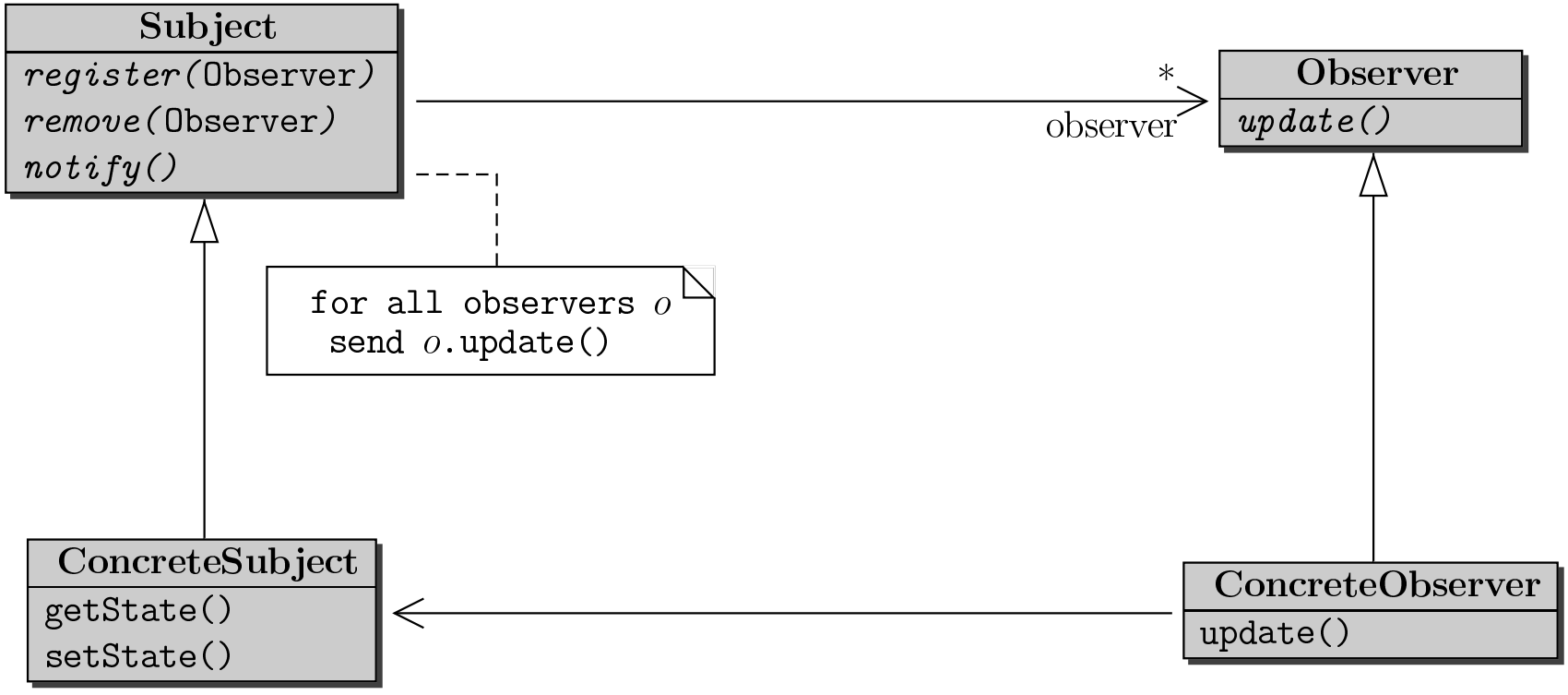
Consequence:

- Independant reuse of subject and observer.
- Observers can be added without changing the observer or subject.

The class structure of the observer pattern



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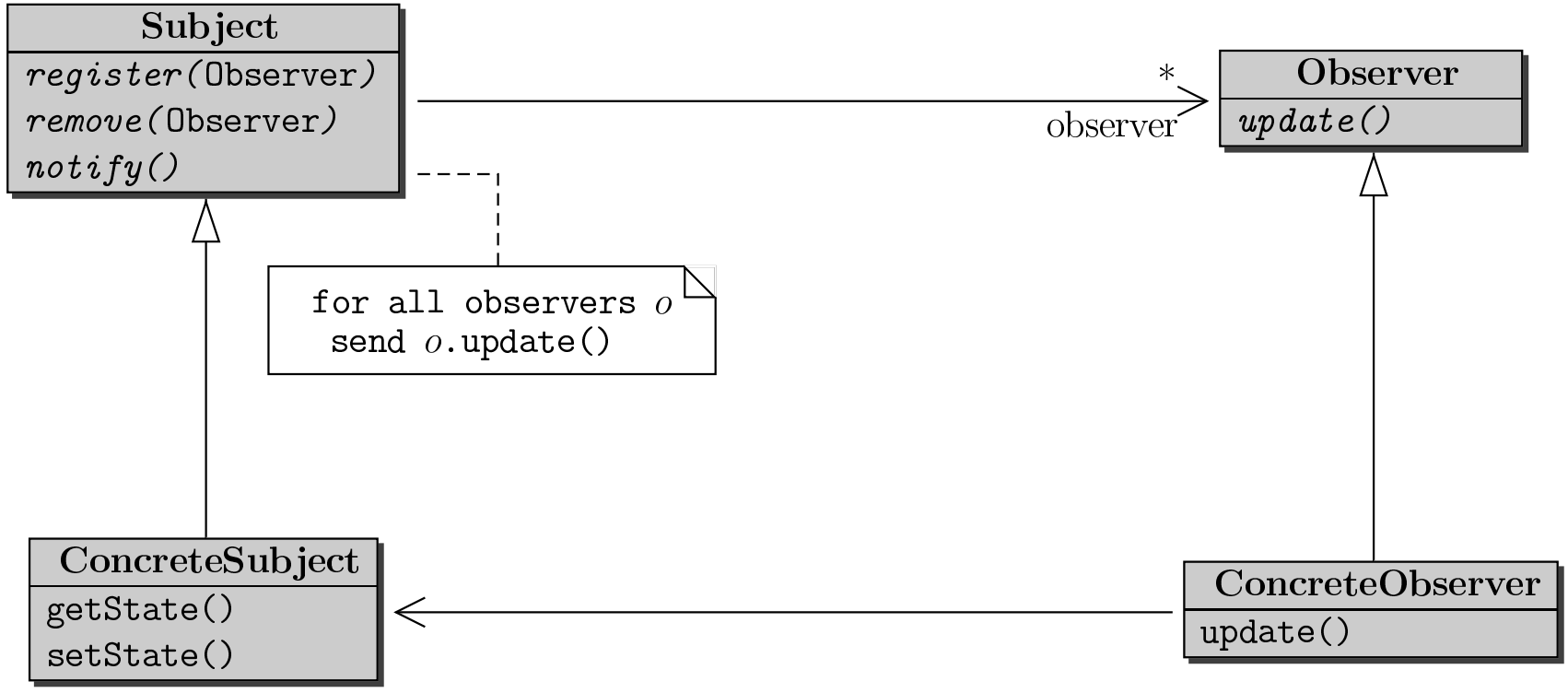

Two modes:

- **pull: the observer has to ask for the new subject state (`getState`)**

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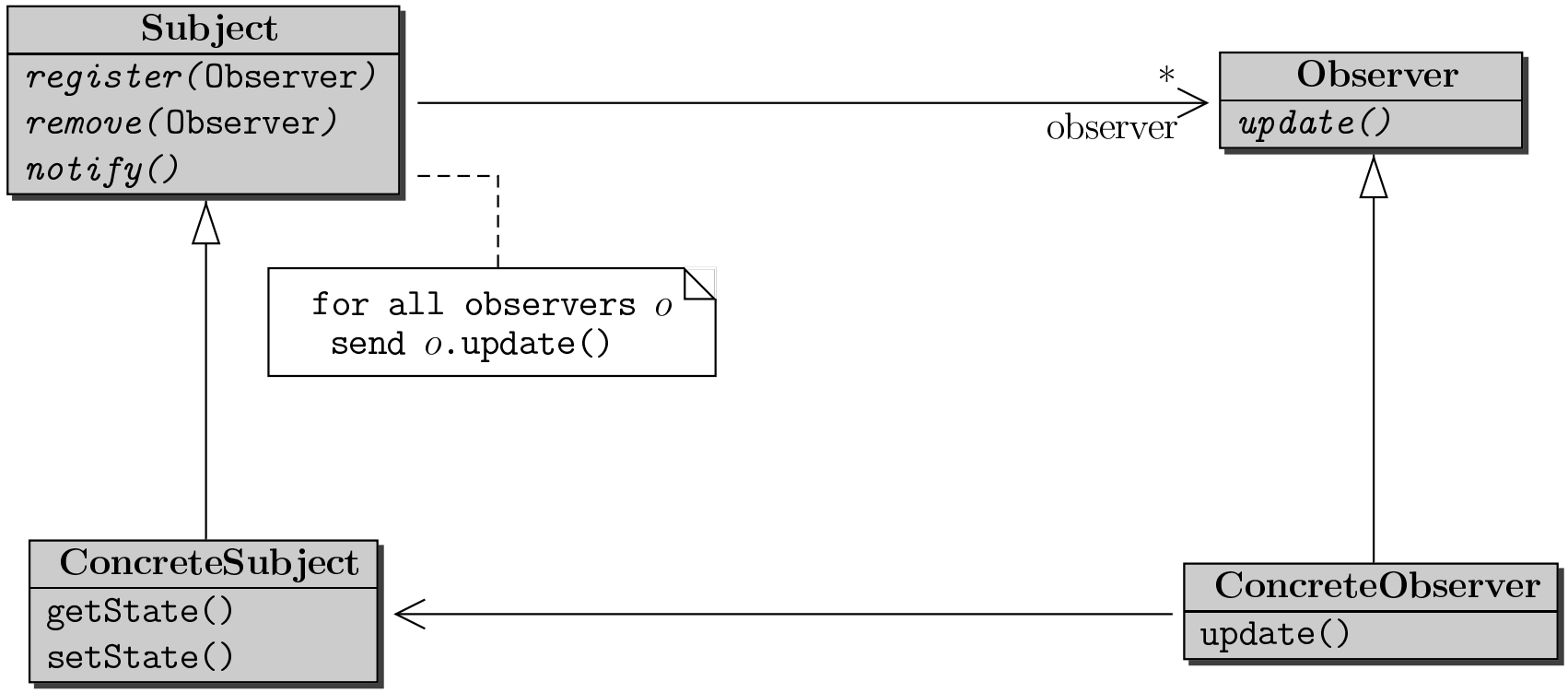
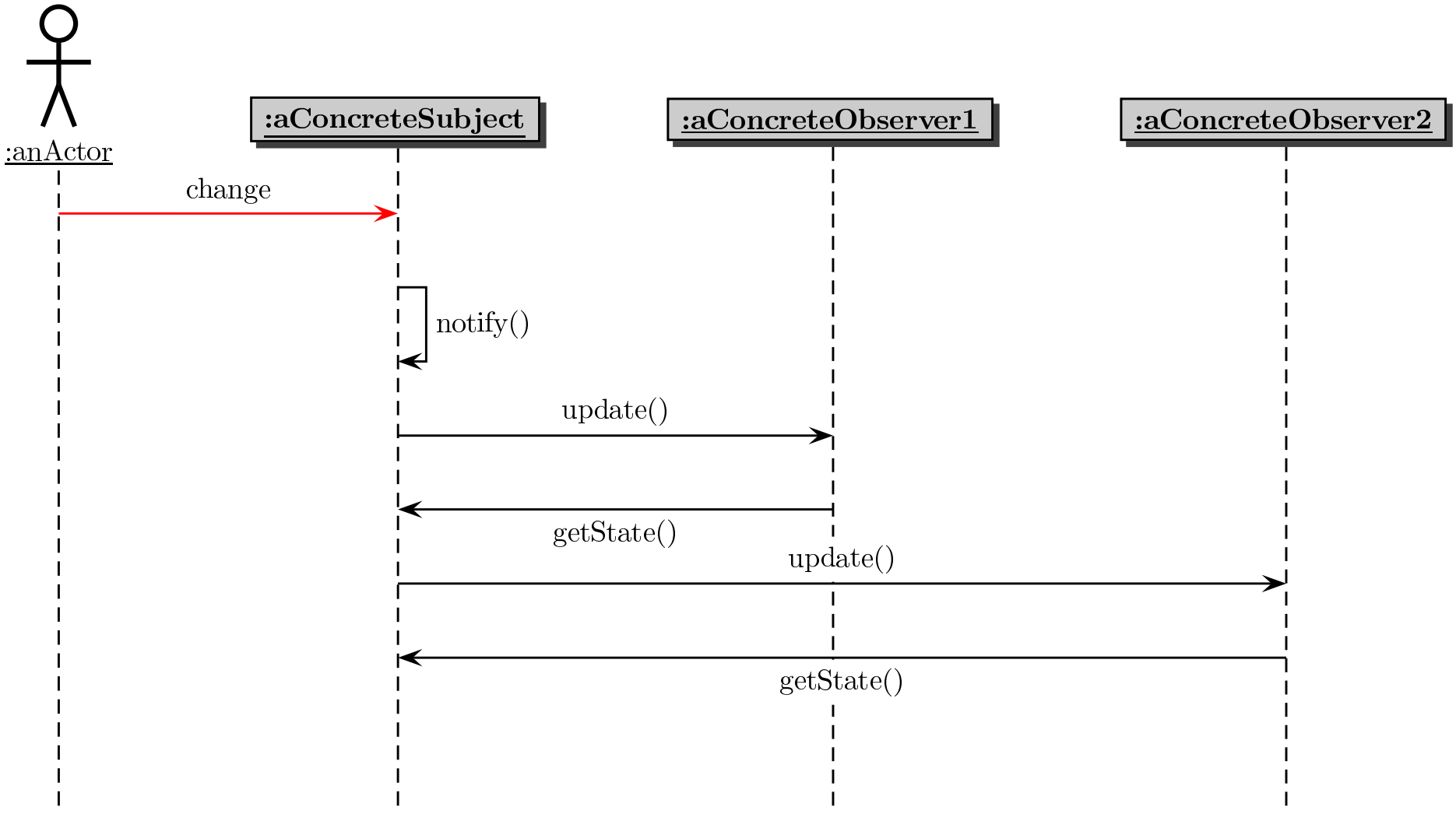


Two modes:

- **pull: the observer has to ask for the new subject state (`getState`)**
- **push: change information is handed over to the observer when notifying**

Update of views implementing an observer



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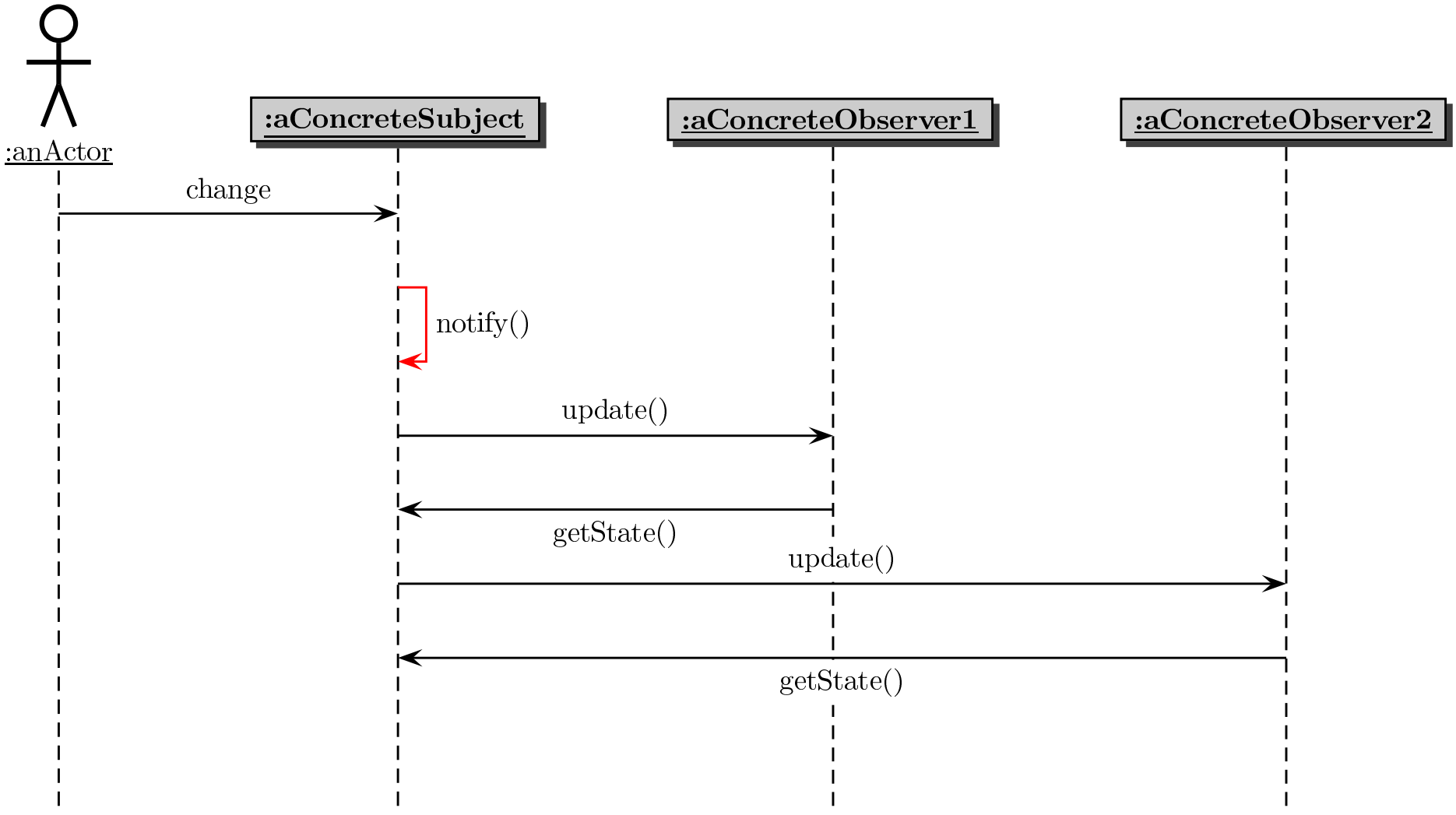

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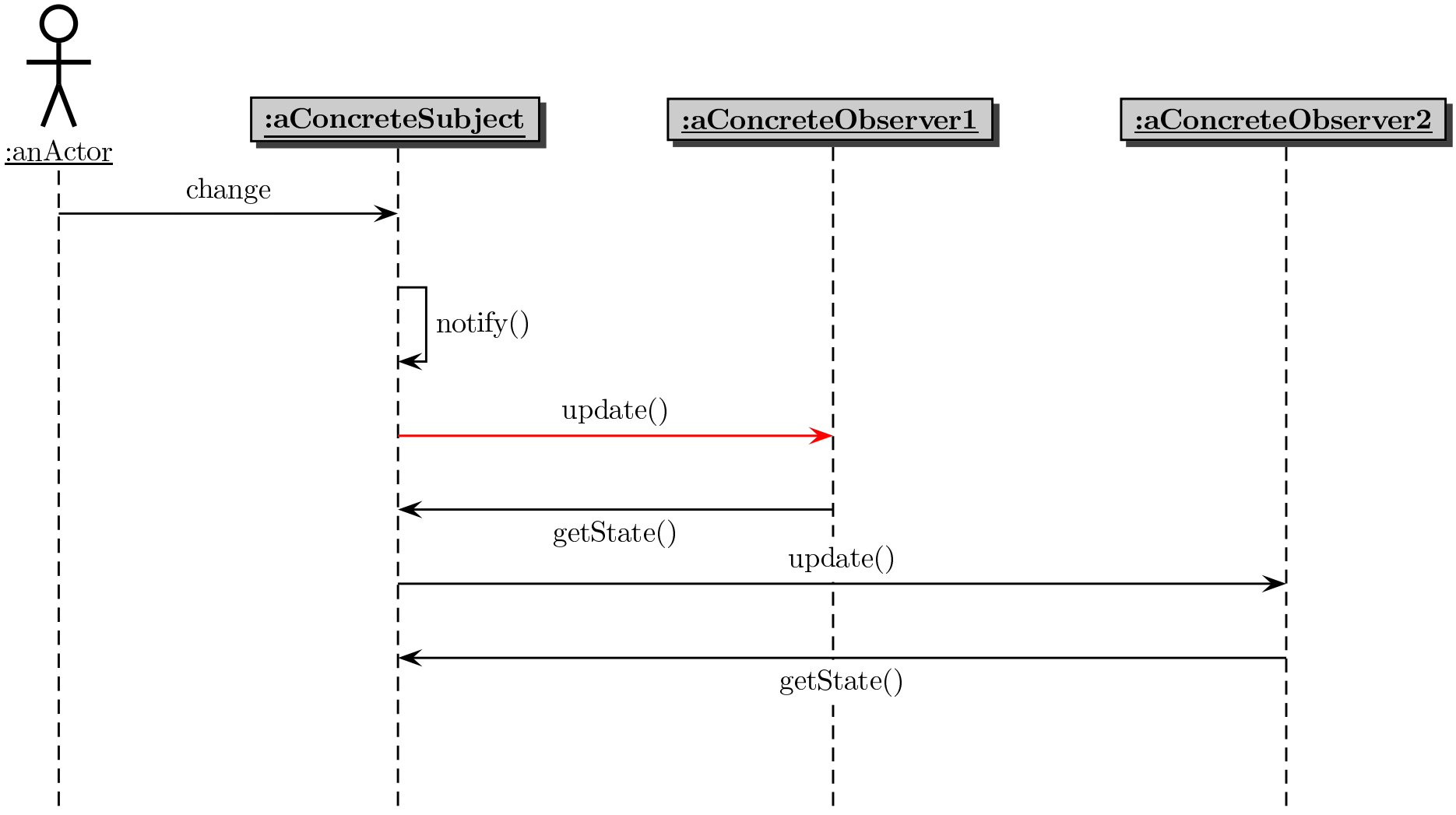

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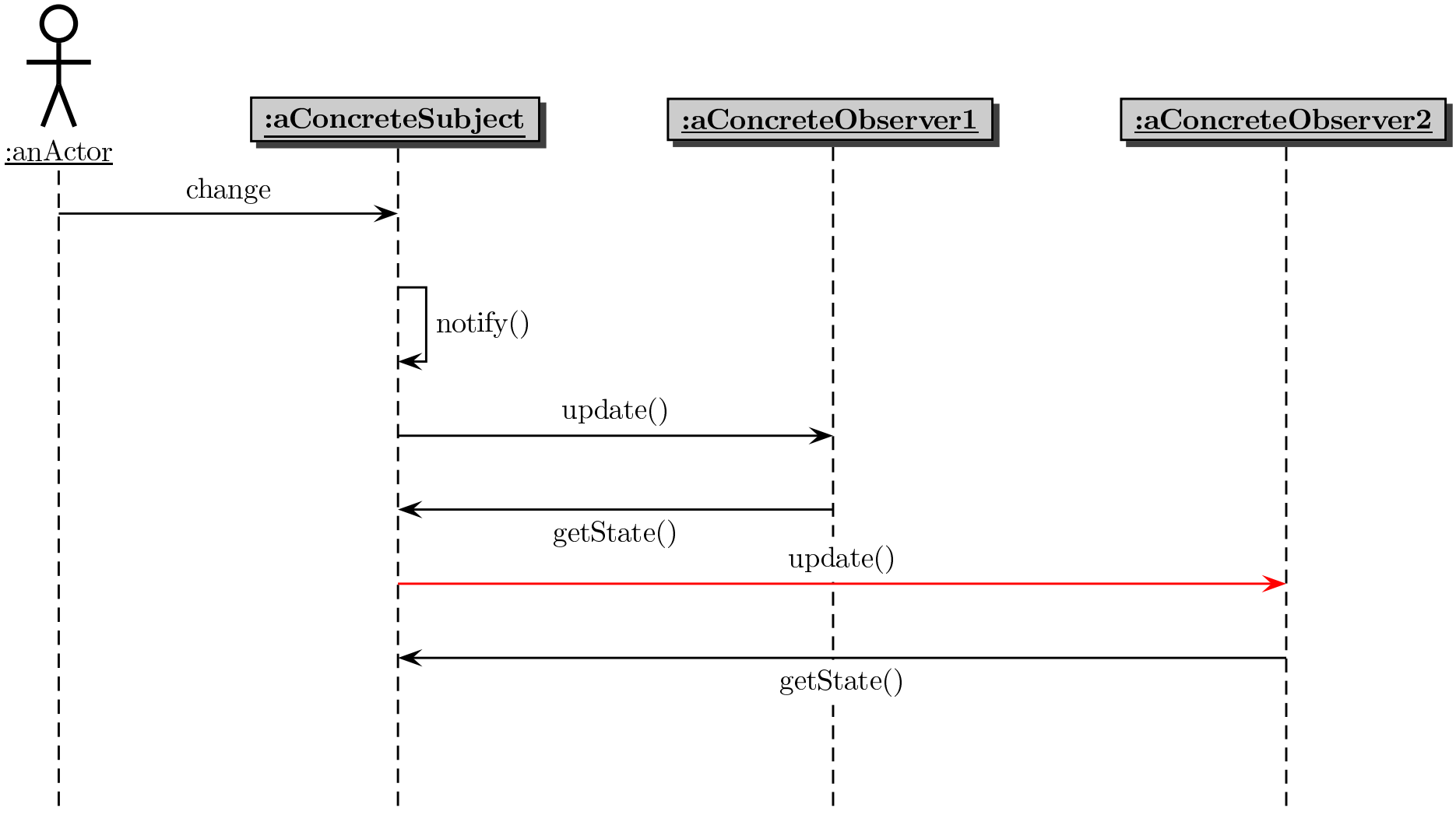
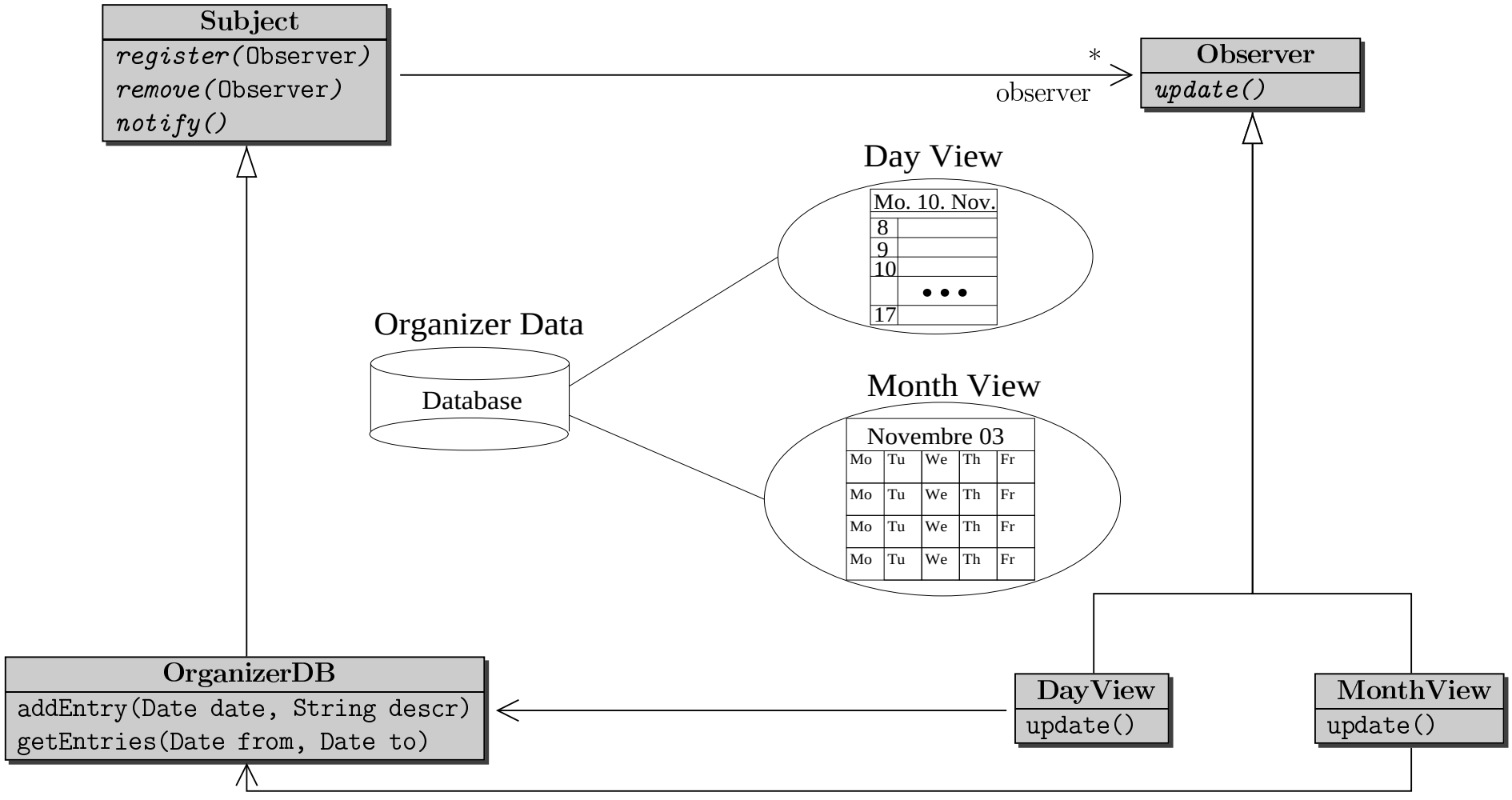
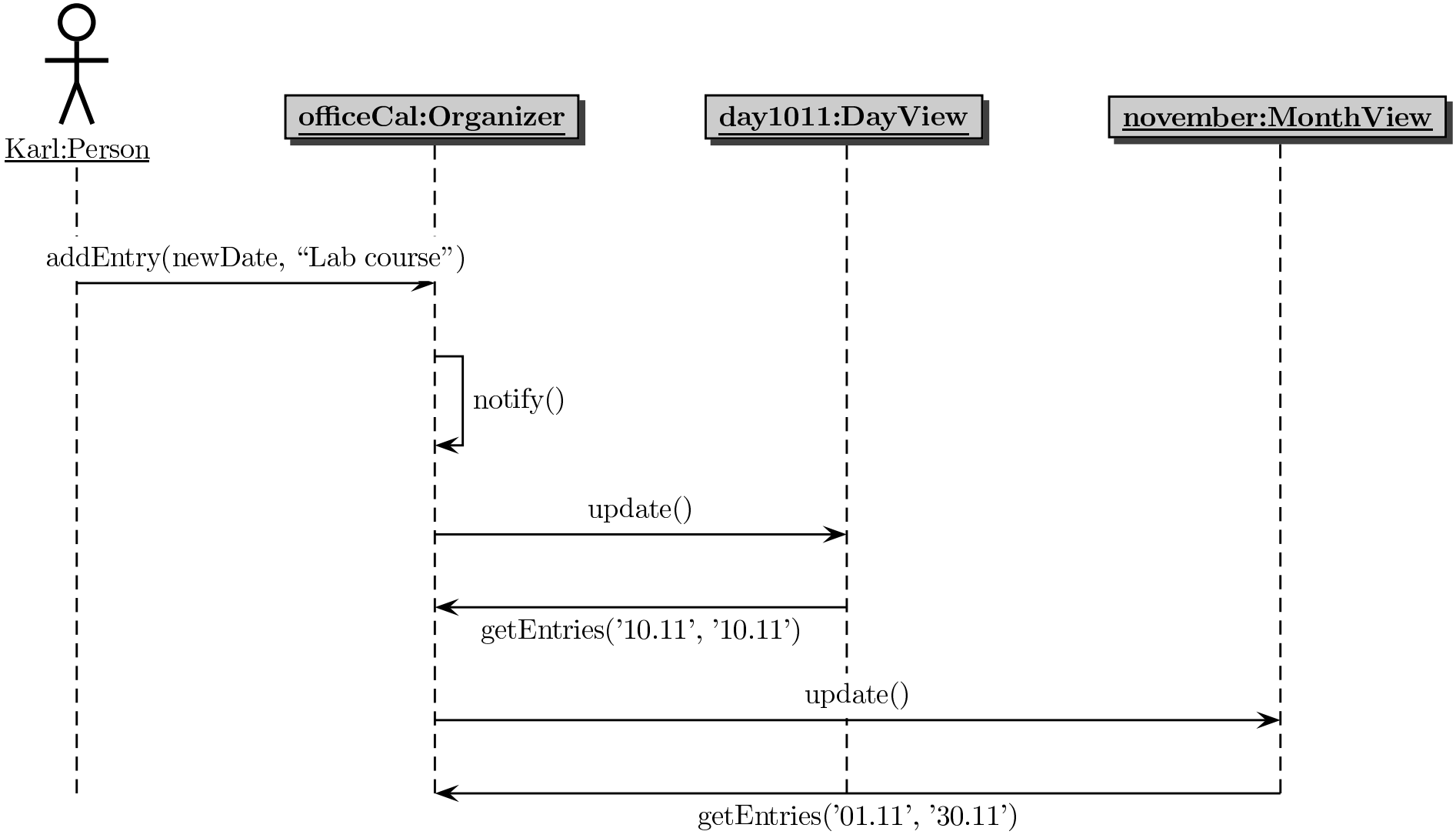


Example: Views of an organizer



Updating the organizer's views



The »Command«: Actions as objects

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The »Command«: Actions as objects

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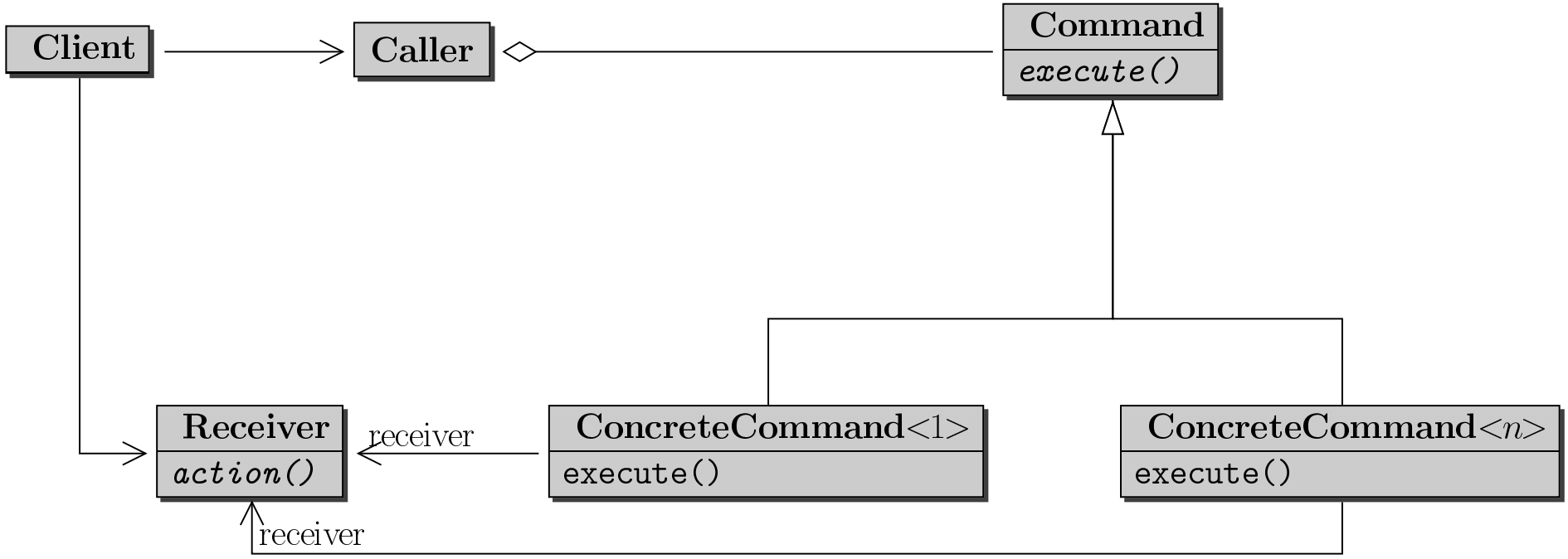
Applicability:

- parameterise clients,
- log commands,
- realise undo functionality or
- cache commands in a queue in order to execute them at a certain time in the future

The class structure of the command pattern



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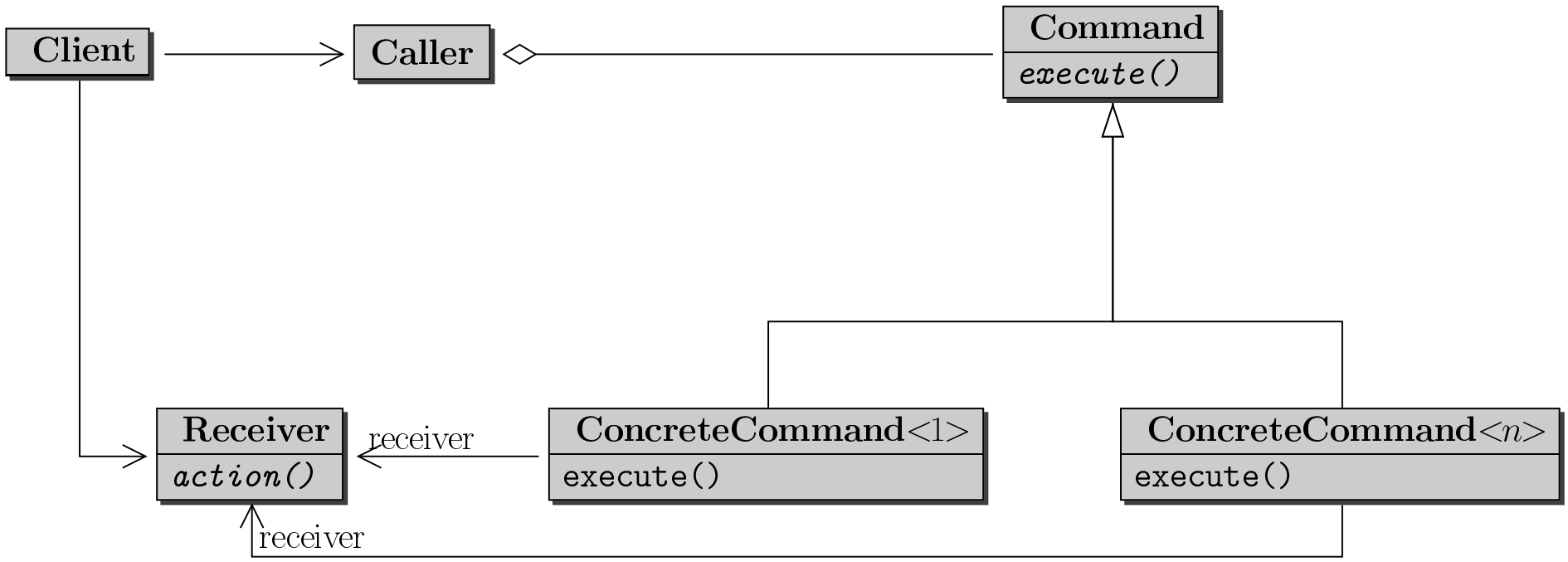

Call of `execute()` on `Command` invokes the receiver's `action()` operation.

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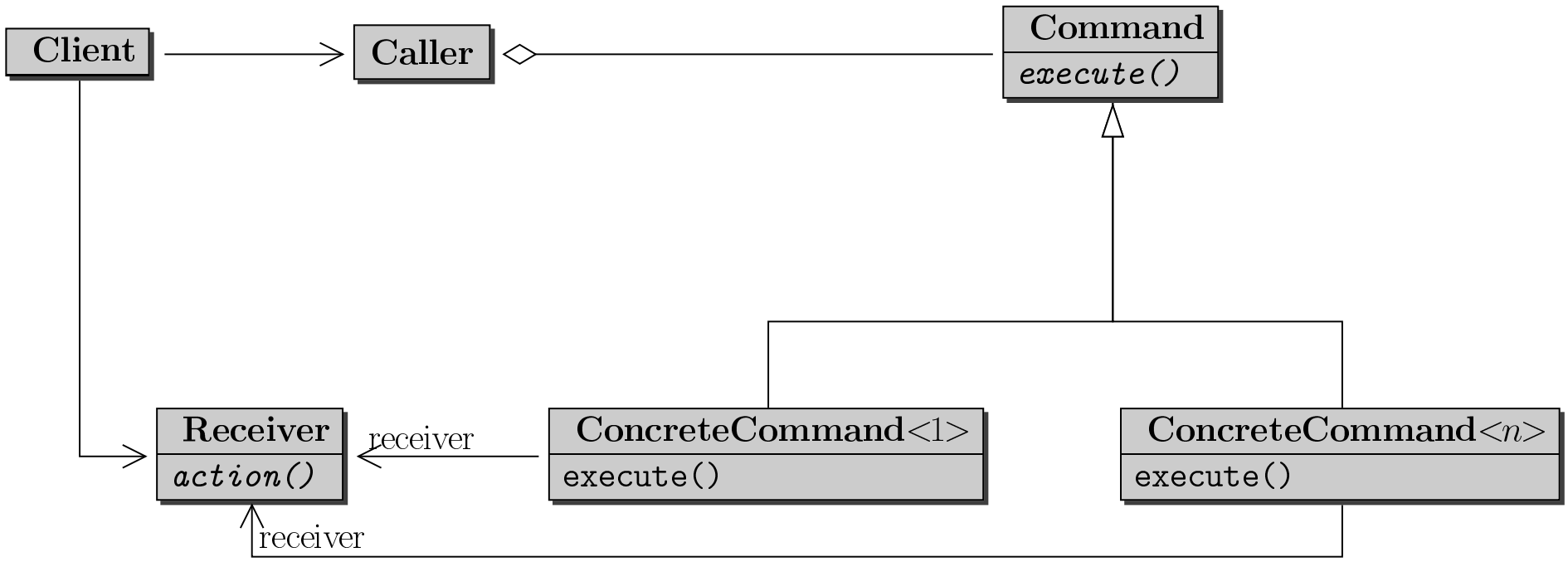

Call of `execute()` on `Command` invokes the receiver's `action()` operation.

Different `Command` subclasses may invokes different `action()` operations.

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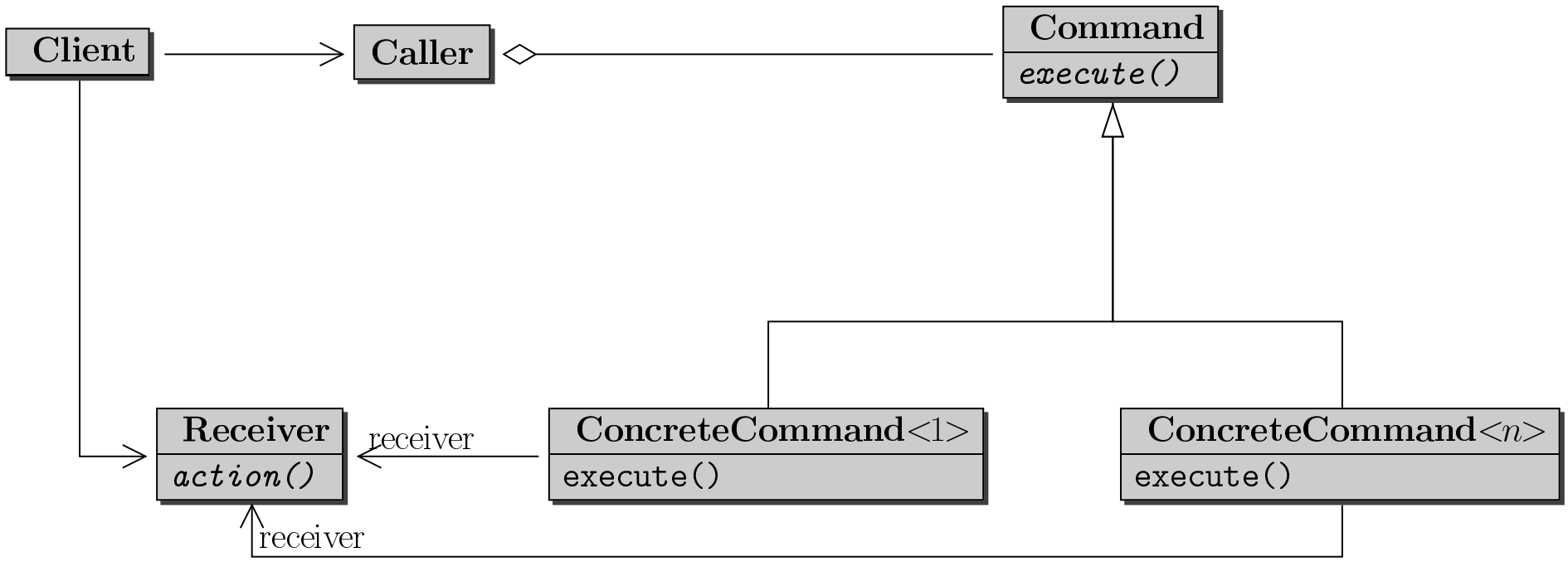


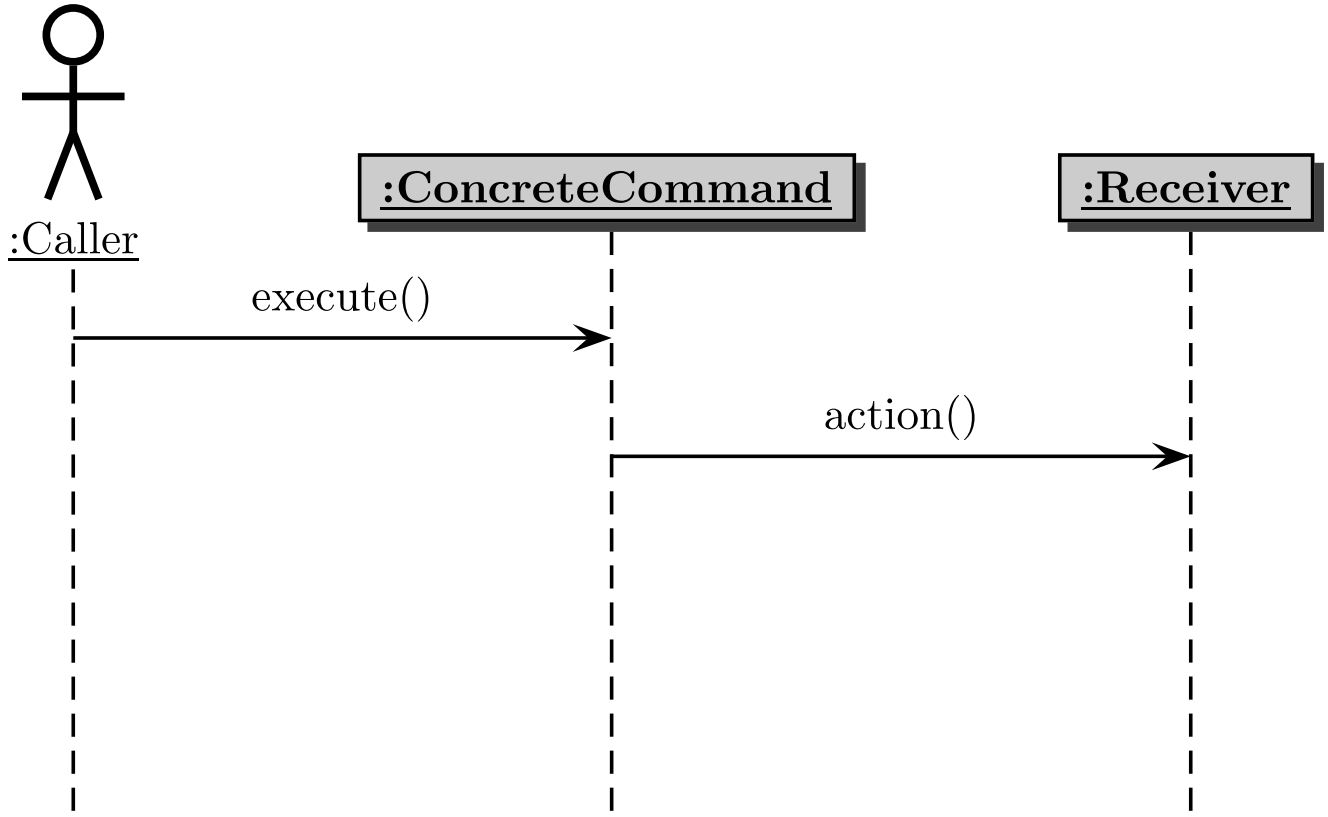
Call of `execute()` on `Command` invokes the receiver's `action()` operation.

Not necessary each `Command` subclass invokes same `action()` operation.

How could the pattern be altered to avoid encoding the receiver association as attribute?

Execution of a command

General



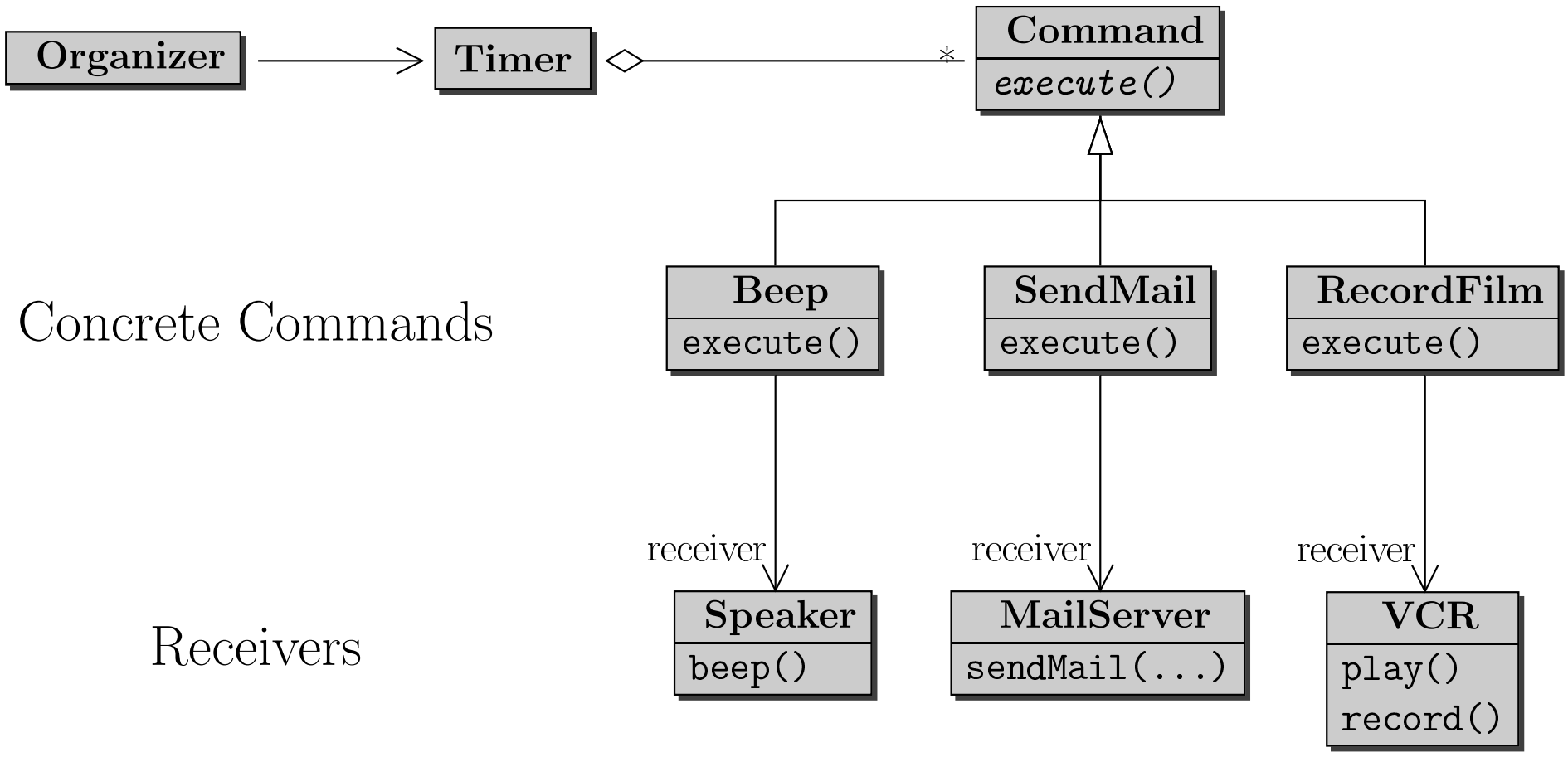
Example: Timer triggered actions

One feature of the organizer in the former examples is to execute actions, when a certain date (time) has been reached.

For example:

- **beep 5 minutes before a meeting**
- **send to all participants of a meeting an invitation e-mail a week before it is scheduled**
- **record a TV film**

Example (cont'd): Timer triggered actions



Literature

- **»Design Patterns: Elements of Reusable Object-Oriented Software«, by E. Gamma, R. Helm, R. Johnson and J. Vlissides, Addison-Wesley (1995)**

- **Lecture Notes »Softwaretechnik«, W.F. Tichy and G. Goos (WS 1998/99)**

- **Lecture Notes »Design Patterns Overview«, Rob Kremer (2002),**
  `http://sern.ucalgary.ca/courses/SENG/443/W02/patterns/index.html`

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but:

They don't make your design decisions.