

Software Design & Architecture

Design Patterns/ Builder, Prototype, Memento

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Design Patterns Categories

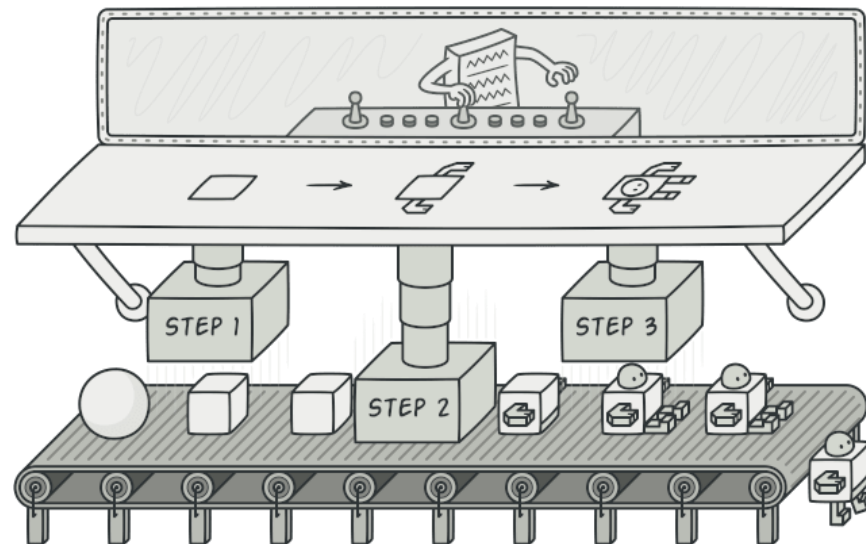
- **Creational**: concern the process of object creation
 - Singleton, Factory Method, Abstract Factory, *design patterns 1*
Builder, Prototype, Object Pool
- **Structural**: concern the process of assembling objects and classes
 - Adapter, Composite, Decorator, *design patterns 2*
Façade, Bridge, Flyweight, Proxy
- **Behavioral**: concern the interaction between classes or objects
 - Observer, Strategy, Template Method, *design patterns 3*
Iterator, State, Chain of Responsibility,
Command, Mediator, Memento *today – your pick from the remaining ones*

The background of the slide is a close-up, high-angle photograph of architectural blueprints. The blueprints are spread out on a surface, with a yellow ruler and a pencil visible. The word "FIRST" is printed in large, bold, capital letters across the top of the blueprints. Other text on the blueprints includes "FIRE SHUTTERS SEE SPEC.", "UPPER", "SLOPE", "DRAIN", "FLOOR DRAIN", and "DOTTED LINES INDICATED". The overall scene is in a cool, blue-toned color palette.

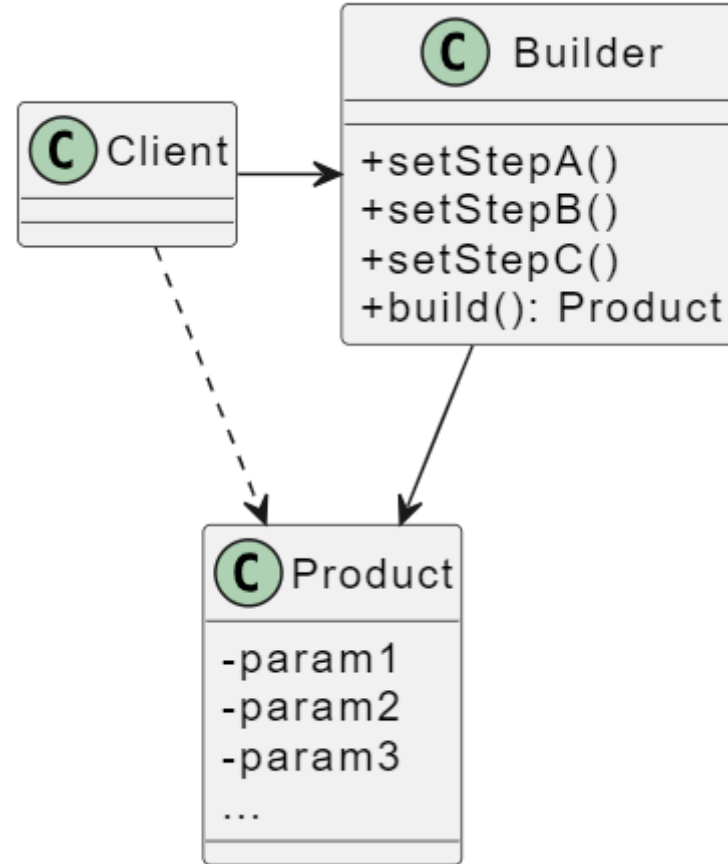
Builder

Builder: Motivation and Intent

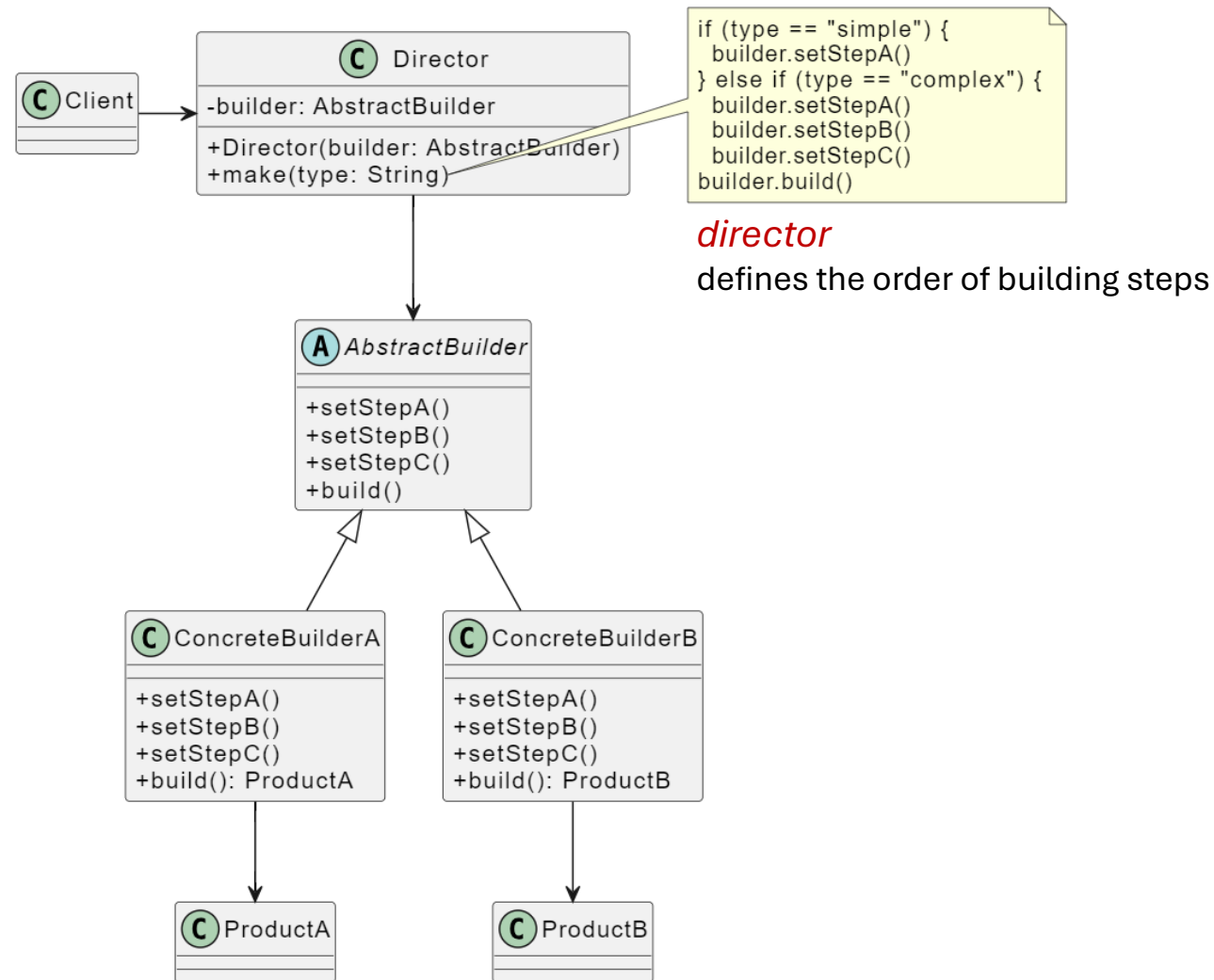
- **Motivation:**
 - constructing objects with many parameters or optional components
 - using constructors becomes ugly:
multiple overloading constructors (especially for programming languages like Java);
hard to validate during construction
- **Intent:** design a helper class (Builder) to construct objects step-by-step



Builder: Solution



Builder: Solution (More Complex Ver.)



The image shows a close-up of architectural blueprints on a light blue background. A large, semi-transparent blue rectangle is overlaid on the center of the page. Inside this rectangle, the word "Prototype" is written in a clean, white, sans-serif font. The blueprints in the background contain various technical drawings, including lines, dimensions, and text. The word "FIRST" is printed in large, bold, capital letters across the top of the blueprints. Other visible text includes "UPPER", "FLOOR DRAIN", and "SLOPE". There are also some smaller annotations and symbols scattered throughout the drawings. A white rectangular object, possibly a piece of paper or a tool, is partially visible in the bottom left corner of the blueprints.

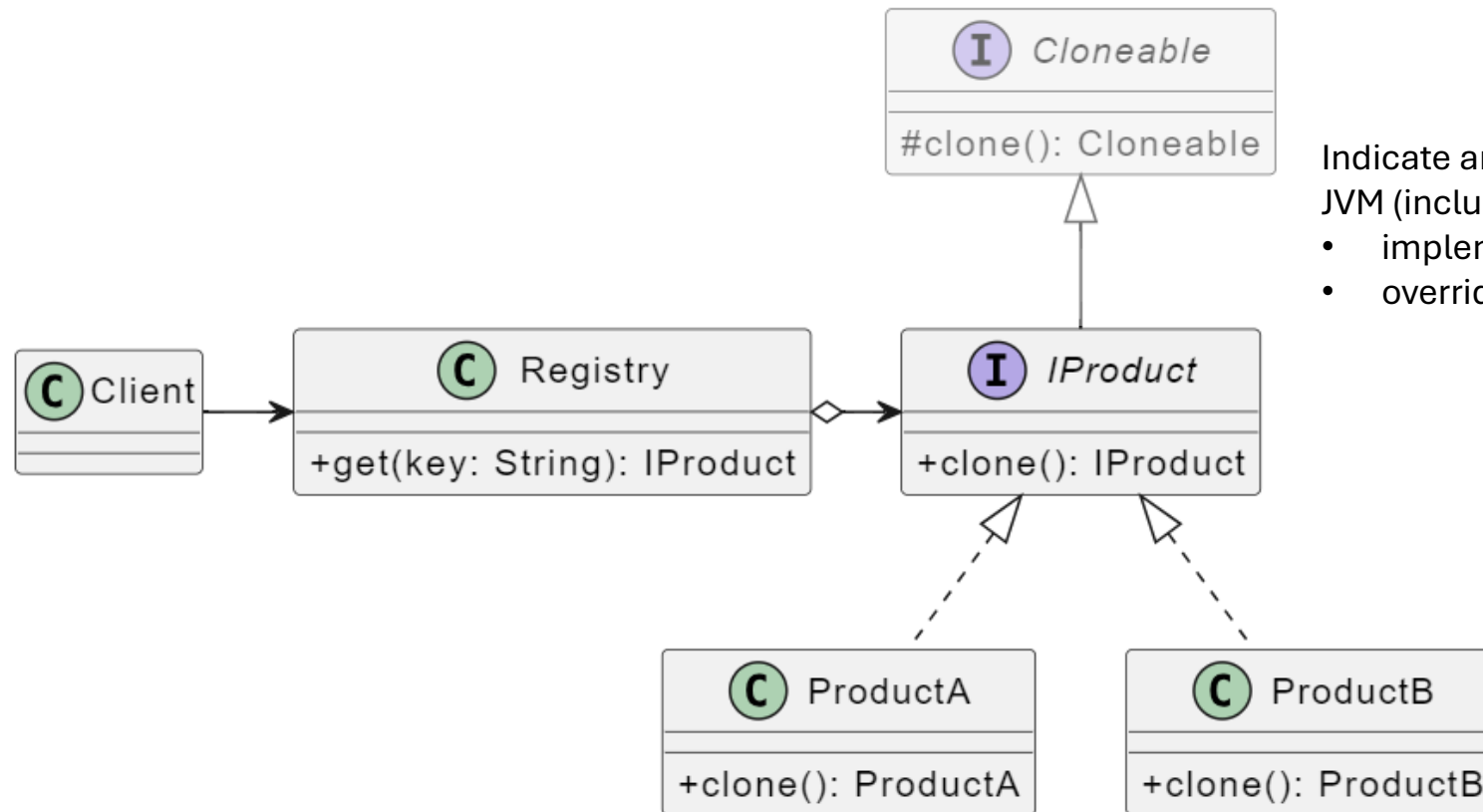
Prototype

Prototype: Motivation and Intent

- **Motivation:**
 - constructing objects that are complex or resource-intensive
 - the client needs a copy of an existing object
- **Intent:** provide a registry to access (common) existing objects and an interface to clone them



Prototype: Solution



Indicate an object of a class can be cloned in JVM (including Kotlin and Java)

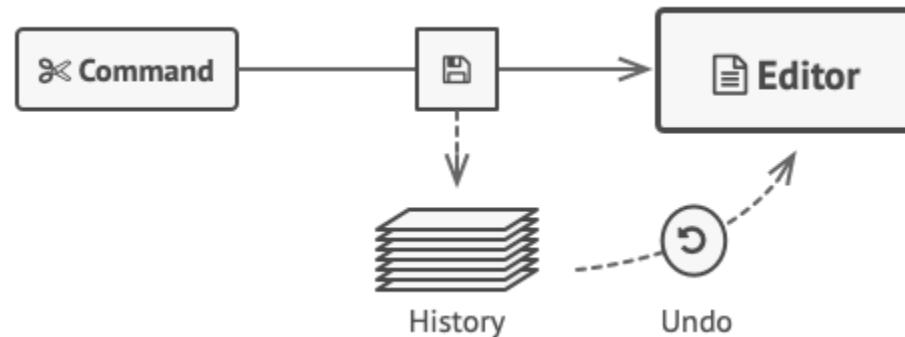
- implement/extend the Cloneable interface
- override the clone() method to a public one

The background of the slide is a close-up, slightly blurred image of architectural blueprints. A yellow ruler is visible in the top left corner, and a pencil lies diagonally across the bottom right. The blueprints contain various technical drawings, lines, and text. The word "FIRST" is printed in large, bold, capital letters across the upper middle section. Other visible text includes "FIRE SHUTTERS SEE SPEC.", "UPPER", "SLOPE", "DRAIN", "FLOOR DRAIN", and "DOTTED LINES". Dimensions such as "3'-10\"", "4'-6\"", "7'-6\"", and "3'-8\"" are also present. A blue rectangular box is overlaid on the center of the image, containing the main title in white text.

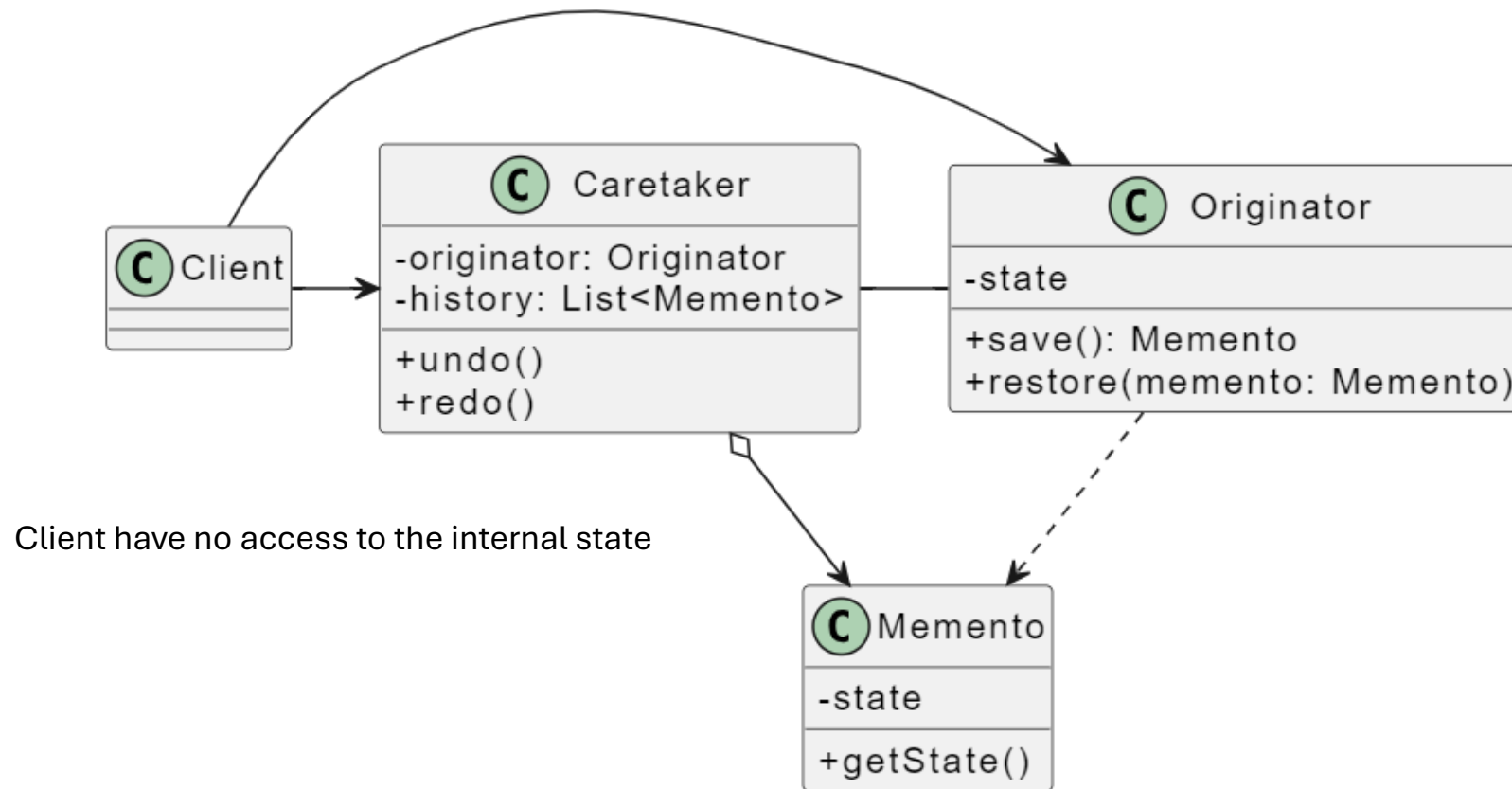
Memento (aka Snapshot)

Memento: Motivation and Intent

- **Motivation:** we want to capture snapshots of an object's state, and be able to restore previous snapshots
- **Intent:**
 - capture an object's internal state without violating encapsulation
 - allow tracking the evolution of an object's state



Memento: Solution



Agenda (recap)

- More design patterns
 - Builder
 - Prototype
 - Memento
- Review P5: Iteration 3 Demo requirements