

# Design Patterns Not Just for Architects

**Jeremy Clark**  
**Developer Betterer**  
**[jeremybytes.com](https://jeremybytes.com)**

**Level: Introductory / Intermediate**



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# What Are Design Patterns?

“Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to the problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice.”

-- Christopher Alexander

# The Gang Of Four (GoF)

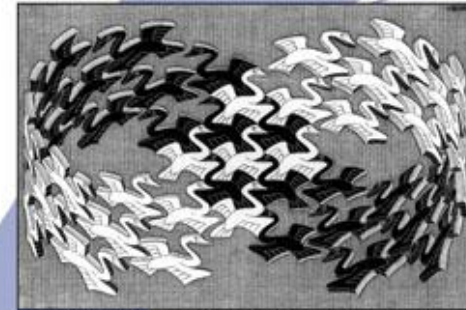
Design Patterns:  
Elements of Reusable  
Object-Oriented Software

- Erich Gamma
- Richard Helm
- Ralph Johnson
- John Vlissides

## Design Patterns

Elements of Reusable  
Object-Oriented Software

Erich Gamma  
Richard Helm  
Ralph Johnson  
John Vlissides



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Foreword by Grady Booch





# Anatomy Of A Design Pattern

- Pattern Name
  - A unique way of referring to the pattern
- Problem
  - The problem that occurs “over and over again”
- Solution
  - The “core” of the solution
- Consequences
  - The drawbacks or considerations when using the pattern

## Creational Patterns

Abstract Factory  
Builder  
Factory Method  
Prototype  
Singleton

## Structural Patterns

Adapter  
Bridge  
Composite

Decorator  
Facade  
Flyweight  
Proxy

Chain of Responsibility  
Command  
Interpreter  
Iterator

## Behavioral Patterns

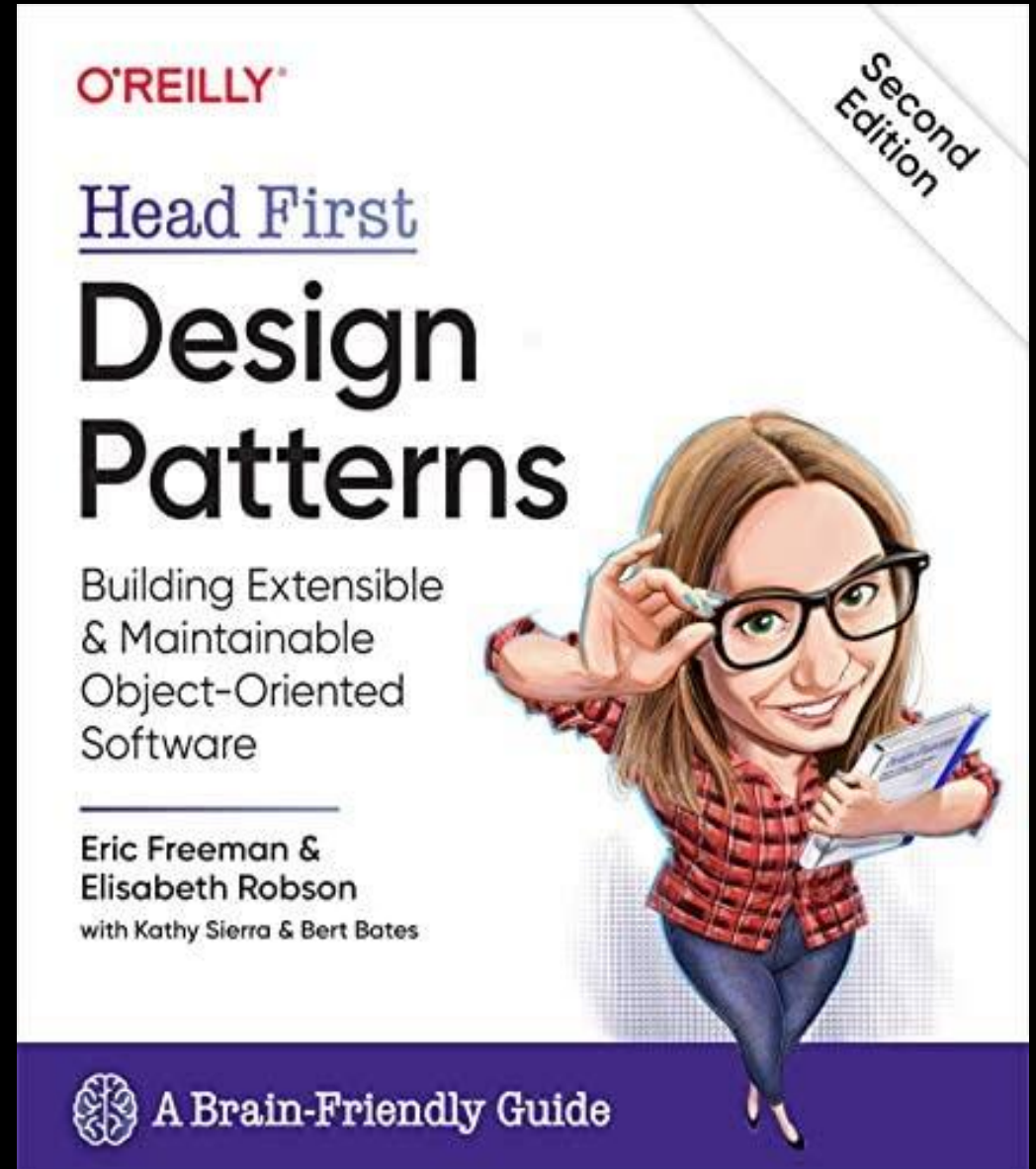
Mediator  
Memento  
Observer  
State  
Strategy  
Template Method  
Visitor

# The GoF Patterns

# A More Approachable Reference

- Head First Design Patterns (Second Edition)
  - Eric Freeman
  - Elisabeth Robson

Covers 12 GoF Patterns





# Why Should We Care?

- Well described solutions
- Shared vocabulary
- Concise language
- Think in design rather than implementation
- Encourage other developers to learn patterns



# Observer

## GoF Description:

“Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically.”

# Real World Observer

- Podcasts

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**Windows Weekly (Audio) • WW 891: Scent of Carbon - CrowdStrike Outage, Windows 23H2, Halo Series**

CrowdStrike: Terrible name, terrible outage CrowdStrike, a company no one has ever heard of, ships an update that borks Windows PCs, servers, and clouds services at the heart of the world's infrastructure. Naturally, everyone blamed Microsoft at first Microsoft says outage impacted under 1 percent of PCs. It was

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# Observer Consequences

- We don't know how many times we will be notified. It could be 1 or it could be 100,000.
- We don't know how frequently we will be notified. It could be once per day or 100 times per ms.
- We don't know if we will be notified at all.



# Iterator

GoF Description:

“Provide a way to access the elements of an aggregate object sequentially without exposing its underlying representation.”

# Real World Iterator

- TV Remote





# Iterator Consequences

- Adding or removing items during iteration can invalidate the iterator.
- Multiple iterators can work on a single object.



# Facade

## GoF Description:

“Provide a unified interface to a set of interfaces in a subsystem. Facade defines a higher-level interface that makes the subsystem easier to use.”

# Real World Facade



- Play Blu-ray
  - Turn on TV
  - Set TV to Blu-ray player
  - Turn on sound bar
  - Set sound bar to digital in
  - Turn on Blu-ray player
  - “Play” on Blu-ray player





# Facade Consequences

- If functionality is added to the sub-system, we may need to change the facade as well.
- Not all functionality of the sub-system may be available. The available functions in the facade are probably limited.



# Chain Of Responsibility

## GoF Description:

“Avoid coupling the sender of a request to its receiver by giving more than one object a chance to handle the request. Chain the receiving objects and pass the request along the chain until an object handles it.”

# Real World Chain Of Responsibility

- Tech Support





# Chain of Responsibility Consequences

- If none of the receivers handle the message, then the message will fall off the end of the chain.



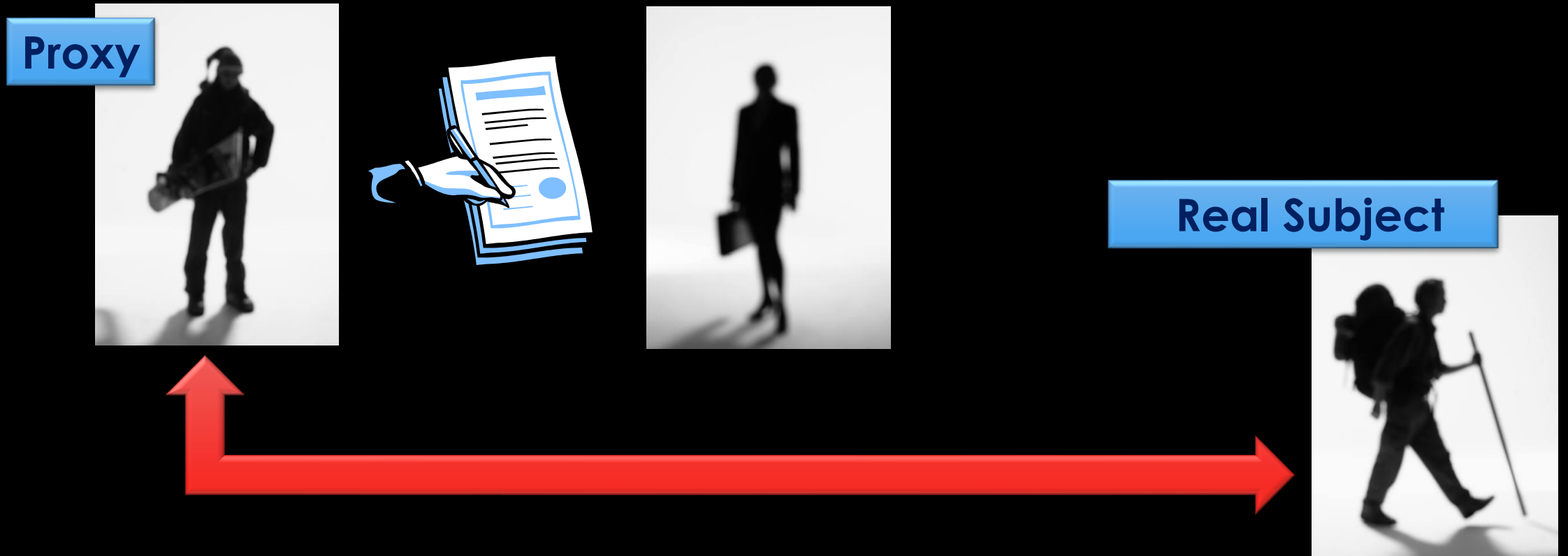
# Proxy

GoF Description:

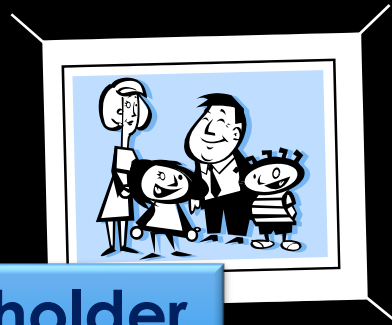
“Provide a surrogate or placeholder for another object to control access to it.”

# Real World Proxy

- Power of Attorney



# Interesting History



Placeholder



Original



# Proxy Consequences

- A remote proxy can hide the fact that the object resides in a different process or across a network.
- The proxy must be kept synchronized with the real object.





# A Million Implementations

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-- Christopher Alexander

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Thank You!

Jeremy Clark

- `jeremybytes.com`
- `jeremy@jeremybytes.com`
- `@jeremybytes`

<https://github.com/jeremybytes/vslive2024-orlando>