



Modul- Fortgeschrittene Programmierkonzepte

Bachelor Informatik

09- design Pattern, pt. 3

Prof. Dr. Marcel Tilly

Fakultät für Informatik, Cloud Computing

Proxy

 dp-proxy  dp-proxy



Variants

Remote proxy (aka. *Ambassador*): Provides local proxy to remote object (different process or physical location)

Virtual proxy: Creates expensive objects on demand; not to be confused with singleton (unique instance)

Protection Proxy: controls access to the original object, e.g. read-only access that simulates write.



Proxy

Examples

Caching for network requests.

Log output routing.

Lazy initialization of expensive objects.

Related: security facade; behaves like proxy, but hides error handling or authentication.



Proxy, Decorator and Composite

Decorator

Adds functionality without subclassing: one enclosed instance plus extra logic.

Composite

Models a recursive structure, such as user interface widgets: arbitrary number of enclosed instances, logic typically restricted to traversing the structure or specific to leaf classe.

Proxy

Mimics the original object (!) while adding access control or caching.



Adapter


Class Adapter

 dp-adapter



Adapter

Object Adapter

 dp-adapter

Best choice if implementation of Adaptee unknown.

Flyweight



Example HTML to render:

```
<ul>
  <li></li>
  <li></li>
  <li></li>
  <li></li>
</ul>
```


Flyweight



A different example:

```
<ul>
  <li></li>
  <li></li>
  <li></li>
  <li></li>
</ul>
```



Flyweight

 do-flyweight

Intrinsic state becomes the *flyweight*.

Extrinsic state managed by client; extrinsic state injected.



Flyweight

Recipe

1. Do you create a lot of objects?
2. Identify what's *intrinsic* and *extrinsic* to your class.
3. Move intrinsic parts to *flyweight*, create factory.
4. Reduce original class to extrinsic parts

Notes

- The term *flyweight* is misleading: it is *light* in a sense of *less and static parts*, but often contains the "heavy" objects.
- Often there is no `operation()`, but just a reference to a shared object.
- The flyweight is often used in combination with the composite pattern (hence `operation()`)



Flyweight

Examples

Glyph (letter) rendering for text fields; intrinsic state: true-type fonts (often several MB), extrinsic state: position on screen, scale (size).

Browser rendering the same media multiple times; intrinsic state: actual media (image, video, audio), extrinsic state: location on screen

Android `RecyclerView`; intrinsic state: inflated layout of `RecyclerView`, extrinsic state: actual contents to be displayed (often nested with further Flyweight).

Video games rendering/tiling engines; intrinsic state: actual texture or tile, extrinsic state: 3D location and orientation



Summary of Design Patterns

There is a total of 23 design patterns described by Gamma *et al.*

Creational Patterns

- Factory and factory method
- Singleton



Summary of Design Patterns

Structural Patterns

- Adapter
- Composite
- Decorator
- Flyweight
- Proxy



Summary of Design Patterns

Behavioral Patterns

- Command
- Iterator
- Observer
- State
- Strategy
- Template method