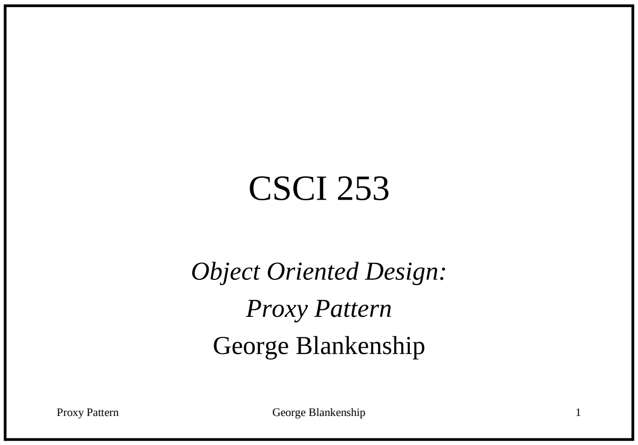
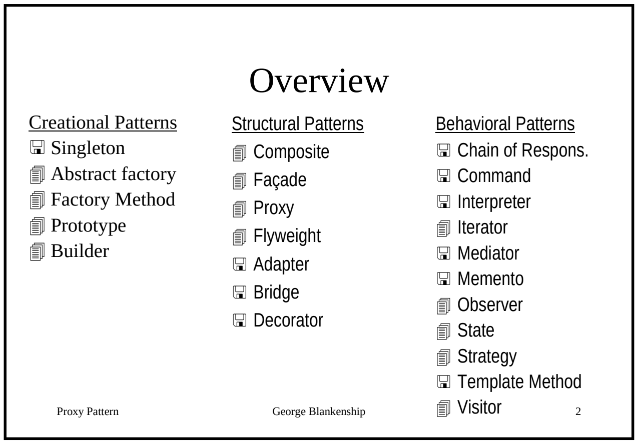


CSCI 253

Object Oriented Design:

Proxy Pattern

George Blankenship



Overview

Creational Patterns

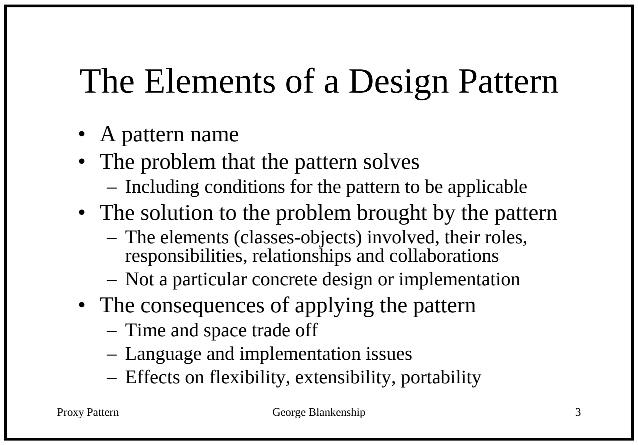
- 🖫 Singleton
- 🗐 Abstract factory
- 🗐 Factory Method
- 🗐 Prototype
- 🗐 Builder

Structural Patterns

- 🗐 Composite
- 🗐 Façade
- 🗐 Proxy
- 🗐 Flyweight
- 🖫 Adapter
- 🖫 Bridge
- 🖫 Decorator

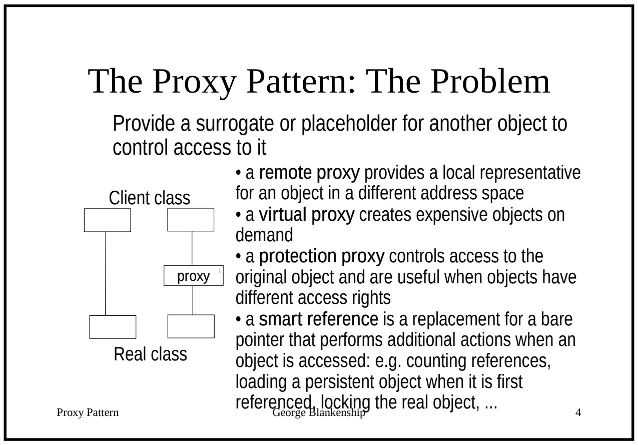
Behavioral Patterns

- 🖫 Chain of Respons.
- 🖫 Command
- 🖫 Interpreter
- 🗐 Iterator
- 🖫 Mediator
- 🖫 Memento
- 🗐 Observer
- 🗐 State
- 🗐 Strategy
- 🖫 Template Method
- 🗐 Visitor



The Elements of a Design Pattern

- A pattern name
- The problem that the pattern solves
  - Including conditions for the pattern to be applicable
- The solution to the problem brought by the pattern
  - The elements (classes-objects) involved, their roles, responsibilities, relationships and collaborations
  - Not a particular concrete design or implementation
- The consequences of applying the pattern
  - Time and space trade off
  - Language and implementation issues
  - Effects on flexibility, extensibility, portability

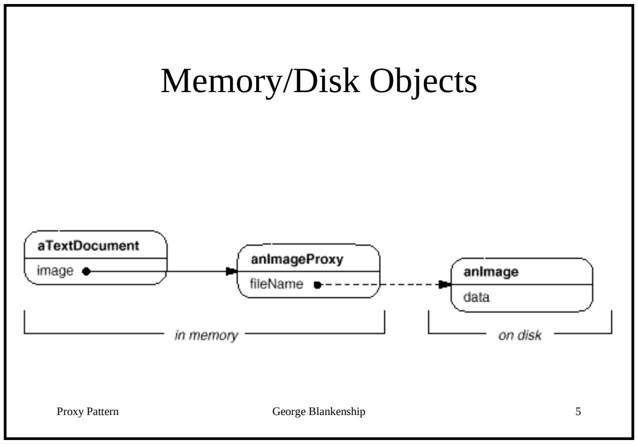


The Proxy Pattern: The Problem

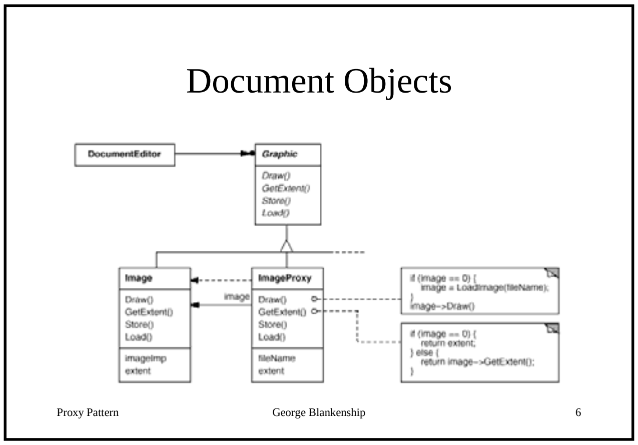
Provide a surrogate or placeholder for another object to control access to it

Client class
proxy
Real class

- a remote proxy provides a local representative for an object in a different address space
- a virtual proxy creates expensive objects on demand
- a protection proxy controls access to the original object and are useful when objects have different access rights
- a smart reference is a replacement for a bare pointer that performs additional actions when an object is accessed: e.g. counting references, loading a persistent object when it is first referenced, locking the real object, ...



Memory/Disk Objects

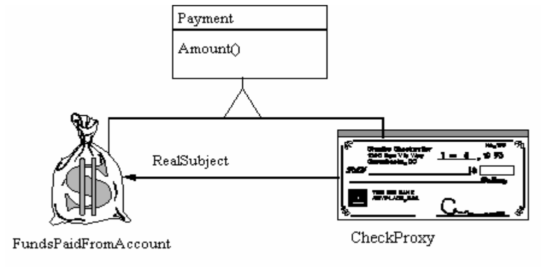


Document Objects

```
if (image == 0) {
    image = LoadImage(fileName);
}
image->Draw()
```

```
if (image == 0) {
    return extent;
} else {
    return image->GetExtent();
}
```

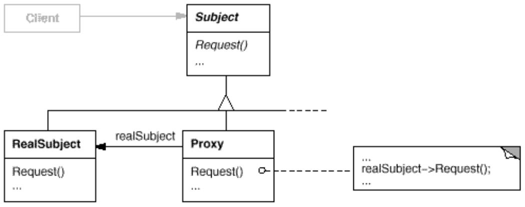
Financial Proxy



The Proxy Pattern Participants

- Maintains a reference that lets the proxy access the real subject
- Provides an interface identical to the Subject’s so that a proxy can be substituted for the real subject
- Controls access to the real subject and may be responsible for creating and deleting it
- Remote proxies are responsible for encoding a request and its arguments and for sending the request to the real subject in the other address space
- Virtual proxies may cache information about the real subject so that they can postpone accessing it
- Protection proxies check that the caller has the access permission to perform a request

Participant Map



The Proxy Pattern Participants and Collaboration

- Subject:
  - Defines a common interface for Realsubject and Proxy so that a Proxy can be used anywhere a Realsubject is expected
- Realsubject
  - Defines the real object that the proxy represents
- Proxy forwards the request to Realsubject when appropriate (depends on the type of proxy)

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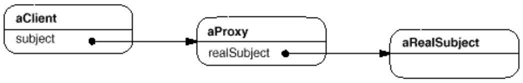
Proxy and Real



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The Proxy Pattern Consequences

- + The Proxy pattern introduces a level of indirection when accessing an object. This indirection has many uses:
  - A remote proxy can hide the fact that the object resides in a different address space
  - A virtual proxy can perform optimisations
  - Both protection proxies and smart pointers allow additional housekeeping
- + The proxy patterns can be used to implement “copy-on-write”: to avoid unnecessary copying of large objects the real subject is referenced counted; each copy requests increments this counter but only when a clients requests an operation that modifies the subject the proxy actually copies it

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