Lecture 14: Proxy Pattern
IN710: Object-Oriented Systems Development
Semester One, 2020

Kaiako: Grayson Orr

Te Kura Matatini ki Otago, Ōtepoti, Aotearoa

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Lecture 13: Template Pattern Recap

- Design pattern 09: template pattern
  - Definition
  - Problem/solution
  - Real world analogy
  - UML & implementation
  - Pros & cons

Lecture 14: Proxy Pattern Topics

- Design pattern 10: proxy pattern
  - Definition
  - Problem/solution
  - UML & implementation
  - Pros & cons

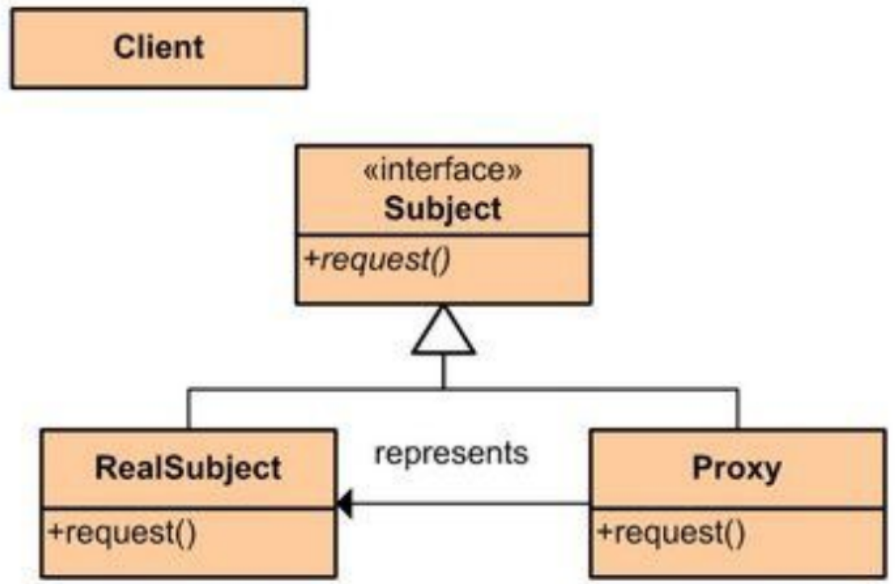
Proxy Pattern: GoF

- GoF definition & UML

Proxy

Type: Structural

What it is:
Provide a surrogate or placeholder for another object to control access to it.



Proxy Pattern: Definition

- Structural pattern
- A class functioning as an interface
- The proxy could interface with anything, for example, a network connection
- A wrapper called by the client to access serving objects behind the scenes

Proxy Pattern: Problem

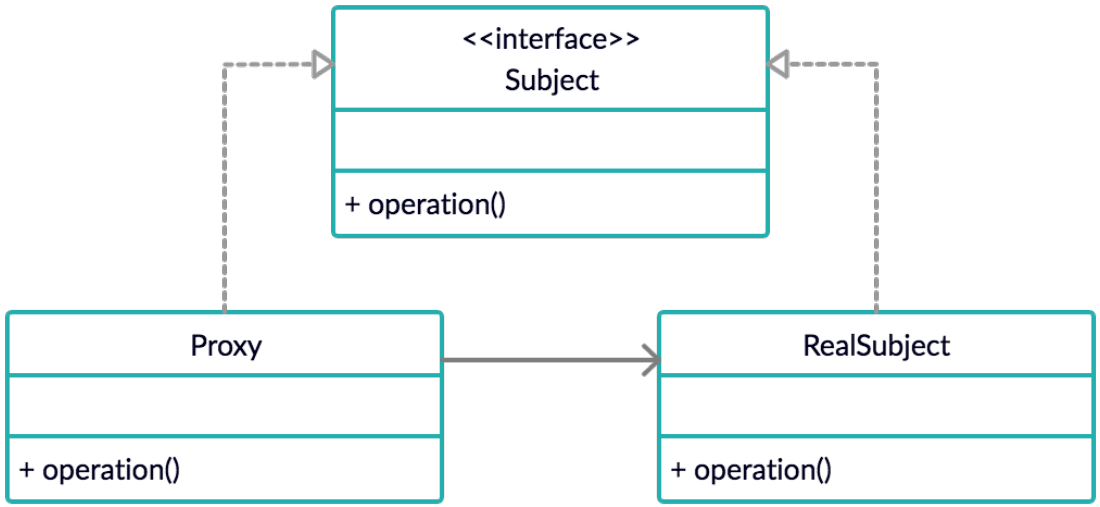
- An object that consumes a large amount of system resources
- Lazy initialisation

Proxy Pattern: Solution

- Create a new proxy class with the same interface as the service object
- Pass the proxy object to all of the client's objects
- Proxy creates a service object and delegates the work to it

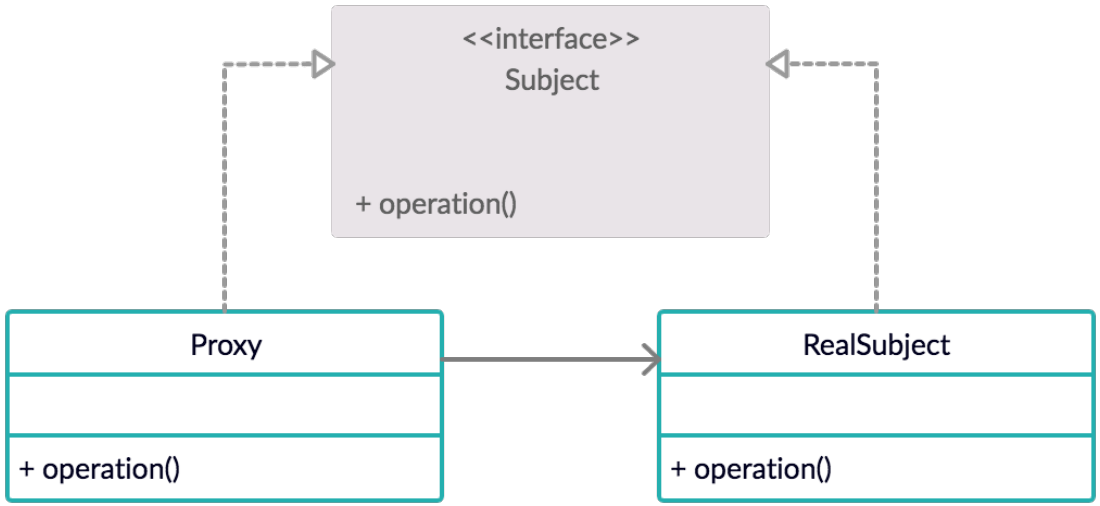
Proxy Pattern: UML

- Consider the following UML diagram:



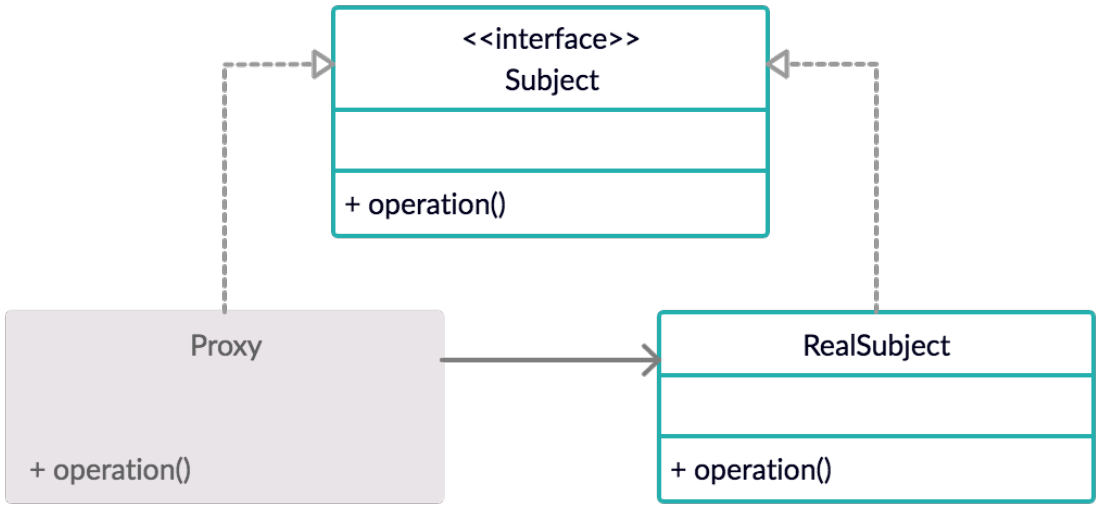
Proxy Pattern: UML

- Subject interface class



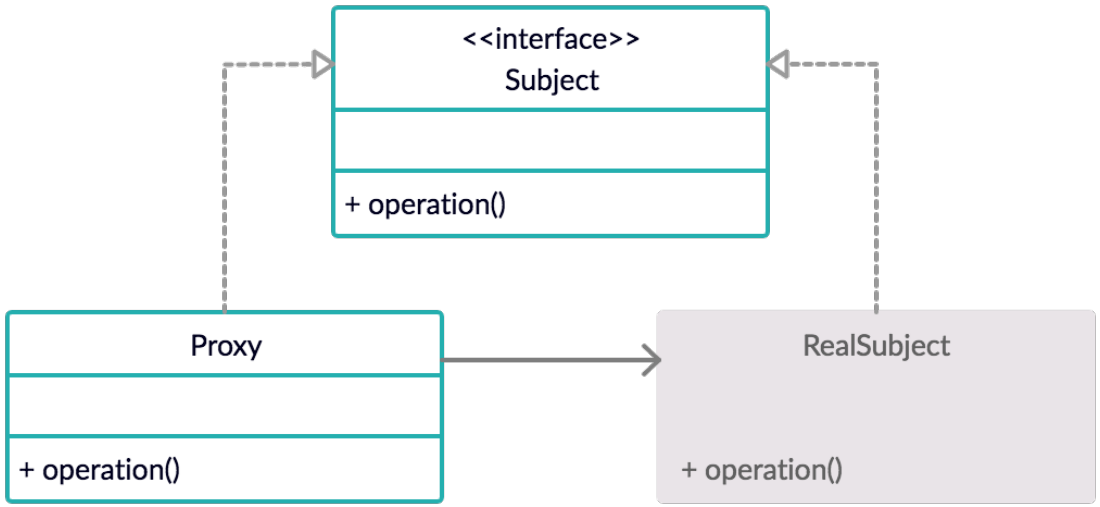
Proxy Pattern: UML

- Proxy class
- Implements subject interface class
- Can act as substitute for subject objects
- Maintains a reference to the substituted object



Proxy Pattern: UML

- RealSubject class
- Substituted object



Proxy Pattern: Implementation

```
from abc import ABC, abstractmethod

class AbstractCar(ABC):
    @abstractmethod
    def drive(self):
        pass

class Car(AbstractCar):
    def drive(self):
        print('The driver is old enough to drive')

class Driver:
    def __init__(self, age):
        self.age = age
```

Proxy Pattern: Implementation

```
class ProxyCar(AbstractCar):
    def __init__(self, driver):
        self.car = Car()
        self.driver = driver

    def drive(self):
        if self.driver.age <= 16:
            print('The driver is too young to drive')
        else:
            self.car.drive()

def main():
    driver = Driver(16)
    car = ProxyCar(driver)
    car.drive()

    driver = Driver(25)
    car = ProxyCar(driver)
    car.drive()

if __name__ == '__main__':
    main()  # The driver is too young to drive
            # The driver is old enough to drive
```

Proxy Pattern: Pros

- New proxies can be introduced without having to change the existing services or clients
- Service object can be controlled without the clients knowing about it
- The proxy works even if the service object isn't available

Proxy Pattern: Cons

- Overall, the complexity of the code increases - new classes need to be introduced

Practical

- Series of tasks covering today's lecture
- Worth 1% of your final mark for the Object-Oriented Systems Development course
- Deadline: Friday, 12 June at 5pm