Технологии программирования

Поведенческие паттерны. Chain of responsibility, Strategy, Command, Memento

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Типы паттернов проектирования

ПОРОЖДАЮЩИЕ

СТРУКТУРНЫЕ

ПОВЕДЕНЧЕСКИЕ

Поведенческие паттерны

CoR

STRATEGY

COMMAND

MEDIATOR

MEMENTO

INTERPRETER

Поведенческие паттерны

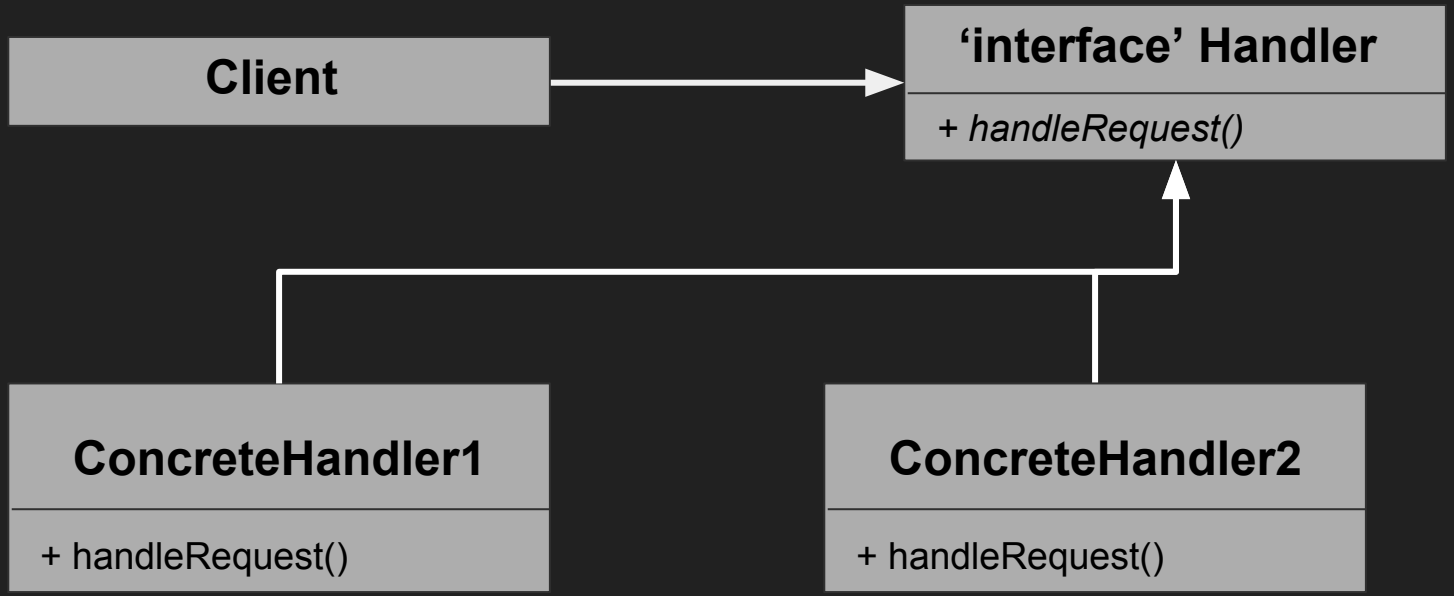
ITERATOR

STATE

OBSERVER

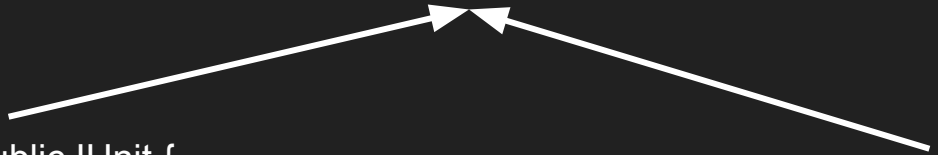
VISITOR

Chain of responsibility



Chain of responsibility example

```
class IUnit {
public:
        virtual result_t fight(CEnemy* enemy) = 0;
        virtual IUnit* set_next(IUnit* next) = 0;
};
```



```
class CFirstTypeUnit : public IUnit {
public:
        virtual result_t fight(CEnemy* enemy) {
                enemy.health -= m_attack *
                                enemy.resistance;
                m_health -= enemy.attack;
                if (enemy.alive) next.fight(enemy);
        }
        virtual IUnit* set_next(IUnit* next) { … }
};
```

```
class CSecondTypeUnit : public IUnit {
public:
        virtual result_t fight(CEnemy* enemy) {
                enemy.health -= m_attack * rand(100);
                m_health -= enemy.attack;
                if (enemy.alive) next.fight(enemy);
        }
        virtual IUnit* set_next(IUnit* next) { … }
};
```

Chain of responsibility example

```
client code
…
CFirstTypeUnit* unit = new CFirstTypeUnit;
IUnit* next = unit;

for (int i = 0; i < 100; ++i) {
        next = next->set_next(new CFirstTypeUnit);

for (int i = 0; i < 10; ++i)
        next = next->set_next(new CSecondTypeUnit);

CEnemy enemy;
unit->fight(enemy);
```

CoR vs Decorator

CoR	Decorator
выполняют независимые действия	расширяют какое-то конкретное действие
в любой момент передача по цепочке может быть прервана	не прерывают работу остальных декораторов

Relations

CoR & Composite

CoR vs Decorator

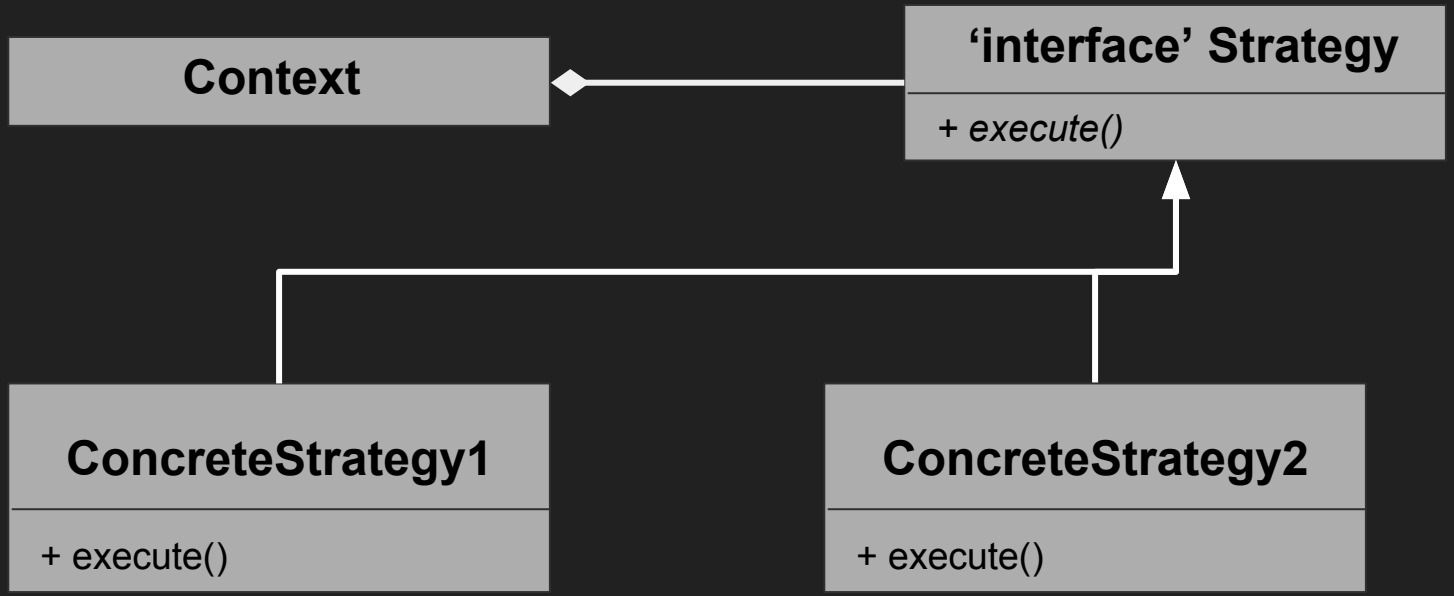
Когда применять?

есть несколько обработчиков; заранее неизвестно какой нужен

важна очередность выполнения обработчиков

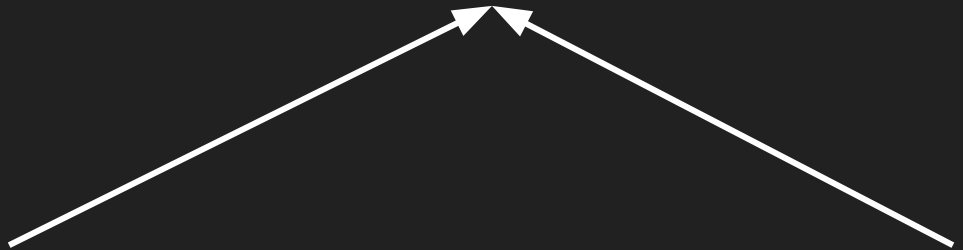
нужно менять цепь обработчиков в runtime

Strategy


Context
‘interface’ Strategy
+ execute()
ConcreteStrategy1
+ execute()
ConcreteStrategy2
+ execute()

Strategy example

```
class IMathEngine {
public:
        virtual int calculate(int first, int second) = 0;
};
```



```
class CAddOperation : public IMathEngine {
public:
        int calculate(int first, int second) {
                return first + second;
        }
};
```

```
class CSubstractOperation : public IMathEngine {
public:
        int calculate(int first, int second) {
                return first - second;
        }
};
```

Strategy example

```
class CContext {
public:
...
        int process(const Expression& expr) {
                auto id = expr.get_next_operation_id();
                auto strategy = CStrategyFactory::get(id);
                strategy->calculate(expr.next_left(), expr.next_right());

        }
...
};
```

Strategy example * (policy)

```
template<class T>
class CNewCreatorStrategy {
public:
        static T* create() { return new T; }
};
```

```
template<class T>
class CMallocCreatorStrategy {
public:
        static T* create() {
                void* buf = malloc(sizeof(T));
                if (!buf) return 0;
                return new(buf) T;
        }
};
```

```
template<class T>
class CPrototypeCreatorStrategy {
private:
        T* m_prototype;
public:
        CPrototypeCreatorStrategy(...) { ... }
        static T* create() {
                return m_prototype ?
                        m_prototype->clone() :
                        0;
        }
        // … get/set methods
};
```

Strategy example * (policy)

```
// код библиотеки
template<class CreationPolicy>
class CWidgetManager : public CreationPolicy {
...
};
```

← host class

```
// код приложения
typedef CWidgetManager< CNewCreatorStrategy<Widget> > MyWidgetManager;
```

Strategy example * (policy)

```
// код библиотеки
template<template <class Created> class CreationPolicy>
class CWidgetManager : public CreationPolicy<Widget> {
...
};
```

← host class

```
// код приложения
typedef CWidgetManager< CNewCreatorStrategy > MyWidgetManager;
```

Relations

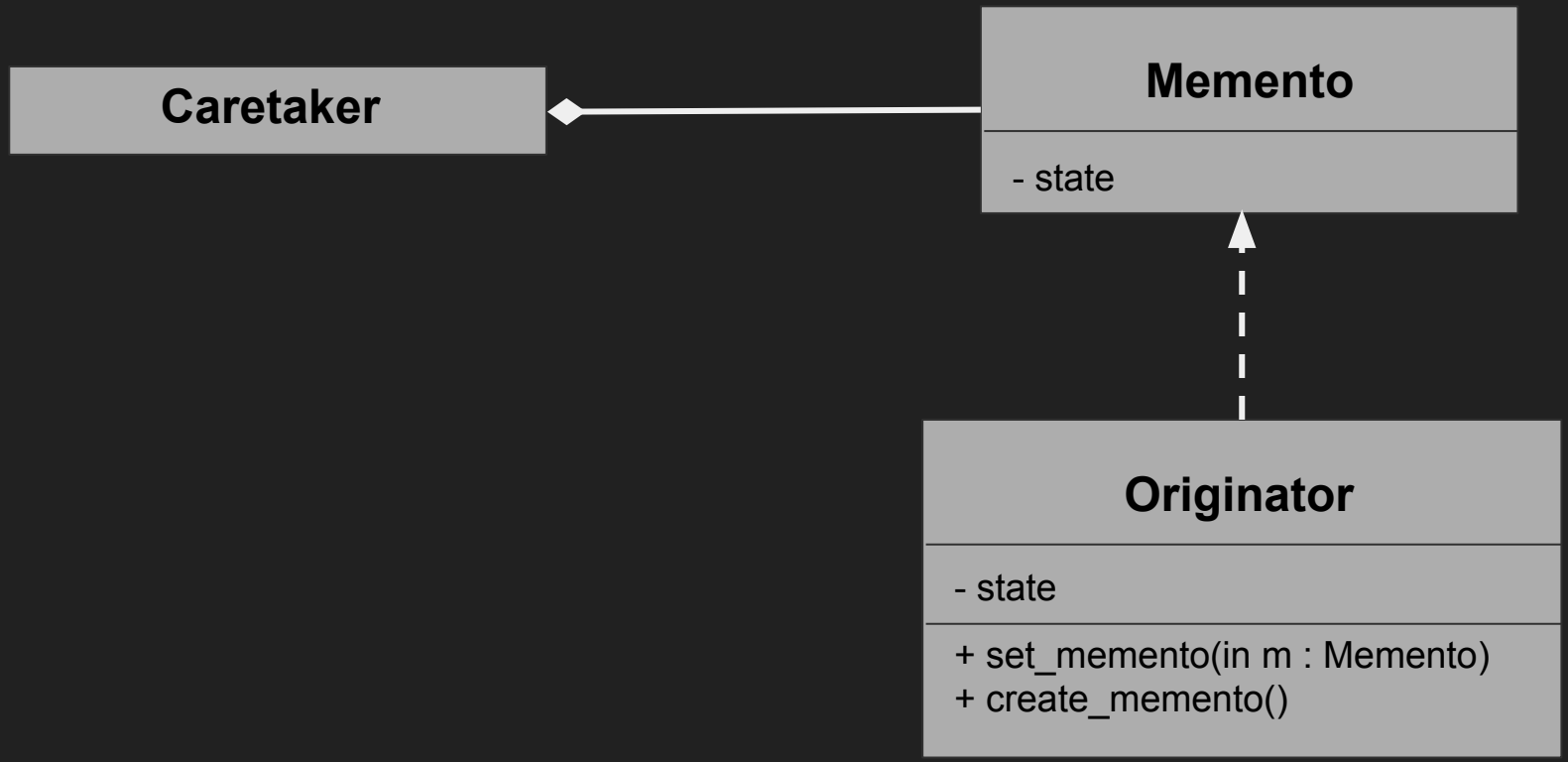
Strategy vs Decorator

Когда применять?

нужно использовать разные вариации одного алгоритма

есть много похожих классов, отличающихся только поведением

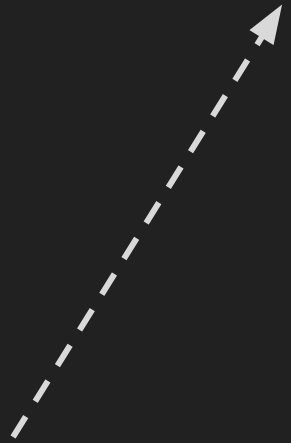
Memento


Caretaker
Memento
- state
Originator
- state
+ set_memento(in m : Memento)
+ create_memento()

Memento example

```
class IOriginator {
public:
        virtual ~IOriginator() {}
        virtual void set_memento(Memento* memento) = 0;
        virtual Memento* get_memento() = 0;
};
```

```
class CSpaceship : public IOriginator {    // originator
private:
        unsigned int m_health;
public:
        virtual ~CSpaceship () { }
        virtual void set_memento(Memento* memento) {
                m_health = memento->get_health();
        };
        virtual Memento* get_memento() {
                Memento* ret = new Memento();
                ret->set_health(m_health);
                return ret;
        }
};
```



```
class Memento {                                    // memento
private:
        unsigned int m_health;
public:
        void set_health(unsigned int health) { … }
        unsigned int get_health() { … }
};
```

```
class CGameContext {                                        // caretaker
private:
        Memento* m_memento;
public:
        void save_state(IOriginator* originator) {
                m_memento = originator->get_memento();
                ...
        }
        void load_state(IOriginator* originator) {
                originator->set_memento(m_memento);
                ...
        }
};
```