Overview of the Design Patterns

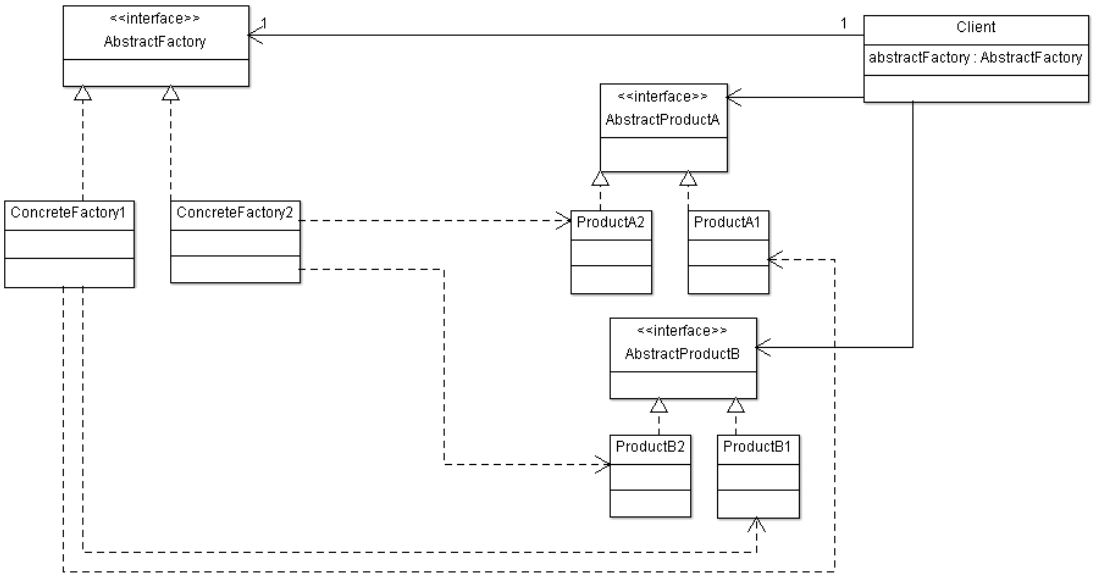
This document gives an overview of the Design Patterns used in the Design Pattern Detection software.

1. Abstract Factory

1.1 participants
AbstractFactory, ConcreteFactory, AbstractProduct, ConcreteProduct, Client

1.2 Collaborations
Client has one attribute of type AbstractFactory, with cardinalities 1 at each side.

1.3 A Diagram



1.4 the pattern xml

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Abstract Factory" family="Abstract Factory">
<nodes>
<node id="Client">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="AbstractFactory">
```

```
<node.rule nodeType="INTERFACE"/>
</node>
<node id="AbstractProductA">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="AbstractProductB">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="ConcreteFactory1">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteFactory2">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ProductA1">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ProductA2">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ProductB1">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ProductB2">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Client" node2="AbstractFactory">
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Client" node2="AbstractProductA">
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Client" node2="AbstractProductB">
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ProductA1" node2="AbstractProductA">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
```

```
<relation node1="ProductA2" node2="AbstractProductA">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ProductB1" node2="AbstractProductB">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ProductB2" node2="AbstractProductB">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory1" node2="AbstractFactory">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory2" node2="AbstractFactory">
<relation.rule relationType="IMPLEMENTS"  cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory1" node2="ProductA1">
<relation.rule relationType="DEPENDS_ON" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory2" node2="ProductA2">
<relation.rule relationType="DEPENDS_ON" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory1" node2="ProductB1">
<relation.rule relationType="DEPENDS_ON" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteFactory2" node2="ProductB2">
<relation.rule relationType="DEPENDS_ON" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

1.5 Other recommendations (GoF p. 102)

a. Concrete factories are singletons. You can implement them like this.
b. Abstract factory should be an interface and not an abstract class.

2. Builder

3. Factory Method

4. Prototype

5. Singleton

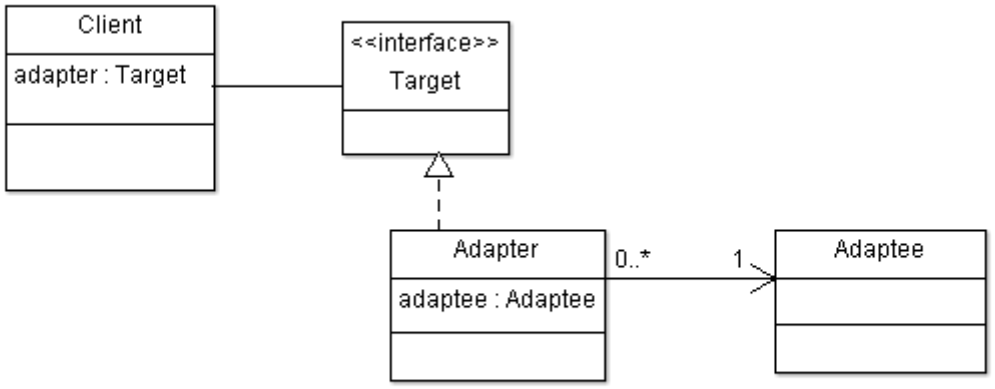
6. Adapter

A. Object Adapter

6.1 Participants
Client, Target, Adapter, Adaptee

6.2 Collaborations
The Client has an attribute of type Target.
The Adapter has one or more attribute of type Adaptee.

6.3 Diagram



6.4 pattern xml

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
```

```
<pattern name="Object Adapter" family="Adapter">
<nodes>
<node id="Client">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Target">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="Adapter">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Adaptee">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Client" node2="Target">
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Adapter" node2="Target">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Adapter" node2="Adaptee">
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..*" cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

6.5. Recommendations

B. Class Adapter

6.1 Participants

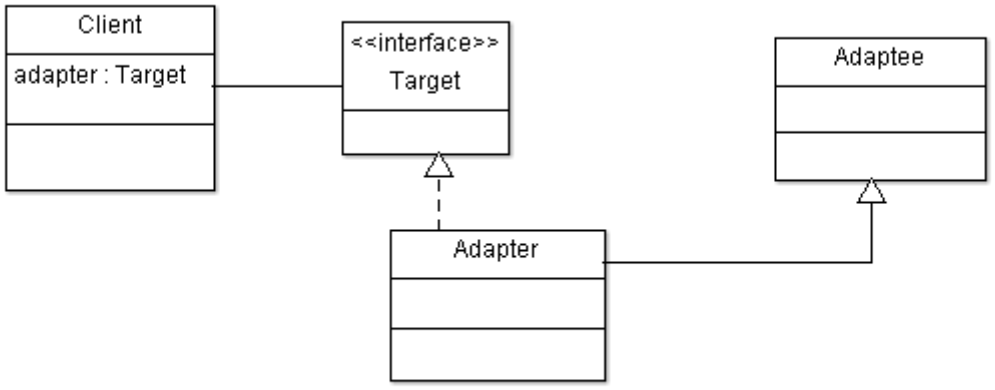
Client, Target, Adapter, Adaptee

In the case of a class adapter, the target must be an interface in a java implementation. The Adapter implements from the Target and inherits from the Adaptee.

6.2 Collaborations

The Client has an attribute of type Target.

6.3 Diagram



6.4 pattern xml

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Object Adapter" family="Adapter">
<nodes>
<node id="Client">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Target">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="Adapter">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Adaptee">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Client" node2="Target">
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Adapter" node2="Target">
```

```
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="Adapter" node2="Adaptee">
<relation.rule relationType="INHERITS_FROM" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

6.5 Recommendations

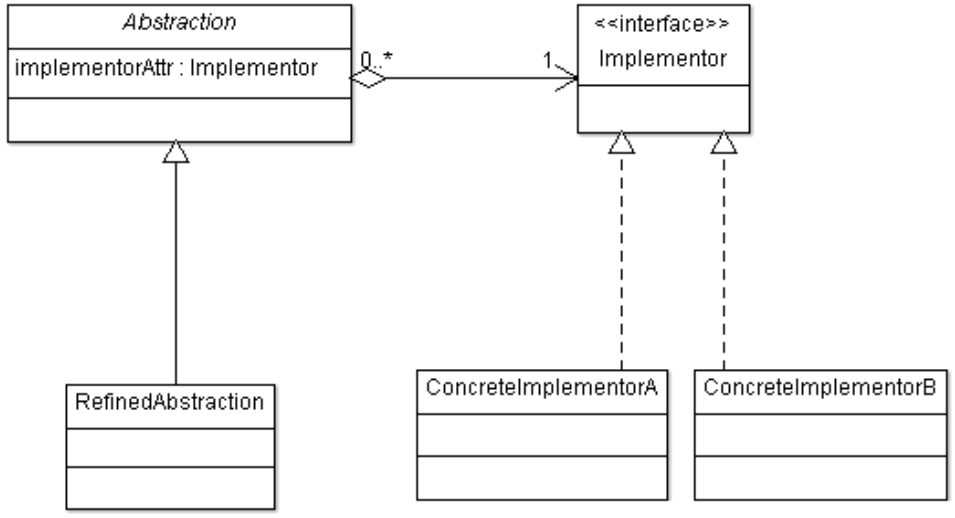
Set the adaptee attribute of the object adapter class Adapter with private visibility.

7. Bridge

1.1 Participants
Abstraction, Implementor, RefindeAbstraction, ConcreteImplementorA, ConcreteImplementorB
As the Abstraction class has an attribute of type Implementor, it must be an abstract class.

1.2 Collaborations
The Abstraction class can have multiple instances of the Implementor class (cardinalities 0..* and 1)

1.3 Diagram



1.4 xml scheme

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Bridge" family="Bridge">
<nodes>
<node id="Abstraction">
<node.rule nodeType="ABSTRACT_CLASS"/>
</node>
<node id="Implementor">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="RefinedAbstraction">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
```

```
<node id="ConcreteImplementor">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Abstraction" node2="Implementor">
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..*" cardinalityRight="1"/>  <relation.rule
relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteImplementor" node2="Implementor">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="RefinedAbstraction" node2="Abstraction">
<relation.rule relationType="INHERITS_FROM" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

1.5 Recommendations

8. Composite

9. Decorator

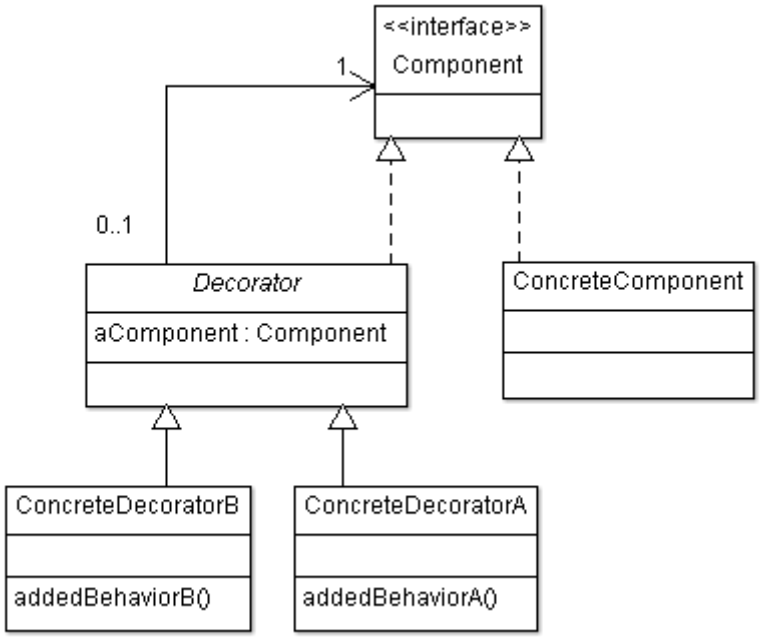
9.1 Participants

Component, ConcreteComponent, Decorator, ConcreteDecoratorA, ConcreteDecoratorB
Decorator implements Component, but is itself abstract. In a java implementation, this means that Decorator must be an abstract class.

9.2 Collaborations

The Decorator class has at most 1 Component attribute.

9.3 Diagram



9.4 XML Scheme

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Decorator" family="Decorator">
<nodes>
<node id="Component">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="Decorator">
<node.rule nodeType="ABSTRACT_CLASS"/>
</node>
<node id="ConcreteComponent">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteDecoratorA">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteDecoratorB">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Decorator" node2="Component">
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..1" cardinalityRight="1"/>
```

```
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>    </relation>
<relation node1="ConcreteComponent" node2="Component">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteDecoratorA" node2="Decorator">
<relation.rule relationType="INHERITS_FROM" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteDecoratorB" node2="Decorator">
<relation.rule relationType="INHERITS_FROM" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

9.5 Recommendations

10. Facade

11. Flyweight

12. Proxy

13. Chain Of Responsibility

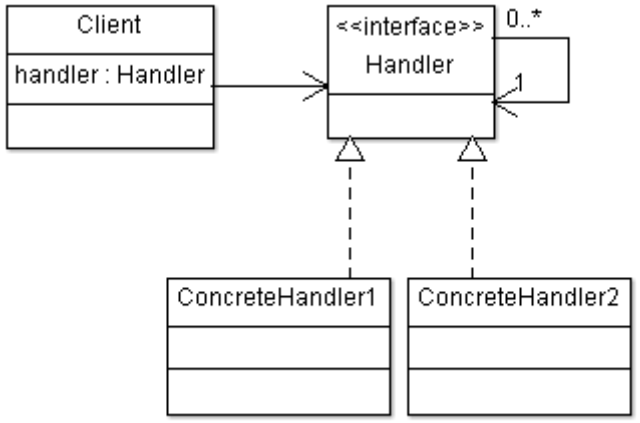
13.1 Participants

Client, Handler, ConcreteHandler1, ConcreteHandler2

13.2 Collaborations

The Client has an attribute of type Handler.
The Handler calls itself, c.q one of its concretizations.

13.3 Diagram



13.4 xml scheme

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="ChainOfResponsability"
family="ChainOfResponsability">
<nodes>
<node id="Client">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Handler">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="ConcreteHandlerA">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteHandlerB">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Client" node2="Handler">
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteHandlerA" node2="Handler">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteHandlerB" node2="Handler">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
```

```
<relation node1="Handler" node2="Handler">
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..*" cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

13.5 Recommendations

TODO
The implementation of the handler is still unclear. How can an interface call itself, can this be explicit in defining a method…?

14. Command

15. Interpreter

16. Iterator

17. Mediator

18. Memento

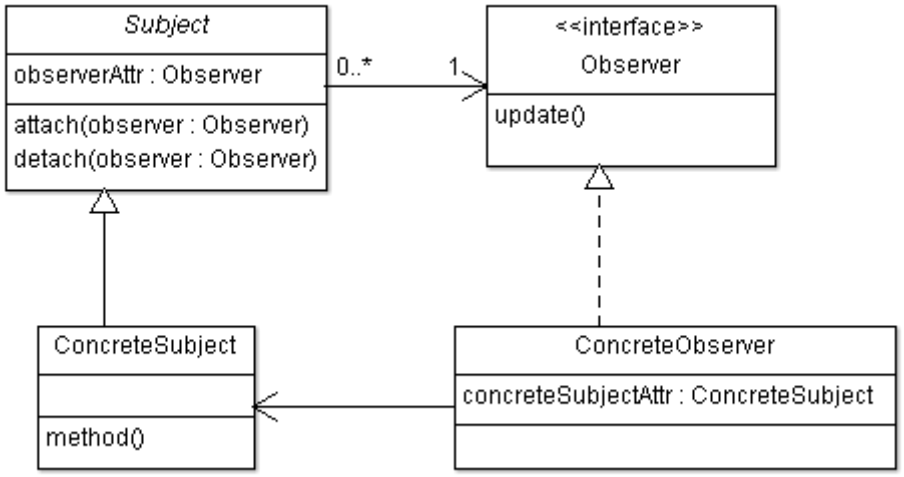
19. Observer

19.1 Participants

Subject, Observer, ConcreteSubject, ConcreteObserver
The Subject holds a reference to none or more Observers. Hence it must be an abstract class and not an interface.

19.2 Collaborations
The Subject must provide methods to attach and detach Observers.

19.3 Diagram



19.4 XML Scheme

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Observer" family="Observer">
<nodes>
<node id="ConcreteSubject">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Subject">
<node.rule nodeType="ABSTRACT_CLASS"/>
</node>
<node id="Observer">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="ConcreteObserver">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Subject" node2="Observer">
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..*" cardinalityRight="1"/>
<relation.rule relationType="HAS_METHOD_PARAMETER_OF_TYPE"
cardinalityLeft="1" cardinalityRight="1"/>
</relation>
<relation node1="ConcreteSubject" node2="Subject">
<relation.rule relationType="INHERITS_FROM" cardinalityLeft="1"
cardinalityRight="1"/>
```

```
</relation>
<relation node1="ConcreteObserver" node2="ConcreteSubject">
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>
<relation.rule relationType="ASSOCIATES_WITH" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
<relation node1="ConcreteObserver" node2="Observer">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>
</relation>
</relations>
</pattern>
</patterns>
```

19.5 Recommendations

20. State

21. Strategy

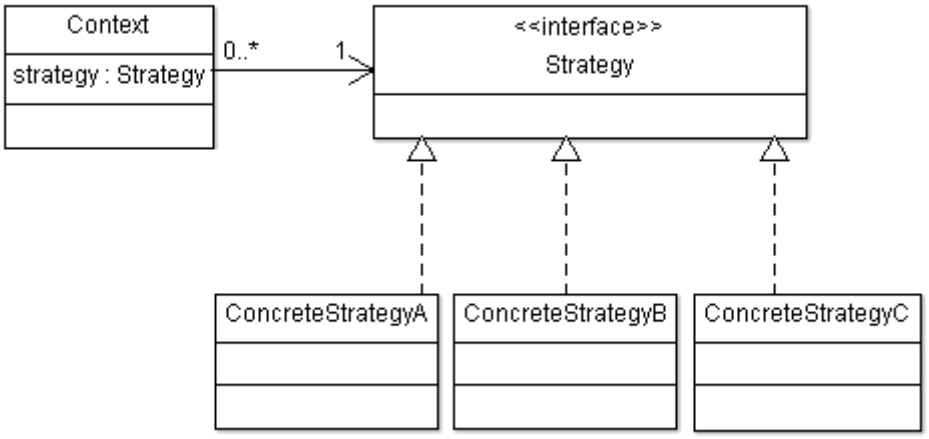
21.1 Participants

Context, Strategy, ConcreteStrategyA, ConcreteStrategyB, ConcreteStrategyC

21.2 Collaborations

The context has an attribute of type Strategy.

21.3 Diagram



21.4 XML Scheme

```
<?xml version="1.0" encoding="UTF-8"?>
<patterns>
<pattern name="Strategy" family="Strategy">
<nodes>
<node id="Context">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="Strategy">
<node.rule nodeType="INTERFACE"/>
</node>
<node id="ConcreteStrategyA">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteStrategyB">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
<node id="ConcreteStrategyC">
<node.rule nodeType="CONCRETE_CLASS"/>
</node>
</nodes>
<relations>
<relation node1="Context" node2="Strategy">
<relation.rule relationType="ASSOCIATES_WITH"
cardinalityLeft="0..*" cardinalityRight="1"/>
<relation.rule relationType="HAS_ATTRIBUTE_OF" cardinalityLeft="1"
cardinalityRight="1"/>                /relation>
<relation node1="ConcreteStrategyA"
node2="Strategy"><relation.rule relationType="IMPLEMENTS"
cardinalityLeft="1" cardinalityRight="1"/>
</relation>
<relation node1="ConcreteStrategyB" node2="Strategy">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>                    </relation>
<relation node1="ConcreteStrategyC" node2="Strategy">
<relation.rule relationType="IMPLEMENTS" cardinalityLeft="1"
cardinalityRight="1"/>                    </relation>
</relations>
</pattern>
</patterns>
```

21.5 recommendations

22. Template Method

23. Visitor