Behavioral Pattern: Visitor

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Coming Up

Describing the visitor pattern

- Calculating discounts for employees and customers

Structure of the visitor pattern

Pattern variation: simplifying the visitor interface

Coming Up

Use cases for this pattern

Pattern consequences

Related patterns

Describing the Visitor Pattern

Creational

Structural

Behavioral

Visitor

The intent of this pattern is to represent an operation to be performed on the elements of an object structure. Visitor lets you define a new operation without changing the classes of the elements on which it operates.

```
public class Customer
{}

public class InternalCustomer : Customer { }

public class GovernmentCustomer : Customer { }

public class PrivateCustomer : Customer { }
```

Describing the Visitor Pattern

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Describing the Visitor Pattern

```
public class Customer
{
       public decimal CalculateDiscount()
       { // do calculation }
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```
public class Customer
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public class Employee
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Describing the Visitor Pattern

Describing the Visitor Pattern

The more additional requirements come in, the more often these classes need to be changed

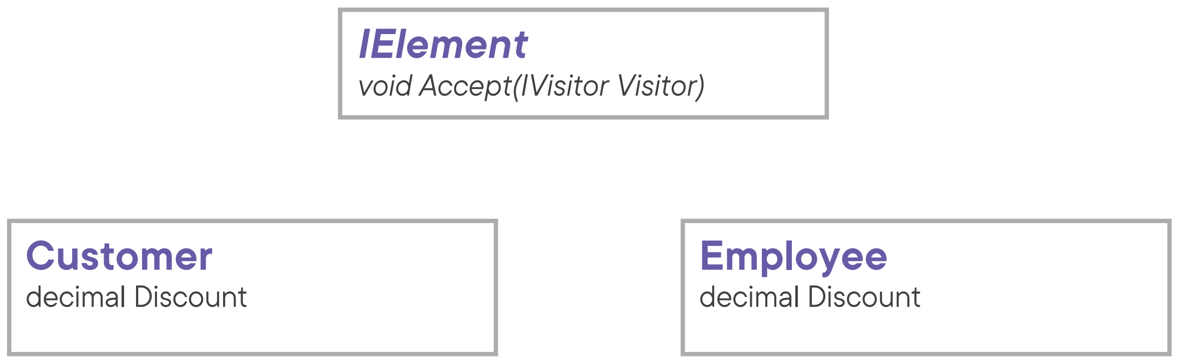
- Also, adding all that behavior violates the single responsibility principle

Describing the Visitor Pattern

Describing the Visitor Pattern

Customer
decimal Discount
Employee
decimal Discount

Describing the Visitor Pattern



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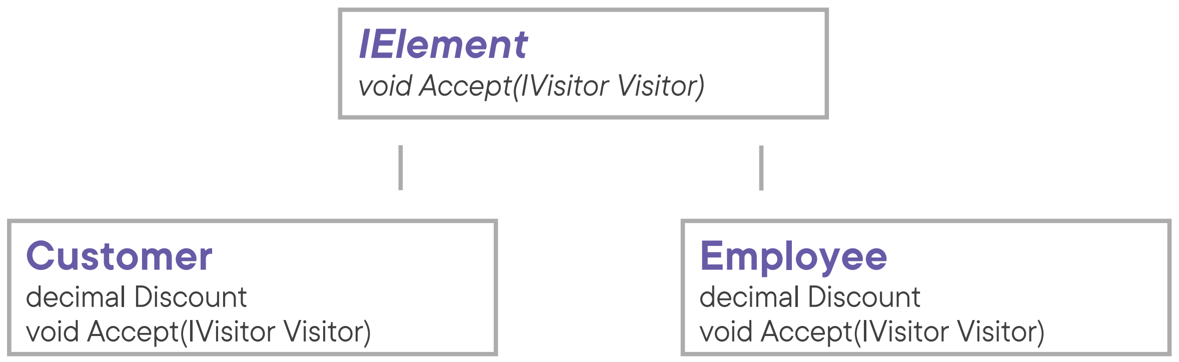
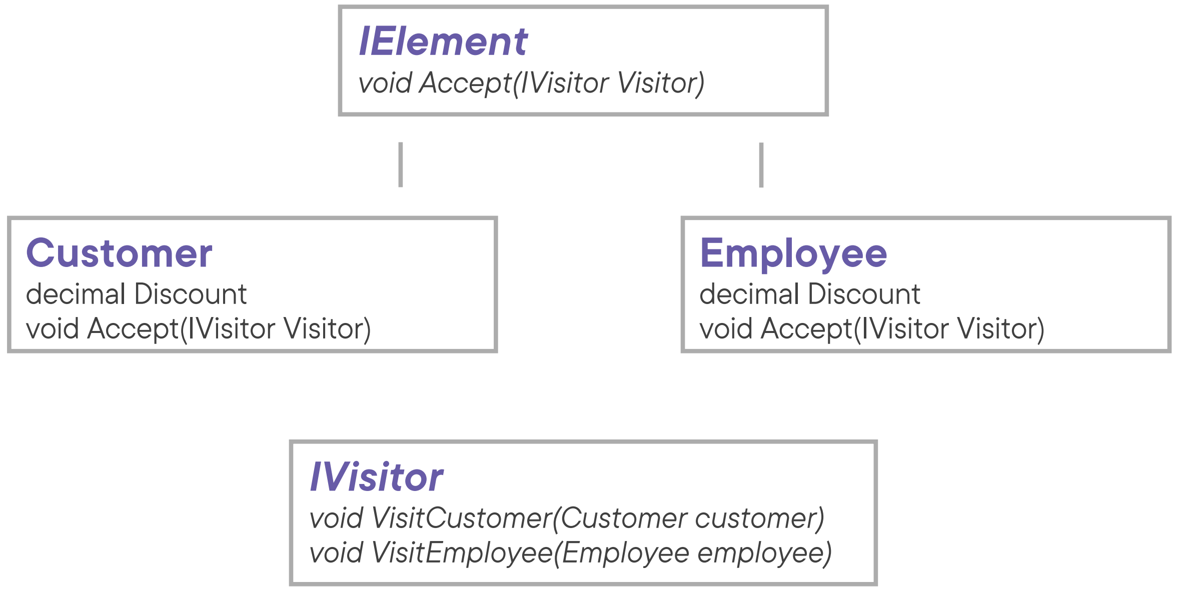

IElement
void Accept(IVisitor Visitor)
Customer
decimal Discount
void Accept(IVisitor Visitor)
Employee
decimal Discount
void Accept(IVisitor Visitor)

Describing the Visitor Pattern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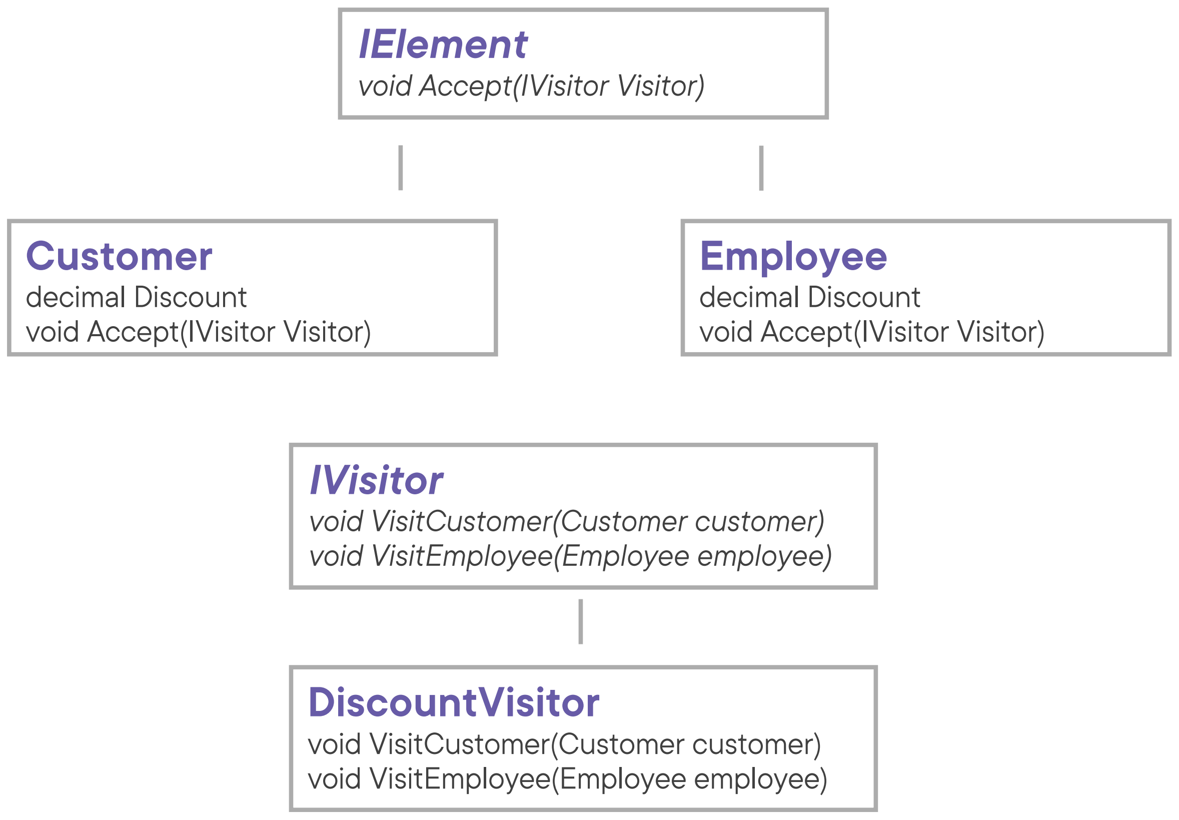
IVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)

Describing the Visitor Pattern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DiscountVisitor
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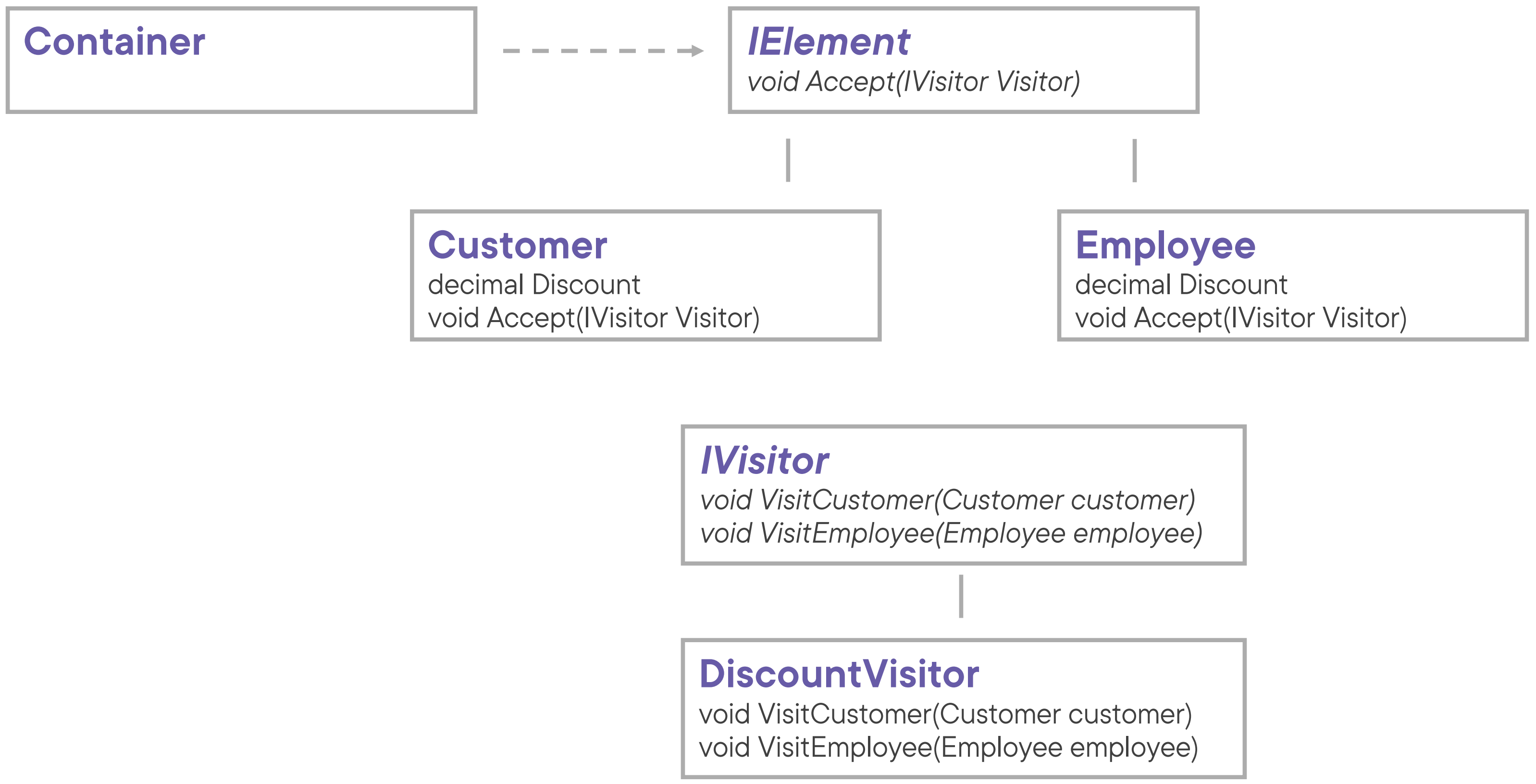
Describing the Visitor Pattern


Container
IElement
void Accept(IVisitor Visitor)
Customer
decimal Discount
void Accept(IVisitor Visitor)
Employee
decimal Discount
void Accept(IVisitor Visitor)
IVisitor
void VisitCustomer(Customer customer)
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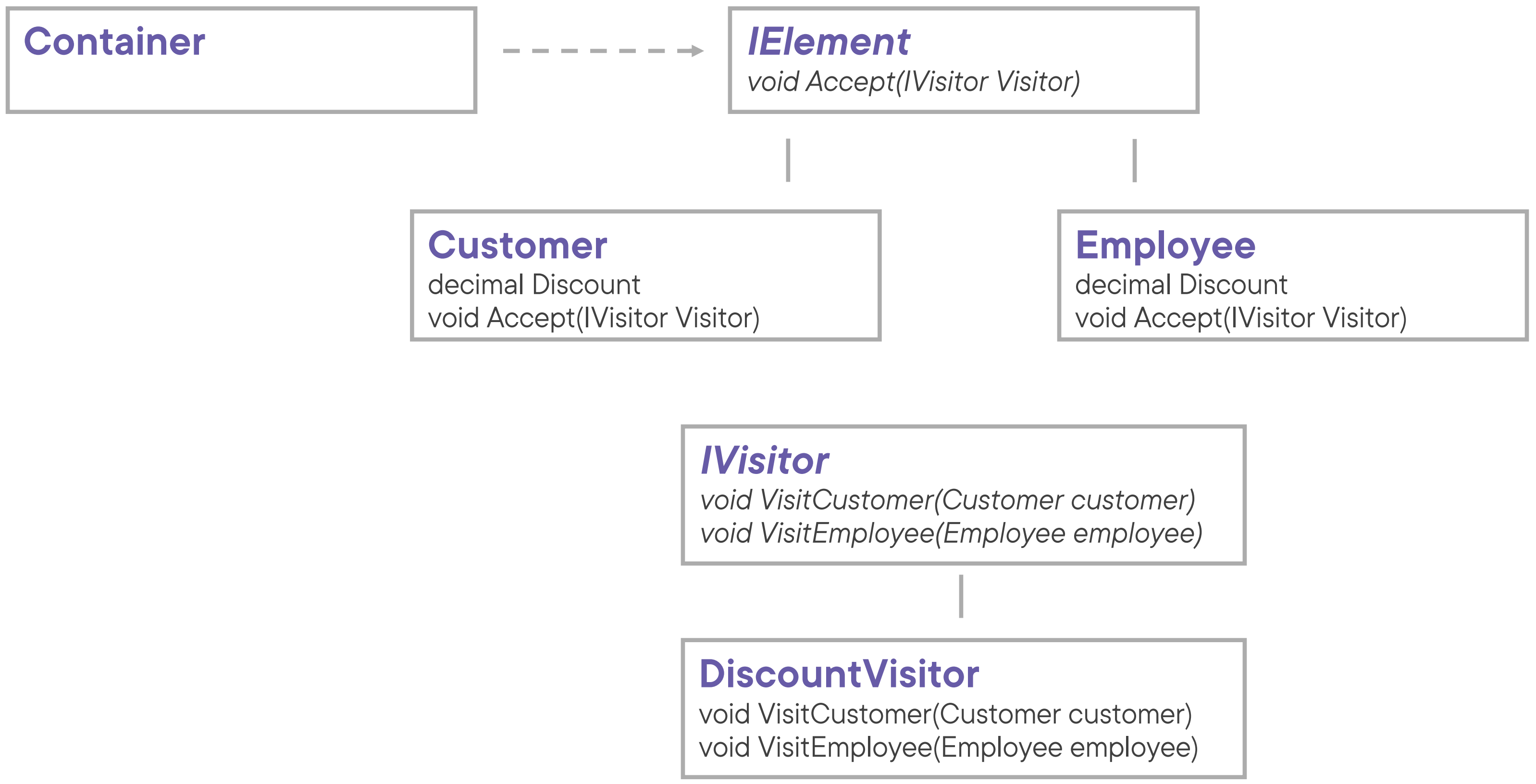
Structure of the Visitor Pattern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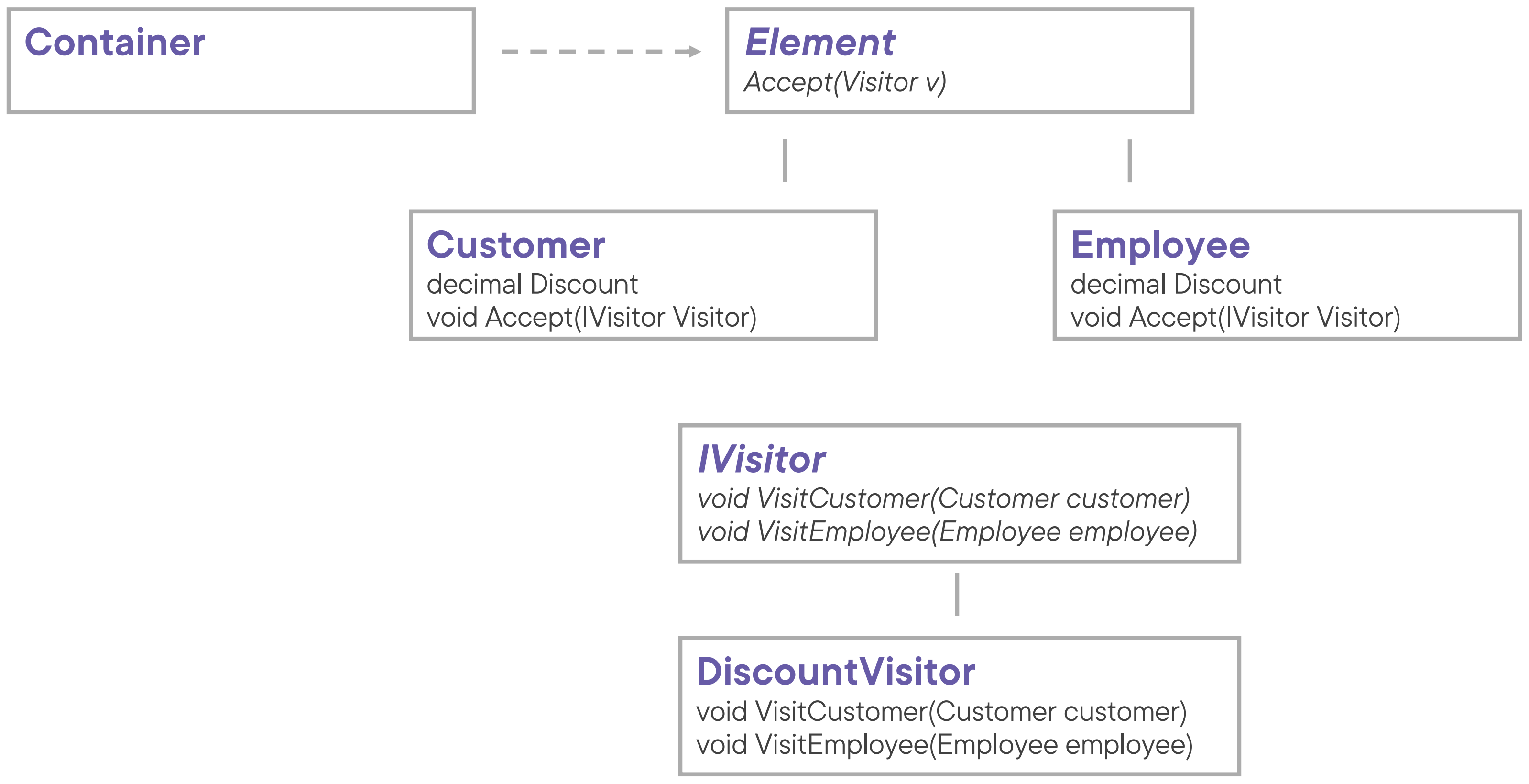
Container
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Accept(Visitor v)
Customer
decimal Discount
void Accept(IVisitor Visitor)
Employee
decimal Discount
void Accept(IVisitor Visitor)
IVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)
DiscountVisitor
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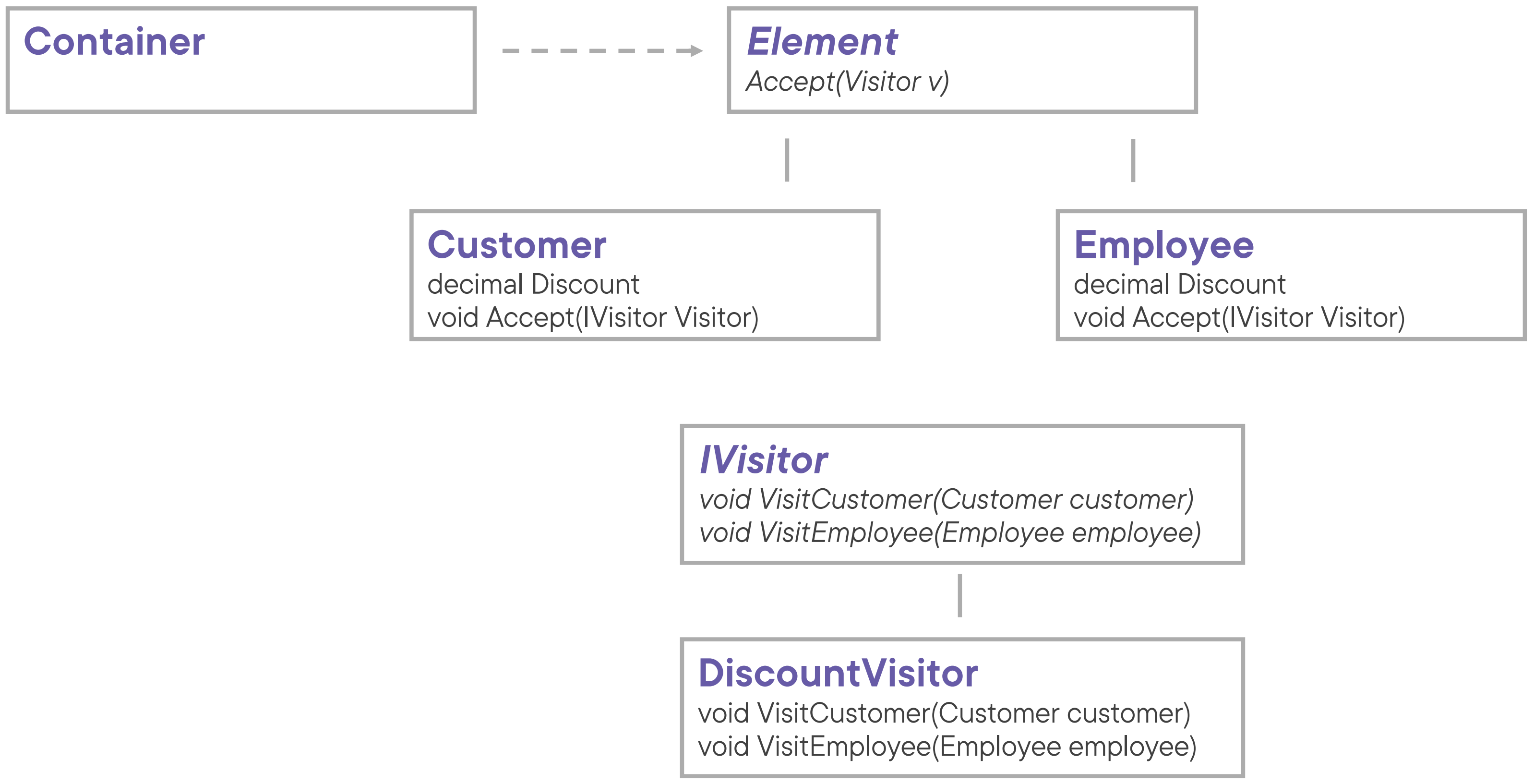
Element defines an accept operation that takes a **Visitor** as an argument

Structure of the Visitor Pattern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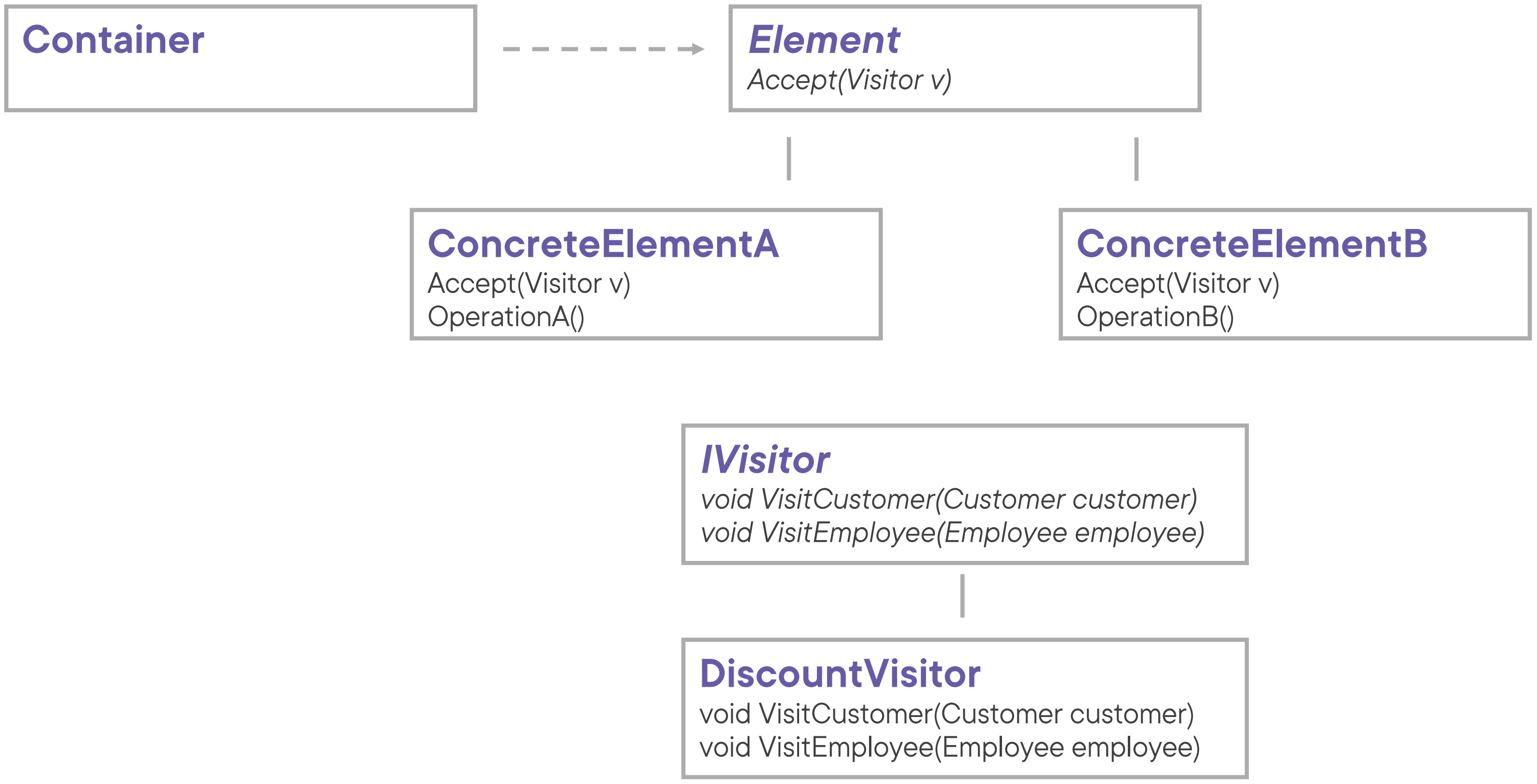
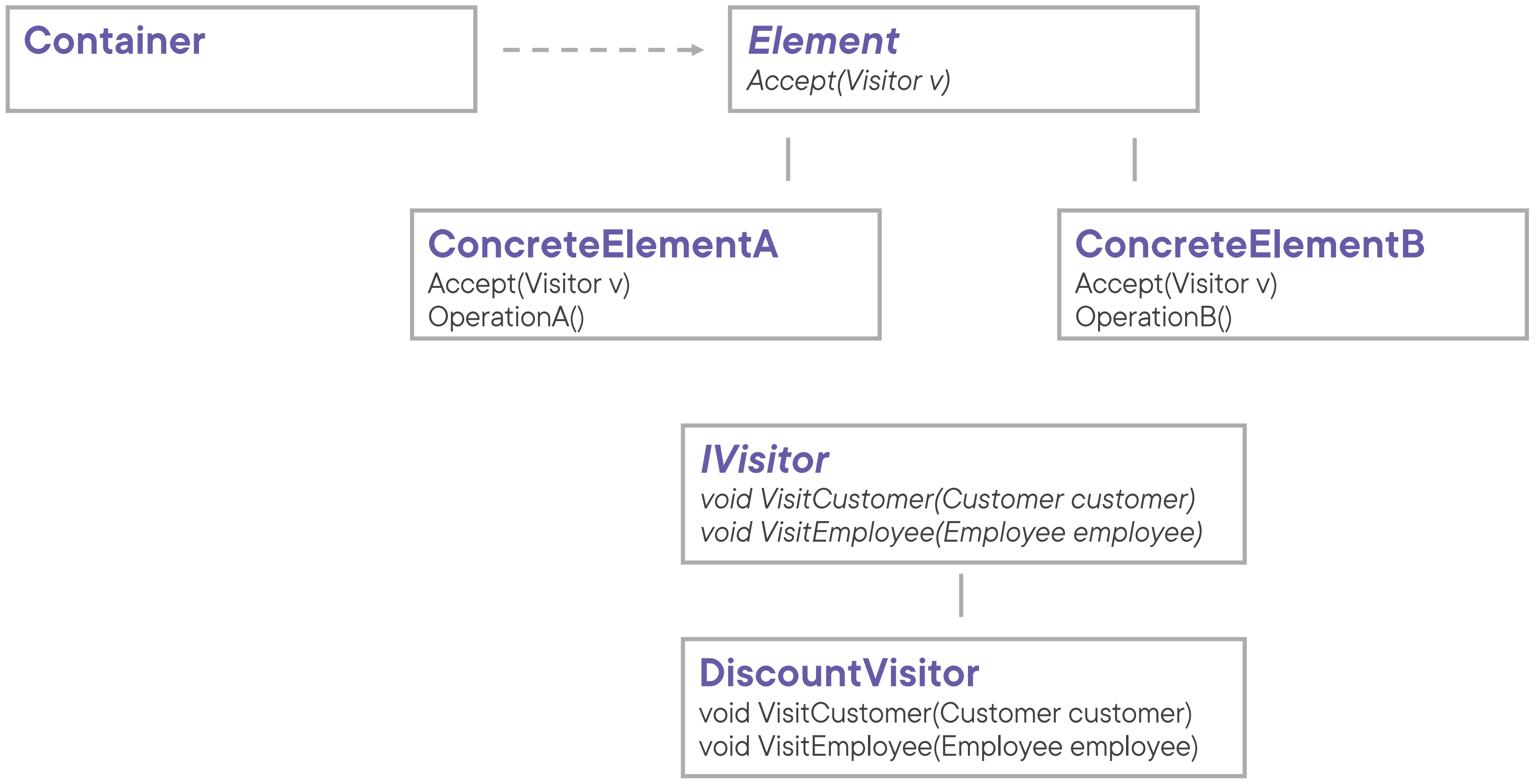
Structure of the Visitor Pattern


Container
Element
Accept(Visitor v)
ConcreteElementA
Accept(Visitor v)
OperationA()
ConcreteElementB
Accept(Visitor v)
OperationB()
IVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)
DiscountVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)

ConcreteElement implements the accept operation that takes a **Visitor** as an argument

ObjectStructure enumerates its elements. It may provide an interface to allow a **Visitor** to visit its **Elements**. It can be a composite or a collection.

Structure of the Visitor Pattern


Container
Element
Accept(Visitor v)
ConcreteElementA
Accept(Visitor v)
OperationA()
ConcreteElementB
Accept(Visitor v)
OperationB()
IVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)
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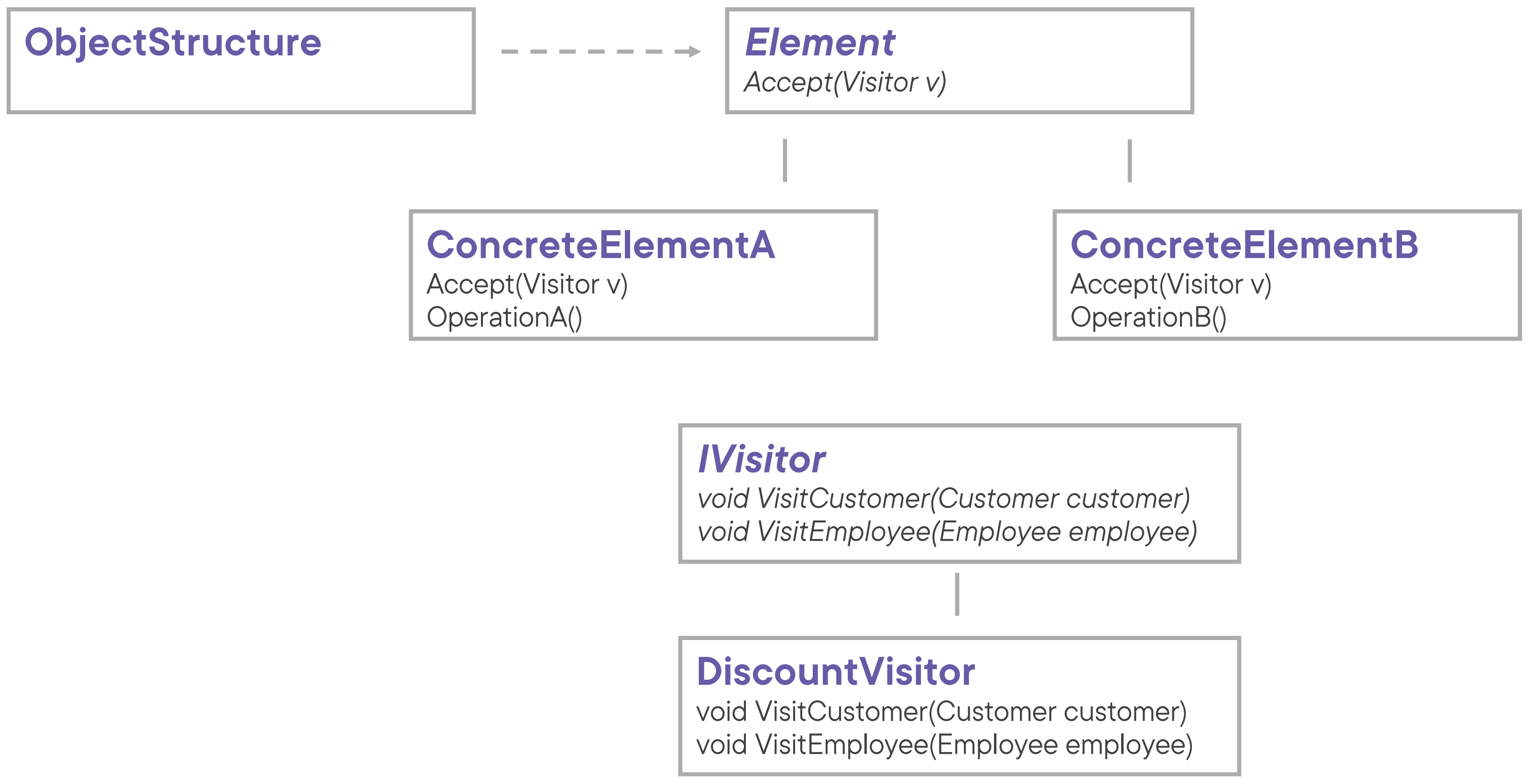
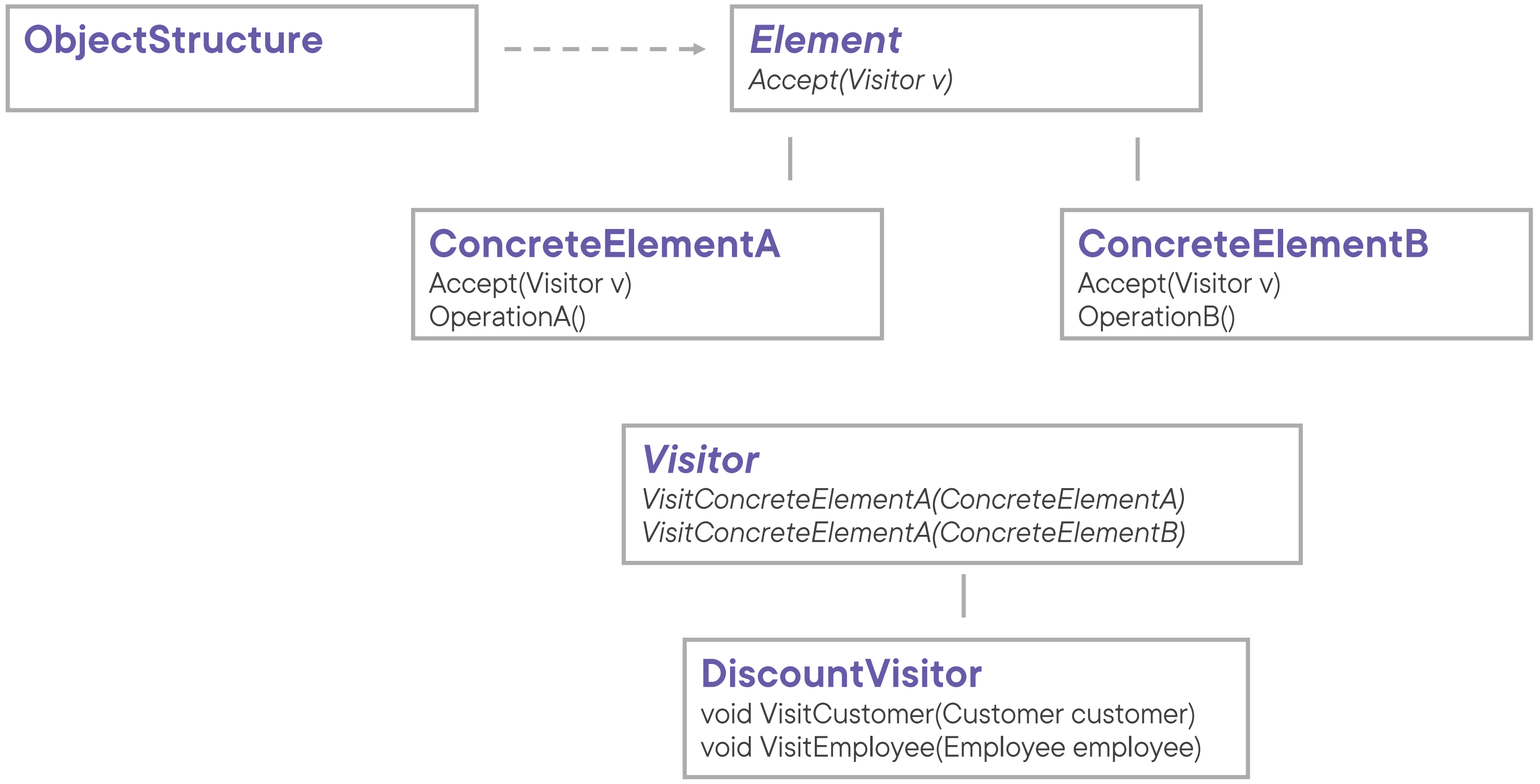
Structure of the Visitor Pattern



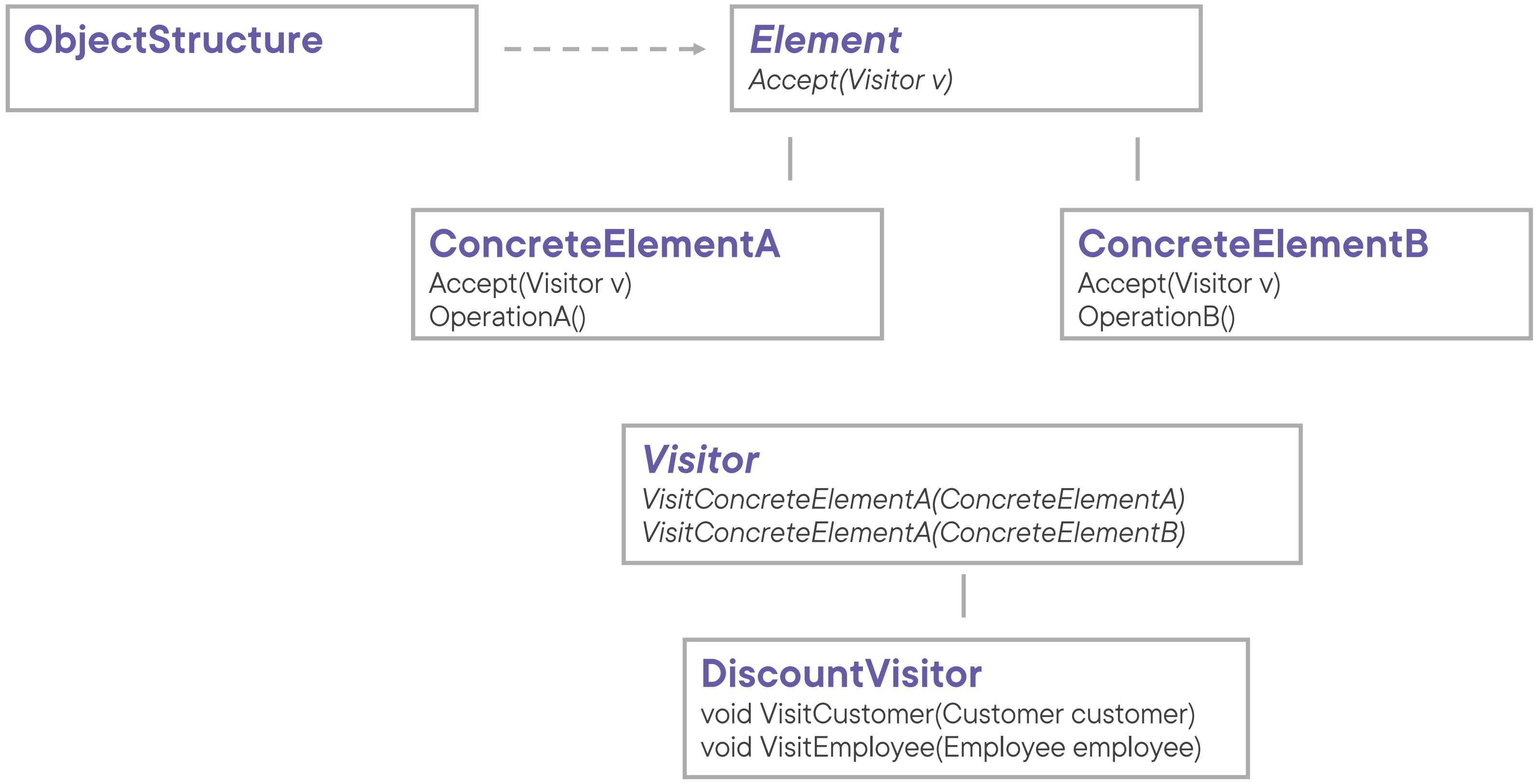
Structure of the Visitor Pattern



ObjectStructure
Element
Accept(Visitor v)
ConcreteElementA
Accept(Visitor v)
OperationA()
ConcreteElementB
Accept(Visitor v)
OperationB()
Visitor
VisitConcreteElementA(ConcreteElementA)
VisitConcreteElementA(ConcreteElementB)
DiscountVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)

Visitor declares a visit operation for each class of **ConcreteElement** in the **ObjectStructure**

Structure of the Visitor Pattern


ObjectStructure
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ConcreteElementA
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OperationA()
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Accept(Visitor v)
OperationB()
Visitor
VisitConcreteElementA(ConcreteElementA)
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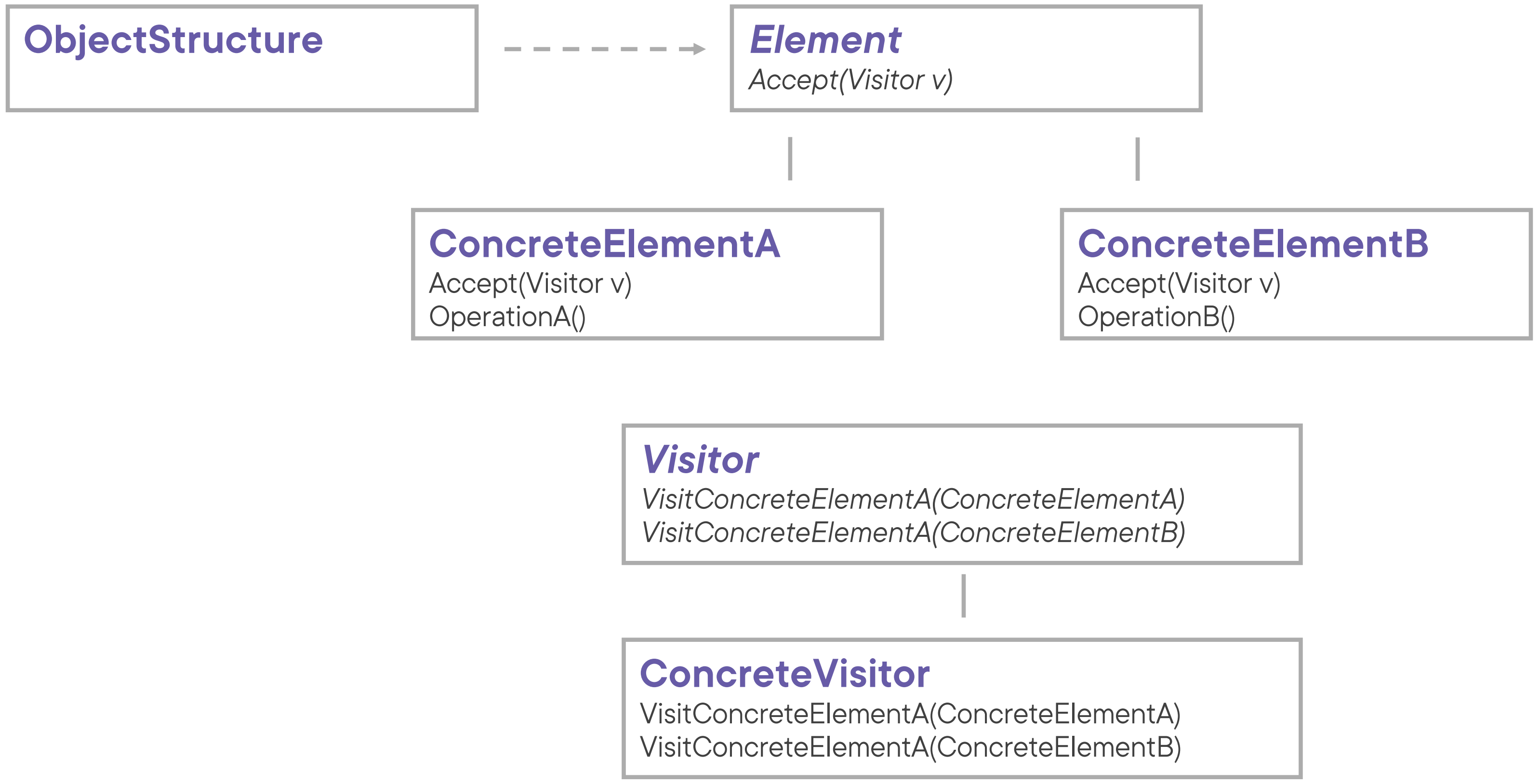
DiscountVisitor
void VisitCustomer(Customer customer)
void VisitEmployee(Employee employee)

Structure of the Visitor Pattern



ConcreteVisitor implements each operation declared by **Visitor**

Demo

Implementing the visitor pattern

Demo

Simplifying the visitor interface

Use Cases for the Visitor Pattern

When an object structure contains many classes of objects with differing interfaces, and you want to perform operations on them that depend on their concrete classes

When the classes defining your object structure don't have to change often, but you do often want to define new operations over the structure

When you've got potentially many operations that need to be performed on objects in your object structure, but not necessarily on all of them

Pattern Consequences

- It makes adding new operations easy; you can define a new operation by creating a new visitor: open/closed principle
- A visitor can accumulate info on the objects it visits
- A visitor gathers related operations together (and separates unrelated ones: single responsibility principle
- Adding a new ConcreteElement class can be hard
- It might require you to break encapsulation

Related Patterns

Composite
A visitor can be used to apply an operation over an object structure defined by the composite pattern

Iterator
You can use an iterator to traverse a potentially complex data structure, and apply logic to the items in that structure with a visitor

Summary

Intent of the visitor pattern:

- To represent an operation to be performed on the elements of an object structure

Summary

Implementation:

- `IVisitor` interface(s) (and implementations) work on concrete elements

Up Next:
Behavioral Pattern: Interpreter