Structural Pattern: Composite

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Coming Up

Describing the composite pattern

Implementation:

- File system scenario

Structure of the composite pattern

Coming Up

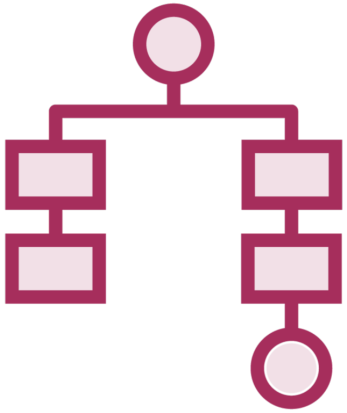
Use cases for this pattern

Pattern consequences

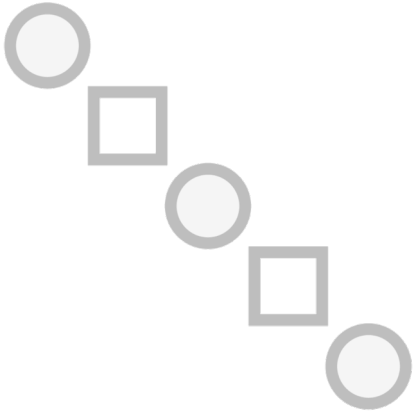
Related patterns

Describing the Composite Pattern

Creational



Structural



Behavioral

Composite

The intent of this pattern is to compose objects into tree structures to represent part-whole hierarchies. As such, it lets clients treat individual objects and compositions of objects uniformly: as if they all were individual objects.

Describing the Composite Pattern

Examples:

- XML document structure
- Composing a drawing

```
public class File { }

public class Directory {

}
```

Describing the Composite Pattern

```
public class File { }

public class Directory {

}
```

Describing the Composite Pattern

```
public class File { }

public class Directory {
    // other directories and/or files
}
```

Describing the Composite Pattern

```
public class File { }

public class Directory {
    // other directories and/or files
}

public class Client {
    // calculate the size of a tree of Directory / File
}
```

Describing the Composite Pattern

Intrinsic knowledge about the object type is required

- Class
- Method to call
- Nesting level

Describing the Composite Pattern

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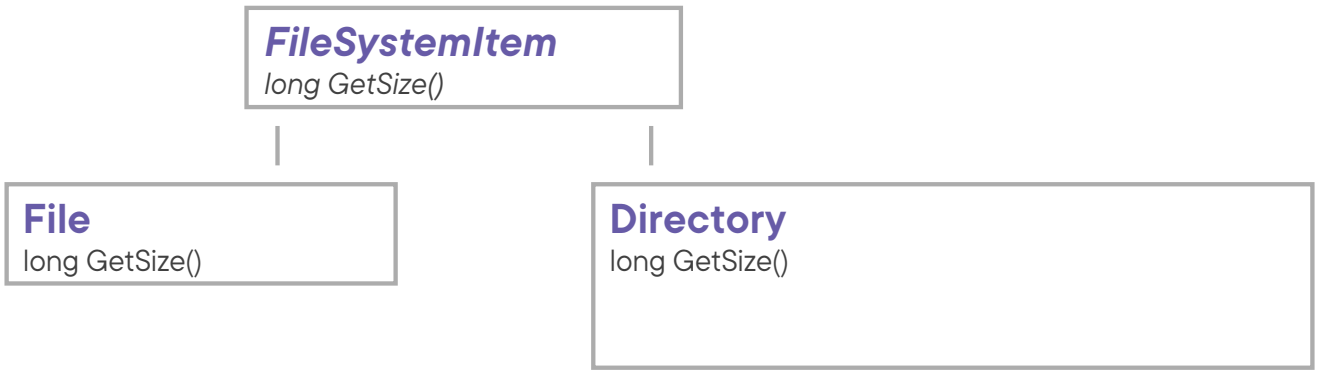
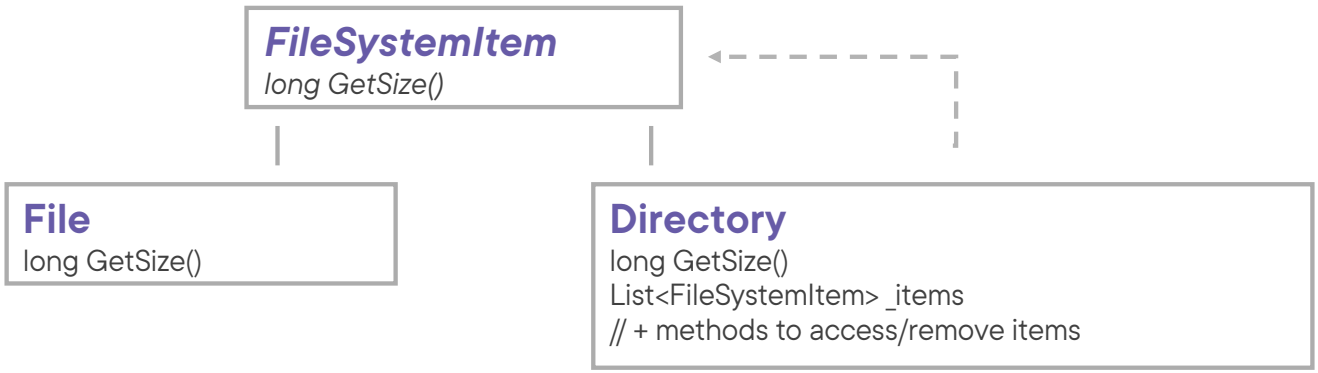
Describing the Composite Pattern



Describing the Composite Pattern



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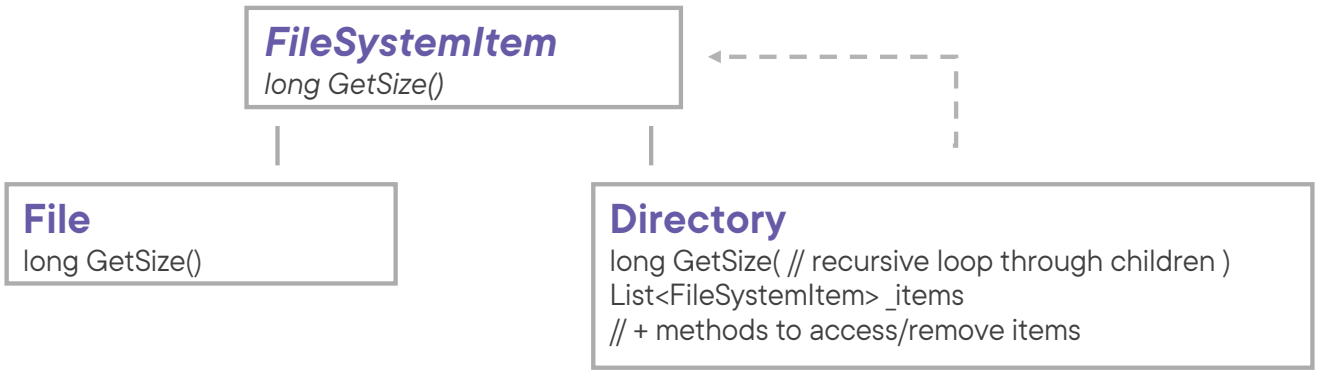
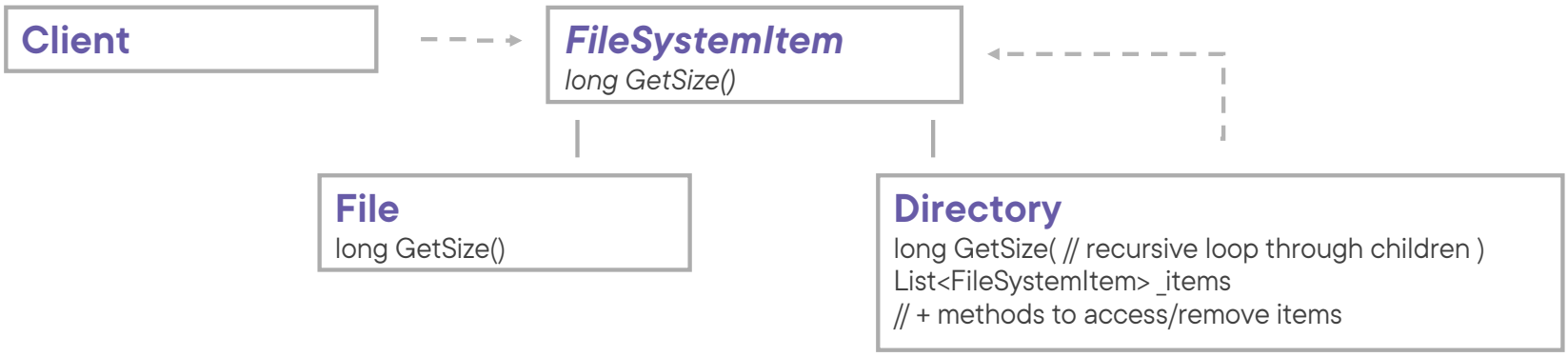
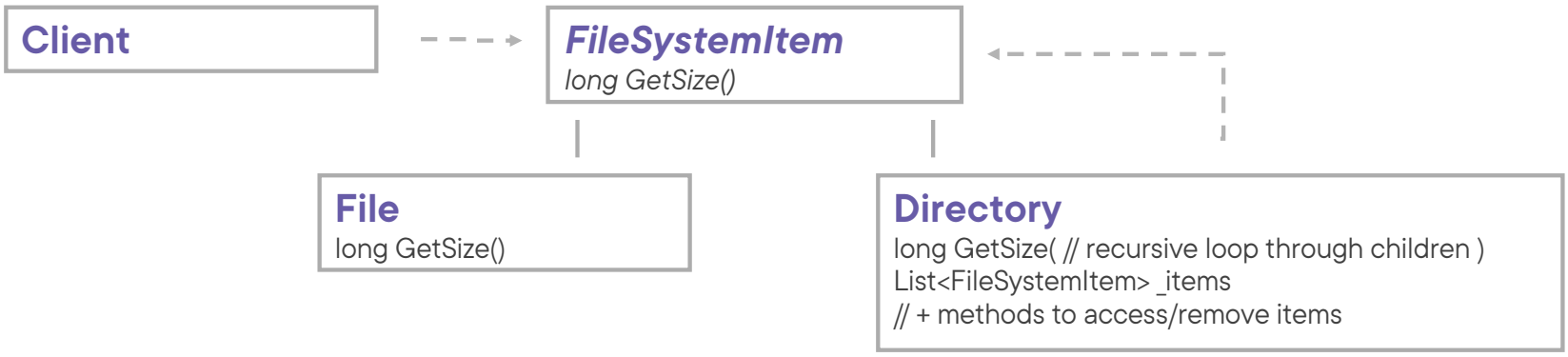


Describing the Composite Pattern



Structure of the Composite Pattern



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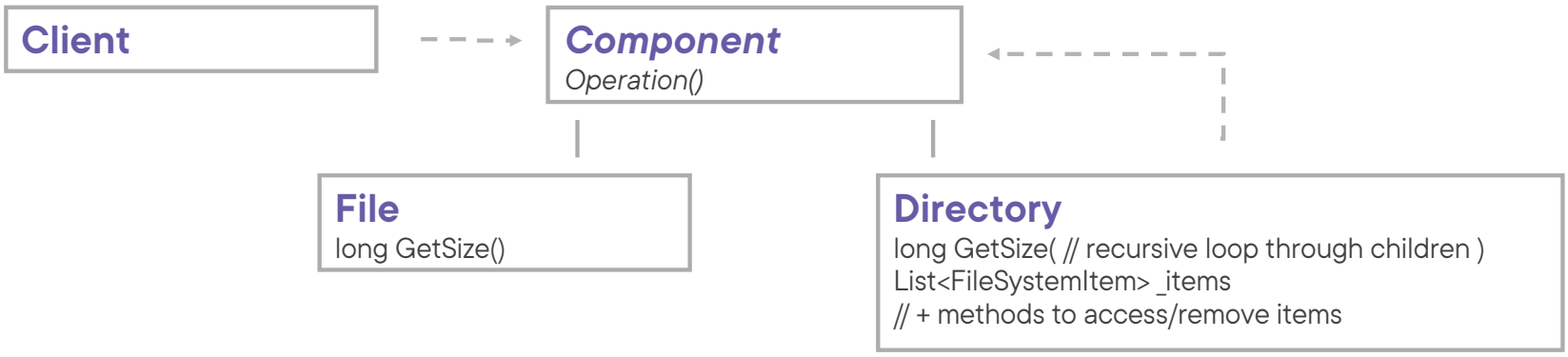
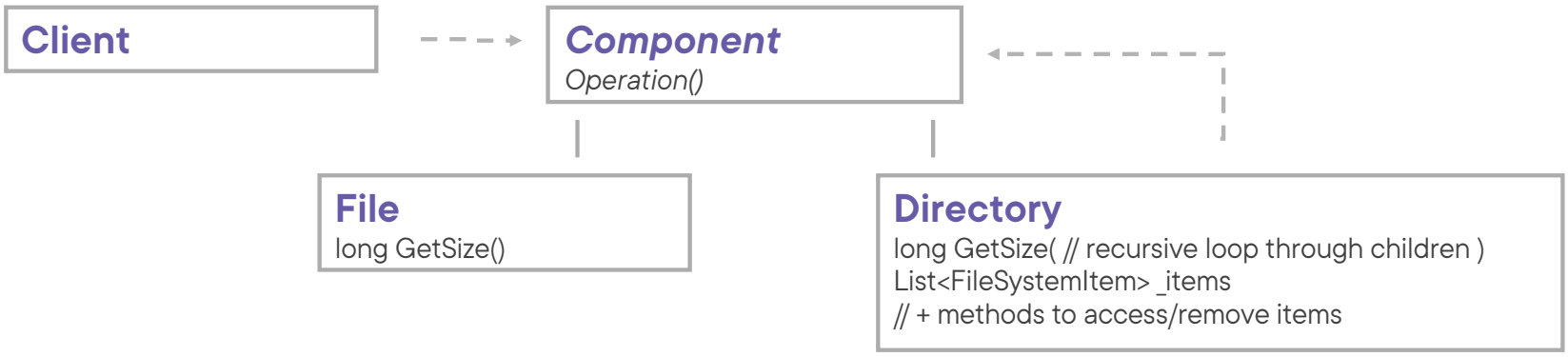
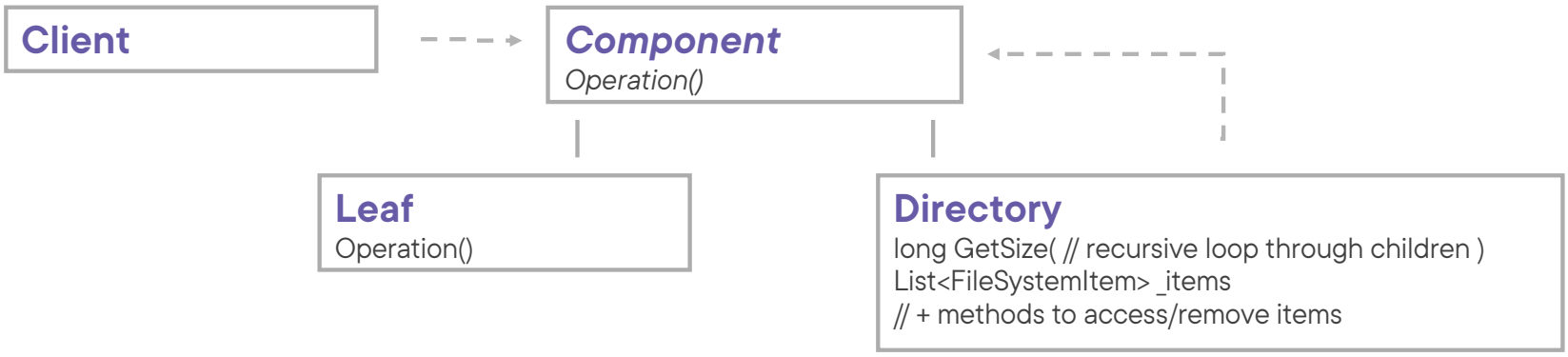


Component declares the interface for objects on the compositions, and contains a common operation

Structure of the Composite Pattern

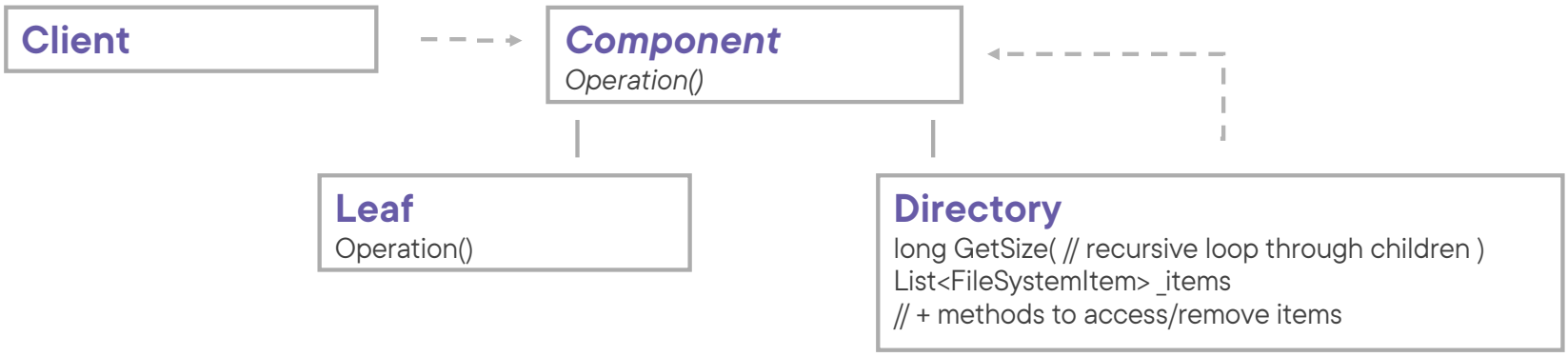


Structure of the Composite Pattern



Leaf represents leaf objects in the composition, and has no children. It defines behavior for primitive objects in the composition.

Structure of the Composite Pattern



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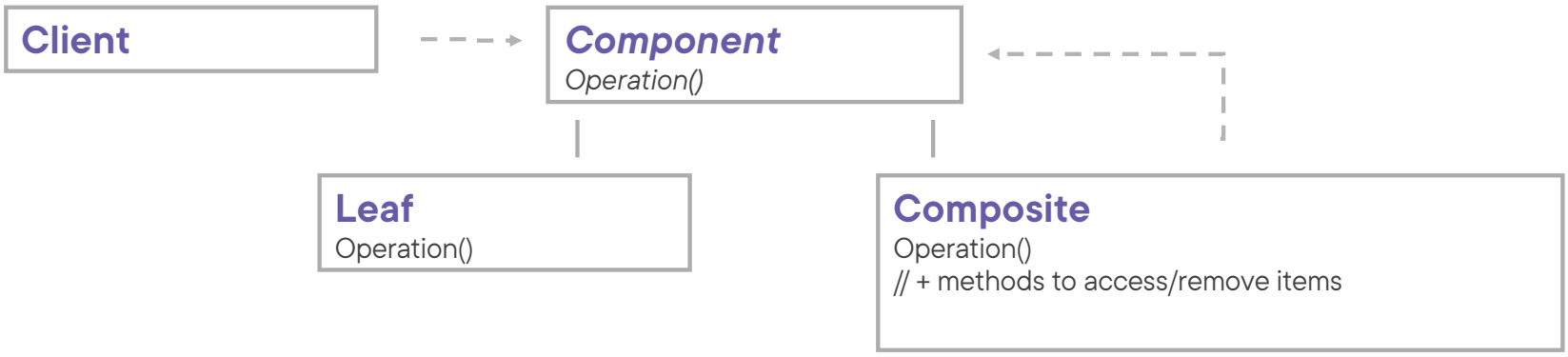
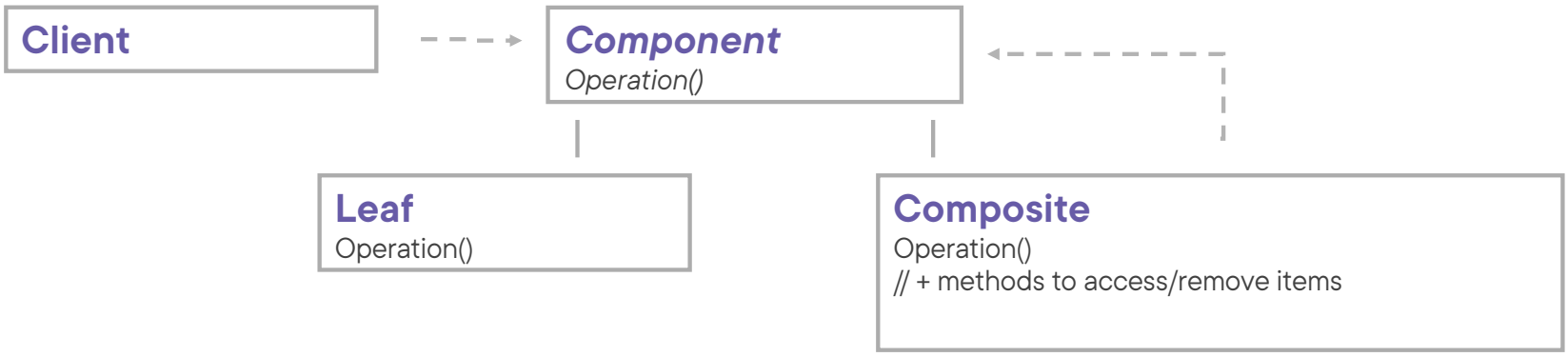


Composite stores child components and defines behavior for components having children

Structure of the Composite Pattern



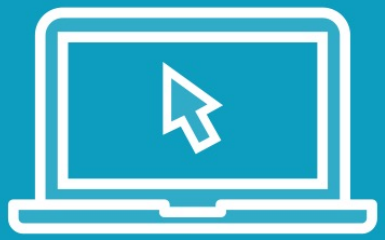
Client manipulates objects in the compositions through the **Component** interface

Structure of the Composite Pattern

Variations exist

- Original template defines an operation to get a specific child
- Original template defines child management operations on the Component abstract base class

Demo



Implementing the composite pattern

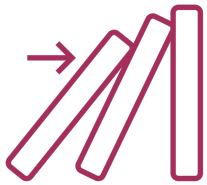
Use Cases for the Composition Pattern

When you want to represent part-whole hierarchies of objects

When you want to be able to ignore the difference between compositions of objects and individual objects

Pattern Consequences

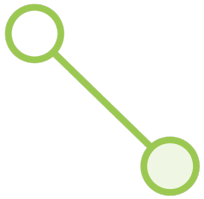
Makes the client simple



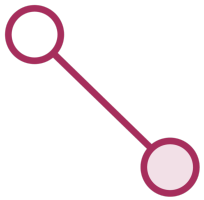
It's easy to add new kinds of components: open/closed principle

It can make the overall system too generic

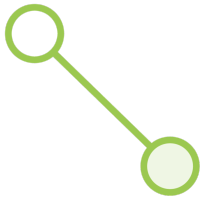
Related Patterns



Chain of responsibility
Leaf component can pass a request through a chain of all parent components



Iterator
Can be used to traverse composites



Visitor
Can be used to execute an operation over the full composite tree

Summary

Intent of the composite pattern:

- Provide a transparent, easy way to work with tree-like structures

Example of recursiveness

Up Next:
Structural Pattern: Facade