Behavioral Pattern: Command

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Coming Up

Describing the command pattern

- Clicking a button to add an employee to a list

Structure of the command pattern

Variation: supporting undo with a command manager

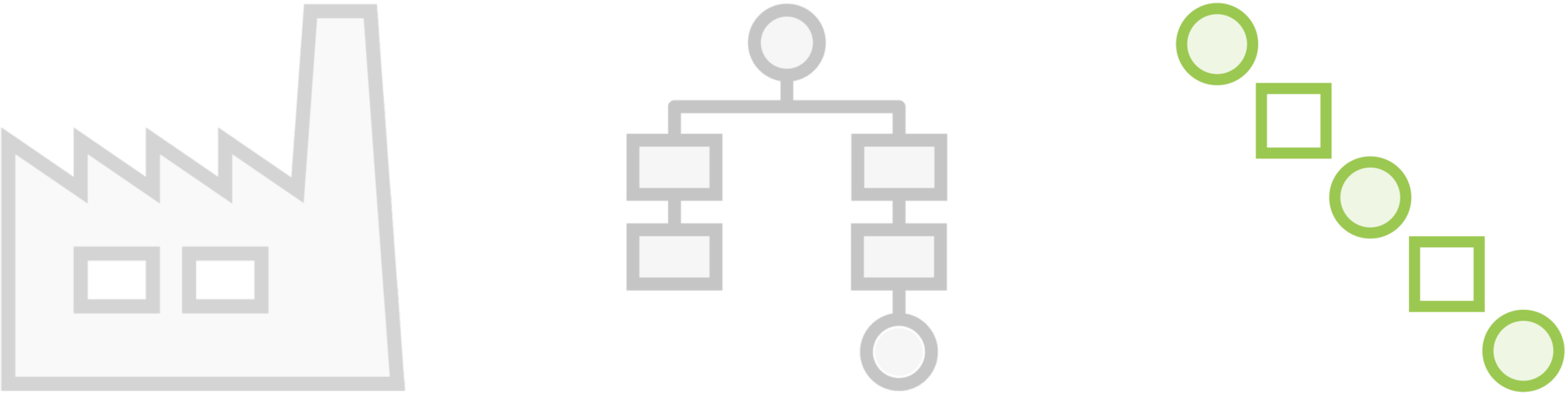
Coming Up

Use cases for this pattern

Pattern consequences

Related patterns

Describing the Command Pattern



Creational

Structural

Behavioral

Command

The intent of this pattern is to encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and support undoable operations.

```
void SomeButton_Click(Object sender, EventArgs e)
{
    // open file...
    // add product...
    // add employee to list...
}
```

Describing the Command Pattern

No separation of concerns
Not a good approach for code reuse
Not technically feasible sometimes

Describing the Command Pattern

Command pattern allows decoupling the requester of an action from the receiver

- Very common in mobile or rich UI development

```
// execute a command on click via binding
<Button Command="{Binding SomeCommand}" Content=“A button"/>

// manually execute a command on click
void SomeButton_Click(Object sender, EventArgs e)
{
    var viewModel = (AViewModelClass)DataContext;
    if (viewModel.SomeCommand.CanExecute())
    {
        viewModel.SomeCommand.Execute();
    }
}
```

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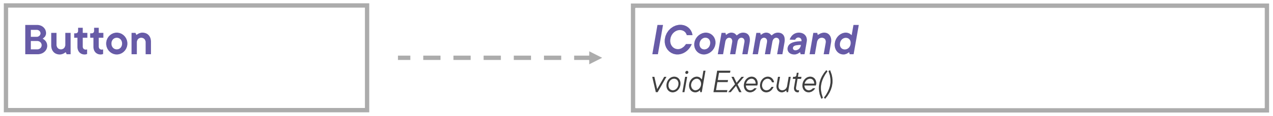

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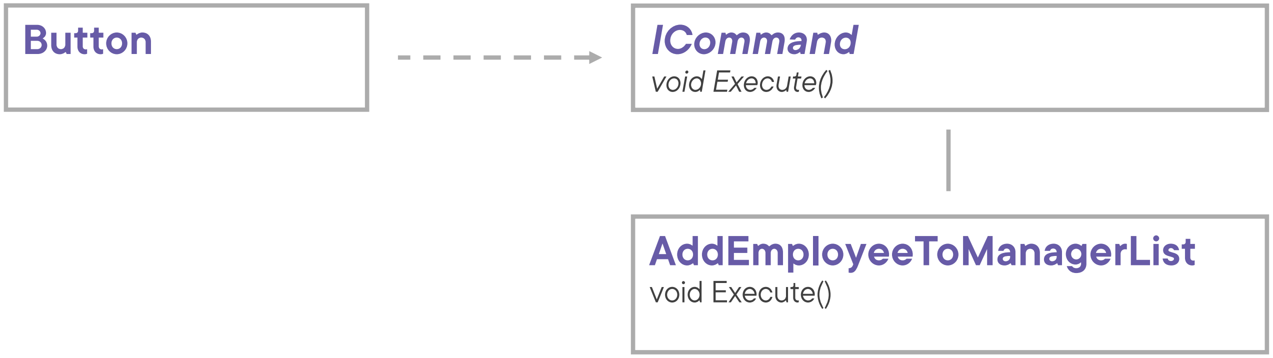

Button

ICommand
void Execute()

AddEmployeeToManagerList
void Execute()

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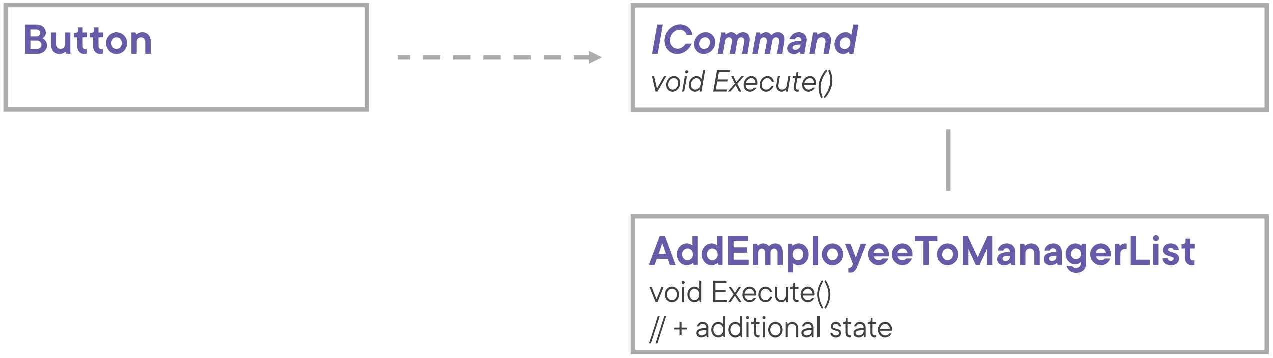

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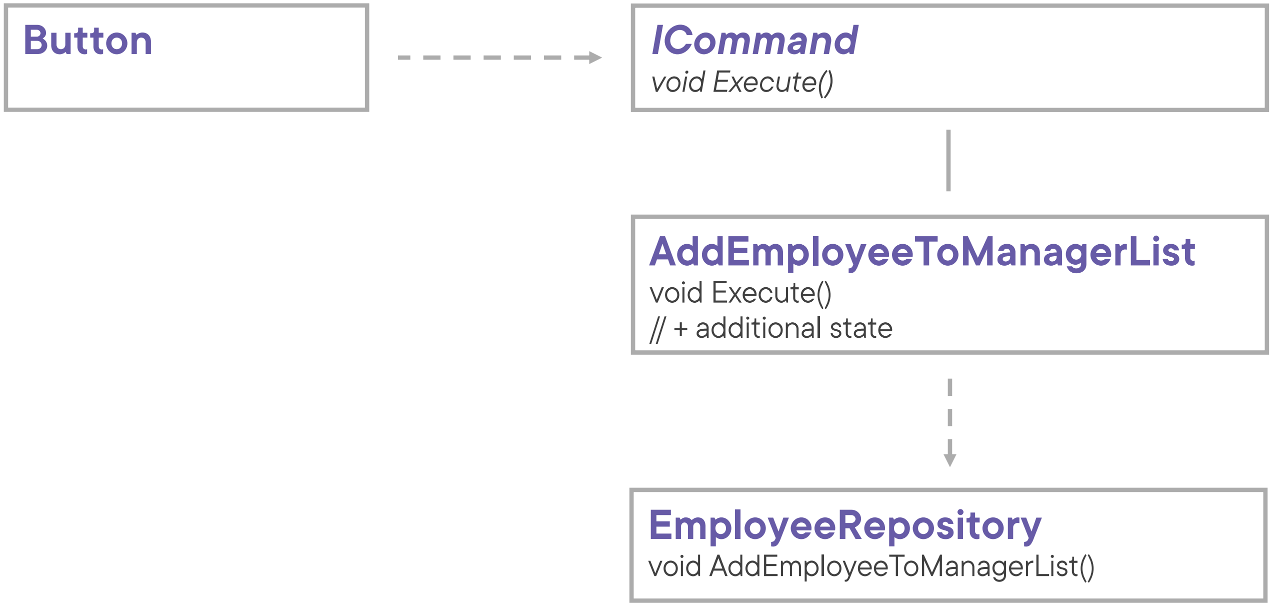


Button

ICommand

void Execute()

AddEmployeeToManagerList

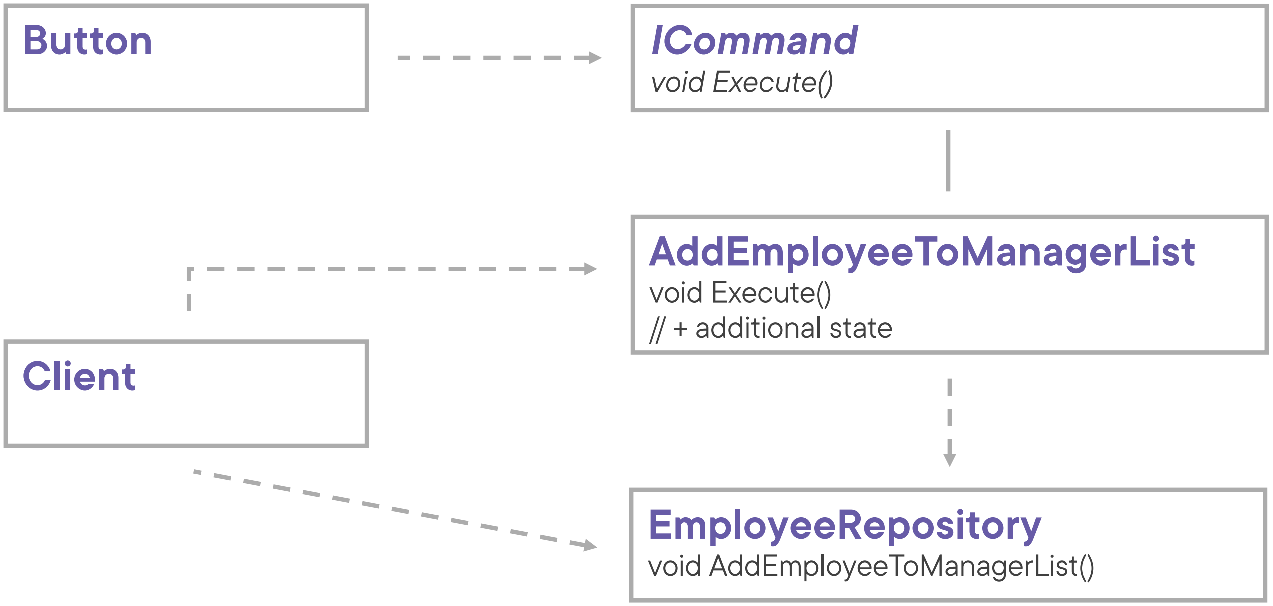
void Execute()

// + additional state

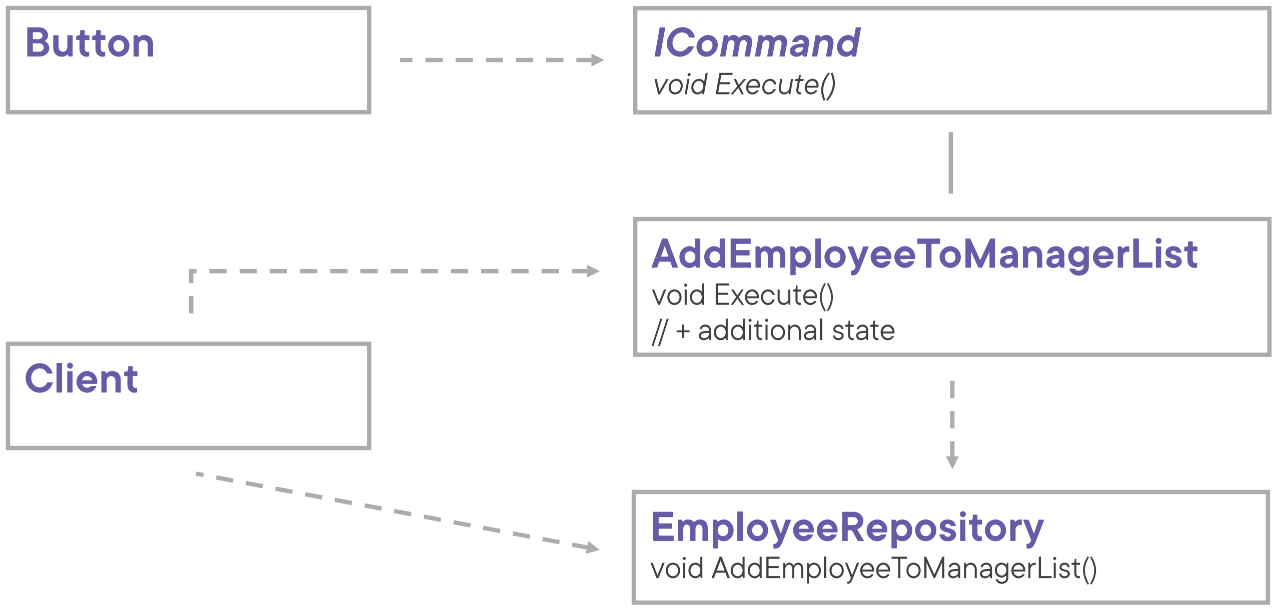
EmployeeRepository

void AddEmployeeToManagerList()

Describing the Command Pattern



Structure of the Command Pattern



Button

ICommand

void Execute()

AddEmployeeToManagerList

void Execute()

// + additional state

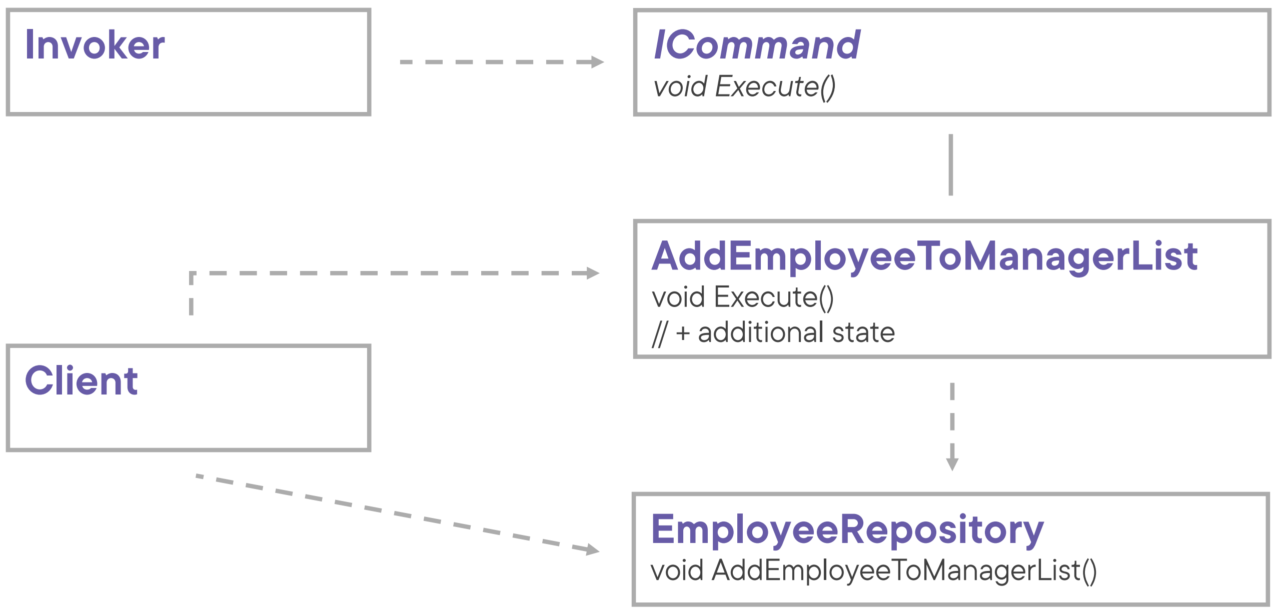
Client

EmployeeRepository

void AddEmployeeToManagerList()

Invoker asks **Command** to cary out a request

Structure of the Command Pattern



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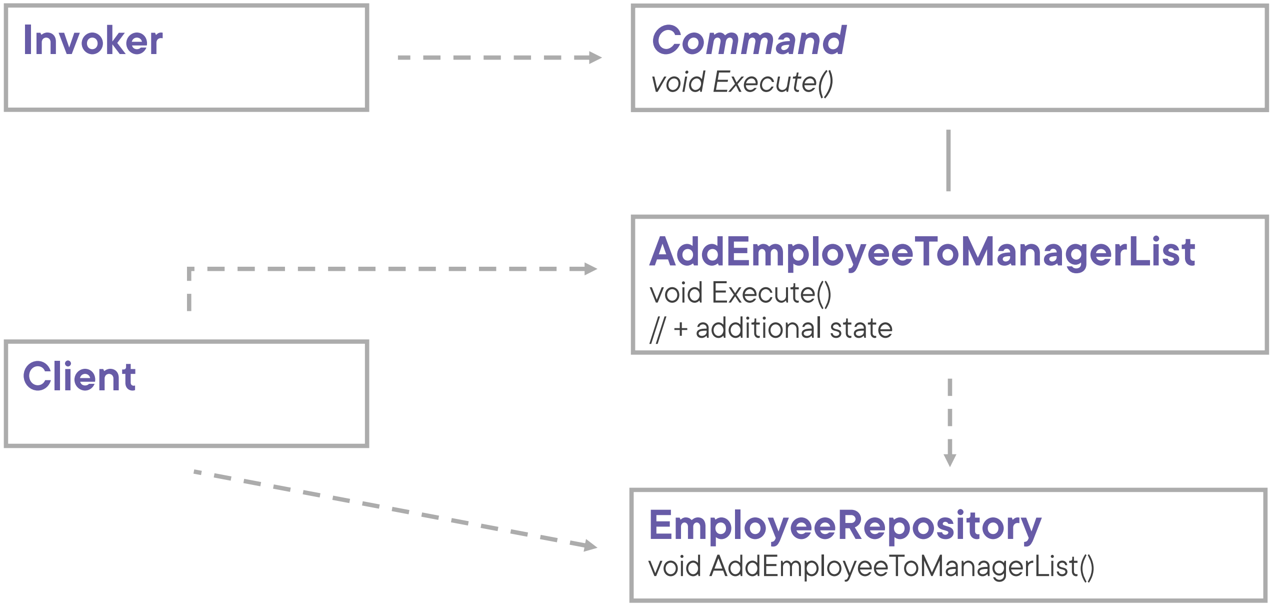
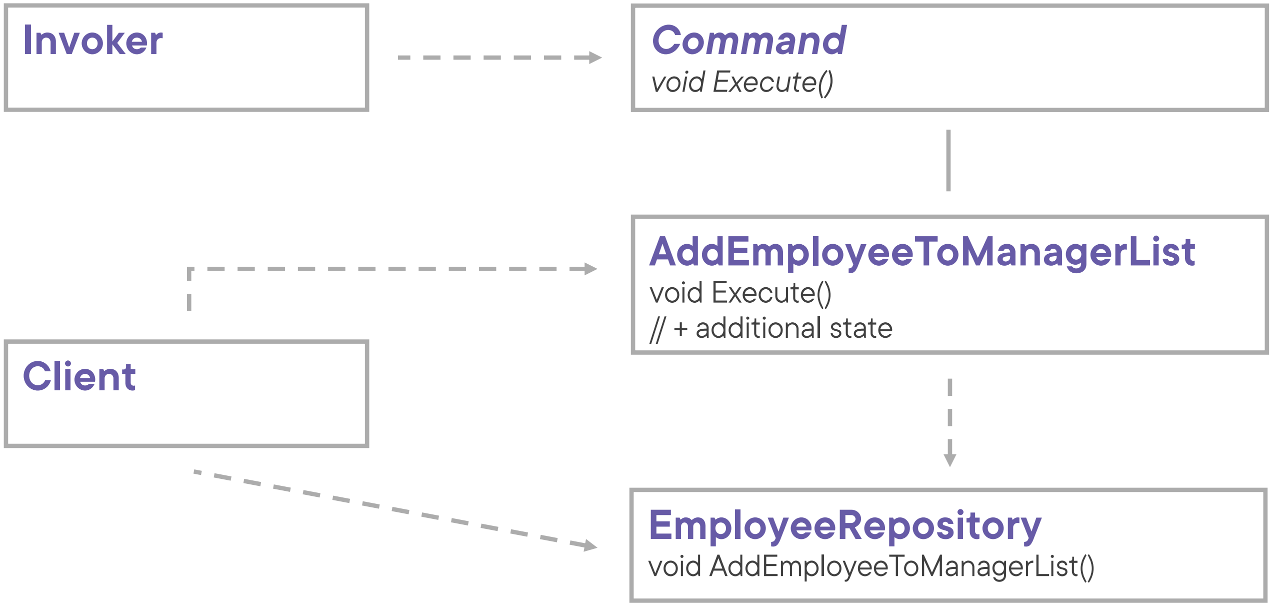


Command declares an interface for executing an operation

Structure of the Command Pattern



Invoker

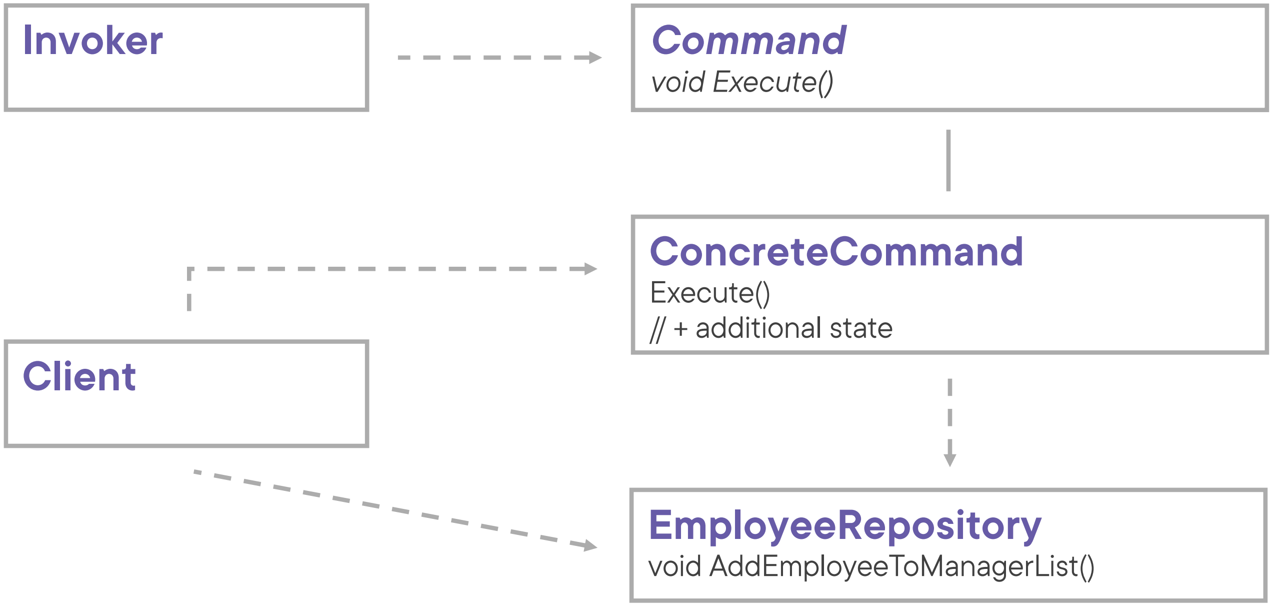
Command
void Execute()

AddEmployeeToManagerList
void Execute()
// + additional state

Client

EmployeeRepository
void AddEmployeeToManagerList()

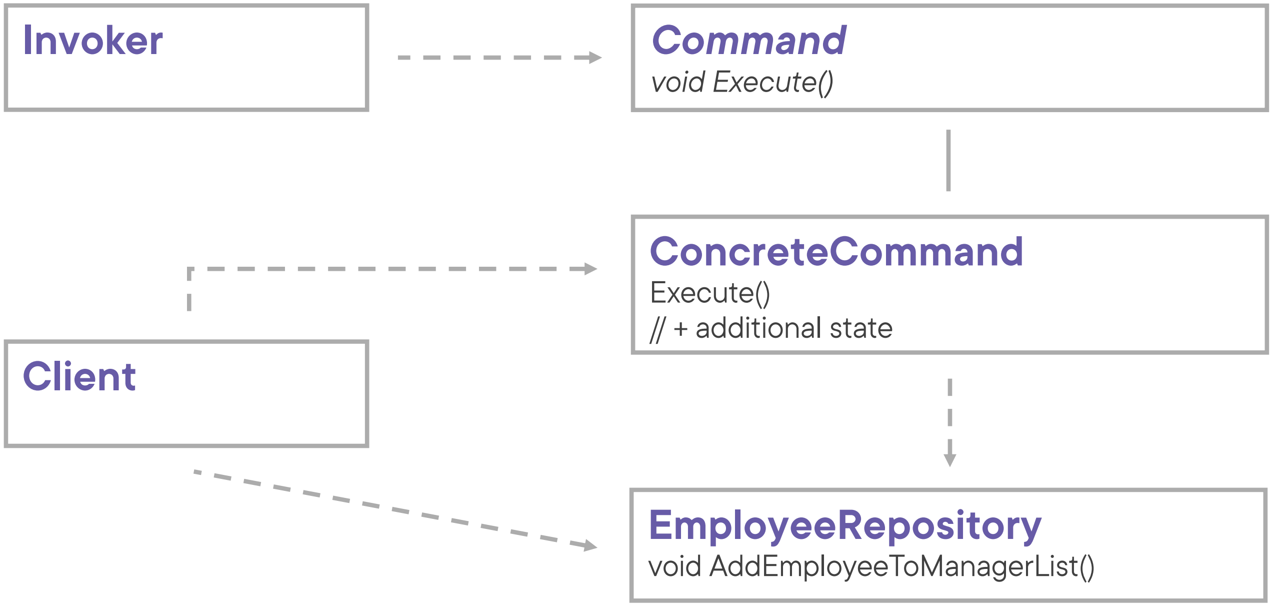
Structure of the Command Pattern



ConcreteCommand defines a binding between a **Receiver** and and action. It implements Execute by invoking the corresponding operation(s) on **Receiver**.

Receiver knows how to perform the operations associated with carrying out a request

Structure of the Command Pattern



Invoker

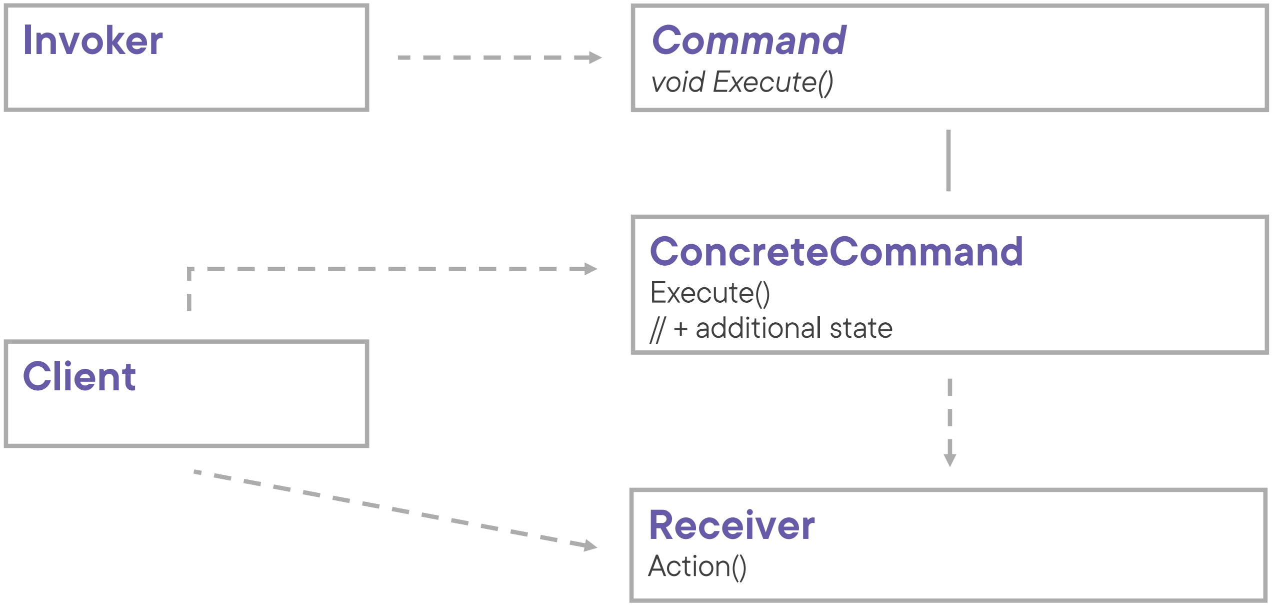
Command
void Execute()

ConcreteCommand
Execute()
// + additional state

Client

EmployeeRepository
void AddEmployeeToManagerList()

Structure of the Command Pattern



Invoker

Command
void Execute()

ConcreteCommand
Execute()
// + additional state

Client

Receiver
Action()

Client creates the **ConcreteCommand** and sets its **Receiver**

Demo

Implementing the command pattern

Demo

Supporting undo with a command manager

Use Cases for the Command Pattern

- When you want to parameterize objects with an action to perform

- When you want to support undo

- When you want to specify, queue and execute requests at different times

- When you need to store a list of changes to potentially reapply later on

Pattern Consequences

- It decouples the class that invokes the operation from the one that knows how to perform it: single responsibility principle
- Commands can be manipulated and extended
- Commands can be assembled into a composite command
- Existing implementations don’t have to be changed to add new commands: open/closed principle
- Because an additional layer is added, complexity increases

Related Patterns

Composite
Can be used to implement commands composed of other commands

Memento
Can be used to store the state a command requires to undo its effect

Prototype
In case of supporting undo, a command that must be copied acts as a prototype

Chain of Responsibility
Handlers can be implemented as commands

Patterns that Connect Senders and Receivers

Chain of Responsibility
Passes a request along a chain of receivers

Command
Connects senders with receivers unidirectionally

Mediator
Eliminates direct connections altogether

Observer
Allows receivers of requests to (un)subscribe at runtime

Summary

Intent of the command pattern:

- To encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and support undoable operations

Summary

Implementation:

- Define methods on `Command`
- Implement on `ConcreteCommand`
- `Invoker` is often a UI element
- `Receiver` can be any object

Consider using a command manager

Up Next:

Behavioral Pattern: Memento