Module 08:
"Command"

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Agenda

- Introductory Example: Toggling Lights
- Challenges
- Implementing the Command Pattern
- Pattern: Command
- Overview of Command Pattern
- .NET Framework Example: WPF Commands
- Command Extensions and Variations

Introductory Example: Moving Parts

```
public class Light
{
    private bool _on;

    public Light() => _on = false;

    public void Toggle()
        => _on = !_on;
}
```

```
Light light = new Light();

string input = Console.ReadLine();
if( input.ToLower() == "toggle" )
{
    light.Toggle();
}
```

Challenges

- How do we decouple the client from the actual light?
- What if we want to toggle more lights?
- What if we want to control other kinds of lights?
- What if we want to support timed controls?

Pattern: Command

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

- Outline
  - A class delegates a request to command object instead of implementing directly
  - Decouples the invoker of a request from how it is executed.

- Origin: Gang of Four

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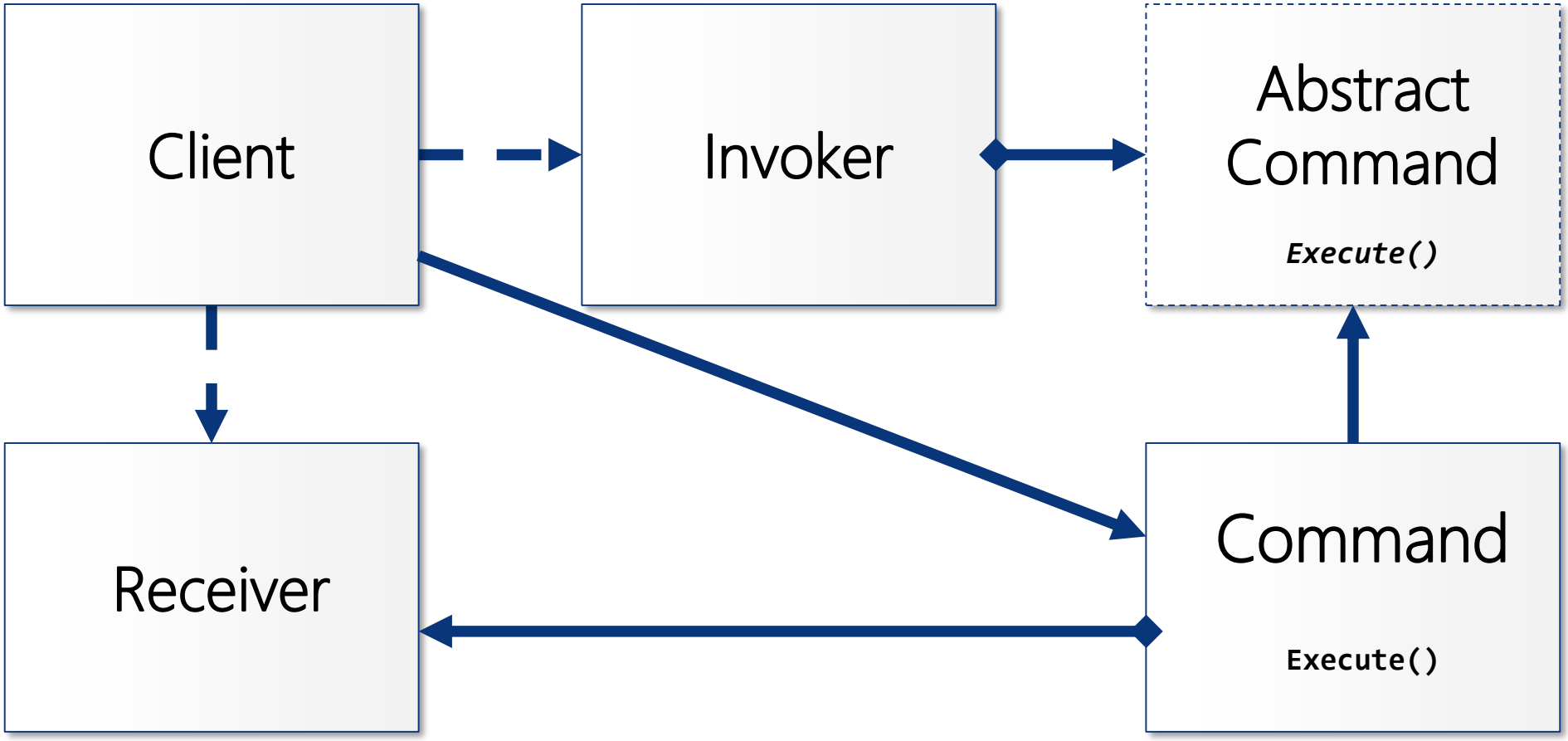
Overview of Command Pattern



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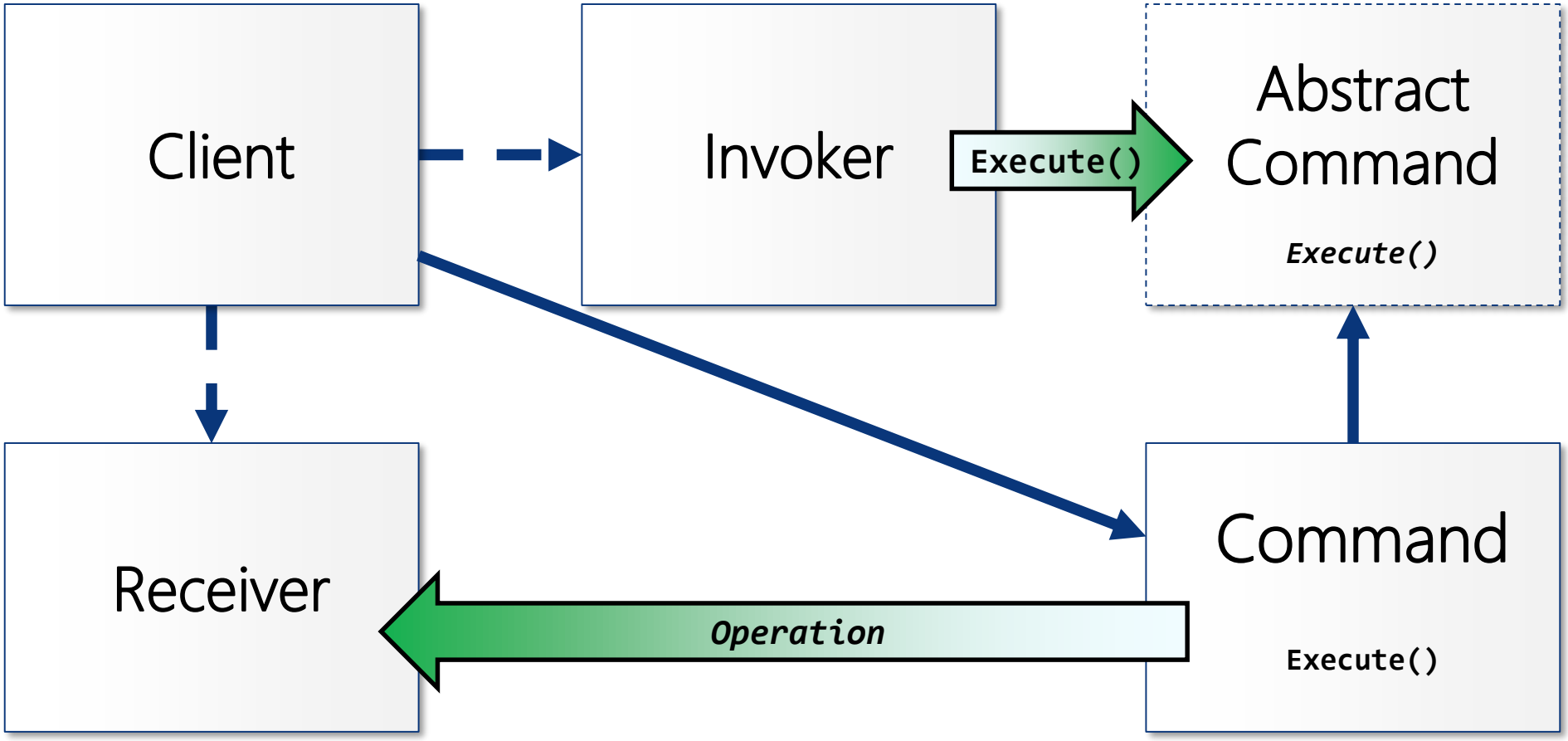
Overview of Command Pattern



Overview of Command Pattern

- Client
  - Creates Command and Invoker and supplies Invoker with Command
- Abstract Command
  - Interface or abstract class defining general `Execute()` method
- Command
  - Concrete command class encapsulating action and parameter to `Execute()` at Receiver
- Invoker
  - Invokes Command without knowing contents of command object
- Receiver
  - Performs specified action when Invoker executes command object

.NET Framework Example: WPF Commands

- Commands have already been built into Windows Presentation Foundation

```
<Button Command="{Binding AddCommand}">Add</Button>
<Button Command="{Binding UndoCommand}">Undo</Button>
```

```
public class RelayCommand : ICommand
{
    public RelayCommand( Action<object> execute,
                         Predicate<object> canExecute )
    { ... }
}
```

Command Extensions and Variations

- Invocations often use parameters
  - These are stored within the Command object
- Commands are often constructed by factories

- Possible extensions to the **`ICommand`** interface
  - **`Validate()`**
  - **`Execute()`**
  - **`Undo()`**


WINCUBATE
Jesper Gulmann Henriksen
PhD, MCT, MCSD, MCPD
Phone : +45 22 12 36 31
Email : jgh@wincubate.net
WWW : http://www.wincubate.net
Ringgårdsvej 4A
8270 Højbjerg
Denmark