The Open/Closed Principle

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The Open/Closed Principle

- Probably around since the late 1980's
  - Betrand Beyer, Object-Oriented Software Construction, 1st edition. Prentice-Hall 1988, ISB 0-13-629031-0

Definition 1 (Bertrand Mayer)

- *"Software entities (classed, modules, functions, etc.) should be open for extension but closed for modifictaion:*
  - *A moudle will be said to be **open** if it is still available for extension. For example it should be possible to add fields to the data structure it contains, or new elements to the set of functions it performs."*
  - *"A module will be seaid to be **closed** if [it] is available for use by other modules. This assumes that the module has been given a well-defined, stable description (thi interface int he sense of information hiding)"*

Definition 2 (Robert C. Martin)

"You should be able to extend the behavior of a system without having to modify that system."

What does it mean?

- Software entites should be **both** *Open for Extension* **and** *Closed for Modification* at the same time
- Open for Extensions: It is possible to extend behavior, i.e. adding functionality
- Closed for Modication: It is not necessary to modify (existing) manifestation of the sofware, i.e. source code, compilation, etc.

Whit is it a "good" thing?

- Change of requirements is immanent through the life cycle of most software
- The OCP decreases change impact, i.e. the number of moudles to modify
  - This number should tond to 0 since you are just adding or replacing modules
  - Allows new features without the need to re-engineer / re-arange existing ones
- The OCP decreases risk of regression because of human error, i.e. developer faults
  - Because change impact decreases

Example: Higher-Order Functions

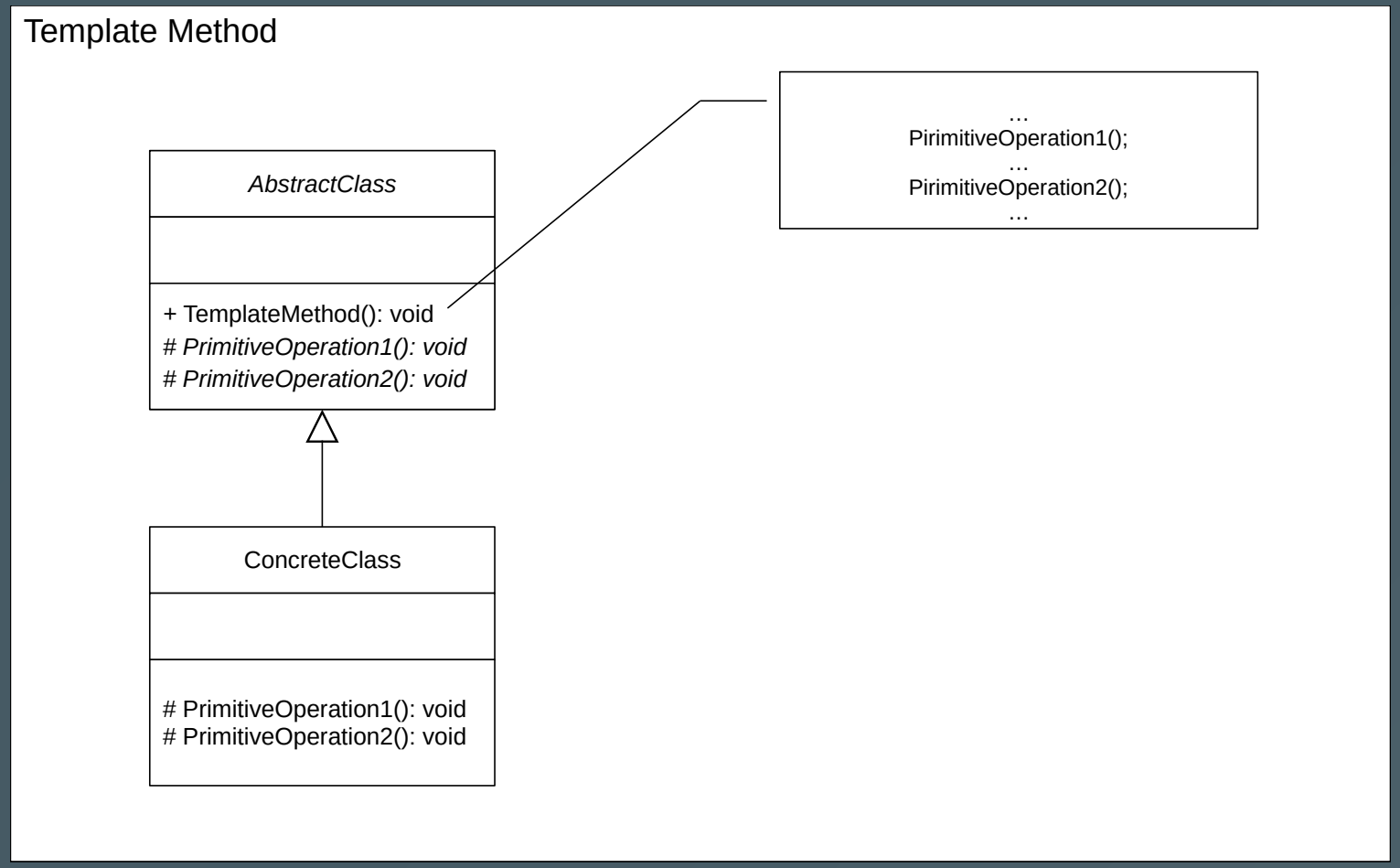
```
const twice = (f, v) => f(f(v))
const add3 = v => v + 3

console.log(twice(add3, 7)) // = 13
```

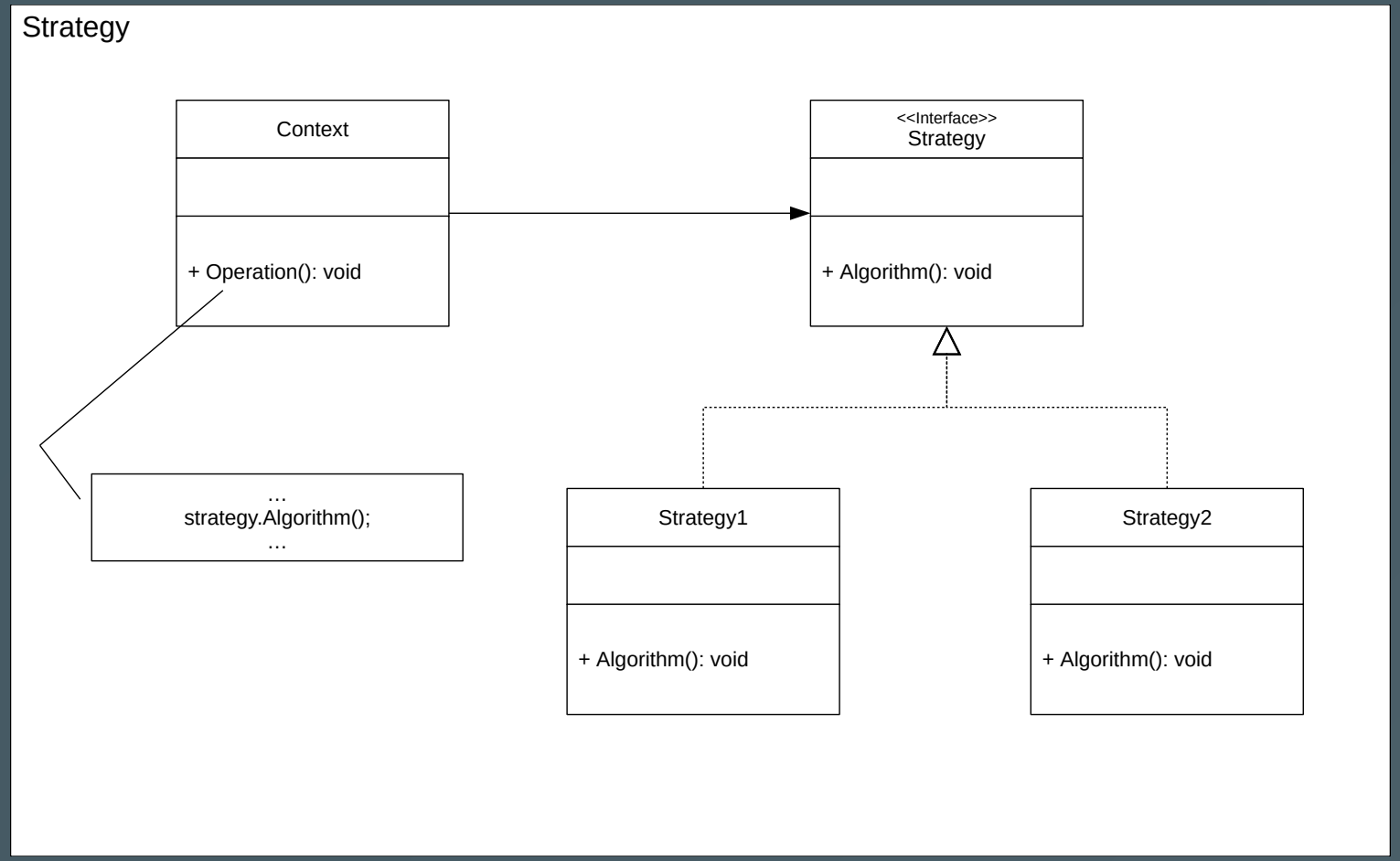
```
Func<Func<int,int>,Func<ing,int>> twice = f => x => f(f(x));
Func<int,int> add3 = x => x + 2;

Console.WriteLine(twice(add3)(7)) // = 13
```

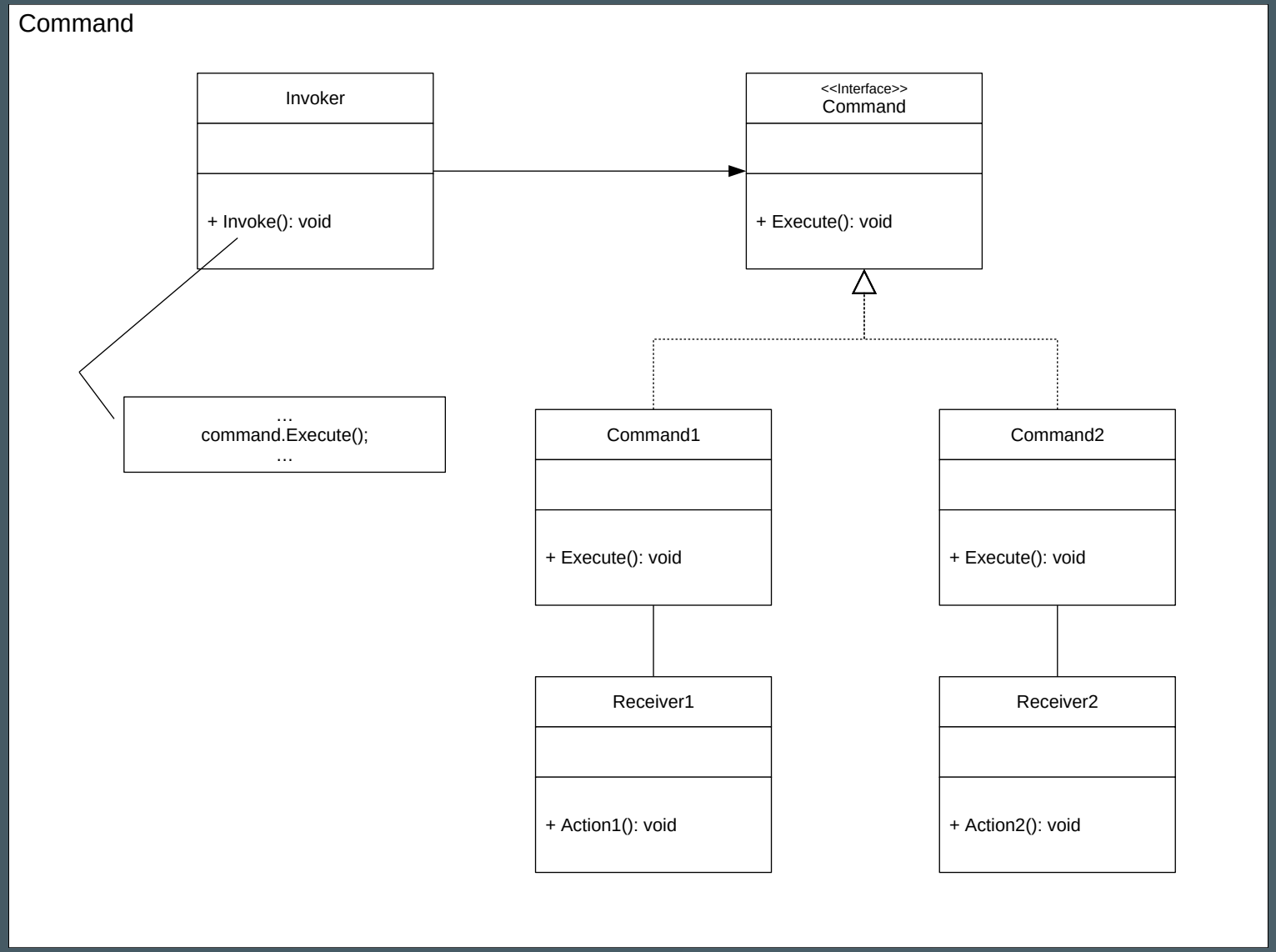
Example: Template Method Pattern



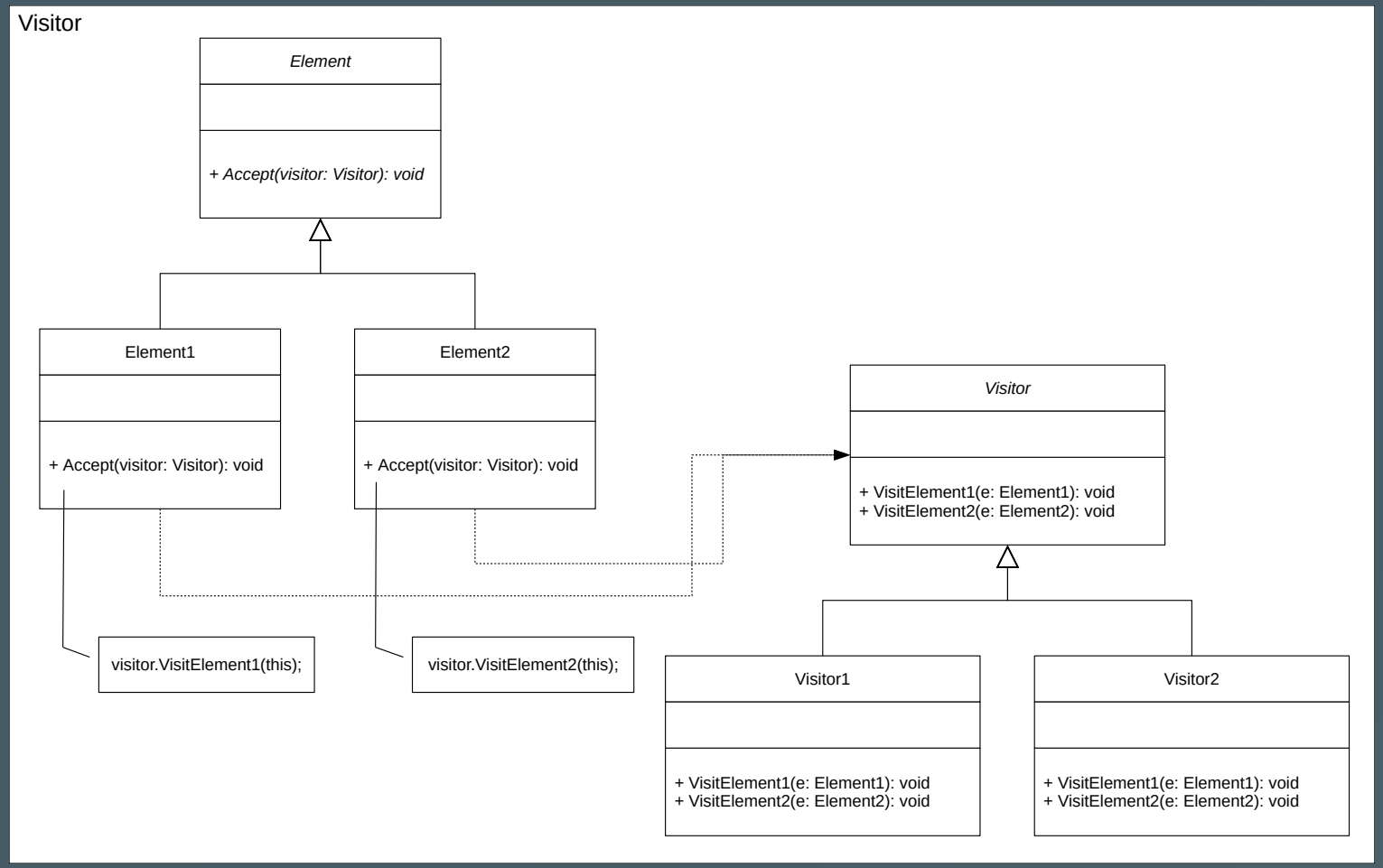
Example: Strategy Patern



Example: Command Patern



Example: Visitor Patern



Thanks!

References

- Bertrand Meyer. 1995. Object-oriented software construction, New York: Prentice Hall.
- Robert C. Martin. 2003. Agile Software Development, Principles, Patterns, and Practices, Prentice Hall.
- Robert C. Martin. 2014. The Open Closed Principle. (May 2014). Retrieved April 25, 2019 from http://blog.cleancoder.com/uncle-bob/2014/05/12/TheOpenClosedPrinciple.html