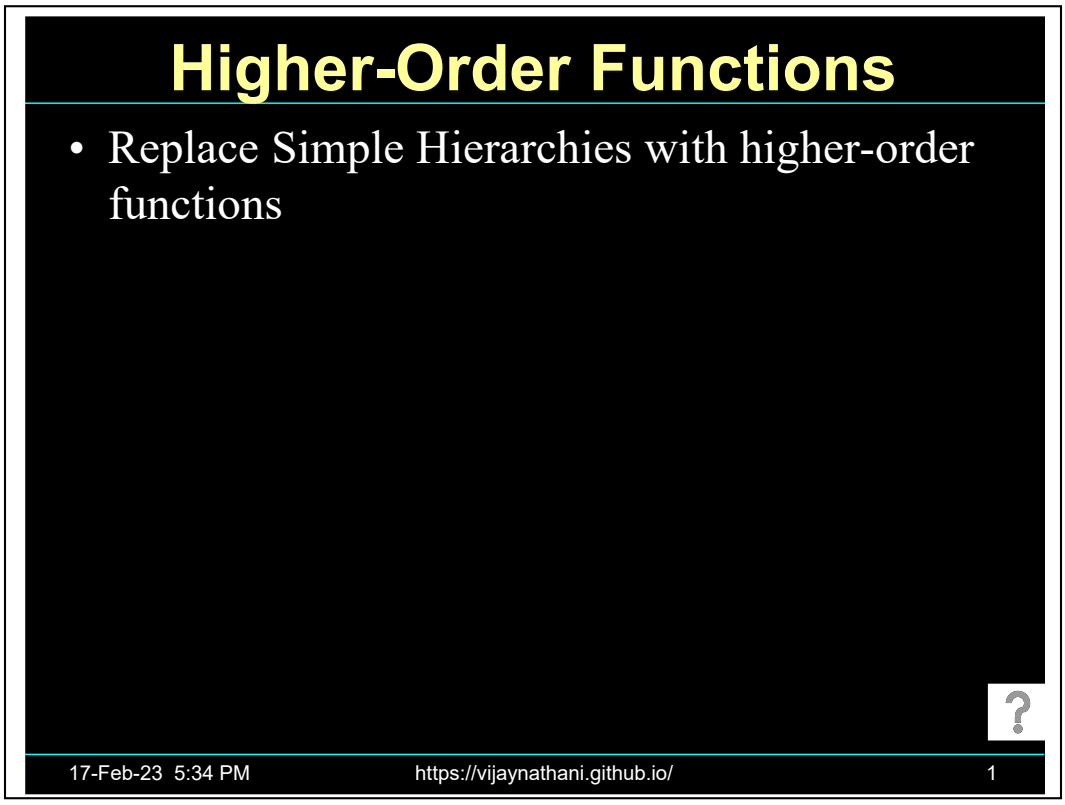

Higher-order functions means a function that either accepts a function or returns a function.

If a hierarchy has only one abstract function, derived class has no instance variables and all classes are small, then replace hierarchy by higher-order function.

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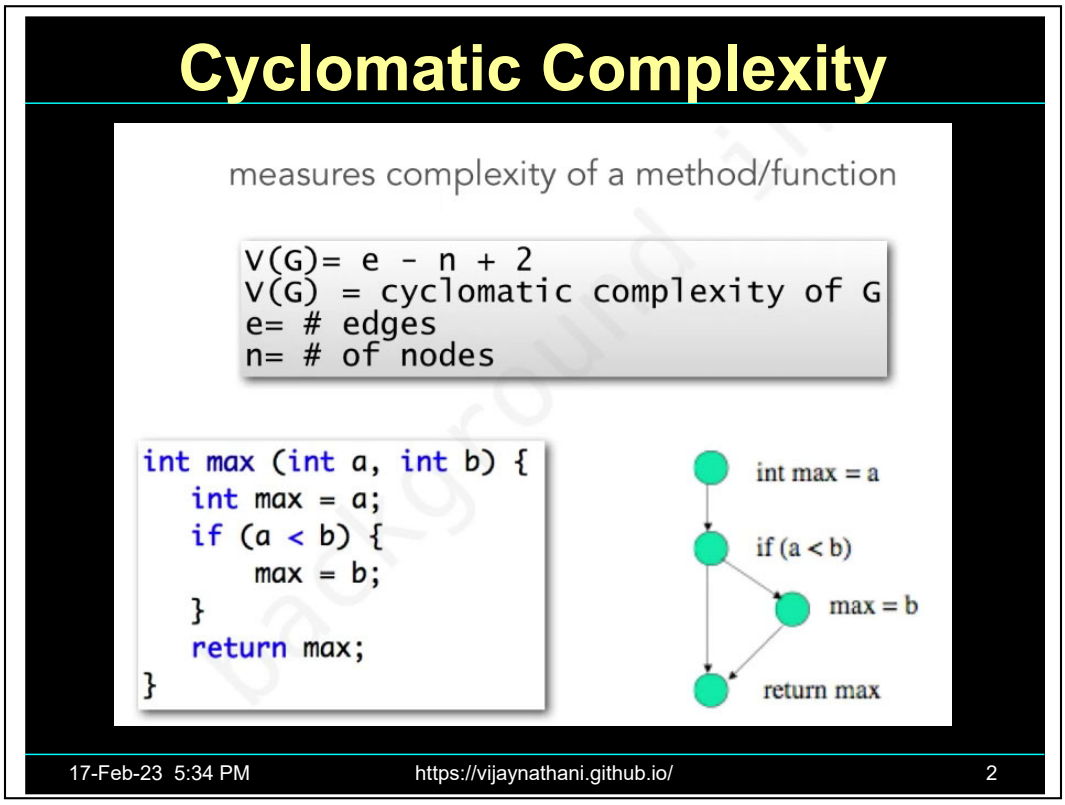
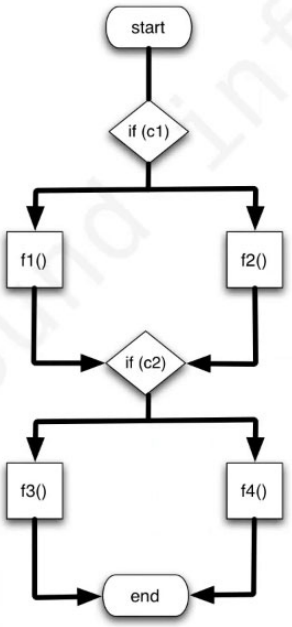


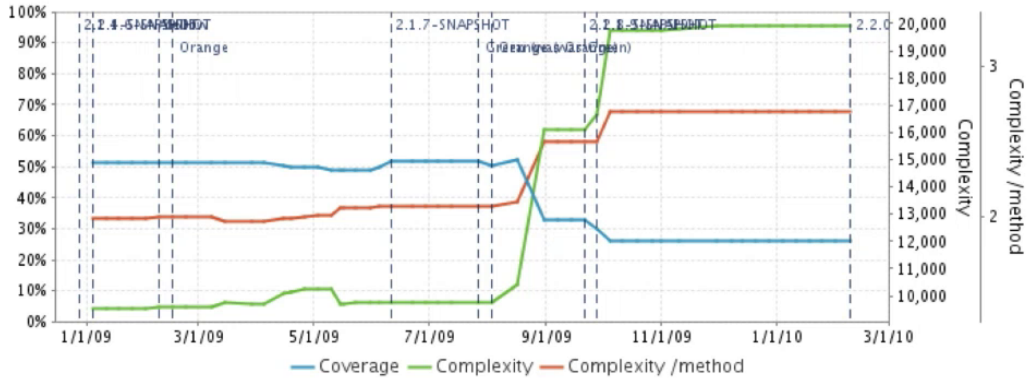
Cyclomatic complexity is a software metric (measurement). It was developed by Thomas J. McCabe, Sr. in 1976 and is used to indicate the complexity of a program. It is a quantitative measure of the complexity of programming instructions. It directly measures the number of linearly independent paths through a program's source code.

Cyclomatic Complexity?

```
public void doIt() {
    if (c1) {
        f1();
    } else {
        f2();
    }
    if (c2) {
        f3();
    } else {
        f4();
    }
}
```



Struts – Time Machine

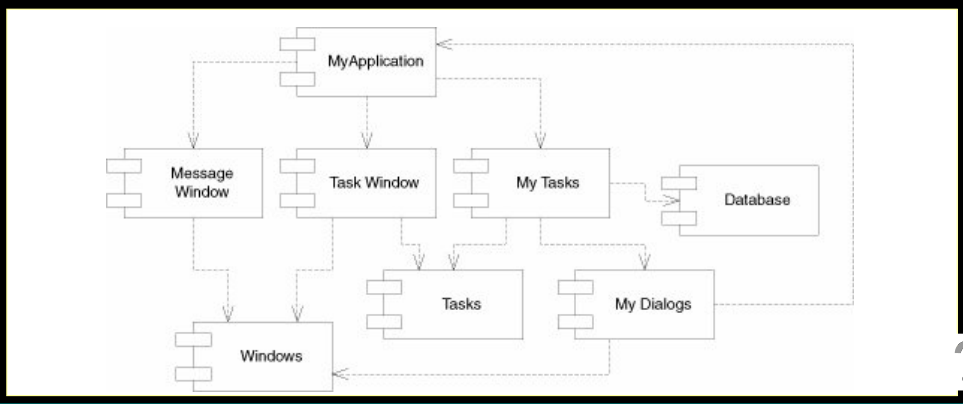


Principles

- The Release/Reuse Equivalency Principle
  - The granule of reuse is the granule of release.
    - ➢Either all the classes in a component are reusable, or none of them are.
- The Common Reuse Principle
  - The classes in a component are reused together.
    - ➢If we reuse one of the classes in a component, we reuse them all.
- The Common Closure Principle
  - Classes that change together, belong together in a package.

Principles

- Acyclic Dependencies Principles (ADP)
  - No cycles in the package diagram of a particular layer.
  - No cycles in the component dependency graph



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A component contains one or more packages. If there are no cycles in package diagram, then there will be no cycles in component diagram.

Cycles are introduced in package diagram as an example of code deterioration. So run JDepend tools regularly.

Example of violation

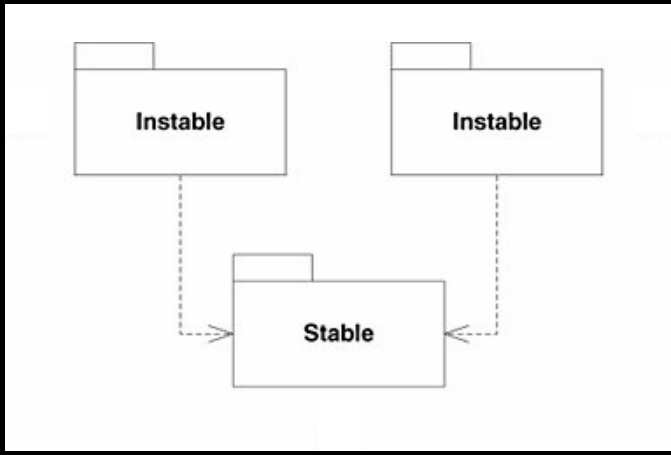
•java.util <-> java.lang : Java.lang.String imports java.util.Locale. java.util.Locale uses String.

•Hibernate

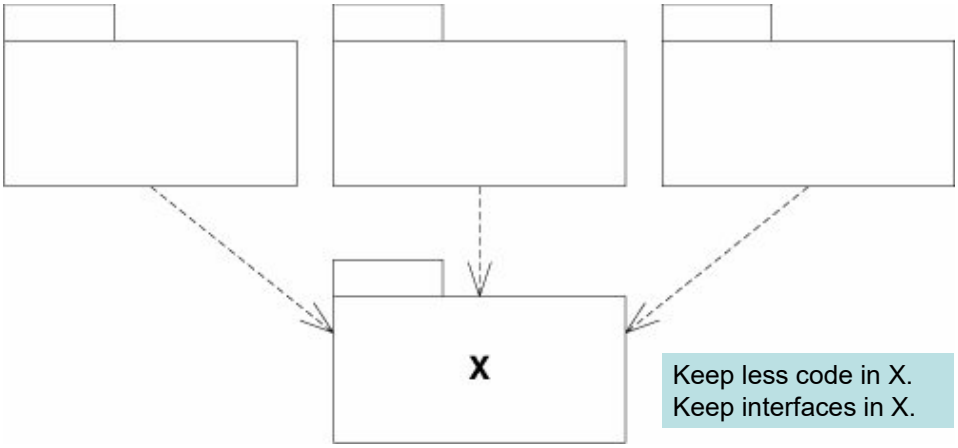
Good example: Spring does not contain a single package circle.

Principles

- Stable Dependencies Principle
  - A package should only depend upon packages that are more stable than it is.

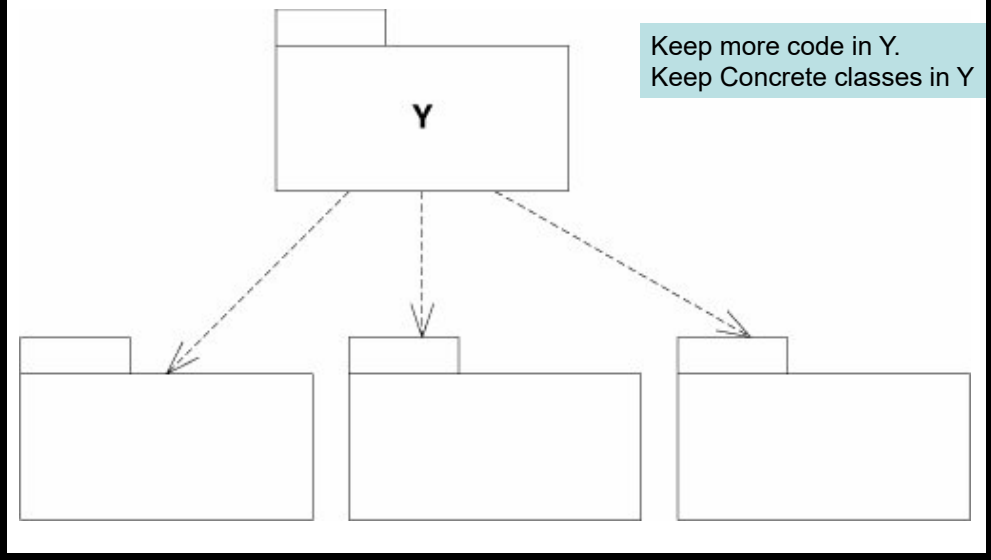


X - a Stable component



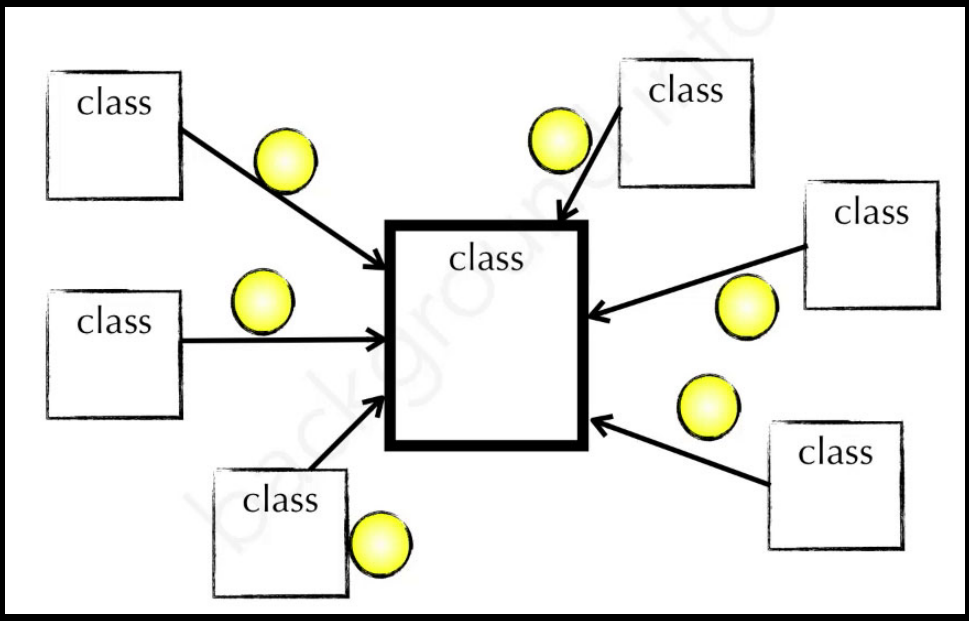
X should be really well-designed.

Y - a Unstable component

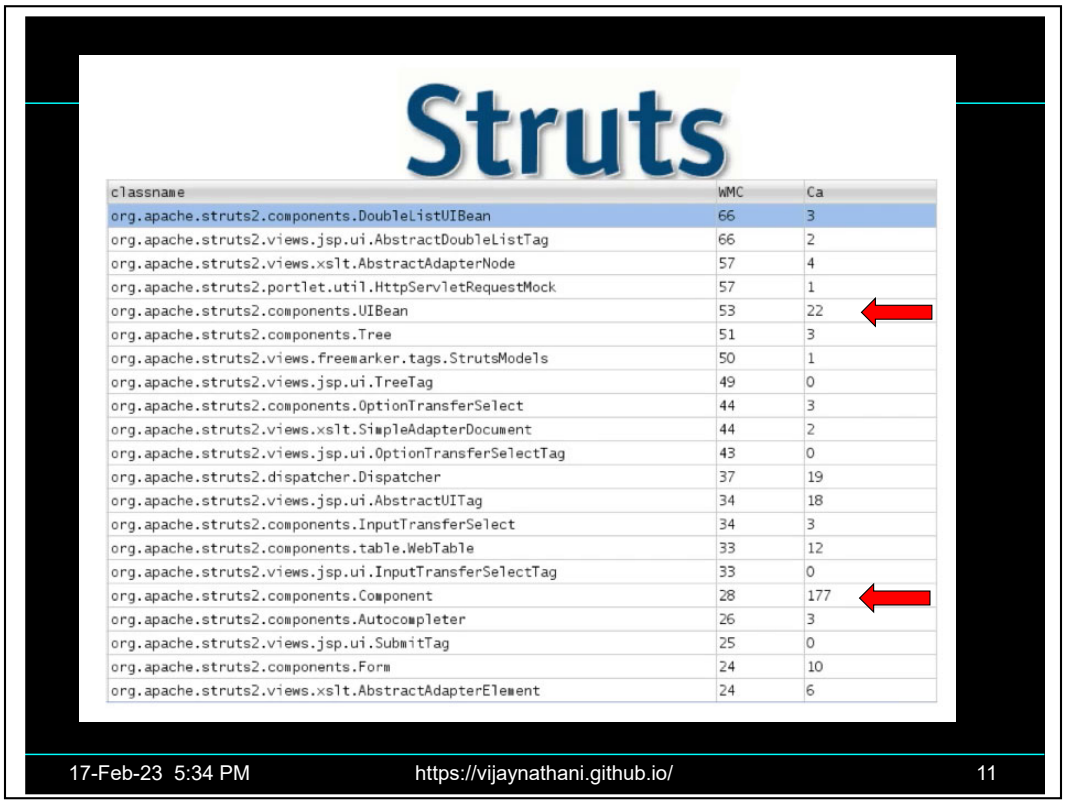


If Y depends on many others, then Y is likely a God-class anti-pattern.

Afferent Coupling



God Class in center should be refactored.



WMC is weighted method count. WMC for a class is the sum of cyclomatic complexity of all its methods.

For every class in Struts, we have cyclomatic complexity and Afferent coupling.

There may be little value in refactoring a class with high cyclomatic complexity, but low Afferent coupling.

A class with low cyclomatic complexity is likey not badly designed.

We need to concentrate on classes where sum of cyclomatic complexity and Afferent coupling is high.