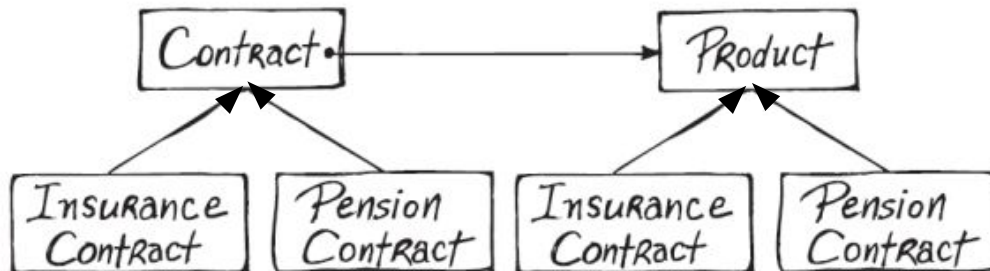
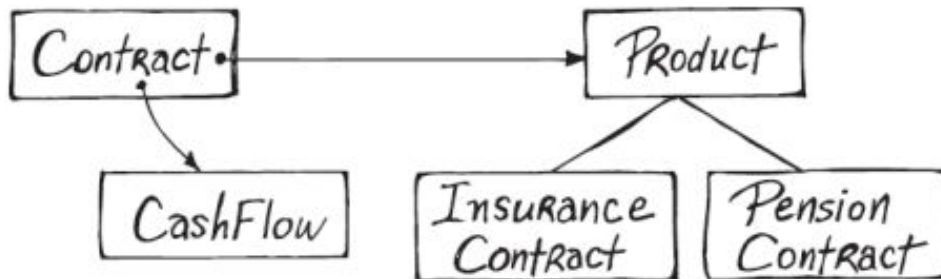


Improve



Eliminate Parallel Hierarchies



Reduce Coupling - Problem

```
Server s = new Server();
```

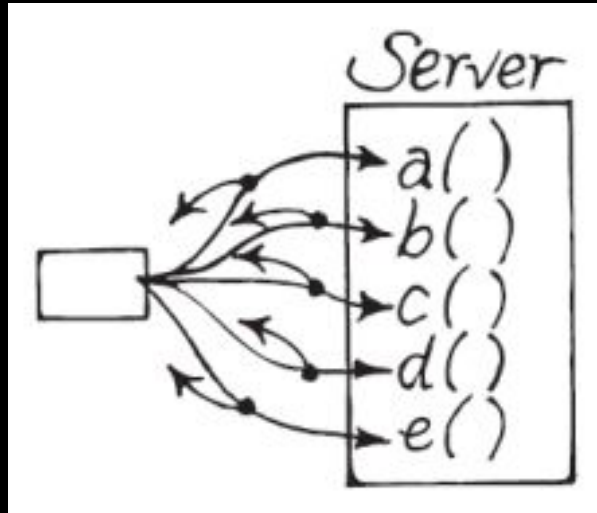
```
s.a(this);
```

```
s.b(this);
```

```
s.c(this);
```

```
s.d(this);
```

```
s.e(this);
```



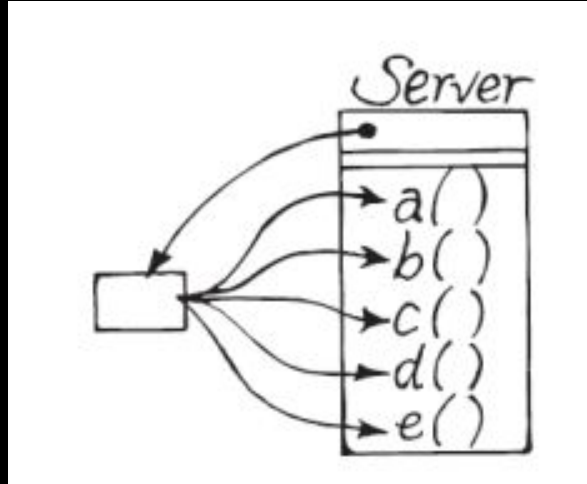
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Reduce Coupling - Solution

```
Server s = new Server(this);  
s.a();  
s.b();  
s.c();  
s.d();  
s.e();
```



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Better still: use Observer design pattern

Classes in an Application

- Many simple classes means that each class
 - encapsulates less of overall system intelligence
 - is more reusable
 - is easier to implement
- A few complex classes means that each class
 - encapsulates a large portion of system intelligence
 - is less likely to be reusable
 - is more difficult to implement

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Lots of little pieces

Classes are cohesive

Methods do only one thing.

Guidelines

- A Java/C# class should have less than 50 lines of code (100 for C++)
- Most Java/C# functions should be less than or equal to 5 lines. (10 for C++)
 - A function taking more than 3 arguments in Java/C# should be rare and justified specially (5 for C++).

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Note: On a Home PC - 1 Million function calls take 8 milliseconds and 1 Million objects are created in 23 milliseconds

Some Real Examples

Tool	Files	Lines/file (avg)	LOC/file (avg)
JUnit	88	71	39
Hibernate	1063	90	72
Eclipse	14,620	153	106
DomainObjects for .NET	422	164	98
Compiere ERP & CRM	1191	163	114
Hsqldb	290	503	198

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Q56srp – Restaurants

Q59srp - Customers

GoogleTest is a C++ project. Most functions are smaller than 10 lines.

CLOC tool reported

Language	files	blank	comment	code
C++	106	8876	11299	36926
C/C++ Header	49	3732	9719	15164