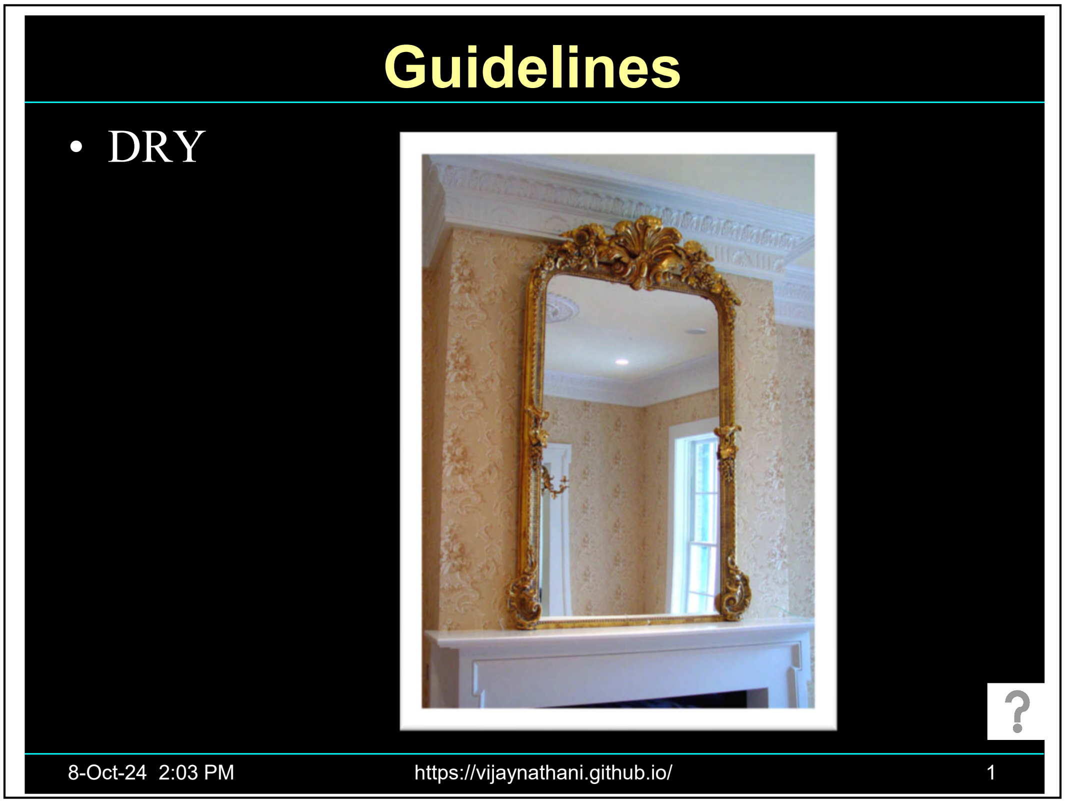


Guidelines

- DRY

Q021: BookRentals; Q11: BookRental; Q33 – SurveyData; Q37 – FOC, TT

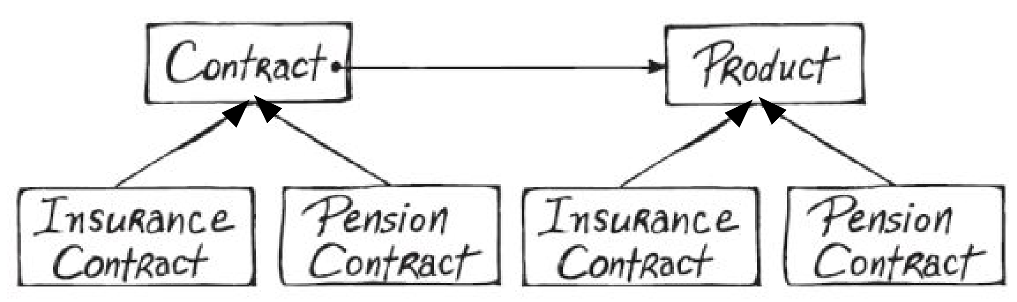
Q10 – Jbutton – Only for Java.

Q34 – replace; Q35 – BookRental

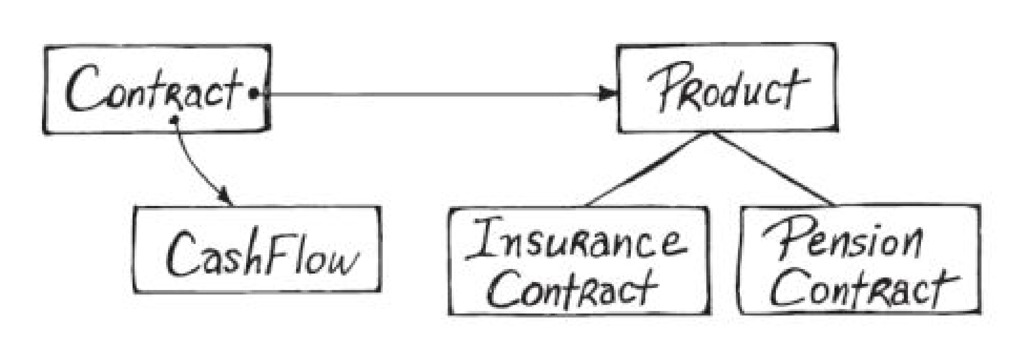
Q70 – Array Scan, Java only.

There are three numbers in software: 0, 1, and infinity. 0 represents the things we do not do in a system (we do those for free). 1 represents the things we do once and only once. But at the moment we do something twice, we should treat it as infinitely many and create cohesive services that allow it to be reused.

Improve

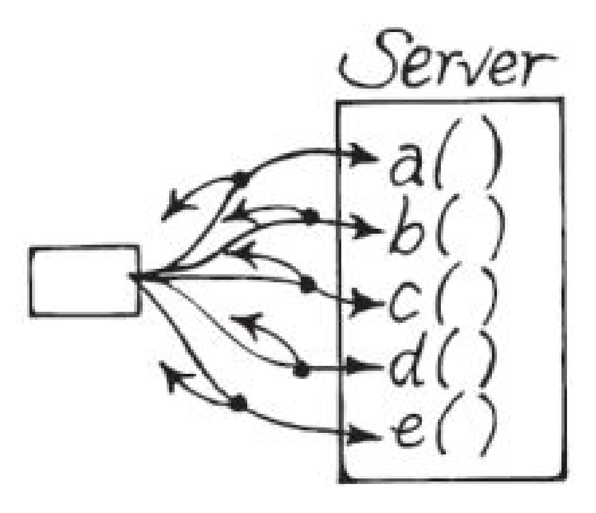

Contract
Product
Insurance Contract
Pension Contract
Insurance Contract
Pension Contract

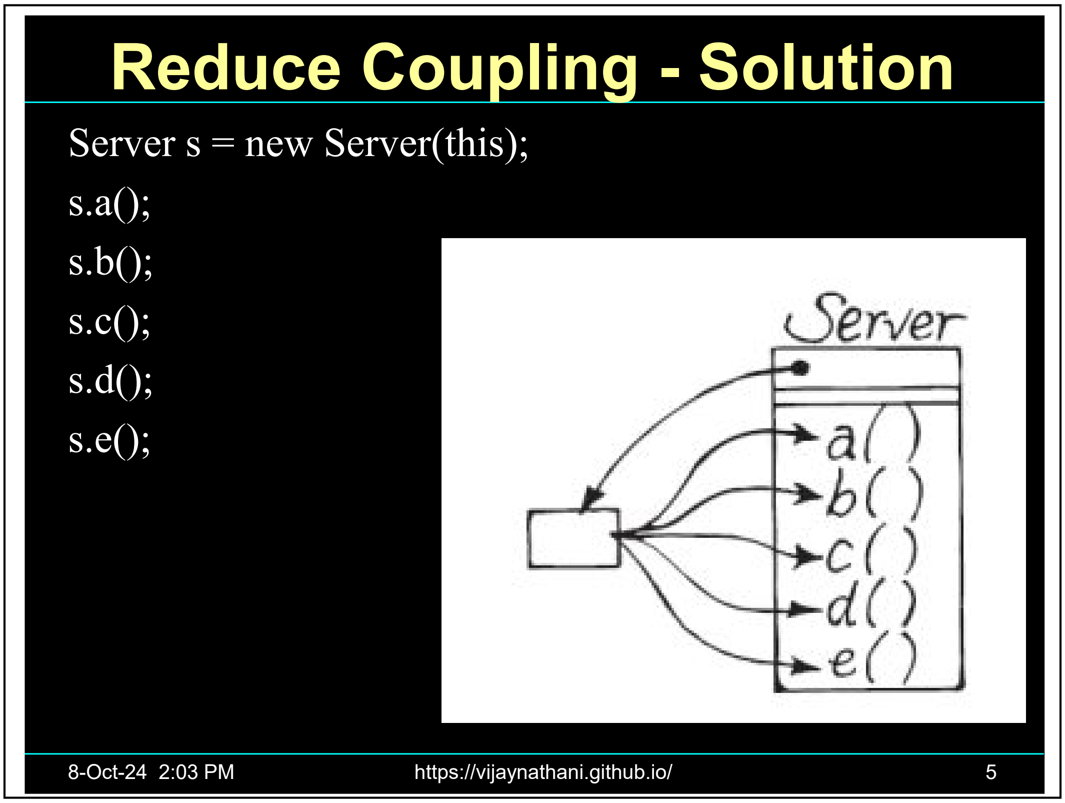
Eliminate Parallel Hierarchies



Reduce Coupling - Problem

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

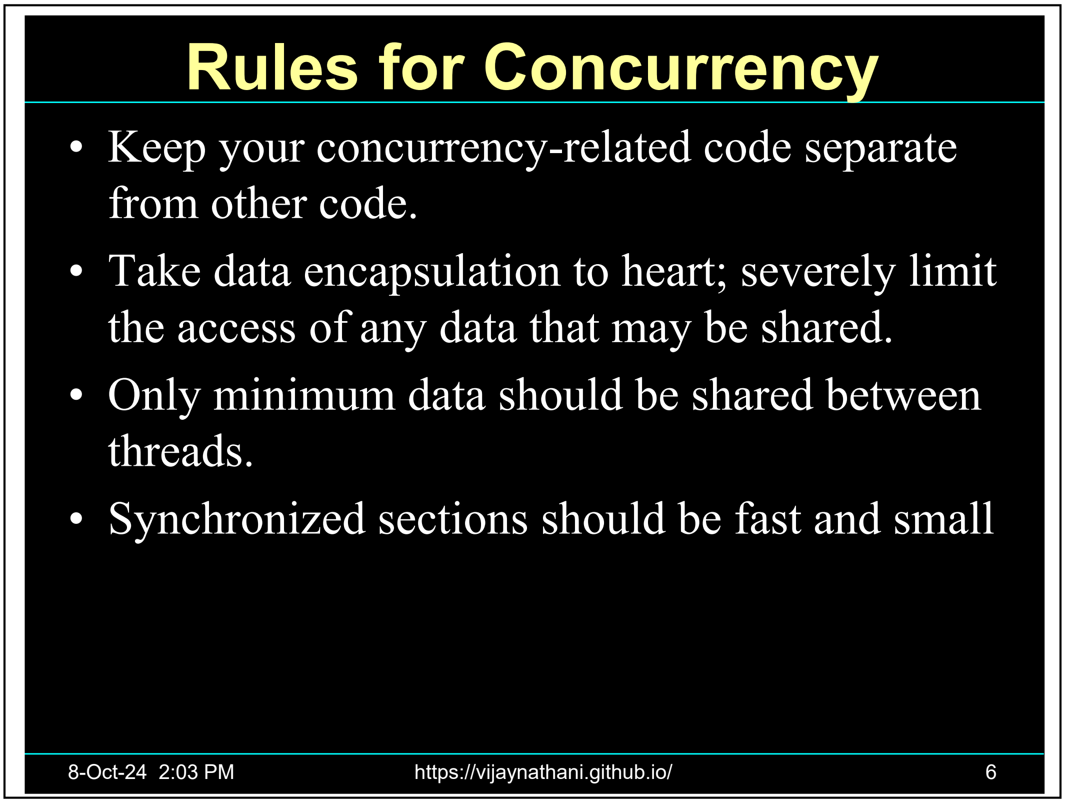




Reduce Coupling - Solution

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

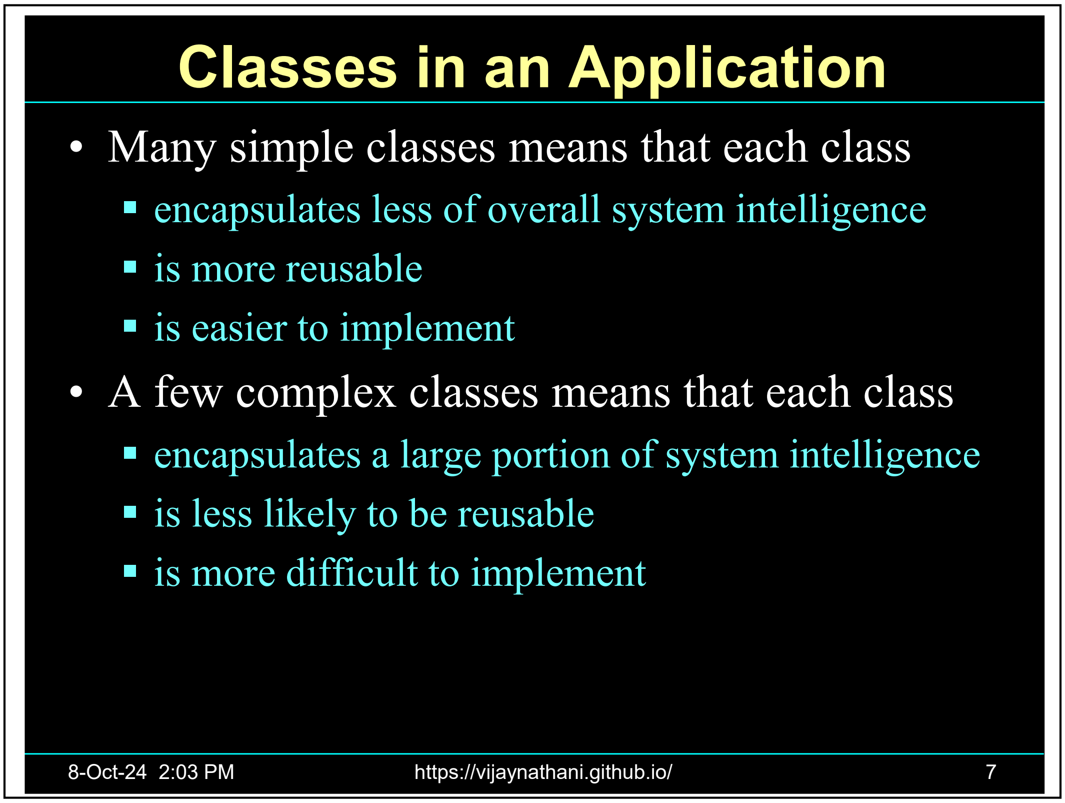
Better still: use Observer design pattern



Rules for Concurrency

- Keep your concurrency-related code separate from other code.
- Take data encapsulation to heart; severely limit the access of any data that may be shared.
- Only minimum data should be shared between threads.
- Synchronized sections should be fast and small

Return copies of data or use immutable objects.



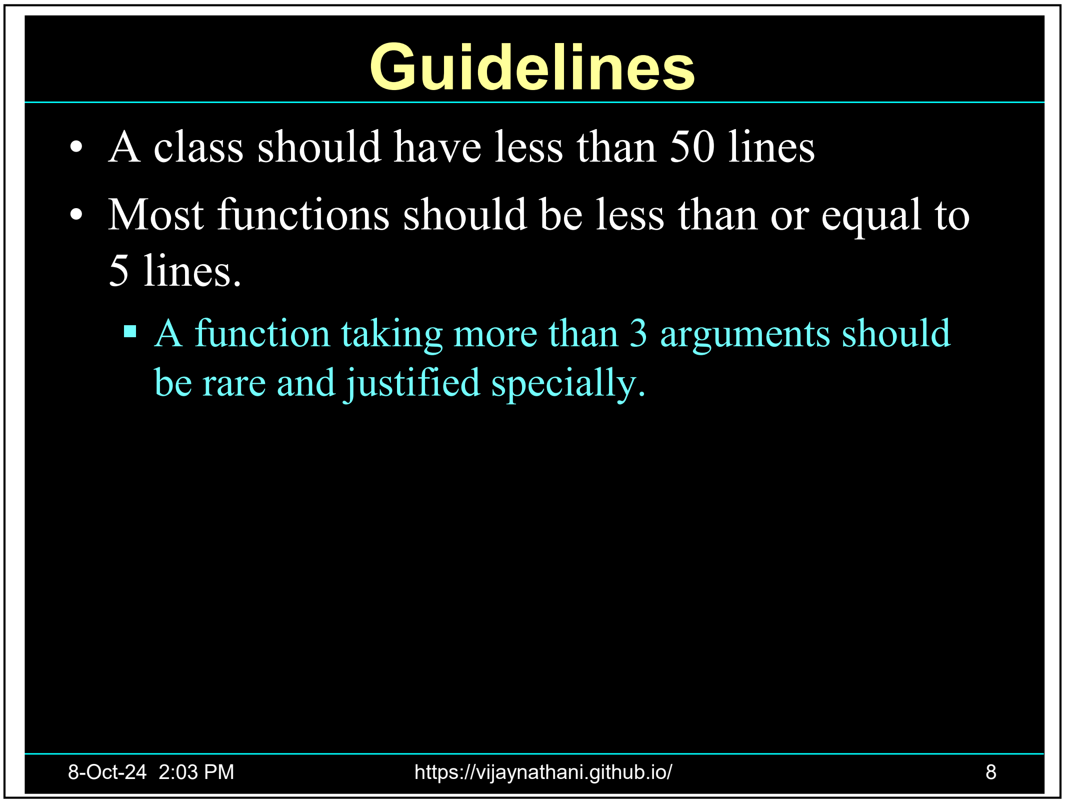
Classes in an Application

- 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

Lots of little pieces

Classes are cohesive

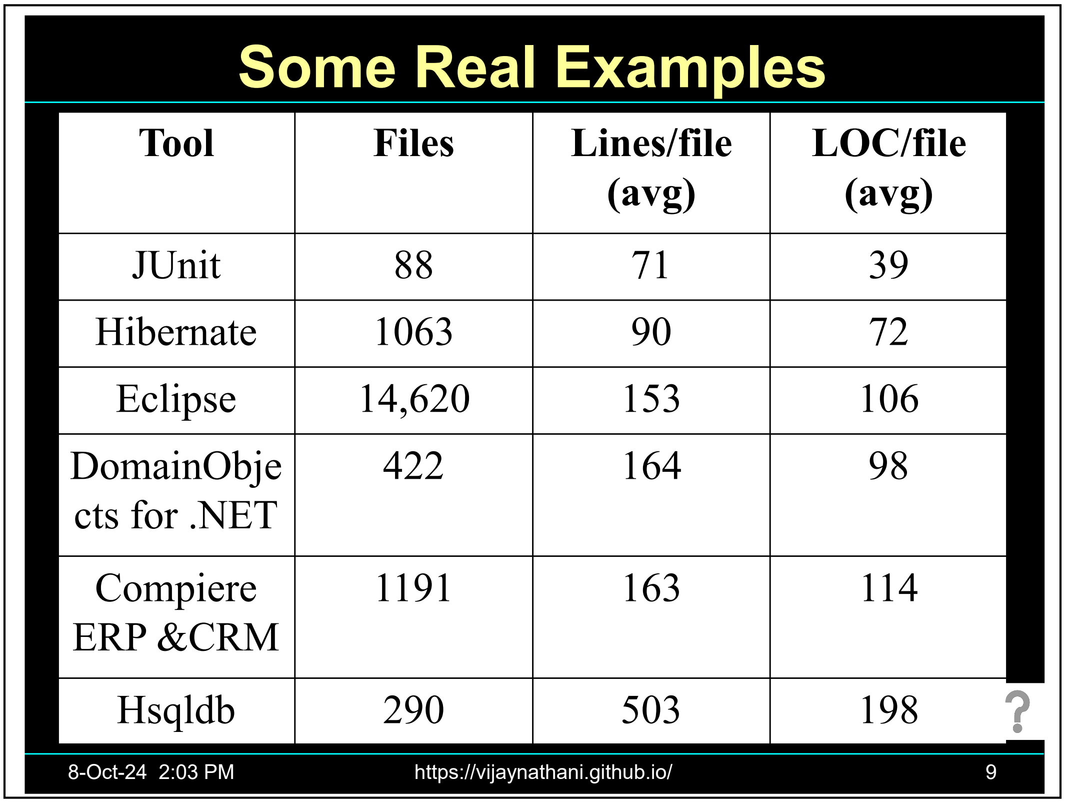
Methods do only one thing.



Guidelines

- A class should have less than 50 lines
- Most functions should be less than or equal to 5 lines.
  - A function taking more than 3 arguments should be rare and justified specially.

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

Q56srp – Restaurants

Q59srp - Customers