ThoughtWorks

the productive programmer: practice

10 ways to improve your code

NEAL FORD software architect / meme wrangler

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- nealford.com
- About me (Bio)
- Book Club
- Triathlon
- Music
- Travel
- *Read my Blog*
- Conference Slides & Samples
- Email Neal

Neal Ford

ThoughtWorker / Meme Wrangler

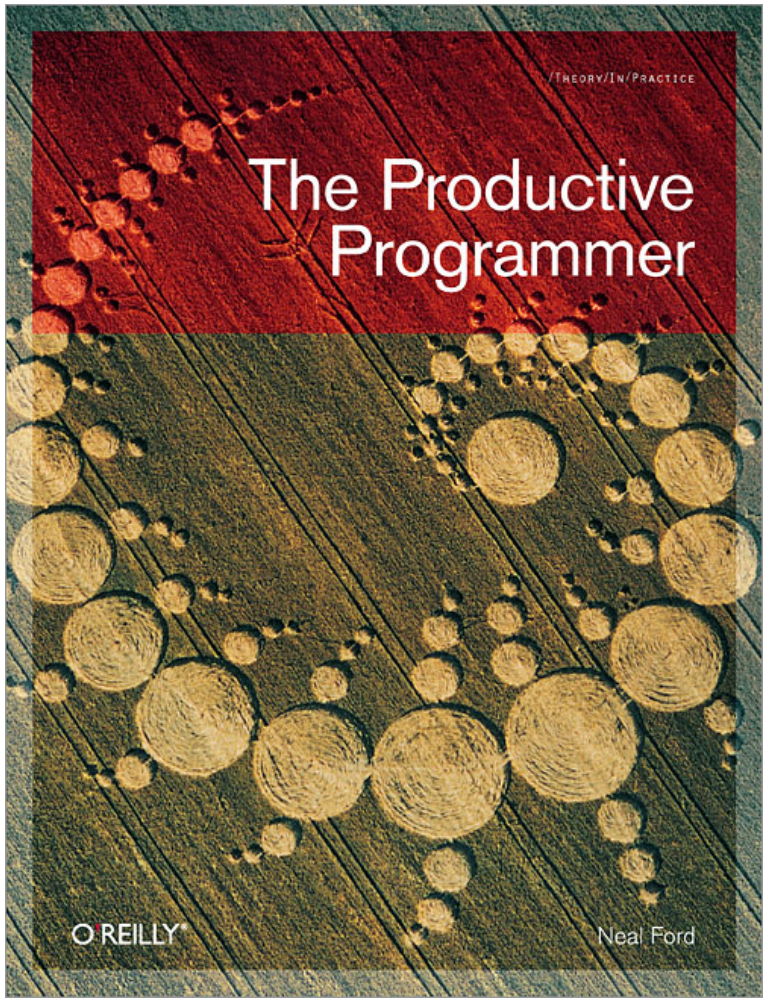
Welcome to the web site of Neal Ford. The purpose of this site is twofold. First, it is an informational site about my professional life, including appearances, articles, presentations, etc. For this type of information, consult the news page (this page) and the About Me pages.

The second purpose for this site is to serve as a forum for the things I enjoy and want to share with the rest of the world. This includes (but is not limited to) reading (Book Club), Triathlon, and Music. This material is highly individualized and all mine!

Please feel free to browse around. I hope you enjoy what you find.

Upcoming Conferences

from whence?

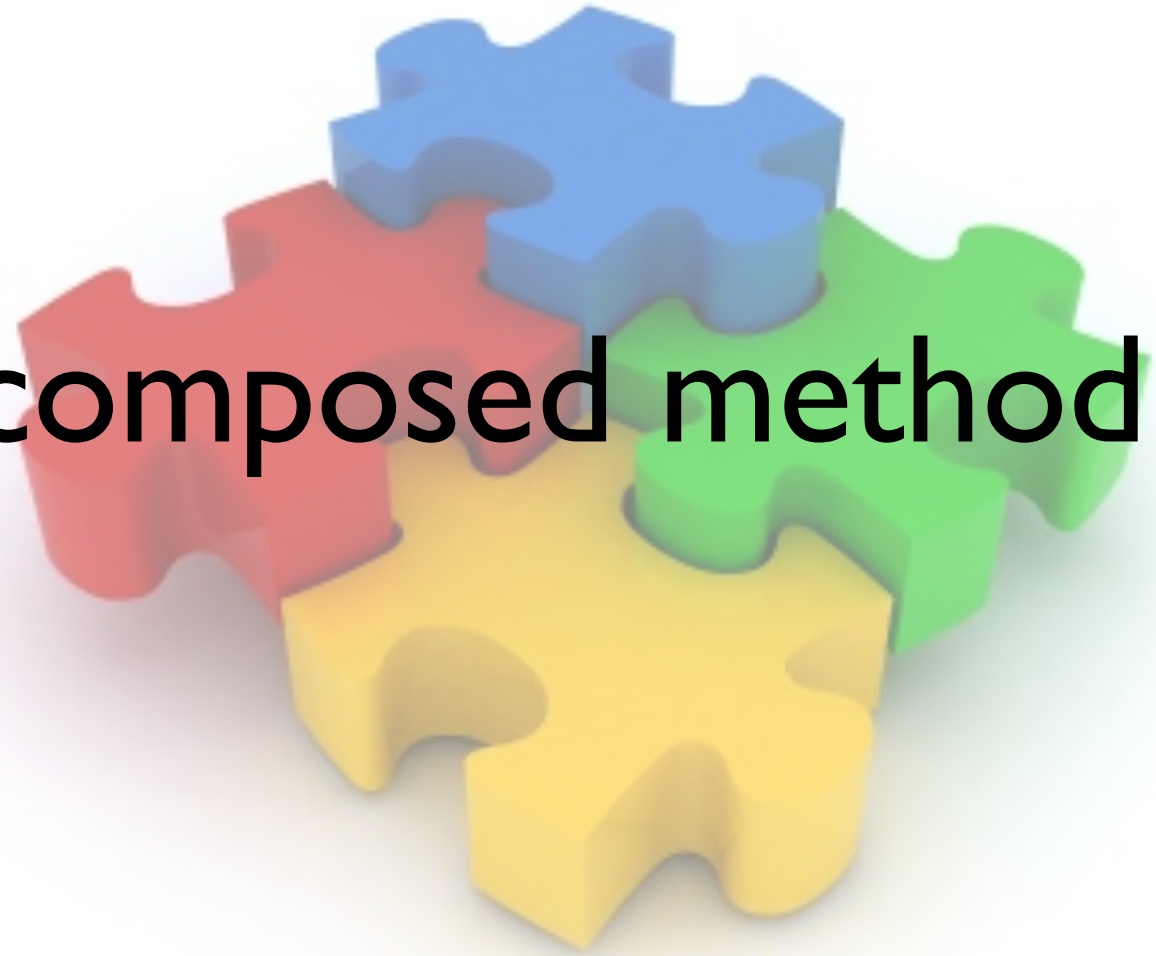


2 parts:

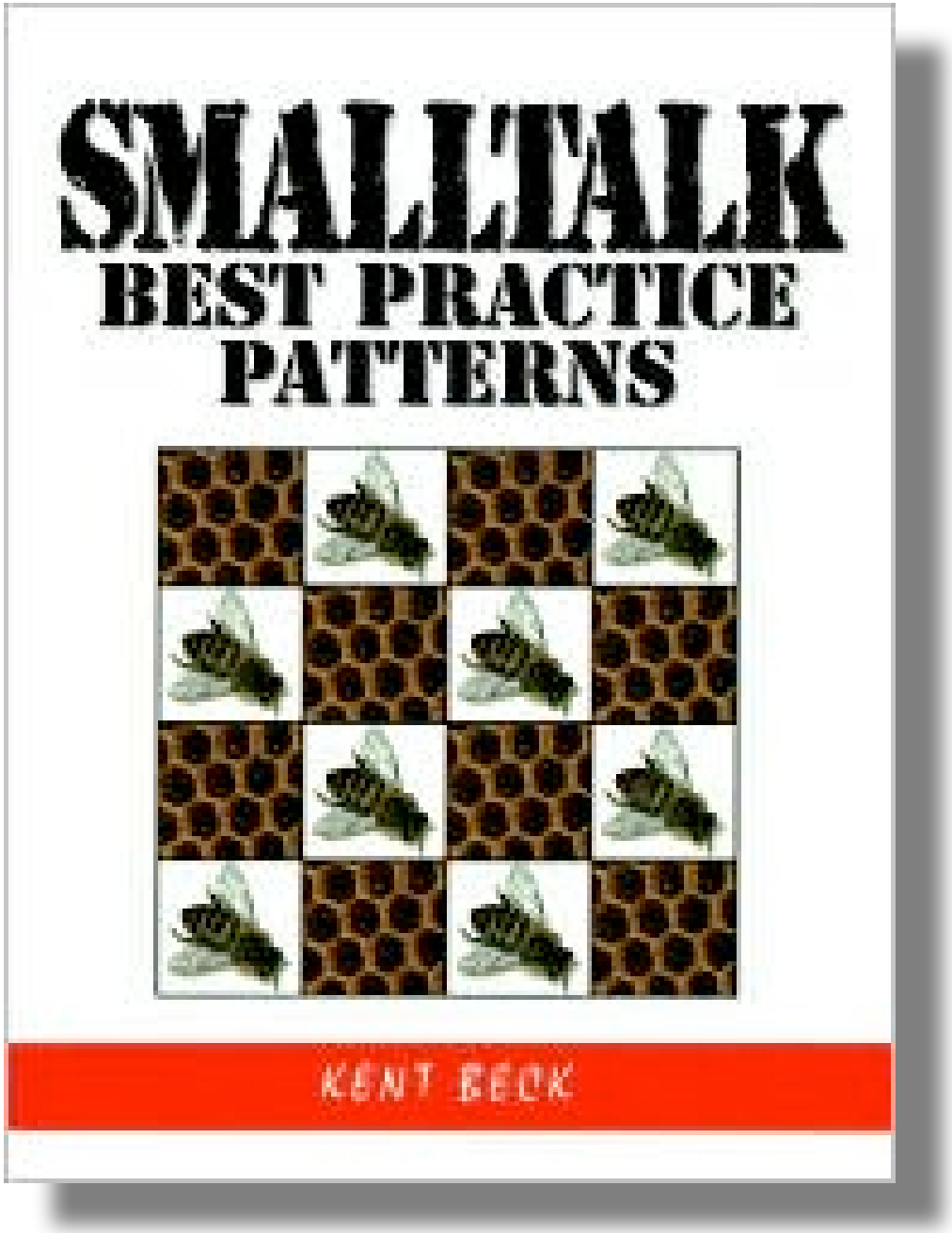
mechanics

practices

1



composed method


SMALLTALK
BEST PRACTICE
PATTERNS
KENT BECK

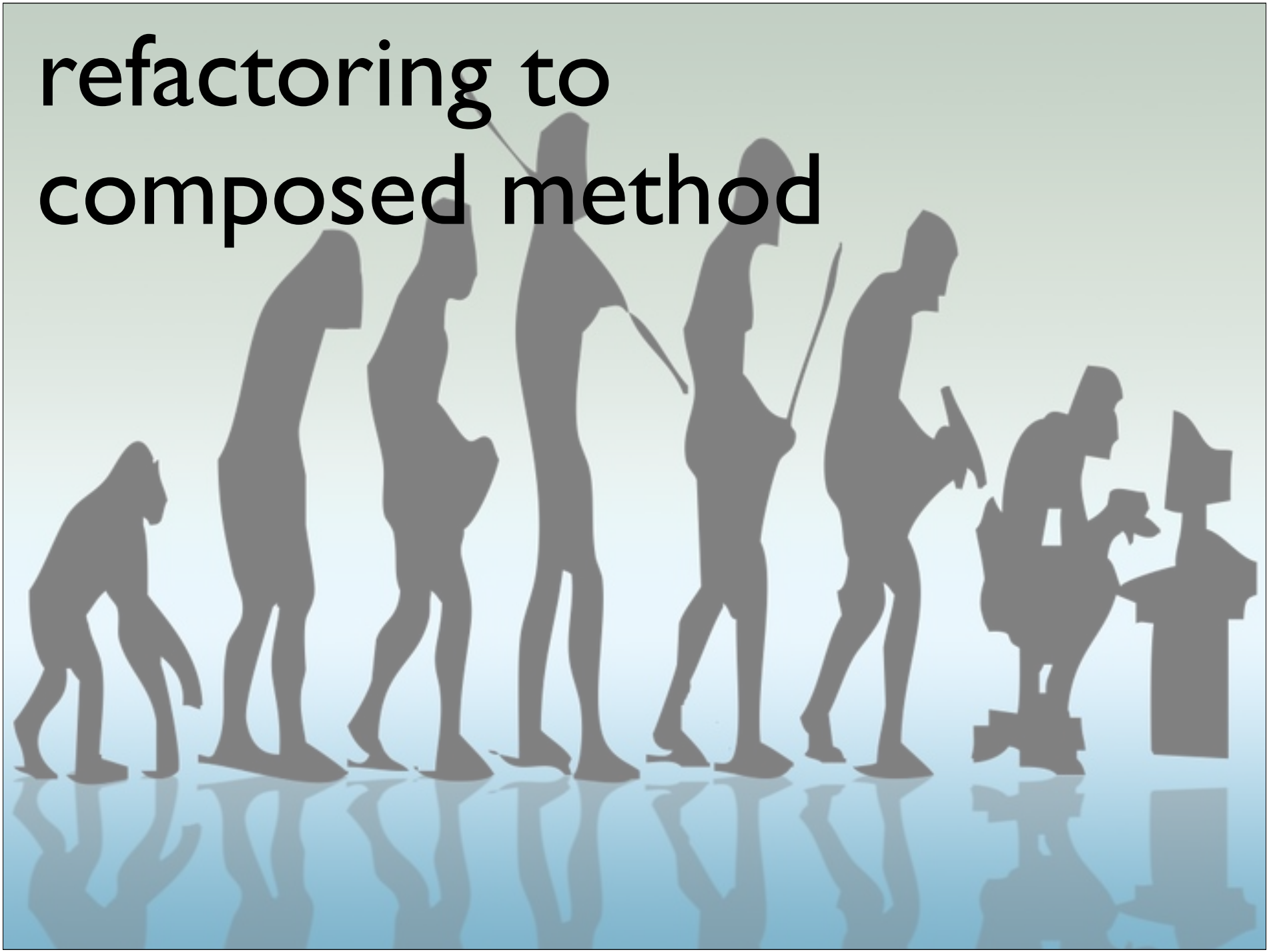
composed method

Divide your program into methods that perform one identifiable task.

Keep all of the operations in a method at the same level of abstraction.

This will naturally result in programs with many small methods, each a few lines long.

refactoring to composed method



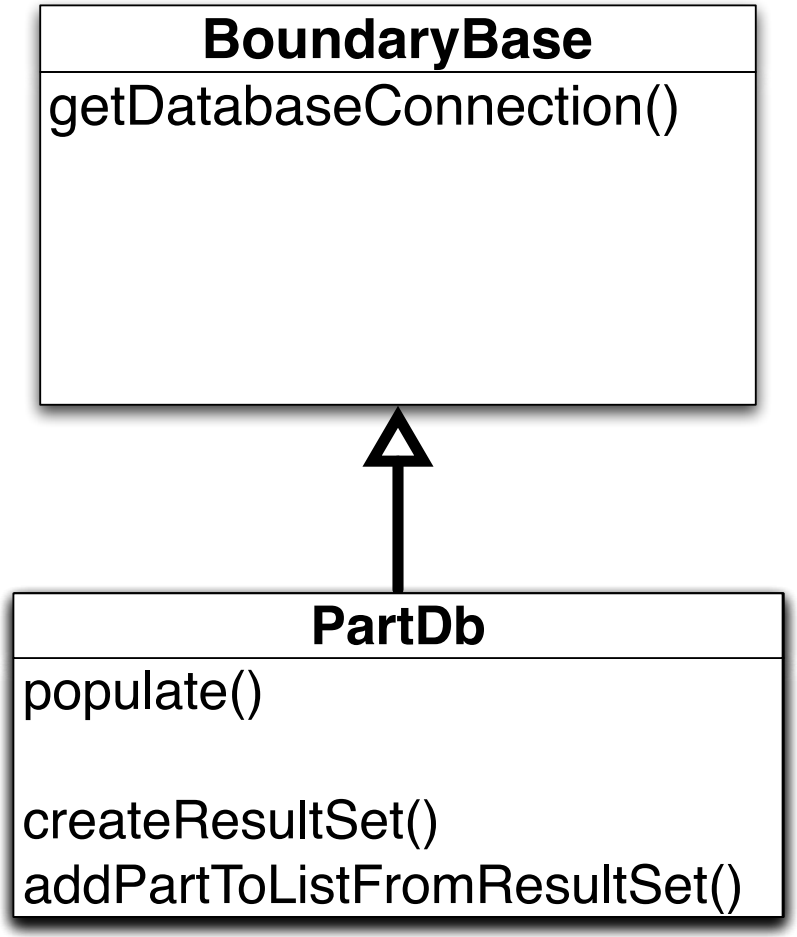
```java
public void populate() throws Exception  {
    Connection c = null;
    try {
        Class.forName(DRIVER_CLASS);
        c = DriverManager.getConnection(DB_URL, USER, PASSWORD);
        Statement stmt = c.createStatement();
        ResultSet rs = stmt.executeQuery(SQL_SELECT_PARTS);
        while (rs.next()) {
            Part p = new Part();
            p.setName(rs.getString("name"));
            p.setBrand(rs.getString("brand"));
            p.setRetailPrice(rs.getDouble("retail_price"));
            partList.add(p);
        }
    } finally {
        c.close();
    }
}
```

```java
private void addPartToListFromResultSet(ResultSet rs)
        throws SQLException {
    Part p = new Part();
    p.setName(rs.getString("name"));
    p.setBrand(rs.getString("brand"));
    p.setRetailPrice(rs.getDouble("retail_price"));
    partList.add(p);
}
```

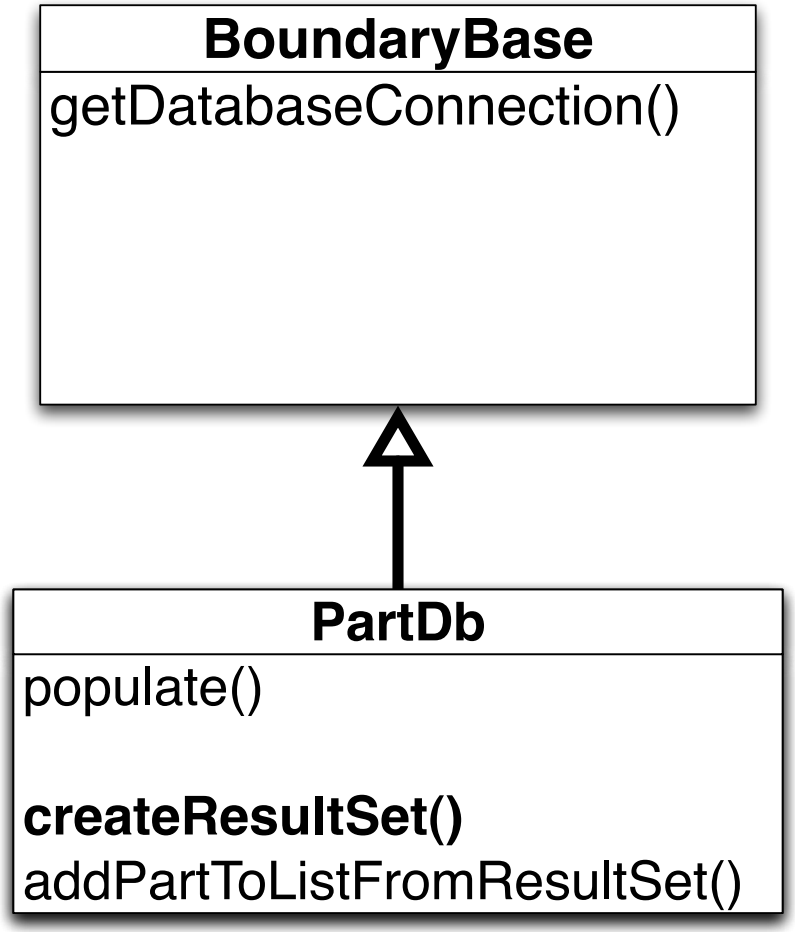
```java
public void populate() throws Exception {
    Connection c = null;
    try {
        c = getDatabaseConnection();
        ResultSet rs = createResultSet(c);
        while (rs.next())
            addPartToListFromResultSet(rs);
    } finally {
        c.close();
    }
}
```

```java
private ResultSet createResultSet(Connection c)
        throws SQLException {
    return c.createStatement().
            executeQuery(SQL_SELECT_PARTS);
}
```

```java
private Connection getDatabaseConnection()
        throws ClassNotFoundException, SQLException {
    Connection c;
    Class.forName(DRIVER_CLASS);
    c = DriverManager.getConnection(DB_URL,
            "webuser", "webpass");
    return c;
}
```




```
private Connection getDatabaseConnection()
        throws ClassNotFoundException, SQLException {
    Connection c;
    Class.forName(DRIVER_CLASS);
    c = DriverManager.getConnection(DB_URL,
            "webuser", "webpass");
    return c;
}
```




```
private ResultSet createResultSet(Connection c)
        throws SQLException {
    return c.createStatement().
            executeQuery(SQL_SELECT_PARTS);
}
```

BoundaryBase

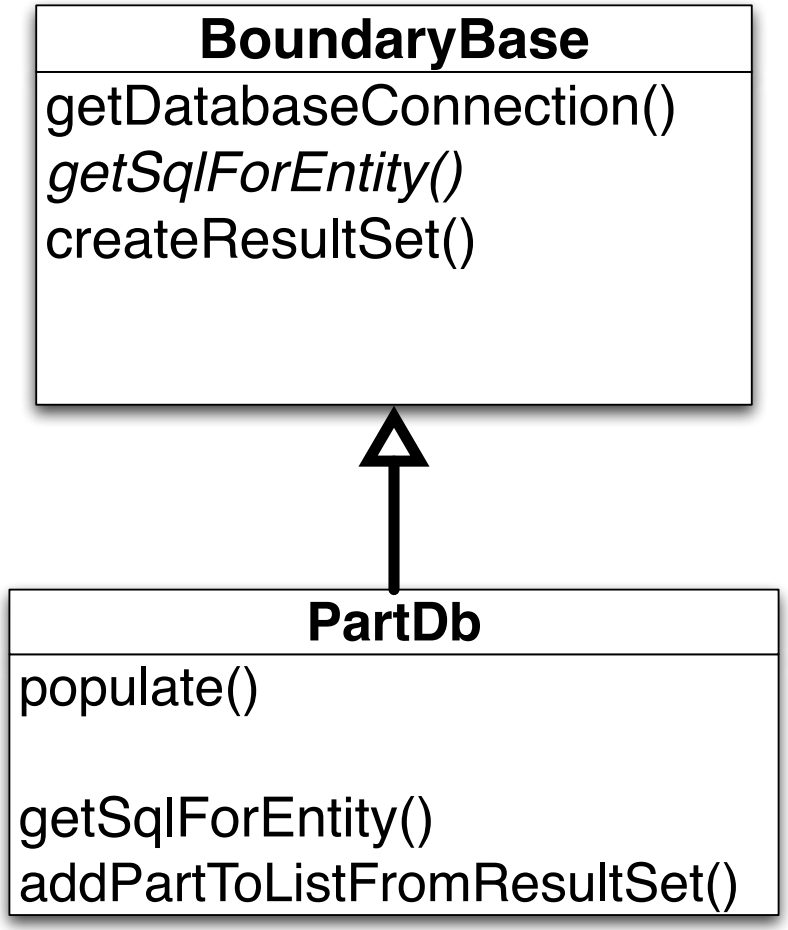
```
abstract protected String getSqlForEntity();

protected ResultSet createResultSet(Connection c) throws SQLException {
    Statement stmt = c.createStatement();
    return stmt.executeQuery(getSqlForEntity());
}
```

```
private ResultSet createResultSet(Connection c)
        throws SQLException {
    return c.createStatement().
            executeQuery(SQL_SELECT_PARTS);
}
```

PartDb

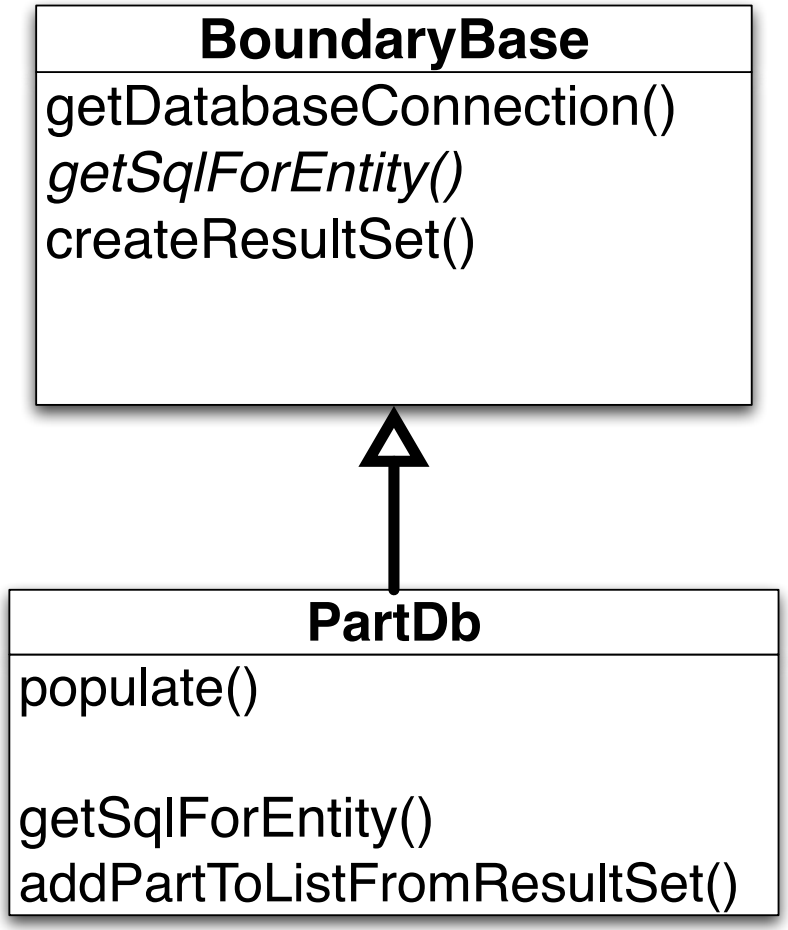
```
protected String getSqlForEntity() {
    return SQL_SELECT_PARTS;
}
```


BoundaryBase
getDatabaseConnection()
getSqlForEntity()
createResultSet()
PartDb
populate()
getSqlForEntity()
addPartToListFromResultSet()

```java
public void populate() throws Exception {
    Connection c = null;
    try {
        c = getDatabaseConnection();
        ResultSet rs = createResultSet(c);
        while (rs.next())
            addPartToListFromResultSet(rs);
    } finally {
        c.close();
    }
}
```

```java
abstract protected void addEntityToListFromResultSet(ResultSet rs)
        throws SQLException;

public void populate() throws Exception {
    Connection c = null;
    try {
        c = getDatabaseConnection();
        ResultSet rs = createResultSet(c);
        while (rs.next())
            addEntityToListFromResultSet(rs);
    } finally {
        c.close();
    }
}
```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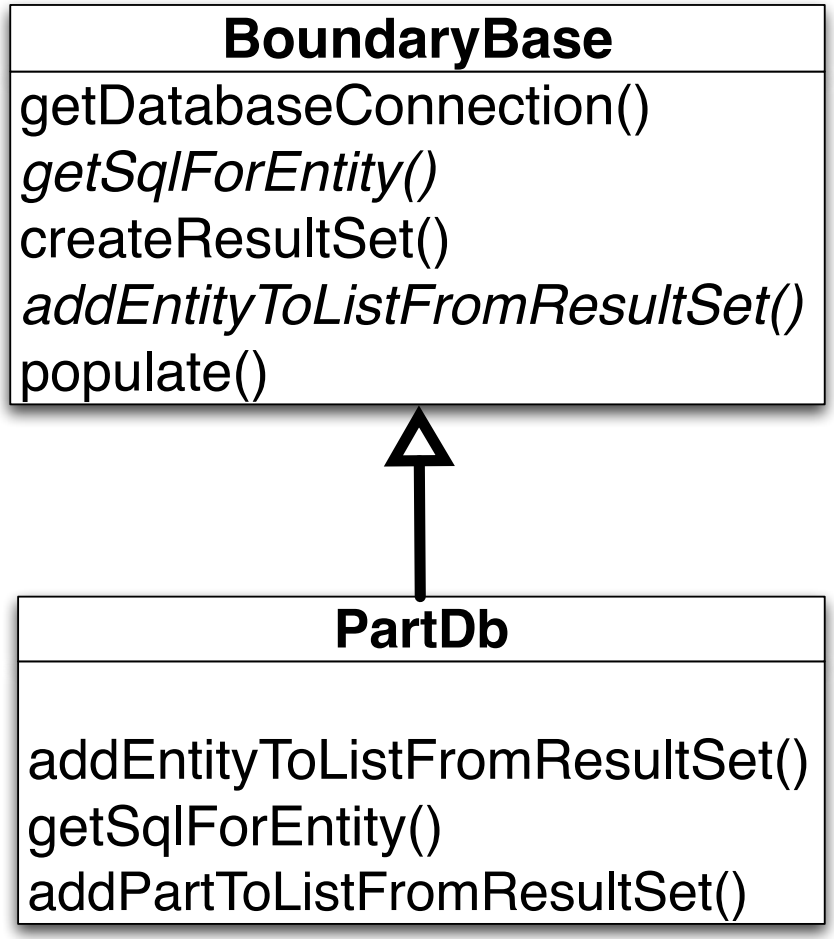
BoundaryBase
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addEntityToListFromResultSet()
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addPartToListFromResultSet()

```java
protected Connection getDatabaseConnection() throws ClassNotFoundException,
        SQLException {
    Connection c;
    Class.forName(DRIVER_CLASS);
    c = DriverManager.getConnection(DB_URL, "webuser", "webpass");
    return c;
}

abstract protected String getSqlForEntity();

protected ResultSet createResultSet(Connection c) throws SQLException {
    Statement stmt = c.createStatement();
    return stmt.executeQuery(getSqlForEntity());
}

abstract protected void addEntityToListFromResultSet(ResultSet rs)
        throws SQLException;

public void populate() throws Exception {
    Connection c = null;
    try {
        c = getDatabaseConnection();
        ResultSet rs = createResultSet(c);
        while (rs.next())
            addEntityToListFromResultSet(rs);
    } finally {
        c.close();
    }
}
```

BoundaryBase

PartDb

```
public Part[] getParts() {
    return (Part[]) partList.toArray(TEMPLATE);
}

protected String getSqlForEntity() {
    return SQL_SELECT_PARTS;
}

protected void addEntityToListFromResultSet(ResultSet rs) throws SQLException {
    Part p = new Part();
    p.setName(rs.getString("name"));
    p.setBrand(rs.getString("brand"));
    p.setRetailPrice(rs.getDouble("retail_price"));
    partList.add(p);
}
```

benefits of composed method

shorter methods easier to test

method names become documentation

large number of very cohesive methods

discover reusable assets that you didn't know were there

2

test-driven development

test-driven *design*

design benefits of tdd

first consumer

think about how the rest of the world uses this class

creates *consumption awareness*

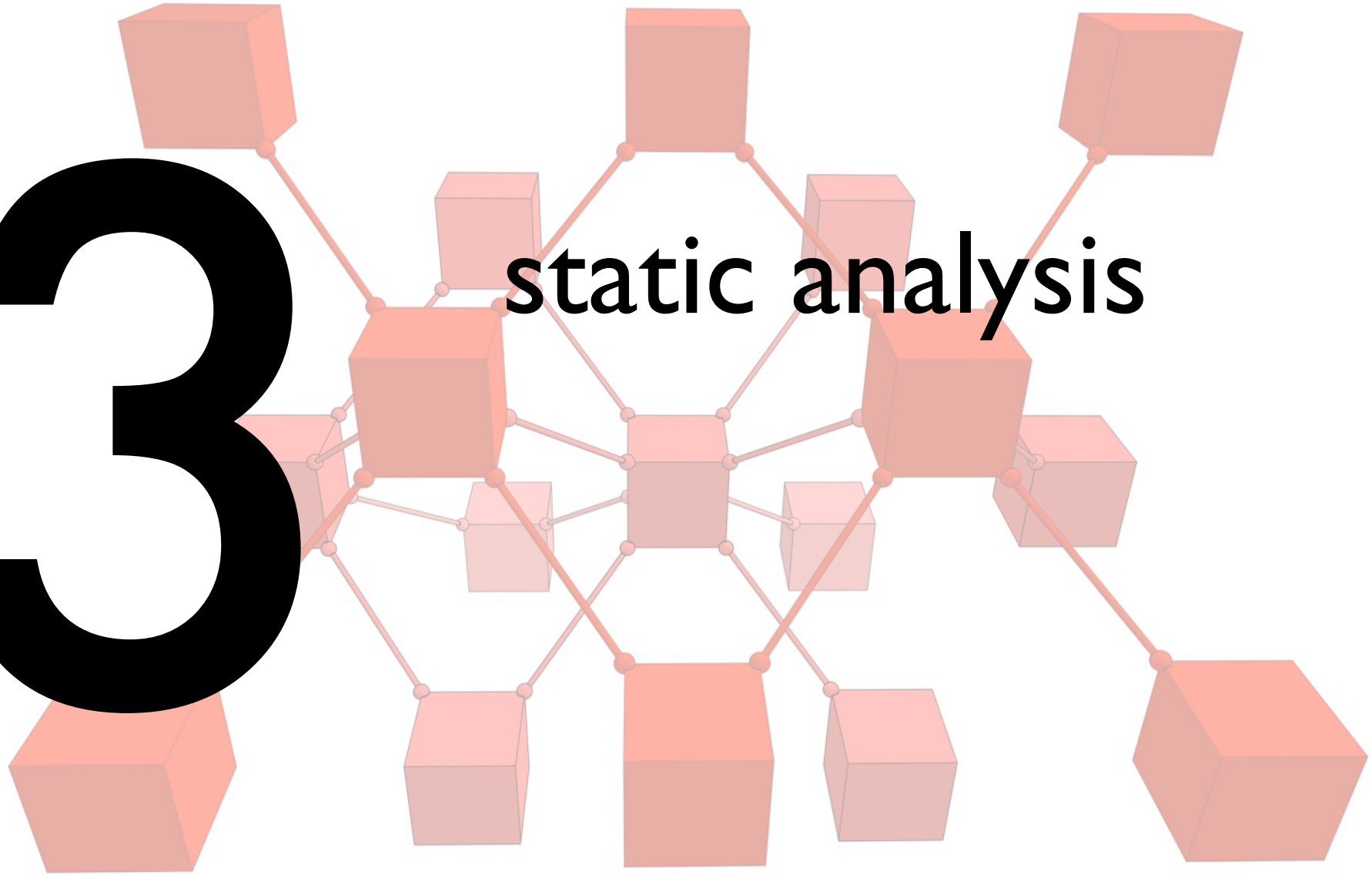
design benefits of tdd

forces mocking of dependent objects

naturally creates composed method

cleaner metrics

3 static analysis



byte-code analysis: findbugs

bug categories

correctness
- probable bug

bad practice
- violation of recommended & essential coding practice

dodgy
- confusing, anomalous, written poorly

FindBugs: Struts-2.0.11

Category | Bug Kind | Bug Pattern

- Bugs (72)
  - Bad practice (13)
    - Bad casts of object referen
      - Equals method should n
        - Equals method for A
        - Equals method for A
        - Equals method for R
        - Equals method for S
        - Equals method for P
        - Equals method for P
        - Equals method for P
        - Equals method for P
    - Bad use of return value fror

unclassified

ApplicationMap.java in org.apache.struts2.dispatcher

```
74      * @return a Set of all servlet context attributes as well as context init parameters.
75      */
76     public Set entrySet() {
77         if (entries == null) {
78             entries = new HashSet<Object>();
79
80             // Add servlet context attributes
81             Enumeration enumeration = context.getAttributeNames();
82
83             while (enumeration.hasMoreElements()) {
84                 final String key = enumeration.nextElement().toString();
85                 final Object value = context.getAttribute(key);
86                 entries.add(new Map.Entry() {
87                     public boolean equals(Object obj) {
88                         Map.Entry entry = (Map.Entry) obj;
89
90                         return ((key == null) ? (entry.getKey() == null) : key.equals(entry.getKey()
91                     }
92
93                     public int hashCode() {
94                         return ((key == null) ? 0 : key.hashCode()) ^ ((value == null) ? 0 : value.h
95                     }
96
97                     public Object getKey() {
98                         return key;
99                     }
100
```

Find | Find Next | Find Previous

Equals method for ApplicationMap$1 assumes the argument is of type ApplicationMap$1
At ApplicationMap.java:[line 88]
In method org.apache.struts2.dispatcher.ApplicationMap$1.equals(Object) [Lines 88 - 90]

Equals method should not assume anything about the type of its argument

The `equals(Object o)` method shouldn't make any assumptions about the type of `o`. It should simply return false if `o` is not the same type as `this`.

http://findbugs.sourceforge.net/

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FindBugs: Struts-2.0.11

Category | Bug Kind | Bug Pattern

- Equals method for P
- Equals method for P
- Equals method for P
- Bad use of return value fror
- Confusing method name (1)
- Equal objects must have eq
- Problems with equals() (1)
- Correctness (8)
  - Bad casts of object referen
    - Impossible cast (3)
      - Impossible cast from
      - Impossible cast from
      - Impossible cast from

unclassified

IteratorGeneratorTag.java in org.apache.struts2.views.jsp.iterator

```
194         // count
195         int count = 0;
196         if (countAttr != null && countAttr.length() > 0) {
197             Object countObj = findValue(countAttr);
198             if (countObj instanceof Integer) {
199                 count = ((Integer)countObj).intValue();
200             }
201             else if (countObj instanceof Float) {
202                 count = ((Float)countObj).intValue();
203             }
204             else if (countObj instanceof Long) {
205                 count = ((Long)countObj).intValue();
206             }
207             else if (countObj instanceof Double) {
208                 count = ((Long)countObj).intValue();
209             }
210             else if (countObj instanceof String) {
211                 try {
212                     count = Integer.parseInt((String)countObj);
213                 }
214                 catch(NumberFormatException e) {
215                     _log.warn("unable to convert count attribute ["+countObj+"] to number, ignore
216                 }
217             }
218         }
219
220         // converter
221         Converter converter = null;
```

Find | Find Next | Find Previous

Impossible cast from java.lang.Double to java.lang.Long in doStartTag()
At IteratorGeneratorTag.java:[line 208]
In method org.apache.struts2.views.jsp.iterator.IteratorGeneratorTag.doStartTag() [Lines 185 - 245]
Actual type java.lang.Double
Expected java.lang.Long

Impossible cast

This cast will always throw a ClassCastException.

http://findbugs.sourceforge.net/

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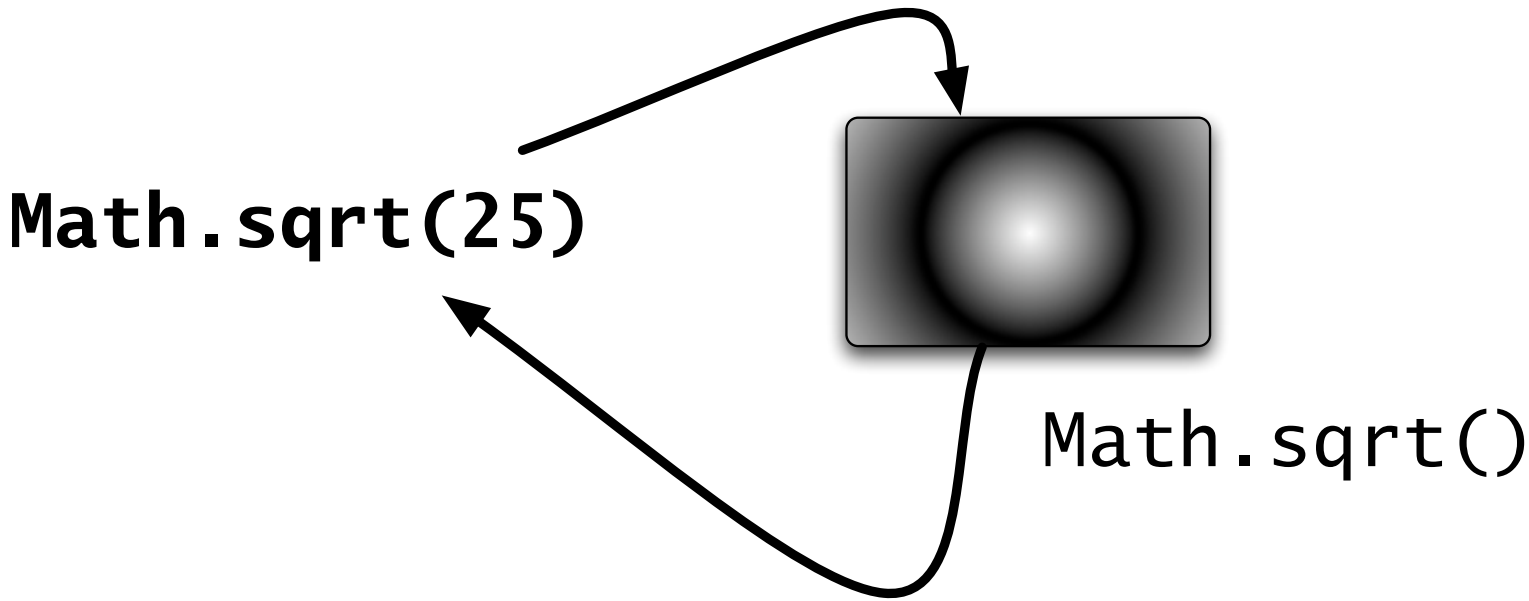
4 good citizenship

static methods



mixing static + state

singleton

singleton is bad because:

- mixes responsibilities
- untestable
- the object version of global variables

avoiding singletons

1. create a pojo for the business behavior

   simple

   testable!

2. create a factory to create the pojo

   also testable

```java
public class ConfigSingleton {
    private static ConfigSingleton myInstance;
    private Point _initialPosition;

    public Point getInitialPosition() {
        return _initialPosition;
    }

    private ConfigSingleton() {
        Dimension screenSize =
                Toolkit.getDefaultToolkit().getScreenSize();
        _initialPosition = new Point();
        _initialPosition.x = (int) screenSize.getWidth() / 2;
        _initialPosition.y = (int) screenSize.getHeight() / 2;
    }

    public static ConfigSingleton getInstance() {
        if (myInstance == null)
            myInstance = new ConfigSingleton();
        return myInstance;
    }
}
```

```java
public class Configuration {
    private Point _initialPosition;

    private Configuration(Dimension screenSize) {
        _initialPosition = new Point();
        _initialPosition.x = (int) screenSize.getWidth() / 2;
        _initialPosition.y = (int) screenSize.getHeight() / 2;
    }

    public int getInitialX() {
        return _initialPosition.x;
    }

    public int getInitialY() {
        return _initialPosition.y;
    }
}
```

```java
public class ConfigurationFactory {
    private static Configuration myConfig;

    public static Configuration getConfiguration() {
        if (myConfig == null) {
            try {
                Constructor cxtor[] =
                    Configuration.class.getDeclaredConstructors();
                cxtor[0].setAccessible(true);
                myConfig = (Configuration) cxtor[0].newInstance(
                        Toolkit.getDefaultToolkit().getScreenSize());
            } catch (Throwable e) {
                throw new RuntimeException("can't construct Configuration");
            }
        }
        return myConfig;
    }
}
```

```java
public class TestConfigurationFactory extends TestCase {

    public void test_Creation_creates_a_single_instance() {
        Configuration config1 = ConfigurationFactory.getConfiguration();
        assertNotNull(config1);
        Configuration config2 = ConfigurationFactory.getConfiguration();
        assertNotNull(config2);
        assertSame(config1, config2);
    }
}
```

5

yagni

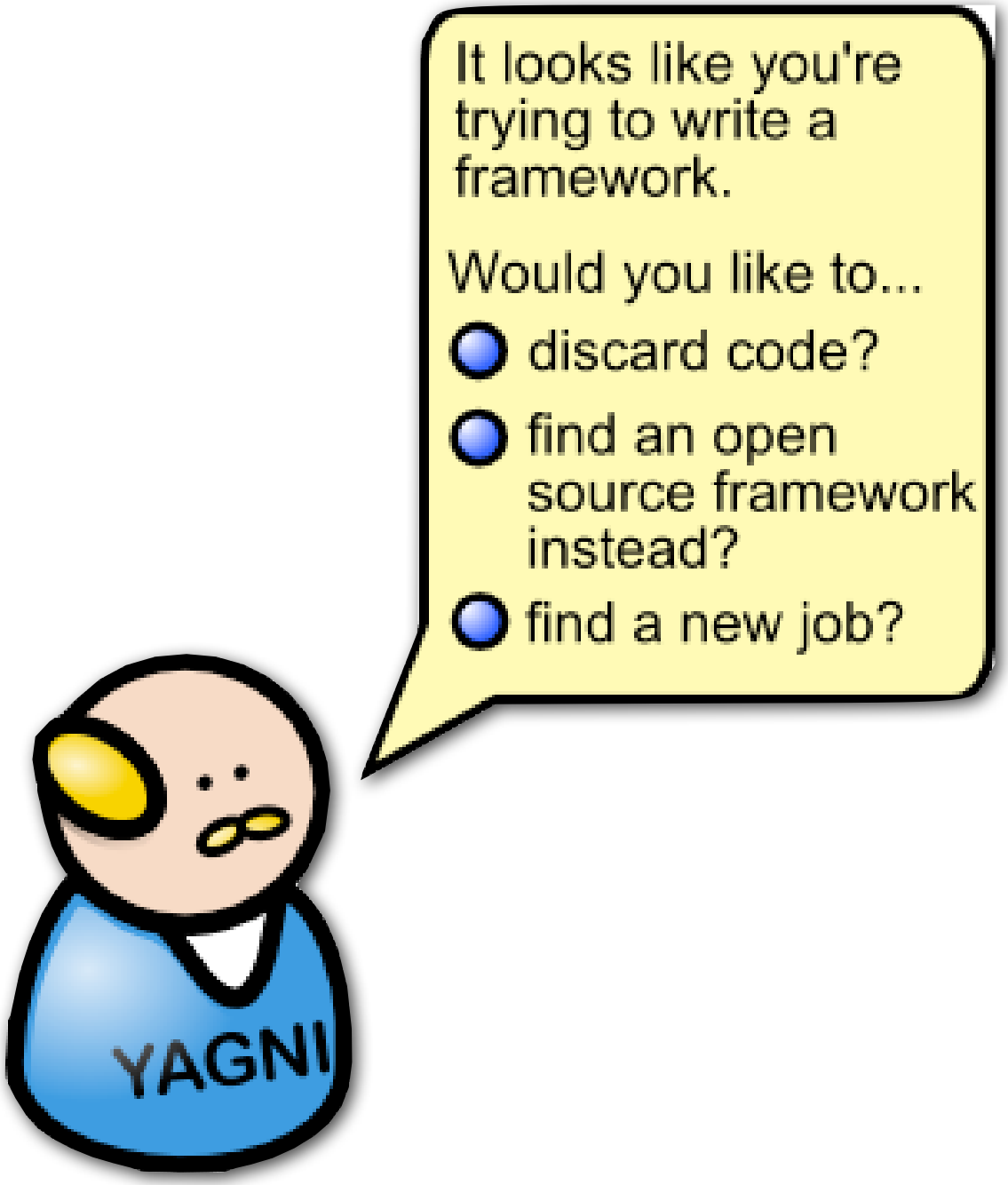
you ain’t gonna need it

discourages gold plating

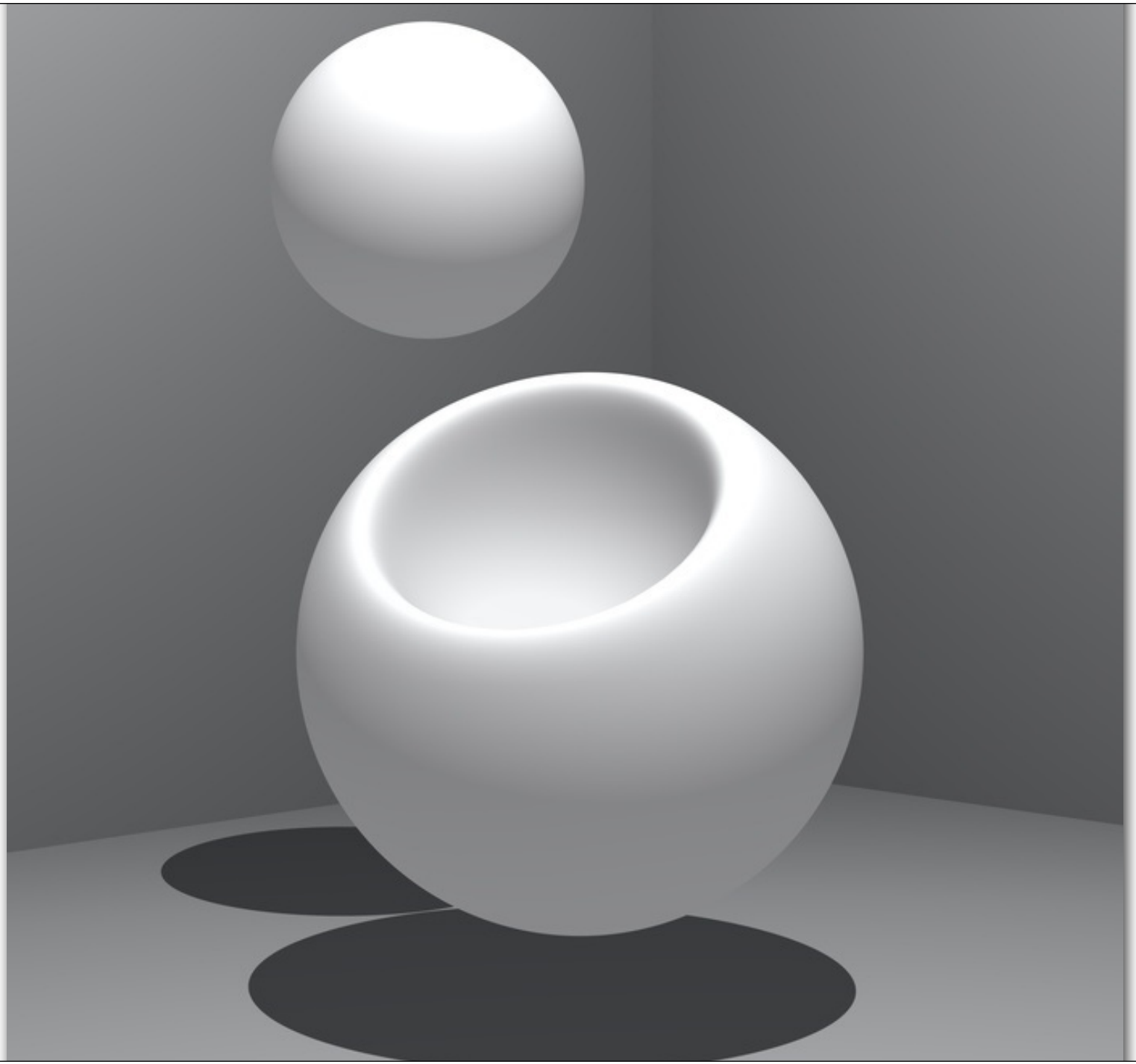
build the simplest thing that we need *right now*

don't indulge in speculative development

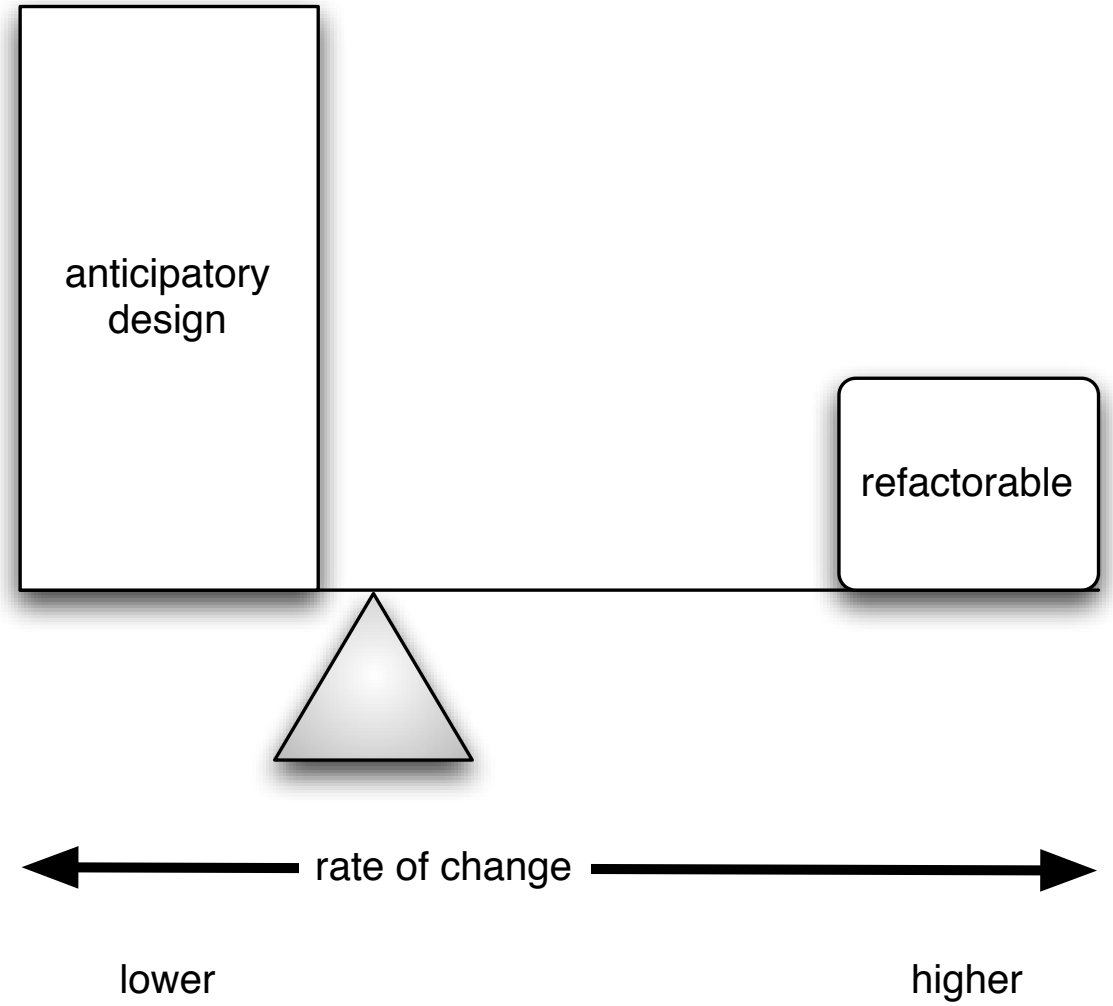
- increases *software entropy*
- only saves time if you can guarantee you won't have to change it later
- leads to *frameworks*


It looks like you're trying to write a framework.
Would you like to...
discard code?
find an open source framework instead?
find a new job?
YAGNI


This is just
what they need!



changeability



corporate code smells

6. We have an Architect who reviews all code pre-checkin and decides whether or not to allow it into version control.

7. We can't use any open source code because our lawyers say we can't.

8. We use WebSphere because...(I always stop listening at this point)

9. We bought the entire tool suite (even though we only needed about 10% of it) because it was cheaper than buying the individual tools.

10. We invented our own web/persistence/messaging/caching framework because none of the existing ones was good enough.

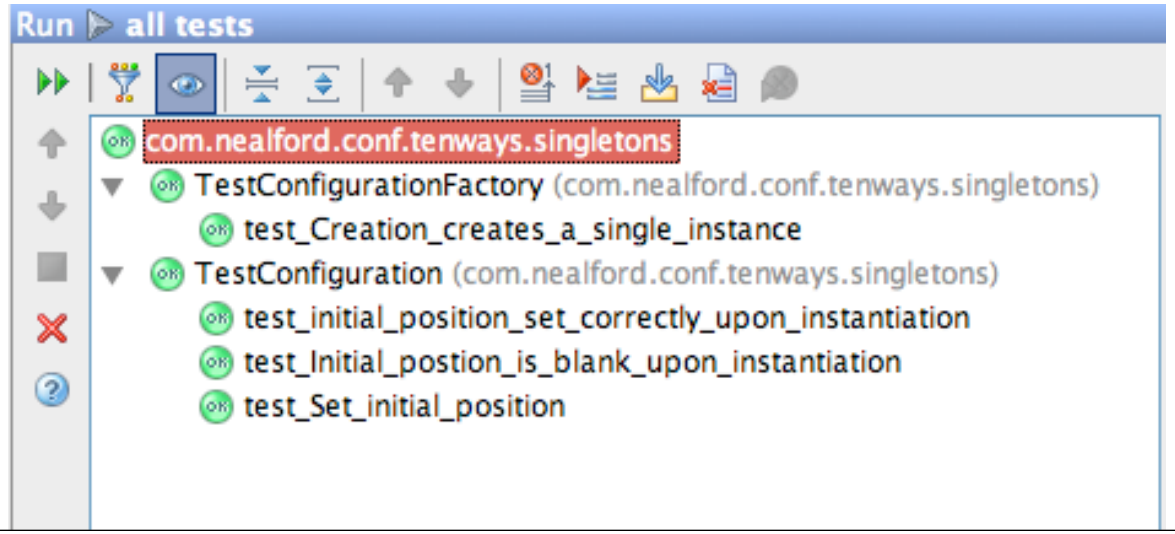
1. There is a reason that WSAD isn't called WHAPPY.
2. The initial estimate must be within 15% of the final cost, the post-analysis estimate must be within 10%, and the post-design estimate must be with 5%
3. We don't have time to write unit tests (we're spending too much time debugging)
4. We keep all of our business logic in stored procedures...for performance reasons.
5. The only JavaDoc is the Eclipse message explaining how to change your default JavaDoc template.


6
question authority

angry monkeys

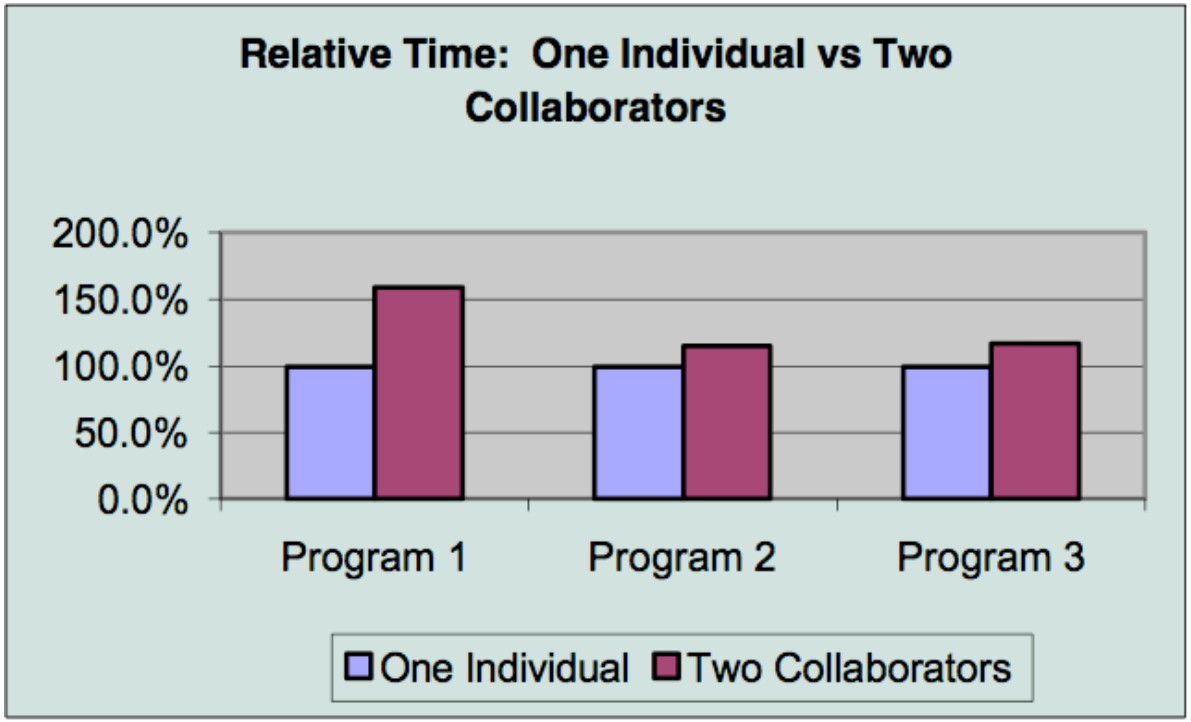
test names

```
testUpdateCacheAndVerifyThatItemExists() {

}

test_Update_cache_and_verify_that_item_exists() {

}
```



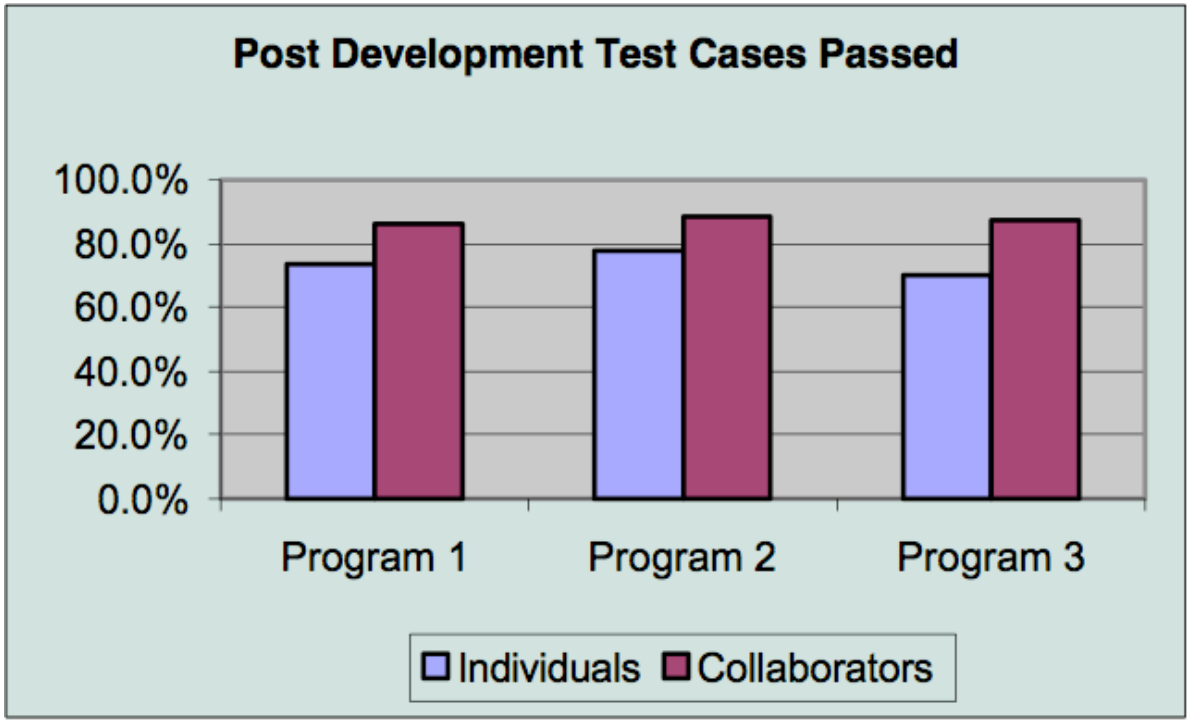
non-intuitive

pair programming studies



after adjusting, pairs produced code 15% more slowly than individuals...

pair programming studies



...with 15% fewer defects

7

slap

single level of abstraction principle

s l a p

keep all lines of code in a method at the same level of abstraction

jumping abstraction layers makes code hard to understand

composed method => slap

refactor to slap

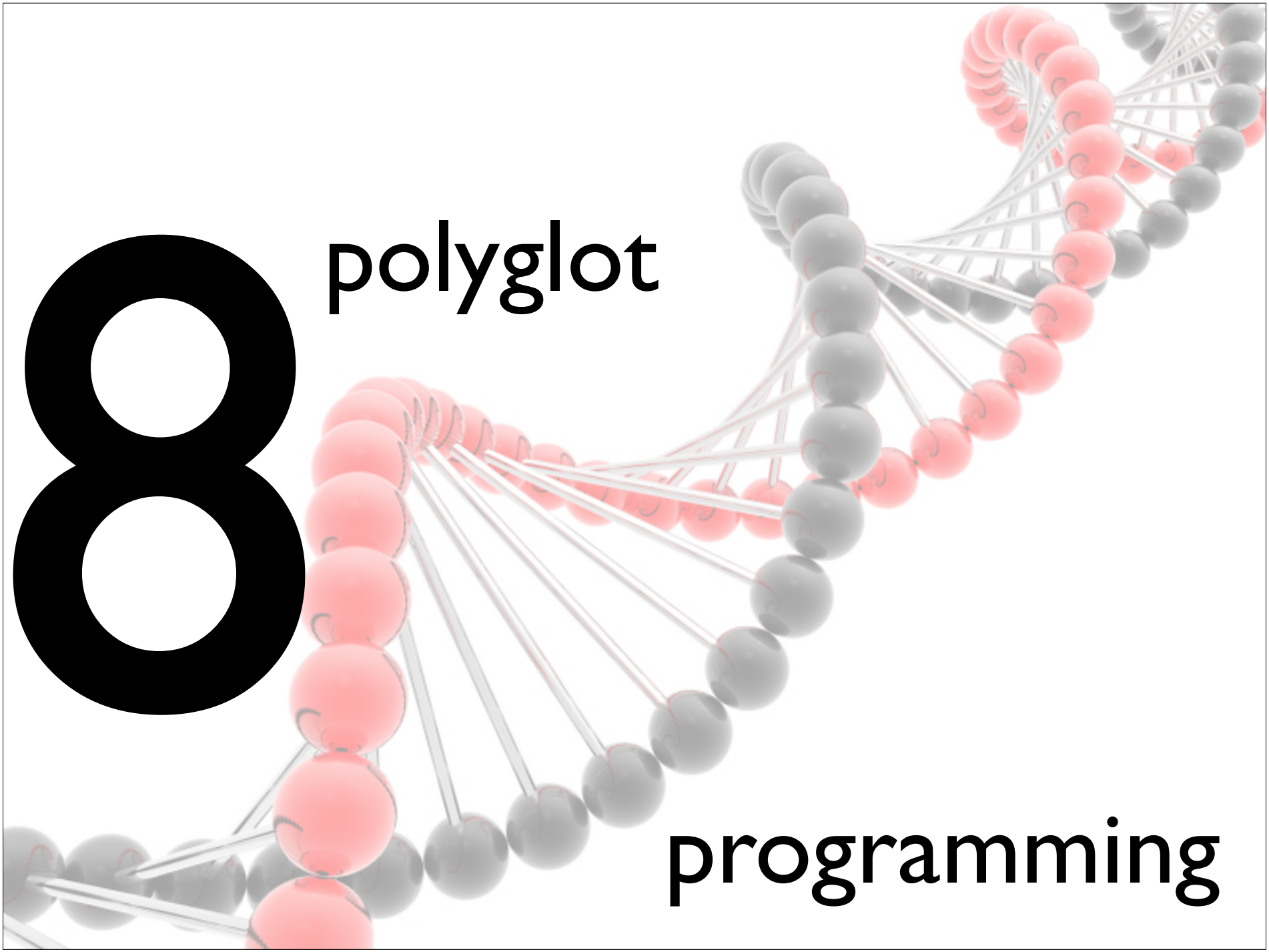
even if it means single-line methods

```java
public void addOrder(final ShoppingCart cart, String userName,
                     Order order) throws SQLException {
    Connection c = null; PreparedStatement ps = null;
    Statement s = null; ResultSet rs = null;
    boolean transactionState = false;
    try {
        c = dbPool.getConnection();
        s = c.createStatement();
        transactionState = c.getAutoCommit();
        int userKey = getUserKey(userName, c, ps, rs);
        c.setAutoCommit(false);
        addSingleOrder(order, c, ps, userKey);
        int orderKey = getOrderKey(s, rs);
        addLineItems(cart, c, orderKey);
        c.commit();
        order.setOrderKey(orderKey);
    } catch (SQLException sqlx) {
        s = c.createStatement();
        c.rollback();
        throw sqlx;
    } finally {
        try {
            c.setAutoCommit(transactionState);
            dbPool.release(c);
            if (s != null)  s.close();
            if (ps != null) ps.close();
            if (rs != null) rs.close();
        } catch (SQLException ignored) {
        }
    }
}
```

```
public void addOrderFrom(ShoppingCart cart, String userName,
                         Order order) throws SQLException {
    setupDataInfrastructure();
    try {
        add(order, userKeyBasedOn(userName));
        addLineItemsFrom(cart, order.getOrderKey());
        completeTransaction();
    } catch (SQLException sqlx) {
        rollbackTransaction();
        throw sqlx;
    } finally {
        cleanUp();
    }
}
```

```
private void completeTransaction() throws SQLException {
    ((Connection)_db.get("connection")).commit();
}
```

8 polyglot programming



leveraging existing *platforms* with *languages* targeted at specific problems and applications

looming problems/ opportunities

massively parallel threading

- use a functional language: jaskell, scala

schedule pressure

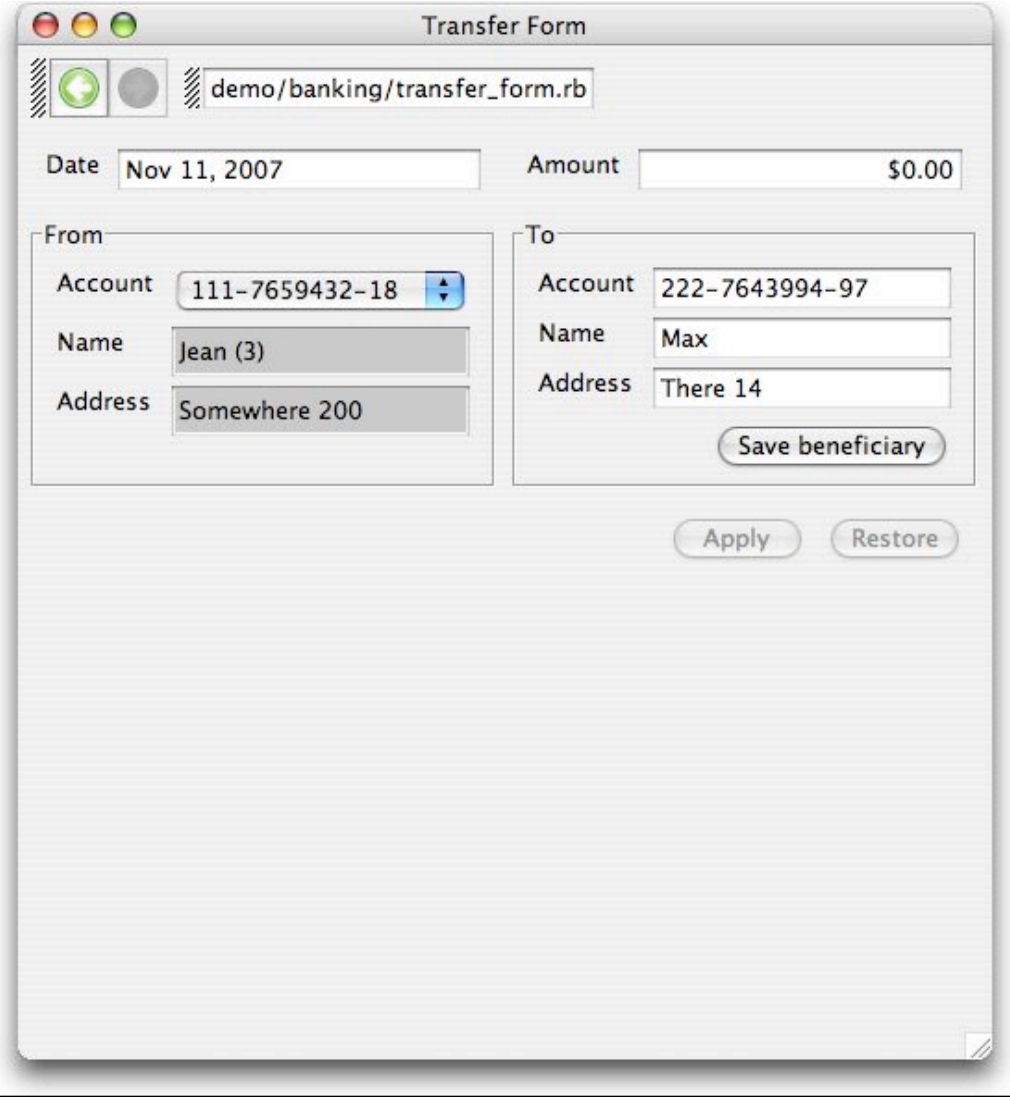
- jruby on rails, grails

looming problems/ opportunities

writing more declarative code via **dsl**s

build fluent interfaces

swiby: jruby + swing



```ruby
require 'transfer_ui'

from_accounts = Account.find_from_accounts
to_accounts = Account.find_to_accounts

current = Transfer.new 0.dollars, from_accounts[2], to_accounts[0]

title "Transfer Form"

content {
  data current
  input "Date", :value_date
  section
  input "Amount", :amount
  next_row
  section "From"
  combo "Account", from_accounts, :account_from do |selection|
      context['account_from.owner'].value = selection.owner
      context['account_from.address'].value = selection.address
  end
  input "Name", :account_from / :owner, :readonly => true
  input "Address", :account_from / :address, :readonly => true
  section "To"
  input "Account", :account_to / :number
  input "Name", :account_to / :owner
  input "Address", :account_to / :address
  button "Save beneficiary"
  next_row
  command :apply, :restore
}

$context.apply_styles $context.session.styles if $context.session.styles
$context.start
```


9
every nuance

java's back alleys

reflection

- "reflection is slow"
- no longer true

elegant solutions to problems

```java
public class Configuration {
    private Point _initialPosition;

    private Configuration(Dimension screenSize) {
        _initialPosition = new Point();
        _initialPosition.x = (int) screenSize.getWidth() / 2;
        _initialPosition.y = (int) screenSize.getHeight() / 2;
    }

    public int getInitialX() {
        return _initialPosition.x;
    }

    public int getInitialY() {
        return _initialPosition.y;
    }
}
```

```java
@Before public void setUp() {
    try {
        Constructor cxtor[] =
                Configuration.class.getDeclaredConstructors();
        cxtor[0].setAccessible(true);
        c = (Configuration) cxtor[0].newInstance(
                Toolkit.getDefaultToolkit().getScreenSize());
    } catch (Throwable e) {
        fail();
    }
}
```

```java
@Test
public void initial_position_set_correctly_upon_instantiation() {
    Configuration specialConfig = null;
    Dimension screenSize = null;
    try {
        Constructor cxtor[] =
                Configuration.class.getDeclaredConstructors();
        cxtor[0].setAccessible(true);
        screenSize = new Dimension(26, 26);
        specialConfig = (Configuration) cxtor[0].newInstance(screenSize);
    } catch (Throwable e) {
        fail();
    }

    Point expected = new Point();
    expected.x = (int) screenSize.getWidth() / 2;
    expected.y = (int) screenSize.getHeight() / 2;
    assertEquals(expected.x, specialConfig.getInitialX());
    assertEquals(expected.y, specialConfig.getInitialY());
}
```

regular expressions &

learn the nuances of java...

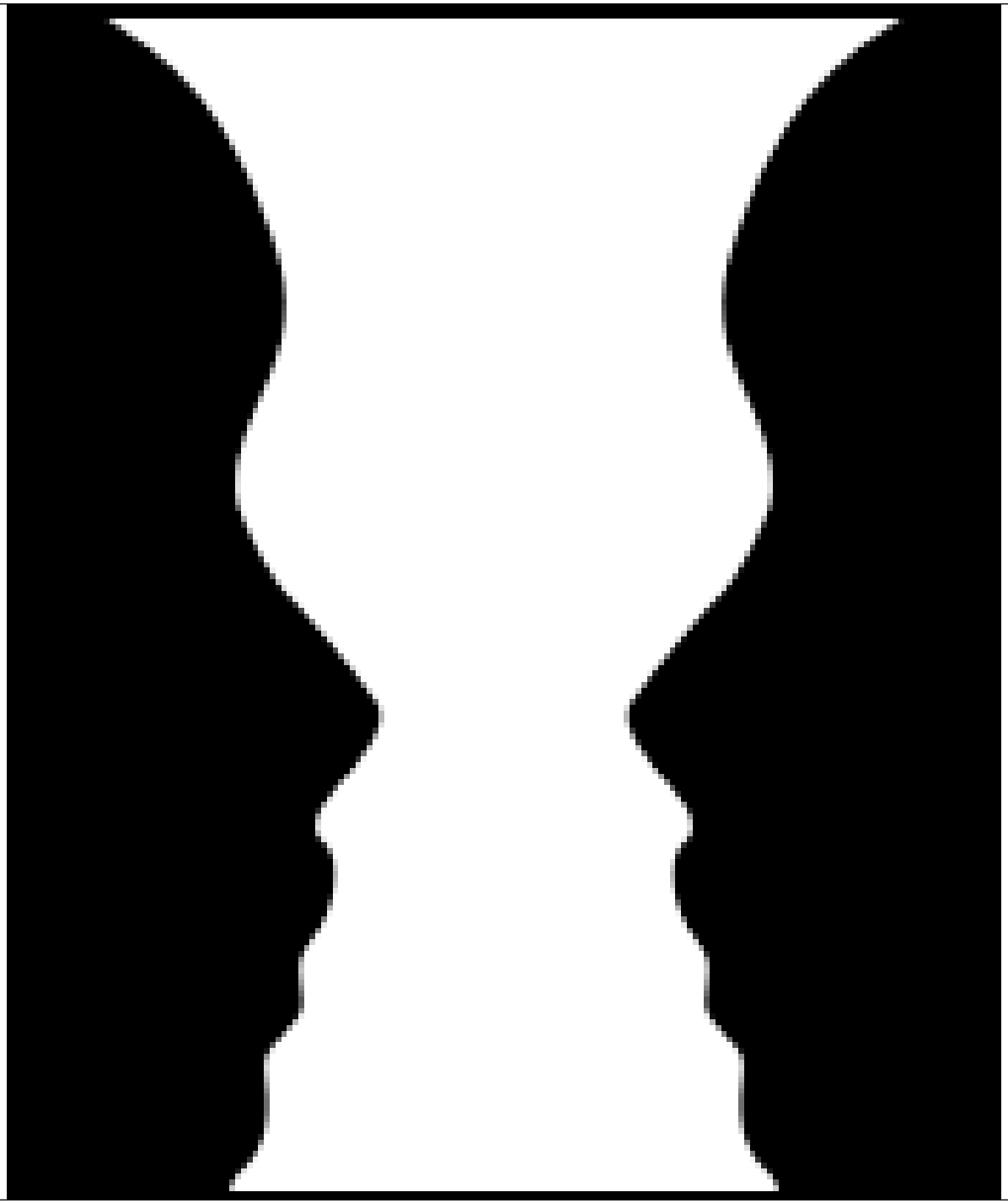
...then tell the other people on your project

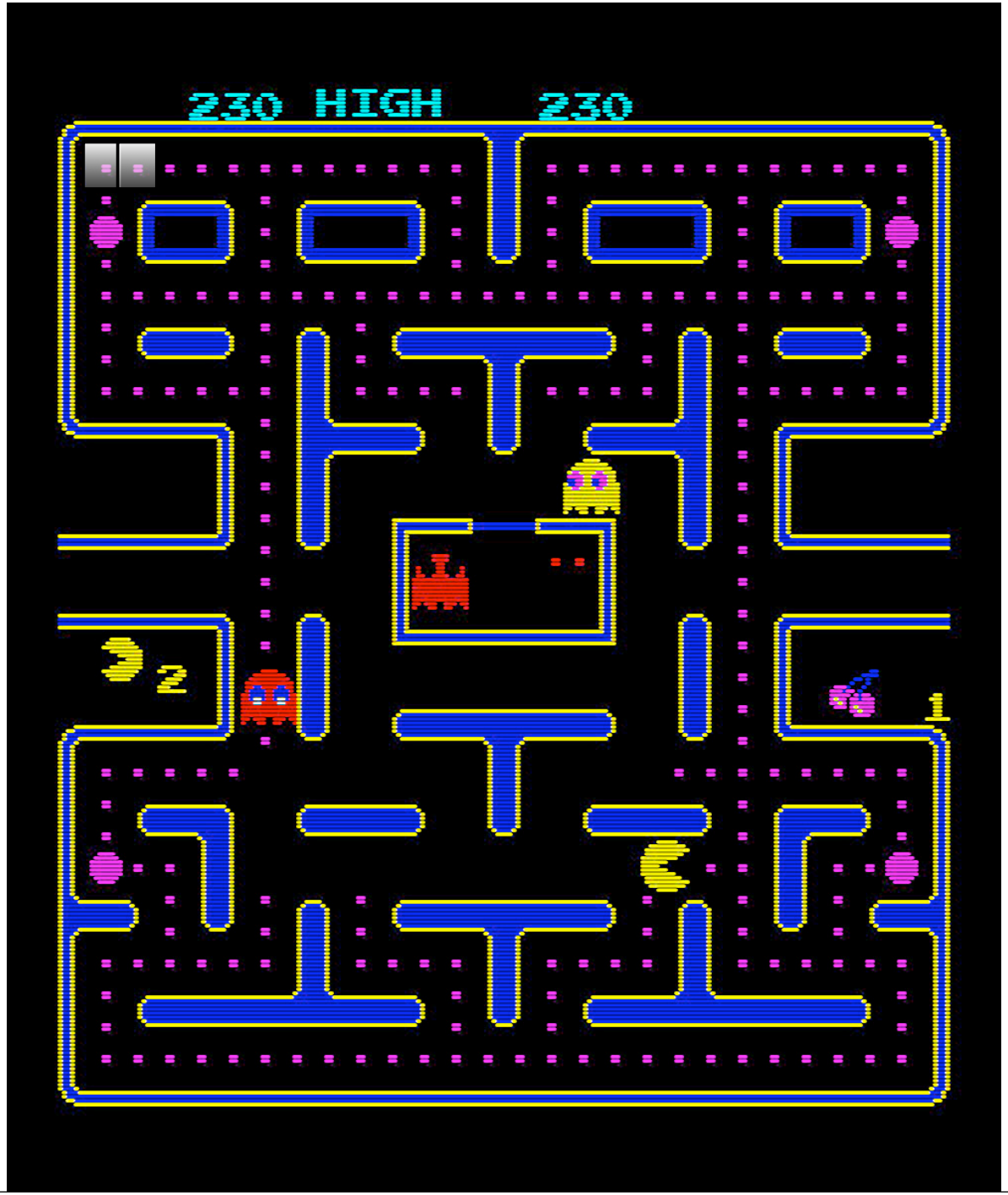
10 anti-objects

collaborative diffusion

"The metaphor of objects can go too far by making us try to create objects that are too much inspired by the real world."

"...an antiobject is a kind of object that appears to essentially do the opposite of what we generally think the object should be doing."

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questions?

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resources

An Initial Investigation of Test Driven Development in Industry -
Laurie Williams, Boby George
http://collaboration.csc.ncsu.edu/laurie/Papers/TDDpaperv8.pdf

findbugs
http://findbugs.sourceforge.net/

pmd/cpd
http://pmd.sourceforge.net/

The legend of the leaning tower
http://physicsworld.com/cws/article/print/16806

AntiPatterns Catalog
http://c2.com/cgi/wiki?AntiPatternsCatalog

resources

Smalltalk Best Practice Patterns Kent Beck
Prentice Hall PTR (October 13, 1996)
ISBN-10: 013476904X

Polyglot Programming
http://memeagora.blogspot.com/2006/12/polyglot-programming.html

Optical Illusions
http://en.wikipedia.org/wiki/Optical_illusion

Collaborative Diffusion: Programming Anti-objects - A Repenning
http://www.cs.colorado.edu/~ralex/papers/PDF/OOPSLA06antiobjects.pdf

resources
pair programming

http://c2.com/cgi/wiki?PairProgramming

http://www.xprogramming.com/Practices/PracPairs.html

http://collaboration.csc.ncsu.edu/laurie/Papers/XPSardinia.PDF

http://www.cs.utah.edu/~lwilliam/Papers/ieeeSoftware.PDF