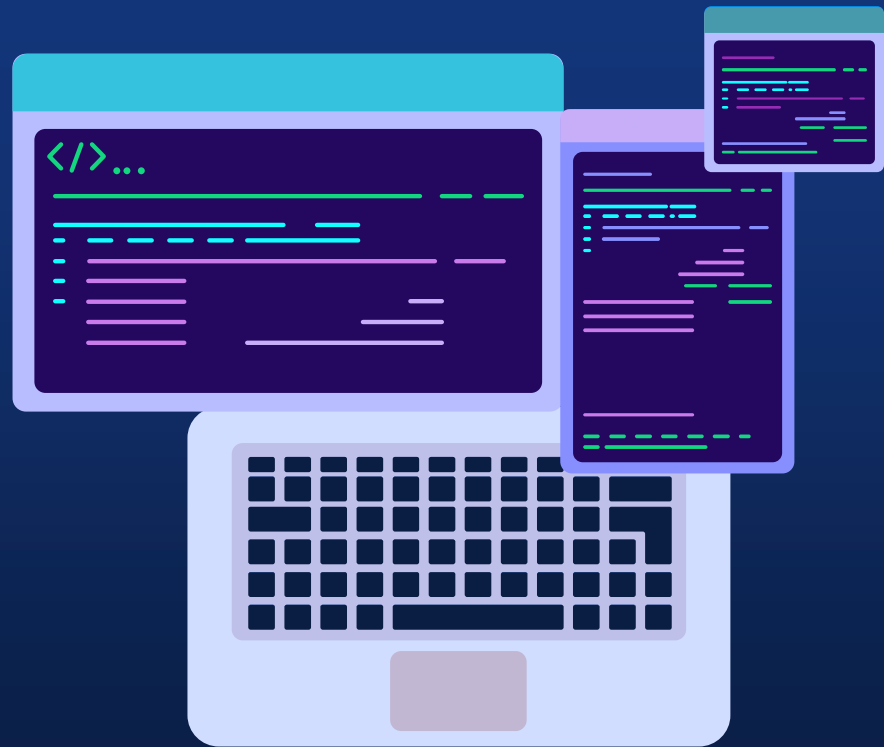


Software Design and Important concepts



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CONTENT



01

OOP Pillars

Inheritance, Polymorphism
Encapsulation, Abstraction

02

Clean Code

Meaningful Names,
Functions, Unit test
Code Smells...

03

SOLID

Single Responsibility
Open closed
Liskov Substitution
Interface Segregation
Dependency Inversion

04

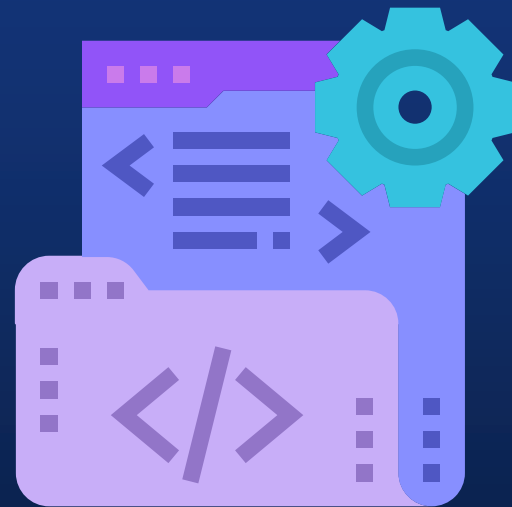
Design patterns

Singleton, Factory Method
Strategy, Observer
Builder...



02

Clean Code



The Goals of Software Design



To allow us to write software that is as helpful as possible.

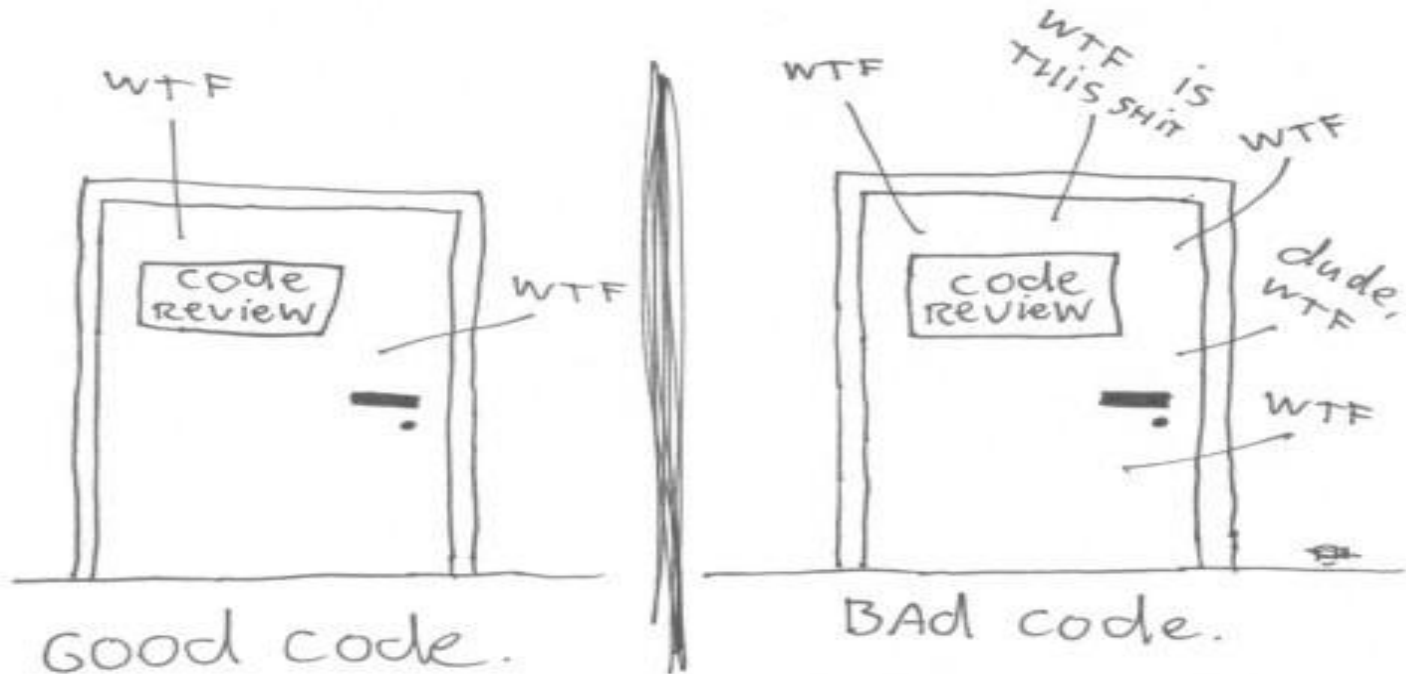


To allow our software to continue to be as helpful as possible.



To design systems that can be created and maintained as easily as possible by their programmers

The ONLY valid measurement
of code quality: WTFs/minute





Agenda

Code Smells



Environment, General...



Code Smells

```
41 static MappedField validateQuery(final Class clazz, final Mapper mapper, final StringBuilder origProp, final FilterOperator op, final  
42 MappedField mf = null) {  
43     final String prop = origProp.toString();  
44     boolean hasTranslations = false;  
45     if (!origProp.substring(0, 1).equals("$")) {  
46         final String[] parts = prop.split(regex: "\\.");  
47         if (clazz == null) { return null; }  
48         MappedClass mc = mapper.getMappedClass(clazz);  
49         //CHECKSTYLE:OFF  
50         for (int i = 0; ; ) {  
51             //CHECKSTYLE:ON  
52             final String part = parts[i];  
53             boolean fieldIsArrayOperator = part.equals("$");  
54             mf = mc.getMappedField(part);  
55             //translate from java field name to stored field name  
56             if (mf == null && !fieldIsArrayOperator) {  
57                 mf = mc.getMappedFieldByJavaName(part);  
58                 if (validateNames && mf == null) {  
59                     throw new ValidationException(format("The field '%s' could not be found in '%s' while validating - %s; if you wish  
60                     to use dot notation, please use the $ operator to denote array operators."));  
61                 }  
62                 hasTranslations = true;  
63                 if (mf != null) {  
64                     parts[i] = mf.getNameToStore();  
65                 }  
66                 i++;  
67                 if (mf != null && mf.isMap()) {  
68                     //skip the map key validation, and move to the next part  
69                     i++;  
70                 }  
71                 if (i >= parts.length) {  
72                     break;  
73                 }  
74                 if (!fieldIsArrayOperator) {  
75                     //catch people trying to search/update into @Reference/@Serialized fields  
76                     if (validateNames && !canQueryPast(mf)) {  
77                         throw new ValidationException(format("Cannot use dot-notation past '%s' in '%s'; found while validating - %s", part,  
78                         prop, mc.getClazz().getName()));  
79                     }  
80                     if (mf == null && mc.isInterface()) {  
81                         break;  
82                     }  
83                     else if (mf == null) {  
84                         throw new ValidationException(format("The field '%s' could not be found in '%s'", prop, mc.getClazz().getName()));  
85                     }  
86                     //get the next MappedClass for the next field validation  
87                     mc = mapper.getMappedClass(mf.isSingleValue() ? mf.getType() : mf.getSubClass());  
88                 }  
89                 //record new property string if there has been a translation to any part  
90                 if (hasTranslations) {  
91                     origProp.setLength(0); // clear existing content  
92                     origProp.append(parts[0]);  
93                     for (int i = 1; i < parts.length; i++) {
```

What's a prop?

What's a part?

Eek!

Why all the null checks?

Control the loop

Comments, because code is unclear

Parameter mutation!

Bad Comments - Obsolete Comments

```
MockRequest request;  
// Example: "Tue, 02 Apr 2003 22:18:49 GMT"  
private Response response;  
private FitNesseContext context;  
private FileResponder responder;  
private Locale saveLocale;  
private final String HTTP_DATE_REGEX =  
    "[SMTWTF][a-z]{2}\\s[0-9]{2}\\s[JFMASOND][a-z]{2}\\s"+  
    "[0-9]{4}\\s[0-9]{2}\\s:[0-9]{2}\\s:[0-9]{2}\\sGMT";
```


Bad Comments - Reduntant Comments

```
/**  
 * Returns the day of the month.  
 *  
 * @return the day of the month.  
 */  
public int getDayOfMonth() {  
    return dayOfMonth;  
}
```

Environment - Build Requires More Than One Step

```
svn get mySystem  
cd mySystem  
ant all
```

Environment - Tests Require More Than One Step

```
npm run test
```

Functions – Too Many Arguments

.....

```
public static String getHtml()
```

//AVOID

```
public static String get(String arg1, String arg2, String arg3, String arg4)
```

Functions - Output Arguments

```
public void addFooter(StringBuffer report) {  
    report.append("- 1 -")  
}
```

Functions - Flag Arguments

....

```
includeSetupAndTeardownPages(pageData, isSuite);
```

//To

```
includeSetupAndTeardownPagesForSuite(pageData);
```

```
includeSetupAndTeardownPagesForReport(pageData);
```

Functions - Dead Function

```
public static String get(String arg1){  
.....  
}
```

General -Multiple Languages in One Source File

```
?>

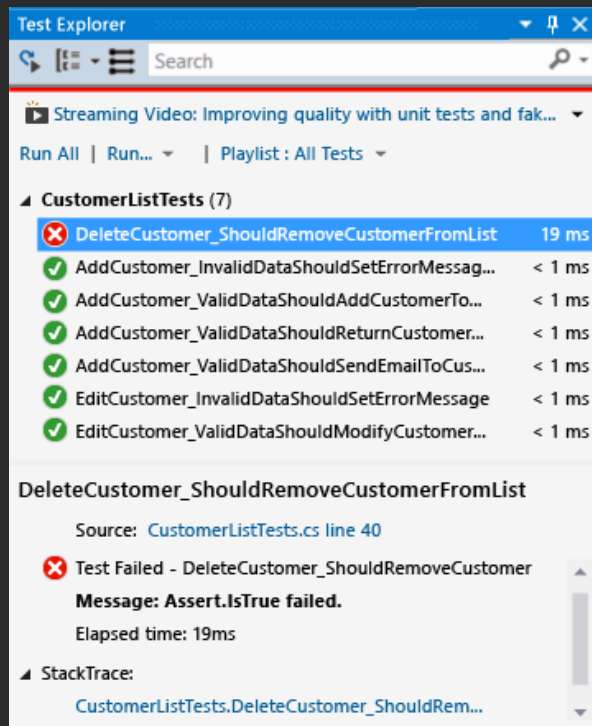
<DOCTYPE html>
<html>
  <head>
    <script>
      var x = 'some js variable';
      var y = <?=$x;?> // js variable set with php value;
    </script>

    <style type="text/css">

    </style>
  </head>
  <body>
    <div>
      <span>

      </span>
    </div>
  </body>
</html>
```


General - Incorrect Behavior at the Boundaries



The screenshot shows the Visual Studio Test Explorer window. At the top, there's a search bar and a 'Run All' button. Below that, a video thumbnail is visible. The main section shows a list of tests under the 'CustomerListTests' group. The test 'DeleteCustomer_ShouldRemoveCustomerFromList' is highlighted in blue and has a red 'X' icon, indicating it failed. The other tests have green checkmark icons and are marked as passed. The failed test's details are shown below the list, including the source file, the error message, and the stack trace.

Test Explorer

Streaming Video: Improving quality with unit tests and fak...

Run All | Run... | Playlist : All Tests

CustomerListTests (7)

- ✗ DeleteCustomer_ShouldRemoveCustomerFromList 19 ms
- ✓ AddCustomer_InvalidDataShouldSetErrorMessage... < 1 ms
- ✓ AddCustomer_ValidDataShouldAddCustomerTo... < 1 ms
- ✓ AddCustomer_ValidDataShouldReturnCustomer... < 1 ms
- ✓ AddCustomer_ValidDataShouldSendEmailToCus... < 1 ms
- ✓ EditCustomer_InvalidDataShouldSetErrorMessage < 1 ms
- ✓ EditCustomer_ValidDataShouldModifyCustomer... < 1 ms

DeleteCustomer_ShouldRemoveCustomerFromList

Source: CustomerListTests.cs line 40

✗ Test Failed - DeleteCustomer_ShouldRemoveCustomer

Message: Assert.IsTrue failed.

Elapsed time: 19ms

Stack Trace:

CustomerListTests.DeleteCustomer_ShouldRem...

General - Overridden Safeties



General - Duplication

```
public class CustomerNameChanger
{
    public void ChangeName(CustomerDbContext context, int customerId, string name)
    {
        var customer = context.Customer.SingleOrDefault(x => x.CustomerId == customerId);
        if(customer == null)
            throw new Exception(string.Format("Customer {0} was not found.", customerId));

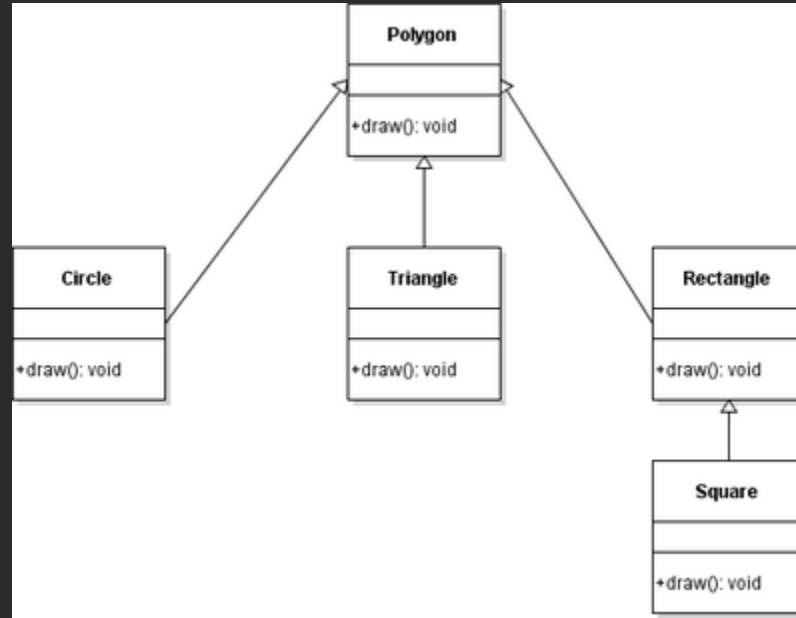
        customer.Name = name;
    }
}

public class CustomerAddressChanger
{
    public void ChangeAddress(CustomerDbContext context, int customerId, string address,
        string postalCode, string city)
    {
        var customer = context.Customer.SingleOrDefault(x => x.CustomerId == customerId);
        if(customer == null)
            throw new Exception(string.Format("Customer {0} was not found.", customerId));

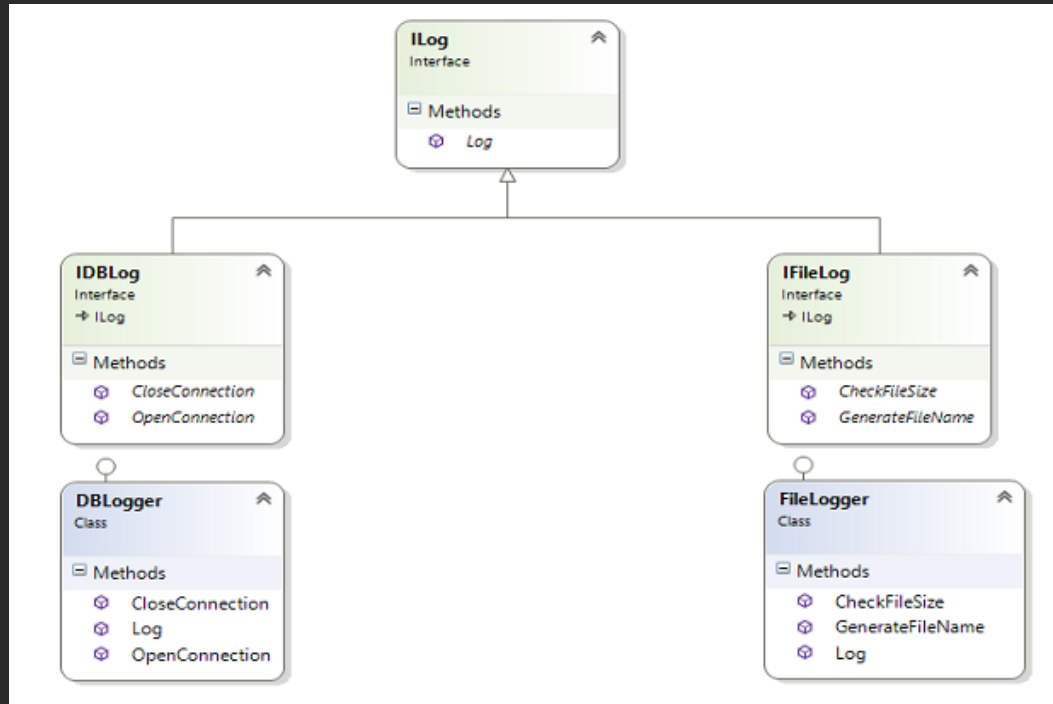
        customer.Address = address;
        customer.PostalCode = postalCode;
        customer.City = city;
    }
}
```

Duplicated Code

General - Base Classes Depending on Their Derivatives



General - Too Much Information



General – Dead Code

```
public static String getPath() {  
  
    String path = "";  
    try {  
        path = "c:/";  
    } catch (Exception exception) {  
        Logger.error(exception);  
    }  
    return path;  
}
```

General – Inconsistency

```
private static String processVerificationRequest() {  
  
}
```

.....

```
private static String processDeletionRequest() {  
  
}
```

General – Artificial Coupling

```
package com.common;  
  
public enum Type {  
    HTML, PDF  
}
```


General - Selector Arguments

.....

```
includeSetupAndTeardownPages(pageData, isSuite);
```

//To

```
includeSetupAndTeardownPagesForSuite(pageData);
```

```
includeSetupAndTeardownPagesForReport(pageData);
```

General - Obscured Intent

```
public int m_otCalc() {  
    return iThsWkd * iThsRte +  
        (int) Math.round(0.5 * iThsRte *  
            Math.max(0, iThsWkd - 400)  
        );  
}
```

//to

```
public int overTimePay() {  
    int overTimeTenths = Math.max(0, getTenthsWorked() - 400);  
    int overTimePay = overTimeBonus(overTimeTenths);  
    return straightPay() + overTimePay;  
}
```

General - Inappropriate Static

Math.max(double a, double b)



HourlyPayCalculator.calculatePay(employee, overtimeRate)



General - Function Names Should Say What They Do

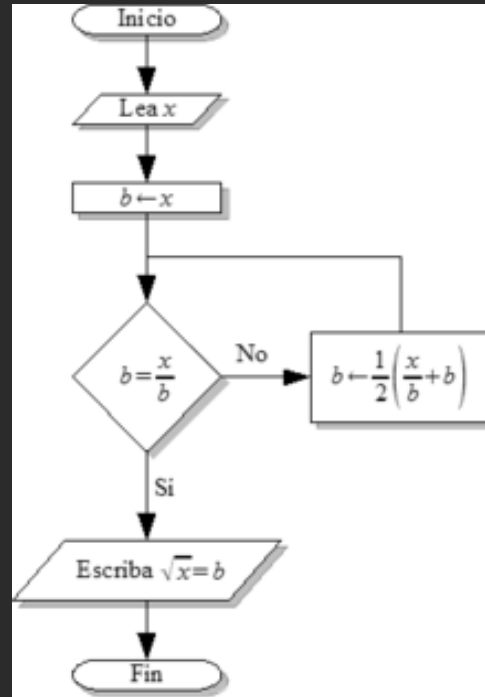
```
Date newDate = date.add(5);
```



```
Date newDate = date.addDays(5);
```



General - Understand the Algorithm



General - Replace Magic Numbers with Named Constants

```
int SECONDS_PER_DAY = 86400;  
int LINES_PER_PAGE = 55;  
double PI = 3.14;
```

General - Encapsulate Conditionals

`if (shouldBeDeleted(timer))`



`if (timer.hasExpired() && !timer.isRecurrent())`



General - Avoid Negative Conditionals

```
if (buffer.shouldCompact())
```



//is preferable to

```
if (!buffer.shouldNotCompact())
```



General - Encapsulate Boundary Conditions

```
if(level + 1 < tags.length)
{
    parts = new Parse(body, tags, level + 1, offset + endTag);
    body = null;
}

//to
int nextLevel = level + 1;
if(nextLevel < tags.length)
{
    parts = new Parse(body, tags, nextLevel, offset + endTag);
    body = null;
}
```

General - Avoid Transitive Navigation

```
a.getB().getC().doSomething();
```



```
myCollaborator.doSomething();
```



Names - Use Long Names for Long Scopes

```
private void rollMany(int n, int pins)
{
    for (int i=0; i<n; i++){
        roll(pins);
    }
}
```