

Design Tests

An Approach to Programmatically Check your Code Against Design Rules

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The Problem

- To Check code against design rules is an important activity to guarantee quality on source code
 - Design Review
 - Manual Process
 - Error-prone
 - Does not scale

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The Problem

- Gap between state-of-the-art and the state-of-the-practice
 - Approaches from the state-of-the-art are difficult to use

The Problem

Lack of structural conformance checking

Design decisions are violated

The Proposed Solution

Design Test

A test that checks whether an implementation complies with a given design rule expressed as an algorithm.

What's the big deal?

- **It is written in the target programming language**
- Automated test

Example of Design Rule

Only *controller* package shall access the *dao* package of the *peer* component.

Example of Design Test

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Design Test Pseudocode

```
1 daoPackage = org.ourgrid.peer.dao
2 controllerPackage = org.ourgrid.peer.controller
3 callers = daoPackage.getCallers()

4 FOR each caller IN callers DO
5   assert ( caller == daoPackage ) || ( caller == controllerPackage )
6 ENDFOR
```

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- Facts about the code (an API)

Example of Design Test

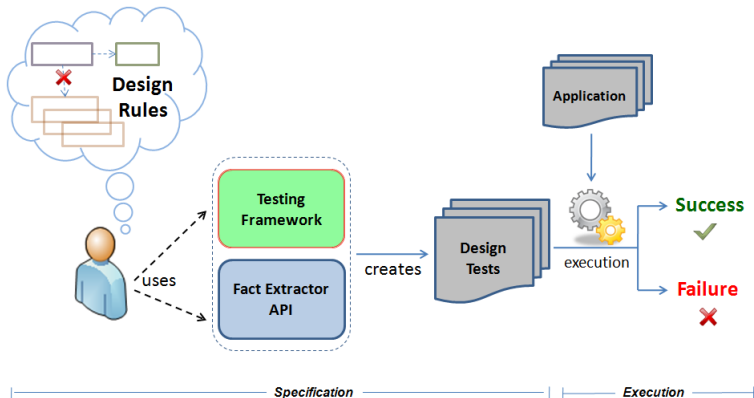
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Design Test Pseudocode

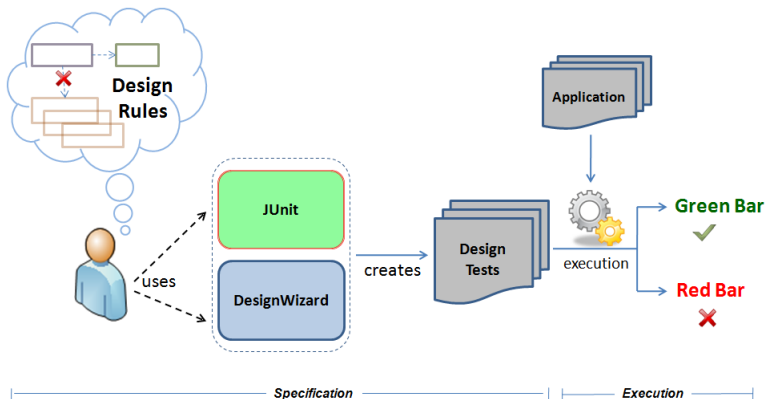
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- Facts about the code (an API)
- Assertion routines

Checking Code against Design Rules with Design Tests



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Design Test Execution

The screenshot shows an IDE window with two panes. The left pane displays the test execution results for 'JUnit'. It indicates that the test 'Finished after 6.888 seconds' and shows a summary: 'Runs: 1/1', 'Errors: 0', and 'Failures: 1'. Below this, a tree view shows the test class 'org.ourgrid.test.design.OurGridDesignTest' and the specific test method 'testCommunication (6.777 s)'. A 'Failure Trace' section is visible at the bottom of the left pane.

The right pane shows the source code for 'OurGridDesignTest.java'. The code is as follows:

```
package org.ourgrid.test.design;

import java.io.IOException;
import java.util.Set;

import junit.framework.TestCase;

import org.designwizard.design.PackageNode;
import org.designwizard.exception.InexistentEntityException;
import org.designwizard.main.DesignWizard;

public class OurGridDesignTest extends TestCase {

    public void testCommunication() throws IOException, InexistentEntityException {

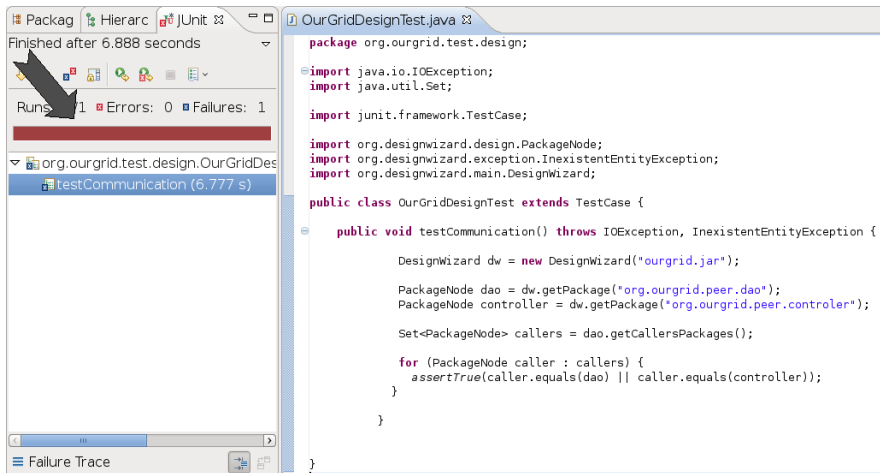
        DesignWizard dw = new DesignWizard("ourgrid.jar");

        PackageNode dao = dw.getPackage("org.ourgrid.peer.dao");
        PackageNode controller = dw.getPackage("org.ourgrid.peer.controller");

        Set<PackageNode> callers = dao.getCallersPackages();

        for (PackageNode caller : callers) {
            assertTrue(caller.equals(dao) || caller.equals(controller));
        }
    }
}
```

Design Test Execution



The screenshot displays an IDE interface with two main panels. The left panel shows the test execution results, and the right panel shows the source code for the test class.

Test Execution Results (Left Panel):

- JUnit icon and "JUnit" label.
- Status: "Finished after 6.888 seconds".
- Summary: "Runs: 1", "Errors: 0", "Failures: 1".
- Test Suite: "org.ourgrid.test.design.OurGridDes".
- Selected Test: "testCommunication (6.777 s)".
- Bottom section: "Failure Trace".

Source Code (Right Panel):

```
OurGridDesignTest.java
package org.ourgrid.test.design;

import java.io.IOException;
import java.util.Set;

import junit.framework.TestCase;

import org.designwizard.design.PackageNode;
import org.designwizard.exception.InexistentEntityException;
import org.designwizard.main.DesignWizard;

public class OurGridDesignTest extends TestCase {

    public void testCommunication() throws IOException, InexistentEntityException {

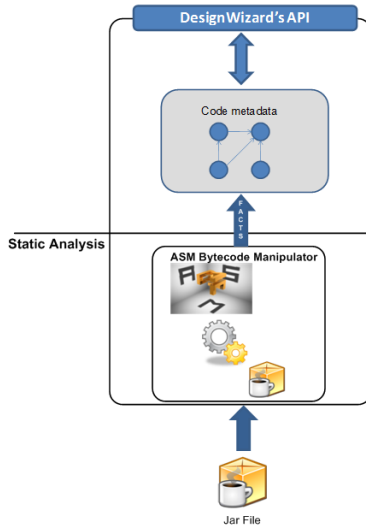
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        Set<PackageNode> callers = dao.getCallersPackages();

        for (PackageNode caller : callers) {
            assertTrue(caller.equals(dao) || caller.equals(controller));
        }
    }
}
```

DesignWizard



Early Evaluation

- OurGrid
 - 100KLOC
 - Execution time: 6.7 seconds
 - 10 violations

Early Evaluation

- All developers understood what the test was supposed to do
- They appreciated the way to check whether they are following the rules
- The test was added in the test suite of OurGrid in order to be performed daily

Examples of design rules to check

- Rules related to framework usage
- Law of Demeter
- Bug patterns

Benefits

- Design tests can express several design rules (Expressivity)
- Design tests are easy to compose/maintain
- Design tests are easy to be added into process development
- Design tests with DesignWizard scales

... but we still have to prove it!

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Thank you

www.designwizard.org