# „Design for Testability“ in der Praxis

Referent: David Völkel

4A Solutions

*Any Application*
*Anytime*
*Anywhere*

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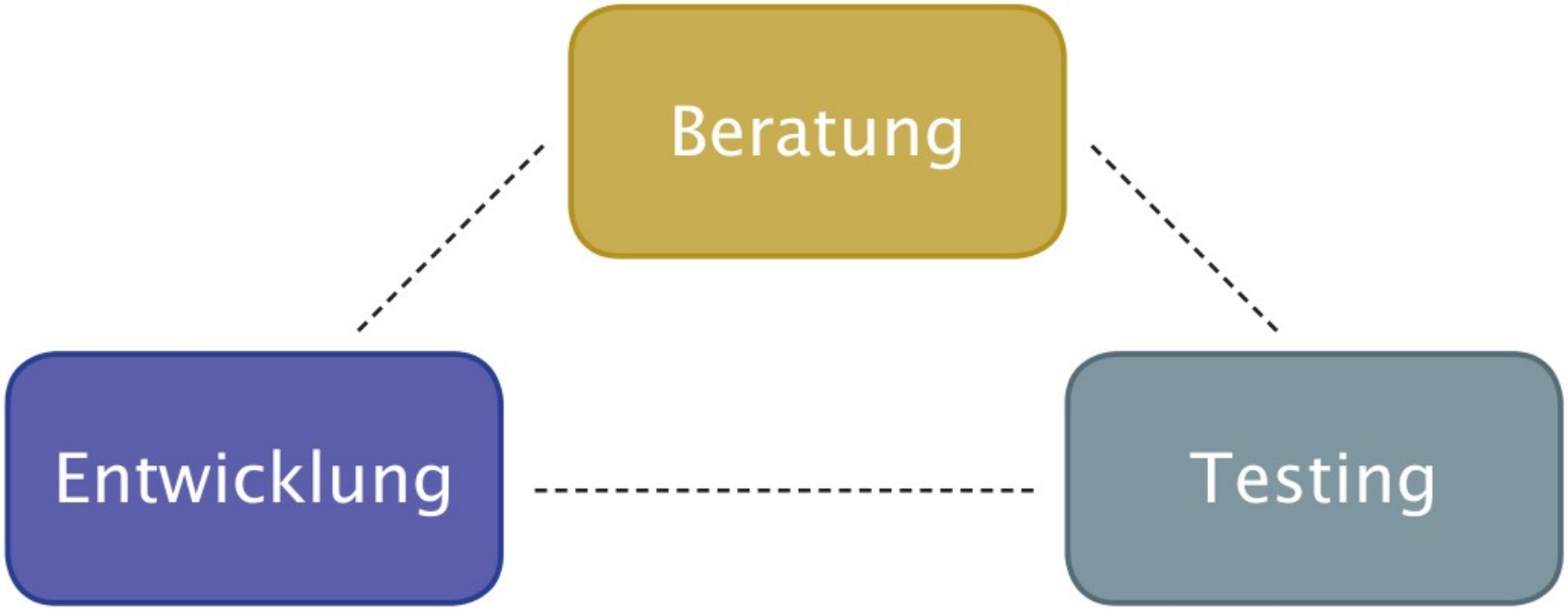
http://commons.wikimedia.org/wiki/File:CarService.JPG




David Völkel

4A Solutions

*Any Application*
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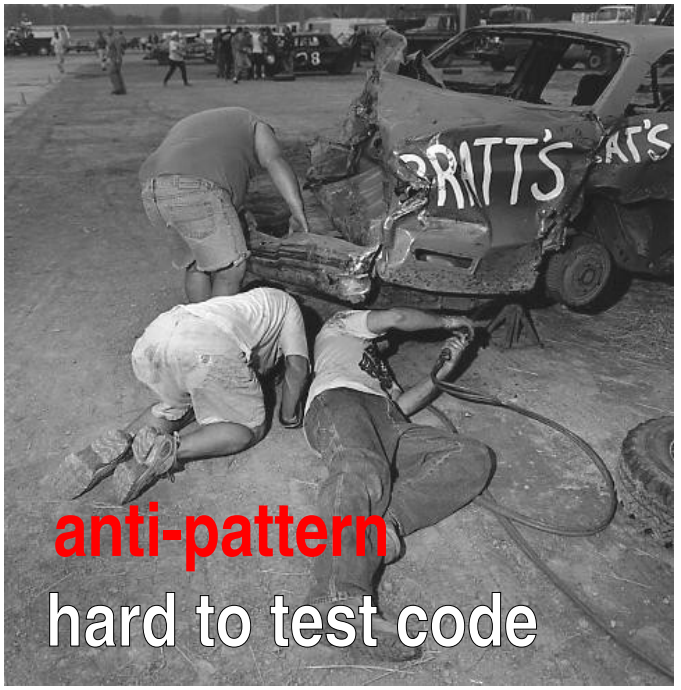
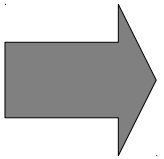
*Anywhere*

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http://commons.wikimedia.org/wiki/File:CarService.JPG

# Überblick

* Testbarkeit
* Test Driven Design vs. Legacy
* Isolation und Refactorings

# Testbarkeit

= Aufwand fürs Testen

Kriterien

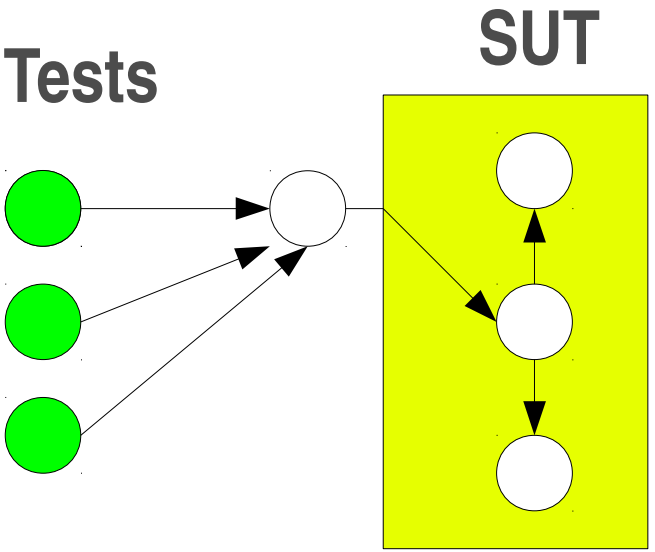
* operability
* decomposability
* observability
* controllability

# Design for Testability (DfT)

**Designziel**

* wenig Testaufwand

**Ursprung E-Technik**



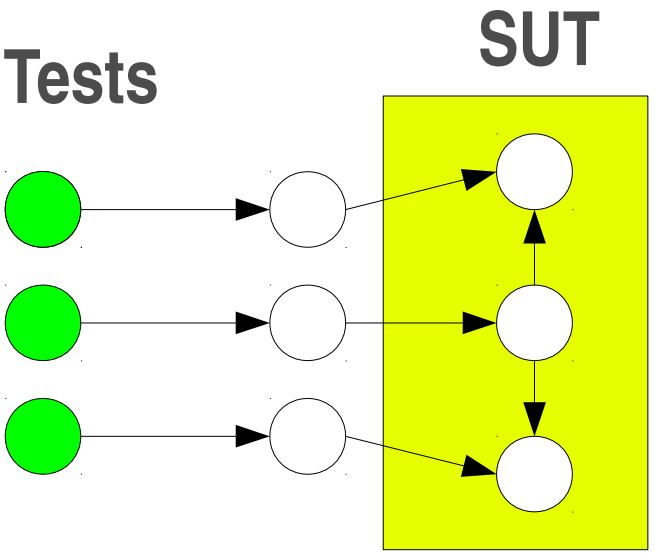
# Design for Testability (DfT)

**Designziel**

* wenig Testaufwand

**Ursprung E-Technik**

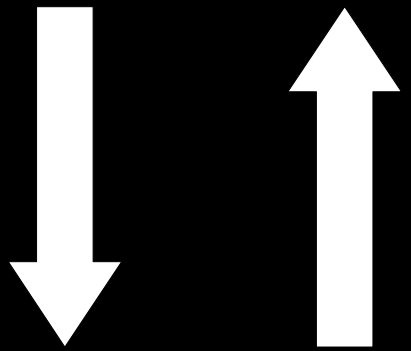
* Testschnittstellen




# Test Driven Design vs. Legacy

# Test Driven Development

write failing test



make the test pass



(refactor)

http://commons.wikimedia.org/wiki/File:Bluebird_land_speed_record_car_1935_rc10413.jpg

# Test Driven Development

write failing test

(refactor)

make the test pass

(refactor)

http://commons.wikimedia.org/wiki/File:Bluebird_land_speed_record_car_1935_rc10413.jpg

# Test Driven Development

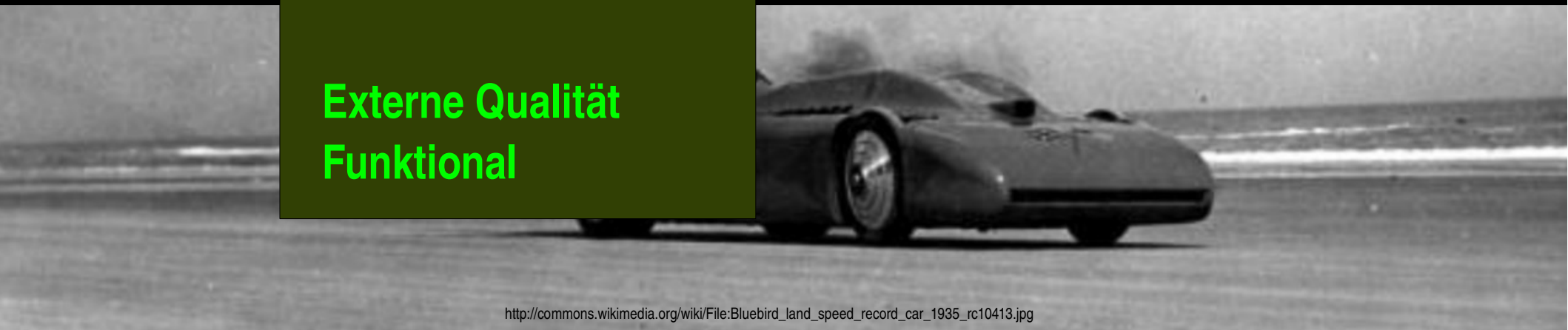
(refactor)

write failing test

make the test pass

(refactor)

Externe Qualität
Funktional



http://commons.wikimedia.org/wiki/File:Bluebird_land_speed_record_car_1935_rc10413.jpg

# Test Driven Development

write failing test

(refactor)

make the test

pass

(refactor)

Interne Qualität

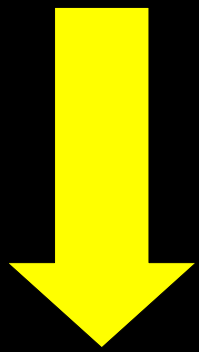
=> Test Driven Design

Externe Qualität

Funktional

# Test Driven Design

* Drive Design
  - kontinuierlich
  - minimalistisch (YAGNI)
  - testbar <=> gutes Design

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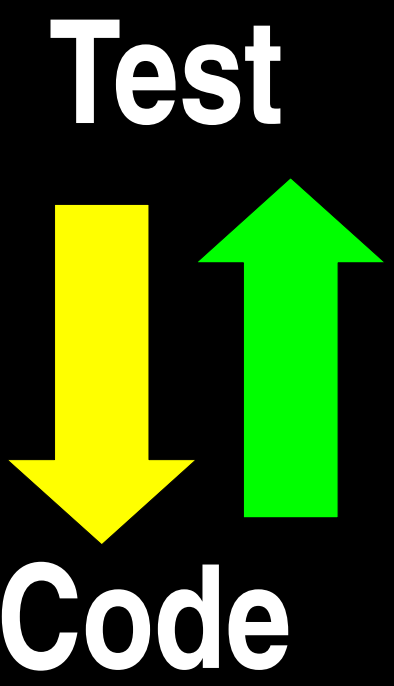
# Test Driven Design

* **Drive** Design
  - kontinuierlich
  - minimalistisch (YAGNI)
  - testbar <=> gutes Design
* **Feedback** auf Design
  - „Listen to your tests“!

(Zitat Johansen, 2010)

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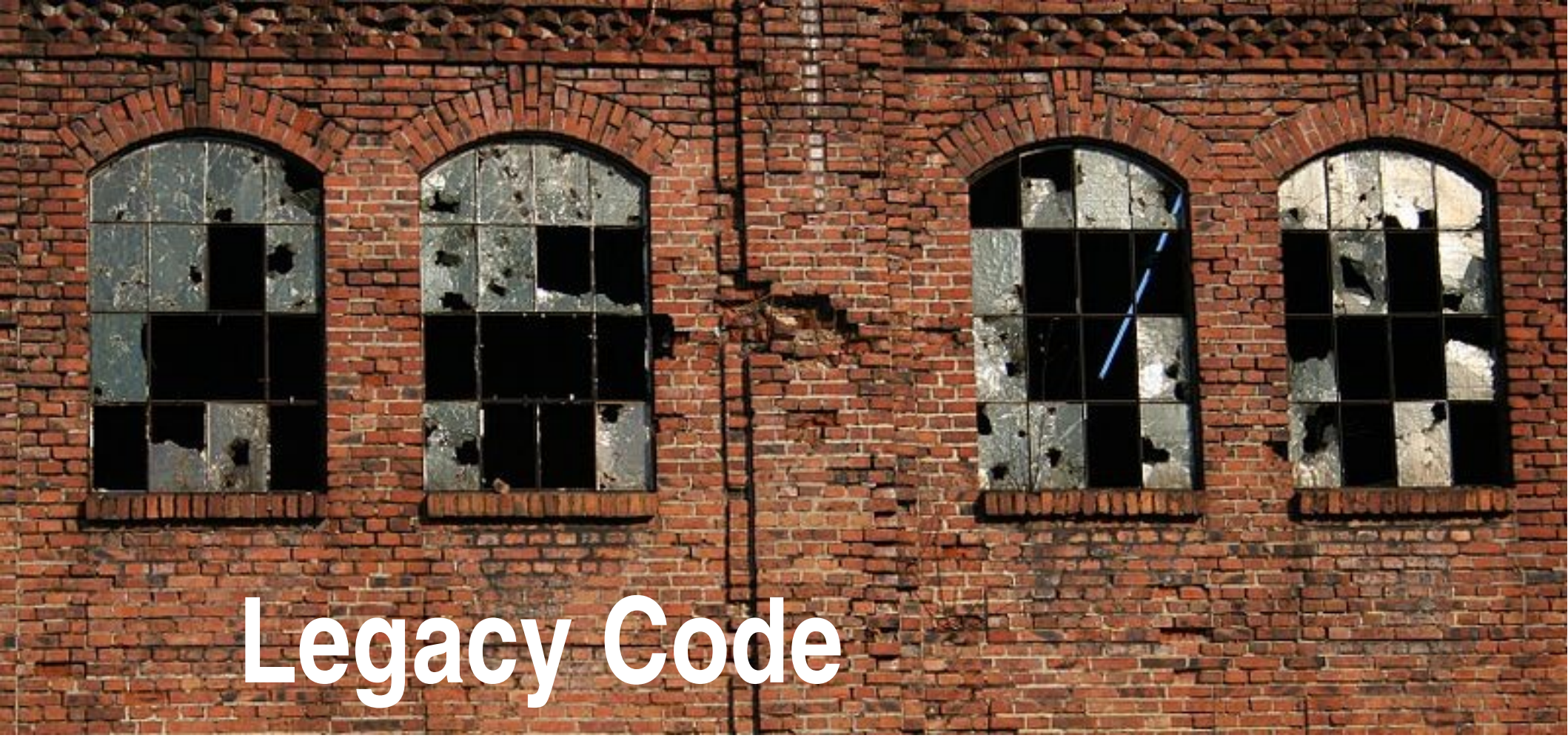

# Legacy Code

= keine Tests

schlecht testbares Design

* eigener Code
* 3rd Party Code (Frameworks)

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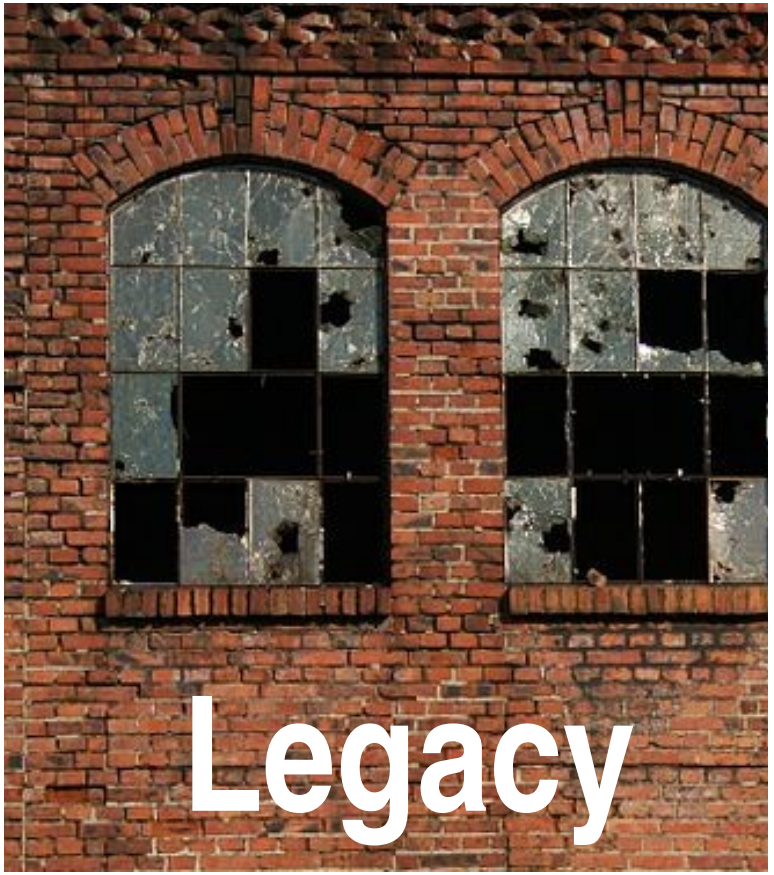


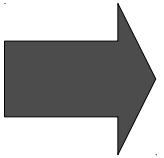


# Renovierung

## Doppelt schwierig

* Noch wenig KnowHow im Team
* Schwer testbarer Code

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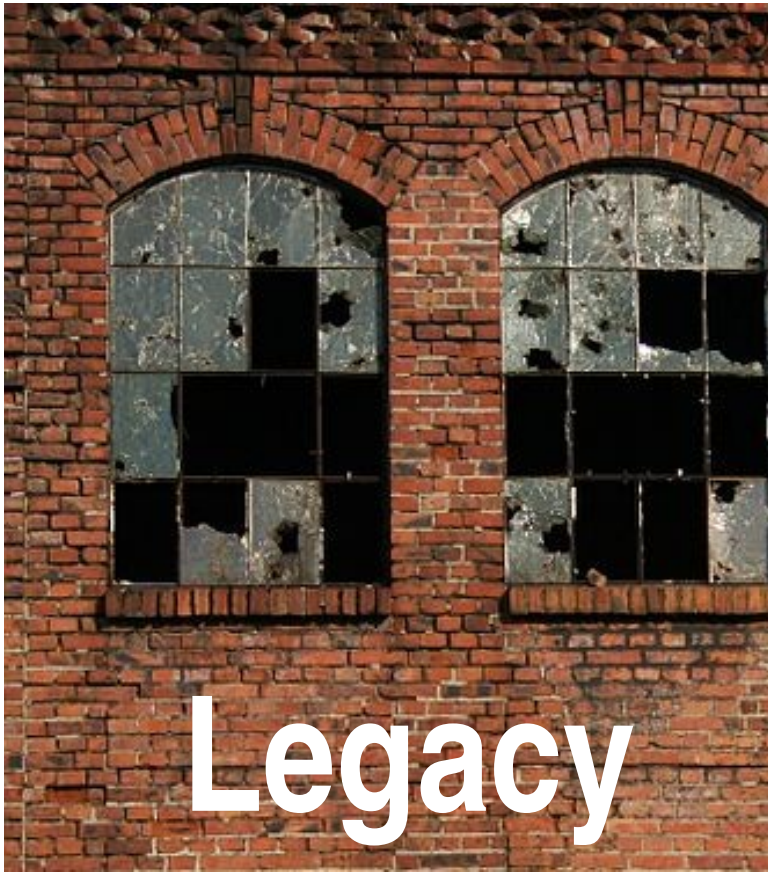
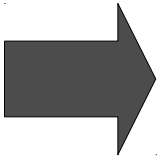
http://commons.wikimedia.org/wiki/File:Bluebird_land_speed_record_car_1935_rc10413.jpg




# Renovierung

* „Lazy“
* Fixierung mit Systemtests
* Refactoring
* Unittests für neue Features

Nach Feathers 2004

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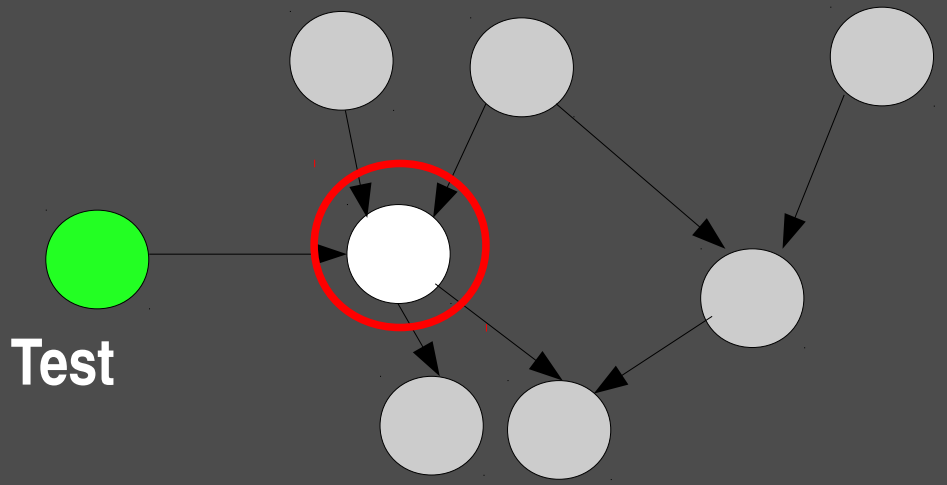
http://commons.wikimedia.org/wiki/File:Bluebird_land_speed_record_car_1935_rc10413.jpg

# Isolation

# Isolation

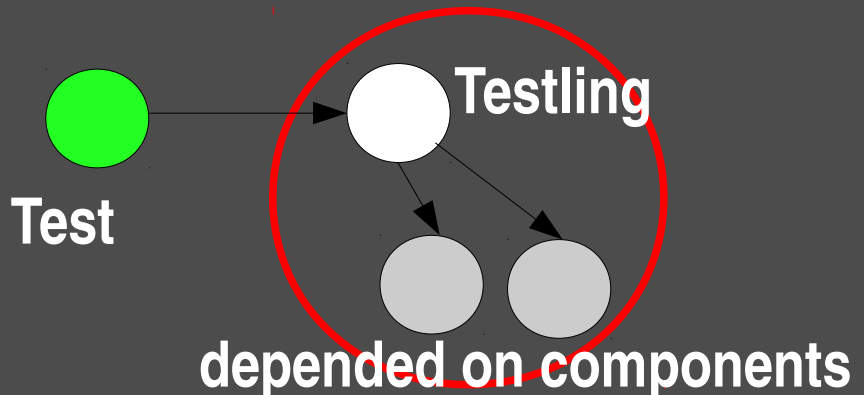
Ziele

* Klarer Fokus
  - Testaufwand sinkt
  - Fehlerlokalisierung einfacher
* Performanz




# front door

* KEINE Isolation
* round trip tests
* state verification





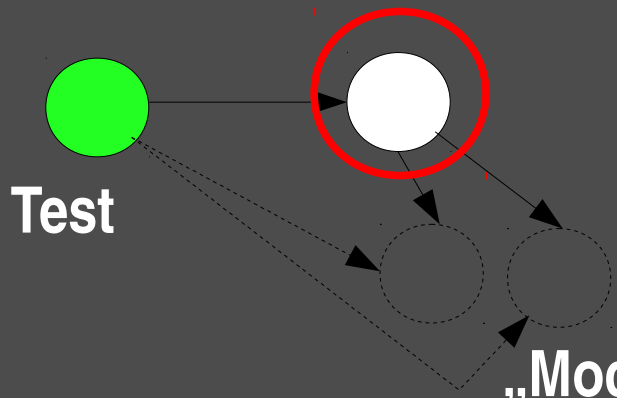
Begriffe nach Meszaros 2007

http://commons.wikimedia.org/wiki/File:Stork_Hotel_door.jpg

# back door

Unittests gegen

- Blätter
- „Units“ mit DOCs





Begriffe nach Meszaros 2007

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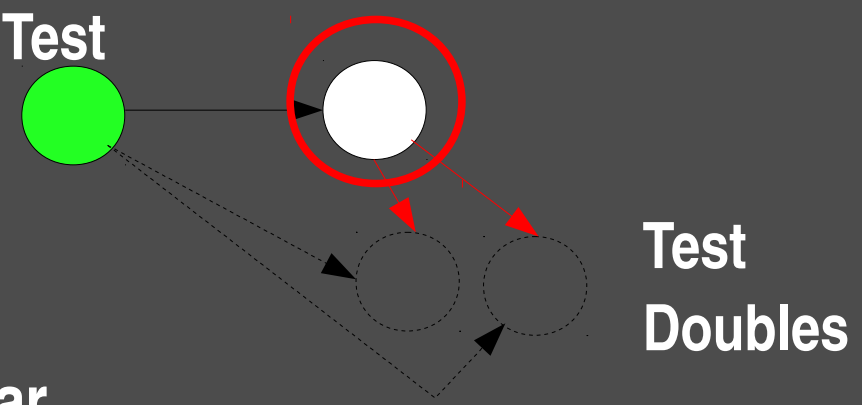
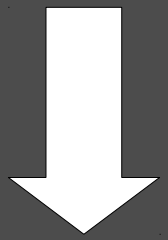
# Isolierbarkeit




Problem:

Test Doubles nicht setzbar

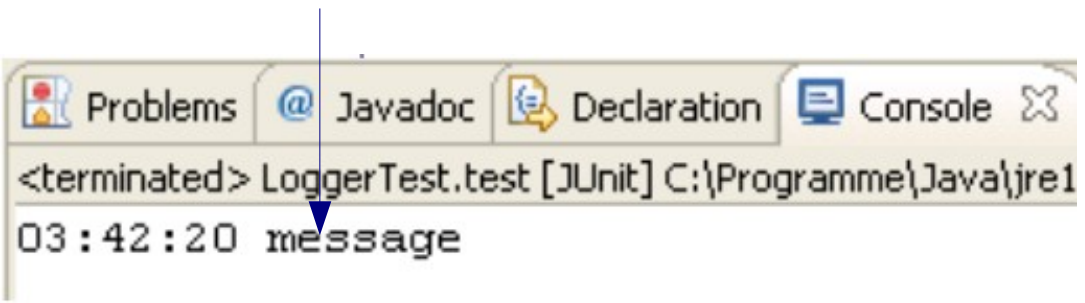


Refactorings

Isolierbar

# Beispiel: Logger

```
public class Logger {

    public void log(String message) {
        Date timeStamp = new Date();

        String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
                .format(timeStamp);

        System.out.println(formatedTimeStamp + " " + message);
    }

}
public class LoggerTest {
    @Test
    public void test() throws Exception {
        Logger logger = new Logger();
        logger.log("message");
    }
}
```

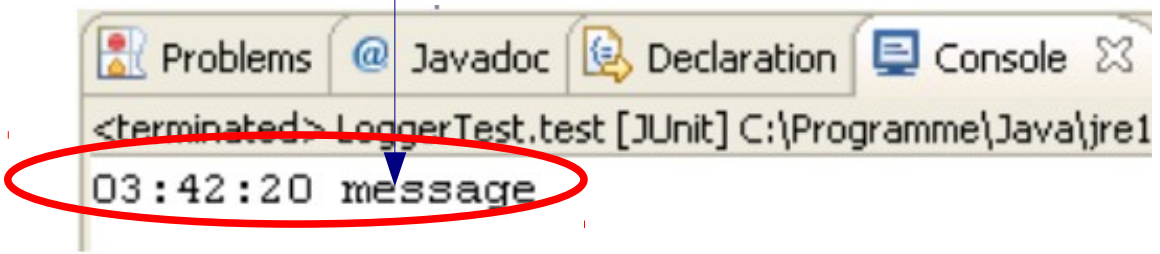


# Probleme

```
public class Logger {

    public void log(String message) {
        Date timeStamp = new Date();

        String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
                .format(timeStamp);

        System.out.println(formatedTimeStamp + " " + message);
    }

}
public class LoggerTest {
    @Test
    public void test() throws Exception {
        Logger logger = new Logger();
        logger.log("message");
    }
}
```

Controllability (INPUT)

Observability (OUTPUT)



# Ursachen

```
public class Logger {

    public void log(String message) {
        Date timeStamp = new Date();

        String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
                .format(timeStamp);

        System.out.println(formatedTimeStamp + " " + message);
    }

}
```

statische Abhängigkeiten

* Konstruktoraufrufe
* Singletons

# Statischer Aufruf => Objekte

```
public class Logger {

    public void log(String message) {
        Date timeStamp = timeSource.getTime();

        String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
                .format(timeStamp);

        String line = formatedTimeStamp + " " + message;
        lineAppender.append(line);
    }
```

Zitat aus Freeman / Pryce 2009

# Statischer Aufruf => Objekte

```
public class Logger {

    public void log(String message) {
        Date timeStamp = timeSource.getTime();

        String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
                .format(timeStamp);

        String line = formatedTimeStamp + " " + message;
        lineAppender.append(line);
    }
```

## Klasse <=> Interface

* weniger Aufwand
* „don't mock concrete classes“

* Abhängigkeiten expliziter
* geringer (ISP)
* Semantik durch Rollen

Zitat aus Freeman / Pryce 2009

# „Setzbarkeit“

```
public class Logger {

    public void log(String message) {..

    private TimeSource timeSource;
    private LineAppender lineAppender;

    public Logger(TimeSource timeSource, LineAppender lineAppender) {
        this.timeSource = timeSource;
        this.lineAppender = lineAppender;
    }

}
```

# Dependency Injection

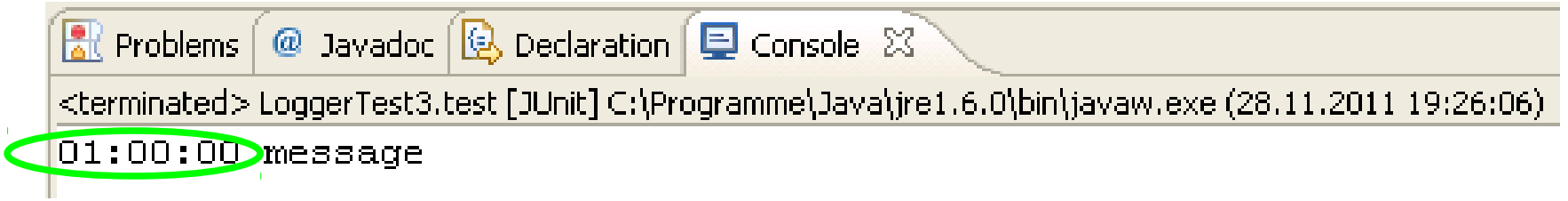
* DOCs setzbar
* Konstruktor vs. Setter
* kein `static`

http://commons.wikimedia.org/wiki/File:Syringe_Glove_01.jpg

# Stub mit Bordmittel

```
@Test
public void test() throws Exception {
    TimeSource timeSourceStub = new TimeSource() {
        public Date getTime() {
            return TIME_01_00_00;
        }
    };
    Logger logger = new Logger(timeSourceStub, CONSOLE_LINE_APPENDER);

    logger.log("message");
}
```

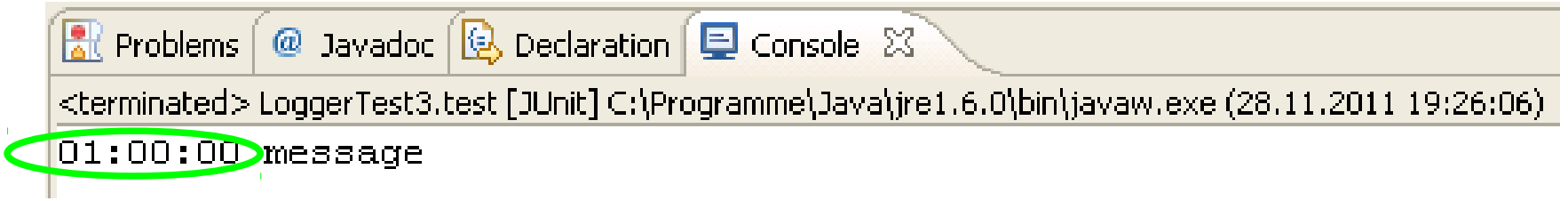
Controllability (INPUT)




* Input kontrollierbar
* etwas sperrig

# Stub mit Mockframework

```
@Test
public void test() throws Exception {
    TimeSource timeSourceStub = mock(TimeSource.class);
    stub(timeSourceStub.getTime()).toReturn(TIME_01_00_00);

    Logger logger = new Logger(timeSourceStub, CONSOLE_LINE_APPENDER);

    logger.log("message");
}
```




## einfacher bei breiteren Interfaces

# Test Spy mit Bordmitteln

```
@Test
public void test() throws Exception {
    // setup
    TimeSource timeSourceStub = mock(TimeSource.class);
    stub(timeSourceStub.getTime()).toReturn(TIME_01_00_00);

    LineAppenderTestSpy lineAppenderTestSpy = new LineAppenderTestSpy();

    Logger logger = new Logger(timeSourceStub, lineAppenderTestSpy);

    // execute
    logger.log("message");

    // verify
    assertEquals("01:00:00 message", lineAppenderTestSpy.line);
}

public class LineAppenderTestSpy implements LineAppender {

    public String line;

    @Override
    public void append(String line) {
        this.line = line;
    }

}
```

Observability (OUTPUT)

# Test Spy mit Mockframework

```
@Test
public void test() throws Exception {
    // setup
    TimeSource timeSourceStub = mock(TimeSource.class);
    stub(timeSourceStub.getTime()).toReturn(TIME_01_00_00);

    LineAppender lineAppenderTestSpy = mock(LineAppender.class);

    Logger logger = new Logger(timeSourceStub, lineAppenderTestSpy);

    // execute
    logger.log("message");

    // verify
    verify(lineAppenderTestSpy).append("01:00:00 message");
}
```

* knapp
* „behavior verification“

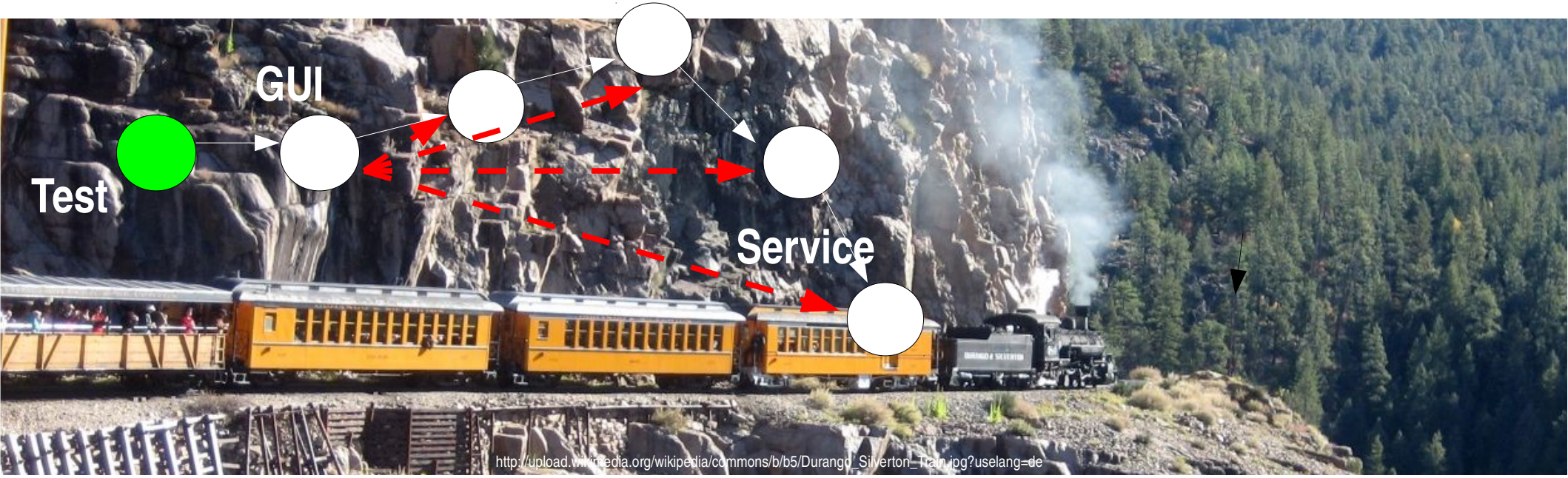
# Transitive Abhängigkeiten

```
public class CustomerGUI {

    public void renderCustomers() {

        service = application.getCustomerModule().getBusinessLayer().getCustomerSearchService();

        customers = service.searchAllCustomers();
                ...
    }
```

**„trainwreck code“**

Begriff von Freeman / Price 2009

**Problem: Implizite Abhängigkeiten**

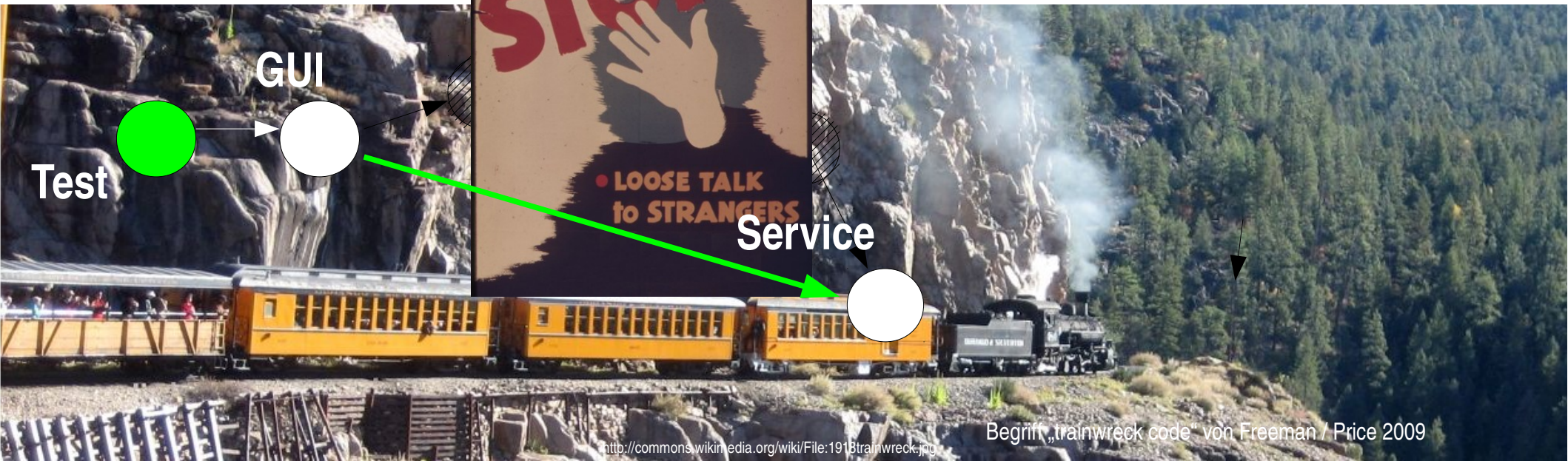



http://upload.wikimedia.org/wikipedia/commons/b/b5/Durango_Silverton_Train.jpg?uselang=de

# Transitive Abhängigkeiten

```
public class CustomerGUI {

    private CustomerSearchService service;

    public CustomerGUI(CustomerSearchService service) {
        this.service = service;
    }

    public void renderCustomers() {
        customers = service.searchAllCustomers();
    }
```

* Abhängigkeit explizit
* nur zu „Nachbarn“




Begriff „trainwreck code“ von Freeman / Price 2009

http://commons.wikimedia.org/wiki/File:1913trainwreck.jpg


http://commons.wikimedia.org/wiki/File:Syringe_Glove_01.jpg


http://commons.wikimedia.org/wiki/File:Crossroads.jpg

# Unfokussiert

```
public void log(String message) {
    Date timeStamp = timeSource.getTime();

    String formatedTimeStamp = new SimpleDateFormat("hh:mm:ss")
            .format(timeStamp);

    String line = formatedTimeStamp + " " + message;
    lineAppender.append(line);
}

@Test
public void testLog() throws Exception {
    ...

    // verify
    verify(lineAppenderTestSpy).append("01:00:00 message");
}
```

2 Aspekte auf einmal

# Extract Class Refactoring

```
public void log(String message) {
    Date timeStamp = timeSource.getTime();

    String formatedTimeStamp = timeStampFormatter.format(timeStamp);

    String line = formatedTimeStamp + " " + message;
    lineAppender.append(line);
}
```

fokussierter

```
@Test
public void testTimeStampFormat() throws Exception {
    assertEquals("01:00:00", formatter.format(TIME_01_00_00));
}
```

einfacher testbar

```
@Test
public void testTimeStampHourLimit() throws Exception {
    assertEquals("01:59:59", formatter.format(TIME_01_59_59));
}

...
```

# DfT Strategie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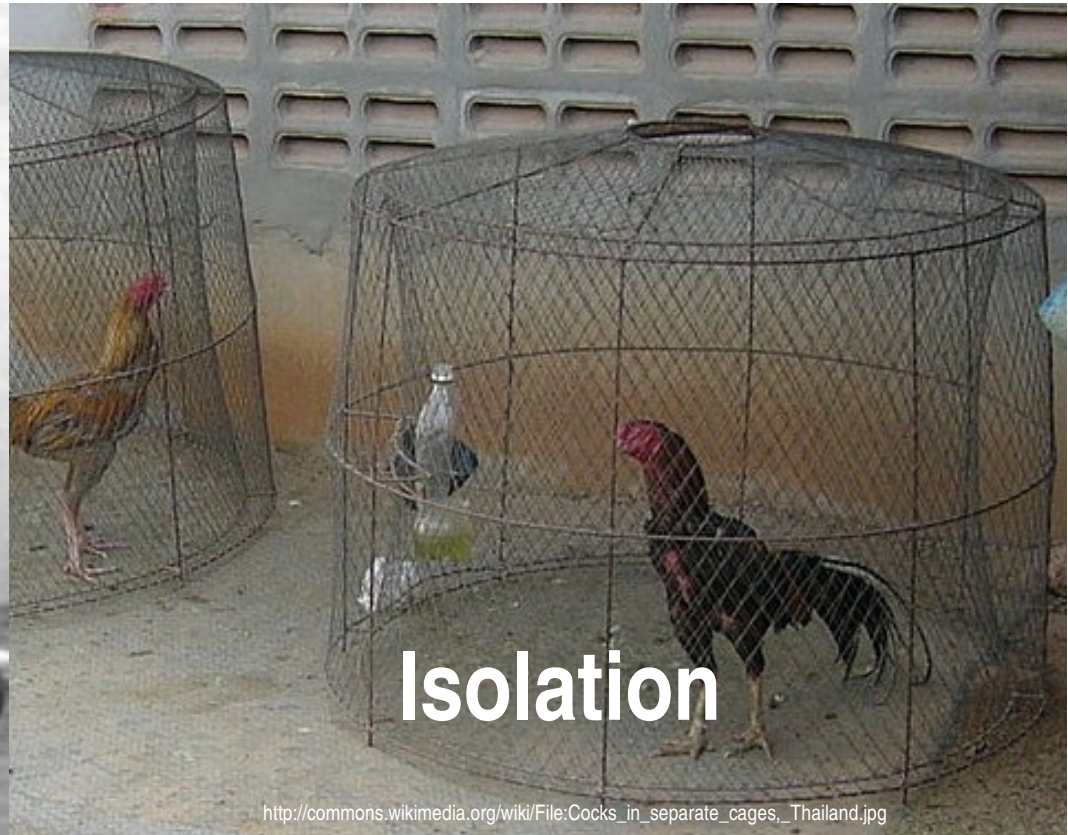


http://commons.wikimedia.org/wiki/File:Cocks_in_separate_cages,_Thailand.jpg

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# Fragen und Diskussion

4A Solutions

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*Anytime*
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